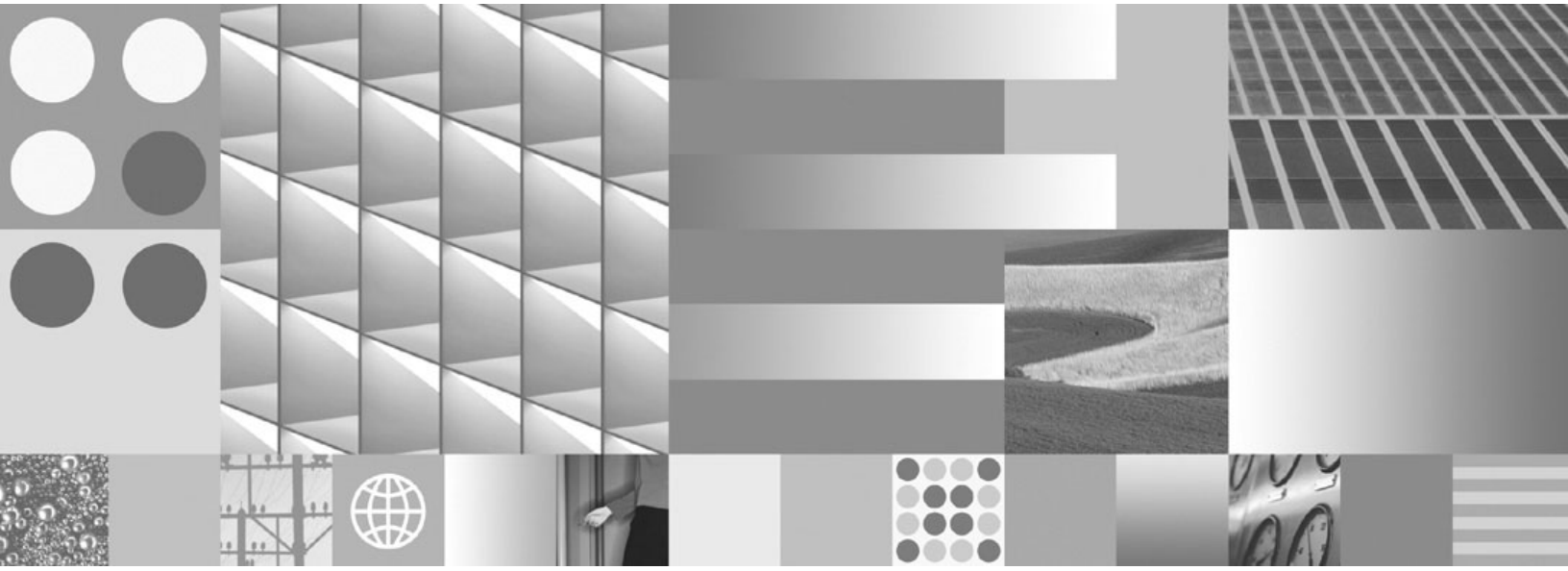
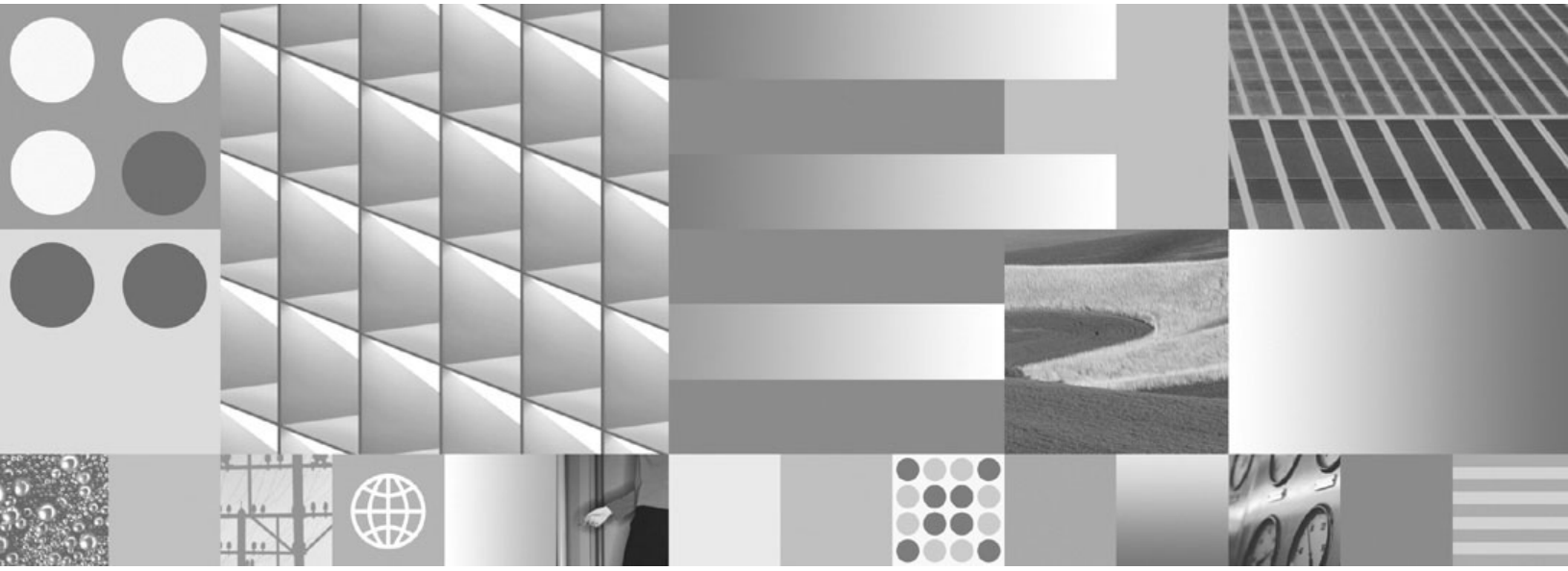
DB2 Version 9.5
for Linux, UNIX, and Windows



Administrative API Reference
Updated April, 2009

SC23-5842-02

DB2 Version 9.5
for Linux, UNIX, and Windows



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Note

Before using this information and the product it supports, read the general information under Appendix D, "Notices," on page 591.

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Contents

About this book

This book provides information about the use of application programming interfaces (APIs) to execute database administrative functions. It presents detailed information on the use of database manager API calls in applications written in the following programming languages:

- C
- C++
- COBOL
- FORTRAN
- REXX

For a compiled language, an appropriate precompiler must be available to process the statements. Precompilers are provided for all supported languages.

Who should use this book

It is assumed that the reader has an understanding of database administration and application programming, plus a knowledge of:

- Structured Query Language (SQL)
- The C, C++, COBOL, FORTRAN, and/or REXX programming languages
- Application program design

How this book is structured

This book provides the reference information needed to use the administrative APIs in application development.

The major subject areas discussed in the chapters of this book are as follows:

Overview of administrative APIs and data structures

- Chapter 1, "DB2® APIs," includes tables that list administrative APIs, include files, and sample programs.
- Chapter 2, "Changed APIs and data structures," uses tables to list supported and unsupported APIs and data structures that have changed.
- Chapter 3, "How the API descriptions are organized," describes how API descriptions are organized and lists the include files for DB2 API applications.

APIs

- Chapter 4, "Administrative APIs," alphabetically lists the DB2 administrative APIs.
- Chapter 5, "Calling DB2 APIs in REXX," describes how to call DB2 APIs from a REXX application.
- Chapter 6, "Indoubt transaction management APIs," presents a set of APIs provided for tool writers to perform heuristic functions on indoubt transactions.
- Chapter 7, "Threaded applications with concurrent access," describes DB2 APIs that can be used in threaded applications.

Plug-in APIs

- Chapter 8, "DB2 database system plug-ins for customizing database management," presents the security, backup, restore, log archiving, and compression/decompression for backup images plug-in APIs that you and third-party vendors can use to customize certain database management functions.

Data structures

- Chapter 9, "Data structures used by APIs," describes the data structures used by APIs.

Appendixes

- Appendix A, "Precompiler customization APIs," provides a link on where to obtain information about a set of documented APIs that enable other application development tools to implement precompiler support for DB2 directly within their products.
- Appendix B, "DB2 log records," describes the structure of the various DB2 log records.

Highlighting conventions

The following highlighting conventions are used in this book.

Bold	Indicates commands, keywords, and other items whose names are predefined by the system.
Italics	Indicates one of the following: • Names or values (variables) that must be supplied by the user • General emphasis • The introduction of a new term • A reference to another source of information
`Monospace`	Indicates one of the following: • Files and directories • Information that you are instructed to type at a command prompt or in a window • Examples of specific data values • Examples of text similar to what might be displayed by the system • Examples of system messages • Samples of programming code

Chapter 1. DB2 APIs

The following tables show the DB2 APIs with the DB2 samples. The first table lists the DB2 APIs grouped by functional category, their respective include files, and the sample programs that demonstrate them (see the note after the table for more information on the include files). The second table lists the C/C++ sample programs and shows the DB2 APIs demonstrated in each C/C++ program. The third table shows the COBOL sample programs and the DB2 APIs demonstrated in each COBOL program.

DB2 APIs, Include files, and Sample Programs
Table 1.

C/C++ Sample Programs with DB2 APIs
Table 2 on page 13.

COBOL Sample Programs with DB2 APIs
Table 3 on page 16.

Table 1. DB2 APIs, Include files, and Sample Programs

API Type	DB2 API	Include File	Sample Programs
Database control APIs	"db2DatabaseQuiesce - Quiesce the database" on page 62	db2ApiDf	n/a
Database control APIs	"db2DatabaseUnquiesce - Unquiesce database" on page 66	db2ApiDf	n/a
Database control APIs	"db2DatabaseRestart - Restart database" on page 63	db2ApiDf	C: dbconn.sqc C++: dbconn.sqC
Database control APIs	"sqlecrea - Create database" on page 312	sqlenv	C: dbcreate.c dbrecov.sqc dbsample.sqc C++: dbcreate.C dbrecov.sq COBOL: db_udcs.cbl dbconf.cbl ebcdicdb.cbl
Database control APIs	"sqlecran - Create a database on a database partition server" on page 310	sqlenv	n/a
Database control APIs	"sqledrpd - Drop database" on page 324	sqlenv	C: dbcreate.c C++: dbcreate.C COBOL: dbconf.cbl
Database control APIs	"sqledpan - Drop a database on a database partition server" on page 323	sqlenv	n/a
Database control APIs	"sqlemgdb - Migrate previous version of DB2 database to current version" on page 341	sqlenv	C: dbmigrat.c C++: dbmigrat.C COBOL: migrate.cbl
Database control APIs	"db2XaListIndTrans - List indoubt transactions" on page 378	db2ApiDf	n/a
Database control APIs	"sqle_activate_db - Activate database" on page 295	sqlenv	n/a
Database control APIs	"sqle_deactivate_db - Deactivate database" on page 297	sqlenv	n/a
Database control APIs	"sqlcspqy - List DRDA indoubt transactions" on page 294	sqlxa	n/a
Database control APIs	"db2SetWriteForDB - Suspend or resume I/O writes for database" on page 254	db2ApiDf	n/a

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Database control APIs	"sqlefrce - Force users and applications off the system" on page 329	sqlenv	C: dbconn.sqc dbsample.sqc instart.c C++: dbconn.sqC instart.C COBOL: dbstop.cbl
Instance control APIs	"db2InstanceStart - Start instance" on page 138	db2ApiDf	C: instart.c C++: instart.C
Instance control APIs	"db2InstanceStop - Stop instance" on page 143	db2ApiDf	C: instart.c C++: instart.C
Instance control APIs	"db2InstanceQuiesce - Quiesce instance" on page 136	db2ApiDf	n/a
Instance control APIs	"db2InstanceUnquiesce - Unquiesce instance" on page 146	db2ApiDf	n/a
Instance control APIs	"sqleatin - Attach to instance" on page 303	sqlenv	C: inattach.c utilapi.c C++: inattach.C utilapi.C COBOL: dbinst.cbl
Instance control APIs	"sqleatcp - Attach to instance and change password" on page 301	sqlenv	C: inattach.c C++: inattach.C COBOL: dbinst.cbl
Instance control APIs	"sqledtin - Detach from instance" on page 327	sqlenv	C: inattach.c utilapi.c C++: inattach.C utilapi.C COBOL: dbinst.cbl
Instance control APIs	"sqlegins - Get current instance" on page 338	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dbinst.cbl
Instance control APIs	"sqluadau - Get current user's authorities" on page 362 **Note:** This API is deprecated for DB2 V9.5.	sqlutil	n/a
Instance control APIs	"db2UtilityControl - Set the priority level of running utilities" on page 271	db2ApiDf	n/a
Database manager and database configuration APIs	"db2CfgGet - Get the database manager or database configuration parameters" on page 51	db2ApiDf	C: dbinfo.c dbrecov.sqc ininfo.c tscreate.sqc C++: dbinfo.C dbrecov.sqC ininfo.C tscreate.sqC
Database manager and database configuration APIs	"db2CfgSet - Set the database manager or database configuration parameters" on page 54	db2ApiDf	C: dbinfo.c dbrecov.sqc ininfo.c C++: dbinfo.C dbrecov.sqC ininfo.C
Database manager and database configuration APIs	"db2AutoConfig - Access the Configuration Advisor" on page 37	db2AuCfg	C: dbcfg.sqc C++: dbcfg.sqC
Database manager and database configuration APIs	"db2AutoConfigFreeMemory - Free the memory allocated by the db2AutoConfig API" on page 41	db2AuCfg	C: dbcfg.sqc C++: dbcfg.sqC
Database monitoring APIs	"db2GetSnapshotSize - Estimate the output buffer size required for the db2GetSnapshot API" on page 97	db2ApiDf	n/a
Database monitoring APIs	"db2AddSnapshotRequest - Add a snapshot request" on page 31	db2ApiDf	n/a

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Database monitoring APIs	"db2MonitorSwitches - Get or update the monitor switch settings" on page 187	db2ApiDf	C: utilsnap.c C++: utilsnap.C
Database monitoring APIs	"db2GetSnapshot - Get a snapshot of the database manager operational status" on page 94	db2ApiDf	C: utilsnap.c C++: utilsnap.C
Database monitoring APIs	"db2ResetMonitor - Reset the database system monitor data" on page 217	db2ApiDf	n/a
Database monitoring APIs	"db2ConvMonStream - Convert the monitor stream to the pre-version 6 format" on page 57	db2ApiDf	n/a
Database monitoring APIs	"db2Inspect - Inspect database for architectural integrity" on page 129	db2ApiDf	n/a
Database health monitoring APIs	"db2AddContact - Add a contact to whom notification messages can be sent" on page 29	db2ApiDf	n/a
Database health monitoring APIs	"db2AddContactGroup - Add a contact group to whom notification messages can be sent" on page 30	db2ApiDf	n/a
Database health monitoring APIs	"db2DropContact - Remove a contact from the list of contacts to whom notification messages can be sent" on page 72	db2ApiDf	n/a
Database health monitoring APIs	"db2DropContactGroup - Remove a contact group from the list of contacts to whom notification messages can be sent" on page 73	db2ApiDf	n/a
Database health monitoring APIs	"db2GetAlertCfg - Get the alert configuration settings for the health indicators" on page 81	db2ApiDf	n/a
Database health monitoring APIs	"db2GetAlertCfgFree - Free the memory allocated by the db2GetAlertCfg API" on page 85	db2ApiDf	n/a
Database health monitoring APIs	"db2GetContactGroup - Get the list of contacts in a single contact group to whom notification messages can be sent" on page 86	db2ApiDf	n/a
Database health monitoring APIs	"db2GetContactGroups - Get the list of contact groups to whom notification messages can be sent" on page 87	db2ApiDf	n/a
Database health monitoring APIs	"db2GetContacts - Get the list of contacts to whom notification messages can be sent" on page 89	db2ApiDf	n/a
Database health monitoring APIs	"db2GetHealthNotificationList - Get the list of contacts to whom health alert notifications can be sent" on page 90	db2ApiDf	n/a
Database health monitoring APIs	"db2ResetAlertCfg - Reset the alert configuration of health indicators" on page 215	db2ApiDf	n/a

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Database health monitoring APIs	"db2UpdateAlertCfg - Update the alert configuration settings for health indicators" on page 259	db2ApiDf	n/a
Database health monitoring APIs	"db2UpdateContact - Update the attributes of a contact" on page 266	db2ApiDf	n/a
Database health monitoring APIs	"db2UpdateContactGroup - Update the attributes of a contact group" on page 268	db2ApiDf	n/a
Database health monitoring APIs	"db2UpdateHealthNotificationList - Update the list of contacts to whom health alert notifications can be sent" on page 269	db2ApiDf	n/a
Database health monitoring APIs	"db2GetSnapshot - Get a snapshot of the database manager operational status" on page 94	db2ApiDf	C: utilsnap.c C++: utilsnap.C
Database health monitoring APIs	"db2GetSnapshotSize - Estimate the output buffer size required for the db2GetSnapshot API" on page 97	db2ApiDf	n/a
Database health monitoring APIs	"db2GetRecommendations - Get recommendations to resolve a health indicator in alert state" on page 91	db2ApiDf	n/a
Database health monitoring APIs	"db2GetRecommendationsFree - Free the memory allocated by the db2GetRecommendations API" on page 93	db2ApiDf	n/a
Data movement APIs	"db2Export - Export data from a database" on page 74	sqlutil	C: tbmove.sqc C++: tbmove.sqC COBOL: expsamp.sqb impexp.sqb tload.sqb
Data movement APIs	"db2Import - Import data into a table, hierarchy, nickname or view" on page 116	db2ApiDf	C: dtformat.sqc tbmove.sqc C++: tbmove.sqC COBOL: expsamp.sqb impexp.sqb
Data movement APIs	"db2Load - Load data into a table" on page 160	db2ApiDf	C: dtformat.sqc tbload.sqc tbmove.sqc C++: tbmove.sqC
Data movement APIs	"db2LoadQuery - Get the status of a load operation" on page 180	db2ApiDf	C: tbmove.sqc C++: tbmove.sqC COBOL: loadqry.sqb
Recovery APIs	"db2Backup - Back up a database or table space" on page 41	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Recovery APIs	"db2Restore - Restore a database or table space" on page 219	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Recovery APIs	"db2Recover - Restore and roll forward a database" on page 203	db2ApiDf	n/a
Recovery APIs	"db2Rollforward - Roll forward a database" on page 232	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Recovery APIs	"db2HistoryOpenScan - Start a history file scan" on page 109	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Recovery APIs	"db2HistoryGetEntry - Get the next entry in the history file" on page 107	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Recovery APIs	"db2HistoryCloseScan - End the history file scan" on page 106	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Recovery APIs	"db2Prune - Delete the history file entries or log files from the active log path" on page 190	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Recovery APIs	"db2HistoryUpdate - Update a history file entry" on page 113	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Recovery APIs	"db2ArchiveLog - Archive the active log file" on page 35	db2ApiDf	n/a
High Availability Disaster Recovery (HADR) APIs	"db2HADRStart - Start high availability disaster recovery (HADR) operations" on page 101	db2ApiDf	n/a
High Availability Disaster Recovery (HADR) APIs	"db2HADRStop - Stop high availability disaster recovery (HADR) operations" on page 102	db2ApiDf	n/a
High Availability Disaster Recovery (HADR) APIs	"db2HADRTakeover - Instruct a database to take over as the high availability disaster recovery (HADR) primary database" on page 104	db2ApiDf	n/a
Database directory and DCS directory management APIs	"sqlecadb - Catalog a database in the system database directory" on page 305	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dbcat.cbl
Database directory and DCS directory management APIs	"sqleuncd - Uncatalog a database from the system database directory" on page 355	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dbcat.cbl
Database directory and DCS directory management APIs	"sqlegdad - Catalog a database in the database connection services (DCS) directory" on page 331	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dcscat.cbl
Database directory and DCS directory management APIs	"sqlegdel - Uncatalog a database from the database connection services (DCS) directory" on page 333	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dcscat.cbl
Database directory and DCS directory management APIs	"sqledcgd - Change a database comment in the system or local database directory" on page 321	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dbcmt.cbl
Database directory and DCS directory management APIs	"db2DbDirOpenScan - Start a system or local database directory scan" on page 71	db2ApiDf	C: ininfo.c C++: ininfo.C COBOL: dbcat.cbl dbcmt.cbl

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Database directory and DCS directory management APIs	"db2DbDirGetNextEntry - Get the next system or local database directory entry" on page 68	db2ApiDf	C: ininfo.c C++: ininfo.C COBOL: dbcat.cbl dbcmt.cbl
Database directory and DCS directory management APIs	"db2DbDirCloseScan - End a system or local database directory scan" on page 67	db2ApiDf	C: ininfo.c C++: ininfo.C COBOL: dbcat.cbl dbcmt.cbl
Database directory and DCS directory management APIs	"sqlegdsc - Start a database connection services (DCS) directory scan" on page 337	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dcscat.cbl
Database directory and DCS directory management APIs	"sqlegdgt - Get database connection services (DCS) directory entries" on page 336	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dcscat.cbl
Database directory and DCS directory management APIs	"sqlegdcl - End a database connection services (DCS) directory scan" on page 332	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dcscat.cbl
Database directory and DCS directory management APIs	"sqlegdge - Get a specific entry in the database connection services (DCS) directory" on page 335	sqlenv	C: ininfo.c C++: ininfo.C COBOL: dcscat.cbl
Database directory and DCS directory management APIs	"db2UpdateAlternateServerForDB - Update the alternate server for a database alias in the system database directory" on page 265	db2ApiDf	n/a
Client/server management APIs	"sqleqryc - Query client connection settings" on page 346	sqlenv	C: cli_info.c C++: cli_info.C COBOL: client.cbl
Client/server management APIs	"sqleqryi - Query client information" on page 348	sqlenv	C: cli_info.c C++: cli_info.C
Client/server management APIs	"sqlesetc - Set client connection settings" on page 351	sqlenv	C: cli_info.c dbcfg.sqc dbmcon.sqc C++: cli_info.C dbcfg.sqC dbmcon.sqC COBOL: client.cbl
Client/server management APIs	"sqleseti - Set client information" on page 354	sqlenv	C: cli_info.c C++: cli_info.C
Client/server management APIs	"sqlesact - Set accounting string" on page 349	sqlenv	COBOL: setact.cbl

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Client/server management APIs	"db2DatabasePing - Ping the database to test network response time" on page 60	db2ApiDf	n/a
Client/server management APIs	"sqleisig - Install signal handler" on page 340	sqlenv	COBOL: dbcmt.cbl
Client/server management APIs	"sqleintr - Interrupt application requests" on page 339	sqlenv	n/a
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapRegister - Register the DB2 server on the LDAP server" on page 151	db2ApiDf	n/a
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapUpdate - Update the attributes of the DB2 server on the LDAP server" on page 156	db2ApiDf	n/a
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapDeregister - Deregister the DB2 server and cataloged databases from the LDAP server" on page 150	db2ApiDf	n/a
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapCatalogNode - Provide an alias for node name in LDAP server" on page 149	db2ApiDf	n/a
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapUncatalogNode - Delete alias for node name from LDAP server" on page 155	db2ApiDf	n/a
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapCatalogDatabase - Register the database on the LDAP server" on page 147	db2ApiDf	n/a
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapUncatalogDatabase - Deregister database from LDAP server" on page 154	db2ApiDf	n/a

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Lightweight Directory Access Protocol (LDAP) directory management APIs	"db2LdapUpdateAlternateServerForDB - Update the alternate server for the database on the LDAP server" on page 159	db2ApiDf	n/a
Application programming and preparation APIs	"sqlaintp - Get error message" on page 275	sql	C: dbcfg.sqc utilapi.c C++: dbcfg.sqC utilapi.C COBOL: checkerr.cbl
Application programming and preparation APIs	"sqlogstt - Get the SQLSTATE message" on page 360	sql	C: utilapi.c C++: utilapi.C COBOL: checkerr.cbl
Application programming and preparation APIs	"sqleisig - Install signal handler" on page 340	sqlenv	COBOL: dbcmt.cbl
Application programming and preparation APIs	"sqleintr - Interrupt application requests" on page 339	sqlenv	n/a
Application programming and preparation APIs	"sqlaprep - Precompile application program" on page 276	sql	C: dbpkg.sqc C++: dbpkg.sqC
Application programming and preparation APIs	"sqlabndx - Bind application program to create a package" on page 272	sql	C: dbpkg.sqc dbsample.sqc C++: dbpkg.sqC
Application programming and preparation APIs	"sqlarbnd - Rebind package" on page 278	sql	C: dbpkg.sqc C++: dbpkg.sqC COBOL: rebind.sqb
COBOL, FORTRAN and REXX application specific APIs	"sqlgaddr - Get the address of a variable" on page 358	sqlutil	n/a
COBOL, FORTRAN and REXX application specific APIs	"sqlgdref - Dereference an address" on page 359	sqlutil	n/a
COBOL, FORTRAN and REXX application specific APIs	"sqlgmcpy - Copy data from one memory area to another" on page 359	sqlutil	n/a
Table space and table management APIs	"sqlbtcq - Get the query data for all table space containers" on page 293	sqlutil	C: dbrecov.sqc tsinfo.sqc C++: dbrecov.sqC tsinfo.sqC COBOL: tabscont.sqb tspace.sqb

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Table space and table management APIs	"sqlbotcq - Open a table space container query" on page 287	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabscont.sqb tspace.sqb
Table space and table management APIs	"sqlbftcq - Fetch the query data for rows in a table space container" on page 282	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabscont.sqb tspace.sqb
Table space and table management APIs	"sqlbctcq - Close a table space container query" on page 281	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabscont.sqb tspace.sqb
Table space and table management APIs	"sqlbstsc - Set table space containers" on page 291	sqlutil	C: dbrecov.sqc C++: dbrecov.sqC COBOL: tabscont.sqb tspace.sqb
Table space and table management APIs	"sqlbmtsq - Get the query data for all table spaces" on page 285	sqlutil	C: dbrecov.sqc tsinfo.sqc C++: dbrecov.sqC tsinfo.sqC COBOL: tabspace.sqb tspace.sqb
Table space and table management APIs	"sqlbstpq - Get information about a single table space" on page 290	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabspace.sqb tspace.sqb
Table space and table management APIs	"sqlbotsq - Open a table space query" on page 288	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabspace.sqb tspace.sqb
Table space and table management APIs	"sqlbftpq - Fetch the query data for rows in a table space" on page 283	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabspace.sqb tspace.sqb
Table space and table management APIs	"sqlbctsq - Close a table space query" on page 281	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabspace.sqb tspace.sqb
Table space and table management APIs	"sqlbgtss - Get table space usage statistics" on page 284	sqlutil	C: tsinfo.sqc C++: tsinfo.sqC COBOL: tabspace.sqb tspace.sqb
Table space and table management APIs	"sqluvqdp - Quiesce table spaces for a table" on page 370	sqlutil	C: tbmove.sqc C++: tbmove.sqC COBOL: tload.sqb
Table space and table management APIs	"db2Runstats - Update statistics for tables and indexes" on page 242	db2ApiDf	C: tbreorg.sqc C++: tbreorg.sqC COBOL: dbstat.sqb
Table space and table management APIs	"db2Reorg - Reorganize an index or a table" on page 208	db2ApiDf	C: tbreorg.sqc C++: tbreorg.sqC COBOL: dbstat.sqb

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Table space and table management APIs	"sqlefmem - Free the memory allocated by the sqlbtcq and sqlbmtsq API" on page 328	sqlenv	C: dbrecov.sqc tsinfo.sqc C++: dbrecov.sqC tsinfo.sqC COBOL: tabscont.sqb tabspace.sqb tspace.sqb
Node directory management APIs	"sqlectnd - Catalog an entry in the node directory" on page 318	sqlenv	C: ininfo.c C++: ininfo.C COBOL: nodecat.cbl
Node directory management APIs	"sqleuncn - Uncatalog an entry from the node directory" on page 357	sqlenv	C: ininfo.c C++: ininfo.C COBOL: nodecat.cbl
Node directory management APIs	"sqlenops - Start a node directory scan" on page 345	sqlenv	C: ininfo.c C++: ininfo.C COBOL: nodecat.cbl
Node directory management APIs	"sqlengne - Get the next node directory entry" on page 343	sqlenv	C: ininfo.c C++: ininfo.C COBOL: nodecat.cbl
Node directory management APIs	"sqlencls - End a node directory scan" on page 343	sqlenv	C: ininfo.c C++: ininfo.C COBOL: nodecat.cbl
Node directory management APIs	"db2UpdateAlternateServerForDB - Update the alternate server for a database alias in the system database directory" on page 265	db2ApiDf	n/a
Satellite synchronization APIs	"db2GetSyncSession - Get a satellite synchronization session identifier" on page 100	db2ApiDf	n/a
Satellite synchronization APIs	"db2QuerySatelliteProgress - Get the status of a satellite synchronization session" on page 192	db2ApiDf	n/a
Satellite synchronization APIs	"db2SetSyncSession - Set satellite synchronization session" on page 253	db2ApiDf	n/a
Satellite synchronization APIs	"db2SyncSatellite - Start satellite synchronization" on page 258	db2ApiDf	n/a
Satellite synchronization APIs	"db2SyncSatelliteStop - Pause satellite synchronization" on page 258	db2ApiDf	n/a
Satellite synchronization APIs	"db2SyncSatelliteTest - Test whether a satellite can be synchronized" on page 259	db2ApiDf	n/a
Read log files APIs	"db2ReadLog - Extracts log records" on page 194	db2ApiDf	C: dbrecov.sqc C++: dbrecov.sqC
Read log files APIs	"db2ReadLogNoConn - Read the database logs without a database connection" on page 197	db2ApiDf	n/a
Read log files APIs	"db2ReadLogNoConnInit - Initialize reading the database logs without a database connection" on page 200	db2ApiDf	n/a

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Read log files APIs	"db2ReadLogNoConnTerm - Terminate reading the database logs without a database connection" on page 202	db2ApiDf	n/a
Indoubt transaction management APIs	"db2XaListIndTrans - List indoubt transactions" on page 378	db2ApiDf	n/a
Indoubt transaction management APIs	"sqlxhfrg - Forget transaction status" on page 383	sqlxa	n/a
Indoubt transaction management APIs	"sqlxphcm - Commit an indoubt transaction" on page 384	sqlxa	n/a
Indoubt transaction management APIs	"sqlxphrl - Roll back an indoubt transaction" on page 384	sqlxa	n/a
Indoubt transaction management APIs	"sqlcspqy - List DRDA indoubt transactions" on page 294	sqlxa	n/a
APIs for obtaining concurrent access to a database	"sqleAttachToCtx - Attach to context" on page 387	sql	C: dbthrds.sqc C++: dbthrds.sqC
APIs for obtaining concurrent access to a database	"sqleBeginCtx - Create and attach to an application context" on page 387	sql	C: dbthrds.sqc C++: dbthrds.sqC
APIs for obtaining concurrent access to a database	"sqleDetachFromCtx - Detach from context" on page 388	sql	C: dbthrds.sqc C++: dbthrds.sqC
APIs for obtaining concurrent access to a database	"sqleEndCtx - Detach from and free the memory associated with an application context" on page 389	sql	n/a
APIs for obtaining concurrent access to a database	"sqleGetCurrentCtx - Get current context" on page 390	sql	n/a
APIs for obtaining concurrent access to a database	"sqleInterruptCtx - Interrupt context" on page 391	sql	n/a
APIs for obtaining concurrent access to a database	"sqleSetTypeCtx - Set application context type" on page 391	sql	C: dbthrds.sqc C++: dbthrds.sqC

Table 1. DB2 APIs, Include files, and Sample Programs (continued)

API Type	DB2 API	Include File	Sample Programs
Database partition management APIs	"sqleaddn - Add a database partition server to the partitioned database environment" on page 299	sqlenv	n/a
Database partition management APIs	"sqledrpn - Check whether a database partition server can be dropped" on page 326	sqlenv	n/a
Database partition management APIs	"sqlecran - Create a database on a database partition server" on page 310	sqlenv	n/a
Database partition management APIs	"sqledpan - Drop a database on a database partition server" on page 323	sqlenv	n/a
Database partition management APIs	"sqlesdeg - Set the maximum runtime intra-partition parallelism level or degree for SQL statements" on page 350	sqlenv	C: ininfo.c C++: ininfo.C
Database partition management APIs	"sqlugtpi - Get table distribution information" on page 369	sqlutil	n/a
Database partition management APIs	"sqlugrpn - Get the database partition server number for a row" on page 367	sqlutil	n/a
Miscellaneous APIs	"db2AdminMsgWrite - Write log messages for administration and replication function" on page 33	db2ApiDf	n/a
Miscellaneous APIs	"db2XaGetInfo - Get information for a resource manager" on page 378	sqlxa	n/a

Note: Include file extensions vary with programming language. C/C++ include files have a file extension of `.h`. COBOL include files have a file extension of `.cbl`. The include files can be found in the following directories:

C/C++ (UNIX®):

```
sqllib/include
```

C/C++ (Windows®):

```
sqllib\include
```

COBOL (UNIX):

```
sqllib/include/cobol_a

sqllib/include/cobol_i

sqllib/include/cobol_mf
```

COBOL (Windows):

```
sqllib\include\cobol_a

sqllib\include\cobol_i

sqllib\include\cobol_mf
```

Table 2. C/C++ Sample Programs with DB2 APIs

Sample Program	Included APIs
cli_info.c, cli_info.C	• sqlesetc API - Set client connection settings • sqleseti API - Set client information • sqleqryc API - Query client connection settings • sqleqryi API - Query client information
dbcfg.sqc, dbcfg.sqC	• db2AutoConfig API - Access the Configuration Advisor • db2AutoConfigFreeMemory API - Free the memory allocated by the db2AutoConfig API • sqlesetc API - Set client connection settings • sqlaintp API - Get error message
dbconn.sqc, dbconn.sqC	• db2DatabaseRestart API - Restart database • sqlefrce API - Force users and applications off the system
dbcreate.c, dbcreate.C	• sqlecrea API - Create database • sqledrpd API - Drop database
dbinfo.c, dbinfo.C	• db2CfgGet API - Get the database manager or database configuration parameters • db2CfgSet API - Set the database manager or database configuration parameters
dbmcon.sqc, dbmcon.sqC	• sqlesetc API - Set client connection settings
dbmigrat.c, dbmigrat.C	• sqlemgdb API - Migrate previous version of DB2 database to current version
dbpkg.sqc, dbpkg.sqC	• sqlaprep API - Precompile application program • sqlabndx API - Bind application program to create a package • sqlarbnd API - Rebind package

Table 2. C/C++ Sample Programs with DB2 APIs (continued)

Sample Program	Included APIs
dbrecov.sqc, dbrecov.sqC	• db2HistoryCloseScan API - End the history file scan • db2HistoryGetEntry API - Get the next entry in the history file • db2HistoryOpenScan API - Start a history file scan • db2HistoryUpdate API - Update the history file entry • db2Prune API - Delete the history file entries or log files from the active log path • db2CfgGet API - Get the database manager or database configuration parameters • db2CfgSet API - Set the database manager or database configuration parameters • sqlbmtsq API - Get the query data for all table spaces • sqlbstsc API - Set table space containers • sqlbtcq API - Get the query data for all table space containers • sqlecrea API - Create database • sqledrpd API - Drop database • sqlefmem API - Free the memory allocated by the sqlbtcq and sqlbmtsq APIs • db2Backup API - Back up a database or table space • db2Restore API - Restore a database or table space • db2ReadLog API - Asynchronous read log • db2ReadLogNoConn API - Read log without a database connection • db2Rollforward API - Roll forward a database
dbsample.sqc	• db2DatabaseRestart API - Restart database • sqlecrea API - Create database • sqlefrce API - Force users and applications off the system • sqlabndx API - Bind application program to create a package
dbthrds.sqc, dbthrds.sqC	• sqleAttachToCtx API - Attach to context • sqleBeginCtx API - Create and attach to an application context • sqleDetachFromCtx API - Detach from context • sqleSetTypeCtx API - Set application context type
dtformat.sqc	• db2Load API - Load data into a table • db2Import API - Import data into a table, hierarchy, nickname or view
inattach.c, inattach.C	• sqleatcp API - Attach to instance and change password • sqleatin API - Attach to instance • sqledtin API - Detach from instance

Table 2. C/C++ Sample Programs with DB2 APIs (continued)

Sample Program	Included APIs
ininfo.c, ininfo.C	• db2CfgGet API - Get the database manager or database configuration parameters • db2CfgSet API - Set the database manager or database configuration parameters • sqlegins API - Get current instance • sqlectnd API - Catalog an entry in the node directory • sqlenops API - Start a node directory scan • sqlengne API - Get the next node directory entry • sqlencls API - End a node directory scan • sqleuncn API - Uncatalog an entry from the node directory • sqlecadb API - Catalog a database in the system database directory • db2DbDirOpenScan API - Start a system or local database directory scan • db2DbDirGetNextEntry API - Get the next system or local database directory entry • sqledcgd API - Change a database comment in the system or local database directory • db2DbDirCloseScan API - End a system or local database directory scan • sqleuncd API - Uncatalog a database from the system database directory • sqlegdad API - Catalog a database in the database connection services (DCS) directory • sqlegdsc API - Start a database connection services (DCS) directory scan • sqlegdge API - Get a specific entry in the database connection services (DCS) directory • sqlegdgt API - Get database connection services (DCS) directory entries • sqlegdcl API - End a database connection services (DCS) directory scan • sqlegdel API - Uncatalog a database from the database connection services (DCS) directory • sqlesdeg API - Set the maximum runtime intra-partition parallelism level or degree for SQL statements
instart.c, instart.C	• sqlefrce API - Force users and applications off the system • db2InstanceStart API - Start instance • db2InstanceStop API - Stop instance
tbmove.sqc, tbmove.sqC	• db2Export API - Export data from a database • db2Import API - Import data into a table, hierarchy, nickname or view • sqluvqdp API - Quiesce table spaces for a table • db2Load API - Load data into a table • db2LoadQuery API - Get the status of a load operation
tbreorg.sqc, tbreorg.sqC	• db2Reorg API - Reorganize an index or a table • db2Runstats API - Update statistics about the characteristics of a table and associated indexes

Table 2. C/C++ Sample Programs with DB2 APIs (continued)

Sample Program	Included APIs
tscreate.sqc, tscreate.sqC	• db2CfgGet API - Get the database manager or database configuration parameters
tsinfo.sqc, tsinfo.sqC	• sqlbstpq API - Get information about a single table space • sqlbgtss API - Get table space usage statistics • sqlbmtsq API - Get the query data for all table spaces • sqlefmem API - Free the memory allocated by the sqlbtcq and sqlbmtsq APIs • sqlbotsq API - Open a table space query • sqlbftpq API - Fetch the query data for rows in a table space • sqlbctsq API - Close a table space query • sqlbtcq API - Get the query data for all table space containers • sqlbotcq API - Open a table space container query • sqlbftcq API - Fetch the query data for rows in a table space container • sqlbctcq API - Close a table space container query
utilapi.c, utilapi.C	• sqlaintp API - Get error message • sqlogstt API - Get the SQLSTATE message • sqleatin API - Attach to instance • sqledtin API - Detach from instance
utilsnap.c, utilsnap.C	• db2GetSnapshot API - Get a snapshot of the database manager operational status • db2MonitorSwitches API - Get or update the monitor switch settings

Table 3. COBOL Sample Programs with DB2 APIs

Sample Program	Included APIs
checkerr.cbl	• sqlaintp API - Get error message • sqlogstt API - Get the SQLSTATE message
client.cbl	• sqleqryc API - Query client connection settings • sqlesetc API - Set client connection settings
db_udcs.cbl	• sqleatin API - Attach to instance • sqlecrea API - Create database • sqledrpd API - Drop database
dbcat.cbl	• sqlecadb API - Catalog a database in the system database directory • db2DbDirCloseScan API - End a system or local database directory scan • db2DbDirGetNextEntry API - Get the next system or local database directory entry • db2DbDirOpenScan API - Start a system or local database directory scan • sqleuncd API - Uncatalog a database from the system database directory

Table 3. COBOL Sample Programs with DB2 APIs (continued)

Sample Program	Included APIs
dbcmt.cbl	• sqledcgd API - Change a database comment in the system or local database directory • db2DbDirCloseScan API - End a system or local database directory scan • db2DbDirGetNextEntry API - Get the next system or local database directory entry • db2DbDirOpenScan API - Start a system or local database directory scan • sqleisig API - Install signal handler
dbinst.cbl	• sqleatcp API - Attach to instance and change password • sqleatin API - Attach to instance • sqledtin API - Detach from instance • sqlegins API - Get current instance
dbstat.sqb	• db2Reorg API - Reorganize an index or a table • db2Runstats API - Update statistics about the characteristics of a table and associated indexes
dcscat.cbl	• sqlegdad API - Catalog a database in the database connection services (DCS) directory • sqlegdcl API - End a database connection services (DCS) directory scan • sqlegdel API - Uncatalog a database from the database connection services (DCS) directory • sqlegdge API - Get a specific entry in the database connection services (DCS) directory • sqlegdgt API - Get database connection services (DCS) directory entries • sqlegdsc API - Start a database connection services (DCS) directory scan
ebcdicdb.cbl	• sqleatin API - Attach to instance • sqlecrea API - Create database • sqledrpd API - Drop database
expsamp.sqb	• db2Export API - Export data from a database • db2Import API - Import data into a table, hierarchy, nickname or view
impexp.sqb	• db2Export API - Export data from a database • db2Import API - Import data into a table, hierarchy, nickname or view
loadqry.sqb	• db2LoadQuery API - Get the status of a load operation
migrate.cbl	• sqlemgdb API - Migrate previous version of DB2 database to current version
nodecat.cbl	• sqlectnd API - Catalog an entry in the node directory • sqlencls API - End a node directory scan • sqlengne API - Get the next node directory entry • sqlenops API - Start a node directory scan • sqleuncn API - Uncatalog an entry from the node directory

Table 3. COBOL Sample Programs with DB2 APIs (continued)

Sample Program	Included APIs
rebind.sqb	• sqlarbnd API - Rebind package
tabscont.sqb	• sqlbctcq API - Close a table space container query • sqlbftcq API - Fetch the query data for rows in a table space container • sqlbotcq API - Open a table space container query • sqlbtcq API - Get the query data for all table space containers • sqlefmem API - Free the memory allocated by the sqlbtcq and sqlbmtsq APIs
tabspace.sqb	• sqlbctsq API - Close a table space query • sqlbftpq API - Fetch the query data for rows in a table space • sqlbgtss API - Get table space usage statistics • sqlbmtsq API - Get the query data for all table spaces • sqlbotsq API - Open a table space query • sqlbstpq API - Get information about a single table space • sqlefmem API - Free the memory allocated by the sqlbtcq and sqlbmtsq APIs
tload.sqb	• db2Export API - Export data from a database • sqluvqdp API - Quiesce table spaces for a table
tspace.sqb	• sqlbctcq API - Close a table space container query • sqlbctsq API - Close a table space query • sqlbftcq API - Fetch the query data for rows in a table space container • sqlbftpq API - Fetch the query data for rows in a table space • sqlbgtss API - Get table space usage statistics • sqlbmtsq API - Get the query data for all table spaces • sqlbotcq API - Open a table space container query • sqlbotsq API - Open a table space query • sqlbstpq API - Get information about a single table space • sqlbstsc API - Set table space containers • sqlbtcq API - Get the query data for all table space containers • sqlefmem API - Free the memory allocated by the sqlbtcq and sqlbmtsq APIs
setact.cbl	• sqlesact API - Set accounting string

Chapter 2. Changed APIs and data structures

Table 4. Back-level supported APIs and data structures

API or Data Structure (Version)	Descriptive Name	New API or Data Structure (Version)
sqlbftsq (V2)	Fetch Table Space Query	sqlbftpq (V5)
sqlbstsq (V2)	Single Table Space Query	sqlbstpq (V5)
sqlbtsq (V2)	Table Space Query	sqlbmtsq (V5)
sqlectdd (V2)	Catalog Database	sqlecadb (V5)
sqledosd (V8.1)	Open Database Directory Scan	db2DbDirOpenScan (V8.2)
sqledgne (V8.1)	Get Next Database Directory Entry	db2DbDirGetNextEntry (V8.2)
sqledcls (V8.1)	Close Database Directory Scan	db2DbDirCloseScan (V8.2)
sqlepstart (V5)	Start Database Manager	db2InstanceStart (V8)
sqlepstp (V5)	Stop Database Manager	db2InstanceStop (V8)
sqlepstr (V2)	Start Database Manager (DB2 Parallel Edition Version 1.2)	db2InstanceStart (V8)
sqlestar (V2)	Start Database Manager (DB2 Version 2)	db2InstanceStart (V8)
sqlestop (V2)	Stop Database Manager	db2InstanceStop (V8)
sqlerstd (V5)	Restart Database	db2DatabaseRestart (V6)
sqlfddb (V7)	Get Database Configuration Defaults	db2CfgGet (V8)
sqlfdsys (V7)	Get Database Manager Configuration Defaults	db2CfgGet (V8)
sqlfrdb (V7)	Reset Database Configuration	db2CfgSet (V8)
sqlfrsys (V7)	Reset Database Manager Configuration	db2CfgSet (V8)
sqlfudb (V7)	Update Database Configuration	db2CfgSet (V8)
sqlfusys (V7)	Update Database Manager Configuration	db2CfgSet (V8)
sqlfxdb (V7)	Get Database Configuration	db2CfgGet (V8)
sqlfxsys (V7)	Get Database Configuration	db2CfgGet (V8)
sqlmon (V6)	Get/Update Monitor Switches	db2MonitorSwitches (V7)
sqlmonss (V5)	Get Snapshot	db2GetSnapshot (V6)
sqlmonsz (V6)	Estimate Size Required for sqlmonss() Output Buffer	db2GetSnapshotSize (V7)
sqlmrset (V6)	Reset Monitor	db2ResetMonitor (V7)
sqluadau (V8)	Get Authorizations	AUTH_LIST_AUTHORITIES_FOR_AUTHID table function (V9.5)
sqlubkp (V5)	Backup Database	db2Backup (V8)
sqlubkup (V2)	Backup Database	db2Backup (V8)
sqluexpr	Export	db2Export (V8)
sqlugrpi (V2)	Get Row Partitioning Information (DB2 Parallel Edition Version 1.x)	sqlugrpn (V5)

Table 4. Back-level supported APIs and data structures (continued)

API or Data Structure (Version)	Descriptive Name	New API or Data Structure (Version)
sqluhcls (V5)	Close Recovery History File Scan	db2HistoryCloseScan (V6)
sqluhget (V5)	Retrieve DDL Information From the History File	db2HistoryGetEntry (V6)
sqluhgne (V5)	Get Next Recovery History File Entry	db2HistoryGetEntry (V6)
sqluhops (V5)	Open Recovery History File Scan	db2HistoryOpenScan (V6)
sqluhprn (V5)	Prune Recovery History File	db2Prune (V6)
sqluhupd (V5)	Update Recovery History File	db2HistoryUpdate (V6)
sqluimpr	Import	db2Import (V8)
sqluload (V7)	Load	db2Load (V8)
sqluqry (V5)	Load Query	db2LoadQuery (V6)
sqlureot (V7)	Reorganize Table	db2Reorg (V8)
sqlurestore (V7)	Restore Database	db2Restore (V8)
sqlurlog (V7)	Asynchronous Read Log	db2ReadLog (V8)
sqluroll (V7)	Rollforward Database	db2Rollforward (V8)
sqlursto (V2)	Restore Database	sqlurst (V5)
sqlustat (V7)	Runstats	db2Runstats (V8)
sqlxhcom (V2)	Commit an Indoubt Transaction	sqlxphcm (V5)
sqlxhqry (V2)	List Indoubt Transactions	sqlxphqr (V5)
sqlxhrol (V2)	Roll Back an Indoubt Transaction	sqlxphrl (V5)
SQL-AUTHORIZATIONS (V8)	Authorizations Structure	none
SQLB-TBSQRY-DATA (V2)	Table space data structure.	SQLB-TBSPQRY-DATA (V5)
SQLE-START-OPTIONS (V7)	Start Database Manager data structure	db2StartOptionsStruct (V8)
SQLEDBSTOPOPT (V7)	Start Database Manager data structure	db2StopOptionsStruct (V8)
SQLEDBSTRTOPT (V2)	Start Database Manager data structure (DB2 Parallel Edition Version 1.2)	db2StartOptionsStruct (V8)
SQLEDINFO (v8.1)	Get Next Database Directory Entry data structure	db2DbDirInfo (V8.2)
SQLUEXPT-OUT	Export output structure	db2ExportOut (V8.2)
SQLUHINFO and SQLUHADM (V5)	History file data structures	db2HistData (V6)
SQLUIMPT-IN	Import input structure	db2ImportIn (V8.2)
SQLUIMPT-OUT	Import output structure	db2ImportOut (V8.2)
SQLULOAD-IN (V7)	Load input structure	db2LoadIn (V8)
SQLULOAD-OUT (V7)	Load output structure	db2LoadOut (V8)
db2DbDirInfo (V8.2)	Get Next Database Directory Entry data structure	db2DbDirInfoV9 (V9.1)
db2DbDirNextEntryStruct (V8.2)	Get Next Database Directory Entry data structure	db2DbDirNextEntryStructV9 (V9.1)

Table 4. Back-level supported APIs and data structures (continued)

API or Data Structure (Version)	Descriptive Name	New API or Data Structure (Version)
db2gDbDirNextEntryStruct (V8.2)	Get Next Database Directory Entry data structure	db2gDbDirNextEntryStrV9 (V9.1)

Table 5. Back-level unsupported APIs and data structures

Name	Descriptive Name	API or data structure supported in V9
sqlufrol/sqlgfrol	Roll Forward Database (DB2 Version 1.1)	db2Rollforward
sqluprfw	Rollforward Database (DB2 Parallel Edition Version 1.x)	db2Rollforward
sqlurfwd/sqlgrfwd	Roll Forward Database (DB2 Version 1.2)	db2Rollforward
sqlurllf/sqlgrfwd	Rollforward Database (DB2 Version 2)	db2Rollforward
sqlxphqr	List an Indoubt Transaction	db2XaListIndTrans
SQLXA-RECOVER	Transaction API structure	db2XaRecoverStruct

Chapter 3. How the API descriptions are organized

A short description of each API precedes some or all of the following subsections.

Scope

The API's scope of operation within the instance. In a single-partition database environment, the scope is that single database partition only. In a partitioned database environment, the scope can be the collection of all logical database partition servers defined in the node configuration file (`db2nodes.cfg`) or the database partition from which the API is called.

Authorization

The authority required to successfully call the API.

Required connection

One of the following: database, instance, none, or establishes a connection. Indicates whether the function requires a database connection, an instance attachment, or no connection to operate successfully.

None means that no database connection is required in order for the API to work successfully. *Establishes a connection* means that the API will establish a connection to the database when the API is called.

An explicit connection to the database or attachment to the instance may be required before a particular API can be called. APIs that require a database connection or an instance attachment can be executed either locally or remotely. Those that require neither cannot be executed remotely; when called at the client, they affect the client environment only.

API include file

The name of the include file that contains the API prototype, and any necessary predefined constants and parameters.

Note: Include file extensions vary with programming language. C/C++ include files have a file extension of `.h`. COBOL include files have a file extension of `.cbl`. The include files can be found in the following directories:

C/C++ (UNIX):

```
sqllib/include
```

C/C++ (Windows):

```
sqllib\include
```

COBOL (UNIX):

```
sqllib/include/cobol_a

sqllib/include/cobol_i

sqllib/include/cobol_mf
```

COBOL (Windows):

```
sqllib\include\cobol_a
```

```
sqllib\include\cobol_i
sqllib\include\cobol_mf
```

C API syntax

The C syntax of the API call.

Since Version 6, a new standard has been applied to the DB2 administrative APIs. Implementation of the new API definitions is being carried out in a staged manner. Following is a brief overview of the changes:

- The new API names contain the prefix "db2", followed by a meaningful mixed case string (for example, db2LoadQuery). Related APIs have names that allow them to be logically grouped. For example:

  ```
  db2HistoryCloseScan
  db2HistoryGetEntry
  db2HistoryOpenScan
  db2HistoryUpdate
  ```

- Generic APIs have names that contain the prefix "db2g", followed by a string that matches the C API name. Data structures used by generic APIs have names that also contain the prefix "db2g".
- The first parameter into the function (*versionNumber*) represents the version, release, or PTF level to which the code is to be compiled. This version number is used to specify the level of the structure that is passed in as the second parameter.
- The second parameter into the function is a void pointer to the primary interface structure for the API. Each element in the structure is either an atomic type (for example, db2Long32) or a pointer. Each parameter name adheres to the following naming conventions:

  ```
  piCamelCase  - pointer to input data
  poCamelCase  - pointer to output data
  pioCamelCase - pointer to input or output data
  iCamelCase   - input data
  ioCamelCase  - input/output data
  oCamelCase   - output data
  ```

- The third parameter is a pointer to the SQLCA, and is mandatory.

Generic API syntax

The syntax of the API call for the COBOL and FORTRAN programming languages.

Attention: Provide one extra byte for every character string passed to an API. Failure to do so may cause unexpected errors. This extra byte is modified by the database manager.

API parameters

A description of each API parameter and its values. Predefined values are listed with the appropriate symbolics. Actual values for symbolics can be obtained from the appropriate language include files. COBOL programmers should substitute a hyphen (-) for the underscore (_) in all symbolics. For more information about parameter data types in each host language, see the sample programs.

Note: Applications calling database manager APIs must properly check for error conditions by examining return codes and the SQLCA structure. Most database manager APIs return a zero return code when successful. In general, a non-zero

return code indicates that the secondary error handling mechanism, the SQLCA structure, may be corrupt. In this case, the called API is not executed. A possible cause for a corrupt SQLCA structure is passing an invalid address for the structure.

Error information is returned in the SQLCODE and SQLSTATE fields of the SQLCA structure, which is updated after most database manager API calls. Source files calling database manager APIs can provide one or more SQLCA structures; their names are arbitrary. An SQLCODE value of zero means successful execution (with possible SQLWARN warning conditions). A positive value means that the statement was successfully executed but with a warning, as with truncation of a host variable. A negative value means that an error condition occurred.

An additional field, SQLSTATE, contains a standardized error code that is consistent across other IBM® database products, and across SQL92 compliant database managers. Use SQLSTATEs when concerned about portability, since SQLSTATEs are common across many database managers.

The SQLWARN field contains an array of warning indicators, even if SQLCODE is zero.

REXX API syntax

The REXX syntax of the API call, where appropriate.

The SQLDB2 interface supports calling APIs from REXX. The SQLDB2 interface was created to provide support in REXX for new or previously unsupported APIs that do not have any output other than the SQLCA. Invoking a command through the SQLDB2 interface is syntactically the same as invoking the command through the command line processor (CLP), except that the token `call db2` is replaced by `CALL SQLDB2`. Using the `CALL SQLDB2` from REXX has the following advantages over calling the CLP directly:

- The compound REXX variable SQLCA is set
- By default, all CLP output messages are turned off.

REXX API parameters

A description of each REXX API parameter and its values, where appropriate.

Include files for DB2 API applications

The include files that are intended to be used in your C, C++, COBOL and FORTRAN applications to call DB2 APIs are described below:

C and C++ include files

DB2APIDF (db2ApiDf.h)
This file defines structures, constants, and prototypes for almost all DB2 APIs whose names start with 'db2'.

DB2AUCFG (db2AuCfg.h)
This file defines structures, constants, and prototypes for the DB2 APIs, db2AutoConfig and db2AutoConfigFreeMemory.

DB2SECPLUGIN (db2secPlugin.h)
This file defines structures, constants, and prototypes for APIs used to develop customized security plug-ins for authentication and group membership lookup purposes.

SQL (sql.h)
This file includes language-specific prototypes for the binder, precompiler, and error message retrieval APIs. It also defines system constants.

SQLAPREP (sqlaprep.h)
This file contains definitions required to write your own precompiler.

SQLENV (sqlenv.h)
This file defines language-specific calls for the database environment APIs, and the structures, constants, and return codes for those interfaces.

SQLMON (sqlmon.h)
This file defines language-specific calls for the database system monitor APIs, and the structures, constants, and return codes for those interfaces.

SQLUTIL (sqlutil.h)
This file defines the language-specific calls for the utility APIs, and the structures, constants, and codes required for those interfaces.

SQLUVEND (sqluvend.h)
This file defines structures, constants, and prototypes for the APIs to be used by the storage management vendors.

SQLXA (sqlxa.h)
This file contains function prototypes and constants used by applications that use the X/Open XA Interface.

COBOL include files

SQL (sql.cbl)
This file includes language-specific prototypes for the binder, precompiler, and error message retrieval APIs. It also defines system constants.

SQLAPREP (sqlaprep.cbl)
This file contains definitions required to write your own precompiler.

SQLENV (sqlenv.cbl)
This file defines language-specific calls for the database environment APIs, and the structures, constants, and return codes for those interfaces.

SQLMON (sqlmon.cbl)
This file defines language-specific calls for the database system monitor APIs, and the structures, constants, and return codes for those interfaces.

SQLMONCT (sqlmonct.cbl)
This file contains constant definitions and local data structure definitions required to call the Database System Monitor APIs.

SQLUTIL (sqlutil.cbl)
This file defines the language-specific calls for the utility APIs, and the structures, constants, and codes required for those interfaces.

FORTRAN include files

SQL (sql.f)
This file includes language-specific prototypes for the binder, precompiler, and error message retrieval APIs. It also defines system constants.

SQLAPREP (sqlaprep.f)
This file contains definitions required to write your own precompiler.

SQLENV (sqlenv.f)
This file defines language-specific calls for the database environment APIs, and the structures, constants, and return codes for those interfaces.

SQLMON (sqlmon.f)
This file defines language-specific calls for the database system monitor APIs, and the structures, constants, and return codes for those interfaces.

SQLUTIL (sqlutil.f)
This file defines the language-specific calls for the utility APIs, and the structures, constants, and codes required for those interfaces.

Chapter 4. Administrative APIs

db2AddContact - Add a contact to whom notification messages can be sent

Adds a contact to the contact list. Contacts are users to whom notification messages can be sent. Contacts can be either defined locally on the system or in a global list. The setting of the DB2 administration server (DAS) configuration parameter, contact_host, determines whether the list is local or global.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2AddContact (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2AddContactData
{
   char *piUserid;
   char *piPassword;
   char *piName;
   db2Uint32 iType;
   char *piAddress;
   db2Uint32 iMaxPageLength;
   char *piDescription;
} db2AddContactData;
```

db2AddContact API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2AddContactData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2AddContactData data structure parameters

piUserid
Input. The user name.

piPassword
Input. The password for the user ID specified by parameter piUserid.

piName
Input. The contact name.

iType Input. Specifies the type of contact. Valid values are:

- DB2CONTACT_EMAIL
- DB2CONTACT_PAGE

piAddress
Input. The e-mail or pager address of the iType parameter.

iMaxPageLength
Input. The maximum message length for when iType is set to DB2CONTACT_PAGE.

piDescription
Input. User supplied description of the contact.

Usage notes

This API is not supported on UNIX and Linux®. However, you can access the same functionality through the SQL interface.

db2AddContactGroup - Add a contact group to whom notification messages can be sent

Adds a new contact group to the list of contact groups. A contact group contains a list of users to whom notification messages can be sent. Contact groups can be either defined locally on the system or in a global list. The setting of the DB2 administration server (DAS) configuration parameter contact_host determines whether the list is local or global.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2AddContactGroup (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2AddContactGroupData
{
   char *piUserid;
   char *piPassword;
   char *piGroupName;
   char *piDescription;
   db2Uint32 iNumContacts;
```

```
   struct db2ContactTypeData *piContacts;
} db2AddContactGroupData;

typedef SQL_STRUCTURE db2ContactTypeData
{
   db2Uint32 contactType;
   char *pName;
} db2ContactTypeData;
```

db2AddContactGroup API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2AddContactGroupData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2AddContactGroupData data structure parameters

piUserid
Input. The user name.

piPassword
Input. The password for piUserid.

piGroupName
Input. The name of the group to be retrieved.

piDescription
Input. The description of the group.

iNumContacts
Input. The number of piContacts.

piContacts
A pointer to the db2ContactTypeData structure.

db2ContactTypeData data structure parameters

contactType
Specifies the type of contact. Valid values are:

- DB2CONTACT_SINGLE
- DB2CONTACT_GROUP

pName
The contact group name, or the contact name if contactType is set to DB2CONTACT_SINGLE.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2AddSnapshotRequest - Add a snapshot request

This API prepares the snapshot request stream for db2GetSnapshotSize and db2GetSnapshot.

Scope

Prepares the snapshot request stream for the db2GetSnapshotSize and db2GetSnapshot APIs. The output (a snapshot request that is generated by the db2AddSnapshotRequest API) is passed to the db2GetSnapshotSize and db2GetSnapshot APIs. A snapshot request contains the snapshot request type and the identification information.

Authorization

None.

Required connection

None.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2AddSnapshotRequest (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2AddSnapshotRqstData
{
   void *pioRequestData;
   db2Uint32 iRequestType;
   db2int32 iRequestFlags;
   db2Uint32 iQualType;
   void *piQualData;
} db2AddSnapshotRqstData;

SQL_API_RC SQL_API_FN
  db2gAddSnapshotRequest (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gAddSnapshotRqstData
{
   void *pioRequestData;
   db2Uint32 iRequestType;
   db2int32 iRequestFlags;
   db2Uint32 iQualType;
   void *piQualData;
   db2Uint32 iQualDataLen;
} db2gAddSnapshotRqstData;
```

db2AddSnapshotRequest API parameters

versionNumber

Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct. To use the structure db2AddSnapshotData as described above, specify db2Versio910. If you want to use a different version of this structure, check the db2ApiDf header file in the include directory for the complete list of supported versions. Ensure that you use the version of the db2AddSnapshotRequestData structure that corresponds to the version number that you specify.

pParmStruct
Input and/or output. A pointer to the db2AddSnapshotRequestData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2AddSnapshotRqstData data structure parameters

pioRequestData
Input/output. The request data to be constructed by the db2AddSnapshotRequest API. Initially, this parameter is set to NULL. The memory required for pioRequestData will be allocated by the db2AddSnapshotRequest API. You should free pioRequestData when its usage ends (for example, after the db2GetSnapshot API call).

iRequestType
Input. Snapshot request type, for example, SQLMA_DB2.

iRequestFlags
Input. Bit mapped action flags, the values are SQLM_INSTREAM_ADD_REQUEST, SQLM_INSTREAM_ADD_QUAL or SQLM_INSTREAM_ADD_REQQUAL. If iRequestFlags is not set by the caller:

- if iRequestType is set, iRequestFlags bit SQLM_INSTREAM_ADD_REQUEST is turned on by the API.
- if piQualifierData pointer is not null, SQLM_INSTREAM_ADD_QUAL is turned on by the API.

Upon API call, iRequestType, iQualifierType, iRequestFlags and piQualifierData are reset to 0.

iQualType
Input. Type of the qualifier attached to the snapshot request, for example, SQLM_INSTREAM_ELM_DBNAME.

piQualData
Input. Data describing the qualifier. This is a pointer to a null-terminated string.

db2gAddSnapshotRqstData data structure specific parameters

iQualDataLen
Input. Length of the qualifier data in the piQualData parameter.

db2AdminMsgWrite - Write log messages for administration and replication function

Provides a mechanism for users and Replication to write information to the db2diag.log, and the administration notification log.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2AdminMsgWrite (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef struct db2AdminMsgWriteStruct
{
   db2Uint32 iMsgType;
   db2Uint32 iComponent;
   db2Uint32 iFunction;
   db2Uint32 iProbeID;
   char *piData_title;
   void *piData;
   db2Uint32 iDataLen;
   db2Uint32 iError_type;
} db2AdminMsgWriteStruct;
```

db2AdminMsgWrite API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2AdminMsgWriteStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2AdminMsgWriteStruct data structure parameters

iMsgType
Input. Specify the type of data to be logged. Valid values are BINARY_MSG for binary data, and STRING_MSG for string data.

iComponent
Input. Specify zero.

iFunction
Input. Specify zero.

iProbeID
Input. Specify the numeric probe point. Numeric probe point is a unique internal identifier that is used to locate the point in the source code that reported the message.

piData_title
Input. A pointer to the title string describing the data to be logged. Can be set to NULL if a title is not needed.

piData
Input. A pointer to the data to be logged. Can be set to NULL if data logging is not needed.

iDataLen
Input. The number of bytes of binary data to be used for logging if iMsgType is BINARY_MSG. Not used if iMsgType is STRING_MSG.

iError_type
Input. Valid values are:

- DB2LOG_SEVERE_ERROR: (1) Severe error has occurred
- DB2LOG_ERROR: (2) Error has occurred
- DB2LOG_WARNING: (3) Warning has occurred
- DB2LOG_INFORMATION: (4) Informational

Usage notes

This API will log to the administration notification log only if the specified error type is less than or equal to the value of the notifylevel database manager configuration parameter. It will log to db2diag.log only if the specified error type is less than or equal to the value of the diaglevel database manager configuration parameter. However, all information written to the administration notification log is duplicated in the db2diag.log unless the diaglevel database manager configuration parameter is set to zero.

db2ArchiveLog - Archive the active log file

Closes and truncates the active log file for a recoverable database. If user exit is enabled, it also issues an archive request.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm

Required connection

This API automatically establishes a connection to the specified database. If a connection to the specified database already exists, the API will return an error.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ArchiveLog (
       db2Uint32 versionNumber,
       void * pDB2ArchiveLogStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ArchiveLogStruct
{
   char *piDatabaseAlias;
   char *piUserName;
   char *piPassword;
   db2Uint16 iAllNodeFlag;
   db2Uint16 iNumNodes;
   SQL_PDB_NODE_TYPE *piNodeList;
   db2Uint32 iOptions;
} db2ArchiveLogStruct;
```

```
SQL_API_RC SQL_API_FN
  db2gArchiveLog (
       db2Uint32 versionNumber,
       void * pDB2ArchiveLogStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gArchiveLogStruct
{
   db2Uint32 iAliasLen;
   db2Uint32 iUserNameLen;
   db2Uint32 iPasswordLen;
   char *piDatabaseAlias;
   char *piUserName;
   char *piPassword;
   db2Uint16 iAllNodeFlag;
   db2Uint16 iNumNodes;
   SQL_PDB_NODE_TYPE *piNodeList;
   db2Uint32 iOptions;
} db2gArchiveLogStruct;
```

db2ArchiveLog API parameters

versionNumber
Input. Specifies the version and release level of the variable passed in as the second parameter, pDB2ArchiveLogStruct.

pDB2ArchiveLogStruct
Input. A pointer to the db2ArchiveLogStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ArchiveLogStruct data structure parameters

piDatabaseAlias
Input. A string containing the database alias (as cataloged in the system database directory) of the database for which the active log is to be archived.

piUserName
Input. A string containing the user name to be used when attempting a connection.

piPassword
Input. A string containing the password to be used when attempting a connection.

iAllNodeFlag
Applicable to partitioned database environment only. Input. Flag indicating whether the operation should apply to all nodes listed in the db2nodes.cfg file. Valid values are:

DB2ARCHIVELOG_NODE_LIST
Apply to nodes in a node list that is passed in piNodeList.

DB2ARCHIVELOG_ALL_NODES
Apply to all nodes. piNodeList should be NULL. This is the default value.

DB2ARCHIVELOG_ALL_EXCEPT
Apply to all nodes except those in the node list passed in piNodeList.

iNumNodes
Partitioned database environment only. Input. Specifies the number of nodes in the piNodeList array.

piNodeList
Partitioned database environment only. Input. A pointer to an array of node numbers against which to apply the archive log operation.

iOptions
Input. Reserved for future use.

db2gArchiveLogStruct data structure specific parameters

iAliasLen
Input. A 4-byte unsigned integer representing the length in bytes of the database alias.

iUserNameLen
Input. A 4-byte unsigned integer representing the length in bytes of the user name. Set to zero if no user name is used.

iPasswordLen
Input. A 4-byte unsigned integer representing the length in bytes of the password. Set to zero if no password is used.

db2AutoConfig - Access the Configuration Advisor

Allows application programs to access the Configuration Advisor in the Control Center. Detailed information about this advisor is provided through the online help facility within the Control Center.

Scope

In a partitioned database environment, database recommendations are applied by default on all database partitions. DB2_SG_APPLY_ON_ONE_NODE flag for the db2AutoConfigInterface data structure's iApply parameter forces the changes to be limited to the coordinator partition only. Note that the bufferpool changes are always (DB2_SG_APPLY_ON_ONE_NODE does not matter for bufferpool recommendations) applied to the system catalogs, thus, all database partitions are affected.

Authorization

sysadm

Required connection

Database

API include file

```
db2AuCfg.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
db2AutoConfig(
  db2Uint32 db2VersionNumber,
  void * pAutoConfigInterface,
  struct sqlca * pSqlca);
```

```
typedef struct {
  db2int32 iProductID;
  char iProductVersion[DB2_SG_PROD_VERSION_SIZE+1];
  char iDbAlias[SQL_ALIAS_SZ+1];
  db2int32 iApply;
  db2AutoConfigInput iParams;
  db2AutoConfigOutput oResult;
} db2AutoConfigInterface;

typedef struct {
  db2int32 token;
  db2int32 value;
} db2AutoConfigElement;

typedef struct {
  db2Uint32 numElements;
  db2AutoConfigElement *  pElements;
} db2AutoConfigArray;
typedef db2AutoConfigArray  db2AutoConfigInput;
typedef db2AutoConfigArray  db2AutoConfigDiags;

typedef struct {
  db2Uint32 numElements;
  struct db2CfgParam * pConfigs;
  void * pDataArea;
} db2ConfigValues;

typedef struct {
  char * pName;
  db2int32 value;
} db2AutoConfigNameElement;

typedef struct {
  db2Uint32 numElements;
  db2AutoConfigNameElement * pElements;
} db2AutoConfigNameArray;
typedef db2AutoConfigNameArray db2BpValues;

typedef struct {
  db2ConfigValues oOldDbValues;
  db2ConfigValues oOldDbmValues;
  db2ConfigValues oNewDbValues;
  db2ConfigValues oNewDbmValues;
  db2AutoConfigDiags oDiagnostics;
  db2BpValues oOldBpValues;
  db2BpValues oNewBpValues;
} db2AutoConfigOutput;
```

db2AutoConfig API parameters

db2VersionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pAutoConfigInterface.

pAutoConfigInterface
Input. A pointer to the db2AutoConfigInterface structure.

pSqlca
Output. A pointer to the sqlca structure.

db2AutoConfigInterface data structure parameters

iProductID
Input. Specifies a unique product identifier. Valid values for the iProductID parameter (defined in db2AuCfg.h, located in the include directory) are:

- DB2_SG_PID_DEFAULT
- DB2_SG_PID_WEBSPHERE_COMMERCE_SUITE
- DB2_SG_PID_SAP
- DB2_SG_PID_WEBSPHERE_ADVANCED_SERVER
- DB2_SG_PID_SIEBEL
- DB2_SG_PID_PS_EPM
- DB2_SG_PID_PS_ONLINE
- DB2_SG_PID_PS_BATCH
- DB2_SG_PID_PS
- DB2_SG_PID_LOTUS_DOMINO
- DB2_SG_PID_CONTENT_MANAGER

iProductVersion
Input. A 16 byte string specifying the product version.

iDbAlias
Input. A string specifying a database alias.

iApply
Input. Updates the configuration automatically. Valid values for the iApply parameter (defined in db2AuCfg.h, located in the include directory) are:

DB2_SG_NOT_APPLY
Do not apply any recommendations

DB2_SG_APPLY
Apply all recommendations

DB2_SG_APPLY_DB
Apply only database (and bufferpool) recommendations

DB2_SG_APPLY_ON_ONE_NODE
Apply database recommendations (valid only with DB2_SG_APPLY and DB2_SG_APPLY_DB) on the current database partition only. By default the database recommendations are applied on all database partitions.

iParams
Input. Passes parameters into the advisor.

oResult
Output. Includes all results from the advisor.

db2AutoConfigElement data structure parameters

token Input or output. Specifies the configuration value for both the input parameters and the output diagnostics.

value Input or output. Holds the data specified by the token.

db2AutoConfigArray data structure parameters

numElements
Input or output. The number of array elements.

pElements
Input or output. A pointer to the element array.

db2ConfigValues data structure parameters

numElements
Input or output. The number of array elements.

pConfigs
Input or output. A pointer to an array of db2CfgParam structure.

pDataArea
Input or output. A pointer to the data area containing the values of the configuration.

db2AutoConfigNameElement data structure parameters

pName
Output. The name of the output buffer pool.

value Input or output. Holds the size (in pages) of the buffer pool specified in the name.

db2AutoConfigNameArray data structure parameters

numElements
Input or output. The number of array elements.

pElements
Input or output. A pointer to the element array.

db2AutoConfigOutput data structure parameters

oOldDbValues
Output. If the iApply value is set to update the database configuration or all configurations, this value represents the database configuration value prior to using the advisor. Otherwise, this is the current value.

oOldDbmValues
Output. If the iApply value is set to update all configurations, this value represents the database manager configuration value prior to using the advisor. Otherwise, this is the current value.

oNewDbValues
Output. If the iApply value is set to update the database configuration or all configurations, this value represents the current database configuration value. Otherwise, this is the recommended value for the advisor.

oNewDbmValues
Output. If the iApply value is set to update all configurations, this value represents the current database manager configuration value. Otherwise, this is the recommended value for the advisor.

oDiagnostics
Output. Includes diagnostics from the advisor.

oOldBpValues
Output. If the iApply value is set to update database configuration or all configurations, this value represents the buffer pool sizes in pages prior to using the advisor. Otherwise, this value is the current value.

oNewBpValues
Output. If the iApply value is set to update database configuration or all configurations, this value represents the current buffer pool sizes in pages. Otherwise, this is the recommended value for the advisor.

Usage notes

To free the memory allocated by the db2AutoConfig API, call the db2AutoConfigFreeMemory API.

With the deprecation of the `maxagents` and `maxcagents` configuration parameters, the behavior of the db2AutoConfig API will depend on the db2VersionNumber passed in to the API. If the version is DB2 v9.5 or beyond, `maxagents` will not be returned, but, for versions prior to this, it will. In a future release, these configuration parameters may be removed completely.

db2AutoConfigFreeMemory - Free the memory allocated by the db2AutoConfig API

Frees the memory allocated by the db2AutoConfig API.

Authorization

sysadm

Required connection

Database

API include file

`db2AuCfg.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
db2AutoConfigFreeMemory(
  db2Uint32 db2VersionNumber,
  void * pAutoConfigInterface,
  struct sqlca * pSqlca);
```

db2AutoConfigFreeMemory API parameters

db2VersionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pAutoConfigInterface.

pAutoConfigInterface
Input. A pointer to the db2AutoConfigInterface structure.

pSqlca
Output. A pointer to the sqlca structure.

db2Backup - Back up a database or table space

Creates a backup copy of a database or a table space.

Scope

In a partitioned database environment, by default this API affects only the database partition on which it is executed.

If the option to perform a partitioned backup is specified, the command can be called only on the catalog node. If the option specifies that all database partition

servers are to be backed up, it affects all database partition servers that are listed in the db2nodes.cfg file. Otherwise, it affects the database partition servers that are specified on the API.

Authorization

One of the following:

- *sysadm*
- *sysctrl*
- *sysmaint*

Required connection

Database. This API automatically establishes a connection to the specified database.

The connection will be terminated upon the completion of the backup.

API include file

db2ApiDf.h

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Backup (
       db2Uint32 versionNumber,
       void * pDB2BackupStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2BackupStruct
{
  char *piDBAlias;
  char oApplicationId[SQLU_APPLID_LEN+1];
  char oTimestamp[SQLU_TIME_STAMP_LEN+1];
  struct db2TablespaceStruct *piTablespaceList;
  struct db2MediaListStruct *piMediaList;
  char *piUsername;
  char *piPassword;
  void *piVendorOptions;
  db2Uint32 iVendorOptionsSize;
  db2Uint32 oBackupSize;
  db2Uint32 iCallerAction;
  db2Uint32 iBufferSize;
  db2Uint32 iNumBuffers;
  db2Uint32 iParallelism;
  db2Uint32 iOptions;
  db2Uint32 iUtilImpactPriority;
  char *piComprLibrary;
  void *piComprOptions;
  db2Uint32 iComprOptionsSize;
  db2int32 iAllNodeFlag;
  db2int32 iNumNodes;
  db2NodeType *piNodeList;
  db2int32 iNumMPPOutputStructs;
  struct db2BackupMPPOutputStruct *poMPPOutputStruct;
} db2BackupStruct;

typedef SQL_STRUCTURE db2TablespaceStruct
{
  char                        **tablespaces;
  db2Uint32 numTablespaces;
} db2TablespaceStruct;

typedef SQL_STRUCTURE db2MediaListStruct
```

```
{
  char                         **locations;
  db2Uint32 numLocations;
  char locationType;
} db2MediaListStruct;

typedef SQL_STRUCTURE db2BackupMPPOutputStruct
{
  db2NodeType nodeNumber;
  db2Uint64 backupSize;
  struct sqlca  sqlca;
} db2BackupMPPOutputStruct;

SQL_API_RC SQL_API_FN
  db2gBackup (
       db2Uint32 versionNumber,
       void * pDB2gBackupStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gBackupStruct
{
  char *piDBAlias;
  db2Uint32 iDBAliasLen;
  char *poApplicationId;
  db2Uint32 iApplicationIdLen;
  char *poTimestamp;
  db2Uint32 iTimestampLen;
  struct db2gTablespaceStruct *piTablespaceList;
  struct db2gMediaListStruct *piMediaList;
  char *piUsername;
  db2Uint32 iUsernameLen;
  char *piPassword;
  db2Uint32 iPasswordLen;
  void *piVendorOptions;
  db2Uint32 iVendorOptionsSize;
  db2Uint32 oBackupSize;
  db2Uint32 iCallerAction;
  db2Uint32 iBufferSize;
  db2Uint32 iNumBuffers;
  db2Uint32 iParallelism;
  db2Uint32 iOptions;
  db2Uint32 iUtilImpactPriority;
  char *piComprLibrary;
  db2Uint32 iComprLibraryLen;
  void *piComprOptions;
  db2Uint32 iComprOptionsSize;
  db2int32 iAllNodeFlag;
  db2int32 iNumNodes;
  db2NodeType *piNodeList;
  db2int32 iNumMPPOutputStructs;
  struct db2gBackupMPPOutputStruct *poMPPOutputStruct;
} db2gBackupStruct;

typedef SQL_STRUCTURE db2gTablespaceStruct
{
  struct db2Char *tablespaces;
  db2Uint32 numTablespaces;
} db2gTablespaceStruct;

typedef SQL_STRUCTURE db2gMediaListStruct
{
  struct db2Char *locations;
  db2Uint32 numLocations;
  char locationType;
} db2gMediaListStruct;

typedef SQL_STRUCTURE db2gBackupMPPOutputStruct
```

```
{
  db2NodeType nodeNumber;
  db2Uint64 backupSize;
  struct sqlca  sqlca;
} db2gBackupMPPOutputStruct;

typedef SQL_STRUCTURE db2Char
{
   char *pioData;
   db2Uint32 iLength;
   db2Uint32 oLength;
} db2Char;
```

db2Backup API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter **pDB2BackupStruct**.

pDB2BackupStruct
Input. A pointer to the db2BackupStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2BackupStruct data structure parameters

piDBAlias
Input. A string containing the database alias (as cataloged in the system database directory) of the database to back up.

oApplicationId
Output. The API will return a string identifying the agent servicing the application. Can be used to obtain information about the progress of the backup operation using the database monitor.

oTimestamp
Output. The API will return the time stamp of the backup image

piTablespaceList
Input. List of table spaces to be backed up. Required for table space level backup only. Must be NULL for a database level backup. See structure db2TablespaceStruct.

piMediaList
Input. This structure allows the caller to specify the destination for the backup operation. For more information, see the db2MediaListStruct structure below.

piUsername
Input. A string containing the user name to be used when attempting a connection. Can be NULL.

piPassword
Input. A string containing the password to be used with the user name. Can be NULL.

piVendorOptions
Input. Used to pass information from the application to the vendor functions. This data structure must be flat; that is, no level of indirection is supported. Note that byte-reversal is not done, and code page is not checked for this data.

iVendorOptionsSize
Input. The length of the **piVendorOptions** field, which cannot exceed 65535 bytes.

oBackupSize
Output. Size of the backup image (in MB).

iCallerAction
Input. Specifies action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2BACKUP_BACKUP
Start the backup.

DB2BACKUP_NOINTERRUPT
Start the backup. Specifies that the backup will run unattended, and that scenarios which normally require user intervention will either be attempted without first returning to the caller, or will generate an error. Use this caller action, for example, if it is known that all of the media required for the backup have been mounted, and utility prompts are not desired.

DB2BACKUP_CONTINUE
Continue the backup after the user has performed some action requested by the utility (mount a new tape, for example).

DB2BACKUP_TERMINATE
Terminate the backup after the user has failed to perform some action requested by the utility.

DB2BACKUP_DEVICE_TERMINATE
Remove a particular device from the list of devices used by backup. When a particular medium is full, backup will return a warning to the caller (while continuing to process using the remaining devices). Call backup again with this caller action to remove the device which generated the warning from the list of devices being used.

DB2BACKUP_PARM_CHK
Used to validate parameters without performing a backup. This option does not terminate the database connection after the call returns. After successful return of this call, it is expected that the user will issue a call with SQLUB_CONTINUE to proceed with the action.

DB2BACKUP_PARM_CHK_ONLY
Used to validate parameters without performing a backup. Before this call returns, the database connection established by this call is terminated, and no subsequent call is required.

iBufferSize
Input. Backup buffer size in 4 KB allocation units (pages). Minimum is 8 units.

iNumBuffers
Input. Specifies number of backup buffers to be used. Minimum is 2. Maximum is limited by memory.

iParallelism
Input. Degree of parallelism (number of buffer manipulators). Minimum is 1. Maximum is 1024.

iOptions

Input. A bitmap of backup properties. The options are to be combined using the bitwise OR operator to produce a value for **iOptions**. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2BACKUP_OFFLINE
Offline gives an exclusive connection to the database.

DB2BACKUP_ONLINE
Online allows database access by other applications while the backup operation occurs.

Note: An online backup operation may appear to hang if users are holding locks on SMS LOB data.

DB2BACKUP_DB
Full database backup.

DB2BACKUP_TABLESPACE
Table space level backup. For a table space level backup, provide a list of table spaces in the **piTablespaceList** parameter.

DB2BACKUP_INCREMENTAL
Specifies a cumulative (incremental) backup image. An incremental backup image is a copy of all database data that has changed since the most recent successful, full backup operation.

DB2BACKUP_DELTA
Specifies a noncumulative (delta) backup image. A delta backup image is a copy of all database data that has changed since the most recent successful backup operation of any type.

DB2BACKUP_COMPRESS
Specifies that the backup should be compressed.

DB2BACKUP_INCLUDE_COMPR_LIB
Specifies that the library used for compressing the backup should be included in the backup image.

DB2BACKUP_EXCLUDE_COMPR_LIB
Specifies that the library used for compressing the backup should be not included in the backup image.

DB2BACKUP_INCLUDE_LOGS
Specifies that the backup image should also include the range of log files required to restore and roll forward this image to some consistent point in time. The database manager includes database logs in backup images unless you specify the EXCLUDE LOGS parameter. The default behavior does not apply to a non-SSV backup of a partitioned database. This option is not valid for an offline backup. Logs are included by default in the following backup scenarios:

- Online backup of a single-partitioned database
- Online or offline single system view (SSV) backup of a multi-partitioned database
- Online or offline snapshot backup

DB2BACKUP_EXCLUDE_LOGS
Specifies that the backup image should not include any log files.

Note: When performing an offline backup operation, logs are excluded whether or not this option is specified, with the exception of snapshot backups where INCLUDE is the default. This option is the default behavior for a non-SSV backup of a partitioned database.
Logs are excluded by default in the following backup scenarios:

- Offline backup of a single-partitioned database
- Online or offline backup of a multi-partitioned database, when not using a single system view backup

DB2BACKUP_MPP
Perform backup in a manner suitable for a partitioned database.

iUtilImpactPriority
Input. Specifies the priority value to be used during a backup.

- If this value is non-zero, the utility will run throttled. Otherwise, the utility will run unthrottled.
- If there are multiple concurrent utilities running, this parameter is used to determine a relative priority between the throttled tasks. For example, consider two concurrent backups, one with priority 2 and another with priority 4. Both will be throttled, but the one with priority 4 will be allotted more resources. Setting priorities to 2 and 4 is no different than setting them to 5 and 10 or 30 and 60. Priorities values are purely relative.

piComprLibrary
Input. Indicates the name of the external library to be used to perform compression of the backup image. The name must be a fully-qualified path referring to a file on the server. If the value is a null pointer or a pointer to an empty string, DB2 will use the default library for compression. If the specified library is not found, the backup will fail.

piComprOptions
Input. Describes a block of binary data that will be passed to the initialization routine in the compression library. DB2 will pass this string directly from the client to the server, so any issues of byte-reversal or code-page conversion will have to be handled by the compression library. If the first character of the data block is '@', the remainder of the data will be interpreted by DB2 as the name of a file residing on the server. DB2 will then replace the contents of **piComprOptions** and **iComprOptionsSize** with the contents and size of this file respectively and will pass these new values to the initialization routine instead.

iComprOptionsSize
Input. A four-byte unsigned integer representing the size of the block of data passed as **piComprOptions**. **iComprOptionsSize** shall be zero if and only if **piComprOptions** is a null pointer.

iAllNodeFlag
Input. Partitioned database environments only. Indicates whether the backup operation is to be applied to all or some database partition servers defined in db2nodes.cfg. Valid values are:

DB2_NODE_LIST
Apply to database partition servers in a list that is passed in **piNodeList**.

DB2_ALL_NODES
Apply to all database partition servers. **piNodeList** should be NULL. This is the default value.

DB2_ALL_EXCEPT
Apply to all database partition servers except those in a list that is passed in **piNodeList**.

iNumNodes
Input. Specifies the number of database partition servers in the **piNodeList** array.

piNodeList
Input. A pointer to an array of database partition server numbers on which to perform the backup.

iNumMPPOutputStructs
Input. Specifies the number of elements in the **piMPPOutputStruct** array. This must be equal to or greater than the number of database partition servers that participate in this backup operation.

piMPPOutputStruct
Output. A pointer to an array of db2BackupMPPOutputStruct structures that specify output parameters for particular database partition servers.

db2TablespaceStruct data structure specific parameters

tablespaces
Input. A pointer to the list of table spaces to be backed up. For C, the list is null-terminated strings. In the generic case, it is a list of db2Char structures.

numTablespaces
Input. Number of entries in the **tablespaces** parameter.

db2MediaListStruct data structure parameters

locations
Input. A pointer to the list of media locations. For C, the list is null-terminated strings. In the generic case, it is a list of db2Char structures.

numLocations
Input. The number of entries in the locations parameter.

locationType
Input. A character indicating the media type. Valid values (defined in sqlutil header file, located in the include directory.) are:

SQLU_LOCAL_MEDIA: 'L'
Local devices (tapes, disks, diskettes, or named pipes).

SQLU_XBSA_MEDIA: 'X'
XBSA interface.

SQLU_TSM_MEDIA: 'A'
Tivoli® Storage Manager.

SQLU_OTHER_MEDIA: 'O'
Vendor library.

SQLU_SNAPSHOT_MEDIA: 'F'
Specifies that a snapshot backup is to be taken.

You cannot use SQLU_SNAPSHOT_MEDIA with any of the following:

- DB2BACKUP_COMPRESS
- DB2BACKUP_TABLESPACE
- DB2BACKUP_INCREMENTAL
- **iNumBuffers**
- **iBufferSize**
- **iParallelism**
- **piComprOptions**
- **iUtilImpactPriority**
- **numLocations** field of this structure must be 1 for snapshot restore

The default behavior for a snapshot backup is a FULL DATABASE OFFLINE backup of all paths that make up the database including all containers, local volume directory, database path (DBPATH), and primary log and mirror log paths (INCLUDE LOGS is the default for all snapshot backups unless EXCLUDE LOGS is explicitly stated).

Integrated into IBM Data Server is a DB2 ACS API driver for the following storage hardware:

- IBM TotalStorage® SAN Volume Controller
- IBM Enterprise Storage Server® Model 800
- IBM System Storage™ DS6000™
- IBM System Storage DS8000™
- IBM System Storage N Series
- NetApp V-series
- NetApp FAS

db2BackupMPPOutputStruct and db2gBackupMPPOutputStruct data structure parameters

nodeNumber
The database partition server to which the option applies.

backupSize
The size of the backup on the specified database partition, in kilobytes.

sqlca The sqlca from the specified database partition.

db2gBackupStruct data structure specific parameters

iDBAliasLen
Input. A 4-byte unsigned integer representing the length in bytes of the database alias.

iApplicationIdLen
Input. A 4-byte unsigned integer representing the length in bytes of the **poApplicationId** buffer. Should be equal to SQLU_APPLID_LEN+1 (defined in sqlutil.h).

iTimestampLen
Input. A 4-byte unsigned integer representing the length in bytes of the **poTimestamp** buffer. Should be equal to SQLU_TIME_STAMP_LEN+1 (defined in sqlutil.h).

iUsernameLen
Input. A 4-byte unsigned integer representing the length in bytes of the user name. Set to zero if no user name is provided.

iPasswordLen
Input. A 4-byte unsigned integer representing the length in bytes of the password. Set to zero if no password is provided.

iComprLibraryLen
Input. A four-byte unsigned integer representing the length in bytes of the name of the library specified in **piComprLibrary**. Set to zero if no library name is given.

db2Char data structure parameters

pioData
A pointer to a character data buffer. If NULL, no data will be returned.

iLength
Input. The size of the **pioData** buffer.

oLength
Output. The number of valid characters of data in the **pioData** buffer.

Usage notes

You can only perform a snapshot backup with **versionNumber** db2Version950 or higher. If you specify media type SQLU_SNAPSHOT_MEDIA with a **versionNumber** lower than db2Version950, DB2 database will return an error.

This function is exempt from all label-based access control (LBAC) rules. It backs up all data, even protected data. Also, the data in the backup itself is not protected by LBAC. Any user with the backup and a place in which to restore it can gain access to the data.

As you regularly backup your database, you might accumulate very large database backup images, many database logs and load copy images, all of which might be taking up a large amount of disk space. Refer to "Managing recovery objects" for information on how to manage these recovery objects.

Usage notes for a single system view (SSV) backup in a partitioned database environment

- To perform an SSV backup, specify **iOptions** DB2BACKUP_MPP and one of DB2BACKUP_DB or DB2BACKUP_TABLESPACE.
- You can only perform a SSV backup with **versionNumber** db2Version950 or higher. If you specify **iOptions** DB2BACKUP_MPP with a **versionNumber** lower than db2Version950, DB2 database will return an error. If you specify other options related to SSV backup with a **versionNumber** lower than db2Version950, DB2 database will ignore those options.
- The values for **piMediaList** specified directly in db2BackupStruct will be used as the default values on all nodes.
- The value of **oBackupSize** returned in the db2BackupStruct is the sum of the backup sizes on all nodes. The value of **backupSize** returned in the db2BackupMPPOutputStruct is the size of the backup on the specified database partition.

- **iAllNodeFlag**, **iNumNodes**, and **piNodeList** operate the same as the similarly-named elements in db2RollforwardStruct, with the exception that there is no CAT_NODE_ONLY value for **iAllNodeFlag**.
- SSV backups performed with the DB2BACKUP_BACKUP caller action are performed as if the DB2BACKUP_NOINTERRUPT caller action was specified.
- ***poMPPOutputStruct** points to memory allocated by the caller that contains at least as many elements as there are database partitions participating in the backup.

db2CfgGet - Get the database manager or database configuration parameters

Returns the values of individual entries in a specific database configuration file or a database manager configuration file.

Scope

Information about a specific database configuration file is returned only for the database partition on which it is executed.

Authorization

None

Required connection

To obtain the current online value of a configuration parameter for a specific database configuration file, a connection to the database is required. To obtain the current online value of a configuration parameter for the database manager, an instance attachment is required. Otherwise, a connection to a database or an attachment to an instance is not required.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2CfgGet (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2Cfg
{
   db2Uint32 numItems;
   struct db2CfgParam *paramArray;
   db2Uint32 flags;
   char *dbname;
} db2Cfg;

typedef SQL_STRUCTURE db2CfgParam
{
   db2Uint32 token;
   char *ptrvalue;
   db2Uint32 flags;
} db2CfgParam;
```

```
SQL_API_RC SQL_API_FN
  db2gCfgGet (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gCfg
{
   db2Uint32 numItems;
   struct db2gCfgParam *paramArray;
   db2Uint32 flags;
   db2Uint32 dbname_len;
   char *dbname;
} db2gCfg;

typedef SQL_STRUCTURE db2gCfgParam
{
   db2Uint32 token;
   db2Uint32 ptrvalue_len;
   char *ptrvalue;
   db2Uint32 flags;
} db2gCfgParam;
```

db2CfgGet API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2Cfg structure.

pSqlca
Output. A pointer to the sqlca structure.

db2Cfg data structure parameters

numItems
Input. The number of configuration parameters in the paramArray array. Set this value to db2CfgMaxParam to specify the largest number of elements in the paramArray.

paramArray
Input. A pointer to the db2CfgParam structure.

flags Input. Specifies the type of action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

db2CfgDatabase
Specifies to return the values in the database configuration file.

db2CfgDatabaseManager
Specifies to return the values in the database manager configuration file.

db2CfgImmediate
Returns the current values of the configuration parameters stored in memory.

db2CfgDelayed
Gets the values of the configuration parameters on disk. These do not become the current values in memory until the next database connection or instance attachment.

db2CfgGetDefaults
Returns the default values for the configuration parameter.

db2CfgReset
Reset to default values.

dbname
Input. The database name.

db2CfgParam data structure parameters

token Input. The configuration parameter identifier.

Valid entries and data types for the db2CfgParam token element are listed in ″Configuration parameters summary″.

ptrvalue
Output. The configuration parameter value.

flags Output. Provides specific information for each parameter in a request. Valid values (defined in db2ApiDf header file, located in the include directory) are:

db2CfgParamAutomatic
Indicates whether the retrieved parameter has a value of automatic. To determine whether a given configuration parameter has been set to automatic, perform a boolean AND operation against the value returned by the flag and the db2CfgParamAutomatic keyword defined in db2ApiDf.h.

db2CfgParamComputed
Indicates whether the retrieved parameter has a value of computed. To determine whether a given configuration parameter has been set to computed, perform a boolean AND operation against the value returned by the flag and the db2CfgParamComputed keyword defined in db2ApiDf.h.

If the boolean AND operation is false for both of the keywords above, it means that the retrieved parameter value is set manually.

db2gCfg data structure specific parameters

dbname_len
Input. The length in bytes of dbname parameter.

db2gCfgParam data structure specific parameters

ptrvalue_len
Input. The length in bytes of ptrvalue parameter.

Usage notes

The configuration parameters `maxagents` and `maxcagents` are deprecated. In a future release, these configuration parameters may be removed completely.

The db2CfgGet API will tolerate requests for SQLF_KTN_MAXAGENTS and SQLF_KTN_MAXCAGENTS, but 0 will be returned if the server is DB2 v9.5.

db2CfgSet - Set the database manager or database configuration parameters

Modifies individual entries in a specific database configuration file or a database manager configuration file. A database configuration file resides on every node on which the database has been created.

Scope

Modifications to the database configuration file affect all database partitions by default.

Authorization

For modifications to the database configuration file, one of the following:

- sysadm
- sysctrl
- sysmaint

For modifications to the database manager configuration file:

- sysadm

Required connection

To make an online modification of a configuration parameter for a specific database, a connection to the database is required. To make an online modification of a configuration parameter for the database manager, an attachment to an instance is not required.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
   db2CfgSet (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2Cfg
{
   db2Uint32 numItems;
   struct db2CfgParam *paramArray;
   db2Uint32 flags;
   char *dbname;
   SQL_PDB_NODE_TYPE dbpartitionnum;
}  db2Cfg;

typedef SQL_STRUCTURE db2CfgParam
{
   db2Uint32 token;
   char *ptrvalue;
   db2Uint32 flags;
}  db2CfgParam;

SQL_API_RC SQL_API_FN
   db2gCfgSet (
   db2Uint32 versionNumber,
```

```
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gCfg
{
   db2Uint32 numItems;
   struct db2gCfgParam *paramArray;
   db2Uint32 flags;
   db2Uint32 dbname_len;
   char *dbname;
}  db2gCfg;

typedef SQL_STRUCTURE db2gCfgParam
{
   db2Uint32 token;
   db2Uint32 ptrvalue_len;
   char *ptrvalue;
   db2Uint32 flags;
}  db2gCfgParam;
```

db2CfgSet API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2Cfg structure.

pSqlca
Output. A pointer to the sqlca structure.

db2Cfg data structure parameters

numItems
Input. The number of configuration parameters in the paramArray array. Set this value to db2CfgMaxParam to specify the largest number of elements in the paramArray.

paramArray
Input. A pointer to the db2CfgParam structure.

flags Input. Specifies the type of action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

db2CfgDatabase
Specifies to return the values in the database configuration file.

db2CfgDatabaseManager
Specifies to return the values in the database manager configuration file.

db2CfgImmediate
Returns the current values of the configuration parameters stored in memory.

db2CfgDelayed
Gets the values of the configuration parameters on disk. These do not become the current values in memory until the next database connection or instance attachment.

db2CfgGetDefaults
Returns the default values for the configuration parameter.

db2CfgReset
Reset to default values.

db2CfgSingleDbpartition
To update or reset the database configuration on a specific database partition, set this flag and provide a value for dbpartitionnum.

dbname
Input. The database name.

dbpartitionnum
Input. Specifies on which database partition this API will set the configuration value.

db2CfgParam data structure parameters

token Input. The configuration parameter identifier. Valid entries and data types for the db2CfgParam token element are listed in ″Configuration parameters summary″.

ptrvalue
Output. The configuration parameter value.

flags Input. Provides specific information for each parameter in a request. Valid values (defined in db2ApiDf header file, located in the include directory) are:

db2CfgParamAutomatic
Indicates whether the retrieved parameter has a value of automatic. To determine whether a given configuration parameter has been set to automatic, perform a boolean AND operation against the value returned by the flag and the db2CfgParamAutomatic keyword defined in db2ApiDf.h.

db2CfgParamComputed
Indicates whether the retrieved parameter has a value of computed. To determine whether a given configuration parameter has been set to computed, perform a boolean AND operation against the value returned by the flag and the db2CfgParamComputed keyword defined in db2ApiDf.h.

db2CfgParamManual
Used to unset the automatic or computed setting of a parameter and set the parameter to the current value. The **ptrvalue** field is ignored and can be set to NULL.

db2gCfg data structure specific parameters

dbname_len
Input. The length in bytes of dbname parameter.

db2gCfgParam data structure specific parameters

ptrvalue_len
Input. The length in bytes of ptrvalue parameter.

Usage notes

The configuration parameters `maxagents` and `maxcagents` are deprecated. In a future release, these configuration parameters may be removed completely.

The db2CfgSet API will tolerate updates to the maxagents and maxcagents configuration parameters, however these updates will be ignored by DB2.

Usage samples

CASE 1: The MAXAPPLS parameter will be set to 50 at dbpartitionnum 30.

CASE 2: The MAXAPPLS parameter will be set to 50 on all dbpartitionnum.

```
int updateDbConfig()
{
    struct sqlca sqlca = {0};
    db2Cfg cfgStruct = {0};
    db2CfgParam cfgParameters[2];
    char *dbAlias = "SAMPLE";

    /* initialize cfgParameters */
    cfgParameters[0].flags = 0;
    cfgParameters[0].token = SQLF_DBTN_TSM_OWNER;
    cfgParameters[0].ptrvalue = (char *)malloc(sizeof(char) * 65);
    cfgParameters[1].flags = 0;
    cfgParameters[1].token = SQLF_DBTN_MAXAPPLS;
    cfgParameters[1].ptrvalue = (char *)malloc(sizeof(sqluint16));

    /* set two DB Config. fields  */
    strcpy(cfgParameters[0].ptrvalue, "tsm_owner");
    *(sqluint16 *)(cfgParameters[1].ptrvalue) = 50;

    /* initialize cfgStruct to update db cfg on single partition*/
    cfgStruct.numItems = 2;
    cfgStruct.paramArray = cfgParameters;
    cfgStruct.flags = db2CfgDatabase | db2CfgImmediate;
    cfgStruct.flags |= db2CfgSingleDbpartition;
    cfgStruct.dbname = dbAlias;
    cfgStruct.dbpartitionnum = 30;

    /* CASE 1: update database configuration */
    db2CfgSet(db2Version950, (void *)&cfgStruct, &sqlca);

    /* set cfgStruct to update db cfg on all db partitions */
    cfgStruct.flags &= ~db2CfgSingleDbpartition;

    /* CASE 2: update database configuration */
    db2CfgSet(db2Version950, (void *)&cfgStruct, &sqlca);
    ..............
}
```

db2ConvMonStream - Convert the monitor stream to the pre-version 6 format

Converts the new, self-describing format for a single logical data element (for example, SQLM_ELM_DB2) to the corresponding pre-version 6 external monitor structure (for example, sqlm_db2). When upgrading API calls to use the post-version 5 stream, one must traverse the monitor data using the new stream format (for example, the user must find the SQLM_ELM_DB2 element). This portion of the stream can then be passed into the conversion API to get the associated pre-version 6 data.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ConvMonStream (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ConvMonStreamData
{
   void *poTarget;
   struct sqlm_header_info *piSource;
   db2Uint32 iTargetType;
   db2Uint32 iTargetSize;
   db2Uint32 iSourceType;
} db2ConvMonStreamData;

SQL_API_RC SQL_API_FN
  db2gConvMonStream (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);
```

db2ConvMonStream API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2ConvMonStreamData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ConvMonStreamData data structure parameters

poTarget
Output. A pointer to the target monitor output structure (for example, sqlm_db2). A list of output types, and their corresponding input types, is given below.

piSource
Input. A pointer to the logical data element being converted (for example, SQLM_ELM_DB2). A list of output types, and their corresponding input types, is given below.

iTargetType
Input. The type of conversion being performed. Specify the value for the v5 type in sqlmon.h for instance SQLM_DB2_SS.

iTargetSize
Input. This parameter can usually be set to the size of the structure pointed to by poTarget; however, for elements that have usually been referenced by an offset value from the end of the structure (for example, statement text in sqlm_stmt), specify a buffer that is large enough to contain the sqlm_stmt

statically-sized elements, as well as a statement of the largest size to be extracted; that is, SQL_MAX_STMT_SIZ plus sizeof(sqlm_stmt).

iSourceType
Input. The type of source stream. Valid values are SQLM_STREAM_SNAPSHOT (snapshot stream), or SQLM_STREAM_EVMON (event monitor stream).

Usage notes

Following is a list of supported convertible data elements:

Table 6. Supported convertible data elements: snapshot variables

Snapshot variable datastream type	Structure
SQLM_ELM_APPL	sqlm_appl
SQLM_ELM_APPL_INFO	sqlm_applinfo
SQLM_ELM_DB2	sqlm_db2
SQLM_ELM_FCM	sqlm_fcm
SQLM_ELM_FCM_NODE	sqlm_fcm_node
SQLM_ELM_DBASE	sqlm_dbase
SQLM_ELM_TABLE_LIST	sqlm_table_header
SQLM_ELM_TABLE	sqlm_table
SQLM_ELM_DB_LOCK_LIST	sqlm_dbase_lock
SQLM_ELM_APPL_LOCK_LIST	sqlm_appl_lock
SQLM_ELM_LOCK	sqlm_lock
SQLM_ELM_STMT	sqlm_stmt
SQLM_ELM_SUBSECTION	sqlm_subsection
SQLM_ELM_TABLESPACE_LIST	sqlm_tablespace_header
SQLM_ELM_TABLESPACE	sqlm_tablespace
SQLM_ELM_ROLLFORWARD	sqlm_rollfwd_info
SQLM_ELM_BUFFERPOOL	sqlm_bufferpool
SQLM_ELM_LOCK_WAIT	sqlm_lockwait
SQLM_ELM_DCS_APPL	sqlm_dcs_appl, sqlm_dcs_applid_info, sqlm_dcs_appl_snap_stats, sqlm_xid, sqlm_tpmon
SQLM_ELM_DCS_DBASE	sqlm_dcs_dbase
SQLM_ELM_DCS_APPL_INFO	sqlm_dcs_applid_info
SQLM_ELM_DCS_STMT	sqlm_dcs_stmt
SQLM_ELM_COLLECTED	sqlm_collected

Table 7. Supported convertible data elements: event monitor variables

Event monitor variable datastream type	Structure
SQLM_ELM_EVENT_DB	sqlm_db_event
SQLM_ELM_EVENT_CONN	sqlm_conn_event
SQLM_ELM_EVENT_TABLE	sqlm_table_event
SQLM_ELM_EVENT_STMT	sqlm_stmt_event

Table 7. Supported convertible data elements: event monitor variables (continued)

Event monitor variable datastream type	Structure
SQLM_ELM_EVENT_XACT	sqlm_xaction_event
SQLM_ELM_EVENT_DEADLOCK	sqlm_deadlock_event
SQLM_ELM_EVENT_DLCONN	sqlm_dlconn_event
SQLM_ELM_EVENT_TABLESPACE	sqlm_tablespace_event
SQLM_ELM_EVENT_DBHEADER	sqlm_dbheader_event
SQLM_ELM_EVENT_START	sqlm_evmon_start_event
SQLM_ELM_EVENT_CONNHEADER	sqlm_connheader_event
SQLM_ELM_EVENT_OVERFLOW	sqlm_overflow_event
SQLM_ELM_EVENT_BUFFERPOOL	sqlm_bufferpool_event
SQLM_ELM_EVENT_SUBSECTION	sqlm_subsection_event
SQLM_ELM_EVENT_LOG_HEADER	sqlm_event_log_header

The sqlm_rollfwd_ts_info structure is not converted; it only contains a table space name that can be accessed directly from the stream. The sqlm_agent structure is also not converted; it only contains the pid of the agent, which can also be accessed directly from the stream.

db2DatabasePing - Ping the database to test network response time

Tests the network response time of the underlying connectivity between a client and a database server. This API can be used by an application when a host database server is accessed via DB2® Connect™ either directly or through a gateway.

Authorization

None

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DatabasePing (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DatabasePingStruct
{
   char iDbAlias[SQL_ALIAS_SZ + 1];
   db2int32 RequestPacketSz;
   db2int32 ResponsePacketSz;
   db2Uint16 iNumIterations;
   db2Uint32 *poElapsedTime;
} db2DatabasePingStruct;
```

```
SQL_API_RC SQL_API_FN
  db2gDatabasePing (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gDatabasePingStruct
{
   db2Uint16 iDbAliasLength;
   char iDbAlias[SQL_ALIAS_SZ + 1];
   db2int32 RequestPacketSz;
   db2int32 ResponsePacketSz;
   db2Uint16 iNumIterations;
   db2Uint32 *poElapsedTime;
} db2gDatabasePingStruct;
```

db2DatabasePing API parameters

versionNumber
Input. Specifies the version and release of the DB2 database or DB2 Connect product that the application is using.

pParmStruct
Input. A pointer to the db2DatabasePingStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DatabasePingStruct data structure parameters

iDbAlias
Input. Database alias name. Reserved for future use.If a value is provided, it is ignored.

RequestPacketSz
Input. Size of the packet (in bytes) to be sent to the server. The size must be between 0 and 32767 inclusive. This parameter is only valid on servers running DB2® Universal Database™ (UDB) for Linux, UNIX and Windows Version 8 or higher, or DB2 UDB for z/OS® Version 8 or higher.

ResponsePacketSz
Input. Size of the packet (in bytes) to be returned back to client. The size must be between 0 and 32767 inclusive. This parameter is only valid on servers running DB2 UDB for Linux, UNIX and Windows Version 8 or higher, or DB2 UDB for z/OS Version 8 or higher.

iNumIterations
Input. Number of test request iterations. The value must be between 1 and 32767 inclusive.

poElapsedTime
Output. A pointer to an array of 32-bit integers where the number of elements is equal to iNumIterations. Each element in the array will contain the elapsed time in microseconds for one test request iteration.

Note: The application is responsible for allocating the memory for this array prior to calling this API.

db2gDatabasePingStruct data structure specific parameters

iDbAliasLength
Input. Length of the database alias name. Reserved for future use.

Usage notes

This API will not work when it is used from a DB2 UDB Version 7 client through a DB2 Connect Version 8 to a connected DB2 host database server.

db2DatabaseQuiesce - Quiesce the database

Forces all users off the database, immediately rolls back all active transactions or waits for them to complete their current units of work within the number of minutes specified (if they cannot be completed within the specified number of minutes, the operation will fail), and puts the database into quiesce mode. This API provides exclusive access to the database. During this quiesced period, system administration can be performed on the database by users with appropriate authority. After administration is complete, you can unquiesce the database, using the db2DatabaseUnquiesce API. The db2DatabaseUnquiesce API allows other users to connect to the database, without having to shut down and perform another database start. In this mode only groups or users with QUIESCE CONNECT authority and sysadm, sysmaint, or sysctrl will have access to the database and its objects.

Authorization

One of the following:

- sysadm
- dbadm

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DatabaseQuiesce (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DbQuiesceStruct
{
  char *piDatabaseName;
  db2Uint32 iImmediate;
  db2Uint32 iForce;
  db2Uint32 iTimeout;
} db2DbQuiesceStruct;

SQL_API_RC SQL_API_FN
  db2gDatabaseQuiesce (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gDbQuiesceStruct
{
  db2Uint32 iDatabaseNameLen;
  char *piDatabaseName;
```

```
  db2Uint32 iImmediate;
  db2Uint32 iForce;
  db2Uint32 iTimeout;
} db2gDbQuiesceStruct;
```

db2DatabaseQuiesce API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2DbQuiesceStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DbQuiesceStruct data structure parameters

piDatabaseName
Input. The database name.

iImmediate
Input. Valid values are:

TRUE=1
Force the applications immediately.

FALSE=0
Deferred force. Applications will wait the number of minutes specified by iTimeout parameter to let their current units of work be completed, and then will terminate. If this deferred force cannot be completed within the number of minutes specified by iTimeout parameter, the quiesce operation will fail.

iForce Input. Reserved for future use.

iTimeout
Input. Specifies the time, in minutes, to wait for applications to commit the current unit of work. If iTimeout is not specified, in a single-partition database environment, the default value is 10 minutes. In a partitioned database environment the value specified by the start_stop_time database manager configuration parameter will be used.

db2gDbQuiesceStruct data structure specific parameters

iDatabaseNameLen
Input. Specifies the length in bytes of piDatabaseName.

db2DatabaseRestart - Restart database

Restarts a database that has been abnormally terminated and left in an inconsistent state. At the successful completion of this API, the application remains connected to the database if the user has CONNECT privilege.

Scope

This API affects only the database partition server on which it is executed.

Authorization

None

Required connection

This API establishes a database connection.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DatabaseRestart (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef struct db2RestartDbStruct
{
   char *piDatabaseName;
   char *piUserId;
   char *piPassword;
   char *piTablespaceNames;
   db2int32 iOption;
} db2RestartDbStruct;

SQL_API_RC SQL_API_FN
  db2gDatabaseRestart (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef struct db2gRestartDbStruct
{
   db2Uint32 iDatabaseNameLen;
   db2Uint32 iUserIdLen;
   db2Uint32 iPasswordLen;
   db2Uint32 iTablespaceNamesLen;
   char *piDatabaseName;
   char *piUserId;
   char *piPassword;
   char *piTablespaceNames;
} db2gRestartDbStruct;
```

db2DatabaseRestart API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParamStruct.

pParamStruct
Input. A pointer to the db2RestartDbStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2RestartDbStruct data structure parameters

piDatabaseName
Input. A pointer to a string containing the alias of the database that is to be restarted.

piUserId
Input. A pointer to a string containing the user name of the application. May be NULL.

piPassword
Input. A pointer to a string containing a password for the specified user name (if any). May be NULL.

piTablespaceNames
Input. A pointer to a string containing a list of table space names to be dropped during the restart operation. May be NULL.

iOption
Input. Valid values are:

DB2_DB_SUSPEND_NONE
Performs normal crash recovery.

DB2_DB_RESUME_WRITE
Required to perform crash recovery on a database that has I/O writes suspended.

db2gRestartDbStruct data structure specific parameters

iDatabaseNameLen
Input. Length in bytes of piDatabaseName parameter.

iUserIdLen
Input. Length in bytes of piUserId parameter.

iPasswordLen
Input. Length in bytes of piPassword parameter.

iTablespaceNamesLen
Input. Length in bytes of piTablespaceNames parameter.

Usage notes

Call this API if an attempt to connect to a database returns an error message, indicating that the database must be restarted. This action occurs only if the previous session with this database terminated abnormally (due to power failure, for example).

At the completion of this API, a shared connection to the database is maintained if the user has CONNECT privilege, and an SQL warning is issued if any indoubt transactions exist. In this case, the database is still usable, but if the indoubt transactions are not resolved before the last connection to the database is dropped, another call to the API must be completed before the database can be used again.

In the case of circular logging, a database restart operation will fail if there is any problem with the table spaces, such as an I/O error, an unmounted file system, and so on. If losing such table spaces is not an issue, their names can be explicitly specified; this will put them into drop pending state, and the restart operation can complete successfully.

REXX API syntax

```
RESTART DATABASE database_alias [USER username USING password]
```

REXX API parameters

database_alias
Alias of the database to be restarted.

username
User name under which the database is to be restarted.

password
Password used to authenticate the user name.

db2DatabaseUnquiesce - Unquiesce database

Restores user access to databases which have been quiesced for maintenance or other reasons. User access is restored without necessitating a shutdown and database restart.

Authorization

One of the following:

- sysadm
- dbadm

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DatabaseUnquiesce (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DbUnquiesceStruct
{
             char *piDatabaseName;
} db2DbUnquiesceStruct;

SQL_API_RC SQL_API_FN
  db2gDatabaseUnquiesce (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gDbUnquiesceStruct
{
             db2Uint32 iDatabaseNameLen;
             char *piDatabaseName;
} db2gDbUnquiesceStruct;
```

db2DatabaseUnquiesce API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2DbUnquiesceStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DbUnquiesceStruct data structure parameters

piDatabaseName
Input. The database name.

db2gDbUnquiesceStruct data structure specific parameters

iDatabaseNameLen
Input. Specifies the length in bytes of piDatabaseName.

db2DbDirCloseScan - End a system or local database directory scan

Frees the resources allocated by db2DbDirOpenScan.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DbDirCloseScan (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DbDirCloseScanStruct
{
   db2Uint16 iHandle;
} db2DbDirCloseScanStruct;

SQL_API_RC SQL_API_FN
  db2gDbDirCloseScan (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gDbDirCloseScanStruct
{
   db2Uint16 iHandle;
} db2gDbDirCloseScanStruct;
```

db2DbDirCloseScan API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2DbDirCloseScanStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DbDirCloseScanStruct data structure parameters

iHandle
Input. Identifier returned from the associated db2DbDirOpenScan API.

db2DbDirGetNextEntry - Get the next system or local database directory entry

Returns the next entry in the system database directory or the local database directory copy returned by db2DbDirOpenScan. Subsequent calls to this API return additional entries.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DbDirGetNextEntry (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DbDirNextEntryStructV9
{
   db2Uint16 iHandle;
   struct db2DbDirInfoV9 *poDbDirEntry;
} db2DbDirNextEntryStructV9;

SQL_STRUCTURE db2DbDirInfoV9
{
   _SQLOLDCHAR alias[SQL_ALIAS_SZ];
   _SQLOLDCHAR dbname[SQL_DBNAME_SZ];
   _SQLOLDCHAR drive[SQL_DB_PATH_SZ];
   _SQLOLDCHAR intname[SQL_INAME_SZ];
   _SQLOLDCHAR nodename[SQL_NNAME_SZ];
   _SQLOLDCHAR dbtype[SQL_DBTYP_SZ];
   _SQLOLDCHAR comment[SQL_CMT_SZ];
   short com_codepage;
   _SQLOLDCHAR type;
   unsigned short authentication;
   char glbdbname[SQL_DIR_NAME_SZ];
   _SQLOLDCHAR dceprincipal[SQL_DCEPRIN_SZ];
   short cat_nodenum;
   short nodenum;
   _SQLOLDCHAR althostname[SQL_HOSTNAME_SZ];
   _SQLOLDCHAR altportnumber[SQL_SERVICE_NAME_SZ];
};
```

```
SQL_API_RC SQL_API_FN
  db2gDbDirGetNextEntry (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gDbDirNextEntryStrV9
{
   db2Uint16 iHandle;
   struct db2DbDirInfoV9 *poDbDirEntry;
} db2gDbDirNextEntryStrV9;
```

db2DbDirGetNextEntry API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, **pParmStruct**.

pParmStruct
Input. A pointer to the db2DbDirGetNextEntryStructV9 structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DbDirNextEntryStructV9 data structure parameters

iHandle
Input. Identifier returned from the associated db2DbDirOpenScan API.

poDbDirEntry
Output. A pointer to a db2DbDirInfoV9 structure. The space for the directory data is allocated by the API, and a pointer to that space is returned to the caller.

db2DbDirInfoV9 data structure parameters

alias An alternate database name.

dbname
The name of the database.

drive The local database directory path name where the database resides. This field is returned only if the system database directory is opened for scan.

Note: On Windows, this parameter is CHAR(12).

intname
A token identifying the database subdirectory. This field is returned only if the local database directory is opened for scan.

nodename
The name of the node where the database is located. This field is returned only if the cataloged database is a remote database.

dbtype
Database manager release information.

comment
The comment associated with the database.

com_codepage
The code page of the comment. Not used.

type Entry type. Valid values are:

SQL_INDIRECT
Database created by the current instance (as defined by the value of the **DB2INSTANCE** environment variable).

SQL_REMOTE
Database resides at a different instance.

SQL_HOME
Database resides on this volume (always HOME in local database directory).

SQL_DCE
Database resides in DCE directories.

authentication
Authentication type. Valid values are:

SQL_AUTHENTICATION_SERVER
Authentication of the user name and password takes place at the server.

SQL_AUTHENTICATION_CLIENT
Authentication of the user name and password takes place at the client.

SQL_AUTHENTICATION_DCE
Authentication takes place using DCE Security Services.

SQL_AUTHENTICATION_KERBEROS
Authentication takes place using Kerberos Security Mechanism.

SQL_AUTHENTICATION_NOT_SPECIFIED
DB2 no longer requires authentication to be kept in the database directory. Specify this value when connecting to anything other than an earlier (DB2 V2 or less) server.

SQL_AUTHENTICATION_SVR_ENCRYPT
Specifies that authentication takes place on the node containing the target database, and that the authentication password is to be encrypted.

SQL_AUTHENTICATION_DATAENC
Specifies that authentication takes place on the node containing the target database, and that connections must use data encryption.

SQL_AUTHENTICATION_GSSPLUGIN
Specifies that authentication takes place using an external GSS API-based plug-in security mechanism.

glbdbname
The global name of the target database in the global (DCE) directory, if the entry is of type SQL_DCE.

dceprincipal
The principal name if the authentication is of type DCE or KERBEROS.

cat_nodenum
Catalog node number.

nodenum
Node number.

althostname
The hostname or IP address of the alternate server where the database is reconnected at failover time.

altportnumber
The port number of the alternate server where the database is reconnected at failover time.

Usage notes

All fields of the directory entry information buffer are padded to the right with blanks.

A subsequent db2DbDirGetNextEntry obtains the entry following the current entry.

If db2DbDirGetNextEntry is called when there are no more entries to scan, then SQL1014N is set in the SQLCA.

The count value returned by the db2DbDirOpenScan API can be used to scan through the entire directory by issuing db2DbDirGetNextEntry calls, one at a time, until the number of scans equals the count of entries.

db2DbDirOpenScan - Start a system or local database directory scan

Stores a copy of the system database directory or the local database directory in memory, and returns the number of entries. This copy represents a snapshot of the directory at the time the directory is opened. This copy is not updated, even if the directory itself is changed later.

Use the db2DbDirGetNextEntry API to advance through the database directory, examining information about the database entries. Close the scan using the db2DbDirCloseScan API. This removes the copy of the directory from memory.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DbDirOpenScan (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DbDirOpenScanStruct
{
   char *piPath;
   db2Uint16 oHandle;
   db2Uint16 oNumEntries;
} db2DbDirOpenScanStruct;
```

```
SQL_API_RC SQL_API_FN
  db2gDbDirOpenScan (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gDbDirOpenScanStruct
{
   db2Uint32 iPath_len;
   char *piPath;
   db2Uint16 oHandle;
   db2Uint16 oNumEntries;
} db2gDbDirOpenScanStruct;
```

db2DbDirOpenScan API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2DbDirOpenScanStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DbDirOpenScanStruct data structure parameters

piPath Input. The name of the path on which the local database directory resides. If the specified path is a NULL pointer, the system database directory is used.

oHandle
Output. A 2-byte area for the returned identifier. This identifier must be passed to the db2DbDirGetNextEntry API for scanning the database entries, and to the db2DbDirCloseScan API to release the resources.

oNumEntries
Output. A 2-byte area where the number of directory entries is returned.

db2gDbDirOpenScanStruct data structure specific parameters

iPath_len
Input. The length in bytes of the piPath parameter.

Usage notes

Storage allocated by this API is freed by the db2DbDirCloseScan API.

Multiple db2DbDirOpenScan APIs can be issued against the same directory. However, the results may not be the same. The directory may change between openings.

There can be a maximum of eight opened database directory scans per process.

db2DropContact - Remove a contact from the list of contacts to whom notification messages can be sent

Removes a contact from the list of contacts. Contacts are users to whom notification messages can be sent.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DropContact (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DropContactData
{
   char *piUserid;
   char *piPassword;
   char *piName;
} db2DropContactData;
```

db2DropContact API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2DropContactData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DropContactData data structure parameters

piUserid
Input. The user name.

piPassword
Input. The password for piUserid.

piName
Input. The name of the contact to be dropped.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2DropContactGroup - Remove a contact group from the list of contacts to whom notification messages can be sent

Removes a contact group from the list of contacts. A contact group contains a list of users to whom notification messages can be sent.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2DropContactGroup (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2DropContactData
{
   char *piUserid;
   char *piPassword;
   char *piName;
} db2DropContactData;
```

db2DropContactGroup API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2DropContactData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2DropContactData data structure parameters

piUserid
Input. The user name.

piPassword
Input. The password for piUserid.

piName
Input. The name of the contact to be dropped.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2Export - Export data from a database

Exports data from a database to one of several external file formats. The user specifies the data to be exported by supplying an SQL SELECT statement, or by providing hierarchical information for typed tables.

Authorization

One of the following:

- sysadm
- dbadm

or CONTROL or SELECT privilege on each participating table or view. Label-based access control (LBAC) is enforced for this function. The data that is exported may be limited by the LBAC credentials of the caller if the data is protected by LBAC.

Required connection

Database. If implicit connect is enabled, a connection to the default database is established.

API include file

`db2ApiDf.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Export (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ExportStruct
{
   char *piDataFileName;
   struct sqlu_media_list *piLobPathList;
   struct sqlu_media_list *piLobFileList;
   struct sqldcol *piDataDescriptor;
   struct sqllob *piActionString;
   char *piFileType;
   struct sqlchar *piFileTypeMod;
   char *piMsgFileName;
   db2int16 iCallerAction;
   struct db2ExportOut *poExportInfoOut;
   struct db2ExportIn *piExportInfoIn;
   struct sqlu_media_list *piXmlPathList;
   struct sqlu_media_list *piXmlFileList;
} db2ExportStruct;

typedef SQL_STRUCTURE db2ExportIn
{
   db2Uint16 *piXmlSaveSchema;
} db2ExportIn;

typedef SQL_STRUCTURE db2ExportOut
{
   db2Uint64 oRowsExported;
} db2ExportOut;

SQL_API_RC SQL_API_FN
  db2gExport (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gExportStruct
{
   char *piDataFileName;
   struct sqlu_media_list *piLobPathList;
```

```
   struct sqlu_media_list *piLobFileList;
   struct sqldcol *piDataDescriptor;
   struct sqllob *piActionString;
   char *piFileType;
   struct sqlchar *piFileTypeMod;
   char *piMsgFileName;
   db2int16 iCallerAction;
   struct db2ExportOut *poExportInfoOut;
   db2Uint16 iDataFileNameLen;
   db2Uint16 iFileTypeLen;
   db2Uint16 iMsgFileNameLen;
   struct db2ExportIn *piExportInfoIn;
   struct sqlu_media_list *piXmlPathList;
   struct sqlu_media_list *piXmlFileList;
} db2gExportStruct;
```

db2Export API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2ExportStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ExportStruct data structure parameters

piDataFileName
Input. A string containing the path and the name of the external file into which the data is to be exported.

piLobPathList
Input. Pointer to an sqlu_media_list structure with its media_type field set to SQLU_LOCAL_MEDIA, and its sqlu_media_entry structure listing paths on the client where the LOB files are to be stored. Exported LOB data will be distributed evenly among all the paths listed in the sqlu_media_entry structure.

piLobFileList
Input. Pointer to an sqlu_media_list structure with its media_type field set to SQLU_CLIENT_LOCATION, and its sqlu_location_entry structure containing base file names.

When the name space is exhausted using the first name in this list, the API will use the second name, and so on. When creating LOB files during an export operation, file names are constructed by appending the current base name from this list to the current path (from piLobPathList), and then appending a 3-digit sequence number and the .lob extension. For example, if the current LOB path is the directory /u/foo/lob/path, the current LOB file name is bar, and the LOBSINSEPFILES file type modifier is set, then the created LOB files will be /u/foo/LOB/path/bar.001.lob, /u/foo/LOB/path/bar.002.lob, and so on. If the LOBSINSEPFILES file type modifier is not set, then all the LOB documents will be concatenated and put into one file /u/foo/lob/path/bar.001.lob

piDataDescriptor
Input. Pointer to an sqldcol structure specifying the column names for the output file. The value of the dcolmeth field determines how the remainder

of the information provided in this parameter is interpreted by the export utility. Valid values for this parameter (defined in sqlutil header file, located in the include directory) are:

SQL_METH_N
Names. Specify column names to be used in the output file.

SQL_METH_D
Default. Existing column names from the table are to be used in the output file. In this case, the number of columns and the column specification array are both ignored. The column names are derived from the output of the SELECT statement specified in piActionString.

piActionString
Input. Pointer to an sqllob structure containing a valid dynamic SQL SELECT statement. The structure contains a 4-byte long field, followed by the characters that make up the SELECT statement. The SELECT statement specifies the data to be extracted from the database and written to the external file.

The columns for the external file (from piDataDescriptor), and the database columns from the SELECT statement, are matched according to their respective list/structure positions. The first column of data selected from the database is placed in the first column of the external file, and its column name is taken from the first element of the external column array.

piFileType
Input. A string that indicates the format of the data within the external file. Supported external file formats (defined in sqlutil header file) are:

SQL_DEL
Delimited ASCII, for exchange with dBase, BASIC, and the IBM Personal Decision Series programs, and many other database managers and file managers.

SQL_WSF
Worksheet formats for exchange with Lotus® Symphony and 1-2-3® programs.

SQL_IXF
PC version of the Integration Exchange Format, the preferred method for exporting data from a table. Data exported to this file format can later be imported or loaded into the same table or into another database manager table.

piFileTypeMod
Input. A pointer to an sqldcol structure containing a 2-byte long field, followed by an array of characters that specify one or more processing options. If this pointer is NULL, or the structure pointed to has zero characters, this action is interpreted as selection of a default specification.

Not all options can be used with all of the supported file types. See related link below: ″File type modifiers for the export utility.″

piMsgFileName
Input. A string containing the destination for error, warning, and informational messages returned by the utility. It can be the path and the name of an operating system file or a standard device. If the file already exists, the information is appended . If it does not exist, a file is created.

iCallerAction

Input. An action requested by the caller. Valid values (defined in sqlutil header file, located in the include directory) are:

SQLU_INITIAL

Initial call. This value must be used on the first call to the API. If the initial call or any subsequent call returns and requires the calling application to perform some action prior to completing the requested export operation, the caller action must be set to one of the following:

SQLU_CONTINUE

Continue processing. This value can only be used on subsequent calls to the API, after the initial call has returned with the utility requesting user input (for example, to respond to an end of tape condition). It specifies that the user action requested by the utility has completed, and the utility can continue processing the initial request.

SQLU_TERMINATE

Terminate processing. This value can only be used on subsequent calls to the API, after the initial call has returned with the utility requesting user input (for example, to respond to an end of tape condition). It specifies that the user action requested by the utility was not performed, and the utility is to terminate processing the initial request.

poExportInfoOut

A pointer to the db2ExportOut structure.

piExportInfoIn

Input. Pointer to the db2ExportIn structure.

piXmlPathList

Input. Pointer to an sqlu_media_list structure with its media_type field set to SQLU_LOCAL_MEDIA, and its sqlu_media_entry structure listing paths on the client where the XML files are to be stored. Exported XML data will be distributed evenly among all the paths listed in the sqlu_media_entry structure.

piXmlFileList

Input. Pointer to an sqlu_media_list structure with its media_type field set to SQLU_CLIENT_LOCATION, and its sqlu_location_entry structure containing base file names.

When the name space is exhausted using the first name in this list, the API will use the second name, and so on. When creating XML files during an export operation, file names are constructed by appending the current base name from this list to the current path (from piXmlFileList), and then appending a 3-digit sequence number and the .xml extension. For example, if the current XML path is the directory /u/foo/xml/path, the current XML file name is bar, and the XMLINSEPFILES file type modifier is set, then the created XML files will be /u/foo/xml/path/bar.001.xml, /u/foo/xml/path/bar.002.xml, and so on. If the XMLINSEPFILES file type modifier is not set, then all the XML documents will be concatenated and put into one file /u/foo/xml/path/bar.001.xml

db2ExportIn data structure parameters

piXmlSaveSchema
Input. Indicates that the SQL identifier of the XML schema used to validate each exported XML document should be saved in the exported data file. Possible values are TRUE and FALSE.

db2ExportOut data structure parameters

oRowsExported
Output. Returns the number of records exported to the target file.

db2gExportStruct data structure specific parameters

iDataFileNameLen
Input. A 2-byte unsigned integer representing the length in bytes of the data file name.

iFileTypeLen
Input. A 2-byte unsigned integer representing the length in bytes of the file type.

iMsgFileNameLen
Input. A 2-byte unsigned integer representing the length in bytes of the message file name.

Usage notes

Before starting an export operation, you must complete all table operations and release all locks in one of two ways:

- Close all open cursors that were defined with the WITH HOLD clause, and commit the data changes by executing the COMMIT statement.
- Roll back the data changes by executing the ROLLBACK statement.

Table aliases can be used in the SELECT statement.

The messages placed in the message file include the information returned from the message retrieval service. Each message begins on a new line.

If the export utility produces warnings, the message will be written out to a message file, or standard output if one is not specified.

A warning message is issued if the number of columns (dcolnum field of sqldcol structure) in the external column name array, piDataDescriptor, is not equal to the number of columns generated by the SELECT statement. In this case, the number of columns written to the external file is the lesser of the two numbers. Excess database columns or external column names are not used to generate the output file.

If the db2uexpm.bnd module or any other shipped .bnd files are bound manually, the format option on the binder must not be used.

DB2 Connect can be used to export tables from DRDA® servers such as DB2 for z/OS and OS/390®, DB2 for VM and VSE, and DB2 for System i™. Only PC/IXF export is supported.

PC/IXF import should be used to move data between databases. If character data containing row separators is exported to a delimited ASCII (DEL) file and processed by a text transfer program, fields containing the row separators will shrink or expand.

The export utility will not create multiple-part PC/IXF files when invoked from an AIX® system.

Index definitions for a table are included in the PC/IXF file when the contents of a single database table are exported to a PC/IXF file with a piActionString parameter beginning with SELECT * FROM tablename, and the piDataDescriptor parameter specifying default names. Indexes are not saved for views, or if the SELECT clause of the piActionString includes a join. A WHERE clause, a GROUP BY clause, or a HAVING clause in the piActionString parameter will not prevent the saving of indexes. In all of these cases, when exporting from typed tables, the entire hierarchy must be exported.

The export utility will store the NOT NULL WITH DEFAULT attribute of the table in an IXF file if the SELECT statement provided is in the form: SELECT * FROM tablename.

When exporting typed tables, subselect statements can only be expressed by specifying the target table name and the WHERE clause. Fullselect and select-statement cannot be specified when exporting a hierarchy.

For file formats other than IXF, it is recommended that the traversal order list be specified, because it tells DB2 how to traverse the hierarchy, and what sub-tables to export. If this list is not specified, all tables in the hierarchy are exported, and the default order is the OUTER order. The alternative is to use the default order, which is the order given by the OUTER function.

Note: Use the same traverse order during an import operation. The load utility does not support loading hierarchies or sub-hierarchies.

REXX™ API syntax

```
EXPORT :stmt TO datafile OF filetype
[MODIFIED BY :filetmod] [USING :dcoldata]
MESSAGES msgfile [ROWS EXPORTED :number]


CONTINUE EXPORT


STOP EXPORT
```

REXX API parameters

stmt A REXX host variable containing a valid dynamic SQL SELECT statement. The statement specifies the data to be extracted from the database.

datafile
Name of the file into which the data is to be exported.

filetype
The format of the data in the export file. The supported file formats are:

DEL Delimited ASCII

WSF Worksheet format

IXF PC version of Integration Exchange Format.

filetmod
A host variable containing additional processing options.

dcoldata
A compound REXX host variable containing the column names to be used in the export file. In the following, XXX represents the name of the host variable:

XXX.0 Number of columns (number of elements in the remainder of the variable).

XXX.1 First column name.

XXX.2 Second column name.

XXX.3 and so on.

If this parameter is NULL, or a value for dcoldata has not been specified, the utility uses the column names from the database table.

msgfile
File, path, or device name where error and warning messages are to be sent.

number
A host variable that will contain the number of exported rows.

db2GetAlertCfg - Get the alert configuration settings for the health indicators

Returns the alert configuration settings for the health indicators.

Authorization

None

Required connection

Instance. If there is not instance attachment, a default instance attachment is created.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetAlertCfg (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2GetAlertCfgData
{
   db2Uint32 iObjType;
   char *piObjName;
   db2Uint32 iDefault;
   char *piDbName;
   db2Uint32 ioNumIndicators;
   struct db2GetAlertCfgInd *pioIndicators;
```

```
} db2GetAlertCfgData;

typedef SQL_STRUCTURE db2GetAlertCfgInd
{
   db2Uint32 ioIndicatorID;
   sqlint64 oAlarm;
   sqlint64 oWarning;
   db2Uint32 oSensitivity;
   char *poFormula;
   db2Uint32 oActionEnabled;
   db2Uint32 oCheckThresholds;
   db2Uint32 oNumTaskActions;
   struct db2AlertTaskAction *poTaskActions;
   db2Uint32 oNumScriptActions;
   struct db2AlertScriptAction *poScriptActions;
   db2Uint32 oDefault;
} db2GetAlertCfgInd;

typedef SQL_STRUCTURE db2AlertTaskAction
{
   char *pTaskName;
   db2Uint32 condition;
   char *pUserID;
   char *pPassword;
   char *pHostName;
} db2AlertTaskAction;

typedef SQL_STRUCTURE db2AlertScriptAction
{
   db2Uint32 scriptType;
   db2Uint32 condition;
   char *pPathName;
   char *pWorkingDir;
   char *pCmdLineParms;
   char stmtTermChar;
   char *pUserID;
   char *pPassword;
   char *pHostName;
} db2AlertScriptAction;
```

db2GetAlertCfg API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2GetAlertCfgData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetAlertCfgData data structure parameters

iObjType
Input. Specifies the type of object for which configuration is requested. Valid values are:

- DB2ALERTCFG_OBJTYPE_DBM
- DB2ALERTCFG_OBJTYPE_DATABASES
- DB2ALERTCFG_OBJTYPE_TABLESPACES
- DB2ALERTCFG_OBJTYPE_TS_CONTAINERS
- DB2ALERTCFG_OBJTYPE_DATABASE
- DB2ALERTCFG_OBJTYPE_TABLESPACE

- DB2ALERTCFG_OBJTYPE_TS_CONTAINER

piObjName
Input. The name of the table space or table space container when the object type, iObjType, is set to DB2ALERTCFG_OBJTYPE_TABLESPACE or DB2ALERTCFG_OBJTYPE_TS_CONTAINER.

iDefault
Input. Indicates that the default installation configuration values are to be retrieved.

piDbname
Input. The alias name for the database for which configuration is requested when object type, iObjType, is DB2ALERTCFG_OBJTYPE_TS_CONTAINER, DB2ALERTCFG_OBJTYPE_TABLESPACE, and DB2ALERTCFG_OBJTYPE_DATABASE.

ioNumIndicators
This parameter can be used as either an input or output parameter.

Input: Indicates the number of pioIndicators submitted when requesting the settings for a subset of health indicators.

Output: Indicates the total number of health indicators returned by the API.

pioIndicators
A pointer to the db2GetAlertCfgInd structure. If it is set to NULL, all health indicators for that object will be returned.

db2GetAlertCfgInd data structure parameters

ioIndicatorID
The health indicator (defined in sqlmon.h).

oAlarm
Output. The health indicator alarm threshold setting. This setting is valid for threshold-based health indicators only.

oWarning
Output. The health indicator warning threshold setting. This setting is valid for threshold-based health indicators only.

oSensitivity
Output. The period of time a health indicator's value must remain within a threshold zone before the associated alarm or warning condition is registered.

poFormula
Output. A string representation of the formula used to compute the health indicator's value.

oActionEnabled
Output. If TRUE, then any alert actions that are defined in poTaskActions or poScriptActions will be invoked if a threshold is breached. If FALSE, none of the defined actions will be invoked.

oCheckThresholds
Output. If TRUE, the threshold breaches or state changes will be evaluated. If threshold breaches or states are not evaluated, then alerts will not be issued and alert actions will not be invoked regardless of whether oActionEnabled is TRUE.

oNumTaskActions
Output. The number of task alert actions in the pTaskAction array.

poTaskActions
A pointer to the db2AlertTaskAction structure.

oNumScriptActions
Output. The number of script actions in the poScriptActions array.

poScriptActions
A pointer to the db2AlertScriptAction structure.

oDefault
Output. Indicates whether current settings are inherited from the default. Set to TRUE to indicate the current settings are inherited from the default; set to FALSE otherwise.

db2AlertTaskAction data structure parameters

pTaskname
The name of the task.

condition
The condition for which to run the action.

pUserID
The user account under which the script will be executed.

pPassword
The password for the user account pUserId.

pHostName
The host name on which to run the script. This applies for both task and script.

Script The hostname for where the script resides and will be run.

Task The hostname for where the scheduler resides.

db2AlertScriptAction data structure parameters

scriptType
Specifies the type of script. Valid values are:

- DB2ALERTCFG_SCRIPTTYPE_DB2CMD
- DB2ALERTCFG_SCRIPTTYPE_OS

condition
The condition on which to run the action. Valid values for threshold based health indicators are:

- DB2ALERTCFG_CONDITION_ALL
- DB2ALERTCFG_CONDITION_WARNING
- DB2ALERTCFG_CONDITION_ALARM

For state based health indicators, use the numerical value defined in sqlmon.

pPathname
The absolute pathname of the script.

pWorkingDir
The absolute pathname of the directory in which the script is to be executed.

pCmdLineParms
The command line parameters to be passed to the script when it is invoked. Optional for DB2ALERTCFG_SCRIPTTYPE_OS only.

stmtTermChar
The character that is used in the script to terminate statements. Optional for DB2ALERTCFG_SCRIPTTYPE_DB2CMD only.

pUserID
The user account under which the script will be executed.

pPassword
The password for the user account pUserId.

pHostName
The host name on which to run the script. This applies for both task and script.

Script The hostname for where the script resides and will be run.

Task The hostname for where the scheduler resides.

Usage notes

If pioIndicators is left NULL, all health indicators for that object will be returned. This parameter can be set to an array of db2GetAlertCfgInd structures with the ioIndicatorID set to the health indicator for which the configuration is wanted. When used in this manner, be sure to set ioNumIndicators to the input array length and to set all other fields in db2GetAlertCfgInd to 0 or NULL.

All of the memory under this pointer is allocated by the engine and must be freed with a call to the db2GetAlertCfgFree API whenever the db2GetAlertCfg API returns with no error. See db2ApiDf.h, located in the include directory, for information about the db2GetAlertCfgFree API.

db2GetAlertCfgFree - Free the memory allocated by the db2GetAlertCfg API

Frees the memory allocated by the db2GetAlertCfg API.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetAlertCfgFree (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);
```

db2GetAlertCfgFree API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2GetAlertCfgData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetContactGroup - Get the list of contacts in a single contact group to whom notification messages can be sent

Returns the contacts included in a single contact group. Contacts are users to whom notification messages can be sent. Contacts can be either defined locally on the system or in a global list. The setting of the DB2 administration server (DAS) configuration parameter contact_host determines whether the list is local or global.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetContactGroup (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ContactGroupData
{
   char *pGroupName;
   char *pDescription;
   db2Uint32 numContacts;
   struct db2ContactTypeData *pContacts;
} db2ContactGroupData;

typedef SQL_STRUCTURE db2ContactTypeData
{
   db2Uint32 contactType;
   char *pName;
} db2ContactTypeData;
```

db2GetContactGroup API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2ContactGroupData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ContactGroupData data structure parameters

pGroupName
Input. The name of the group to be retrieved.

pDescription
The description of the group.

numContacts
The number of pContacts.

pContacts
A pointer to the db2ContactTypeData structure. The fields pGroupName, pDescription, pContacts, and pContacts.pName should be preallocated by the user with their respective maximum sizes. Call db2GetContactGroup with numContacts=0 and pContacts=NULL to have the required length for pContacts returned in numContacts.

db2ContactTypeData data structure parameters

contactType
Specifies the type of contact. Valid values are:

- DB2CONTACT_SINGLE
- DB2CONTACT_GROUP

pName
The contact group name, or the contact name if contactType is set to DB2CONTACT_SINGLE.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2GetContactGroups - Get the list of contact groups to whom notification messages can be sent

Returns the list of contact groups. Contacts are users to whom notification messages can be sent. Contact groups can be either defined locally on the system or in a global list. The setting of the DB2 administration server (DAS) configuration parameter contact_host determines whether the list is local or global.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetContactGroups (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2GetContactGroupsData
{
   db2Uint32 ioNumGroups;
   struct db2ContactGroupDesc *poGroups;
} db2GetContactGroupsData;

typedef SQL_STRUCTURE db2ContactGroupDesc
{
   char *poName;
   char *poDescription;
} db2ContactGroupDesc;
```

db2GetContactGroups API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2GetContactGroupsData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetContactGroupsData data structure parameters

ioNumGroups
The number of groups. If oNumGroups = 0 and poGroups = NULL, it will contain the number of db2ContactGroupDesc structures needed in poGroups.

poGroups
Output. A pointer to the db2ContactGroupDesc structure.

db2ContactGroupDesc data structure parameters

poName
Output. The group name. This parameter should be preallocated by the caller with the respective maximum size.

poDescription
Output. The group description. This parameter should be preallocated by the caller with the respective maximum size.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2GetContacts - Get the list of contacts to whom notification messages can be sent

Returns the list of contacts. Contacts are users to whom notification messages can be sent. Contacts can be either defined locally on the system or in a global list. The setting of the DB2 administration server (DAS) configuration parameter contact_host determines whether the list is local or global.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetContacts (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2GetContactsData
{
   db2Uint32 ioNumContacts;
   struct db2ContactData *poContacts;
} db2GetContactsData;

typedef SQL_STRUCTURE db2ContactData
{
   char *pName;
   db2Uint32 type;
   char *pAddress;
   db2Uint32 maxPageLength;
   char *pDescription;
} db2ContactData;
```

db2GetContacts API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2GetContactsData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetContactsData data structure parameters

ioNumContacts
The number of poContacts.

poContacts
Output. A pointer to the db2ContactData structure. The fields poContacts,

pocontacts.pAddress, pocontacts.pDescription, and pocontacts.pName should be preallocated by the user with their respective maximum sizes. Call db2GetContacts with numContacts=0 and poContacts=NULL to have the required length for poContacts returned in numContacts.

db2ContactData data structure parameters

pName
The contact name.

type Specifies the type of contact. Valid values are:
- DB2CONTACT_EMAIL
- DB2CONTACT_PAGE

pAddress
The address of the type parameter.

maxPageLength
The maximum message length for when type is set to DB2CONTACT_PAGE.

pDescription
User supplied description of the contact.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2GetHealthNotificationList - Get the list of contacts to whom health alert notifications can be sent

Returns the list of contacts and/or contact groups that are notified about the health of an instance. A contact list consists of e-mail addresses or pager internet addresses of individuals who are to be notified when non-normal health conditions are present for an instance or any of its database objects.

Authorization

None

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetHealthNotificationList (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2GetHealthNotificationListData
{
```

```
   db2Uint32 ioNumContacts;
   struct db2ContactTypeData *poContacts;
} db2GetHealthNotificationListData;

typedef SQL_STRUCTURE db2ContactTypeData
{
   db2Uint32 contactType;
   char *pName;
} db2ContactTypeData;
```

db2GetHealthNotificationList API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2GetHealthNotificationListData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetHealthNotificationListData data structure parameters

ioNumContacts
The number of contacts. If the API was called with a NULL poContact, then ioNumContacts will be set to the number of contacts the user should allocate to perform a successful call.

poContacts
Output. A pointer to the db2ContactTypeData structure.

db2ContactTypeData data structure parameters

contactType
Specifies the type of contact. Valid values are:

- DB2CONTACT_SINGLE
- DB2CONTACT_GROUP

pName
The contact group name, or the contact name if contactType is set to DB2CONTACT_SINGLE.

db2GetRecommendations - Get recommendations to resolve a health indicator in alert state

Retrieves a set of recommendations to resolve a health indicator in alert state on a particular object. The recommendations are returned as an XML document.

Authorization

None

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetRecommendations (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2GetRecommendationsData
{
   db2Uint32 iSchemaVersion;
   db2Uint32 iNodeNumber;
   db2Uint32 iIndicatorID;
   db2Uint32 iObjType;
   char *piObjName;
   char *piDbName;
   char *poRecommendation;
} db2GetRecommendationsData;
```

db2GetRecommendations API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2GetRecommendationsData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetRecommendationsData data structure parameters

iSchemaVersion
Input. Version ID of the schema used to represent the XML document. The recommendation document will only contain elements or attributes that were defined for that schema version. Set this parameter to: `DB2HEALTH_RECSCHEMA_VERSION8_2`

iNodeNumber
Input. Specifies the database partition number where the health indicator (HI) entered an alert state. Use the constant SQLM_ALL_NODES to retrieve recommendations for a given object on a given HI across all database partitions. If the HI has the same recommendations on different database partitions, those recommendations will be grouped into a single recommendation set, where the problem is the group of HIs on different database partitions and the recommendations apply to all of these HIs. To retrieve recommendations on the current database partition, use the constant value SQLM_CURRENT_NODE. For standalone instances, SQLM_CURRENT_NODE should be used.

iIndicatorID
Input. The health indicator that has entered an alert state and for which a recommendation is requested. Values are externalized in the header file sqlmon.h in the include directory.

iObjType
Input. Specifies the type of object on which the health indicator (identified by iIndicatorID) entered an alert state. Value values are:

- DB2HEALTH_OBJTYPE_DBM
- DB2HEALTH_OBJTYPE_DATABASE
- DB2HEALTH_OBJTYPE_TABLESPACE
- DB2HEALTH_OBJTYPE_TS_CONTAINER

piObjName
Input. The name of the table space or table space container when the object type parameter, iObjType, is set to DB2HEALTH_OBJTYPE_TABLESPACE or DB2HEALTH_OBJTYPE_TS_CONTAINER. Specify NULL if not required. In the case of a table space container, the object name is specified as <tablespace name>.<container name>.

piDbname
Input. The alias name for the database on which the HI entered an alert state when the object type parameter, iObjType, is DB2HEALTH_OBJTYPE_TS_CONTAINER, DB2HEALTH_OBJTYPE_TABLESPACE, or DB2HEALTH_OBJTYPE_DATABASE. Specify NULL otherwise.

poRecommendation
Output. Character pointer that will be set to the address of a buffer in memory containing the recommendation text, formatted as an XML document according to the schema provided in sqllib/misc/DB2RecommendationSchema.xsd. The XML document will be encoded in UTF-8, and text in the document will be in the caller's locale.

The xml:lang attribute on the DB2_HEALTH node will be set to the appropriate client language. The API should be considered as a trusted source and the XML document should not be validated. XML is used as a means of structuring the output data. All memory under this pointer is allocated by the engine and must be freed with a db2GetRecommendationsFree call whenever db2GetRecommendations returns with no error.

Usage notes

- Invoke this API to retrieve a set of recommendations to resolve a health alert on a specific DB2 object. If the input health indicator is not in an alert state on the object identified, an error will be returned.
- The recommendations are returned as an XML document, and contain information about actions and scripts that can be run to resolve the alert. Any scripts returned by the API must be executed on the instance on which the health indicator entered the alert state. For information about the structure and content of the recommendation XML document returned, refer to the schema at sqllib/misc/DB2RecommendationSchema.xsd
- All memory allocated by the engine and returned by this function (the recommendation document) must be freed with a db2GetRecommendationsFree call whenever db2GetRecommendations returns with no error.

db2GetRecommendationsFree - Free the memory allocated by the db2GetRecommendations API

Frees the memory allocated by the db2GetRecommendations API.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetRecommendationsFree (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);
```

db2GetRecommendationsFree API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2GetRecommendationsData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetSnapshot - Get a snapshot of the database manager operational status

Collects database manager monitor information and returns it to a user-allocated data buffer. The information returned represents a snapshot of the database manager operational status at the time the API was called.

Scope

This API can return information for the database partition server on the instance, or all database partitions on the instance.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- sysmon

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

To obtain a snapshot from a remote instance (or a different local instance), it is necessary to first attach to that instance.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetSnapshot (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2GetSnapshotData
{
   void *piSqlmaData;
   struct sqlm_collected *poCollectedData;
   void *poBuffer;
   db2Uint32 iVersion;
   db2Uint32 iBufferSize;
   db2Uint32 iStoreResult;
   db2int32 iNodeNumber;
   db2Uint32 *poOutputFormat;
   db2Uint32 iSnapshotClass;
} db2GetSnapshotData;

SQL_API_RC SQL_API_FN
  db2gGetSnapshot (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gGetSnapshotData
{
   void *piSqlmaData;
   struct sqlm_collected *poCollectedData;
   void *poBuffer;
   db2Uint32 iVersion;
   db2Uint32 iBufferSize;
   db2Uint32 iStoreResult;
   db2int32 iNodeNumber;
   db2Uint32 *poOutputFormat;
   db2Uint32 iSnapshotClass;
} db2gGetSnapshotData;
```

API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct. To use the structure as described above, specify db2Version810 or newer. If you want to use a different version of this structure, check the db2ApiDf.h header file in the include directory for the complete list of supported versions. Ensure that you use the version of the db2GetSnapshotData structure that corresponds to the version number that you specify.

pParmStruct
Input/Output. A pointer to the db2GetSnapshotData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetSnapshotData data structure parameters

piSqlmaData
Input. Pointer to the user-allocated sqlma (monitor area) structure or request data structure, "poRequestData" constructed and returned by the db2AddSnapshotRequest API. The structure specifies the type or types of snapshot data to be collected. If a pointer to the sqlma structure is used, the version passed to the db2GetSnapshot API in the versionNumber parameter should be less than db2Version900 (for example, db2Version810, db2Version822). If a pointer to the request data structure returned by the db2AddSnapshotRequest API in poRequestData parameter is used then the value db2Version900 should be passed in the versionNumber parameter of the db2GetSnapshot API.

poCollectedData
Output. A pointer to the sqlm_collected structure into which the database monitor delivers summary statistics and the number of each type of data structure returned in the buffer area.

Note: This structure is only used for pre-Version 6 data streams. However, if a snapshot call is made to an earlier remote server, this structure must be passed in for results to be processed. It is therefore recommended that this parameter always be passed in.

poBuffer
Output. Pointer to the user-defined data area into which the snapshot information will be returned.

iVersion
Input. Version ID of the database monitor data to collect. The database monitor only returns data that was available for the requested version. Set this parameter to one of the following constants:

- SQLM_DBMON_VERSION1
- SQLM_DBMON_VERSION2
- SQLM_DBMON_VERSION5
- SQLM_DBMON_VERSION5_2
- SQLM_DBMON_VERSION6
- SQLM_DBMON_VERSION7
- SQLM_DBMON_VERSION8
- SQLM_DBMON_VERSION9
- SQLM_DBMON_VERSION9_5

Note: Constants SQLM_DBMON_VERSION5_2, and earlier, are deprecated and may be removed in a future release of DB2.

iBufferSize
Input. The length of the data buffer. Use the db2GetSnapshotSize API to estimate the size of this buffer. If the buffer is not large enough, a warning is returned, along with the information that will fit in the assigned buffer. It may be necessary to resize the buffer and call the API again.

iStoreResult
Input. An indicator set to constant value TRUE or FALSE, depending on whether the snapshot results are to be stored at the DB2 server for viewing through SQL. This parameter should only be set to TRUE when the snapshot is being taken over a database connection, and when one of the snapshot types in the sqlma is SQLMA_DYNAMIC_SQL.

iNodeNumber
Input. The node where the request is to be sent. Based on this value, the request will be processed for the current node, all nodes or a user specified node. Valid values are:

- SQLM_CURRENT_NODE
- SQLM_ALL_NODES. Only allowed when the iVersion parameter is set to SQLM_DBMON_VERSION7 or newer.
- node value

Note: For standalone instances the SQLM_CURRENT_NODE value must be used.

poOutputFormat
The format of the stream returned by the server. It will be one of the following:

- SQLM_STREAM_STATIC_FORMAT
- SQLM_STREAM_DYNAMIC_FORMAT

iSnapshotClass
Input. The class qualifier for the snapshot. Valid values (defined in sqlmon header file, located in the include directory) are:

- SQLM_CLASS_DEFAULT for a standard snapshot
- SQLM_CLASS_HEALTH for a health snapshot
- SQLM_CLASS_HEALTH_WITH_DETAIL for a health snapshot including additional details

Usage notes

If an alias for a database residing at a different instance is specified, an error message is returned.

To retrieve a health snapshot with full collection information, use the AGENT_ID field in the SQLMA data structure.

db2GetSnapshotSize - Estimate the output buffer size required for the db2GetSnapshot API

Estimates the buffer size needed by the db2GetSnapshot API.

Scope

This API can either affect the database partition server on the instance, or all database partitions on the instance.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- sysmon

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

To obtain information from a remote instance (or a different local instance), it is necessary to first attach to that instance. If an attachment does not exist, an implicit instance attachment is made to the node specified by the DB2INSTANCE environment variable.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetSnapshotSize (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2GetSnapshotSizeData
{
   void *piSqlmaData;
   sqluint32 *poBufferSize;
   db2Uint32 iVersion;
   db2int32 iNodeNumber;
   db2Uint32 iSnapshotClass;
} db2GetSnapshotSizeData;

SQL_API_RC SQL_API_FN
  db2gGetSnapshotSize (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gGetSnapshotSizeData
{
   void *piSqlmaData;
   sqluint32 *poBufferSize;
   db2Uint32 iVersion;
   db2int32 iNodeNumber;
   db2Uint32 iSnapshotClass;
} db2gGetSnapshotSizeData;
```

db2GetSnapshotSize API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct. To use the structure as described above, specify db2Version810 or newer. If you want to use a different version of this structure, check the db2ApiDf.h header file in the include directory for the complete list of supported versions. Ensure that you use the version of the db2GetSnapshotSizeStruct structure that corresponds to the version number that you specify.

pParmStruct
Input. A pointer to the db2GetSnapshotSizeStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetSnapshotSizeData data structure parameters

piSqlmaData
Input. Pointer to the user-allocated sqlma (monitor area) structure or request data structure, ″poRequestData″ constructed and returned by the db2AddSnapshotRequest API. The structure specifies the type or types of snapshot data to be collected. If a pointer to the sqlma structure is used, the version passed to the db2GetSnapshotSize API in the versionNumber parameter should be less than db2Version900 (for example, db2Version810, db2Version822). If a pointer to the request data structure returned by the db2AddSnapshotRequest API in poRequestData parameter is used then the value db2Version900 should be passed in the versionNumber parameter of the db2GetSnapshotSize API.

poBufferSize
Output. A pointer to the returned estimated buffer size needed by the GET SNAPSHOT API.

iVersion
Input. Version ID of the database monitor data to collect. The database monitor only returns data that was available for the requested version. Set this parameter to one of the following symbolic constants:

- SQLM_DBMON_VERSION1
- SQLM_DBMON_VERSION2
- SQLM_DBMON_VERSION5
- SQLM_DBMON_VERSION5_2
- SQLM_DBMON_VERSION6
- SQLM_DBMON_VERSION7
- SQLM_DBMON_VERSION8
- SQLM_DBMON_VERSION9
- SQLM_DBMON_VERSION9_5

Note: Constants SQLM_DBMON_VERSION5_2, and earlier, are deprecated and may be removed in a future release of DB2.

iNodeNumber
Input. The database partition server where the request is to be sent. Based on this value, the request will be processed for the current database partition server, all database partition servers, or a user specified database partition server. Valid values are:

- SQLM_CURRENT_NODE
- SQLM_ALL_NODES. Only allowed when iVersion is set to SQLM_DBMON_VERSION7 or newer.
- node value

For stand-alone instances, the value, SQLM_CURRENT_NODE must be used.

iSnapshotClass
Input. The class qualifier for the snapshot. Valid values (defined in sqlmon header file, located in the include directory) are:

- SQLM_CLASS_DEFAULT for a standard snapshot
- SQLM_CLASS_HEALTH for a health snapshot
- SQLM_CLASS_HEALTH_WITH_DETAIL for a health snapshot including additional details

Usage notes

This function generates a significant amount of overhead. Allocating and freeing memory dynamically for each db2GetSnapshot API call is also expensive. If calling db2GetSnapshot repeatedly, for example, when sampling data over a period of time, it may be preferable to allocate a buffer of fixed size, rather than call db2GetSnapshotSize.

If the database system monitor finds no active databases or applications, it may return a buffer size of zero (if, for example, lock information related to a database that is not active is requested). Verify that the estimated buffer size returned by this API is non-zero before calling db2GetSnapshot. If an error is returned by db2GetSnapshot because of insufficient buffer space to hold the output, call this API again to determine the new size requirements.

db2GetSyncSession - Get a satellite synchronization session identifier

Gets the satellite's current synchronization session identifier.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2GetSyncSession (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef struct db2GetSyncSessionStruct
{
   char *poSyncSessionID;
} db2GetSyncSessionStruct;
```

db2GetSyncSession API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2GetSyncSessionStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2GetSyncSessionStruct data structure parameters

poSyncSessionID
Output. Specifies an identifier for the synchronization session that a satellite is currently using.

db2HADRStart - Start high availability disaster recovery (HADR) operations

Starts HADR operations on a database.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

Instance. The API establishes a database connection if one does not exist, and closes the database connection when the API completes.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2HADRStart (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2HADRStartStruct
{
   char *piDbAlias;
   char *piUserName;
   char *piPassword;
   db2Uint32 iDbRole;
   db2Uint16 iByForce;
} db2HADRStartStruct;

SQL_API_RC SQL_API_FN
  db2gHADRStart (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gHADRStartStruct
{
   char *piDbAlias;
   db2Uint32 iAliasLen;
   char *piUserName;
   db2Uint32 iUserNameLen;
   char *piPassword;
   db2Uint32 iPasswordLen;
   db2Uint32 iDbRole;
   db2Uint16 iByForce;
} db2gHADRStartStruct;
```

db2HADRStart API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2HADRStartStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2HADRStartStruct data structure parameters

piDbAlias
Input. A pointer to the database alias.

piUserName
Input. A pointer to the user name under which the command will be executed.

piPassword
Input. A pointer to a string containing the password.

iDbRole
Input. Specifies which HADR database role should be started on the specified database. Valid values are:

DB2HADR_DB_ROLE_PRIMARY
Start HADR operations on the database in the primary role.

DB2HADR_DB_ROLE_STANDBY
Start HADR operations on the database in the standby role.

iByForce
Input. This argument is ignored if the iDbRole parameter is set to DB2HADR_DB_ROLE_STANDBY. Valid values are:

DB2HADR_NO_FORCE
Specifies that HADR is started on the primary database only if a standby database connects to it within a prescribed time limit.

DB2HADR_FORCE
Specifies that HADR is to be started by force, without waiting for the standby database to connect to the primary database.

db2gHADRStartStruct data structure specific parameters

iAliasLen
Input. Specifies the length in bytes of the database alias.

iUserNameLen
Input. Specifies the length in bytes of the user name.

iPasswordLen
Input. Specifies the length in bytes of the password.

db2HADRStop - Stop high availability disaster recovery (HADR) operations

Stops HADR operations on a database.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

Instance. The API establishes a database connection if one does not exist, and closes the database connection when the API completes.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2HADRStop (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2HADRStopStruct
{
   char *piDbAlias;
   char *piUserName;
   char *piPassword;
} db2HADRStopStruct;

SQL_API_RC SQL_API_FN
  db2gHADRStop (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gHADRStopStruct
{
   char *piDbAlias;
   db2Uint32 iAliasLen;
   char *piUserName;
   db2Uint32 iUserNameLen;
   char *piPassword;
   db2Uint32 iPasswordLen;
} db2gHADRStopStruct;
```

db2HADRStop API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2HADRStopStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2HADRStopStruct data structure parameters

piDbAlias
Input. A pointer to the database alias.

piUserName
Input. A pointer to the user name under which the command will be executed.

piPassword
Input. A pointer to a string containing the password.

db2gHADRStopStruct data structure specific parameters

iAliasLen
Input. Specifies the length in bytes of the database alias.

iUserNameLen
Input. Specifies the length in bytes of the user name.

iPasswordLen
Input. Specifies the length in bytes of the password.

db2HADRTakeover - Instruct a database to take over as the high availability disaster recovery (HADR) primary database

Instructs a standby database to take over as the primary database. This API can be called against a standby database only.

Authorization

One of the following:

- *sysadm*
- *sysctrl*
- *sysmaint*

Required connection

Instance. The API establishes a database connection if one does not exist, and closes the database connection when the API completes.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2HADRTakeover (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2HADRTakeoverStruct
{
   char *piDbAlias;
   char *piUserName;
   char *piPassword;
   db2Uint16 iByForce;
} db2HADRTakeoverStruct;

SQL_API_RC SQL_API_FN
  db2gHADRTakeover (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);
```

```
typedef SQL_STRUCTURE db2gHADRTakeoverStruct
{
   char *piDbAlias;
   db2Uint32 iAliasLen;
   char *piUserName;
   db2Uint32 iUserNameLen;
   char *piPassword;
   db2Uint32 iPasswordLen;
   db2Uint16 iByForce;
} db2gHADRTakeoverStruct;
```

db2HADRTakeover API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2HADRTakeoverStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2HADRTakeoverStruct data structure parameters

piDbAlias
Input. A pointer to the database alias.

piUserName
Input. A pointer to the user name under which the command will be executed.

piPassword
Input. A pointer to a string containing the password.

iByForce
Input. Valid values are:

DB2HADR_NO_FORCE
Specifies that a takeover occurs only if the two systems are in peer state with communication established; this results in a role reversal between the HADR primary and HADR standby databases.

DB2HADR_FORCE
Specifies that the standby database takes over as the primary database without waiting for confirmation that the original primary database has been shut down. Forced takeover must be issued when the standby database is in either remote catchup pending or peer state.

DB2HADR_FORCE_PEERWINDOW
When this option is specified, there will not be any committed transaction loss if the command succeeds and the primary database is brought down before the end of the peer window period (set the database configuration parameter **HADR_PEER_WINDOW** to a non-zero value). Not bringing down the primary database, before the peer window expires, will result in *split brain*. If executed when the HADR pair is not in a peer or disconnected peer state (the peer window has expired), an error is returned.

Note: The takeover operation with the DB2HADR_FORCE_PEERWINDOW parameter may behave

incorrectly, if the primary database clock and the standby database clock are not synchronized to within 5 seconds of each other. That is, the operation may succeed when it should fail, or fail when it should succeed. You should use a time synchronization service (e.g., NTP) to keep the clocks synchronized to the same source.

```
/* Values for iByForce                                          */
#define DB2HADR_NO_FORCE           0    /* Do not perform START or   */
                                        /* TAKEOVER HADR operation   */
                                        /* by force                  */
#define DB2HADR_FORCE              1    /* Do perform START or       */
                                        /* TAKEOVER HADR operation   */
                                        /* by force                  */
#define DB2HADR_FORCE_PEERWINDOW   2    /* Perform TAKEOVER HADR     */
                                        /* operation by force inside */
                                        /* the Peer Window only      */
```

db2gHADRTakeoverStruct data structure specific parameters

iAliasLen
Input. Specifies the length in bytes of the database alias.

iUserNameLen
Input. Specifies the length in bytes of the user name.

iPasswordLen
Input. Specifies the length in bytes of the password.

db2HistoryCloseScan - End the history file scan

Ends a history file scan and frees DB2 resources required for the scan. This API must be preceded by a successful call to thedb2HistoryOpenScan API.

Authorization

None

Required connection

Instance. It is not necessary to call the sqleatin API before calling this API.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2HistoryCloseScan (
       db2Uint32 versionNumber,
       void * piHandle,
       struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  db2gHistoryCloseScan (
       db2Uint32 versionNumber,
       void * piHandle,
       struct sqlca * pSqlca);
```

db2HistoryCloseScan API parameters

versionNumber
Input. Specifies the version and release level of the second parameter, piHandle.

piHandle
Input. Specifies a pointer to the handle for scan access that was returned by the db2HistoryOpenScan API.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

For a detailed description of the use of the history file APIs, refer to the db2HistoryOpenScan API.

REXX API syntax

```
CLOSE RECOVERY HISTORY FILE :scanid
```

REXX API parameters

scanid Host variable containing the scan identifier returned from OPEN RECOVERY HISTORY FILE SCAN.

db2HistoryGetEntry - Get the next entry in the history file

Gets the next entry from the history file. This API must be preceded by a successful call to the db2HistoryOpenScan API.

Authorization

None

Required connection

Instance. It is not necessary to call sqleatin before calling this API.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2HistoryGetEntry (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2HistoryGetEntryStruct
{
   struct db2HistoryData *pioHistData;
   db2Uint16 iHandle;
   db2Uint16 iCallerAction;
} db2HistoryGetEntryStruct;

SQL_API_RC SQL_API_FN
```

```
db2gHistoryGetEntry (
     db2Uint32 versionNumber,
     void * pParmStruct,
     struct sqlca * pSqlca);
```

db2HistoryGetEntry API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2HistoryGetEntryStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2HistoryGetEntryStruct data structure parameters

pioHistData
Input. A pointer to the db2HistData structure.

iHandle
Input. Contains the handle for scan access that was returned by the db2HistoryOpenScan API.

iCallerAction
Input. Specifies the type of action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2HISTORY_GET_ENTRY
Get the next entry, but without any command data.

DB2HISTORY_GET_DDL
Get only the command data from the previous fetch.

DB2HISTORY_GET_ALL
Get the next entry, including all data.

Usage notes

The records that are returned will have been selected using the values specified in the call to the db2HistoryOpenScan API.

For a detailed description of the use of the history file APIs, refer to the db2HistoryOpenScan API.

REXX API syntax

```
GET RECOVERY HISTORY FILE ENTRY :scanid [USING :value]
```

REXX API parameters

scanid Host variable containing the scan identifier returned from OPEN RECOVERY HISTORY FILE SCAN.

value A compound REXX host variable into which the history file entry information is returned. In the following, XXX represents the host variable name:

XXX.0 Number of first level elements in the variable (always 15)

XXX.1 Number of table space elements

XXX.2 Number of used table space elements

XXX.3 OPERATION (type of operation performed)

XXX.4 OBJECT (granularity of the operation)

XXX.5 OBJECT_PART (time stamp and sequence number)

XXX.6 OPTYPE (qualifier of the operation)

XXX.7 DEVICE_TYPE (type of device used)

XXX.8 FIRST_LOG (earliest log ID)

XXX.9 LAST_LOG (current log ID)

XXX.10
BACKUP_ID (identifier for the backup)

XXX.11
SCHEMA (qualifier for the table name)

XXX.12
TABLE_NAME (name of the loaded table)

XXX.13.0
NUM_OF_TABLESPACES (number of table spaces involved in backup or restore)

XXX.13.1
Name of the first table space backed up/restored

XXX.13.2
Name of the second table space backed up/restored

XXX.13.3
and so on

XXX.14
LOCATION (where backup or copy is stored)

XXX.15
COMMENT (text to describe the entry).

db2HistoryOpenScan - Start a history file scan

This API starts a history file scan.

Authorization

None

Required connection

Instance. If the database is cataloged as remote, call the sqleatin API before calling this API.

API include file

`db2ApiDf.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2HistoryOpenScan (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2HistoryOpenStruct
{
   char *piDatabaseAlias;
   char *piTimestamp;
   char *piObjectName;
   db2Uint32 oNumRows;
   db2Uint32 oMaxTbspaces;
   db2Uint16 iCallerAction;
   db2Uint16 oHandle;
} db2HistoryOpenStruct;

SQL_API_RC SQL_API_FN
  db2gHistoryOpenScan (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gHistoryOpenStruct
{
   char *piDatabaseAlias;
   char *piTimestamp;
   char *piObjectName;
   db2Uint32 iAliasLen;
   db2Uint32 iTimestampLen;
   db2Uint32 iObjectNameLen;
   db2Uint32 oNumRows;
   db2Uint32 oMaxTbspaces;
   db2Uint16 iCallerAction;
   db2Uint16 oHandle;
} db2gHistoryOpenStruct;
```

db2HistoryOpenScan API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input or Output. A pointer to the db2HistoryOpenStruct data structure.

pSqlca
Output. A pointer to the sqlca structure.

db2HistoryOpenStruct data structure parameters

piDatabaseAlias
Input. A pointer to a string containing the database alias.

piTimestamp
Input. A pointer to a string specifying the time stamp to be used for selecting records. Records whose time stamp is equal to or greater than this value are selected. Setting this parameter to NULL, or pointing to zero, prevents the filtering of entries using a time stamp.

piObjectName
Input. A pointer to a string specifying the object name to be used for selecting records. The object may be a table or a table space. If it is a table,

the fully qualified table name must be provided. Setting this parameter to NULL, or pointing to zero, prevents the filtering of entries using the object name.

oNumRows
Output. Upon return from the API call, this parameter contains the number of matching history file entries.

oMaxTbspaces
Output. The maximum number of table space names stored with any history entry.

iCallerAction
Input. Specifies the type of action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2HISTORY_LIST_HISTORY
Lists all events that are currently logged in the history file.

DB2HISTORY_LIST_BACKUP
Lists backup and restore operations.

DB2HISTORY_LIST_ROLLFORWARD
Lists rollforward operations.

DB2HISTORY_LIST_DROPPED_TABLE
Lists dropped table records. The DDL field associated with an entry is not returned. To retrieve the DDL information for an entry, db2HistoryGetEntry must be called with a caller action of DB2HISTORY_GET_DDL immediately after the entry is fetched.

DB2HISTORY_LIST_LOAD
Lists load operations.

DB2HISTORY_LIST_CRT_TABLESPACE
Lists table space create and drop operations.

DB2HISTORY_LIST_REN_TABLESPACE
Lists table space renaming operations.

DB2HISTORY_LIST_ALT_TABLESPACE
Lists alter table space operations. The DDL field associated with an entry is not returned. To retrieve the DDL information for an entry, db2HistoryGetEntry must be called with a caller action of DB2HISTORY_GET_DDL immediately after the entry is fetched.

DB2HISTORY_LIST_REORG
Lists REORGANIZE TABLE operations. This value is not currently supported.

oHandle
Output. Upon return from the API, this parameter contains the handle for scan access. It is subsequently used in the db2HistoryGetEntry, and db2HistoryCloseScan APIs.

db2gHistoryOpenStruct data structure specific parameters

iAliasLen
Input. Specifies the length in bytes of the database alias string.

iTimestampLen
Input. Specifies the length in bytes of the timestamp string.

iObjectNameLen
Input. Specifies the length in bytes of the object name string.

Usage notes

The combination of time stamp, object name and caller action can be used to filter records. Only records that pass all specified filters are returned.

The filtering effect of the object name depends on the value specified:

- Specifying a table will return records for load operations, because this is the only information for tables in the history file.
- Specifying a table space will return records for backup, restore, and load operations for the table space.

Note: To return records for tables, they must be specified as schema.tablename. Specifying tablename will only return records for table spaces.

A maximum of eight history file scans per process is permitted.

To list every entry in the history file, a typical application will perform the following steps:

1. Call the db2HistoryOpenScan API, which returns parameter value oNumRows.
2. Allocate a db2HistData structure with space for n oTablespace fields, where n is an arbitrary number.
3. Set the iNumTablespaces field of the db2HistoryData structure to n.
4. In a loop, perform the following:
   - Call the db2HistoryGetEntry API to fetch from the history file.
   - If db2HistoryGetEntry API returns an SQLCODE value of SQL_RC_OK, use the oNumTablespaces field of the db2HistoryData structure to determine the number of table space entries returned.
   - If db2HistoryGetEntry API returns an SQLCODE value of SQLUH_SQLUHINFO_VARS_WARNING, not enough space has been allocated for all of the table spaces that DB2 is trying to return; free and reallocate the db2HistoryData structure with enough space for oDB2UsedTablespace table space entries, and set iDB2NumTablespace to oDB2UsedTablespace.
   - If db2HistoryGetEntry API returns an SQLCODE value of SQLE_RC_NOMORE, all history file entries have been retrieved.
   - Any other SQLCODE indicates a problem.
5. When all of the information has been fetched, call the db2HistoryCloseScan API to free the resources allocated by the call to db2HistoryOpenScan.

The macro SQLUHINFOSIZE(n) (defined in sqlutil header file) is provided to help determine how much memory is required for a db2HistoryData structure with space for n oTablespace entries.

REXX API syntax

```
OPEN [BACKUP] RECOVERY HISTORY FILE FOR database_alias
[OBJECT objname] [TIMESTAMP :timestamp]
USING :value
```

REXX API parameters

database_alias
The alias of the database that is to have its history file listed.

objname
Specifies the object name to be used for selecting records. The object may be a table or a table space. If it is a table, the fully qualified table name must be provided. Setting this parameter to NULL prevents the filtering of entries using objname.

timestamp
Specifies the time stamp to be used for selecting records. Records whose time stamp is equal to or greater than this value are selected. Setting this parameter to NULL prevents the filtering of entries using timestamp.

value A compound REXX host variable to which history file information is returned. In the following, XXX represents the host variable name.

XXX.0 Number of elements in the variable (always 2)

XXX.1 Identifier (handle) for future scan access

XXX.2 Number of matching history file entries.

db2HistoryUpdate - Update a history file entry

Updates the location, device type, or comment in a history file entry.

Authorization

One of the following:

- *sysadm*
- *sysctrl*
- *sysmaint*
- *dbadm*

Required connection

Database. To update entries in the history file for a database other than the default database, a connection to the database must be established before calling this API.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2HistoryUpdate (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2HistoryUpdateStruct
{
   char *piNewLocation;
   char *piNewDeviceType;
   char *piNewComment;
   char *piNewStatus;
   db2HistoryEID iEID;
} db2HistoryUpdateStruct;
```

```
typedef SQL_STRUCTURE db2HistoryEID
{
   SQL_PDB_NODE_TYPE ioNode;
   db2Uint32 ioHID;
} db2HistoryEID;

SQL_API_RC SQL_API_FN
  db2gHistoryUpdate (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gHistoryUpdateStruct
{
   char *piNewLocation;
   char *piNewDeviceType;
   char *piNewComment;
   char *piNewStatus;
   db2Uint32 iNewLocationLen;
   db2Uint32 iNewDeviceLen;
   db2Uint32 iNewCommentLen;
   db2Uint32 iNewStatusLen;
   db2HistoryEID iEID;
} db2gHistoryUpdateStruct;
```

db2HistoryUpdate API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2HistoryUpdateStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2HistoryUpdateStruct data structure parameters

piNewLocation
Input. A pointer to a string specifying a new location for the backup, restore, or load copy image. Setting this parameter to NULL, or pointing to zero, leaves the value unchanged.

piNewDeviceType
Input. A pointer to a string specifying a new device type for storing the backup, restore, or load copy image. Setting this parameter to NULL, or pointing to zero, leaves the value unchanged. Valid device types are:

D Disk

K Diskette

T Tape

F Snapshot backup

A Tivoli Storage Manager

U User exit

P Pipe

N Null device

X XBSA

Q SQL statement

O Other

piNewComment
Input. A pointer to a string specifying a new comment to describe the entry. Setting this parameter to NULL, or pointing to zero, leaves the comment unchanged.

piNewStatus
Input. A pointer to a string specifying a new status type for the entry. Setting this parameter to NULL, or pointing to zero, leaves the status unchanged. Valid values are:

A Active. The backup image is on the active log chain. Most entries are active.

I Inactive. Backup images that no longer correspond to the current log sequence, also called the current log chain are flagged as inactive.

E Expired. Backup images that are no longer required because there are more than NUM_DB_BACKUPS active images are flagged as expired.

D Deleted. Backup images that are no longer available for recovery should be marked as having been deleted.

X Do_not_delete. Recovery history entries that are marked as do not delete will not be pruned or deleted by calls to the PRUNE HISTORY command, running the ADMIN_CMD procedure with PRUNE HISTORY, calls to the db2Prune API, or automated recovery history file pruning. You can use the do_not_delete status to protect key recovery file entries from being pruned and the recovery objects associated with them from being deleted.

iEID Input. A unique identifier that can be used to update a specific entry in the history file.

db2HistoryEID data structure parameters

ioNode
This parameter can be used as either an input or output parameter.

Indicates the node number.

ioHID This parameter can be used as either an input or output parameter.

Indicates the local history file entry ID.

db2gHistoryUpdateStruct data structure specific parameters

iNewLocationLen
Input. Specifies the length in bytes of the piNewLocation parameter.

iNewDeviceLen
Input. Specifies the length in bytes of the piNewDeviceType parameter.

iNewCommentLen
Input. Specifies the length in bytes of the piNewComment parameter.

iNewStatusLen
Input. Specifies the length in bytes of the piNewStatus parameter.

Usage notes

This is an update function, and all information prior to the change is replaced and cannot be recreated. These changes are not logged.

The primary purpose of the database history file is to record information, but the data contained in the history is used directly by automatic restore operations. During any restore where the AUTOMATIC option is specified, the history of backup images and their locations will be referenced and used by the restore utility to fulfill the automatic restore request. If the automatic restore function is to be used and backup images have been relocated since they were created, it is recommended that the database history record for those images be updated to reflect the current location. If the backup image location in the database history is not updated, automatic restore will not be able to locate the backup images, but manual restore commands can still be used successfully.

REXX API syntax

```
UPDATE RECOVERY HISTORY USING :value
```

REXX API parameters

value A compound REXX host variable containing information pertaining to the new location of a history file entry. In the following, XXX represents the host variable name:

XXX.0 Number of elements in the variable (must be between 1 and 4)

XXX.1 OBJECT_PART (time stamp with a sequence number from 001 to 999)

XXX.2 New location for the backup or copy image (this parameter is optional)

XXX.3 New device used to store the backup or copy image (this parameter is optional)

XXX.4 New comment (this parameter is optional).

db2Import - Import data into a table, hierarchy, nickname or view

Inserts data from an external file with a supported file format into a table, hierarchy, nickname or view. The load utility is faster than this function. The load utility, however, does not support loading data at the hierarchy level or loading into a nickname.

Authorization

- IMPORT using the **INSERT** option requires one of the following:
  - sysadm
  - dbadm
  - CONTROL privilege on each participating table, view or nickname
  - INSERT and SELECT privilege on each participating table or view
- IMPORT to an existing table using the **INSERT_UPDATE** option, requires one of the following:
  - sysadm
  - dbadm
  - CONTROL privilege on the table, view or nickname

  - INSERT, SELECT, UPDATE and DELETE privilege on each participating table or view
- IMPORT to an existing table using the **REPLACE** or **REPLACE_CREATE** option, requires one of the following:
  - sysadm
  - dbadm
  - CONTROL privilege on the table or view
  - INSERT, SELECT, and DELETE privilege on the table or view
- IMPORT to a new table using the **CREATE** or **REPLACE_CREATE** option, requires one of the following:
  - sysadm
  - dbadm
  - CREATETAB authority on the database and USE privilege on the table space, as well as one of:
    - IMPLICIT_SCHEMA authority on the database, if the implicit or explicit schema name of the table does not exist
    - CREATEIN privilege on the schema, if the schema name of the table refers to an existing schema
- IMPORT to a table or a hierarchy that does not exist using the **CREATE**, or the **REPLACE_CREATE** option, requires one of the following:
  - sysadm
  - dbadm
  - CREATETAB authority on the database, and one of:
    - IMPLICIT_SCHEMA authority on the database, if the schema name of the table does not exist
    - CREATEIN privilege on the schema, if the schema of the table exists
    - CONTROL privilege on every sub-table in the hierarchy, if the **REPLACE_CREATE** option on the entire hierarchy is used
- IMPORT to an existing hierarchy using the **REPLACE** option requires one of the following:
  - sysadm
  - dbadm
  - CONTROL privilege on every sub-table in the hierarchy

Required connection

Database. If implicit connect is enabled, a connection to the default database is established.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Import (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ImportStruct
{
```

```
   char *piDataFileName;
   struct sqlu_media_list *piLobPathList;
   struct sqldcol *piDataDescriptor;
   struct sqlchar *piActionString;
   char *piFileType;
   struct sqlchar *piFileTypeMod;
   char *piMsgFileName;
   db2int16 iCallerAction;
   struct db2ImportIn *piImportInfoIn;
   struct db2ImportOut *poImportInfoOut;
   db2int32 *piNullIndicators;
   struct sqllob *piLongActionString;
} db2ImportStruct;

typedef SQL_STRUCTURE db2ImportIn
{
   db2Uint64 iRowcount;
   db2Uint64 iRestartcount;
   db2Uint64 iSkipcount;
   db2int32 *piCommitcount;
   db2Uint32 iWarningcount;
   db2Uint16 iNoTimeout;
   db2Uint16 iAccessLevel;
   db2Uint16 *piXmlParse;
   struct db2DMUXmlValidate *piXmlValidate;
} db2ImportIn;

typedef SQL_STRUCTURE db2ImportOut
{
   db2Uint64 oRowsRead;
   db2Uint64 oRowsSkipped;
   db2Uint64 oRowsInserted;
   db2Uint64 oRowsUpdated;
   db2Uint64 oRowsRejected;
   db2Uint64 oRowsCommitted;
} db2ImportOut;

typedef SQL_STRUCTURE db2DMUXmlMapSchema
{
   struct db2Char                       iMapFromSchema;
   struct db2Char                       iMapToSchema;
} db2DMUXmlMapSchema;

typedef SQL_STRUCTURE db2DMUXmlValidateXds
{
   struct db2Char *piDefaultSchema;
   db2Uint32 iNumIgnoreSchemas;
   struct db2Char *piIgnoreSchemas;
   db2Uint32 iNumMapSchemas;
   struct db2DMUXmlMapSchema *piMapSchemas;
} db2DMUXmlValidateXds;

typedef SQL_STRUCTURE db2DMUXmlValidateSchema
{
   struct db2Char *piSchema;
} db2DMUXmlValidateSchema;

typedef SQL_STRUCTURE db2DMUXmlValidate
{
   db2Uint16 iUsing;
   struct db2DMUXmlValidateXds *piXdsArgs;
   struct db2DMUXmlValidateSchema *piSchemaArgs;
} db2DMUXmlValidate;

SQL_API_RC SQL_API_FN
  db2gImport (
   db2Uint32 versionNumber,
```

```
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gImportStruct
{
   char *piDataFileName;
   struct sqlu_media_list *piLobPathList;
   struct sqldcol *piDataDescriptor;
   struct sqlchar *piActionString;
   char *piFileType;
   struct sqlchar *piFileTypeMod;
   char *piMsgFileName;
   db2int16 iCallerAction;
   struct db2gImportIn *piImportInfoIn;
   struct dbg2ImportOut *poImportInfoOut;
   db2int32 *piNullIndicators;
   db2Uint16 iDataFileNameLen;
   db2Uint16 iFileTypeLen;
   db2Uint16 iMsgFileNameLen;
   struct sqllob *piLongActionString;
} db2gImportStruct;

typedef SQL_STRUCTURE db2gImportIn
{
   db2Uint64 iRowcount;
   db2Uint64 iRestartcount;
   db2Uint64 iSkipcount;
   db2int32 *piCommitcount;
   db2Uint32 iWarningcount;
   db2Uint16 iNoTimeout;
   db2Uint16 iAccessLevel;
   db2Uint16 *piXmlParse;
   struct db2DMUXmlValidate *piXmlValidate;
} db2gImportIn;

typedef SQL_STRUCTURE db2gImportOut
{
   db2Uint64 oRowsRead;
   db2Uint64 oRowsSkipped;
   db2Uint64 oRowsInserted;
   db2Uint64 oRowsUpdated;
   db2Uint64 oRowsRejected;
   db2Uint64 oRowsCommitted;
} db2gImportOut;
```

db2Import API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter **pParmStruct**.

pParmStruct
Input/Output. A pointer to the db2ImportStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ImportStruct data structure parameters

piDataFileName
Input. A string containing the path and the name of the external input file from which the data is to be imported.

piLobPathList
Input. Pointer to an sqlu_media_list with its media_type field set to

SQLU_LOCAL_MEDIA, and its sqlu_media_entry structure listing paths on the client where the LOB files can be found. This parameter is not valid when you import to a nickname.

piDataDescriptor
Input. Pointer to an sqldcol structure containing information about the columns being selected for import from the external file. The value of the dcolmeth field determines how the remainder of the information provided in this parameter is interpreted by the import utility. Valid values for this parameter are:

SQL_METH_N
Names. Selection of columns from the external input file is by column name.

SQL_METH_P
Positions. Selection of columns from the external input file is by column position.

SQL_METH_L
Locations. Selection of columns from the external input file is by column location. The database manager rejects an import call with a location pair that is invalid because of any one of the following conditions:

- Either the beginning or the ending location is not in the range from 1 to the largest signed 2-byte integer.
- The ending location is smaller than the beginning location.
- The input column width defined by the location pair is not compatible with the type and the length of the target column.

A location pair with both locations equal to zero indicates that a nullable column is to be filled with NULLs.

SQL_METH_D
Default. If **piDataDescriptor** is NULL, or is set to SQL_METH_D, default selection of columns from the external input file is done. In this case, the number of columns and the column specification array are both ignored. For DEL, IXF, or WSF files, the first n columns of data in the external input file are taken in their natural order, where n is the number of database columns into which the data is to be imported.

piActionString
Deprecated. Replaced by **piLongActionString**.

piLongActionString
Input. Pointer to an sqllob structure containing a 4-byte long field, followed by an array of characters specifying an action that affects the table.

The character array is of the form:

```
{INSERT | INSERT_UPDATE | REPLACE | CREATE | REPLACE_CREATE}
INTO {tname[(tcolumn-list)] |
[{ALL TABLES | (tname[(tcolumn-list)][, tname[(tcolumn-list)]])}]
[IN] HIERARCHY {STARTING tname | (tname[, tname])}
[UNDER sub-table-name | AS ROOT TABLE]}
```

INSERT
Adds the imported data to the table without changing the existing table data.

INSERT_UPDATE
Adds the imported rows if their primary key values are not in the table, and uses them for update if their primary key values are found. This option is only valid if the target table has a primary key, and the specified (or implied) list of target columns being imported includes all columns for the primary key. This option cannot be applied to views.

REPLACE
Deletes all existing data from the table by truncating the table object, and inserts the imported data. The table definition and the index definitions are not changed. (Indexes are deleted and replaced if indexixf is in FileTypeMod, and FileType is SQL_IXF.) If the table is not already defined, an error is returned.

Note: If an error occurs after the existing data is deleted, that data is lost.
This parameter is not valid when you import to a nickname.

CREATE

Note: The CREATE parameter is deprecated and may be removed in a future release. For additional details, see "IMPORT command options CREATE and REPLACE_CREATE are deprecated".

Creates the table definition and the row contents using the information in the specified PC/IXF file, if the specified table is not defined. If the file was previously exported by DB2, indexes are also created. If the specified table is already defined, an error is returned. This option is valid for the PC/IXF file format only. This parameter is not valid when you import to a nickname.

REPLACE_CREATE

Note: The REPLACE_CREATE parameter is deprecated and may be removed in a future release. For additional details, see "IMPORT command options CREATE and REPLACE_CREATE are deprecated".

Replaces the table contents using the PC/IXF row information in the PC/IXF file, if the specified table is defined. If the table is not already defined, the table definition and row contents are created using the information in the specified PC/IXF file. If the PC/IXF file was previously exported by DB2, indexes are also created. This option is valid for the PC/IXF file format only.

Note: If an error occurs after the existing data is deleted, that data is lost.
This parameter is not valid when you import to a nickname.

tname The name of the table, typed table, view, or object view into which the data is to be inserted. An alias for REPLACE, INSERT_UPDATE, or INSERT can be specified, except in the case of an earlier server, when a qualified or unqualified name should be specified. If it is a view, it cannot be a read-only view.

tcolumn-list
A list of table or view column names into which the data is to be inserted. The column names must be separated by commas. If

column names are not specified, column names as defined in the CREATE TABLE or the ALTER TABLE statement are used. If no column list is specified for typed tables, data is inserted into all columns within each sub-table.

sub-table-name
Specifies a parent table when creating one or more sub-tables under the CREATE option.

ALL TABLES
An implicit keyword for hierarchy only. When importing a hierarchy, the default is to import all tables specified in the traversal-order-list.

HIERARCHY
Specifies that hierarchical data is to be imported.

STARTING
Keyword for hierarchy only. Specifies that the default order, starting from a given sub-table name, is to be used.

UNDER
Keyword for hierarchy and CREATE only. Specifies that the new hierarchy, sub-hierarchy, or sub-table is to be created under a given sub-table.

AS ROOT TABLE
Keyword for hierarchy and CREATE only. Specifies that the new hierarchy, sub-hierarchy, or sub-table is to be created as a stand-alone hierarchy.

The tname and the tcolumn-list parameters correspond to the tablename and the colname lists of SQL INSERT statements, and have the same restrictions.

The columns in tcolumn-list and the external columns (either specified or implied) are matched according to their position in the list or the structure (data from the first column specified in the sqldcol structure is inserted into the table or view field corresponding to the first element of the tcolumn-list).

If unequal numbers of columns are specified, the number of columns actually processed is the lesser of the two numbers. This could result in an error (because there are no values to place in some non-nullable table fields) or an informational message (because some external file columns are ignored).

This parameter is not valid when you import to a nickname.

piFileType
Input. A string that indicates the format of the data within the external file. Supported external file formats are:

SQL_ASC
Non-delimited ASCII.

SQL_DEL
Delimited ASCII, for exchange with dBase, BASIC, and the IBM Personal Decision Series programs, and many other database managers and file managers.

SQL_IXF
PC version of the Integration Exchange Format, the preferred

method for exporting data from a table so that it can be imported later into the same table or into another database manager table.

SQL_WSF
Worksheet formats for exchange with Lotus Symphony and 1-2-3 programs. The WSF file type is not supported when you import to a nickname.

piFileTypeMod
Input. A pointer to a structure containing a 2-byte long field, followed by an array of characters that specify one or more processing options. If this pointer is NULL, or the structure pointed to has zero characters, this action is interpreted as selection of a default specification.

Not all options can be used with all of the supported file types. See related link "File type modifiers for the import utility".

piMsgFileName
Input. A string containing the destination for error, warning, and informational messages returned by the utility. It can be the path and the name of an operating system file or a standard device. If the file already exists, it is appended to. If it does not exist, a file is created.

iCallerAction
Input. An action requested by the caller. Valid values are:

SQLU_INITIAL
Initial call. This value must be used on the first call to the API. If the initial call or any subsequent call returns and requires the calling application to perform some action prior to completing the requested import operation, the caller action must be set to one of the following:

SQLU_CONTINUE
Continue processing. This value can only be used on subsequent calls to the API, after the initial call has returned with the utility requesting user input (for example, to respond to an end of tape condition). It specifies that the user action requested by the utility has completed, and the utility can continue processing the initial request.

SQLU_TERMINATE
Terminate processing. This value can only be used on subsequent calls to the API, after the initial call has returned with the utility requesting user input (for example, to respond to an end of tape condition). It specifies that the user action requested by the utility was not performed, and the utility is to terminate processing the initial request.

piImportInfoIn
Input. Pointer to the db2ImportIn structure.

poImportInfoOut
Output. Pointer to the db2ImportOut structure.

piNullIndicators
Input. For ASC files only. An array of integers that indicate whether or not the column data is nullable. The number of elements in this array must match the number of columns in the input file; there is a one-to-one ordered correspondence between the elements of this array and the columns being imported from the data file. Therefore, the number of

elements must equal the dcolnum field of the **piDataDescriptor** parameter. Each element of the array contains a number identifying a column in the data file that is to be used as a null indicator field, or a zero indicating that the table column is not nullable. If the element is not zero, the identified column in the data file must contain a Y or an N. A Y indicates that the table column data is NULL, and N indicates that the table column data is not NULL.

piXmlPathList
Input. Pointer to an sqlu_media_list with its media_type field set to SQLU_LOCAL_MEDIA, and its sqlu_media_entry structure listing paths on the client where the XML files can be found.

db2ImportIn data structure parameters

iRowcount
Input. The number of physical records to be loaded. Allows a user to load only the first **iRowcount** rows in a file. If **iRowcount** is 0, import will attempt to process all the rows from the file.

iRestartcount
Input. The number of records to skip before starting to insert or update records. Functionally equivalent to **iSkipcount** parameter. **iRestartcount** and **iSkipcount** parameters are mutually exclusive.

iSkipcount
Input. The number of records to skip before starting to insert or update records. Functionally equivalent to **iRestartcount**.

piCommitcount
Input. The number of records to import before committing them to the database. A commit is performed whenever **piCommitcount** records are imported. A NULL value specifies the default commit count value, which is zero for offline import and AUTOMATIC for online import. Commitcount AUTOMATIC is specified by passing in the value DB2IMPORT_COMMIT_AUTO.

iWarningcount
Input. Stops the import operation after **iWarningcount** warnings. Set this parameter if no warnings are expected, but verification that the correct file and table are being used is desired. If the import file or the target table is specified incorrectly, the import utility will generate a warning for each row that it attempts to import, which will cause the import to fail.

If **iWarningcount** is 0, or this option is not specified, the import operation will continue regardless of the number of warnings issued.

iNoTimeout
Input. Specifies that the import utility will not time out while waiting for locks. This option supersedes the **locktimeout** database configuration parameter. Other applications are not affected. Valid values are:

DB2IMPORT_LOCKTIMEOUT
Indicates that the value of the **locktimeout** configuration parameter is respected.

DB2IMPORT_NO_LOCKTIMEOUT
Indicates there is no timeout.

iAccessLevel
Input. Specifies the access level. Valid values are:

- SQLU_ALLOW_NO_ACCESS
Specifies that the import utility locks the table exclusively.

- SQLU_ALLOW_WRITE_ACCESS
Specifies that the data in the table should still be accessible to readers and writers while the import is in progress.

An intent exclusive (IX) lock on the target table is acquired when the first row is inserted. This allows concurrent readers and writers to access table data. Online mode is not compatible with the **REPLACE**, **CREATE**, or **REPLACE_CREATE** import options. Online mode is not supported in conjunction with buffered inserts. The import operation will periodically commit inserted data to prevent lock escalation to a table lock and to avoid running out of active log space. These commits will be performed even if the **piCommitCount** parameter was not used. During each commit, import will lose its IX table lock, and will attempt to reacquire it after the commit. This parameter is required when you import to a nickname and **piCommitCount** parameter must be specified with a valid number (AUTOMATIC is not considered a valid option).

piXmlParse
Input. Type of parsing that should occur for XML documents. Valid values found in the db2ApiDf header file in the include directory, are:

DB2DMU_XMLPARSE_PRESERVE_WS
Whitespace should be preserved.

DB2DMU_XMLPARSE_STRIP_WS
Whitespace should be stripped.

piXmlValidate
Input. Pointer to the db2DMUXmlValidate structure. Indicates that XML schema validation should occur for XML documents.

db2ImportOut data structure parameters

oRowsRead
Output. Number of records read from the file during import.

oRowsSkipped
Output. Number of records skipped before inserting or updating begins.

oRowsInserted
Output. Number of rows inserted into the target table.

oRowsUpdated
Output. Number of rows in the target table updated with information from the imported records (records whose primary key value already exists in the table).

oRowsRejected
Output. Number of records that could not be imported.

oRowsCommitted
Output. Number of records imported successfully and committed to the database.

db2DMUXmlMapSchema data structure parameters

iMapFromSchema
Input. The SQL identifier of the XML schema to map from.

iMapToSchema
Input. The SQL identifier of the XML schema to map to.

db2DMUXmlValidateXds data structure parameters

piDefaultSchema
Input. The SQL identifier of the XML schema that should be used for validation when an XDS does not contain an SCH attribute.

iNumIgnoreSchemas
Input. The number of XML schemas that will be ignored during XML schema validation if they are referred to by an SCH attribute in XDS.

piIgnoreSchemas
Input. The list of XML schemas that will be ignored during XML schema validation if they are referred to by an SCH attribute in XDS.

iNumMapSchemas
Input. The number of XML schemas that will be mapped during XML schema validation. The first schema in the schema map pair represents a schema that is referred to by an SCH attribute in an XDS. The second schema in the pair represents the schema that should be used to perform schema validation.

piMapSchemas
Input. The list of XML schema pairs, where each pair represents a mapping of one schema to a different one. The first schema in the pair represents a schema that is referred to by an SCH attribute in an XDS. The second schema in the pair represents the schema that should be used to perform schema validation.

db2DMUXmlValidateSchema data structure parameters

piSchema
Input. The SQL identifier of the XML schema to use.

db2DMUXmlValidate data structure parameters

iUsing
Input. A specification of what to use to perform XML schema validation. Valid values found in the db2ApiDf header file in the include directory, are:

- **DB2DMU_XMLVAL_XDS**
  Validation should occur according to the XDS. This corresponds to the CLP "**XMLVALIDATE USING XDS**" clause.
- **DB2DMU_XMLVAL_SCHEMA**
  Validation should occur according to a specified schema. This corresponds to the CLP "**XMLVALIDATE USING SCHEMA**" clause.
- **DB2DMU_XMLVAL_SCHEMALOC_HINTS**
  Validation should occur according to schemaLocation hints found within the XML document. This corresponds to the "**XMLVALIDATE USING SCHEMALOCATION HINTS**" clause.

piXdsArgs
Input. Pointer to a db2DMUXmlValidateXds structure, representing arguments that correspond to the CLP "**XMLVALIDATE USING XDS**" clause.

This parameter applies only when the **iUsing** parameter in the same structure is set to DB2DMU_XMLVAL_XDS.

piSchemaArgs
Input. Pointer to a db2DMUXmlValidateSchema structure, representing arguments that correspond to the CLP "**XMLVALIDATE USING SCHEMA**" clause.

This parameter applies only when the **iUsing** parameter in the same structure is set to DB2DMU_XMLVAL_SCHEMA.

db2gImportStruct data structure specific parameters

iDataFileNameLen
Input. Specifies the length in bytes of **piDataFileName** parameter.

iFileTypeLen
Input. Specifies the length in bytes of **piFileType** parameter.

iMsgFileNameLen
Input. Specifies the length in bytes of **piMsgFileName** parameter.

Usage notes

Before starting an import operation, you must complete all table operations and release all locks in one of two ways:

- Close all open cursors that were defined with the WITH HOLD clause, and commit the data changes by executing the COMMIT statement.
- Roll back the data changes by executing the ROLLBACK statement.

The import utility adds rows to the target table using the SQL INSERT statement.

The utility issues one INSERT statement for each row of data in the input file. If an INSERT statement fails, one of two actions result:

- If it is likely that subsequent INSERT statements can be successful, a warning message is written to the message file, and processing continues.
- If it is likely that subsequent INSERT statements will fail, and there is potential for database damage, an error message is written to the message file, and processing halts.

The utility performs an automatic COMMIT after the old rows are deleted during a **REPLACE** or a **REPLACE_CREATE** operation. Therefore, if the system fails, or the application interrupts the database manager after the table object is truncated, all of the old data is lost. Ensure that the old data is no longer needed before using these options.

If the log becomes full during a **CREATE**, **REPLACE**, or **REPLACE_CREATE** operation, the utility performs an automatic COMMIT on inserted records. If the system fails, or the application interrupts the database manager after an automatic COMMIT, a table with partial data remains in the database. Use the **REPLACE** or the **REPLACE_CREATE** option to rerun the whole import operation, or use **INSERT** with the **iRestartcount** parameter set to the number of rows successfully imported.

By default, automatic COMMITs are not performed for the **INSERT** or the **INSERT_UPDATE** option. They are, however, performed if the ***piCommitcount** parameter is not zero. A full log results in a ROLLBACK.

Whenever the import utility performs a COMMIT, two messages are written to the message file: one indicates the number of records to be committed, and the other is written after a successful COMMIT. When restarting the import operation after a failure, specify the number of records to skip, as determined from the last successful COMMIT.

The import utility accepts input data with minor incompatibility problems (for example, character data can be imported using padding or truncation, and numeric data can be imported with a different numeric data type), but data with major incompatibility problems is not accepted.

One cannot **REPLACE** or **REPLACE_CREATE** an object table if it has any dependents other than itself, or an object view if its base table has any dependents (including itself). To replace such a table or a view, do the following:

1. Drop all foreign keys in which the table is a parent.
2. Run the import utility.
3. Alter the table to recreate the foreign keys.

If an error occurs while recreating the foreign keys, modify the data to maintain referential integrity.

Referential constraints and foreign key definitions are not preserved when creating tables from PC/IXF files. (Primary key definitions are preserved if the data was previously exported using SELECT *.)

Importing to a remote database requires enough disk space on the server for a copy of the input data file, the output message file, and potential growth in the size of the database.

If an import operation is run against a remote database, and the output message file is very long (more than 60 KB), the message file returned to the user on the client may be missing messages from the middle of the import operation. The first 30 KB of message information and the last 30 KB of message information are always retained.

Non-default values for **piDataDescriptor**, or specifying an explicit list of table columns in **piLongActionString**, makes importing to a remote database slower.

The database table or hierarchy must exist before data in the ASC, DEL, or WSF file formats can be imported; however, if the table does not already exist, IMPORT **CREATE** or IMPORT **REPLACE_CREATE** creates the table when it imports data from a PC/IXF file. For typed tables, IMPORT **CREATE** can create the type hierarchy and the table hierarchy as well.

PC/IXF import should be used to move data (including hierarchical data) between databases. If character data containing row separators is exported to a delimited ASCII (DEL) file and processed by a text transfer program, fields containing the row separators will shrink or expand.

The data in ASC and DEL files is assumed to be in the code page of the client application performing the import. PC/IXF files, which allow for different code pages, are recommended when importing data in different code pages. If the PC/IXF file and the import utility are in the same code page, processing occurs as for a regular application. If the two differ, and the **FORCEIN** option is specified, the import utility assumes that data in the PC/IXF file has the same code page as

the application performing the import. This occurs even if there is a conversion table for the two code pages. If the two differ, the **FORCEIN** option is not specified, and there is a conversion table, all data in the PC/IXF file will be converted from the file code page to the application code page. If the two differ, the **FORCEIN** option is not specified, and there is no conversion table, the import operation will fail. This applies only to PC/IXF files on DB2 for AIX clients.

For table objects on an 8KB page that are close to the limit of 1012 columns, import of PC/IXF data files may cause DB2 to return an error, because the maximum size of an SQL statement was exceeded. This situation can occur only if the columns are of type CHAR, VARCHAR, or CLOB. The restriction does not apply to import of DEL or ASC files.

DB2 Connect can be used to import data to DRDA servers such as DB2 for OS/390, DB2 for VM and VSE, and DB2 for OS/400®. Only PC/IXF import (**INSERT** option) is supported. The **restartcnt** parameter, but not the **commitcnt** parameter, is also supported.

When using the CREATE option with typed tables, create every sub-table defined in the PC/IXF file; sub-table definitions cannot be altered. When using options other than CREATE with typed tables, the traversal order list enables one to specify the traverse order; therefore, the traversal order list must match the one used during the export operation. For the PC/IXF file format, one need only specify the target sub-table name, and use the traverse order stored in the file. The import utility can be used to recover a table previously exported to a PC/IXF file. The table returns to the state it was in when exported.

Data cannot be imported to a system table, a declared temporary table, or a summary table.

Views cannot be created through the import utility.

On the Windows operating system:

- Importing logically split PC/IXF files is not supported.
- Importing bad format PC/IXF or WSF files is not supported.

Federated considerations

When using the db2Import API and the **INSERT**, **UPDATE**, or **INSERT_UPDATE** parameters, you must ensure that you have CONTROL privilege on the participating nickname. You must ensure that the nickname you wish to use when doing an import operation already exists.

db2Inspect - Inspect database for architectural integrity

Inspects the database for architectural integrity and checks the pages of the database for page consistency.

Scope

In a single partition database environment, the scope is the single database partition only. In a partitioned database environment it is the collection of all logical database partitions defined in `db2nodes.cfg`. For partitioned tables, the scope for database and table space level inspection includes individual data partitions and non-partitioned indexes. Table level inspection for a partitioned

table checks all the data partitions and indexes in a table, rather than checking a single data partition or index.

Authorization

One of the following:

- *sysadm*
- *sysctrl*
- *sysmaint*
- *dbadm*
- CONTROL privilege on the table

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Inspect (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2InspectStruct
{
   char *piTablespaceName;
   char *piTableName;
   char *piSchemaName;
   char *piResultsName;
   char *piDataFileName;
   SQL_PDB_NODE_TYPE *piNodeList;
   db2Uint32 iAction;
   db2int32 iTablespaceID;
   db2int32 iObjectID;
   db2Uint32 iFirstPage;
   db2Uint32 iNumberOfPages;
   db2Uint32 iFormatType;
   db2Uint32 iOptions;
   db2Uint32 iBeginCheckOption;
   db2int32 iLimitErrorReported;
   db2Uint16 iObjectErrorState;
   db2Uint16 iCatalogToTablespace;
   db2Uint16 iKeepResultfile;
   db2Uint16 iAllNodeFlag;
   db2Uint16 iNumNodes;
   db2Uint16 iLevelObjectData;
   db2Uint16 iLevelObjectIndex;
   db2Uint16 iLevelObjectLong;
   db2Uint16 iLevelObjectLOB;
   db2Uint16 iLevelObjectBlkMap;
   db2Uint16 iLevelExtentMap;
   db2Uint16 iLevelObjectXML;
   db2Uint32 iLevelCrossObject;
} db2InspectStruct;

SQL_API_RC SQL_API_FN
  db2gInspect (
   db2Uint32 versionNumber,
```

```
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gInspectStruct
{
   char *piTablespaceName;
   char *piTableName;
   char *piSchemaName;
   char *piResultsName;
   char *piDataFileName;
   SQL_PDB_NODE_TYPE *piNodeList;
   db2Uint32 iResultsNameLength;
   db2Uint32 iDataFileNameLength;
   db2Uint32 iTablespaceNameLength;
   db2Uint32 iTableNameLength;
   db2Uint32 iSchemaNameLength;
   db2Uint32 iAction;
   db2int32 iTablespaceID;
   db2int32 iObjectID;
   db2Uint32 iFirstPage;
   db2Uint32 iNumberOfPages;
   db2Uint32 iFormatType;
   db2Uint32 iOptions;
   db2Uint32 iBeginCheckOption;
   db2int32 iLimitErrorReported;
   db2Uint16 iObjectErrorState;
   db2Uint16 iCatalogToTablespace;
   db2Uint16 iKeepResultfile;
   db2Uint16 iAllNodeFlag;
   db2Uint16 iNumNodes;
   db2Uint16 iLevelObjectData;
   db2Uint16 iLevelObjectIndex;
   db2Uint16 iLevelObjectLong;
   db2Uint16 iLevelObjectLOB;
   db2Uint16 iLevelObjectBlkMap;
   db2Uint16 iLevelExtentMap;
   db2Uint16 iLevelObjectXML;
   db2Uint32 iLevelCrossObject;
} db2gInspectStruct;
```

db2Inspect API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2InspectStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2InspectStruct data structure parameters

piTablespaceName
Input. A string containing the table space name. The table space must be identified for operations on a table space. If the pointer is NULL, the table space ID value is used as input.

piTableName
Input. A string containing the table name. The table must be identified for operations on a table or a table object. If the pointer is NULL, the table space ID and table object ID values are used as input.

piSchemaName
Input. A string containing the schema name.

piResultsName
Input. A string containing the name for results output file. This input must be provided. The file will be written out to the diagnostic data directory path.

piDataFileName
Input. Reserved for future use. Must be set to NULL.

piNodeList
Input. A pointer to an array of database partition numbers on which to perform the operation.

iAction
Input. Specifies the inspect action. Valid values (defined in the db2ApiDf header file, which is located in the include directory) are:

DB2INSPECT_ACT_CHECK_DB
Inspect the entire database.

DB2INSPECT_ACT_CHECK_TABSPACE
Inspect a table space.

DB2INSPECT_ACT_CHECK_TABLE
Inspect a table.

DB2INSPECT_ACT_FORMAT_XML
Format an XML object page.

DB2INSPECT_ACT_ROWCMPEST_TBL
Estimate row compression effectiveness on a table.

iTablespaceID
Input. Specifies the table space ID. If the table space must be identified, the table space ID value is used as input if the pointer to table space name is NULL.

iObjectID
Input. Specifies the object ID. If the table must be identified, the object ID value is used as input if the pointer to table name is NULL.

iBeginCheckOption
Input. Option for check database or check table space operation to indicate where operation should begin. It must be set to zero to begin from the normal start. Values are:

DB2INSPECT_BEGIN_TSPID
Use this value for check database to begin with the table space specified by the table space ID field, the table space ID must be set.

DB2INSPECT_BEGIN_TSPID_OBJID
Use this value for check database to begin with the table specified by the table space ID and object ID field. To use this option, the table space ID and object ID must be set.

DB2INSPECT_BEGIN_OBJID
Use this value for check table space to begin with the table specified by the object ID field, the object ID must be set.

iLimitErrorReported
Input. Specifies the reporting limit of the number of pages in error for an object. Specify the number you want to use as the limit value or specify one the following values:

DB2INSPECT_LIMIT_ERROR_DEFAULT
Use this value to specify that the maximum number of pages in error to be reported is the extent size of the object.

DB2INSPECT_LIMIT_ERROR_ALL
Use this value to report all pages in error.

When DB2INSPECT_LVL_XOBJ_INXDAT_RID is used in the iLevelCrossObject field, the limit value specified, or the above DEFAULT or ALL values, represent a limit in the number of errors, instead of number of pages in error, to be reported during the online index to data consistency checking.

iObjectErrorState
Input. Specifies whether to scan objects in error state. Valid values are:

DB2INSPECT_ERROR_STATE_NORMAL
Process object only in normal state.

DB2INSPECT_ERROR_STATE_ALL
Process all objects, including objects in error state.

When DB2INSPECT_LVL_XOBJ_INXDAT_RID is used in the iLevelCrossObject field, as long as the index or data object is in an error state, DB2INSPECT_ERROR_STATE_ALL will be ignored if specified in this field, and the online index to data consistency checking will not be performed.

iKeepResultfile
Input. Specifies result file retention. Valid values are:

DB2INSPECT_RESFILE_CLEANUP
If errors are reported, the result output file will be retained. Otherwise, the result file will be removed at the end of the operation.

DB2INSPECT_RESFILE_KEEP_ALWAYS
The result output file will be retained.

iAllNodeFlag
Input. Indicates whether the operation is to be applied to all nodes defined in `db2nodes.cfg`. Valid values are:

DB2_NODE_LIST
Apply to all nodes in a node list that is passed in pNodeList.

DB2_ALL_NODES
Apply to all nodes. pNodeList should be NULL. This is the default value.

DB2_ALL_EXCEPT
Apply to all nodes except those in a node list that is passed in pNodeList.

iNumNodes
Input. Specifies the number of nodes in the pNodeList array.

iLevelObjectData
Input. Specifies processing level for data object. Valid values are:

DB2INSPECT_LEVEL_NORMAL
Level is normal.

DB2INSPECT_LEVEL_LOW
Level is low.

DB2INSPECT_LEVEL_NONE
Level is none.

iLevelObjectIndex
Input. Specifies processing level for index object. Valid values are:

DB2INSPECT_LEVEL_NORMAL
Level is normal.

DB2INSPECT_LEVEL_LOW
Level is low.

DB2INSPECT_LEVEL_NONE
Level is none.

iLevelObjectLong
Input. Specifies processing level for long object. Valid values are:

DB2INSPECT_LEVEL_NORMAL
Level is normal.

DB2INSPECT_LEVEL_LOW
Level is low.

DB2INSPECT_LEVEL_NONE
Level is none.

iLevelObjectLOB
Input. Specifies processing level for LOB object. Valid values are:

DB2INSPECT_LEVEL_NORMAL
Level is normal.

DB2INSPECT_LEVEL_LOW
Level is low.

DB2INSPECT_LEVEL_NONE
Level is none.

iLevelObjectBlkMap
Input. Specifies processing level for block map object. Valid values are:

DB2INSPECT_LEVEL_NORMAL
Level is normal.

DB2INSPECT_LEVEL_LOW
Level is low.

DB2INSPECT_LEVEL_NONE
Level is none.

iLevelExtentMap
Input. Specifies processing level for extent map. Valid values (defined in the db2ApiDf header file, which is located in the include directory) are:

DB2INSPECT_LEVEL_NORMAL
Level is normal.

DB2INSPECT_LEVEL_LOW
Level is low.

DB2INSPECT_LEVEL_NONE
Level is none.

iLevelObjectXML
Input. Specifies processing level for XML object. Valid values (defined in the db2ApiDf header file, which is located in the include directory) are:

DB2INSPECT_LEVEL_NORMAL
Level is normal.

DB2INSPECT_LEVEL_LOW
Level is low.

DB2INSPECT_LEVEL_NONE
Level is none.

iLevelCrossObject
A bit-based field used for any cross object consistency checking. Valid values are:

DB2INSPECT_LVL_XOBJ_NONE
Online index data consistency checking will not be performed (0x00000000).

DB2INSPECT_LVL_XOBJ_INXDAT_RID
INDEXDATA checking is enabled on RID index (0x00000001) and will be performed with IS table lock to allow for both readers and writers.

db2gInspectStruct data structure specific parameters

iResultsNameLength
Input. The string length of the results file name.

iDataFileNameLength
Input. The string length of the data output file name.

iTablespaceNameLength
Input. The string length of the table space name.

iTableNameLength
Input. The string length of the table name.

iSchemaNameLength
Input. The string length of the schema name.

Usage notes

The online inspect processing will access database objects using isolation level uncommitted read. Commit processing will be done during the inspect processing. It is advisable to end the unit of work by committing or rolling back changes, by executing a COMMIT or ROLLBACK statement respectively, before starting the inspect operation.

The inspect check processing will write out unformatted inspection data results to the result file. The file will be written out to the diagnostic data directory path. If there are no errors found by the check processing, the result output file will be erased at the end of the inspect operation. If there are errors found by the check processing, the result output file will not be erased at the end of the inspect operation. To see the inspection details, format the inspection result output file with the db2inspf utility.

In a partitioned database environment, the extension of the result output file will correspond to the database partition number. The file is located in the database manager diagnostic data directory path.

A unique results output file name must be specified. If the result output file already exists, the operation will not be processed.

When you call the db2Inspect API, you need to specify `iLevelCrossObject` in the db2InspectStruct with a proper value. When DB2INSPECT_LVL_XOBJ_NONE is used, online index data consistency checking will not be performed. To enable online index data consistency checking, DB2INSPECT_LVL_XOBJ_INXDAT_RID needs to be specified in the `iLevelCrossObject` field.

The processing of table spaces will process only the objects that reside in that table space. The exception is during an index data consistency check, when data objects can reside in other table spaces and still benefit from the checking, as long as the index objects are in the table space to be inspected. For a partitioned table, each index can reside in a different table space. Only those indexes that reside in the specified table space will benefit from the index to data checking.

db2InstanceQuiesce - Quiesce instance

Forces all users off the instance, immediately rolls back all active transaction, and puts the database into quiesce mode. This API provides exclusive access to the instance. During this quiesced period, system administration can be performed on the instance. After administration is complete, you can unquiesce the database using the db2DatabaseUnquiesce API. This API allows other users to connect to the database without having to shut down and perform another database start.

In this mode only groups or users with QUIESCE CONNECT authority and sysadm, sysmaint, or sysctrl authority will have access to the database and its objects.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2InstanceQuiesce (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2InsQuiesceStruct
{
             char *piInstanceName;
```

```
            char *piUserId;
            char *piGroupId;
            db2Uint32 iImmediate;
            db2Uint32 iForce;
            db2Uint32 iTimeout;
} db2InsQuiesceStruct;

SQL_API_RC SQL_API_FN
  db2gInstanceQuiesce (
            db2Uint32 versionNumber,
            void * pParmStruct,
            struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gInsQuiesceStruct
{
            db2Uint32 iInstanceNameLen;
            char *piInstanceName;
            db2Uint32 iUserIdLen;
            char *piUserId;
            db2Uint32 iGroupIdLen;
            char *piGroupId;
            db2Uint32 iImmediate;
            db2Uint32 iForce;
            db2Uint32 iTimeout;
} db2gInsQuiesceStruct;
```

db2InstanceQuiesce API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2InsQuiesceStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2InsQuiesceStruct data structure parameters

piInstanceName
Input. The instance name.

piUserId
Input. The name of the a user who will be allowed access to the instance while it is quiesced.

piGroupId
Input. The name of a group that will be allowed access to the instance while the instance is quiesced.

iImmediate
Input. Valid values are:

TRUE=1
Force the applications immediately.

FALSE=0
Deferred force. Applications will wait the number of minutes specified by iTimeout parameter to let their current units of work be completed, and then will terminate. If this deferred force cannot be completed within the number of minutes specified by iTimeout parameter, the quiesce operation will fail.

iForce Input. Reserved for future use.

iTimeout
Input. Specifies the time, in minutes, to wait for applications to commit the current unit of work. If iTimeout is not specified, in a single-partition database environment, the default value is 10 minutes. In a partitioned database environment the value specified by the start_stop_time database manager configuration parameter will be used.

db2gInsQuiesceStruct data structure specific parameters

iInstanceNameLen
Input. Specifies the length in bytes of piInstanceName.

iUserIdLen
Input. Specifies the length in bytes of piUserID.

iGroupIdLen
Input. Specifies the length in bytes of piGroupId.

db2InstanceStart - Start instance

Starts a local or remote instance.

Scope

In a single-partition database environment, the scope is that single database partition only. In a partitioned database environment, it is the collection of all logical database partition servers defined in the node configuration file, `db2nodes.cfg`.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

None

API include file

`db2ApiDf.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2InstanceStart (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2InstanceStartStruct
{
             db2int8 iIsRemote;
             char *piRemoteInstName;
             db2DasCommData * piCommData;
             db2StartOptionsStruct * piStartOpts;
} db2InstanceStartStruct;
```

```
typedef SQL_STRUCTURE db2DasCommData
{
             db2int8 iCommParam;
             char *piNodeOrHostName;
             char *piUserId;
             char *piUserPw;
} db2DasCommData;

typedef SQL_STRUCTURE db2StartOptionsStruct
{
             db2Uint32 iIsProfile;
             char *piProfile;
             db2Uint32 iIsNodeNum;
             db2NodeType iNodeNum;
             db2Uint32 iOption;
             db2Uint32 iIsHostName;
             char *piHostName;
             db2Uint32 iIsPort;
             db2PortType iPort;
             db2Uint32 iIsNetName;
             char *piNetName;
             db2Uint32 iTblspaceType;
             db2NodeType iTblspaceNode;
             db2Uint32 iIsComputer;
             char *piComputer;
             char *piUserName;
             char *piPassword;
             db2QuiesceStartStruct iQuiesceOpts;
} db2StartOptionsStruct;

typedef SQL_STRUCTURE db2QuiesceStartStruct
{
             db2int8 iIsQRequested;
             char *piQUsrName;
             char *piQGrpName;
             db2int8 iIsQUsrGrpDef;
} db2QuiesceStartStruct;

SQL_API_RC SQL_API_FN
  db2gInstanceStart (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gInstanceStStruct
{
             db2int8 iIsRemote;
             db2Uint32 iRemoteInstLen;
             char *piRemoteInstName;
             db2gDasCommData * piCommData;
             db2gStartOptionsStruct * piStartOpts;
} db2gInstanceStStruct;

typedef SQL_STRUCTURE db2gDasCommData
{
             db2int8 iCommParam;
             db2Uint32 iNodeOrHostNameLen;
             char *piNodeOrHostName;
             db2Uint32 iUserIdLen;
             char *piUserId;
             db2Uint32 iUserPwLen;
             char *piUserPw;
} db2gDasCommData;

typedef SQL_STRUCTURE db2gStartOptionsStruct
{
             db2Uint32 iIsProfile;
```

```
              char *piProfile;
              db2Uint32 iIsNodeNum;
              db2NodeType iNodeNum;
              db2Uint32 iOption;
              db2Uint32 iIsHostName;
              char *piHostName;
              db2Uint32 iIsPort;
              db2PortType iPort;
              db2Uint32 iIsNetName;
              char *piNetName;
              db2Uint32 iTblspaceType;
              db2NodeType iTblspaceNode;
              db2Uint32 iIsComputer;
              char *piComputer;
              char *piUserName;
              char *piPassword;
              db2gQuiesceStartStruct iQuiesceOpts;
} db2gStartOptionsStruct;

typedef SQL_STRUCTURE db2gQuiesceStartStruct
{
              db2int8 iIsQRequested;
              db2Uint32 iQUsrNameLen;
              char *piQUsrName;
              db2Uint32 iQGrpNameLen;
              char *piQGrpName;
              db2int8 iIsQUsrGrpDef;
} db2gQuiesceStartStruct;
```

db2InstanceStart API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2InstanceStartStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2InstanceStartStruct data structure parameters

iIsRemote
Input. An indicator set to constant integer value TRUE or FALSE. This parameter should be set to TRUE if this is a remote start.

piRemoteInstName
Input. The name of the remote instance.

piCommData
Input. A pointer to the db2DasCommData structure.

piStartOpts
Input. A pointer to the db2StartOptionsStruct structure.

db2DasCommData data structure parameters

iCommParam
Input. An indicator set to TRUE or FALSE. This parameter should be set to TRUE if this is a remote start.

piNodeOrHostName
Input. The database partition or hostname.

piUserId
Input. The user name.

piUserPw
Input. The user password.

db2StartOptionsStruct data structure parameters

iIsProfile
Input. Indicates whether a profile is specified. If this field indicates that a profile is not specified, the file db2profile is used.

piProfile
Input. The name of the profile file to be executed at each node to define the DB2 environment (MPP only). This file is executed before the nodes are started. The default value is db2profile.

iIsNodeNum
Input. Indicates whether a node number is specified. If specified, the start command only affects the specified node.

iNodeNum
Input. The database partition number.

iOption
Input. Specifies an action. Valid values for OPTION (defined in sqlenv header file, located in the include directory) are:

SQLE_NONE
Issue the normal db2start operation.

SQLE_ADDNODE
Issue the ADD NODE command.

SQLE_RESTART
Issue the RESTART DATABASE command.

SQLE_RESTART_PARALLEL
Issue the RESTART DATABASE command for parallel execution.

SQLE_STANDALONE
Start the node in STANDALONE mode.

iIsHostName
Input. Indicates whether a host name is specified.

piHostName
Input. The system name.

iIsPort
Input. Indicates whether a port number is specified.

iPort Input. The port number.

iIsNetName
Input. Indicates whether a net name is specified.

piNetName
Input. The network name.

iTblspaceType
Input. Specifies the type of system temporary table space definitions to be used for the node being added. Valid values are:

SQLE_TABLESPACES_NONE
Do not create any system temporary table spaces.

SQLE_TABLESPACES_LIKE_NODE
The containers for the system temporary table spaces should be the same as those for the specified node.

SQLE_TABLESPACES_LIKE_CATALOG
The containers for the system temporary table spaces should be the same as those for the catalog node of each database.

iTblspaceNode
Input. Specifies the node number from which the system temporary table space definitions should be obtained. The node number must exist in the db2nodes.cfg file, and is only used if the tblspace_type field is set to SQLE_TABLESPACES_LIKE_NODE.

iIsComputer
Input. Indicates whether a computer name is specified. Valid on the Windows operating system only.

piComputer
Input. Computer name. Valid on the Windows operating system only.

piUserName
Input. Logon account user name. Valid on the Windows operating system only.

piPassword
Input. The password corresponding to the logon account user name.

iQuiesceOpts
Input. A pointer to the db2QuiesceStartStruct structure.

db2QuiesceStartStruct data structure parameters

iIsQRequested
Input. An indicator set to TRUE or FALSE. This parameter should be set to TRUE if quiesce is requested.

piQUsrName
Input. The quiesced username.

piQGrpName
Input. The quiesced group name.

iIsQUsrGrpDef
Input. An indicator set to TRUE or FALSE. This parameter should be set to TRUE if a quiesced user or quiesced group is defined.

db2gInstanceStStruct data structure specific parameters

iRemoteInstLen
Input. Specifies the length in bytes of piRemoteInstName.

db2gDasCommData data structure specific parameters

iNodeOrHostNameLen
Input. Specifies the length in bytes of piNodeOrHostName.

iUserIdLen
Input. Specifies the length in bytes of piUserId.

iUserPwLen
Input. Specifies the length in bytes of piUserPw.

db2gQuiesceStartStruct data structure specific parameters

iQUsrNameLen
Input. Specifies the length in bytes of piQusrName.

iQGrpNameLen
Input. Specifies the length in bytes of piQGrpName.

db2InstanceStop - Stop instance

Stops the local or remote DB2 instance.

Scope

In a single-partition database environment, the scope is that single database partition only. In a partitioned database environment, it is the collection of all logical database partition servers defined in the node configuration file, db2nodes.cfg.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

None

API include file

`db2ApiDf.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2InstanceStop (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2InstanceStopStruct
{
             db2int8 iIsRemote;
             char *piRemoteInstName;
             db2DasCommData * piCommData;
             db2StopOptionsStruct * piStopOpts;
} db2InstanceStopStruct;

typedef SQL_STRUCTURE db2DasCommData
{
             db2int8 iCommParam;
             char *piNodeOrHostName;
             char *piUserId;
             char *piUserPw;
} db2DasCommData;
```

```
typedef SQL_STRUCTURE db2StopOptionsStruct
{
             db2Uint32 iIsProfile;
             char *piProfile;
             db2Uint32 iIsNodeNum;
             db2NodeType iNodeNum;
             db2Uint32 iStopOption;
             db2Uint32 iCallerac;
} db2StopOptionsStruct;

SQL_API_RC SQL_API_FN
  db2gInstanceStop (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gInstanceStopStruct
{
             db2int8 iIsRemote;
             db2Uint32 iRemoteInstLen;
             char *piRemoteInstName;
             db2gDasCommData * piCommData;
             db2StopOptionsStruct * piStopOpts;
} db2gInstanceStopStruct;

typedef SQL_STRUCTURE db2gDasCommData
{
             db2int8 iCommParam;
             db2Uint32 iNodeOrHostNameLen;
             char *piNodeOrHostName;
             db2Uint32 iUserIdLen;
             char *piUserId;
             db2Uint32 iUserPwLen;
             char *piUserPw;
} db2gDasCommData;
```

db2InstanceStop API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2InstanceStopStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2InstanceStopStruct data structure parameters

iIsRemote
Input. An indicator set to TRUE or FALSE. This parameter should be set to TRUE if this is a remote start.

piRemoteInstName
Input. The name of the remote instance.

piCommData
Input. A pointer to the db2DasCommData structure.

piStopOpts
Input. A pointer to the db2StopOptionsStruct structure.

db2DasCommData data structure parameters

iCommParam
Input. An indicator set to TRUE or FALSE. This parameter should be set to TRUE if this is a remote start.

piNodeOrHostName
Input. The database partition or hostname.

piUserId
Input. The user name.

piUserPw
Input. The user password.

db2StopOptionsStruct data structure parameters

iIsProfile
Input. Indicates whether a profile is specified. Possible values are TRUE and FALSE. If this field indicates that a profile is not specified, the file db2profile is used.

piProfile
Input. The name of the profile file that was executed at startup to define the DB2 environment for those nodes that were started (MPP only). If a profile for the db2InstanceStart API was specified, the same profile must be specified here.

iIsNodeNum
Input. Indicates whether a node number is specified. Possible values are TRUE and FALSE. If specified, the stop command only affects the specified node.

iNodeNum
Input. The database partition number.

iStopOption
Input. Option. Valid values are:

SQLE_NONE
Issue the normal db2stop operation.

SQLE_FORCE
Issue the FORCE APPLICATION (ALL) command.

SQLE_DROP
Drop the node from the db2nodes.cfg file.

iCallerac
Input. This field is valid only for the SQLE_DROP value of the OPTION field. Valid values are:

SQLE_DROP
Initial call. This is the default value.

SQLE_CONTINUE
Subsequent call. Continue processing after a prompt.

SQLE_TERMINATE
Subsequent call. Terminate processing after a prompt.

db2gInstanceStopStruct data structure specific parameters

iRemoteInstLen
Input. Specifies the length in bytes of piRemoteInstName.

db2gDasCommData data structure specific parameters

iNodeOrHostNameLen
Input. Specifies the length in bytes of piNodeOrHostName.

iUserIdLen
Input. Specifies the length in bytes of piUserId.

iUserPwLen
Input. Specifies the length in bytes of piUserPw.

db2InstanceUnquiesce - Unquiesce instance

Unquiesce all databases in the instance.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2InstanceUnquiesce (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2InsUnquiesceStruct
{
             char *piInstanceName;
} db2InsUnquiesceStruct;

SQL_API_RC SQL_API_FN
  db2gInstanceUnquiesce (
             db2Uint32 versionNumber,
             void * pParmStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gInsUnquiesceStruct
{
             db2Uint32 iInstanceNameLen;
             char *piInstanceName;
} db2gInsUnquiesceStruct;
```

db2InstanceUnquiesce API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2InsUnquiesceStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2InsUnquiesceStruct data structure parameters

piInstanceName
Input. The instance name.

db2gInsUnquiesceStruct data structure specific parameters

iInstanceNameLen
Input. Specifies the length in bytes of piInstanceName.

db2LdapCatalogDatabase - Register the database on the LDAP server

Catalogs a database entry in LDAP (Lightweight Directory Access Protocol).

Authorization

None

Required connection

None

API include file

`db2ApiDf.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapCatalogDatabase (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LdapCatalogDatabaseStruct
{
   char *piAlias;
   char *piDatabaseName;
   char *piComment;
   char *piNodeName;
   char *piGWNodeName;
   char *piParameters;
   char *piARLibrary;
   unsigned short                      iAuthentication;
   char *piDCEPrincipalName;
   char *piBindDN;
   char *piPassword;
} db2LdapCatalogDatabaseStruct;
```

db2LdapCatalogDatabase API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParamStruct.

pParamStruct
Input. A pointer to the db2LdapCatalogDatabaseStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapCatalogDatabaseStruct data structure parameters

piAlias
Input. Specify an alias to be used as an alternate name for the database being cataloged. If an alias is not specified, the database manager uses the database name as the alias name.

piDatabaseName
Input. Specify the name of the database to catalog. This parameter is mandatory.

piComment
Input. Describes the DB2 server. Any comment that helps to describe the server registered in the network directory can be entered. Maximum length is 30 characters. A carriage return or a line feed character is not permitted.

piNodeName
Input. Specify the node name of the database server on which the database resides. This parameter is required if the database resides on a remote database server.

piGWNodename
Input. Specify the node name of the DB2 Connect gateway server. If the database server node type is DCS (reserved for host database servers), and the client does not have DB2 Connect installed, the client will connect to the DB2 Connect gateway server.

piParameters
Input. Specify a parameter string that is to be passed to the application requester (AR). Authentication DCE is not supported.

piARLibrary
Input. Specify the name of the application requester (AR) library.

iAuthentication
Input. Specifying an authentication type can result in a performance benefit.

piDCEPrincipalName
Input. Specify the fully qualified DCE principal name for the target server.

piBindDN
Input. Specify the user's LDAP distinguished name (DN). The LDAP user DN must have sufficient authority to create and update the object in the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current logon user will be used.

piPassword
Input. Account password.

Usage notes

A database may need to be manually registered or cataloged in LDAP if:

- The database server does not support LDAP. In this case, the administrator needs to manually register each database in LDAP to allow clients that support LDAP to access the database without having to catalog the database locally on each client machine.

- The application wants to use a different name to connect to the database. In this case, the administrator needs to catalog the database using a different alias name.

- During CREATE DATABASE IN LDAP, the database name already exists in LDAP. The database is still created on the local machine (and can be accessed by local applications), but the existing entry in LDAP will not be modified to reflect the new database. In this case, the administrator can: -- Remove the existing database entry from LDAP, and manually register the new database in LDAP. -- Register the new database in LDAP using a different alias name.

db2LdapCatalogNode - Provide an alias for node name in LDAP server

Specifies an alternate name for the node entry in LDAP (Lightweight Directory Access Protocol), or a different protocol type for connecting to the database server.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapCatalogNode (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LdapCatalogNodeStruct
{
   char *piAlias;
   char *piNodeName;
   char *piBindDN;
   char *piPassword;
} db2LdapCatalogNodeStruct;
```

db2LdapCatalogNode API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParamStruct.

pParamStruct
Input. A pointer to the db2LdapCatalogNodeStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapCatalogNodeStruct data structure parameters

piAlias
Input. Specify a new alias to be used as an alternate name for the node entry.

piNodeName
Input. Specify a node name that represents the DB2 server in LDAP.

piBindDN
Input. Specify the user's LDAP distinguished name (DN). The LDAP user DN must have sufficient authority to create and update the object in the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current logon user will be used.

piPassword
Input. Account password.

db2LdapDeregister - Deregister the DB2 server and cataloged databases from the LDAP server

Deregisters the DB2 server from LDAP (Lightweight Directory Access Protocol).

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapDeregister (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LdapDeregisterStruct
{
   char *piNodeName;
   char *piBindDN;
   char *piPassword;
} db2LdapDeregisterStruct;
```

db2LdapDeregister API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParamStruct.

pParamStruct
Input. A pointer to the db2LdapDeregisterStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapDeregisterStruct data structure parameters

piNodeName
Input. Specify a short name that represents the DB2 server in LDAP.

piBindDN
Input. Specify the user's LDAP distinguished name (DN). The LDAP user DN must have sufficient authority to delete the object from the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current logon user will be used.

piPassword
Input. Account password.

db2LdapRegister - Register the DB2 server on the LDAP server

Registers the DB2 server in LDAP (Lightweight Directory Access Protocol).

Note: NetBIOS is no longer supported. SNA, including its APIs APPC, APPN, and CPI-C, is also no longer supported. If you use these protocols, you must re-catalog your nodes and databases using a supported protocol such as TCP/IP. References to these protocols should be ignored.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapRegister (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LdapRegisterStruct
{
   char *piNodeName;
   char *piComputer;
   char *piInstance;
   unsigned short                      iNodeType;
   unsigned short                      iOsType;
   db2LdapProtocolInfo iProtocol;
   char *piComment;
   char *piBindDN;
   char *piPassword;
} db2LdapRegisterStruct;

typedef SQL_STRUCTURE db2LdapProtocolInfo
{
   char iType;
```

```
   char *piHostName;
   char *piServiceName;
   char *piNetbiosName;
   char *piNetworkId;
   char *piPartnerLU;
   char *piTPName;
   char *piMode;
   unsigned short                       iSecurityType;
   char *piLanAdapterAddress;
   char *piChangePasswordLU;
   char *piIpxAddress;
} db2LdapProtocolInfo;
```

db2LdapRegister API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParamStruct.

pParamStruct
Input. A pointer to the db2LdapRegisterStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapRegisterStruct data structure parameters

piNodeName
Input. Specify a short name (less than 8 characters) that represents the DB2 server in LDAP.

piComputer
Input. Specify the name of the computer on which the DB2 server resides. The computer name value must be the same as the value specified when adding the server machine to LDAP. On Windows operating systems, this is the Windows computer name. On UNIX based systems, this is the TCP/IP host name. Specify NULL to register the DB2 server on the local computer.

piInstance
Input. Specify the instance name of the DB2 server. The instance name must be specified if the computer name is specified to register a remote server. Specify NULL to register the current instance (as defined by the DB2SYSTEM environment variable).

iNodeType
Input. Specify the node type for the database server. Valid values are:

- SQLF_NT_SERVER
- SQLF_NT_MPP
- SQLF_NT_DCS

iOsType
Input. Specifies the operating system type of the server machine. If an operating system type is not specified, the local operating system type will be used for a local server and no operating system type will be used for a remote server.

iProtocol
Input. Specify the protocol information in the db2LdapProtocolInfo structure.

piComment
Input. Describes the DB2 server. Any comment that helps to describe the server registered in the network directory can be entered. Maximum length is 30 characters. A carriage return or a line feed character is not permitted.

piBindDN
Input. Specify the user's LDAP distinguished name (DN). The LDAP user DN must have sufficient authority to create and update the object in the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current logon user will be used.

piPassword
Input. Account password.

db2LdapProtocolInfo data structure parameters

iType Input. Specify the protocol type that this server supports. If the server supports more than one protocol, multiple registrations (each with a different node name and protocol type) are required. Valid values are:

SQL_PROTOCOL_TCPIP
For TCP/IPv4 or TCP/IPv6 support

SQL_PROTOCOL_TCPIP4
For TCP/IPv4 support

SQL_PROTOCOL_TCPIP6
For TCP/IPv6 support

SQL_PROTOCOL_SOCKS
For TCP/IP with security SOCKS

SQL_PROTOCOL_SOCKS4
For TCP/IPv4 with security SOCKS

SQL_PROTOCOL_NPIPE
For Windows Named Pipe support

piHostName
Input. Specify the TCP/IP host name or the IP address. The IP address can be an IPv4 or an IPv6 address. If an IP address is specified, it must match the protocol type selected. For example, if SQL_PROTOCOL_TCPIP4 is selected, the IP address specified must be an IPv4 address.

piServiceName
Input. Specify the TCP/IP service name or port number.

piNetbiosName
Input. Specify the NetBIOS workstation name. The NetBIOS name must be specified for NetBIOS support.

piNetworkID
Input. Specify the network ID. The network ID must be specified for APPC/APPN support.

piPartnerLU
Input. Specify the partner LU name for the DB2 server machine. The partner LU must be specified for APPC/APPN support.

piTPName
Input. Specify the transaction program name. The transaction program name must be specified for APPC/APPN support.

piMode
Input. Specify the mode name. The mode must be specified for APPC/APPN support.

iSecurityType
Input. Specify the APPC security level. Valid values are:

- SQL_CPIC_SECURITY_NONE (default)
- SQL_CPIC_SECURITY_SAME
- SQL_CPIC_SECURITY_PROGRAM

piLanAdapterAddress
Input. Specify the network adapter address. This parameter is only required for APPC support. For APPN, this parameter can be set to NULL.

piChangePasswordLU
Input. Specify the name of the partner LU to use when changing the password for the host database server.

piIpxAddress
Input. Specify the complete IPX address. The IPX address must be specified for IPX/SPX support.

Usage notes

Register the DB2 server once for each protocol that the server supports each time specifying a unique node name.

If any protocol configuration parameter is specified when registering a DB2 server locally, it will override the value specified in the database manager configuration file.

Only a remote DB2 server can be registered in LDAP. The computer name and the instance name of the remote server must be specified, along with the protocol communication for the remote server.

When registering a host database server, a value of SQLF_NT_DCS must be specified for the iNodeType parameter.

db2LdapUncatalogDatabase - Deregister database from LDAP server

Removes a database entry from LDAP (Lightweight Directory Access Protocol).

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapUncatalogDatabase (
   db2Uint32 versionNumber,
```

```
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LdapUncatalogDatabaseStruct
{
   char *piAlias;
   char *piBindDN;
   char *piPassword;
} db2LdapUncatalogDatabaseStruct;
```

db2LdapUncatalogDatabase API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParamStruct.

pParamStruct
Input. A pointer to the db2LdapUncatalogDatabaseStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapUncatalogDatabaseStruct data structure parameters

piAlias
Input. Specify an alias name for the database entry. This parameter is mandatory.

piBindDN
Input. Specify the user's LDAP distinguished name (DN). The LDAP user DN must have sufficient authority to delete the object from the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current logon user will be used.

piPassword
Input. Account password.

db2LdapUncatalogNode - Delete alias for node name from LDAP server

Removes a node entry from LDAP (Lightweight Directory Access Protocol).

Authorization

None

Required connection

None

API include file

`db2ApiDf.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapUncatalogNode (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);
```

```
typedef SQL_STRUCTURE db2LdapUncatalogNodeStruct
{
   char *piAlias;
   char *piBindDN;
   char *piPassword;
} db2LdapUncatalogNodeStruct;
```

db2LdapUncatalogNode API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParamStruct
Input. A pointer to the db2LdapUncatalogNodeStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapUncatalogNodeStruct data structure parameters

piAlias
Input. Specify the alias of the node to uncatalog from LDAP.

piBindDN
Input. Specify the user's LDAP distinguished name (DN). The LDAP user DN must have sufficient authority to delete the object from the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current logon user will be used.

piPassword
Input. Account password.

db2LdapUpdate - Update the attributes of the DB2 server on the LDAP server

Updates the communication protocol information for the DB2 server in LDAP (Lightweight Directory Access Protocol).

Note: NetBIOS is no longer supported. SNA, including its APIs APPC, APPN, and CPI-C, is also no longer supported. If you use these protocols, you must re-catalog your nodes and databases using a supported protocol such as TCP/IP. References to these protocols should be ignored.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapUpdate (
   db2Uint32 versionNumber,
```

```
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LdapUpdateStruct
{
   char *piNodeName;
   char *piComment;
   unsigned short                      iNodeType;
   db2LdapProtocolInfo iProtocol;
   char *piBindDN;
   char *piPassword;
} db2LdapUpdateStruct;

typedef SQL_STRUCTURE db2LdapProtocolInfo
{
   char iType;
   char *piHostName;
   char *piServiceName;
   char *piNetbiosName;
   char *piNetworkId;
   char *piPartnerLU;
   char *piTPName;
   char *piMode;
   unsigned short                      iSecurityType;
   char *piLanAdapterAddress;
   char *piChangePasswordLU;
   char *piIpxAddress;
} db2LdapProtocolInfo;
```

db2LdapUpdate API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParamStruct.

pParamStruct
Input. A pointer to the db2LdapUpdateStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapUpdateStruct data structure parameters

piNodeName
Input. Specify the node name that represents the DB2 server in LDAP.

piComment
Input. Specify a new description for the DB2 server. Maximum length is 30 characters. A carriage return or a line feed character is not permitted.

iNodeType
Input. Specify a new node type. Valid values are:

- SQLF_NT_SERVER
- SQLF_NT_MPP
- SQLF_NT_DCS
- SQL_PARM_UNCHANGE

iProtocol
Input. Specify the updated protocol information in the db2LdapProtocolInfo structure.

piBindDN
Input. Specify the user's LDAP distinguished name (DN). The LDAP user

DN must have sufficient authority to create and update the object in the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current logon user will be used.

piPassword
Input. Account password.

db2LdapProtocolInfo data structure parameters

iType Input. Specify the protocol type that this server supports. If the server supports more than one protocol, multiple registrations (each with a different node name and protocol type) are required. Valid values are:

SQL_PROTOCOL_TCPIP
For TCP/IPv4 or TCP/IPv6 support

SQL_PROTOCOL_TCPIP4
For TCP/IPv4 support

SQL_PROTOCOL_TCPIP6
For TCP/IPv6 support

SQL_PROTOCOL_SOCKS
For TCP/IP with security SOCKS

SQL_PROTOCOL_SOCKS4
For TCP/IPv4 with security SOCKS

SQL_PROTOCOL_NPIPE
For Windows Named Pipe support

piHostName
Input. Specify the TCP/IP host name or the IP address. The IP address can be an IPv4 or an IPv6 address. If an IP address is specified, it must match the protocol type selected. For example, if SQL_PROTOCOL_TCPIP4 is selected, the IP address specified must be an IPv4 address.

piServiceName
Input. Specify the TCP/IP service name or port number.

piNetbiosName
Input. Specify the NetBIOS workstation name. The NetBIOS name must be specified for NetBIOS support.

piNetworkID
Input. Specify the network ID. The network ID must be specified for APPC/APPN support.

piPartnerLU
Input. Specify the partner LU name for the DB2 server machine. The partner LU must be specified for APPC/APPN support.

piTPName
Input. Specify the transaction program name. The transaction program name must be specified for APPC/APPN support.

piMode
Input. Specify the mode name. The mode must be specified for APPC/APPN support.

iSecurityType
Input. Specify the APPC security level. Valid values are:

- SQL_CPIC_SECURITY_NONE (default)

- SQL_CPIC_SECURITY_SAME
- SQL_CPIC_SECURITY_PROGRAM

piLanAdapterAddress
Input. Specify the network adapter address. This parameter is only required for APPC support. For APPN, this parameter can be set to NULL.

piChangePasswordLU
Input. Specify the name of the partner LU to use when changing the password for the host database server.

piIpxAddress
Input. Specify the complete IPX address. The IPX address must be specified for IPX/SPX support.

db2LdapUpdateAlternateServerForDB - Update the alternate server for the database on the LDAP server

Updates the alternate server for a database in Lightweight Directory Access Protocol (LDAP).

Authorization

Read/write access to the LDAP server.

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LdapUpdateAlternateServerForDB (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LdapUpdateAltServerStruct
{
   char *piDbAlias;
   char *piNode;
   char *piGWNode;
   char *piBindDN;
   char *piPassword;
} db2LdapUpdateAltServerStruct;
```

db2LdapUpdateAlternateServerForDB API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2LdapUpdateAltServerStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LdapUpdateAltServerStruct data structure parameters

piDbAlias
Input. A string containing an alias for the database to be updated.

piNode
Input. A string containing the alternate node name. This node name must exist in LDAP.

piGWNode
Input. A string containing the alternate gateway node name. This node name must exist in LDAP. This is used by the IBM Data Server Runtime Client to connect to the host via the gateway.

piBindDN
Input. Specifies the user's LDAP distinguished name (DN). The user's LDAP DN must have sufficient authority to create and update objects in the LDAP directory. If the user's LDAP DN is not specified, the credentials of the current user will be used.

piPassword
Input. Account password.

db2Load - Load data into a table

Loads data into a DB2 table. Data residing on the server may be in the form of a file, cursor, tape, or named pipe. Data residing on a remotely connected client may be in the form of a fully qualified file, a cursor, or named pipe. Although faster than the import utility, the load utility does not support loading data at the hierarchy level or loading into a nickname.

Authorization

One of the following:

- *sysadm*
- *dbadm*
- load authority on the database and:
  - INSERT privilege on the table when the load utility is invoked in INSERT mode, TERMINATE mode (to terminate a previous load insert operation), or RESTART mode (to restart a previous load insert operation)
  - INSERT and DELETE privilege on the table when the load utility is invoked in REPLACE mode, TERMINATE mode (to terminate a previous load replace operation), or RESTART mode (to restart a previous load replace operation)
  - INSERT privilege on the exception table, if such a table is used as part of the load operation.

Note: In general, all load processes and all DB2 server processes are owned by the instance owner. All of these processes use the identification of the instance owner to access needed files. Therefore, the instance owner must have read access to the input files, regardless of who invokes the command.

Required connection

Database. If implicit connect is enabled, a connection to the default database is established. Utility access to Linux, UNIX, or Windows database servers from

Linux, UNIX, or Windows clients must be a direct connection through the engine and not through a DB2 Connect gateway or loop back environment.

Instance. An explicit attachment is not required. If a connection to the database has been established, an implicit attachment to the local instance is attempted.

API include file

db2ApiDf.h

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Load (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LoadStruct
{
   struct sqlu_media_list *piSourceList;
   struct sqlu_media_list *piLobPathList;
   struct sqldcol *piDataDescriptor;
   struct sqlchar *piActionString;
   char *piFileType;
   struct sqlchar *piFileTypeMod;
   char *piLocalMsgFileName;
   char *piTempFilesPath;
   struct sqlu_media_list *piVendorSortWorkPaths;
   struct sqlu_media_list *piCopyTargetList;
   db2int32 *piNullIndicators;
   struct db2LoadIn *piLoadInfoIn;
   struct db2LoadOut *poLoadInfoOut;
   struct db2PartLoadIn *piPartLoadInfoIn;
   struct db2PartLoadOut *poPartLoadInfoOut;
   db2int16 iCallerAction;
   struct sqlu_media_list *piXmlPathList;
   struct sqllob *piLongActionString;
} db2LoadStruct;

typedef SQL_STRUCTURE db2LoadUserExit
{
   db2Char iSourceUserExitCmd;
   struct db2Char *piInputStream;
   struct db2Char *piInputFileName;
   struct db2Char *piOutputFileName;
   db2Uint16 *piEnableParallelism;
} db2LoadUserExit;

typedef SQL_STRUCTURE db2LoadIn
{
   db2Uint64 iRowcount;
   db2Uint64 iRestartcount;
   char *piUseTablespace;
   db2Uint32 iSavecount;
   db2Uint32 iDataBufferSize;
   db2Uint32 iSortBufferSize;
   db2Uint32 iWarningcount;
   db2Uint16 iHoldQuiesce;
   db2Uint16 iCpuParallelism;
   db2Uint16 iDiskParallelism;
   db2Uint16 iNonrecoverable;
   db2Uint16 iIndexingMode;
   db2Uint16 iAccessLevel;
   db2Uint16 iLockWithForce;
   db2Uint16 iCheckPending;
   char iRestartphase;
```

```
   char iStatsOpt;
   db2Uint16 *piXmlParse;
   db2DMUXmlValidate *piXmlValidate;
   db2Uint16 iSetIntegrityPending;
   struct db2LoadUserExit *piSourceUserExit;
} db2LoadIn;

typedef SQL_STRUCTURE db2LoadOut
{
   db2Uint64 oRowsRead;
   db2Uint64 oRowsSkipped;
   db2Uint64 oRowsLoaded;
   db2Uint64 oRowsRejected;
   db2Uint64 oRowsDeleted;
   db2Uint64 oRowsCommitted;
} db2LoadOut;

typedef SQL_STRUCTURE db2PartLoadIn
{
   char *piHostname;
   char *piFileTransferCmd;
   char *piPartFileLocation;
   struct db2LoadNodeList *piOutputNodes;
   struct db2LoadNodeList *piPartitioningNodes;
   db2Uint16 *piMode;
   db2Uint16 *piMaxNumPartAgents;
   db2Uint16 *piIsolatePartErrs;
   db2Uint16 *piStatusInterval;
   struct db2LoadPortRange *piPortRange;
   db2Uint16 *piCheckTruncation;
   char *piMapFileInput;
   char *piMapFileOutput;
   db2Uint16 *piTrace;
   db2Uint16 *piNewline;
   char *piDistfile;
   db2Uint16 *piOmitHeader;
   SQL_PDB_NODE_TYPE *piRunStatDBPartNum;
} db2PartLoadIn;

typedef SQL_STRUCTURE db2LoadNodeList
{
   SQL_PDB_NODE_TYPE *piNodeList;
   db2Uint16 iNumNodes;
} db2LoadNodeList;

typedef SQL_STRUCTURE db2LoadPortRange
{
   db2Uint16 iPortMin;
   db2Uint16 iPortMax;
} db2LoadPortRange;

typedef SQL_STRUCTURE db2PartLoadOut
{
   db2Uint64 oRowsRdPartAgents;
   db2Uint64 oRowsRejPartAgents;
   db2Uint64 oRowsPartitioned;
   struct db2LoadAgentInfo *poAgentInfoList;
   db2Uint32 iMaxAgentInfoEntries;
   db2Uint32 oNumAgentInfoEntries;
} db2PartLoadOut;

typedef SQL_STRUCTURE db2LoadAgentInfo
{
   db2int32 oSqlcode;
   db2Uint32 oTableState;
   SQL_PDB_NODE_TYPE oNodeNum;
   db2Uint16 oAgentType;
```

```
} db2LoadAgentInfo;

SQL_API_RC SQL_API_FN
  db2gLoad (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gLoadStruct
{
   struct sqlu_media_list *piSourceList;
   struct sqlu_media_list *piLobPathList;
   struct sqldcol *piDataDescriptor;
   struct sqlchar *piActionString;
   char *piFileType;
   struct sqlchar *piFileTypeMod;
   char *piLocalMsgFileName;
   char *piTempFilesPath;
   struct sqlu_media_list *piVendorSortWorkPaths;
   struct sqlu_media_list *piCopyTargetList;
   db2int32 *piNullIndicators;
   struct db2gLoadIn *piLoadInfoIn;
   struct db2LoadOut *poLoadInfoOut;
   struct db2gPartLoadIn *piPartLoadInfoIn;
   struct db2PartLoadOut *poPartLoadInfoOut;
   db2int16 iCallerAction;
   db2Uint16 iFileTypeLen;
   db2Uint16 iLocalMsgFileLen;
   db2Uint16 iTempFilesPathLen;
   struct sqlu_media_list *piXmlPathList;
   struct sqllob *piLongActionString;
} db2gLoadStruct;

typedef SQL_STRUCTURE db2gLoadIn
{
   db2Uint64 iRowcount;
   db2Uint64 iRestartcount;
   char *piUseTablespace;
   db2Uint32 iSavecount;
   db2Uint32 iDataBufferSize;
   db2Uint32 iSortBufferSize;
   db2Uint32 iWarningcount;
   db2Uint16 iHoldQuiesce;
   db2Uint16 iCpuParallelism;
   db2Uint16 iDiskParallelism;
   db2Uint16 iNonrecoverable;
   db2Uint16 iIndexingMode;
   db2Uint16 iAccessLevel;
   db2Uint16 iLockWithForce;
   db2Uint16 iCheckPending;
   char iRestartphase;
   char iStatsOpt;
   db2Uint16 iUseTablespaceLen;
   db2Uint16 iSetIntegrityPending;
   db2Uint16 *piXmlParse;
   db2DMUXmlValidate *piXmlValidate;
   struct db2LoadUserExit *piSourceUserExit;
} db2gLoadIn;

typedef SQL_STRUCTURE db2gPartLoadIn
{
   char *piHostname;
   char *piFileTransferCmd;
   char *piPartFileLocation;
   struct db2LoadNodeList *piOutputNodes;
   struct db2LoadNodeList *piPartitioningNodes;
   db2Uint16 *piMode;
```

```
   db2Uint16 *piMaxNumPartAgents;
   db2Uint16 *piIsolatePartErrs;
   db2Uint16 *piStatusInterval;
   struct db2LoadPortRange *piPortRange;
   db2Uint16 *piCheckTruncation;
   char *piMapFileInput;
   char *piMapFileOutput;
   db2Uint16 *piTrace;
   db2Uint16 *piNewline;
   char *piDistfile;
   db2Uint16 *piOmitHeader;
   void *piReserved1;
   db2Uint16 iHostnameLen;
   db2Uint16 iFileTransferLen;
   db2Uint16 iPartFileLocLen;
   db2Uint16 iMapFileInputLen;
   db2Uint16 iMapFileOutputLen;
   db2Uint16 iDistfileLen;
} db2gPartLoadIn;


/* Definitions for iUsing value of db2DMUXmlValidate structure               */
#define DB2DMU_XMLVAL_XDS              1         /* Use XDS                  */
#define DB2DMU_XMLVAL_SCHEMA           2         /* Use a specified schema   */
#define DB2DMU_XMLVAL_SCHEMALOC_HINTS  3         /* Use schemaLocation hints */
#define DB2DMU_XMLVAL_ORIGSCHEMA       4         /* Use schema that document was
                                                    originally validated against
                                                    (load from cursor only) */
```

db2Load API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2LoadStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LoadStruct data structure parameters

piSourceList
Input. A pointer to an sqlu_media_list structure used to provide a list of source files, devices, vendors, pipes, or SQL statements.

The information provided in this structure depends on the value of the media_type field. Valid values (defined in sqlutil header file, located in the include directory) are:

SQLU_SQL_STMT
If the media_type field is set to this value, the caller provides an SQL query through the pStatement field of the target field. The pStatement field is of type sqlu_statement_entry. The sessions field must be set to the value of 1, since the load utility only accepts a single SQL query per load.

SQLU_SERVER_LOCATION
If the media_type field is set to this value, the caller provides information through sqlu_location_entry structures. The sessions field indicates the number of sqlu_location_entry structures provided. This is used for files, devices, and named pipes.

SQLU_CLIENT_LOCATION
If the media_type field is set to this value, the caller provides information through sqlu_location_entry structures. The sessions field indicates the number of sqlu_location_entry structures provided. This is used for fully qualified files and named pipes. Note that this media_type is only valid if the API is being called via a remotely connected client.

SQLU_TSM_MEDIA
If the media_type field is set to this value, the sqlu_vendor structure is used, where filename is the unique identifier for the data to be loaded. There should only be one sqlu_vendor entry, regardless of the value of sessions. The sessions field indicates the number of TSM sessions to initiate. The load utility will start the sessions with different sequence numbers, but with the same data in the one sqlu_vendor entry.

SQLU_OTHER_MEDIA
If the media_type field is set to this value, the sqlu_vendor structure is used, where shr_lib is the shared library name, and filename is the unique identifier for the data to be loaded. There should only be one sqlu_vendor entry, regardless of the value of sessions. The sessions field indicates the number of other vendor sessions to initiate. The load utility will start the sessions with different sequence numbers, but with the same data in the one sqlu_vendor entry.

SQLU_REMOTEFETCH
If the media_type field is set to this value, the caller provides information through an sqlu_remotefetch_entry structure. The sessions field must be set to the value of 1.

piLobPathList
Input. A pointer to an sqlu_media_list structure. For IXF, ASC, and DEL file types, a list of fully qualified paths or devices to identify the location of the individual LOB files to be loaded. The file names are found in the IXF, ASC, or DEL files, and are appended to the paths provided.

The information provided in this structure depends on the value of the media_type field. Valid values (defined in sqlutil header file, located in the include directory) are:

SQLU_LOCAL_MEDIA
If set to this value, the caller provides information through sqlu_media_entry structures. The sessions field indicates the number of sqlu_media_entry structures provided.

SQLU_TSM_MEDIA
If set to this value, the sqlu_vendor structure is used, where filename is the unique identifier for the data to be loaded. There should only be one sqlu_vendor entry, regardless of the value of sessions. The sessions field indicates the number of TSM sessions to initiate. The load utility will start the sessions with different sequence numbers, but with the same data in the one sqlu_vendor entry.

SQLU_OTHER_MEDIA
If set to this value, the sqlu_vendor structure is used, where shr_lib is the shared library name, and filename is the unique identifier for the data to be loaded. There should only be one sqlu_vendor entry,

regardless of the value of sessions. The sessions field indicates the number of other vendor sessions to initiate. The load utility will start the sessions with different sequence numbers, but with the same data in the one sqlu_vendor entry.

piDataDescriptor
Input. Pointer to an sqldcol structure containing information about the columns being selected for loading from the external file.

If the piFileType parameter is set to SQL_ASC, the dcolmeth field of this structure must be set to SQL_METH_L. The user specifies the start and end locations for each column to be loaded.

If the file type is SQL_DEL, dcolmeth can be either SQL_METH_P or SQL_METH_D. If it is SQL_METH_P, the user must provide the source column position. If it is SQL_METH_D, the first column in the file is loaded into the first column of the table, and so on.

If the file type is SQL_IXF, dcolmeth can be one of SQL_METH_P, SQL_METH_D, or SQL_METH_N. The rules for DEL files apply here, except that SQL_METH_N indicates that file column names are to be provided in the sqldcol structure.

piActionString
Deprecated, replaced by piLongActionString.

piLongActionString
Input. Pointer to an *sqllob* structure containing a 4-byte long field, followed by an array of characters specifying an action that affects the table.

The character array is of the form:

```
"INSERT|REPLACE KEEPDICTIONARY|REPLACE RESETDICTIONARY|RESTART|TERMINATE
INTO tbname [(column_list)]
[FOR EXCEPTION e_tbname]"
```

INSERT
Adds the loaded data to the table without changing the existing table data.

REPLACE
Deletes all existing data from the table, and inserts the loaded data. The table definition and the index definitions are not changed.

RESTART
Restarts a previously interrupted load operation. The load operation will automatically continue from the last consistency point in the load, build, or delete phase.

TERMINATE
Terminates a previously interrupted load operation, and rolls back the operation to the point in time at which it started, even if consistency points were passed. The states of any table spaces involved in the operation return to normal, and all table objects are made consistent (index objects may be marked as invalid, in which case index rebuild will automatically take place at next access). If the table spaces in which the table resides are not in load pending state, this option does not affect the state of the table spaces.

The load terminate option will not remove a backup pending state from table spaces.

tbname
The name of the table into which the data is to be loaded. The

table cannot be a system table or a declared temporary table. An alias, or the fully qualified or unqualified table name can be specified. A qualified table name is in the form schema.tablename. If an unqualified table name is specified, the table will be qualified with the CURRENT SCHEMA.

(column_list)
A list of table column names into which the data is to be inserted. The column names must be separated by commas. If a name contains spaces or lowercase characters, it must be enclosed by quotation marks.

FOR EXCEPTION e_tbname
Specifies the exception table into which rows in error will be copied. The exception table is used to store copies of rows that violate unique index rules, range constraints and security policies.

NORANGEEXC
Indicates that if a row is rejected because of a range violation it will not be inserted into the exception table.

NOUNIQUEEXC
Indicates that if a row is rejected because it violates a unique constraint it will not be inserted into the exception table.

piFileType
Input. A string that indicates the format of the input data source. Supported external formats (defined in sqlutil) are:

SQL_ASC
Non-delimited ASCII.

SQL_DEL
Delimited ASCII, for exchange with dBase, BASIC, and the IBM Personal Decision Series programs, and many other database managers and file managers.

SQL_IXF
PC version of the Integration Exchange Format, the preferred method for exporting data from a table so that it can be loaded later into the same table or into another database manager table.

SQL_CURSOR
An SQL query. The sqlu_media_list structure passed in through the piSourceList parameter is either of type SQLU_SQL_STMT or SQLU_REMOTEFETCH, and refers to an SQL query or a table name.

piFileTypeMod
Input. A pointer to the sqlchar structure, followed by an array of characters that specify one or more processing options. If this pointer is NULL, or the structure pointed to has zero characters, this action is interpreted as selection of a default specification.

Not all options can be used with all of the supported file types. See related link "File type modifiers for the load utility."

piLocalMsgFileName
Input. A string containing the name of a local file to which output messages are to be written.

piTempFilesPath
Input. A string containing the path name to be used on the server for temporary files. Temporary files are created to store messages, consistency points, and delete phase information.

piVendorSortWorkPaths
Input. A pointer to the sqlu_media_list structure which specifies the Vendor Sort work directories.

piCopyTargetList
Input. A pointer to an sqlu_media_list structure used (if a copy image is to be created) to provide a list of target paths, devices, or a shared library to which the copy image is to be written.

The values provided in this structure depend on the value of the media_type field. Valid values for this parameter (defined in sqlutil header file, located in the include directory) are:

SQLU_LOCAL_MEDIA
If the copy is to be written to local media, set the media_type to this value and provide information about the targets in sqlu_media_entry structures. The sessions field specifies the number of sqlu_media_entry structures provided.

SQLU_TSM_MEDIA
If the copy is to be written to TSM, use this value. No further information is required.

SQLU_OTHER_MEDIA
If a vendor product is to be used, use this value and provide further information via an sqlu_vendor structure. Set the shr_lib field of this structure to the shared library name of the vendor product. Provide only one sqlu_vendor entry, regardless of the value of sessions. The sessions field specifies the number of sqlu_media_entry structures provided. The load utility will start the sessions with different sequence numbers, but with the same data provided in the one sqlu_vendor entry.

piNullIndicators
Input. For ASC files only. An array of integers that indicate whether or not the column data is nullable. There is a one-to-one ordered correspondence between the elements of this array and the columns being loaded from the data file. That is, the number of elements must equal the dcolnum field of the piDataDescriptor parameter. Each element of the array contains a number identifying a location in the data file that is to be used as a NULL indicator field, or a zero indicating that the table column is not nullable. If the element is not zero, the identified location in the data file must contain a Y or an N. A Y indicates that the table column data is NULL, and N indicates that the table column data is not NULL.

piLoadInfoIn
Input. A pointer to the db2LoadIn structure.

poLoadInfoOut
Output. A pointer to the db2LoadOut structure.

piPartLoadInfoIn
Input. A pointer to the db2PartLoadIn structure.

poPartLoadInfoOut
Output. A pointer to the db2PartLoadOut structure.

iCallerAction
Input. An action requested by the caller. Valid values (defined in sqlutil header file, located in the include directory) are:

SQLU_INITIAL
Initial call. This value (or SQLU_NOINTERRUPT) must be used on the first call to the API.

SQLU_NOINTERRUPT
Initial call. Do not suspend processing. This value (or SQLU_INITIAL) must be used on the first call to the API.

If the initial call or any subsequent call returns and requires the calling application to perform some action prior to completing the requested load operation, the caller action must be set to one of the following:

SQLU_CONTINUE
Continue processing. This value can only be used on subsequent calls to the API, after the initial call has returned with the utility requesting user input (for example, to respond to an end of tape condition). It specifies that the user action requested by the utility has completed, and the utility can continue processing the initial request.

SQLU_TERMINATE
Terminate processing. Causes the load utility to exit prematurely, leaving the table spaces being loaded in LOAD_PENDING state. This option should be specified if further processing of the data is not to be done.

SQLU_ABORT
Terminate processing. Causes the load utility to exit prematurely, leaving the table spaces being loaded in LOAD_PENDING state. This option should be specified if further processing of the data is not to be done.

SQLU_RESTART
Restart processing.

SQLU_DEVICE_TERMINATE
Terminate a single device. This option should be specified if the utility is to stop reading data from the device, but further processing of the data is to be done.

piXmlPathList
Input. Pointer to an sqlu_media_list with its media_type field set to SQLU_LOCAL_MEDIA, and its sqlu_media_entry structure listing paths on the client where the xml files can be found.

db2LoadUserExit data structure parameters

iSourceUserExitCmd
Input. The fully qualified name of an executable that will be used to feed data to the utility. For security reasons, the executable must be placed within the `sqllib/bin` directory on the server. This parameter is mandatory if the piSourceUserExit structure is not NULL.

The piInputStream, piInputFileName, piOutputFileName and piEnableParallelism fields are optional.

piInputStream
Input. A generic byte-stream that will be passed directly to the user-exit application via STDIN. You have complete control over what data is contained in this byte-stream and in what format. The load utility will simply carry this byte-stream over to the server and pass it into the user-exit application by feeding the process' STDIN (it will not codepage convert or modify the byte-stream). Your user-exit application would read the arguments from STDIN and use the data however intended.

One important attribute of this feature is the ability to hide sensitive information (such as userid/passwords).

piInputFileName
Input. Contains the name of a fully qualified client-side file, whose contents will be passed into the user-exit application by feeding the process' STDIN.

piOutputFileName
Input. The fully qualified name of a server-side file. The STDOUT and STDERR streams of the process which is executing the user-exit application will be streamed into this file. When piEnableParallelism is TRUE, multiple files will be created (one per user-exit instance), and each file name will be appended with a 3 digit numeric node-number value, such as `<filename>.000`).

piEnableParallelism
Input. A flag indicating that the utility should attempt to parallelize the invocation of the user-exit application.

db2LoadIn data structure parameters

iRowcount
Input. The number of physical records to be loaded. Allows a user to load only the first rowcnt rows in a file.

iRestartcount
Input. Reserved for future use.

piUseTablespace
Input. If the indexes are being rebuilt, a shadow copy of the index is built in table space iUseTablespaceName and copied over to the original table space at the end of the load. Only system temporary table spaces can be used with this option. If not specified then the shadow index will be created in the same table space as the index object.

If the shadow copy is created in the same table space as the index object, the copy of the shadow index object over the old index object is instantaneous. If the shadow copy is in a different table space from the index object a physical copy is performed. This could involve considerable I/O and time. The copy happens while the table is offline at the end of a load.

This field is ignored if iAccessLevel is SQLU_ALLOW_NO_ACCESS.

This option is ignored if the user does not specify INDEXING MODE REBUILD or INDEXING MODE AUTOSELECT. This option will also be ignored if INDEXING MODE AUTOSELECT is chosen and load chooses to incrementally update the index.

iSavecount
The number of records to load before establishing a consistency point. This

value is converted to a page count, and rounded up to intervals of the extent size. Since a message is issued at each consistency point, this option should be selected if the load operation will be monitored using db2LoadQuery - Load Query. If the value of savecount is not sufficiently high, the synchronization of activities performed at each consistency point will impact performance.

The default value is 0, meaning that no consistency points will be established, unless necessary.

iDataBufferSize
The number of 4KB pages (regardless of the degree of parallelism) to use as buffered space for transferring data within the utility. If the value specified is less than the algorithmic minimum, the required minimum is used, and no warning is returned.

This memory is allocated directly from the utility heap, whose size can be modified through the util_heap_sz database configuration parameter.

If a value is not specified, an intelligent default is calculated by the utility at run time. The default is based on a percentage of the free space available in the utility heap at the instantiation time of the loader, as well as some characteristics of the table.

iSortBufferSize
Input. This option specifies a value that overrides the SORTHEAP database configuration parameter during a load operation. It is relevant only when loading tables with indexes and only when the iIndexingMode parameter is not specified as SQLU_INX_DEFERRED. The value that is specified cannot exceed the value of SORTHEAP. This parameter is useful for throttling the sort memory used by LOAD without changing the value of SORTHEAP, which would also affect general query processing.

iWarningcount
Input. Stops the load operation after warningcnt warnings. Set this parameter if no warnings are expected, but verification that the correct file and table are being used is desired. If the load file or the target table is specified incorrectly, the load utility will generate a warning for each row that it attempts to load, which will cause the load to fail. If warningcnt is 0, or this option is not specified, the load operation will continue regardless of the number of warnings issued.

If the load operation is stopped because the threshold of warnings was exceeded, another load operation can be started in RESTART mode. The load operation will automatically continue from the last consistency point. Alternatively, another load operation can be initiated in REPLACE mode, starting at the beginning of the input file.

iHoldQuiesce
Input. A flag whose value is set to TRUE if the utility is to leave the table in quiesced exclusive state after the load, and to FALSE if it is not.

iCpuParallelism
Input. The number of processes or threads that the load utility will create for parsing, converting and formatting records when building table objects. This parameter is designed to exploit intra-partition parallelism. It is particularly useful when loading presorted data, because record order in the source data is preserved. If the value of this parameter is zero, the load utility uses an intelligent default value at run time. Note: If this parameter

is used with tables containing either LOB or LONG VARCHAR fields, its value becomes one, regardless of the number of system CPUs, or the value specified by the user.

iDiskParallelism
Input. The number of processes or threads that the load utility will create for writing data to the table space containers. If a value is not specified, the utility selects an intelligent default based on the number of table space containers and the characteristics of the table.

iNonrecoverable
Input. Set to SQLU_NON_RECOVERABLE_LOAD if the load transaction is to be marked as non-recoverable, and it will not be possible to recover it by a subsequent roll forward action. The rollforward utility will skip the transaction, and will mark the table into which data was being loaded as "invalid". The utility will also ignore any subsequent transactions against that table. After the roll forward is completed, such a table can only be dropped. With this option, table spaces are not put in backup pending state following the load operation, and a copy of the loaded data does not have to be made during the load operation. Set to SQLU_RECOVERABLE_LOAD if the load transaction is to be marked as recoverable.

iIndexingMode
Input. Specifies the indexing mode. Valid values (defined in sqlutil header file, located in the include directory) are:

SQLU_INX_AUTOSELECT
LOAD chooses between REBUILD and INCREMENTAL indexing modes.

SQLU_INX_REBUILD
Rebuild table indexes.

SQLU_INX_INCREMENTAL
Extend existing indexes.

SQLU_INX_DEFERRED
Do not update table indexes.

iAccessLevel
Input. Specifies the access level. Valid values are:

SQLU_ALLOW_NO_ACCESS
Specifies that the load locks the table exclusively.

SQLU_ALLOW_READ_ACCESS
Specifies that the original data in the table (the non-delta portion) should still be visible to readers while the load is in progress. This option is only valid for load appends, such as a load insert, and will be ignored for load replace.

iLockWithForce
Input. A boolean flag. If set to TRUE load will force other applications as necessary to ensure that it obtains table locks immediately. This option requires the same authority as the FORCE APPLICATIONS command (SYSADM or SYSCTRL).

SQLU_ALLOW_NO_ACCESS loads may force conflicting applications at the start of the load operation. At the start of the load, the utility may force applications that are attempting to either query or modify the table.

SQLU_ALLOW_READ_ACCESS loads may force conflicting applications at the start or end of the load operation. At the start of the load, the load utility may force applications that are attempting to modify the table. At the end of the load, the load utility may force applications that are attempting to either query or modify the table.

iCheckPending
This parameter is being deprecated as of Version 9.1. Use the iSetIntegrityPending parameter instead.

iRestartphase
Input. Reserved. Valid value is a single space character ' '.

iStatsOpt
Input. Granularity of statistics to collect. Valid values are:

SQLU_STATS_NONE
No statistics to be gathered.

SQLU_STATS_USE_PROFILE
Statistics are collected based on the profile defined for the current table. This profile must be created using the RUNSTATS command. If no profile exists for the current table, a warning is returned and no statistics are collected.

iSetIntegrityPending
Input. Specifies to put the table into set integrity pending state. If the value SQLU_SI_PENDING_CASCADE_IMMEDIATE is specified, set integrity pending state will be immediately cascaded to all dependent and descendent tables. If the value SQLU_SI_PENDING_CASCADE_DEFERRED is specified, the cascade of set integrity pending state to dependent tables will be deferred until the target table is checked for integrity violations.
SQLU_SI_PENDING_CASCADE_DEFERRED is the default value if the option is not specified.

piSourceUserExit
Input. A pointer to the db2LoadUserExit structure.

piXmlParse
Input. Type of parsing that should occur for XML documents. Valid values found in the db2ApiDf header file in the include directory are:

DB2DMU_XMLPARSE_PRESERVE_WS
Whitespace should be preserved.

DB2DMU_XMLPARSE_STRIP_WS
Whitespace should be stripped.

piXmlValidate
Input. Pointer to the db2DMUXmlValidate structure. Indicates that XML schema validation should occur for XML documents.

```
/* XML Validate structure                                          */
typedef SQL_STRUCTURE db2DMUXmlValidate
{
   db2Uint16                        iUsing;      /* What to use to perform   */
                                                 /* validation               */
   struct db2DMUXmlValidateXds    *piXdsArgs;    /* Arguments for            */
                                                 /* XMLVALIDATE USING XDS    */
   struct db2DMUXmlValidateSchema *piSchemaArgs; /* Arguments for            */
                                                 /* XMLVALIDATE USING SCHEMA */
} db2DMUXmlValidate;
```

db2LoadOut data structure parameters

oRowsRead
Output. Number of records read during the load operation.

oRowsSkipped
Output. Number of records skipped before the load operation begins.

oRowsLoaded
Output. Number of rows loaded into the target table.

oRowsRejected
Output. Number of records that could not be loaded.

oRowsDeleted
Output. Number of duplicate rows deleted.

oRowsCommitted
Output. The total number of processed records: the number of records loaded successfully and committed to the database, plus the number of skipped and rejected records.

db2PartLoadIn data structure parameters

piHostname
Input. The hostname for the iFileTransferCmd parameter. If NULL, the hostname will default to ″nohost″. This parameter is deprecated.

piFileTransferCmd
Input. File transfer command parameter. If not required, it must be set to NULL. This parameter is deprecated. Use the piSourceUserExit parameter instead.

piPartFileLocation
Input. In PARTITION_ONLY, LOAD_ONLY, and LOAD_ONLY_VERIFY_PART modes, this parameter can be used to specify the location of the partitioned files. This location must exist on each database partition specified by the piOutputNodes option.

For the SQL_CURSOR file type, this parameter cannot be NULL and the location does not refer to a path, but to a fully qualified file name. This will be the fully qualified base file name of the partitioned files that are created on each output database partition for PARTITION_ONLY mode, or the location of the files to be read from each database partition for LOAD_ONLY mode. For PARTITION_ONLY mode, multiple files may be created with the specified base name if there are LOB columns in the target table. For file types other than SQL_CURSOR, if the value of this parameter is NULL, it will default to the current directory.

piOutputNodes
Input. The list of Load output database partitions. A NULL indicates that all nodes on which the target table is defined.

piPartitioningNodes
Input. The list of partitioning nodes. A NULL indicates the default.

piMode
Input. Specifies the load mode for partitioned databases. Valid values (defined in db2ApiDf header file, located in the include directory) are:

- DB2LOAD_PARTITION_AND_LOAD
Data is distributed (perhaps in parallel) and loaded simultaneously on the corresponding database partitions.

- DB2LOAD_PARTITION_ONLY
Data is distributed (perhaps in parallel) and the output is written to files in a specified location on each loading database partition. For file types other than SQL_CURSOR, the name of the output file on each database partition will have the form filename.xxx, where filename is the name of the first input file specified by piSourceList and xxx is the database partition number.For the SQL_CURSOR file type, the name of the output file on each database partition will be determined by the piPartFileLocation parameter. Refer to the piPartFileLocation parameter for information about how to specify the location of the database partition file on each database partition.

Note: This mode cannot be used for a CLI LOAD.

DB2LOAD_LOAD_ONLY
Data is assumed to be already distributed; the distribution process is skipped, and the data is loaded simultaneously on the corresponding database partitions. For file types other than SQL_CURSOR, the input file name on each database partition is expected to be of the form filename.xxx, where filename is the name of the first file specified by piSourceList and xxx is the 13-digit database partition number. For the SQL_CURSOR file type, the name of the input file on each database partition will be determined by the piPartFileLocation parameter. Refer to the piPartFileLocation parameter for information about how to specify the location of the database partition file on each database partition.

Note: This mode cannot be used when loading a data file located on a remote client, nor can it be used for a CLI LOAD.

DB2LOAD_LOAD_ONLY_VERIFY_PART
Data is assumed to be already distributed, but the data file does not contain a database partition header. The distribution process is skipped, and the data is loaded simultaneously on the corresponding database partitions. During the load operation, each row is checked to verify that it is on the correct database partition. Rows containing database partition violations are placed in a dumpfile if the dumpfile file type modifier is specified. Otherwise, the rows are discarded. If database partition violations exist on a particular loading database partition, a single warning will be written to the load message file for that database partition. The input file name on each database partition is expected to be of the form filename.xxx, where filename is the name of the first file specified by piSourceList and xxx is the 13-digit database partition number.

Note: This mode cannot be used when loading a data file located on a remote client, nor can it be used for a CLI LOAD.

DB2LOAD_ANALYZE
An optimal distribution map with even distribution across all database partitions is generated.

piMaxNumPartAgents
Input. The maximum number of partitioning agents. A NULL value indicates the default, which is 25.

piIsolatePartErrs

Input. Indicates how the load operation will react to errors that occur on individual database partitions. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOAD_SETUP_ERRS_ONLY

In this mode, errors that occur on a database partition during setup, such as problems accessing a database partition or problems accessing a table space or table on a database partition, will cause the load operation to stop on the failing database partitions but to continue on the remaining database partitions. Errors that occur on a database partition while data is being loaded will cause the entire operation to fail and rollback to the last point of consistency on each database partition.

DB2LOAD_LOAD_ERRS_ONLY

In this mode, errors that occur on a database partition during setup will cause the entire load operation to fail. When an error occurs while data is being loaded, the database partitions with errors will be rolled back to their last point of consistency. The load operation will continue on the remaining database partitions until a failure occurs or until all the data is loaded. On the database partitions where all of the data was loaded, the data will not be visible following the load operation. Because of the errors in the other database partitions the transaction will be aborted. Data on all of the database partitions will remain invisible until a load restart operation is performed. This will make the newly loaded data visible on the database partitions where the load operation completed and resume the load operation on database partitions that experienced an error.

Note: This mode cannot be used when iAccessLevel is set to SQLU_ALLOW_READ_ACCESS and a copy target is also specified.

DB2LOAD_SETUP_AND_LOAD_ERRS

In this mode, database partition-level errors during setup or loading data cause processing to stop only on the affected database partitions. As with the DB2LOAD_LOAD_ERRS_ONLY mode, when database partition errors do occur while data is being loaded, the data on all database partitions will remain invisible until a load restart operation is performed.

Note: This mode cannot 1be used when iAccessLevel is set to SQLU_ALLOW_READ_ACCESS and a copy target is also specified.

DB2LOAD_NO_ISOLATION

Any error during the Load operation causes the transaction to be aborted. If this parameter is NULL, it will default to DB2LOAD_LOAD_ERRS_ONLY, unless iAccessLevel is set to SQLU_ALLOW_READ_ACCESS and a copy target is also specified, in which case the default is DB2LOAD_NO_ISOLATION.

piStatusInterval

Input. Specifies the number of megabytes (MB) of data to load before generating a progress message. Valid values are whole numbers in the range of 1 to 4000. If NULL is specified, a default value of 100 will be used.

piPortRange
Input. The TCP port range for internal communication. If NULL, the port range used will be 6000-6063.

piCheckTruncation
Input. Causes Load to check for record truncation at Input/Output. Valid values are TRUE and FALSE. If NULL, the default is FALSE.

piMapFileInput
Input. Distribution map input filename. If the mode is not ANALYZE, this parameter should be set to NULL. If the mode is ANALYZE, this parameter must be specified.

piMapFileOutput
Input. Distribution map output filename. The rules for piMapFileInput apply here as well.

piTrace
Input. Specifies the number of records to trace when you need to review a dump of all the data conversion process and the output of hashing values. If NULL, the number of records defaults to 0.

piNewline
Input. Forces Load to check for newline characters at end of ASC data records if RECLEN file type modifier is also specified. Possible values are TRUE and FALSE. If NULL, the value defaults to FALSE.

piDistfile
Input. Name of the database partition distribution file. If a NULL is specified, the value defaults to ″DISTFILE″.

piOmitHeader
Input. Indicates that a distribution map header should not be included in the database partition file when using DB2LOAD_PARTITION_ONLY mode. Possible values are TRUE and FALSE. If NULL, the default is FALSE.

piRunStatDBPartNum
Specifies the database partition on which to collect statistics. The default value is the first database partition in the output database partition list.

db2LoadNodeList data structure parameters

piNodeList
Input. An array of node numbers.

iNumNodes
Input. The number of nodes in the piNodeList array. A 0 indicates the default, which is all nodes on which the target table is defined.

db2LoadPortRange data structure parameters

iPortMin
Input. Lower port number.

iPortMax
Input. Higher port number.

db2PartLoadOut data structure parameters

oRowsRdPartAgents
Output. Total number of rows read by all partitioning agents.

oRowsRejPartAgents
Output. Total number of rows rejected by all partitioning agents.

oRowsPartitioned
Output. Total number of rows partitioned by all partitioning agents.

poAgentInfoList
Output. During a load operation into a partitioned database, the following load processing entities may be involved: load agents, partitioning agents, pre-partitioning agents, file transfer command agents and load-to-file agents (these are described in the Data Movement Guide). The purpose of the poAgentInfoList output parameter is to return to the caller information about each load agent that participated in a load operation. Each entry in the list contains the following information:

oAgentType
A tag indicating what kind of load agent the entry describes.

oNodeNum
The number of the database partition on which the agent executed.

oSqlcode
The final sqlcode resulting from the agent's processing.

oTableState
The final status of the table on the database partition on which the agent executed (relevant only for load agents).

It is up to the caller of the API to allocate memory for this list prior to calling the API. The caller should also indicate the number of entries for which they allocated memory in the iMaxAgentInfoEntries parameter. If the caller sets poAgentInfoList to NULL or sets iMaxAgentInfoEntries to 0, then no information will be returned about the load agents.

iMaxAgentInfoEntries
Input. The maximum number of agent information entries allocated by the user for poAgentInfoList. In general, setting this parameter to 3 times the number of database partitions involved in the load operation should be sufficient.

oNumAgentInfoEntries
Output. The actual number of agent information entries produced by the load operation. This number of entries will be returned to the user in the poAgentInfoList parameter as long as iMaxAgentInfoEntries is greater than or equal to oNumAgentInfoEntries. If iMaxAgentInfoEntries is less than oNumAgentInfoEntries, then the number of entries returned in poAgentInfoList is equal to iMaxAgentInfoEntries.

db2LoadAgentInfo data structure parameters

oSqlcode
Output. The final sqlcode resulting from the agent's processing.

oTableState
Output. The purpose of this output parameter is not to report every possible state of the table after the load operation. Rather, its purpose is to report only a small subset of possible tablestates in order to give the caller a general idea of what happened to the table during load processing. This value is relevant for load agents only. The possible values are:

DB2LOADQUERY_NORMAL
Indicates that the load completed successfully on the database

partition and the table was taken out of the LOAD IN PROGRESS (or LOAD PENDING) state. In this case, the table still could be in SET INTEGRITY PENDING state due to the need for further constraints processing, but this will not reported as this is normal.

DB2LOADQUERY_UNCHANGED
Indicates that the load job aborted processing due to an error but did not yet change the state of the table on the database partition from whatever state it was in prior to calling db2Load. It is not necessary to perform a load restart or terminate operation on such database partitions.

DB2LOADQUERY_LOADPENDING
Indicates that the load job aborted during processing but left the table on the database partition in the LOAD PENDING state, indicating that the load job on that database partition must be either terminated or restarted.

oNodeNum
Output. The number of the database partition on which the agent executed.

oAgentType
Output. The agent type. Valid values (defined in db2ApiDf header file, located in the include directory) are :

- DB2LOAD_LOAD_AGENT
- DB2LOAD_PARTITIONING_AGENT
- DB2LOAD_PRE_PARTITIONING_AGENT
- DB2LOAD_FILE_TRANSFER_AGENT
- DB2LOAD_LOAD_TO_FILE_AGENT

db2gLoadStruct data structure specific parameters

iFileTypeLen
Input. Specifies the length in bytes of iFileType parameter.

iLocalMsgFileLen
Input. Specifies the length in bytes of iLocalMsgFileName parameter.

iTempFilesPathLen
Input. Specifies the length in bytes of iTempFilesPath parameter.

piXmlPathList
Input. Pointer to an sqlu_media_list with its media_type field set to SQLU_LOCAL_MEDIA, and its sqlu_media_entry structure listing paths on the client where the xml files can be found.

db2gLoadIn data structure specific parameters

iUseTablespaceLen
Input. The length in bytes of piUseTablespace parameter.

piXmlParse
Input. Type of parsing that should occur for XML documents. Valid values found in the db2ApiDf header file in the include directory are:

DB2DMU_XMLPARSE_PRESERVE_WS
Whitespace should be preserved.

DB2DMU_XMLPARSE_STRIP_WS
Whitespace should be stripped.

piXmlValidate
Input. Pointer to the db2DMUXmlValidate structure. Indicates that XML schema validation should occur for XML documents.

```
/* XML Validate structure                                              */
typedef SQL_STRUCTURE db2DMUXmlValidate
{
   db2Uint16                      iUsing;       /* What to use to perform   */
                                                /* validation               */
   struct db2DMUXmlValidateXds    *piXdsArgs;   /* Arguments for            */
                                                /* XMLVALIDATE USING XDS    */
   struct db2DMUXmlValidateSchema *piSchemaArgs; /* Arguments for            */
                                                /* XMLVALIDATE USING SCHEMA */
} db2DMUXmlValidate;
```

db2gPartLoadIn data structure specific parameters

piReserved1
Reserved for future use.

iHostnameLen
Input. The length in bytes of piHostname parameter.

iFileTransferLen
Input. The length in bytes of piFileTransferCmd parameter.

iPartFileLocLen
Input. The length in bytes of piPartFileLocation parameter.

iMapFileInputLen
Input. The length in bytes of piMapFileInput parameter.

iMapFileOutputLen
Input. The length in bytes of piMapFileOutput parameter.

iDistfileLen
Input. The length in bytes of piDistfile parameter.

Usage notes

Data is loaded in the sequence that appears in the input file. If a particular sequence is desired, the data should be sorted before a load is attempted.

The load utility builds indexes based on existing definitions. The exception tables are used to handle duplicates on unique keys. The utility does not enforce referential integrity, perform constraints checking, or update summary tables that are dependent on the tables being loaded. Tables that include referential or check constraints are placed in set integrity pending state. Summary tables that are defined with REFRESH IMMEDIATE, and that are dependent on tables being loaded, are also placed in set integrity pending state. Issue the SET INTEGRITY statement to take the tables out of set integrity pending state. Load operations cannot be carried out on replicated summary tables.

For clustering indexes, the data should be sorted on the clustering index prior to loading. The data need not be sorted when loading into an multi-dimensionally clustered (MDC) table.

db2LoadQuery - Get the status of a load operation

Checks the status of a load operation during processing.

Authorization

None

Required connection

Database

API include file

db2ApiDf.h

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2LoadQuery (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2LoadQueryStruct
{
   db2Uint32 iStringType;
   char *piString;
   db2Uint32 iShowLoadMessages;
   struct db2LoadQueryOutputStruct *poOutputStruct;
   char *piLocalMessageFile;
} db2LoadQueryStruct;

typedef SQL_STRUCTURE db2LoadQueryOutputStruct
{
   db2Uint32 oRowsRead;
   db2Uint32 oRowsSkipped;
   db2Uint32 oRowsCommitted;
   db2Uint32 oRowsLoaded;
   db2Uint32 oRowsRejected;
   db2Uint32 oRowsDeleted;
   db2Uint32 oCurrentIndex;
   db2Uint32 oNumTotalIndexes;
   db2Uint32 oCurrentMPPNode;
   db2Uint32 oLoadRestarted;
   db2Uint32 oWhichPhase;
   db2Uint32 oWarningCount;
   db2Uint32 oTableState;
} db2LoadQueryOutputStruct;

typedef SQL_STRUCTURE db2LoadQueryOutputStruct64
{
   db2Uint64 oRowsRead;
   db2Uint64 oRowsSkipped;
   db2Uint64 oRowsCommitted;
   db2Uint64 oRowsLoaded;
   db2Uint64 oRowsRejected;
   db2Uint64 oRowsDeleted;
   db2Uint32 oCurrentIndex;
   db2Uint32 oNumTotalIndexes;
   db2Uint32 oCurrentMPPNode;
   db2Uint32 oLoadRestarted;
   db2Uint32 oWhichPhase;
   db2Uint32 oWarningCount;
   db2Uint32 oTableState;
} db2LoadQueryOutputStruct64;

typedef SQL_STRUCTURE db2LoadQueryStruct64
{
   db2Uint32 iStringType;
```

```
   char *piString;
   db2Uint32 iShowLoadMessages;
   struct db2LoadQueryOutputStruct64 *poOutputStruct;
   char *piLocalMessageFile;
} db2LoadQueryStruct64;

SQL_API_RC SQL_API_FN
  db2gLoadQuery (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gLoadQueryStruct
{
   db2Uint32 iStringType;
   db2Uint32 iStringLen;
   char *piString;
   db2Uint32 iShowLoadMessages;
   struct db2LoadQueryOutputStruct *poOutputStruct;
   db2Uint32 iLocalMessageFileLen;
   char *piLocalMessageFile;
} db2gLoadQueryStruct;

typedef SQL_STRUCTURE db2gLoadQueryStru64
{
   db2Uint32 iStringType;
   db2Uint32 iStringLen;
   char *piString;
   db2Uint32 iShowLoadMessages;
   struct db2LoadQueryOutputStruct64 *poOutputStruct;
   db2Uint32 iLocalMessageFileLen;
   char *piLocalMessageFile;
} db2gLoadQueryStru64;
```

db2LoadQuery API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2LoadQueryStruct structure. If the version is Version 9 or higher, it is a pointer to the db2LoadQueryStruct64 structure. Otherwise, it is a pointer to the db2LoadQueryStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2LoadQueryStruct data structure parameters

iStringType
Input. Specifies a type for piString. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_TABLENAME
Specifies a table name for use by the db2LoadQuery API.

piString
Input. Specifies a temporary files path name or a table name, depending on the value of iStringType.

iShowLoadMessages
Input. Specifies the level of messages that are to be returned by the load utility. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_SHOW_ALL_MSGS
Return all load messages.

DB2LOADQUERY_SHOW_NO_MSGS
Return no load messages.

DB2LOADQUERY_SHOW_NEW_MSGS
Return only messages that have been generated since the last call to this API.

poOutputStruct
Output. A pointer to the db2LoadQueryOutputStruct structure, which contains load summary information. Set to NULL if a summary is not required.

piLocalMessageFile
Input. Specifies the name of a local file to be used for output messages.

db2LoadQueryOutputStruct data structure parameters

oRowsRead
Output. Number of records read so far by the load utility.

oRowsSkipped
Output. Number of records skipped before the load operation began.

oRowsCommitted
Output. Number of rows committed to the target table so far.

oRowsLoaded
Output. Number of rows loaded into the target table so far.

oRowsRejected
Output. Number of rows rejected from the target table so far.

oRowsDeleted
Output. Number of rows deleted from the target table so far (during the delete phase).

oCurrentIndex
Output. Index currently being built (during the build phase).

oNumTotalIndexes
Output. Total number of indexes to be built (during the build phase).

oCurrentMPPNode
Output. Indicates which database partition server is being queried (for partitioned database environment mode only).

oLoadRestarted
Output. A flag whose value is TRUE if the load operation being queried is a load restart operation.

oWhichPhase
Output. Indicates the current phase of the load operation being queried. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_LOAD_PHASE
Load phase.

DB2LOADQUERY_BUILD_PHASE
Build phase.

DB2LOADQUERY_DELETE_PHASE
Delete phase.

DB2LOADQUERY_INDEXCOPY_PHASE
Index copy phase.

oWarningCount
Output. Total number of warnings returned so far.

oTableState
Output. The table states. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_NORMAL
No table states affect the table.

DB2LOADQUERY_SI_PENDING
The table has constraints and the constraints have yet to be verified. Use the SET INTEGRITY command to take the table out of the DB2LOADQUERY_SI_PENDING state. The load utility puts a table into the DB2LOADQUERY_SI_PENDING state when it begins a load on a table with constraints.

DB2LOADQUERY_LOAD_IN_PROGRESS
There is a load actively in progress on this table.

DB2LOADQUERY_LOAD_PENDING
A load has been active on this table but has been aborted before the load could commit. Issue a load terminate, a load restart, or a load replace to bring the table out of the DB2LOADQUERY_LOAD_PENDING state.

DB2LOADQUERY_REORG_PENDING
A reorg recommended alter has been performed on this table. A classic reorg must be performed before the table will be accessible.

DB2LOADQUERY_READ_ACCESS
The table data is available for read access queries. Loads using the DB2LOADQUERY_READ_ACCESS option put the table into Read Access Only state.

DB2LOADQUERY_NOTAVAILABLE
The table is unavailable. The table may only be dropped or it may be restored from a backup. Rollforward through a non-recoverable load will put a table into the unavailable state.

DB2LOADQUERY_NO_LOAD_RESTART
The table is in a partially loaded state that will not allow a load restart. The table will also be in the Load Pending state. Issue a load terminate or a load replace to bring the table out of the No Load Restartable state. The table can be placed in the DB2LOADQUERY_NO_LOAD_RESTART state during a rollforward operation. This can occur if you rollforward to a point in time that is prior to the end of a load operation, or if you roll forward through an aborted load operation but do not roll forward to the end of the load terminate or load restart operation.

DB2LOADQUERY_TYPE1_INDEXES
The table currently uses type-1 indexes. The indexes can be converted to type-2 using the CONVERT option when using the REORG utility on the indexes.

db2LoadQueryOutputStruct64 data structure parameters

oRowsRead
Output. Number of records read so far by the load utility.

oRowsSkipped
Output. Number of records skipped before the load operation began.

oRowsCommitted
Output. Number of rows committed to the target table so far.

oRowsLoaded
Output. Number of rows loaded into the target table so far.

oRowsRejected
Output. Number of rows rejected from the target table so far.

oRowsDeleted
Output. Number of rows deleted from the target table so far (during the delete phase).

oCurrentIndex
Output. Index currently being built (during the build phase).

oNumTotalIndexes
Output. Total number of indexes to be built (during the build phase).

oCurrentMPPNode
Output. Indicates which database partition server is being queried (for partitioned database environment mode only).

oLoadRestarted
Output. A flag whose value is TRUE if the load operation being queried is a load restart operation.

oWhichPhase
Output. Indicates the current phase of the load operation being queried. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_LOAD_PHASE
Load phase.

DB2LOADQUERY_BUILD_PHASE
Build phase.

DB2LOADQUERY_DELETE_PHASE
Delete phase.

DB2LOADQUERY_INDEXCOPY_PHASE
Index copy phase.

oWarningCount
Output. Total number of warnings returned so far.

oTableState
Output. The table states. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_NORMAL
No table states affect the table.

DB2LOADQUERY_SI_PENDING
The table has constraints and the constraints have yet to be verified. Use the SET INTEGRITY command to take the table out

of the DB2LOADQUERY_SI_PENDING state. The load utility puts a table into the DB2LOADQUERY_SI_PENDING state when it begins a load on a table with constraints.

DB2LOADQUERY_LOAD_IN_PROGRESS
There is a load actively in progress on this table.

DB2LOADQUERY_LOAD_PENDING
A load has been active on this table but has been aborted before the load could commit. Issue a load terminate, a load restart, or a load replace to bring the table out of the DB2LOADQUERY_LOAD_PENDING state.

DB2LOADQUERY_REORG_PENDING
A reorg recommended alter has been performed on this table. A classic reorg must be performed before the table will be accessible.

DB2LOADQUERY_READ_ACCESS
The table data is available for read access queries. Loads using the DB2LOADQUERY_READ_ACCESS option put the table into Read Access Only state.

DB2LOADQUERY_NOTAVAILABLE
The table is unavailable. The table may only be dropped or it may be restored from a backup. Rollforward through a non-recoverable load will put a table into the unavailable state.

DB2LOADQUERY_NO_LOAD_RESTART
The table is in a partially loaded state that will not allow a load restart. The table will also be in the Load Pending state. Issue a load terminate or a load replace to bring the table out of the No Load Restartable state. The table can be placed in the DB2LOADQUERY_NO_LOAD_RESTART state during a rollforward operation. This can occur if you rollforward to a point in time that is prior to the end of a load operation, or if you roll forward through an aborted load operation but do not roll forward to the end of the load terminate or load restart operation.

DB2LOADQUERY_TYPE1_INDEXES
The table currently uses type-1 indexes. The indexes can be converted to type-2 using the CONVERT option when using the REORG utility on the indexes.

db2LoadQueryStruct64 data structure parameters

iStringType
Input. Specifies a type for piString. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_TABLENAME
Specifies a table name for use by the db2LoadQuery API.

piString
Input. Specifies a temporary files path name or a table name, depending on the value of iStringType.

iShowLoadMessages
Input. Specifies the level of messages that are to be returned by the load utility. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2LOADQUERY_SHOW_ALL_MSGS
Return all load messages.

DB2LOADQUERY_SHOW_NO_MSGS
Return no load messages.

DB2LOADQUERY_SHOW_NEW_MSGS
Return only messages that have been generated since the last call to this API.

poOutputStruct
Output. A pointer to the db2LoadQueryOutputStruct structure, which contains load summary information. Set to NULL if a summary is not required.

piLocalMessageFile
Input. Specifies the name of a local file to be used for output messages.

db2gLoadQueryStruct data structure specific parameters

iStringLen
Input. Specifies the length in bytes of piString parameter.

iLocalMessageFileLen
Input. Specifies the length in bytes of piLocalMessageFile parameter.

db2gLoadQueryStru64 data structure specific parameters

iStringLen
Input. Specifies the length in bytes of piString parameter.

iLocalMessageFileLen
Input. Specifies the length in bytes of piLocalMessageFile parameter.

Usage notes

This API reads the status of the load operation on the table specified by piString, and writes the status to the file specified by piLocalMsgFileName.

db2MonitorSwitches - Get or update the monitor switch settings

Selectively turns on or off switches for groups of monitor data to be collected by the database manager. Returns the current state of these switches for the application issuing the call.

Scope

This API can return information for the database partition server on the instance, or all database partitions on the instance.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- sysmon

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

To display the settings for a remote instance (or a different local instance), it is necessary to first attach to that instance.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2MonitorSwitches (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2MonitorSwitchesData
{
   struct sqlm_recording_group *piGroupStates;
   void *poBuffer;
   db2Uint32 iBufferSize;
   db2Uint32 iReturnData;
   db2Uint32 iVersion;
   db2int32 iNodeNumber;
   db2Uint32 *poOutputFormat;
} db2MonitorSwitchesData;

SQL_API_RC SQL_API_FN
  db2gMonitorSwitches (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gMonitorSwitchesData
{
   struct sqlm_recording_group *piGroupStates;
   void *poBuffer;
   db2Uint32 iBufferSize;
   db2Uint32 iReturnData;
   db2Uint32 iVersion;
   db2int32 iNodeNumber;
   db2Uint32 *poOutputFormat;
} db2gMonitorSwitchesData;
```

db2MonitorSwitches API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct. To use the structure as described above, specify db2Version810. If you want to use a different version of this structure, check the db2ApiDf.h header file in the include directory for the complete list of supported versions. Ensure that you use the version of the db2MonitorSwitchesStruct structure that corresponds to the version number that you specify.

pParmStruct
Input. A pointer to the db2MonitorSwitchesStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2MonitorSwitchesData data structure parameters

piGroupStates
Input. A pointer to the sqlm-recording-group structure (defined in sqlmon.h) containing a list of switches.

poBuffer
A pointer to a buffer where the switch state data will be written.

iBufferSize
Input. Specifies the size of the output buffer.

iReturnData
Input. A flag specifying whether or not the current switch states should be written to the data buffer pointed to by poBuffer.

iVersion
Input. Version ID of the database monitor data to collect. The database monitor only returns data that was available for the requested version. Set this parameter to one of the following symbolic constants:

- SQLM_DBMON_VERSION1
- SQLM_DBMON_VERSION2
- SQLM_DBMON_VERSION5
- SQLM_DBMON_VERSION5_2
- SQLM_DBMON_VERSION6
- SQLM_DBMON_VERSION7
- SQLM_DBMON_VERSION8
- SQLM_DBMON_VERSION9
- SQLM_DBMON_VERSION9_5

Note: If SQLM_DBMON_VERSION1 is specified as the version, the APIs cannot be run remotely.

Note: Constants SQLM_DBMON_VERSION5_2, and earlier, are deprecated and may be removed in a future release of DB2.

iNodeNumber
Input. The database partition server where the request is to be sent. Based on this value, the request will be processed for the current database partition server, all database partition servers or a user specified database partition server. Valid values are:

- SQLM_CURRENT_NODE
- SQLM_ALL_NODES
- node value

Note: For standalone instances SQLM_CURRENT_NODE must be used.

poOutputFormat
The format of the stream returned by the server. It will be one of the following:

SQLM_STREAM_STATIC_FORMAT
Indicates that the switch states are returned in static, pre-Version 7 switch structures.

SQLM_STREAM_DYNAMIC_FORMAT
Indicates that the switches are returned in a self-describing format, similar to the format returned for db2GetSnapshot.

Usage notes

To obtain the status of the switches at the database manager level, call db2GetSnapshot, specifying SQLMA_DB2 for OBJ_TYPE (get snapshot for database manager).

The timestamp switch is unavailable if iVersion is less than SQLM_DBMON_VERSION8.

db2Prune - Delete the history file entries or log files from the active log path

Deletes entries from the history file or log files from the active log path.

Authorization

One of the following:

- *sysadm*
- *sysctrl*
- *sysmaint*
- *dbadm*

Required connection

Database. To delete entries from the history file for any database other than the default database, a connection to the database must be established before calling this API.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Prune (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2PruneStruct
{
  char *piString;
  db2HistoryEID iEID;
  db2Uint32 iAction;
  db2Uint32 iOptions;
} db2PruneStruct;

SQL_API_RC SQL_API_FN
  db2gPrune (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gPruneStruct
```

```
{
  db2Uint32 iStringLen;
  char *piString;
  db2HistoryEID iEID;
  db2Uint32 iAction;
  db2Uint32 iOptions;
} db2gPruneStruct;
```

db2Prune API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2PruneStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2PruneStruct data structure parameters

piString
Input. A pointer to a string specifying a time stamp or a log sequence number (LSN). The time stamp or part of a time stamp (minimum yyyy, or year) is used to select records for deletion. All entries equal to or less than the time stamp will be deleted. A valid time stamp must be provided; a NULL parameter value is invalid.

This parameter can also be used to pass an LSN, so that inactive logs can be pruned.

iEID Input. Specifies a unique identifier that can be used to prune a single entry from the history file.

iAction
Input. Specifies the type of action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2PRUNE_ACTION_HISTORY
Remove history file entries.

DB2PRUNE_ACTION_LOG
Remove log files from the active log path.

iOptions
Input. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2PRUNE_OPTION_FORCE
Force the removal of the last backup.

DB2PRUNE_OPTION_DELETE
Delete log files that are pruned from the history file.

If you set the **auto_del_rec_obj** database configuration parameter to ON, calling db2Prune with DB2PRUNE_OPTION_DELETE also causes the associated backup images and load copy images to be deleted.

DB2PRUNE_OPTION_LSNSTRING
Specify that the value of piString is an LSN, used when a caller action of DB2PRUNE_ACTION_LOG is specified.

db2gPruneStruct data structure specific parameters

iStringLen
Input. Specifies the length in bytes of piString.

Usage notes

Those entries with do_not_delete status will not be pruned or deleted. You can set the status of recovery history file entries to do_not_delete using the UPDATE HISTORY command, the ADMIN_CMD with UPDATE_HISTORY, or the db2HistoryUpdate API. You can use the do_not_delete status to prevent key recovery history file entries from being pruned or deleted.

If the latest full database backup is deleted from the media (in addition to being pruned from the history file), the user must ensure that all table spaces, including the catalog table space and the user table spaces, are backed up. Failure to do so may result in a database that cannot be recovered, or the loss of some portion of the user data in the database.

You can prune snapshot backup database history file entries using db2Prune, but you cannot delete the related physical recovery objects using the DB2PRUNE_OPTION_DELETE parameter. The only way to delete snapshot backup object is to use the db2acsutil command.

REXX API syntax

```
PRUNE RECOVERY HISTORY BEFORE :timestamp [WITH FORCE OPTION]
```

REXX API parameters

timestamp
A host variable containing a time stamp. All entries with time stamps equal to or less than the time stamp provided are deleted from the history file.

WITH FORCE OPTION
If specified, the history file will be pruned according to the time stamp specified, even if some entries from the most recent restore set are deleted from the file. If not specified, the most recent restore set will be kept, even if the time stamp is less than or equal to the time stamp specified as input.

db2QuerySatelliteProgress - Get the status of a satellite synchronization session

Checks on the status of a satellite synchronization session.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2QuerySatelliteProgress (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef struct db2QuerySatelliteProgressStruct
{
   db2int32 oStep;
   db2int32 oSubstep;
   db2int32 oNumSubsteps;
   db2int32 oScriptStep;
   db2int32 oNumScriptSteps;
   char *poDescription;
   char *poError;
   char *poProgressLog;
} db2QuerySatelliteProgressStruct;
```

db2QuerySatelliteProgress API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2QuerySatelliteProgressStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2QuerySatelliteProgressStruct data structure parameters

oStep Output. The current step of the synchronization session (defined in db2ApiDf header file, located in the include directory).

oSubstep
Output. If the synchronization step indicated by parameter, oStep, can be broken down into substeps, this will be the current substep.

oNumSubsteps
Output. If there exists a substep (oSubstep) for the current step of the synchronization session, this will be the total number of substeps that comprise the synchronization step.

oScriptStep
Output. If the current substep is the execution of a script, this parameter reports on the progress of the script execution, if available.

oNumScriptSteps
Output. If a script step is reported, this parameter contains the total number of steps that comprise the script's execution.

poDescription
Output. A description of the state of the satellite's synchronization session.

poError
Output. If the synchronization session is in error, a description of the error is passed by this parameter.

poProgressLog
Output. The entire log of the satellite's synchronization session is returned by this parameter.

db2ReadLog - Extracts log records

Extracts log records from the DB2 database logs and the Log Manager for current log state information. This API can only be used with recoverable databases. A database is recoverable if the database configuration parameters logarchmeth1 and/or logarchmeth2 are not set to OFF.

Authorization

One of the following:

- sysadm
- dbadm

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ReadLog (
       db2Uint32 versionNumber,
       void * pDB2ReadLogStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ReadLogStruct
{
   db2Uint32 iCallerAction;
   SQLU_LSN *piStartLSN;
   SQLU_LSN *piEndLSN;
   char *poLogBuffer;
   db2Uint32 iLogBufferSize;
   db2Uint32 iFilterOption;
   db2ReadLogInfoStruct *poReadLogInfo;
} db2ReadLogStruct;

typedef SQL_STRUCTURE db2ReadLogInfoStruct
{
   SQLU_LSN initialLSN;
   SQLU_LSN firstReadLSN;
   SQLU_LSN nextStartLSN;
   db2Uint32 logRecsWritten;
   db2Uint32 logBytesWritten;
   SQLU_LSN firstReusedLSN;
   db2Uint32 timeOfLSNReuse;
   db2TimeOfLog currentTimeValue;
} db2ReadLogInfoStruct;

typedef SQL_STRUCTURE db2TimeOfLog
{
   db2Uint32 seconds;
   db2Uint32 accuracy;
} db2TimeOfLog;
```

db2ReadLog API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter, pDB2ReadLogStruct.

pDB2ReadLogStruct
Input. A pointer to the db2ReadLogStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ReadLogStruct data structure parameters

iCallerAction
Input. Specifies the action to be performed.

DB2READLOG_READ
Read the database log from the starting log sequence to the ending log sequence number and return log records within this range.

DB2READLOG_READ_SINGLE
Read a single log record (propagatable or not) identified by the starting log sequence number.

DB2READLOG_QUERY
Query the database log. Results of the query will be sent back via the db2ReadLogInfoStruct structure.

piStartLsn
Input. The starting log sequence number specifies the starting relative byte address for the reading of the log. This value must be the start of an actual log record.

piEndLsn
Input. The ending log sequence number specifies the ending relative byte address for the reading of the log. This value must be greater than the startLsn parameter, and does not need to be the end of an actual log record.

poLogBuffer
Output. The buffer where all the propagatable log records read within the specified range are stored sequentially. This buffer must be large enough to hold a single log record. As a guideline, this buffer should be a minimum of 32 bytes. Its maximum size is dependent on the size of the requested range. Each log record in the buffer is prefixed by a six byte log sequence number (LSN), representing the LSN of the following log record.

iLogBufferSize
Input. Specifies the size, in bytes, of the log buffer.

iFilterOption
Input. Specifies the level of log record filtering to be used when reading the log records. Valid values are:

DB2READLOG_FILTER_OFF
Read all log records in the given LSN range.

DB2READLOG_FILTER_ON
Reads only log records in the given LSN range marked as propagatable. This is the traditional behavior of the asynchronous log read API. The log records that are returned when this value is

used are documented in the ″DB2 log records″ topic. All other log records are for IBM internal use only and are therefore not documented.

poReadLogInfo
Output. A structure detailing information regarding the call and the database log.

db2ReadLogInfoStruct data structure parameters

initialLSN
The first LSN used, or that will be used, by the database since it was activated.

firstReadLSN
The first LSN present in poLogBuffer parameter.

nextStartLSN
The start of the next log record the caller should read. Because some log records can be filtered and not returned in poLogBuffer parameter, using this LSN as the start of the next read instead of the end of the last log record in poLogBuffer parameter will prevent rescanning log records which have already been filtered.

logRecsWritten
The number of log records written to poLogBuffer parameter.

logBytesWritten
The total number of bytes of data written to poLogBuffer parameter.

firstReusedLSN
The first LSN to be reused due to a database restore or rollforward operation.

timeOfLSNReuse
The time at which the LSN represented by firstReusedLSN was reused. The time is the number of seconds since January 1, 1970.

currentTimeValue
The current time according to the database.

db2TimeOfLog data structure parameters

seconds
The number of seconds since Januray 1, 1970.

accuracy
A high accuracy counter which allows callers to distinguish the order of events when comparing timestamps that occurred within the same second.

Usage notes

If the requested action is to read the log, you must provide a log sequence number range and a buffer to hold the log records. This API reads the log sequentially, bounded by the requested LSN range, and returns log records associated with tables defined with the DATA CAPTURE CHANGES clause, and a db2ReadLogInfoStruct structure with the current active log information. If the requested action is a query of the database log (indicated by specifying the value DB2READLOG_QUERY), the API returns a db2ReadLogInfoStruct structure with the current active log information.

To use the Asynchronous Log Reader, first query the database log for a valid starting LSN. Following the query call, the read log information structure (db2ReadLogInfoStruct) will contain a valid starting LSN (in the initialLSN member), to be used on a read call. The value used as the ending LSN on a read can be one of the following:

- A value greater than initialLSN
- FFFF FFFF FFFF, which is interpreted by the asynchronous log reader as the end of the current log.

The propagatable log records that are read within the starting and ending LSN range are returned in the log buffer. A log record does not contain its LSN; it is contained in the buffer before the actual log record. Descriptions of the various DB2 log records returned by db2ReadLog the DB2 Log Records section.

To read the next sequential log record after the initial read, use the nextStartLSN field returned in the db2ReadLogStruct structure. Resubmit the call, with this new starting LSN and a valid ending LSN. The next block of records is then read. An sqlca code of SQLU_RLOG_READ_TO_CURRENT means that the log reader has read to the end of the current active log.

This API reads data from the DB2 logs. Label-based access control (LBAC) is not enforced on such logs. Thus, an application that calls this API can gain access to table data if the caller has sufficient authority to call the API and is able to understand the log records format.

The db2ReadLog API works on the current database connection. If multiple database connections are created with the same process, then use the concurrent access APIs to manage the multiple contexts.

Calling the db2ReadLog API from an application can result in an error when the application disconnects from the database if a commit or rollback is not performed before the disconnect:

- A CLI0116E error might be generated if the db2ReadLog API is called from a CLI application.
- A SQL0428N error might be generated if the db2ReadLog API is called from an embedded SQL application written in C.

Workaround 1: For non-embedded SQL applications, set autocommit mode on before calling the db2ReadLog API.

Workaround 2: Issue a COMMIT or ROLLBACK statement after calling the db2ReadLog API and before disconnecting from the database.

db2ReadLogNoConn - Read the database logs without a database connection

Extracts log records from the DB2 database logs and queries the Log Manager for current log state information. Prior to using this API, call the db2ReadLogNoConnInit API to allocate the memory that is passed as an input parameter to this API. After calling this API, call the db2ReadLogNoConnTerm API to deallocate the memory.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ReadLogNoConn (
       db2Uint32 versionNumber,
       void * pDB2ReadLogNoConnStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ReadLogNoConnStruct
{
   db2Uint32 iCallerAction;
   SQLU_LSN *piStartLSN;
   SQLU_LSN *piEndLSN;
   char *poLogBuffer;
   db2Uint32 iLogBufferSize;
   char *piReadLogMemPtr;
   db2ReadLogNoConnInfoStruct *poReadLogInfo;
} db2ReadLogNoConnStruct;

typedef SQL_STRUCTURE db2ReadLogNoConnInfoStruct
{
   SQLU_LSN firstAvailableLSN;
   SQLU_LSN firstReadLSN;
   SQLU_LSN nextStartLSN;
   db2Uint32 logRecsWritten;
   db2Uint32 logBytesWritten;
   db2Uint32 lastLogFullyRead;
   db2TimeOfLog currentTimeValue;
} db2ReadLogNoConnInfoStruct;
```

db2ReadLogNoConn API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter, pDB2ReadLogNoConnStruct.

pDB2ReadLogNoConnStruct
Input. A pointer to the db2ReadLogNoConnStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ReadLogNoConnStruct data structure parameters

iCallerAction
Input. Specifies the action to be performed. Valid values are:

DB2READLOG_READ
Read the database log from the starting log sequence to the ending log sequence number and return log records within this range.

DB2READLOG_READ_SINGLE
Read a single log record (propagatable or not) identified by the starting log sequence number.

DB2READLOG_QUERY
Query the database log. Results of the query will be sent back via the db2ReadLogNoConnInfoStruct structure.

piStartLSN
Input. The starting log sequence number specifies the starting relative byte address for the reading of the log. This value must be the start of an actual log record.

piEndLSN
Input. The ending log sequence number specifies the ending relative byte address for the reading of the log. This value must be greater than piStartLsn, and does not need to be the end of an actual log record.

poLogBuffer
Output. The buffer where all the propagatable log records read within the specified range are stored sequentially. This buffer must be large enough to hold a single log record. As a guideline, this buffer should be a minimum of 32 bytes. Its maximum size is dependent on the size of the requested range.

Each log record in the buffer is prefixed by a six byte log sequence number (LSN), representing the LSN of the following log record.

iLogBufferSize
Input. Specifies the size, in bytes, of the log buffer.

piReadLogMemPtr
Input. Block of memory of size iReadLogMemoryLimit that was allocated in the initialization call. This memory contains persistent data that the API requires at each invocation. This memory block must not be reallocated or altered in any way by the caller.

poReadLogInfo
Output. A pointer to the db2ReadLogNoConnInfoStruct structure.

db2ReadLogNoConnInfoStruct data structure parameters

firstAvailableLSN
First available LSN in available logs.

firstReadLSN
First LSN read on this call.

nextStartLSN
Next readable LSN.

logRecsWritten
Number of log records written to the log buffer field, poLogBuffer.

logBytesWritten
Number of bytes written to the log buffer field, poLogBuffer.

lastLogFullyRead
Number indicating the last log file that was read to completion.

currentTimeValue
Reserved for future use.

Usage notes

The db2ReadLogNoConn API requires a memory block that must be allocated using the db2ReadLogNoConnInit API. The memory block must be passed as an input parameter to all subsequent db2ReadLogNoConn API calls, and must not be altered.

When requesting a sequential read of log, the API requires a log sequence number (LSN) range and the allocated memory . The API will return a sequence of log records based on the filter option specified when initialized and the LSN range. When requesting a query, the read log information structure will contain a valid starting LSN, to be used on a read call. The value used as the ending LSN on a read can be one of the following:

- A value greater than the caller-specified startLSN.
- FFFF FFFF FFFF which is interpreted by the asynchronous log reader as the end of the available logs.

The propagatable log records read within the starting and ending LSN range are returned in the log buffer. A log record does not contain its LSN, it is contained in the buffer before the actual log record. Descriptions of the various DB2 log records returned by db2ReadLogNoConn can be found in the DB2 Log Records section.

After the initial read, in order to read the next sequential log record, use the nextStartLSN value returned in db2ReadLogNoConnInfoStruct. Resubmit the call, with this new starting LSN and a valid ending LSN and the next block of records is then read. An sqlca code of SQLU_RLOG_READ_TO_CURRENT means the log reader has read to the end of the available log files.

When the API will no longer be used, use db2ReadLogNoConnTerm to terminate the memory.

This API reads data from the DB2 logs. Label-based access control (LBAC) is not enforced on such logs. Thus, an application that calls this API can potentially gain access to table data if the caller has sufficient authority to call the API and is able to understand the log records format.

db2ReadLogNoConnInit - Initialize reading the database logs without a database connection

Allocates the memory to be used by db2ReadLogNoConn in order to extract log records from the DB2 database logs and query the Log Manager for current log state information.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ReadLogNoConnInit (
       db2Uint32 versionNumber,
       void * pDB2ReadLogNoConnInitStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ReadLogNoConnInitStruct
{
   db2Uint32 iFilterOption;
   char *piLogFilePath;
   char *piOverflowLogPath;
   db2Uint32 iRetrieveLogs;
   char *piDatabaseName;
   char *piNodeName;
   db2Uint32 iReadLogMemoryLimit;
   char                                **poReadLogMemPtr;
} db2ReadLogNoConnInitStruct;
```

db2ReadLogNoConnInit API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pDB2ReadLogNoConnInitStruct.

pDB2ReadLogNoConnInitStruct
Input. A pointer to the db2ReadLogNoConnInitStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ReadLogNoConnInitStruct data structure parameters

iFilterOption
Input. Specifies the level of log record filtering to be used when reading the log records. Valid values are:

DB2READLOG_FILTER_OFF
Read all log records in the given LSN range.

DB2READLOG_FILTER_ON
Reads only log records in the given LSN range marked as propagatable. This is the traditional behavior of the asynchronous log read API.

piLogFilePath
Input. Path where the log files to be read are located.

piOverflowLogPath
Input. Alternate path where the log files to be read may be located.

iRetrieveLogs
Input. Option specifying if userexit should be invoked to retrieve log files that cannot be found in either the log file path or the overflow log path. Valid values are:

DB2READLOG_RETRIEVE_OFF
Userexit should not be invoked to retrieve missing log files.

DB2READLOG_RETRIEVE_LOGPATH
Userexit should be invoked to retrieve missing log files into the specified log file path.

DB2READLOG_RETRIEVE_OVERFLOW
Userexit should be invoked to retrieve missing log files into the specified overflow log path.

piDatabaseName
Input. Name of the database that owns the recovery logs being read. This is required if the retrieve option above is specified.

piNodeName
Input. Name of the node that owns the recovery logs being read. This is required if the retrieve option above is specified.

iReadLogMemoryLimit
Input. Maximum number of bytes that the API may allocate internally.

poReadLogMemPtr
Output. API-allocated block of memory of size iReadLogMemoryLimit. This memory contains persistent data that the API requires at each invocation. This memory block must not be reallocated or altered in any way by the caller.

Usage notes

The memory initialized by db2ReadLogNoConnInit must not be altered.

When db2ReadLogNoConn will no longer be used, invoke db2ReadLogNoConnTerm to deallocate the memory initialized by db2ReadLogNoConnInit.

db2ReadLogNoConnTerm - Terminate reading the database logs without a database connection

Deallocates the memory used by the db2ReadLogNoConn API, originally initialized by the db2ReadLogNoConnInit API.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ReadLogNoConnTerm (
       db2Uint32 versionNumber,
       void * pDB2ReadLogNoConnTermStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ReadLogNoConnTermStruct
{
   char                                **poReadLogMemPtr;
} db2ReadLogNoConnTermStruct;
```

db2ReadLogNoConnTerm API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pDB2ReadLogNoConnTermStruct.

pDB2ReadLogNoConnTermStruct
Input. A pointer to the db2ReadLogNoConnTermStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ReadLogNoConnTermStruct data structure parameters

poReadLogMemPtr
Output. Pointer to the block of memory allocated in the initialization call. This pointer will be freed and set to NULL.

db2Recover - Restore and roll forward a database

Restores and rolls forward a database to a particular point in time or to the end of the logs.

Scope

In a partitioned database environment, this API can only be called from the catalog partition. If no database partition servers are specified, it affects all database partition servers that are listed in the db2nodes.cfg file. If a point in time is specified, the API affects all database partitions.

Authorization

To recover an existing database, one of the following:

- sysadm
- sysctrl
- sysmaint

To recover to a new database, one of the following:

- sysadm
- sysctrl

Required connection

To recover an existing database, a database connection is required. This API automatically establishes a connection to the specified database and will release the connection when the recover operation finishes. Instance and database, to recover to a new database. The instance attachment is required to create the database.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Recover (
       db2Uint32 versionNumber,
       void * pDB2RecovStruct,
```

```
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2RecoverStruct
{
  char *piSourceDBAlias;
  char *piUsername;
  char *piPassword;
  db2Uint32 iRecoverCallerAction;
  db2Uint32 iOptions;
  sqlint32 *poNumReplies;
  struct sqlurf_info *poNodeInfo;
  char *piStopTime;
  char *piOverflowLogPath;
  db2Uint32 iNumChngLgOvrflw;
  struct sqlurf_newlogpath *piChngLogOvrflw;
  db2int32 iAllNodeFlag;
  db2int32 iNumNodes;
  SQL_PDB_NODE_TYPE *piNodeList;
  db2int32 iNumNodeInfo;
  char *piHistoryFile;
  db2Uint32 iNumChngHistoryFile;
  struct sqlu_histFile *piChngHistoryFile;
  char *piComprLibrary;
  void *piComprOptions;
  db2Uint32 iComprOptionsSize;
} db2RecoverStruct;

SQL_STRUCTURE sqlu_histFile
{
   SQL_PDB_NODE_TYPE nodeNum;
   unsigned short  filenameLen;
   char filename[SQL_FILENAME_SZ+1];
};

SQL_API_RC SQL_API_FN
  db2gRecover (
       db2Uint32 versionNumber,
       void * pDB2gRecoverStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gRecoverStruct
{
  char *piSourceDBAlias;
  db2Uint32 iSourceDBAliasLen;
  char *piUserName;
  db2Uint32 iUserNameLen;
  char *piPassword;
  db2Uint32 iPasswordLen;
  db2Uint32 iRecoverCallerAction;
  db2Uint32 iOptions;
  sqlint32 *poNumReplies;
  struct sqlurf_info *poNodeInfo;
  char *piStopTime;
  db2Uint32 iStopTimeLen;
  char *piOverflowLogPath;
  db2Uint32 iOverflowLogPathLen;
  db2Uint32 iNumChngLgOvrflw;
  struct sqlurf_newlogpath *piChngLogOvrflw;
  db2int32 iAllNodeFlag;
  db2int32 iNumNodes;
  SQL_PDB_NODE_TYPE *piNodeList;
  db2int32 iNumNodeInfo;
  char *piHistoryFile;
  db2Uint32 iHistoryFileLen;
  db2Uint32 iNumChngHistoryFile;
  struct sqlu_histFile *piChngHistoryFile;
  char *piComprLibrary;
```

```
  db2Uint32 iComprLibraryLen;
  void *piComprOptions;
  db2Uint32 iComprOptionsSize;
} db2gRecoverStruct;
```

db2Recover API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pDB2RecoverStruct.

pDB2RecoverStruct
Input. A pointer to the db2RecoverStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2RecoverStruct data structure parameters

piSourceDBAlias
Input. A string containing the database alias of the database to be recovered.

piUserName
Input. A string containing the user name to be used when attempting a connection. Can be NULL.

piPassword
Input. A string containing the password to be used with the user name. Can be NULL.

iRecoverCallerAction
Input. Valid values are:

DB2RECOVER
Starts the recover operation. Specifies that the recover will run unattended, and that scenarios that normally require user intervention will either be attempted without first returning to the caller, or will generate an error. Use this caller action, for example, if it is known that all of the media required for the recover have been mounted, and utility prompts are not desired.

DB2RECOVER_RESTART
Allows the user to ignore a prior recover and start over from the beginning.

DB2RECOVER_CONTINUE
Continue using the device that generated the warning message (for example, when a new tape has been mounted).

DB2RECOVER_LOADREC_TERM
Terminate all devices being used by load recovery.

DB2RECOVER_DEVICE_TERM
Stop using the device that generated the warning message (for example, when there are no more tapes).

DB2RECOVER_PARM_CHK_ONLY
Used to validate parameters without performing a recover operation. Before this call returns, the database connection established by this call is terminated, and no subsequent call is required.

DB2RECOVER_DEVICE_TERMINATE
Removes a particular device from the list of devices used by the recover operation. When a particular device has exhausted its input, recover will return a warning to the caller. Call the recover utility again with this caller action to remove the device that generated the warning from the list of devices being used.

iOptions
Input. Valid values are:

- DB2RECOVER_EMPTY_FLAG
No flags specified.

- DB2RECOVER_LOCAL_TIME
Indicates that the value specified for the stop time by piStopTime is in local time, not GMT. This is the default setting.

- DB2RECOVER_GMT_TIME
This flag indicates that the value specified for the stop time by piStopTime is in GMT (Greenwich Mean Time).

poNumReplies
Output. The number of replies received.

poNodeInfo
Output. Database partition reply information.

piStopTime
Input. A character string containing a time stamp in ISO format. Database recovery will stop when this time stamp is exceeded. Specify SQLUM_INFINITY_TIMESTAMP to roll forward as far as possible. May be NULL for DB2ROLLFORWARD_QUERY, DB2ROLLFORWARD_PARM_CHECK, and any of the load recovery (DB2ROLLFORWARD_LOADREC_) caller actions.

piOverflowLogPath
Input. This parameter is used to specify an alternate log path to be used. In addition to the active log files, archived log files need to be moved (by the user) into the location specified by the logpath configuration parameter before they can be used by this utility. This can be a problem if the user does not have sufficient space in the log path. The overflow log path is provided for this reason. During roll-forward recovery, the required log files are searched, first in the log path, and then in the overflow log path. The log files needed for table space rollforward recovery can be brought into either the log path or the overflow log path. If the caller does not specify an overflow log path, the default value is the log path.

In a partitioned database environment, the overflow log path must be a valid, fully qualified path; the default path is the default overflow log path for each database partition. In a single-partition database environment, the overflow log path can be relative if the server is local.

iNumChngLgOvrflw
Input. Partitioned database environments only. The number of changed overflow log paths. These new log paths override the default overflow log path for the specified database partition server only.

piChngLogOvrflw
Input. Partitioned database environments only. A pointer to a structure

containing the fully qualified names of changed overflow log paths. These new log paths override the default overflow log path for the specified database partition server only.

iAllNodeFlag
Input. Partitioned database environments only. Indicates whether the rollforward operation is to be applied to all database partition servers defined in db2nodes.cfg. Valid values are:

DB2_NODE_LIST
Apply to database partition servers in a list that is passed in piNodeList.

DB2_ALL_NODES
Apply to all database partition servers. piNodeList should be NULL. This is the default value.

DB2_ALL_EXCEPT
Apply to all database partition servers except those in a list that is passed in piNodeList.

DB2_CAT_NODE_ONLY
Apply to the catalog partition only. piNodeList should be NULL.

iNumNodes
Input. Specifies the number of database partition servers in the piNodeList array.

piNodeList
Input. A pointer to an array of database partition server numbers on which to perform the rollforward recovery.

iNumNodeInfo
Input. Defines the size of the output parameter poNodeInfo, which must be large enough to hold status information from each database partition that is being rolled forward. In a single-partition database environment, this parameter should be set to 1. The value of this parameter should be the same as the number of database partition servers for which this API is being called.

piHistoryFile
History file.

iNumChngHistoryFile
Number of history files in list.

piChngHistoryFile
List of history files.

piComprLibrary
Input. Indicates the name of the external library to be used to perform decompression of the backup image if the image is compressed. The name must be a fully-qualified path referring to a file on the server. If the value is a null pointer or a pointer to an empty string, DB2 will attempt to use the library stored in the image. If the backup was not compressed, the value of this parameter will be ignored. If the specified library is not found, the restore will fail.

piComprOptions
Input. Describes a block of binary data that will be passed to the initialization routine in the decompression library. DB2 will pass this string directly from the client to the server, so any issues of byte-reversal or

code-page conversion will have to be handled by the compression library. If the first character of the data block is '@', the remainder of the data will be interpreted by DB2 as the name of a file residing on the server. DB2 will then replace the contents of piComprOptions and iComprOptionsSize with the contents and size of this file respectively and will pass these new values to the initialization routine instead.

iComprOptionsSize
Input. Represents the size of the block of data passed as piComprOptions. iComprOptionsSize shall be zero if and only if piComprOptions is a null pointer.

sqlu_histFile data structure parameters

nodeNum
Input. Specifies which database partition this entry should be used for.

filenameLen
Input. Length in bytes of filename.

filename
Input. Path to the history file for this database partition. The path must end with a slash.

db2gRecoverStruct data structure specific parameters

iSourceDBAliasLen
Specifies the length in bytes of the piSourceDBAlias parameter.

iUserNameLen
Specified the length in bytes of the piUsername parameter.

iPasswordLen
Specifies the length in bytes of the piPassword parameter.

iStopTimeLen
Specifies the length in bytes of the piStopTime parameter.

iOverflowLogPathLen
Specifies the length in bytes of the piOverflowLogPath parameter.

iHistoryFileLen
Specifies the length in bytes of the piHistoryFile parameter.

iComprLibraryLen
Input. Specifies the length in bytes of the name of the library specified in the piComprLibrary parameter. Set to zero if no library name is given.

db2Reorg - Reorganize an index or a table

Reorganizes a table or all indexes defined on a table by compacting the information and reconstructing the rows or index data to eliminate fragmented data.

Authorization

One of the following:
- SYSADM
- SYSCTRL
- SYSMAINT

- DBADM
- CONTROL privilege on the table

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Reorg (
             db2Uint32 versionNumber,
             void * pReorgStruct,
             struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ReorgStruct
{
  db2Uint32 reorgType;
  db2Uint32 reorgFlags;
  db2int32 nodeListFlag;
  db2Uint32 numNodes;
  SQL_PDB_NODE_TYPE *pNodeList;
  union db2ReorgObject        reorgObject;
} db2ReorgStruct;

union db2ReorgObject
{
  struct db2ReorgTable             tableStruct;
  struct db2ReorgIndexesAll        indexesAllStruct;
};

typedef SQL_STRUCTURE db2ReorgTable
{
  char *pTableName;
  char *pOrderByIndex;
  char *pSysTempSpace;
  char *pLongTempSpace;
} db2ReorgTable;

typedef SQL_STRUCTURE db2ReorgIndexesAll
{
  char *pTableName;
  char *pIndexName;
} db2ReorgIndexesAll;

SQL_API_RC SQL_API_FN
  db2gReorg (
              db2Uint32 versionNumber,
              void * pReorgStruct,
              struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gReorgStruct
{
  db2Uint32 reorgType;
  db2Uint32 reorgFlags;
  db2int32 nodeListFlag;
  db2Uint32 numNodes;
  SQL_PDB_NODE_TYPE *pNodeList;
  union db2gReorgObject       reorgObject;
} db2gReorgStruct;

typedef SQL_STRUCTURE db2gReorgNodes
```

```
{
  SQL_PDB_NODE_TYPE nodeNum[SQL_PDB_MAX_NUM_NODE];
} db2gReorgNodes;

union db2gReorgObject
{
  struct db2gReorgTable            tableStruct;
  struct db2gReorgIndexesAll       indexesAllStruct;
};

typedef SQL_STRUCTURE db2gReorgTable
{
  db2Uint32 tableNameLen;
  char *pTableName;
  db2Uint32 orderByIndexLen;
  char *pOrderByIndex;
  db2Uint32 sysTempSpaceLen;
  char *pSysTempSpace;
  db2Uint32 longTempSpaceLen;
  char *pLongTempSpace;
} db2gReorgTable;

typedef SQL_STRUCTURE db2gReorgIndexesAll
{
  db2Uint32 tableNameLen;
  char *pTableName;
  db2Uint32 indexNameLen;
  char *pIndexName;
} db2gReorgIndexesAll;
```

db2Reorg API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter, **pReorgStruct**.

pReorgStruct
Input. A pointer to the db2ReorgStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ReorgStruct data structure parameters

reorgType
Input. Specifies the type of reorganization. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2REORG_OBJ_TABLE_OFFLINE
Reorganize the table offline.

DB2REORG_OBJ_TABLE_INPLACE
Reorganize the table inplace.

DB2REORG_OBJ_INDEXESALL
Reorganize all indexes.

DB2REORG_OBJ_INDEX
Reorganize one index.

reorgFlags
Input. Reorganization options. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2REORG_OPTION_NONE
Default action.

DB2REORG_LONGLOB
Reorganize long fields and lobs, used when DB2REORG_OBJ_TABLE_OFFLINE is specified as the **reorgType**.

DB2REORG_INDEXSCAN
Recluster utilizing index scan, used when DB2REORG_OBJ_TABLE_OFFLINE is specified as the **reorgType**.

DB2REORG_START_ONLINE
Start online reorganization, used when DB2REORG_OBJ_TABLE_INPLACE is specified as the **reorgType**.

DB2REORG_PAUSE_ONLINE
Pause an existing online reorganization, used when DB2REORG_OBJ_TABLE_INPLACE is specified as the **reorgType**.

DB2REORG_STOP_ONLINE
Stop an existing online reorganization, used when DB2REORG_OBJ_TABLE_INPLACE is specified as the **reorgType**.

DB2REORG_RESUME_ONLINE
Resume a paused online reorganization, used when DB2REORG_OBJ_TABLE_INPLACE is specified as the **reorgType**.

DB2REORG_NOTRUNCATE_ONLINE
Do not perform table truncation, used when DB2REORG_OBJ_TABLE_INPLACE is specified as the **reorgType**.

DB2REORG_ALLOW_NONE
No read or write access to the table. This parameter is not supported when DB2REORG_OBJ_TABLE_INPLACE is specified as the **reorgType**.

DB2REORG_ALLOW_WRITE
Allow read and write access to the table. This parameter is not supported when DB2REORG_OBJ_TABLE_OFFLINE is specified as the **reorgType**.

DB2REORG_ALLOW_READ
Allow only read access to the table.

DB2REORG_CLEANUP_NONE
No clean up is required, used when DB2REORG_OBJ_INDEXESALL or DB2REORG_OBJ_INDEX are specified as the **reorgType**.

DB2REORG_CLEANUP_ALL
Clean up the committed pseudo deleted keys and committed pseudo empty pages, used when DB2REORG_OBJ_INDEXESALL or DB2REORG_OBJ_INDEX are specified as the **reorgType**.

DB2REORG_CLEANUP_PAGES
Clean up committed pseudo empty pages only, but do not clean up pseudo deleted keys on pages that are not pseudo empty, used when DB2REORG_OBJ_INDEXESALL or DB2REORG_OBJ_INDEX are specified as the **reorgType**.

DB2REORG_CONVERT_NONE
No conversion is required, used when DB2REORG_OBJ_INDEXESALL or DB2REORG_OBJ_INDEX are specified as the **reorgType**.

DB2REORG_CONVERT
Convert to type 2 index, used when DB2REORG_OBJ_INDEXESALL is specified as the **reorgType**.

DB2REORG_RESET_DICTIONARY
If the COMPRESS attribute for the table is YES then a new row compression dictionary is built. All the rows processed during reorganization are subject to compression using this new dictionary. This dictionary replaces any previous dictionary. If the COMPRESS attribute for the table is NO and the table does have an existing compression dictionary then reorg processing will remove the dictionary and all rows in the newly reorganized table will be in non-compressed format. This parameter is only supported for the DB2REORG_OBJ_TABLE_OFFLINE **reorgType**.

DB2REORG_KEEP_DICTIONARY
If the COMPRESS attribute for the table is YES and a dictionary exists, it is kept. If the COMPRESS attribute for the table is YES and a dictionary does not exist, one is built, as the option defaults to DB2REORG_RESET_DICTIONARY in that case. All rows processed by reorganization are subject to compression. If the COMPRESS attribute for the table is NO, the dictionary will be retained (if one existed), and all rows in the newly reorganized table will be in non-compressed format. This parameter is only supported for the DB2REORG_OBJ_TABLE_OFFLINE **reorgType**.

nodeListFlag
Input. Specifies which nodes to reorganize. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2REORG_NODE_LIST
Submit to all nodes in the nodelist array.

DB2REORG_ALL_NODES
Submit to all nodes in the database partition group.

DB2REORG_ALL_EXCEPT
Submit to all nodes except the ones specified by the nodelist parameter.

numNodes
Input. Number of nodes in the nodelist array.

pNodeList
A pointer to the array of node numbers.

reorgObject
Input. Specifies the type of object to be reorganized.

db2ReorgObject union parameters

tableStruct
Specifies the options for a table reorganization.

indexesAllStruct
Specifies the options for an index reorganization.

db2ReorgTable data structure parameters

pTableName
Input. Specifies the name of the table to reorganize.

pOrderByIndex
Input. Specifies the index to order the table by.

pSysTempSpace
Input. Specifies the system temporary table space where temporary objects are created. The REORG command may expand rows in cases where a column is added to a table (i.e. from ALTER TABLE ADD COLUMN) and the rows were inserted before the column was added. For a non-partitioned table, this parameter must specify a table space with enough room to create the new table object. A partitioned table is reorganized a single data partition at a time. In this case, there must be enough free space in the table space to hold the largest data partition of the table.

If this parameter is not specified for a non-partitioned table the table space the table resides in is used. If this parameter is not specified for a partitioned table, the table space where each data partition is located is used for temporary storage of that data partition. There must be enough free space in each data partition's table space to hold a copy of the data partition.

pLongTempSpace
Input. Specifies the temporary table space to create long objects (LONG VARCHAR and LOB columns) in during table reorganization. If the **pSysTempSpace** parameter is not specified, this parameter is ignored. If this parameter is not specified, but the **pSysTempSpace** parameter is specified, then DB2 will create the long data objects in the table space specified by the **pSysTempSpace** parameter, unless the page sizes differ.

When page sizes differ, if **pSysTempSpace** is specified, but this parameter is not, DB2 will attempt to find an existing table space with a matching page size to create the long objects in.

db2ReorgIndexesAll data structure parameters

pTableName
Input. Specifies the name of the table for index reorganization. If DB2REORG_OBJ_INDEX is specified as the **reorgType**, the **pTableName** parameter is not required and can be NULL. However, if the **pTableName** parameter is specified, it must be the table on which the index is defined.

pIndexName
Input. Specifies the name of the index to reorganize. This parameter is used only when the **reorgType** parameter is set to a value of DB2REORG_OBJ_INDEX otherwise set **pIndexName** parameter to NULL.

db2gReorgTable data structure specific parameters

tableNameLen
Input. Specifies the length in bytes of **pTableName**.

orderByIndexLen
Input. Specifies the length in byte of **pOrderByIndex**.

sysTempSpaceLen
Input. Specifies the length in bytes of **pSysTempSpace**.

longTempSpaceLen
Input. Specifies the length of the name stored in the **pLongTempSpace** parameter.

db2gReorgIndexesAll data structure specific parameters

tableNameLen
Input. Specifies the length in bytes of **pTableName**.

indexNameLen
Input. Specifies the length in bytes of the **pIndexName** parameter.

Usage notes

- Performance of table access, index scans, and the effectiveness of index page prefetching can be adversely affected when the table data has been modified many times, becoming fragmented and unclustered. Use REORGCHK to determine whether a table or its indexes are candidates for reorganizing. All work will be committed and all open cursors will be closed during reorg processing. After reorganizing a table or its indexes, use db2Runstats to update the statistics and sqlarbnd to rebind the packages that use this table.
- If the table data is distributed onto several nodes and the reorganization fails on any of the affected nodes, then only the failing nodes will have the reorganization rolled back. If table reorganization is not successful, temporary files should not be deleted. The database manager uses these files to recover the database.
- For table reorganization, if the name of an index is specified, the database manager reorganizes the data according to the order in the index. To maximize performance, specify an index that is often used in SQL queries. If the name of an index is not specified, and if a clustering index exists, the data will be ordered according to the clustering index.
- The PCTFREE value of a table determines the amount of free space designated per page. If the value has not been set, the utility will fill up as much space as possible on each page.
- To complete a table space rollforward recovery following a table reorganization, both data and LONG table spaces must be rollforward enabled.
- If the table contains LOB columns not defined with the COMPACT option, the LOB DATA storage object can be significantly larger following table reorganization. This can be a result of the order in which the rows were reorganized, and the types of table spaces used (SMS/DMS).
- The following table illustrates the default table access chosen based on the type of reorg and table:

Table 8. Default table access chosen based on the type of reorg and table

Type of reorg and applicable flags which can affect the default table access		Access mode chosen for each table type	
reorgType	**reorgFlags (if applicable)**	**Non-partitioned table**	**Partitioned table**
DB2REORG_OBJ_TABLE_ OFFLINE		DB2REORG_ALLOW_ READ	DB2REORG_ALLOW_ NONE
DB2REORG_OBJ_TABLE_ INPLACE		DB2REORG_ALLOW_ WRITE	N/A
DB2REORG_OBJ_ INDEXESALL		DB2REORG_ALLOW_ READ	DB2REORG_ALLOW_ NONE
DB2REORG_OBJ_ INDEXESALL	DB2REORG_CLEANUP_ ALL, DB2REORG_CLEANUP_ PAGES	DB2REORG_ALLOW_ READ	DB2REORG_ALLOW_ READ
DB2REORG_OBJ_INDEX		N/A	DB2REORG_ALLOW_ READ
DB2REORG_OBJ_INDEX	DB2REORG_CLEANUP_ ALL, DB2REORG_CLEANUP_ PAGES	N/A	DB2REORG_ALLOW_ READ

N/A: Not applicable at this time since it is not supported.

Note: Some access modes may not be supported on certain types of tables or indexes. In these cases and where possible, the least restrictive access mode is used. (The most restrictive access mode being DB2REORG_ALLOW_NONE, followed by DB2REORG_ALLOW_READ, and then DB2REORG_ALLOW_WRITE, which is the least restrictive). As support for existing table or index types change, or new table or index types are provided, the default can change from a more restrictive access mode to a less restrictive mode. The least restrictive mode chosen for the default will not go beyond DB2REORG_ALLOW_READ when the **reorgType** is not DB2REORG_OBJ_TABLE_INPLACE. The default access mode is chosen when none of the DB2REORG_ALLOW_NONE, DB2REORG_ALLOW_READ, or DB2REORG_ALLOW_WRITE flags are specified.

- When reorganizing indexes, use the access option to allow other transactions either read only or read-write access to the table. There is a brief lock-out period when the reorganized index(es) are being made available during which no access to the table is allowed.
- If an index reorganization with allow read or allow write access fails because the indexes need to be rebuilt, the reorganization will be switched to allow no access and carry on. A message will be written to both the administration notification log and the diagnostics log to warn you about the change in the access mode. For an index reorganization of a partitioned table, any indexes that need to be rebuilt are rebuilt offline and then the index you specified is reorganized, assuming it was not already rebuilt. This reorganization uses the access mode specified by you. A message will be written to the administration notification log and the diagnostics log to warn you that the indexes are being rebuilt offline.
- For non-inplace table reorganization, if neither DB2REORG_RESET_DICTIONARY or DB2REORG_KEEP_DICTIONARY is specified, the default is DB2REORG_KEEP_DICTIONARY.
- If an index reorganization with no access fails, some or all indexes will not be available and will be rebuilt on the next table access.
- This API cannot be used with:
  - views or an index that is based on an index extension
  - a DMS table while an online backup of a table space in which the table resides is being performed
  - declared temporary tables

db2ResetAlertCfg - Reset the alert configuration of health indicators

Resets the health indicator settings for specific objects to the current defaults for that object type or resets the current default health indicator settings for an object type to the install defaults.

Authorization

One of the following:

- sysadm
- sysmaint
- sysctrl

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ResetAlertCfg (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ResetAlertCfgData
{
   db2Uint32 iObjType;
   char *piObjName;
   char *piDbName;
   db2Uint32 iIndicatorID;
} db2ResetAlertCfgData;
```

db2ResetAlertCfg API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2ResetAlertCfgData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ResetAlertCfgData data structure parameters

iObjType
Input. Specifies the type of object for which configuration should be reset. Valid values (defined in db2ApiDf header file, located in the include directory) are:

- DB2ALERTCFG_OBJTYPE_DBM
- DB2ALERTCFG_OBJTYPE_DATABASES
- DB2ALERTCFG_OBJTYPE_TABLESPACES
- DB2ALERTCFG_OBJTYPE_TS_CONTAINERS
- DB2ALERTCFG_OBJTYPE_DATABASE
- DB2ALERTCFG_OBJTYPE_TABLESPACE
- DB2ALERTCFG_OBJTYPE_TS_CONTAINER

piObjName
Input. The name of the table space or table space container when object type, iObjType, is set to DB2ALERTCFG_OBJTYPE_TS_CONTAINER or DB2ALERTCFG_OBJTYPE_TABLESPACE. The name of the table space container is defined as <tablespace-numericalID>.<tablespace-container-name>.

piDbname
Input. The alias name for the database for which configuration should be reset when object type, iObjType, is set to DB2ALERTCFG_OBJTYPE_TS_CONTAINER, DB2ALERTCFG_OBJTYPE_TABLESPACE, and DB2ALERTCFG_OBJTYPE_DATABASE.

iIndicatorID
Input. The health indicator for which the configuration resets are to apply.

Usage notes

The current default for the object type is reset when iObjType is DB2ALERTCFG_OBJTYPE_DBM, DB2ALERTCFG_OBJTYPE_DATABASES, DB2ALERTCFG_OBJTYPE_TABLESPACES, DB2ALERTCFG_OBJTYPE_TS_CONTAINERS or when piObjName and piDbName are both NULL. If iObjType is DB2ALERTCFG_OBJTYPE_DATABASE, DB2ALERTCFG_OBJTYPE_TABLESPACE, DB2ALERTCFG_OBJTYPE_TS_CONTAINER and piDbName and piObjName (not needed for database) are specified, then the current settings for that specific object will be reset.

db2ResetMonitor - Reset the database system monitor data

Resets the database system monitor data of a specified database, or of all active databases, for the application issuing the call.

Scope

This API can either affect a given database partition on the instance, or all database partitions on the instance.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- sysmon

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

To reset the monitor switches for a remote instance (or a different local instance), it is necessary to first attach to that instance.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2ResetMonitor (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2ResetMonitorData
{
   db2Uint32 iResetAll;
   char *piDbAlias;
   db2Uint32 iVersion;
```

```
   db2int32 iNodeNumber;
} db2ResetMonitorData;

SQL_API_RC SQL_API_FN
  db2gResetMonitor (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gResetMonitorData
{
   db2Uint32 iResetAll;
   char *piDbAlias;
   db2Uint32 iDbAliasLength;
   db2Uint32 iVersion;
   db2int32 iNodeNumber;
} db2gResetMonitorData;
```

db2ResetMonitor API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2ResetMonitorData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2ResetMonitorData data structure parameters

iResetAll
Input. The reset flag.

piDbAlias
Input. A pointer to the database alias.

iVersion
Input. Version ID of the database monitor data to collect. The database monitor only returns data that was available for the requested version. Set this parameter to one of the following symbolic constants:

- SQLM_DBMON_VERSION1
- SQLM_DBMON_VERSION2
- SQLM_DBMON_VERSION5
- SQLM_DBMON_VERSION5_2
- SQLM_DBMON_VERSION6
- SQLM_DBMON_VERSION7
- SQLM_DBMON_VERSION8
- SQLM_DBMON_VERSION9
- SQLM_DBMON_VERSION9_5

Note: If SQLM_DBMON_VERSION1 is specified as the version, the APIs cannot be run remotely.

Note: Constants SQLM_DBMON_VERSION5_2, and earlier, are deprecated and may be removed in a future release of DB2.

iNodeNumber
Input. The database partition server where the request is to be sent. Based

on this value, the request will be processed for the current database partition server, all database partition servers or a user specified database partition server. Valid values are:

- SQLM_CURRENT_NODE
- SQLM_ALL_NODES
- node value

Note: For standalone instances the value, SQLM_CURRENT_NODE, must be used.

db2gResetMonitorData data structure specific parameters

iDbAliasLength
Input. Specifies the length in bytes of the piDbAlias parameter.

Usage notes

Each process (attachment) has its own private view of the monitor data. If one user resets, or turns off a monitor switch, other users are not affected. When an application first calls any database monitor function, it inherits the default switch settings from the database manager configuration file. These settings can be overridden with db2MonitorSwitches - Get/Update Monitor Switches.

If all active databases are reset, some database manager information is also reset to maintain the consistency of the data that is returned.

This API cannot be used to selectively reset specific data items or specific monitor groups. However, a specific group can be reset by turning its switch off, and then on, using db2MonitorSwitches - Get/Update Monitor Switches.

db2Restore - Restore a database or table space

Recreates a damaged or corrupted database that has been backed up using the db2Backup API. The restored database is in the same state it was in when the backup copy was made. This utility can also restore to a database with a name different from the database name in the backup image (in addition to being able to restore to a new database), the exception being a snapshot restore where the backup image database name must be the same.

This utility can also be used to restore DB2 databases created in the two previous releases.

This utility can also restore from a table space level backup, or restore table spaces from within a database backup image.

Scope

This API only affects the database partition from which it is called.

Authorization

To restore to an existing database, one of the following:

- *sysadm*
- *sysctrl*

- *sysmaint*

To restore to a new database, one of the following:

- *sysadm*
- *sysctrl*

Required connection

Database, to restore to an existing database. This API automatically establishes a connection to the specified database and will release the connection when the restore operation finishes.

Instance and *database*, to restore to a new database. The instance attachment is required to create the database.

For snapshot restore, *instance* and *database* connections are required.

To restore to a new database at an instance different from the current instance (as defined by the value of the **DB2INSTANCE** environment variable), it is necessary to first attach to the instance where the new database will reside.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Restore (
       db2Uint32 versionNumber,
       void * pDB2RestoreStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2RestoreStruct
{
  char *piSourceDBAlias;
  char *piTargetDBAlias;
  char oApplicationId[SQLU_APPLID_LEN+1];
  char *piTimestamp;
  char *piTargetDBPath;
  char *piReportFile;
  struct db2TablespaceStruct *piTablespaceList;
  struct db2MediaListStruct *piMediaList;
  char *piUsername;
  char *piPassword;
  char *piNewLogPath;
  void *piVendorOptions;
  db2Uint32 iVendorOptionsSize;
  db2Uint32 iParallelism;
  db2Uint32 iBufferSize;
  db2Uint32 iNumBuffers;
  db2Uint32 iCallerAction;
  db2Uint32 iOptions;
  char *piComprLibrary;
  void *piComprOptions;
  db2Uint32 iComprOptionsSize;
  char *piLogTarget;
  struct db2StoragePathsStruct *piStoragePaths;
  char *piRedirectScript;
} db2RestoreStruct;

typedef SQL_STRUCTURE db2TablespaceStruct
{
```

```
  char                         **tablespaces;
  db2Uint32 numTablespaces;
} db2TablespaceStruct;

typedef SQL_STRUCTURE db2MediaListStruct
{
  char                         **locations;
  db2Uint32 numLocations;
  char locationType;
} db2MediaListStruct;

typedef SQL_STRUCTURE db2StoragePathsStruct
{
  char                         **storagePaths;
  db2Uint32 numStoragePaths;
} db2StoragePathsStruct;

SQL_API_RC SQL_API_FN
  db2gRestore (
       db2Uint32 versionNumber,
       void * pDB2gRestoreStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gRestoreStruct
{
  char *piSourceDBAlias;
  db2Uint32 iSourceDBAliasLen;
  char *piTargetDBAlias;
  db2Uint32 iTargetDBAliasLen;
  char *poApplicationId;
  db2Uint32 iApplicationIdLen;
  char *piTimestamp;
  db2Uint32 iTimestampLen;
  char *piTargetDBPath;
  db2Uint32 iTargetDBPathLen;
  char *piReportFile;
  db2Uint32 iReportFileLen;
  struct db2gTablespaceStruct *piTablespaceList;
  struct db2gMediaListStruct *piMediaList;
  char *piUsername;
  db2Uint32 iUsernameLen;
  char *piPassword;
  db2Uint32 iPasswordLen;
  char *piNewLogPath;
  db2Uint32 iNewLogPathLen;
  void *piVendorOptions;
  db2Uint32 iVendorOptionsSize;
  db2Uint32 iParallelism;
  db2Uint32 iBufferSize;
  db2Uint32 iNumBuffers;
  db2Uint32 iCallerAction;
  db2Uint32 iOptions;
  char *piComprLibrary;
  db2Uint32 iComprLibraryLen;
  void *piComprOptions;
  db2Uint32 iComprOptionsSize;
  char *piLogTarget;
  db2Uint32 iLogTargetLen;
  struct db2gStoragePathsStruct *piStoragePaths;
  char *piRedirectScript;
  db2Uint32 iRedirectScriptLen;
} db2gRestoreStruct;

typedef SQL_STRUCTURE db2gTablespaceStruct
{
  struct db2Char *tablespaces;
  db2Uint32 numTablespaces;
```

```
} db2gTablespaceStruct;

typedef SQL_STRUCTURE db2gMediaListStruct
{
  struct db2Char *locations;
  db2Uint32 numLocations;
  char locationType;
} db2gMediaListStruct;

typedef SQL_STRUCTURE db2gStoragePathsStruct
{
  struct db2Char *storagePaths;
  db2Uint32 numStoragePaths;
} db2gStoragePathsStruct;

typedef SQL_STRUCTURE db2Char
{
   char *pioData;
   db2Uint32 iLength;
   db2Uint32 oLength;
} db2Char;
```

db2Restore API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter **pDB2RestoreStruct**.

pDB2RestoreStruct
Input. A pointer to the db2RestoreStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2RestoreStruct data structure parameters

piSourceDBAlias
Input. A string containing the database alias of the source database backup image.

piTargetDBAlias
Input. A string containing the target database alias. If this parameter is null, the value of the **piSourceDBAlias** parameter will be used.

oApplicationId
Output. The API will return a string identifying the agent servicing the application. Can be used to obtain information about the progress of the backup operation using the database monitor.

piTimestamp
Input. A string representing the time stamp of the backup image. This field is optional if there is only one backup image in the source specified.

piTargetDBPath
Input. A string containing the relative or fully qualified name of the target database directory on the server. Used if a new database is to be created for the restored backup; otherwise not used.

piReportFile
Input. The file name, if specified, must be fully qualified.

Note: This parameter is obsolete, but still defined.

piTablespaceList
Input. List of table spaces to be restored. Used when restoring a subset of table spaces from a database or table space backup image. For rebuild cases, this can be an include list or exclude list of table spaces used to rebuild your database. See the DB2TablespaceStruct structure. The following restrictions apply:

- The database must be recoverable (for non-rebuild cases only); that is, log retain or user exits must be enabled.
- The database being restored to must be the same database that was used to create the backup image. That is, table spaces can not be added to a database through the table space restore function.
- The rollforward utility will ensure that table spaces restored in a partitioned database environment are synchronized with any other database partition containing the same table spaces. If a table space restore operation is requested and the **piTablespaceList** is NULL, the restore utility will attempt to restore all of the table spaces in the backup image.
- When restoring a table space that has been renamed since it was backed up, the new table space name must be used in the restore command. If the old table space name is used, it will not be found.
- In the case of rebuild, the list must be given for 3 of the 5 rebuild types: `DB2RESTORE_ALL_TBSP_IN_DB_EXC`, `DB2RESTORE_ALL_TBSP_IN_IMG_EXC` and `DB2RESTORE_ALL_TBSP_IN_LIST`.

piMediaList
Input. Source media for the backup image.

For more information, see the db2MediaListStruct structure below.

piUsername
Input. A string containing the user name to be used when attempting a connection. Can be NULL.

piPassword
Input. A string containing the password to be used with the user name. Can be NULL.

piNewLogPath
Input. A string representing the path to be used for logging after the restore has completed. If this field is null the default log path will be used.

piVendorOptions
Input. Used to pass information from the application to the vendor functions. This data structure must be flat; that is, no level of indirection is supported. Note that byte-reversal is not done, and the code page is not checked for this data.

iVendorOptionsSize
Input. The length in bytes of the **piVendorOptions** parameter, which cannot exceed 65535 bytes.

iParallelism
Input. Degree of parallelism (number of buffer manipulators). Minimum is 1. Maximum is 1024.

iBufferSize
Input. Backup buffer size in 4 KB allocation units (pages). Minimum is 8 units. The size entered for a restore must be equal to or an integer multiple of the buffer size used to produce the backup image.

iNumBuffers
Input. Specifies number of restore buffers to be used.

iCallerAction
Input. Specifies action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

- DB2RESTORE_RESTORE - Start the restore operation.
- DB2RESTORE_NOINTERRUPT - Start the restore. Specifies that the restore will run unattended, and that scenarios which normally require user intervention will either be attempted without first returning to the caller, or will generate an error. Use this caller action, for example, if it is known that all of the media required for the restore have been mounted, and utility prompts are not desired.
- DB2RESTORE_CONTINUE - Continue the restore after the user has performed some action requested by the utility (mount a new tape, for example).
- DB2RESTORE_TERMINATE - Terminate the restore after the user has failed to perform some action requested by the utility.
- DB2RESTORE_DEVICE_TERMINATE - Remove a particular device from the list of devices used by restore. When a particular device has exhausted its input, restore will return a warning to the caller. Call restore again with this caller action to remove the device which generated the warning from the list of devices being used.
- DB2RESTORE_PARM_CHK - Used to validate parameters without performing a restore. This option does not terminate the database connection after the call returns. After a successful return of this call, it is expected that the user will issue another call to this API with the **iCallerAction** parameter set to the value DB2RESTORE_CONTINUE to continue with the restore.
- DB2RESTORE_PARM_CHK_ONLY - Used to validate parameters without performing a restore. Before this call returns, the database connection established by this call is terminated, and no subsequent call is required.
- DB2RESTORE_TERMINATE_INCRE - Terminate an incremental restore operation before completion.
- DB2RESTORE_RESTORE_STORDEF - Initial call. Table space container redefinition requested.
- DB2RESTORE_STORDEF_NOINTERRUPT - Initial call. The restore will run uninterrupted. Table space container redefinition requested.

iOptions
Input. A bitmap of restore properties. The options are to be combined using the bitwise OR operator to produce a value for **iOptions**. Valid values (defined in db2ApiDf header file, located in the include directory) are:

- DB2RESTORE_OFFLINE - Perform an offline restore operation.
- DB2RESTORE_ONLINE - Perform an online restore operation.
- DB2RESTORE_DB - Restore all table spaces in the database. This must be run offline.
- DB2RESTORE_TABLESPACE - Restore only the table spaces listed in the **piTablespaceList** parameter from the backup image. This can be online or offline.
- DB2RESTORE_HISTORY - Restore only the history file.

- DB2RESTORE_COMPR_LIB - Indicates that the compression library is to be restored. This option cannot be used simultaneously with any other type of restore process. If the object exists in the backup image, it will be restored into the database directory. If the object does not exist in the backup image, the restore operation will fail.
- DB2RESTORE_LOGS - Specifies that only the set of log files contained in the backup image are to be restored. If the backup image does not include log files, the restore operation will fail. If this option is specified, the **piLogTarget** parameter must also be specified.
- DB2RESTORE_INCREMENTAL - Perform a manual cumulative restore operation.
- DB2RESTORE_AUTOMATIC - Perform an automatic cumulative (incremental) restore operation. Must be specified with DB2RESTORE_INCREMENTAL.
- DB2RESTORE_ROLLFWD - Place the database in rollforward pending state after it has been successfully restored.
- DB2RESTORE_NOROLLFWD - Do not place the database in rollforward pending state after it has been successfully restored. This cannot be specified for backups taken online or for table space level restores. If, following a successful restore, the database is in roll-forward pending state, the db2Rollforward API must be called before the database can be used.
- DB2RESTORE_GENERATE_SCRIPT - Create a script, that can be used to perform a redirected restore. **piRedirectScript** must contain a valid file name. The **iCallerAction** need to be either DB2RESTORE_RESTORE_STORDEF or DB2RESTORE_STORDEF_NOINTERRUPT.

The following values should be used for rebuild operations only:

- DB2RESTORE_ALL_TBSP_IN_DB - Restores the database with all the table spaces known to the database at the time of the image being restored. This rebuild overwrites a database if it already exists.
- DB2RESTORE_ALL_TBSP_IN_DB_EXC - Restores the database with all the table spaces known to the database at the time of the image being restored except for those specified in the list pointed to by the **piTablespaceList** parameter. This rebuild overwrites a database if it already exists.
- DB2RESTORE_ALL_TBSP_IN_IMG - Restores the database with only the table spaces in the image being restored. This rebuild overwrites a database if it already exists.
- DB2RESTORE_ALL_TBSP_IN_IMG_EXC - Restores the database with only the table spaces in the image being restored except for those specified in the list pointed to by the **piTablespaceList** parameter. This rebuild overwrites a database if it already exists.
- DB2RESTORE_ALL_TBSP_IN_LIST - Restores the database with only the table spaces specified in the list pointed to by the **piTablespaceList** parameter. This rebuild overwrites a database if it already exists.

NOTE: If the backup image is of a recoverable database, then WITHOUT ROLLING FORWARD (DB2RESTORE_NOROLLFWD) cannot be specified with any of the above rebuild actions.

piComprLibrary

Input. Indicates the name of the external library to use to decompress the backup image if the image is compressed. The name must be a

fully-qualified path that refers to a file on the server. If the value is a null pointer or a pointer to an empty string, the DB2 database system attempts to use the library stored in the image. If the backup is not compressed, the value of this parameter will be ignored. If the specified library is not found, the restore operation will fail.

piComprOptions
Input. This API parameter describes a block of binary data that will be passed to the initialization routine in the decompression library. The DB2 database system passes this string directly from the client to the server, so any issues of byte-reversal or code-page conversion must be handled by the compression library. If the first character of the data block is '@', the remainder of the data is interpreted as the name of a file residing on the server. The DB2 database system then replaces the contents of the **piComprOptions** and **iComprOptionsSize** parameters with the contents and size of this file and passes these new values to the initialization routine.

iComprOptionsSize
Input. A four-byte unsigned integer that represents the size of the block of data passed as **piComprOptions**. The **iComprOptionsSize** parameter should be zero if and only if the **piComprOptions** value is a null pointer.

piLogTarget
Input. Specifies the absolute path of a directory on the database server that must be used as the target directory for extracting log files from a backup image. If this parameter is specified, any log files included in the backup image are extracted into the target directory. If this parameter is not specified, log files included in the backup image are not extracted. To extract only the log files from the backup image, DB2RESTORE_LOGS value should be passed to the **iOptions** parameter.

For snapshot restore, one of the following must be given:

- DB2RESTORE_LOGTARGET_INCLUDE "INCLUDE"

  Restore log directory volumes from the snapshot image. If this option is specified and the backup image contains log directories, then they will be restored. Existing log directories and log files on disk will be left intact if they do not conflict with the log directories in the backup image. If existing log directories on disk conflict with the log directories in the backup image, then an error will be returned.
- DB2RESTORE_LOGTARGET_EXCLUDE "EXCLUDE"

  Do not restore log directory volumes. If this option is specified, then log directories will not be restored from the backup image. Existing log directories and log files on disk will be left intact if they do not conflict with the log directories in the backup image. If a path belonging to the database is restored and a log directory will implicitly be restored because of this, thus causing a log directory to be overwritten, an error will be returned.
- DB2RESTORE_LOGTARGET_INCFORCE "INCLUDE FORCE"

  Allow existing log directories to be overwritten and replaced when restoring the snapshot image. If this option is specified and the backup image contains log directories, then they will be restored. Existing log directories and log files on disk will be left intact if they do not conflict with the log directories in the backup image. If existing log directories on disk conflict with the log directories in the backup image, then they will be overwritten by those from the backup image.

- DB2RESTORE_LOGTARGET_EXCFORCE ″EXCLUDE FORCE″

  Allow existing log directories to be overwritten and replaced when restoring the snapshot image. If this option is specified, then log directories will not be restored from the backup image. Existing log directories and log files on disk will be left intact if they do not conflict with the log directories in the backup image. If a path belonging to the database is restored and a log directory will implicitly be restored because of this, thus causing a log directory to be overwritten, the restore will go ahead and overwrite the conflicting log directory.

where DB2RESTORE_LOGTARGET_EXCLUDE is the default.

piStoragePaths
Input. A structure containing fields that describe a list of storage paths used for automatic storage. Set this to NULL if automatic storage is not enabled for the database.

piRedirectScript
Input. The file name for the redirect restore script that will be created on client side. The file name can be specified relative or absolute. The **iOptions** field need to have the DB2RESTORE_GENERATE_SCRIPT bit set.

db2TablespaceStruct data structure specific parameters

tablespaces
Input. A pointer to the list of table spaces to be backed up. For C, the list is null-terminated strings. In the generic case, it is a list of db2Char structures.

numTablespaces
Input. Number of entries in the **tablespaces** parameter.

db2MediaListStruct data structure parameters

locations
Input. A pointer to the list of media locations. For C, the list is null-terminated strings. In the generic case, it is a list of db2Char structures.

numLocations
Input. The number of entries in the locations parameter.

locationType
Input. A character indicating the media type. Valid values (defined in sqlutil header file, located in the include directory) are:

SQLU_LOCAL_MEDIA: 'L'
Local devices (tapes, disks, diskettes, or named pipes).

SQLU_XBSA_MEDIA: 'X'
XBSA interface.

SQLU_TSM_MEDIA: 'A'
Tivoli Storage Manager.

SQLU_OTHER_MEDIA: 'O'
Vendor library.

SQLU_SNAPSHOT_MEDIA: 'F'
Specifies that the data is to be restored from a snapshot backup.

You cannot use SQLU_SNAPSHOT_MEDIA with any of the following:

- caller actions: DB2RESTORE_RESTORE_STORDEF, DB2RESTORE_STORDEF_NOINTERRUPT, DB2RESTORE_TERMINATE_INCRE
- DB2RESTORE_REPLACE_HISTORY
- DB2RESTORE_TABLESPACE
- DB2RESTORE_COMPR_LIB
- DB2RESTORE_INCREMENTAL
- DB2RESTORE_HISTORY
- DB2RESTORE_LOGS
- **piStoragePaths** - it must be NULL or empty in order to use it
- **piTargetDBPath**
- **piTargetDBAlias**
- **piNewLogPath**
- **iNumBuffers**
- **iBufferSize**
- **piRedirectScript**
- **iRedirectScriptLen**
- **iParallelism**
- **piComprLibrary**, **iComprLibraryLen**, **piComprOptions,** or **iComprOptionsSize**
- **numLocations** field of this structure must be 1 for snapshot restore

Also, you cannot use the SNAPSHOT parameter with any restore operation that involves a table space list.

The default behavior when restoring data from a snapshot backup image will be a FULL DATABASE OFFLINE restore of all paths that make up the database including all containers, local volume directory, database path (**DBPATH**), primary log and mirror log paths of the most recent snapshot backup if no timestamp is provided (INCLUDE LOGS is the default for all snapshot backups unless EXCLUDE LOGS is explicitly stated). If a timestamp is provided then that snapshot backup image will be restored.

Integrated into IBM Data Server is a DB2 ACS API driver for the following storage hardware:

- IBM TotalStorage SAN Volume Controller
- IBM Enterprise Storage Server Model 800
- IBM System Storage DS6000
- IBM System Storage DS8000
- IBM System Storage N Series
- NetApp V-series
- NetApp FAS

db2StoragePathsStruct data structure parameters

storagePaths

Input. An array of strings containing fully qualified names of storage paths on the server that will be used for automatic storage table spaces. In a multi-partition database the same storage paths are used on all database

partitions. If a multi-partition database is being restored with new storage paths, then the catalog partition must be restored before any other database partitions are restored.

numStoragePaths
Input. The number of storage paths in the **storagePaths** parameter of the db2StoragePathsStruct structure.

db2gRestoreStruct data structure specific parameters

iSourceDBAliasLen
Input. Specifies the length in bytes of the **piSourceDBAlias** parameter.

iTargetDBAliasLen
Input. Specifies the length in bytes of the **piTargetDBAlias** parameter.

iApplicationIdLen
Input. Specifies the length in bytes of the **poApplicationId** parameter. Should be equal to SQLU_APPLID_LEN + 1. The constant SQLU_APPLID_LEN is defined in sqlutil header file that is located in the include directory.

iTimestampLen
Input. Specifies the length in bytes of the **piTimestamp** parameter.

iTargetDBPathLen
Input. Specifies the length in bytes of the **piTargetDBPath** parameter.

iReportFileLen
Input. Specifies the length in bytes of the **piReportFile** parameter.

iUsernameLen
Input. Specifies the length in bytes of the **piUsername** parameter. Set to zero if no user name is provided.

iPasswordLen
Input. Specifies the length in bytes of the **piPassword** parameter. Set to zero if no password is provided.

iNewLogPathLen
Input. Specifies the length in bytes of the **piNewLogPath** parameter.

iLogTargetLen
Input. Specifies the length in bytes of the **piLogTarget** parameter.

iRedirectScriptLen
Input. A four-byte unsigned integer representing the length in bytes of the name of the library specified in **piRedirectScript**. Set to zero if no script name is given.

db2Char data structure parameters

pioData
A pointer to a character data buffer. If NULL, no data will be returned.

iLength
Input. The size of the **pioData** buffer.

oLength
Output. The number of valid characters of data in the **pioData** buffer.

Usage notes

- For offline restore, this utility connects to the database in exclusive mode. The utility fails if any application, including the calling application, is already connected to the database that is being restored. In addition, the request will fail if the restore utility is being used to perform the restore, and any application, including the calling application, is already connected to any database on the same workstation. If the connect is successful, the API locks out other applications until the restore is completed.
- The current database configuration file will not be replaced by the backup copy unless it is unusable. In this case, if the file is replaced, a warning message is returned.
- The database or table space must have been backed up using the db2Backup API.
- If the caller action value is DB2RESTORE_NOINTERRUPT, the restore continues without prompting the application. If the caller action value is DB2RESTORE_RESTORE, and the utility is restoring to an existing database, the utility returns control to the application with a message requesting some user interaction. After handling the user interaction, the application calls RESTORE DATABASE again, with the caller action value set to indicate whether processing is to continue (DB2RESTORE_CONTINUE) or terminate (DB2RESTORE_TERMINATE) on the subsequent call. The utility finishes processing, and returns an SQLCODE in the **sqlca**.
- To close a device when finished, set the caller action value to DB2RESTORE_DEVICE_TERMINATE. If, for example, a user is restoring from 3 tape volumes using 2 tape devices, and one of the tapes has been restored, the application obtains control from the API with an SQLCODE indicating end of tape. The application can prompt the user to mount another tape, and if the user indicates ″no more″, return to the API with caller action value SQLUD_DEVICE_TERMINATE to signal end of the media device. The device driver will be terminated, but the rest of the devices involved in the restore will continue to have their input processed until all segments of the restore set have been restored (the number of segments in the restore set is placed on the last media device during the backup process). This caller action can be used with devices other than tape (vendor supported devices).
- To perform a parameter check before returning to the application, set caller action value to DB2RESTORE_PARM_CHK.
- Set caller action value to DB2RESTORE_RESTORE_STORDEF when performing a redirected restore; used in conjunction with the sqlbstsc API.
- If a system failure occurs during a critical stage of restoring a database, the user will not be able to successfully connect to the database until a successful restore is performed. This condition will be detected when the connection is attempted, and an error message is returned. If the backed-up database is not configured for roll-forward recovery, and there is a usable current configuration file with either of these parameters enabled, following the restore, the user will be required to either take a new backup of the database, or disable the log retain and user exit parameters before connecting to the database.
- Although the restored database will not be dropped (unless restoring to a nonexistent database), if the restore fails, it will not be usable.
- If the restore type specifies that the history file in the backup is to be restored, it will be restored over the existing history file for the database, effectively erasing any changes made to the history file after the backup that is being restored. If this is undesirable, restore the history file to a new or test database so that its contents can be viewed without destroying any updates that have taken place.

- If, at the time of the backup operation, the database was enabled for roll forward recovery, the database can be brought to the state it was in prior to the occurrence of the damage or corruption by issuing db2Rollforward after successful execution of db2Restore. If the database is recoverable, it will default to roll forward pending state after the completion of the restore.
- If the database backup image is taken offline, and the caller does not want to roll forward the database after the restore, the DB2RESTORE_NOROLLFWD option can be used for the restore. This results in the database being usable immediately after the restore. If the backup image is taken online, the caller must roll forward through the corresponding log records at the completion of the restore.
- To restore log files from a backup image that contains them, the **LOGTARGET** option must be specified, assuming a fully qualified and valid path exists on the DB2 server. If those conditions are satisfied, the restore utility writes the log files from the image to the target path. If **LOGTARGET** is specified during a restoration of a backup image that does not include logs, the restore operation returns an error before attempting to restore any table space data. A restore operation also fails with an error if an invalid or read-only **LOGTARGET** path is specified.
- If any log files exist in the **LOGTARGET** path at the time the RESTORE command is issued, a warning prompt is returned to user. This warning is not returned if **WITHOUT PROMPTING** is specified.
- During a restore operation in which a **LOGTARGET** is specified, if any log file cannot be extracted, the restore operation fails and returns an error. If any of the log files being extracted from the backup image have the same name as an existing file in the **LOGTARGET** path, the restore operation fails and an error is returned. The restore utility does not overwrite existing log files in the **LOGTARGET** directory.
- You can restore only the saved log set from a backup image. To indicate that only the log files are to be restored, specify the **LOGS** option in addition to the **LOGTARGET** path. Specifying the **LOGS** option without a **LOGTARGET** path results in an error. If any problem occurs while restoring log files in this mode the restore operation terminates immediately and an error is returned.
- During an automatic incremental restore operation, only the logs included in the target image of the restore operation are retrieved from the backup image. Any logs that are included in intermediate images that are referenced during the incremental restore process are not extracted from those intermediate backup images. During a manual incremental restore operation, the **LOGTARGET** path should be specified only with the final RESTORE command.
- If a backup is compressed, the DB2 database system detects this state and automatically decompresses the data before restoring it. If a library is specified on the db2Restore API, it is used for decompressing the data. If a library is not specified on the db2Restore API, the library stored in the backup image is used. And if there is no library stored in the backup image, the data cannot be decompressed and the restore operation fails.
- If the compression library is being restored from a backup image (either explicitly by specifying the DB2RESTORE_COMPR_LIB restore type or implicitly by performing a normal restoration of a compressed backup), the restore operation must be done on the same platform that the backup was taken on. If the platforms are different, the restore operation will fail, even when the DB2 database system normally supports cross-platform restore operations involving the two systems.
- If restoring a database that is enabled for automatic storage, the storage paths associated with the database can be redefined or they can remain as they were

previously. To keep the storage path definitions as is, do not provide any storage paths as part of the restore operation. Otherwise, specify a new set of storage paths to associate with the database. Automatic storage table spaces will be automatically redirected to the new storage paths during the restore operation.

Snapshot restore

Like a traditional (non-snapshot) restore, the default behavior when restoring a snapshot backup image will be to NOT restore the log directories — DB2RESTORE_LOGTARGET_EXCLUDE.

If the DB2 manager detects that any log directory's group ID is shared among any of the other paths to be restored, then an error is returned. In this case, DB2RESTORE_LOGTARGET_INCLUDE or DB2RESTORE_LOGTARGET_INCFORCE must be specified, as the log directories must be part of the restore.

The DB2 manager will make all efforts to save existing log directories (primary, mirror and overflow) before the restore of the paths from the backup image takes place.

If you wish the log directories to be restored and the DB2 manager detects that the preexisting log directories on disk conflict with the log directories in the backup image, then the DB2 manager will report an error. In such a case, if you have specified DB2RESTORE_LOGTARGET_INCFORCE, then this error will be suppressed and the log directories from the image will be restored, deleting whatever existed beforehand.

There is a special case in which the DB2RESTORE_LOGTARGET_EXCLUDE option is specified and a log directory path resides under the database directory (for example, /NODExxxx/SQLxxxxx/SQLOGDIR/). In this case, a restore would still overwrite the log directory as the database path, and all of the contents beneath it, would be restored. If the DB2 manager detects this scenario and log files exist in this log directory, then an error will be reported. If you specify DB2RESTORE_LOGTARGET_EXCLUDE, then this error will be suppressed and those log directories from the backup image will overwrite the conflicting log directories on disk.

db2Rollforward - Roll forward a database

Recovers a database by applying transactions recorded in the database log files. Called after a database or a table space backup has been restored, or if any table spaces have been taken offline by the database due to a media error. The database must be recoverable (that is, either the **logarchmeth1** database configuration parameter or the **logarchmeth2** database configuration parameter must be set to a value other than OFF) before the database can be recovered with rollforward recovery.

Scope

In a partitioned database environment, you must call this API from the catalog partition. The partitions that are rolled forward depend on what you specify in the TO clause:

- A point-in-time rollforward call affects all database partition servers that are listed in the `db2nodes.cfg` file.

- An END OF LOGS rollforward call affects the database partition servers that are specified in the ON DATABASE PARTITION clause. If no database partition servers are specified, the rollforward call affects all database partition servers that are listed in the db2nodes.cfg file.
- A database or table space rollforward call specifying end of backup affects all database partitions servers that are listed in the db2nodes.cfg file.

If all of the transactions on a particular database partition server have already been applied to the current database, and therefore none of those transactions need to be rolled forward, that database partition server is ignored.

When you roll forward a partitioned table to a certain point in time, you must also roll forward the table spaces that contain that table to the same point in time. However, when you roll forward a table space, you do not have to roll forward all the tables in that table space.

Authorization

One of the following:

- *sysadm*
- *sysctrl*
- *sysmaint*

Required connection

None. This API establishes a database connection.

API include file

db2ApiDf.h

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Rollforward (
       db2Uint32 versionNumber,
       void * pDB2RollforwardStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2RollforwardStruct
{
  struct db2RfwdInputStruct *piRfwdInput;
  struct db2RfwdOutputStruct *poRfwdOutput;
} db2RollforwardStruct;

typedef SQL_STRUCTURE db2RfwdInputStruct
{
  sqluint32 iVersion;
  char *piDbAlias;
  db2Uint32 iCallerAction;
  char *piStopTime;
  char *piUserName;
  char *piPassword;
  char *piOverflowLogPath;
  db2Uint32 iNumChngLgOvrflw;
  struct sqlurf_newlogpath *piChngLogOvrflw;
  db2Uint32 iConnectMode;
  struct sqlu_tablespace_bkrst_list *piTablespaceList;
  db2int32 iAllNodeFlag;
  db2int32 iNumNodes;
  SQL_PDB_NODE_TYPE *piNodeList;
```

```
  db2int32 iNumNodeInfo;
  char *piDroppedTblID;
  char *piExportDir;
  db2Uint32 iRollforwardFlags;
} db2RfwdInputStruct;

typedef SQL_STRUCTURE db2RfwdOutputStruct
{
  char *poApplicationId;
  sqlint32 *poNumReplies;
  struct sqlurf_info *poNodeInfo;
  db2Uint32 oRollforwardFlags;
} db2RfwdOutputStruct;

SQL_STRUCTURE sqlurf_newlogpath
{
   SQL_PDB_NODE_TYPE nodenum;
   unsigned short  pathlen;
   char logpath[SQL_LOGPATH_SZ+SQL_LOGFILE_NAME_SZ+1];
};

typedef SQL_STRUCTURE sqlu_tablespace_bkrst_list
{
   sqlint32 num_entry;
   struct sqlu_tablespace_entry *tablespace;
} sqlu_tablespace_bkrst_list;

typedef SQL_STRUCTURE sqlu_tablespace_entry
{
   sqluint32 reserve_len;
   char tablespace_entry[SQLU_MAX_TBS_NAME_LEN+1];
   char filler[1];
} sqlu_tablespace_entry;

SQL_STRUCTURE sqlurf_info
{
   SQL_PDB_NODE_TYPE nodenum;
   sqlint32 state;
   unsigned char   nextarclog[SQLUM_ARCHIVE_FILE_LEN+1];
   unsigned char   firstarcdel[SQLUM_ARCHIVE_FILE_LEN+1];
   unsigned char   lastarcdel[SQLUM_ARCHIVE_FILE_LEN+1];
   unsigned char   lastcommit[SQLUM_TIMESTAMP_LEN+1];
};

SQL_API_RC SQL_API_FN
  db2gRollforward (
       db2Uint32 versionNumber,
       void * pDB2gRollforwardStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gRollforwardStruct
{
  struct db2gRfwdInputStruct *piRfwdInput;
  struct db2RfwdOutputStruct *poRfwdOutput;
} db2gRollforwardStruct;

typedef SQL_STRUCTURE db2gRfwdInputStruct
{
  db2Uint32 iDbAliasLen;
  db2Uint32 iStopTimeLen;
  db2Uint32 iUserNameLen;
  db2Uint32 iPasswordLen;
  db2Uint32 iOvrflwLogPathLen;
  db2Uint32 iDroppedTblIDLen;
  db2Uint32 iExportDirLen;
  sqluint32 iVersion;
  char *piDbAlias;
```

```
  db2Uint32 iCallerAction;
  char *piStopTime;
  char *piUserName;
  char *piPassword;
  char *piOverflowLogPath;
  db2Uint32 iNumChngLgOvrflw;
  struct sqlurf_newlogpath *piChngLogOvrflw;
  db2Uint32 iConnectMode;
  struct sqlu_tablespace_bkrst_list *piTablespaceList;
  db2int32 iAllNodeFlag;
  db2int32 iNumNodes;
  SQL_PDB_NODE_TYPE *piNodeList;
  db2int32 iNumNodeInfo;
  char *piDroppedTblID;
  char *piExportDir;
  db2Uint32 iRollforwardFlags;
} db2gRfwdInputStruct;
```

db2Rollforward API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter.

pDB2RollforwardStruct
Input. A pointer to the db2RollforwardStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2RollforwardStruct data structure parameters

piRfwdInput
Input. A pointer to the db2RfwdInputStruct structure.

poRfwdOutput
Output. A pointer to the db2RfwdOutputStruct structure.

db2RfwdInputStruct data structure parameters

iVersion
Input. The version ID of the rollforward parameters. It is defined as SQLUM_RFWD_VERSION.

piDbAlias
Input. A string containing the database alias. This is the alias that is cataloged in the system database directory.

iCallerAction
Input. Specifies action to be taken. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2ROLLFORWARD_ROLLFWD
Rollforward to the point in time specified by the piStopTime parameter. For database rollforward, the database is left in rollforward-pending state. For table space rollforward to a point in time, the table spaces are left in rollforward-in-progress state.

DB2ROLLFORWARD_STOP
End roll-forward recovery by rolling forward the database using available log files and then rolling it back. Uncommitted transactions are backed out and the rollforward-pending state of the database or table spaces is turned off. A synonym for this value is DB2ROLLFORWARD_RFWD_COMPLETE.

DB2ROLLFORWARD_RFWD_STOP
Rollforward to the point in time specified by piStopTime, and end roll-forward recovery. The rollforward-pending state of the database or table spaces is turned off. A synonym for this value is DB2ROLLFORWARD_RFWD_COMPLETE.

DB2ROLLFORWARD_QUERY
Query values for nextarclog, firstarcdel, lastarcdel, and lastcommit. Return database status and a node number.

DB2ROLLFORWARD_PARM_CHECK
Validate parameters without performing the roll forward.

DB2ROLLFORWARD_CANCEL
Cancel the rollforward operation that is currently running. The database or table space are put in recovery pending state.

Note: This option cannot be used while the rollforward is actually running. It can be used if the rollforward is paused (that is, waiting for a STOP), or if a system failure occurred during the rollforward. It should be used with caution.
Rolling databases forward may require a load recovery using tape devices. The rollforward API will return with a warning message if user intervention on a device is required. The API can be called again with one of the following three caller actions:

DB2ROLLFORWARD_LOADREC_CONT
Continue using the device that generated the warning message (for example, when a new tape has been mounted).

DB2ROLLFORWARD_DEVICE_TERM
Stop using the device that generated the warning message (for example, when there are no more tapes).

DB2ROLLFORWARD_LOAD_REC_TERM
Terminate all devices being used by load recovery.

piStopTime
Input. A character string containing a time stamp in ISO format. Database recovery will stop when this time stamp is exceeded. Specify SQLUM_INFINITY_TIMESTAMP to roll forward as far as possible. May be NULL for DB2ROLLFORWARD_QUERY, DB2ROLLFORWARD_PARM_CHECK, and any of the load recovery (DB2ROLLFORWARD_LOADREC_xxx) caller actions.

piUserName
Input. A string containing the user name of the application. Can be NULL.

piPassword
Input. A string containing the password of the supplied user name (if any). Can be NULL.

piOverflowLogPath
Input. This parameter is used to specify an alternate log path to be used. In addition to the active log files, archived log files need to be moved (by the user) into the logpath before they can be used by this utility. This can be a problem if the database does not have sufficient space in the logpath. The overflow log path is provided for this reason. During roll-forward recovery, the required log files are searched, first in the logpath, and then in the overflow log path. The log files needed for table space roll-forward recovery can be brought into either the logpath or the overflow log path. If

the caller does not specify an overflow log path, the default value is the logpath. In a partitioned database environment, the overflow log path must be a valid, fully qualified path; the default path is the default overflow log path for each node. In a single-partition database environment, the overflow log path can be relative if the server is local.

iNumChngLgOvrflw
Input. Partitioned database environments only. The number of changed overflow log paths. These new log paths override the default overflow log path for the specified database partition server only.

piChngLogOvrflw
Input. Partitioned database environments only. A pointer to a structure containing the fully qualified names of changed overflow log paths. These new log paths override the default overflow log path for the specified database partition server only.

iConnectMode
Input. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2ROLLFORWARD_OFFLINE
Offline roll forward. This value must be specified for database roll-forward recovery.

DB2ROLLFORWARD_ONLINE
Online roll forward.

piTablespaceList
Input. A pointer to a structure containing the names of the table spaces to be rolled forward to the end-of-logs or to a specific point in time. If not specified, the table spaces needing rollforward will be selected.

For partitioned tables, point in time (PIT) roll-forward of a table space containing any piece of a partitioned table must also roll forward all of the other table spaces in which that table resides to the same point in time. Roll forward to the end of the logs for a single table space containing a piece of a partitioned table is still allowed.

If a partitioned table has any attached, detached or dropped data partitions, then PIT roll-forward must include all table spaces for these data partitions as well. To determine if a partitioned table has any attached, detached, or dropped data partitions, query the Status field of the SYSDATAPARTITIONS catalog table.

Because a partitioned table can reside in multiple table spaces, it is generally necessary to roll forward multiple table spaces. Data that is recovered via dropped table recovery is written to the export directory specified in the piExportDir parameter. It is possible to roll forward all table spaces in one command, or do repeated roll-forward operations for subsets of the table spaces involved. A warning will be written to the notify log if the db2Rollforward API did not specify the full set of the table spaces necessary to recover all the data for the table. A warning will be returned to the user with full details of all partitions not recovered on the command found in the administration notification log.

Allowing the roll forward of a subset of the table spaces makes it easier to deal with cases where there is more data to be recovered than can fit into a single export directory.

iAllNodeFlag
Input. Partitioned database environments only. Indicates whether the rollforward operation is to be applied to all database partition servers defined in db2nodes.cfg. Valid values are:

DB2_NODE_LIST
Apply to database partition servers in a list that is passed in piNodeList.

DB2_ALL_NODES
Apply to all database partition servers. This is the default value. The piNodeList parameter must be set to NULL, if this value is used.

DB2_ALL_EXCEPT
Apply to all database partition servers except those in a list that is passed in piNodeList.

DB2_CAT_NODE_ONLY
Apply to the catalog partition only. The piNodeList parameter must be set to NULL, if this value is used.

iNumNodes
Input. Specifies the number of database partition servers in the piNodeList array.

piNodeList
Input. A pointer to an array of database partition server numbers on which to perform the roll-forward recovery.

iNumNodeInfo
Input. Defines the size of the output parameter poNodeInfo, which must be large enough to hold status information from each database partition that is being rolled forward. In a single-partition database environment, this parameter should be set to 1. The value of this parameter should be the same as the number of database partition servers for which this API is being called.

piDroppedTblID
Input. A string containing the ID of the dropped table whose recovery is being attempted. For partitioned tables, the drop-table-id identifies the table as a whole, so that all data partitions of the table can be recovered in a single roll-forward command.

piExportDir
Input. The name of the directory into which the dropped table data will be exported.

iRollforwardFlags
Input. Specifies the rollforward flags. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2ROLLFORWARD_EMPTY_FLAG
No flags specified.

DB2ROLLFORWARD_LOCAL_TIME
Allows the user to rollforward to a point in time that is the user's local time rather than GMT time. This makes it easier for users to rollforward to a specific point in time on their local machines, and eliminates potential user errors due to the translation of local to GMT time.

DB2ROLLFORWARD_NO_RETRIEVE
Controls which log files to be rolled forward on the standby machine by allowing the user to disable the retrieval of archived logs. By controlling the log files to be rolled forward, one can ensure that the standby machine is X hours behind the production machine, to prevent the user affecting both systems. This option is useful if the standby system does not have access to archive, for example, if TSM is the archive, it only allows the original machine to retrieve the files. It will also remove the possibility that the standby system would retrieve an incomplete log file while the production system is archiving a file and the standby system is retrieving the same file.

DB2ROLLFORWARD_END_OF_BACKUP
Specifies that the database should be rolled forward to the *minimum recovery time*.

db2RfwdOutputStruct data structure parameters

poApplicationId
Output. The application ID.

poNumReplies
Output. The number of replies received.

poNodeInfo
Output. Database partition reply information.

oRollforwardFlags
Output. Rollforward output flags. Valid values are:

DB2ROLLFORWARD_OUT_LOCAL_TIME
Indicates to user that the last committed transaction timestamp is displayed in local time rather than UTC. Local time is based on the server's local time, not on the client's. In a partitioned database environment, local time is based on the catalog partition's local time.

sqlurf_newlogpath data structure parameters

nodenum
Input. The number of the database partition that this structure details.

pathlen
Input. The total length of the logpath field.

logpath
Input. A fully qualified path to be used for a specific node for the rollforward operation.

sqlu_tablespace_bkrst_list data structure parameters

num_entry
Input. The number of structures contained in the list pointed to by the table space parameter.

tablespace
Input. A pointer to a list of sqlu_tablespace_entry structures.

sqlu_tablespace_entry data structure parameters

reserve_len
Input. Specifies the length in bytes of the tablespace_entry parameter.

tablespace_entry
Input. The name of the table space to rollforward.

filler Filler used for proper alignment of data structure in memory.

sqlurf_info data structure parameters

nodenum
Output. The number of the database partition that this structure contains information for.

state Output. The current state of the database or table spaces that were included in the rollforward on a database partition.

nextarclog
Output. If the rollforward has completed, this field will be empty. If the rollforward has not yet completed, this will be the name of the next log file which will be processed for the rollforward.

firstarcdel
Output. The first log file replayed by the rollforward.

lastarcdel
Output. The last log file replayed by the rollforward.

lastcommit
Output. The time of the last committed transaction.

db2gRfwdInputStruct data structure specific parameters

iDbAliasLen
Input. Specifies the length in bytes of the database alias.

iStopTimeLen
Input. Specifies the length in bytes of the stop time parameter. Set to zero if no stop time is provided.

iUserNameLen
Input. Specifies the length in bytes of the user name. Set to zero if no user name is provided.

iPasswordLen
Input. Specifies the length in bytes of the password. Set to zero if no password is provided.

iOverflowLogPathLen
Input. Specifies the length in bytes of the overflow log path. Set to zero if no overflow log path is provided.

iDroppedTblIDLen
Input. Specifies the length in bytes of the dropped table ID (piDroppedTblID parameter). Set to zero if no dropped table ID is provided.

iExportDirLen
Input. Specifies the length in bytes of the dropped table export directory (piExportDir parameter). Set to zero if no dropped table export directory is provided.

Usage notes

The database manager uses the information stored in the archived and the active log files to reconstruct the transactions performed on the database since its last backup.

The action performed when this API is called depends on the rollforward_pending flag of the database prior to the call. This can be queried using db2CfgGet - Get Configuration Parameters. The rollforward_pending flag is set to DATABASE if the database is in roll-forward pending state. It is set to TABLESPACE if one or more table spaces are in SQLB_ROLLFORWARD_PENDING or SQLB_ROLLFORWARD_IN_PROGRESS state. The rollforward_pending flag is set to NO if neither the database nor any of the table spaces needs to be rolled forward.

If the database is in roll-forward pending state when this API is called, the database will be rolled forward. Table spaces are returned to normal state after a successful database roll-forward, unless an abnormal state causes one or more table spaces to go offline. If the rollforward_pending flag is set to TABLESPACE, only those table spaces that are in roll-forward pending state, or those table spaces requested by name, will be rolled forward.

Note: If table space rollforward terminates abnormally, table spaces that were being rolled forward will be put in SQLB_ROLLFORWARD_IN_PROGRESS state. In the next invocation of ROLLFORWARD DATABASE, only those table spaces in SQLB_ROLLFORWARD_IN_PROGRESS state will be processed. If the set of selected table space names does not include all table spaces that are in SQLB_ROLLFORWARD_IN_PROGRESS state, the table spaces that are not required will be put into SQLB_RESTORE_PENDING state.

If the database is not in roll-forward pending state and no point in time is specified, any table spaces that are in rollforward-in-progress state will be rolled forward to the end of logs. If no table spaces are in rollforward-in-progress state, any table spaces that are in rollforward pending state will be rolled forward to the end of logs.

This API reads the log files, beginning with the log file that is matched with the backup image. The name of this log file can be determined by calling this API with a caller action of DB2ROLLFORWARD_QUERY before rolling forward any log files.

The transactions contained in the log files are reapplied to the database. The log is processed as far forward in time as information is available, or until the time specified by the stop time parameter.

Recovery stops when any one of the following events occurs:

- No more log files are found
- A time stamp in the log file exceeds the completion time stamp specified by the stop time parameter
- An error occurs while reading the log file.

Some transactions might not be recovered. The value returned in lastcommit indicates the time stamp of the last committed transaction that was applied to the database.

If the need for database recovery was caused by application or human error, the user may want to provide a time stamp value in piStopTime, indicating that recovery should be stopped before the time of the error. This applies only to full database roll-forward recovery, and to table space rollforward to a point in time. It also permits recovery to be stopped before a log read error occurs, determined during an earlier failed attempt to recover.

When the rollforward_recovery flag is set to DATABASE, the database is not available for use until roll-forward recovery is terminated. Termination is accomplished by calling the API with a caller action of DB2ROLLFORWARD_STOP or DB2ROLLFORWARD_RFWRD_STOP to bring the database out of roll-forward pending state. If the rollforward_recovery flag is TABLESPACE, the database is available for use. However, the table spaces in SQLB_ROLLFORWARD_PENDING and SQLB_ROLLFORWARD_IN_PROGRESS states will not be available until the API is called to perform table space roll-forward recovery. If rolling forward table spaces to a point in time, the table spaces are placed in backup pending state after a successful rollforward.

When the RollforwardFlags option is set to DB2ROLLFORWARD_LOCAL_TIME, all messages returned to the user will also be in local time. All times are converted on the server, and on the catalog partition, if it is a partitioned database environment. The timestamp string is converted to GMT on the server, so the time is local to the server's time zone, not the client's. If the client is in one time zone and the server in another, the server's local time should be used. This is different from the local time option from the Control Center, which is local to the client. If the timestamp string is close to the time change of the clock due to daylight savings, it is important to know if the stop time is before or after the clock change, and specify it correctly.

db2Runstats - Update statistics for tables and indexes

Updates statistics about the characteristics of a table and/or any associated indexes or statistical views. These characteristics include, among many others, number of records, number of pages, and average record length. The optimizer uses these statistics when determining access paths to the data.

When used on tables, this utility should be called when a table has had many updates, after reorganizing a table, or after creating a new index.

Statistics are based on the portion of the table that resides on the database partition where the API executes. Global table statistics are derived by multiplying the values obtained at a database partition by the number of database partitions on which the table is completely stored. The global statistics are stored in the catalog tables. The database partition from which the API is called does not have to contain a portion of the table:

- If the API is called from a database partition that contains a portion of the table, the utility executes at this database partition.
- If the API is called from a database partition that does not contain a portion of the table, the request is sent to the first database partition in the database partition group that contains a portion of the table. The utility then executes at this database partition. When you collect statistics for a statistical view, statistics are collected for all database partitions.

When used on statistical views, this utility should be called when changes to underlying tables have substantially affected the rows returned by a view. These views must have been enabled for use in query optimization using "ALTER VIEW ... ENABLE QUERY OPTIMIZATION."

Scope

This API can be called from any database partition server in the db2nodes.cfg file. It can be used to update the catalogs on the catalog database partition.

Authorization

When used on tables, one of the following:

- sysadm
- sysctrl
- sysmaint
- CONTROL privilege on the table
- LOAD

When used on statistical views, one of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm
- CONTROL privilege on the view

In addition, the user needs to have the appropriate authority or privilege to access rows from the view. Specifically, for each table, view or nickname referenced in the view definition, the user must have one of the following authorities or privileges:

- sysadm or dbadm
- CONTROL privilege
- SELECT privilege

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2Runstats (
                db2Uint32 versionNumber,
                void * data,
                struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2RunstatsData
{
  double iSamplingOption;
  unsigned char *piTablename;
  struct db2ColumnData        **piColumnList;
  struct db2ColumnDistData    **piColumnDistributionList;
  struct db2ColumnGrpData     **piColumnGroupList;
  unsigned char               **piIndexList;
```

```
  db2Uint32 iRunstatsFlags;
  db2int16 iNumColumns;
  db2int16 iNumColdist;
  db2int16 iNumColGroups;
  db2int16 iNumIndexes;
  db2int16 iParallelismOption;
  db2int16 iTableDefaultFreqValues;
  db2int16 iTableDefaultQuantiles;
  db2Uint32 iSamplingRepeatable;
  db2Uint32 iUtilImpactPriority;
} db2RunstatsData;

typedef SQL_STRUCTURE db2ColumnData
{
  unsigned char *piColumnName;
  db2int16 iColumnFlags;
} db2ColumnData;

typedef SQL_STRUCTURE db2ColumnDistData
{
  unsigned char *piColumnName;
  db2int16 iNumFreqValues;
  db2int16 iNumQuantiles;
} db2ColumnDistData;

typedef SQL_STRUCTURE db2ColumnGrpData
{
  unsigned char               **piGroupColumnNames;
  db2int16 iGroupSize;
  db2int16 iNumFreqValues;
  db2int16 iNumQuantiles;
} db2ColumnGrpData;

SQL_API_RC SQL_API_FN
  db2gRunstats (
                db2Uint32 versionNumber,
                void * data,
                struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gRunstatsData
{
  double iSamplingOption;
  unsigned char *piTablename;
  struct db2gColumnData       **piColumnList;
  struct db2gColumnDistData   **piColumnDistributionList;
  struct db2gColumnGrpData    **piColumnGroupList;
  unsigned char               **piIndexList;
  db2Uint16 *piIndexNamesLen;
  db2Uint32 iRunstatsFlags;
  db2Uint16 iTablenameLen;
  db2int16 iNumColumns;
  db2int16 iNumColdist;
  db2int16 iNumColGroups;
  db2int16 iNumIndexes;
  db2int16 iParallelismOption;
  db2int16 iTableDefaultFreqValues;
  db2int16 iTableDefaultQuantiles;
  db2Uint32 iSamplingRepeatable;
  db2Uint32 iUtilImpactPriority;
} db2gRunstatsData;

typedef SQL_STRUCTURE db2gColumnData
{
  unsigned char *piColumnName;
  db2Uint16 iColumnNameLen;
  db2int16 iColumnFlags;
} db2gColumnData;
```

```
typedef SQL_STRUCTURE db2gColumnDistData
{
  unsigned char *piColumnName;
  db2Uint16 iColumnNameLen;
  db2int16 iNumFreqValues;
  db2int16 iNumQuantiles;
} db2gColumnDistData;

typedef SQL_STRUCTURE db2gColumnGrpData
{
  unsigned char               **piGroupColumnNames;
  db2Uint16 *piGroupColumnNamesLen;
  db2int16 iGroupSize;
  db2int16 iNumFreqValues;
  db2int16 iNumQuantiles;
} db2gColumnGrpData;
```

db2Runstats API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter data.

data Input. A pointer to the db2RunstatsData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2RunstatsData data structure parameters

iSamplingOption
Input. Indicates that statistics are to be collected on a sample of table or view data. iSamplingOption represents the size of the sample as a percentage P. This value must be a positive number that is less than or equal to 100, but may be between 1 and 0. For example, a value of 0.01 represents one one-hundredth of a percent, such that 1 row in 10 000 would be sampled, on average. A value of 0 or 100 will be treated by DB2 as if sampling was not specified, regardless of whether DB2RUNSTATS_SAMPLING_SYSTEM has been specified. A value greater than 100 or less than 0 will be treated by DB2 as an error (SQL1197N). The two possible types of sampling are BERNOULLI and SYSTEM. The sampling type specification is controlled by the indicated setting of DB2RUNSTATS_SAMPLING_SYSTEM in the iRunstatsFlags.

piTablename
Input. A pointer to the fully qualified name of the table or statistical view on which statistics are to be gathered. The name can be an alias. For row types, piTablename must be the name of the hierarchy's root table.

piColumnList
Input. An array of db2ColumnData elements. Each element of this array is made up of two sub-elements:

- a string that represents the name of the column on which to collect statistics
- a flags field indicating statistic options for the column

If iNumColumns is zero then piColumnList is ignored if provided.

piColumnDistributionList
Input. An array of db2ColumnDistData elements. These elements are

provided when collecting distribution statistics on a particular column or columns is desired. Each element of this array is made up of three sub-elements:

- a string that represents the name of the column on which to collect distribution statistics
- the number of frequent values to collect.
- the number of quantiles to collect

Any columns which appear in the piColumnDistributionList that do NOT appear in the piColumnList, will have basic column statistics collected on them. This would be the same effect as having included these columns in the piColumnList in the first place. If iNumColdist is zero then piColumnDistributionList is ignored.

piColumnGroupList

Input. An array of db2ColumnGrpData elements. These elements are provided when collecting column statistics on a group of columns. That is, the values in each column of the group for each row will be concatenated together and treated as a single value. Each db2ColumnGrpData is made up of 3 integer fields and an array of strings. The first integer field represents the number of strings in the array of strings piGroupColumns. Each string in this array contains one column name. For example, if column combinations statistics are to be collected on column groups (c1,c2) and on (c3,c4,c5) then there are 2 db2ColumnGrpData elements in piGroupColumns.

The first db2ColumnGrpData element is as follows: piGroupSize = 2 and the array of strings contains 2 elements, namely, c1 and c2.

The second db2ColumnGrpData element is as follows: piGroupSize = 3 and the array of strings contains 3 elements, namely, c3, c4 and c5.

The second and the third integer fields represent the number of frequent values and the number of quantiles respectively when collecting distribution statistics on column groups. This is not currently supported.

Any columns which appear in the piColumnGroupList that do NOT appear in the piColumnList, will have basic column statistics collected on them. This would be the same effect as having included these columns in the piColumnList in the first place. If iNumColGroups is zero then piColumnGroupList is ignored.

piIndexList

Input. An array of strings. Each string contains one fully qualified index name. If NumIndexes is zero then piIndexList is ignored.

iRunstatsFlags

Input. A bit mask field used to specify statistics options. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2RUNSTATS_ALL_COLUMNS

Collect statistics on all columns of the table or statistical view. This option can be specified in combination with column, column distribution, column group or index structure lists. This is useful if you would like to collect statistics on all columns of the table or view but would like to provide statistics options for specific columns.

DB2RUNSTATS_KEY_COLUMNS

Collect statistics only on the columns that make up all the indexes

defined on the table. This option cannot be used for statistical views. On tables, it can be specified in combination with column, column distribution, column group or index structure lists. This is useful if you would like to collect statistics on all key columns of the table but would also like to gather statistics for some non-key columns or would like to provide statistics options for specific key columns. XML type columns are, by definition, not key columns and will not be included for statistics collection when the iRunstatsFlags parameter is set to the value DB2RUNSTATS_KEY_COLUMNS.

DB2RUNSTATS_DISTRIBUTION
Collect distribution statistics. This option can only be used with DB2RUNSTATS_ALL_COLUMNS and DB2RUNSTATS_KEY_COLUMNS. When used with DB2RUNSTATS_ALL_COLUMNS, distribution statistics are gathered for all columns of the table or statistical view. When used with DB2RUNSTATS_KEY_COLUMNS, distribution statistics are gathered for all columns that make up all the indexes defined on the table. When used with both DB2RUNSTATS_ALL_COLUMNS and DB2RUNSTATS_KEY_COLUMNS, basic statistics are gathered for all columns of the table and distribution statistics are gathered for only columns that make up all the indexes defined on the table.

DB2RUNSTATS_ALL_INDEXES
Collect statistics on all indexes defined on the table. This option cannot be used for statistical views.

DB2RUNSTATS_EXT_INDEX
Collect detailed index statistics. The option must be specified with either DB2RUNSTATS_ALL_INDEXES or an explicit list of index names (piIndexList and iNumIndexes > 0). This option cannot be used for statistical views.

DB2RUNSTATS_EXT_INDEX_SAMPLED
Collect detailed index statistics using sampling methods. The option must be specified with either DB2RUNSTATS_ALL_INDEXES or an explicit list of index names (piIndexList and iNumIndexes > 0). DB2RUNSTATS_EXT_INDEX will be ignored if specified at the same time. This option cannot be used for statistical views.

DB2RUNSTATS_ALLOW_READ
Allows others to have read-only access while the statistics are being gathered. The default is to allow read and write access.

DB2RUNSTATS_SAMPLING_SYSTEM
Collect statistics on a percentage of the data pages as specified by the user via the iSamplingOption parameter. SYSTEM sampling considers each page individually, including that page with probability P/100 (where P is the value of iSamplingOption) and excluding it with probability 1-P/100. Thus, if iSamplingOption is the value 10, representing a 10 percent sample, each page would be included with probability 0.1 and be excluded with probability 0.9.

SYSTEM sampling cannot be specified on statistical views. Only BERNOULLI sampling can be used to sample view data.

If DB2RUNSTATS_SAMPLING_SYSTEM is not specified, DB2 will assume that BERNOULLI sampling is to be used as the sampling

method. BERNOULLI sampling considers each row individually, including that row with probability P/100 (where P is the value of iSamplingOption) and excluding it with probability 1-P/100.

In both SYSTEM and BERNOULLI sampling, unless the DB2RUNSTATS_SAMPLING_REPEAT flag is specified, each execution of statistics collection will usually yield a different sample of the table or statistical view.

DB2RUNSTATS_SAMPLING_REPEAT
Specifies that a seed has been passed through the iSamplingRepeatable parameter. The iSamplingRepeatable value will be used as the seed to generate the data sample. The iSamplingOption parameter must also be specified to indicate the sampling rate.

DB2RUNSTATS_USE_PROFILE
Collect statistics for a table or statistical view by using a statistics profile already registered in the catalogs of the table or view. If the USE PROFILE option is specified by this flag set in iRunstatsFlags bit mask, all other options in db2RunstatsData will be ignored.

DB2RUNSTATS_SET_PROFILE
Generate and store a profile in the catalogs recording the statistics options specified and collect statistics using those same options.

DB2RUNSTATS_SET_PROFILE_ONLY
Generate and store a profile in the catalogs recording the statistics options specified without actually collecting statistics for the table or view.

DB2RUNSTATS_UNSET_PROFILE
Unsetting a statistics profile will remove the statistics profile from the system catalogs by setting the SYSCAT.STATISTICS_PROFILE to NULL. If a statistics profile does not exist, attempting to unset it will result in an error (SQLCODE -2315).

DB2RUNSTATS_UPDATE_PROFILE
Modify an existing statistics profile in the catalogs and collect statistics using the options from the updated profile.

DB2RUNSTATS_UPDA_PROFILE_ONLY
Modify an existing statistics profile in the catalogs without actually collecting statistics for the table or view.

DB2RUNSTATS_EXCLUDING_XML
Do not collect statistics on XML type columns. Statistics will still be collected on all specified columns that have non-XML type. This option takes precedence over all other methods that specify XML columns.

iNumColumns
Input. The number of items specified in the piColumnList list.

iNumColdist
Input. The number of items specified in the piColumnDistributionList list.

iNumColGroups
Input. The number of items specified in the piColumnGroupList list.

iNumIndexes
Input. The number of items specified in the piIndexList list.

iParallelismOption
Input. Reserved for future use. Valid value is 0.

iTableDefaultFreqValues
Input. Specifies the default number of frequent values to collect for the table or view. Valid values are:

n n frequent values will be collected unless otherwise specified at the column level.

0 No frequent values will be collected unless otherwise specified at the column level.

-1 Use the default database configuration parameter NUM_FREQVALUES for the number of frequent values to collect.

iTableDefaultQuantiles
Input. Specifies the default number of quantiles to collect for the table or view. Valid values are:

n n quantiles will be collected unless otherwise specified at the column level.

0 No quantiles will be collected unless otherwise specified at the column level.

-1 Use the default database configuration parameter NUM_QUANTILES for the number of quantiles to collect.

iSamplingRepeatable
Input. A non-negative integer representing the seed to be used in table or view sampling. Passing a negative seed will result in an error (SQL1197N).

The DB2RUNSTATS_SAMPLING_REPEAT flag must be set to use this seed. This option is used in conjunction with the iSamplingOption parameter to generate the same sample of data in subsequent statistics collection. The sample set may still vary between repeatable requests if activity against the table or view resulted in changes to the table or view data since the last time a repeatable request was run. Also, the method by which the sample was obtained (BERNOULLI or SYSTEM) must also be the same to ensure consistent results.

iUtilImpactPriority
Input. Priority for the runstats invocation. Valid values must fall in the range 0-100, with 70 representing unthrottled and 100 representing the highest possible priority. This option cannot be used for statistical views.

db2ColumnData data structure parameters

piColumnName
Input. Pointer to a string representing a column name.

iColumnFlags
Input. A bit mask field used to specify statistics options for the column. Valid values are:

DB2RUNSTATS_COLUMN_LIKE_STATS
Collect LIKE statistics on the column.

db2ColumnDistData data structure parameters

piColumnName
Input. Pointer to a string representing a column name.

iNumFreqValues
Input. The number of frequent values to collect on the column. Valid values are:

n Collect n frequent values on the column.

-1 Use the table default number of frequent values, such as iTableDefaultFreqValues if set, or the database configuration parameter NUM_FREQVALUES.

iNumQuantiles
Input. The number of quantiles to collect on the column. Valid values are:

n Collect n quantiles on the column.

-1 Use the table default number of quantiles, iTableDefaultQuantiles if set, or the database configuration parameter NUM_QUANTILES.

db2ColumnGrpData data structure parameters

piGroupColumnNames
Input. An array of strings. Each string represents a column name that is part of the column group on which to collect statistics.

iGroupSize
Input. Number of columns in the column group. Valid values are:

n The column group is made up of n columns.

iNumFreqValues
Input. Reserved for future use.

iNumQuantiles
Input. Reserved for future use.

db2gRunstatsData data structure specific parameters

piIndexNamesLen
Input. An array of values representing the length in bytes of each of the index names in the index list. If NumIndexes is zero then piIndexNamesLen is ignored.

iTablenameLen
Input. A value representing the length in bytes of the table or view name.

db2gColumnData data structure specific parameters

iColumnNameLen
Input. A value representing the length in bytes of the column name.

db2gColumnDistData data structure specific parameters

iColumnNameLen
Input. A value representing the length in bytes of the column name.

db2gColumnGrpData data structure specific parameters

piGroupColumnNamesLen
Input. An array of values representing the length in bytes of each of the column names in the column names list.

Usage notes

Use db2Runstats to update statistics:

- On tables that have been modified many times (for example, if a large number of updates have been made, or if a significant amount of data has been inserted or deleted)
- On tables that have been reorganized
- When a new index has been created.
- On views whose underlying tables have been modified substantially so as to change the rows that are returned by the view.

After statistics have been updated, new access paths to the table can be created by rebinding the packages using sqlabndx - Bind.

If index statistics are requested, and statistics have never been run on the table containing the index, statistics on both the table and indexes are calculated.

If the db2Runstats API is collecting statistics on indexes only then previously collected distribution statistics are retained. Otherwise, the API will drop previously collected distribution statistics. If the db2Runstats API is collecting statistics on XML columns only, then previously collected basic column statistics and distribution statistics are retained. In the case where statistics on some XML columns have been collected previously, the previously collected statistics for an XML column will either be dropped if no statistics on that XML column are collected by the current call to the db2Runstats API, or be replaced if statistics on that XML column are collected by the current call to the db2Runstats API. Otherwise, the API will drop previously collected distribution statistics.

If the iRunstatsFlags parameter is set to the value DB2RUNSTATS_EXCLUDING_XML, statistics will not be collected on XML columns. This value takes precedence over all other methods that specify XML columns.

After calling this API, the application should issue a COMMIT to release the locks.

To allow new access plans to be generated, the packages that reference the target table must be rebound after calling this API. Packages that contain queries that can take advantage of statistical views must also be rebound after updating statistics on such views.

When statistics are collected for statistical views, an SQL query is run internally. The EXPLAIN facility can be used to examine the access plan selected for this query to investigate any performance problems with the statistics collection. To save the query access plan in the EXPLAIN tables, set the CURRENT EXPLAIN MODE special register to YES.

Running this API on the table only may result in a situation where the table level statistics are inconsistent with the already existing index level statistics. For example, if index level statistics are collected on a particular table and later a significant number of rows is deleted from this table, issuing this API on the table only may end up with the table cardinality less than FIRSTKEYCARD (FIRSTKEYCARD is a catalog statistics field in SYSCAT.INDEXES and SYSSTAT.INDEXES catalog views) which is an inconsistent state. Likewise, issuing this API for indexes only may leave the already existing table level statistics in an inconsistent state. For example, if table level statistics are collected on a particular

table and later a significant number of rows is deleted from this table, issuing the db2Runstats API for the indexes only may end up with some columns having a COLCARD (COLCARD is a catalog statistics field in SYSCAT.COLUMNS and SYSSTAT.COLUMNS catalog views) greater than the table cardinality. A warning will be returned if such an inconsistency is detected.

db2SelectDB2Copy - Select the DB2 copy to be used by your application

Sets the environment required by your application to use a particular DB2 copy or the location specified. If your environment is already set up for the DB2 copy you want to use, you do not need to call this API. If, however, you need to use a different DB2 copy you must call this API. Call this API before loading any DB2 dll files within your process. This call can only be made once per process.

Authorization

None

Required connection

None

API include file

```
db2ApiInstall.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2SelectDB2Copy (
   db2Uint32 versionNumber,
   void *pDB2SelectDB2CopyStruct);

typedef enum DB2CopyParmType
{
   DB2CopyInvalid=0,
   DB2CopyName,
   DB2CopyPath
} db2CopyParmType;

typedef struct DB2SelectDB2CopyStruct
{
   DB2CopyParmType  Type;
   char *pszDB2Copy;
} db2SelectDB2CopyStruct
```

db2SelectDB2Copy API parameters

versionNumber
Input. Specifies the version number and release level of the variable passed in as the second parameter, `pDB2SelectInstallationStruct`.

pDB2SelectDB2CopyStruct
Input. A pointer to the `DB2SelectDB2CopyStruct` structure.

DB2SelectDB2CopyStruct data structure parameters

Type Input. This can be either `DB2CopyName` or `DB2CopyPath`.

psziDB2Copy
Input. If Type is specified as DB2CopyName, psziDB2Copy is the name of the DB2 copy. If Type is specified as db2CopyPath, psziDB2Copy is the DB2 installation path. This cannot be NULL.

Usage notes

To use the API, you will need to include db2ApiInstall.h, which will force your application to statically link in db2ApiInstall.lib.

In addition, this API must be called before loading any DB2 libraries and can only be called once by an application. You can avoid loading DB2 libraries by making use of the /delayload option when linking DB2 libraries or you can load these libraries dynamically using LoadLibraryEx and specifying LOAD_WITH_ALTERED_SEA.

db2SetSyncSession - Set satellite synchronization session

Sets the synchronization session for a satellite. A synchronization session is associated with the version of the user application executing on the satellite. Each version of an application is supported by a particular database configuration, and manipulates particular data sets, each of which can be synchronized with a central site.

Authorization

None

Required connection

None

API include file

db2ApiDf.h

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2SetSyncSession (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef struct db2SetSyncSessionStruct
{
   char *piSyncSessionID;
} db2SetSyncSessionStruct;
```

db2SetSyncSession API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2SetSyncSessionStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2SetSyncSessionStruct data structure parameters

piSyncSessionID
Input. Specifies an identifier for the synchronization session that a satellite will use. The specified value must match the appropriate application version for the satellite's group, as defined at the satellite control server.

db2SetWriteForDB - Suspend or resume I/O writes for database

Sets the database to be I/O write suspended, or resumes I/O writes to disk. I/O writes must be suspended for a database before a split mirror can be taken. To avoid potential problems, keep the same connection to do the write suspension and resumption.

Scope

This API only affects the database partition on which it is executed.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

Database

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2SetWriteForDB (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef struct db2SetWriteDbStruct
{
   db2int32 iOption;
   char *piTablespaceNames;
} db2SetWriteDbStruct;
```

db2SetWriteForDB API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2SetWriteDbStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2SetWriteDbStruct data structure parameters

iOption
Input. Specifies the action. Valid values are:

- **DB2_DB_SUSPEND_WRITE**
  Suspends I/O write to disk.
- **DB2_DB_RESUME_WRITE**
  Resumes I/O write to disk.

piTablespaceNames
Input. Reserved for future use.

---

db2SpmListIndTrans - List SPM indoubt transactions

Provides a list of transactions that are indoubt at the Syncpoint Manager.

Scope

This API only affects the database partition on which it is issued.

Authorization

None

Required connection

Connection to the Syncpoint Manager

API include file

`sqlxa.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
db2SpmListIndTrans (
  db2Uint32 versionNumber,
  void * pParmStruct,
  struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2SpmListIndTransStruct
{
db2SpmRecoverStruct * piIndoubtData;
db2Uint32            iIndoubtDataLen;
db2Uint32            oNumIndoubtsReturned;
db2Uint32            oNumIndoubtsTotal;
db2Uint32            oReqBufferLen;
} db2XaListIndTransStruct;

typedef SQL_STRUCTURE db2SpmRecoverStruct
{
   SQLXA_XID    xid;
   char         luwid[SQLCSPQY_LUWID_SZ+1];
   char         corrtok[SQLCSPQY_APPLID_SZ+1];
   char         partner[SQLCSPQY_LUNAME_SZ+1];
   char         dbname[SQLCSPQY_DBNAME_SZ+1];
   char         dbalias[SQLCSPQY_DBNAME_SZ+1];
   char         role;
   char         uow_status;
   char         partner_status;
} db2SpmRecoverStruct;
```

db2SpmListIndTrans API parameters

versionNumber
Input. Specifies the version and release level.

pParmStruct
Input. A pointer to the `db2SpmListIndTransStruct` structure.

pSqlca
Output. A pointer to the `sqlca` structure.

db2SpmListIndTransStruct data structure parameters

piIndoubtData
Input. A pointer to the application supplied buffer where indoubt data will be returned. The indoubt data is in `db2SpmRecoverStruct` format. The application can traverse the list of indoubt transactions by using the size of the `db2SpmRecoverStruct` structure, starting at the address provided by this parameter. If the value is `NULL`, size of the required buffer is calculated and returned in `oReqBufferLen`. `oNumIndoubtsTotal` will contain the total number of indoubt transactions. The application may allocate the required buffer size and issue the API again.

oNumIndoubtsReturned
Output. The number of indoubt transaction records returned in the buffer specified by `pIndoubtData`.

oNumIndoubtsTotal
Output. The total number of indoubt transaction records available at the time of API invocation. If the `piIndoubtData` buffer is too small to contain all the records, `oNumIndoubtsTotal` will be greater than the total for `oNumIndoubtsReturned`. The application may reissue the API in order to obtain all records.

This number may change between API invocations as a result of automatic or heuristic indoubt transaction resynchronization, or as a result of other transactions entering the indoubt state.

oReqBufferLen
Output. Required buffer length to hold all indoubt transaction records at the time of API invocation. The application can use this value to determine the required buffer size by calling the API with `pIndoubtData` set to `NULL`. This value can then be used to allocate the required buffer, and the API can be issued with `pIndoubtData` set to the address of the allocated buffer.

The required buffer size may change between API invocations as a result of automatic or heuristic indoubt transaction resynchronization, or as a result of other transactions entering the indoubt state. The application may allocate a larger buffer to account for this.

db2SpmRecoverStruct data structure parameters

xid Output. Specifies the XA identifier assigned by the transaction manager to uniquely identify a global transaction.

luwid Output. Specifies the Logical Unit of Work ID (LUWID) assigned by the Syncpoint Manager to identify the XA Identifier (XID) at the partner system.

corrtok
Output. Specifies the application identifier assigned by the Syncpoint manager for this transaction.

partner
Output. Specifies the name of the Partner system.

dbname
Output. Database of the partner system

dbalias
Output. Specifies the alias of the database where the indoubt transaction is found.

role Output. Role of the Syncpoint manager.

SQLCSPQY_AR
Syncpoint Manager is an Application Requestor

SQLCSPQY_AS
Syncpoint manager is an Application Server

uow_status
Output. Indicates the status of this indoubt transaction at the Syncpoint Manager. Valid values are:

SQLCSPQY_STATUS_COM
The transaction is in commit status at the Syncpoint Manager. The Transaction is waiting to be resynchronized with the partner system during the next resynchronization interval.

SQLCSPQY_STATUS_RBK
The transaction is in rollback status at the Syncpoint Manager. Waiting for the Partner system to initiate resynchronization and resolve indoubt.

SQLCSPQY_STATUS_IDB
The transaction is in prepared state at the Syncpoint manager. The connected parameter can be used to determine whether the transaction is waiting for the second phase of normal commit processing or whether an error occurred and resynchronization with the transaction manager is required.

SQLCSPQY_STATUS_HCM
The transaction has been heuristically committed.

SQLCSPQY_STATUS_HRB
The transaction has been heuristically rolled back.

Usage notes

A typical application will perform the following steps after setting the current connection to the Syncpoint Manager*:

1. Call `db2SpmListIndTrans` API with `piIndoubtData` set to `NULL`. This will return values in `oReqBufferLen` and `oNumIndoubtsTotal`.
2. Use the returned value in `oReqBufferLen` to allocate a buffer. This buffer may not be large enough if there are additional indoubt transactions because of the initial invocation of this API to obtain `oReqBufferLen`. The application may provide a buffer larger than `oReqBufferLen`.
3. Determine if all indoubt transaction records have been obtained. This can be done by comparing `oNumIndoubtsReturned` to `oNumIndoubtsTotal`. If `oNumIndoubtsTotal` is greater than `oNumIndoubtsReturned`, the application can repeat the above steps.

* To connect to the Syncpoint Manager, determine the name of the Syncpoint Manager being used at the DB2 Connect Server. This can determined by querying the database configuration parameter, spm_name, at the DB2 Connect Server. Issue a connect by specifying the spm_name as the database alias on the connect API.

db2SyncSatellite - Start satellite synchronization

Synchronizes a satellite. Satellite synchronization involves bringing a satellite to a state that is consistent with the other satellites of its group.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2SyncSatellite (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);
```

db2SyncSatellite API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. Set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

db2SyncSatelliteStop - Pause satellite synchronization

Stops the satellite's currently active synchronization session. The session is stopped in such a way that synchronization for this satellite can be restarted where it left off by invoking db2SyncSatellite.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2SyncSatelliteStop (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);
```

db2SyncSatelliteStop API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. Set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

db2SyncSatelliteTest - Test whether a satellite can be synchronized

Tests the ability of a satellite to synchronize that is, tests whether the satellite can be brought to a state that is consistent with the other satellites of its group.

Authorization

None

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2SyncSatelliteTest (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);
```

db2SyncSatelliteTest API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. Set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

db2UpdateAlertCfg - Update the alert configuration settings for health indicators

Updates the alert configuration settings for health indicators.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

API include file

db2ApiDf.h

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2UpdateAlertCfg (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2UpdateAlertCfgData
{
   db2Uint32 iObjType;
   char *piObjName;
   char *piDbName;
   db2Uint32 iIndicatorID;
   db2Uint32 iNumIndAttribUpdates;
   struct db2AlertAttrib *piIndAttribUpdates;
   db2Uint32 iNumActionUpdates;
   struct db2AlertActionUpdate *piActionUpdates;
   db2Uint32 iNumActionDeletes;
   struct db2AlertActionDelete *piActionDeletes;
   db2Uint32 iNumNewActions;
   struct db2AlertActionNew *piNewActions;
} db2UpdateAlertCfgData;

typedef SQL_STRUCTURE db2AlertAttrib
{
   db2Uint32 iAttribID;
   char *piAttribValue;
} db2AlertAttrib;

typedef SQL_STRUCTURE db2AlertActionUpdate
{
   db2Uint32 iActionType;
   char *piActionName;
   db2Uint32 iCondition;
   db2Uint32 iNumParmUpdates;
   struct db2AlertAttrib *piParmUpdates;
} db2AlertActionUpdate;

typedef SQL_STRUCTURE db2AlertActionDelete
{
   db2Uint32 iActionType;
   char *piName;
   db2Uint32 iCondition;
} db2AlertActionDelete;

typedef SQL_STRUCTURE db2AlertActionNew
{
   db2Uint32 iActionType;
```

```
   struct db2AlertScriptAction *piScriptAttribs;
   struct db2AlertTaskAction *piTaskAttribs;
} db2AlertActionNew;

typedef SQL_STRUCTURE db2AlertScriptAction
{
   db2Uint32 scriptType;
   db2Uint32 condition;
   char *pPathName;
   char *pWorkingDir;
   char *pCmdLineParms;
   char stmtTermChar;
   char *pUserID;
   char *pPassword;
   char *pHostName;
} db2AlertScriptAction;

typedef SQL_STRUCTURE db2AlertTaskAction
{
   char *pTaskName;
   db2Uint32 condition;
   char *pUserID;
   char *pPassword;
   char *pHostName;
} db2AlertTaskAction;
```

db2UpdateAlertCfg API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2UpdateAlertCfgData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2UpdateAlertCfgData data structure parameters

iObjType
Input. Specifies the type of object for which configuration is requested. Valid values are:

- DB2ALERTCFG_OBJTYPE_DBM
- DB2ALERTCFG_OBJTYPE_DATABASES
- DB2ALERTCFG_OBJTYPE_TABLESPACES
- DB2ALERTCFG_OBJTYPE_TS_CONTAINERS
- DB2ALERTCFG_OBJTYPE_DATABASE
- DB2ALERTCFG_OBJTYPE_TABLESPACE
- DB2ALERTCFG_OBJTYPE_TS_CONTAINER

piObjName
Input. The name of the table space or table space container when object type, iObjType, is set to DB2ALERTCFG_OBJTYPE_TABLESPACE or DB2ALERTCFG_OBJTYPE_TS_CONTAINER, otherwise set to NULL.

piDbName
Input. The alias name for the database for which configuration is requested when object type, iObjType, is DB2ALERTCFG_OBJTYPE_TS_CONTAINER,

DB2ALERTCFG_OBJTYPE_TABLESPACE, and DB2ALERTCFG_OBJTYPE_DATABASE, otherwise set to NULL.

iIndicatorID
Input. The health indicator for which the configuration updates are to apply.

iNumIndAttribUpdates
Input. The number of alert attributes to be updated for the iIndicatorID health indicator.

piIndAttribUpdates
Input. A pointer to the db2AlertAttrib structure array.

iNumActionUpdates
Input. The number of alert actions to be updated for the iIndicatorID health indicator.

piActionUpdates
Input. A pointer to the db2AlertActionUpdate structure array.

iNumActionDeletes
Input. The number of alert actions to be deleted from the iIndicatorID health indicator.

piActionDeletes
Input. A pointer to the db2AlertActionDelete structure array.

iNumNewActions
Input. The number of new alert actions to be added to the iIndicatorID health indicator.

piNewActions
Input. A pointer to the db2AlertActionNew structure array.

db2AlertAttrib data structure parameters

iAttribID
Input. Specifies the alert attribute that will be updated. Valid values include:

- DB2ALERTCFG_ALARM
- DB2ALERTCFG_WARNING
- DB2ALERTCFG_SENSITIVITY
- DB2ALERTCFG_ACTIONS_ENABLED
- DB2ALERTCFG_THRESHOLD_CHECK

piAttribValue
Input. The new value of the alert attribute. Valid values are:

- DB2ALERTCFG_ALARM
- DB2ALERTCFG_WARNING
- DB2ALERTCFG_SENSITIVITY
- DB2ALERTCFG_ACTIONS_ENABLED
- DB2ALERTCFG_THRESHOLD_CHECK

db2AlertActionUpdate data structure parameters

iActionType
Input. Specifies the alert action. Valid values are:

- DB2ALERTCFG_ACTIONTYPE_SCRIPT

- DB2ALERTCFG_ACTIONTYPE_TASK

piActionName
Input. The alert action name. The name of a script action is the absolute pathname of the script. The name of a task action is a string in the form: <task-numberical-ID>.<task-numberical-suffix>.

iCondition
The condition on which to run the action. Valid values for threshold based health indicators are:

- DB2ALERTCFG_CONDITION_ALL
- DB2ALERTCFG_CONDITION_WARNING
- DB2ALERTCFG_CONDITION_ALARM

For state based health indicators, use the numerical value defined in sqlmon.

iNumParmUpdates
Input. The number of action attributes to be updated in the piParmUpdates array.

piParmUpdates
Input. A pointer to the db2AlertAttrib structure.

db2AlertActionDelete data structure parameters

iActionType
Input. Specifies the alert action. Valid values are:

- DB2ALERTCFG_ACTIONTYPE_SCRIPT
- DB2ALERTCFG_ACTIONTYPE_TASK

piName
Input. The name of the alert action or the script action. The name of the script action is the absolute pathname of the script, whereas the name of the task action is a string in the form: <task-numerical-ID>.<task-numerical-suffix>.

iCondition
The condition on which to run the action. Valid values for threshold based health indicators are:

- DB2ALERTCFG_CONDITION_ALL
- DB2ALERTCFG_CONDITION_WARNING
- DB2ALERTCFG_CONDITION_ALARM

For state based health indicators, use the numerical value defined in sqlmon.

db2AlertActionNew data structure parameters

iActionType
Input. Specifies the alert action. Valid values are:

- DB2ALERTCFG_ACTIONTYPE_SCRIPT
- DB2ALERTCFG_ACTIONTYPE_TASK

piScriptAttribs
Input. A pointer to the db2AlertScriptAction structure.

piTaskAttribs
Input. A pointer to the db2AlertTaskAction structure.

db2AlertScriptAction data structure parameters

scriptType

Specifies the type of script. Valid values are:

- DB2ALERTCFG_SCRIPTTYPE_DB2CMD
- DB2ALERTCFG_SCRIPTTYPE_OS

condition

The condition on which to run the action. Valid values for threshold based health indicators are:

- DB2ALERTCFG_CONDITION_ALL
- DB2ALERTCFG_CONDITION_WARNING
- DB2ALERTCFG_CONDITION_ALARM

For state based health indicators, use the numerical value defined in sqlmon.

pPathname

The absolute pathname of the script.

pWorkingDir

The absolute pathname of the directory in which the script is to be executed.

pCmdLineParms

The command line parameters to be passed to the script when it is invoked. Optional for DB2ALERTCFG_SCRIPTTYPE_OS only.

stmtTermChar

The character that is used in the script to terminate statements. Optional for DB2ALERTCFG_SCRIPTTYPE_DB2CMD only.

pUserID

The user account under which the script will be executed.

pPassword

The password for the user account pUserId.

pHostName

The host name on which to run the script. This applies for both task and script.

Script The hostname for where the script resides and will be run.

Task The hostname for where the scheduler resides.

db2AlertTaskAction data structure parameters

pTaskname

The name of the task.

condition

The condition for which to run the action.

pUserID

The user account under which the script will be executed.

pPassword

The password for the user account pUserId.

pHostName

The host name on which to run the script. This applies for both task and script.

Script The hostname for where the script resides and will be run.

Task The hostname for where the scheduler resides.

db2UpdateAlternateServerForDB - Update the alternate server for a database alias in the system database directory

Updates the alternate server for a database alias in the system database directory.

Scope

This API affects the system database directory.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2UpdateAlternateServerForDB (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2UpdateAltServerStruct
{
   char *piDbAlias;
   char *piHostName;
   char *piPort;
} db2UpdateAltServerStruct;

SQL_API_RC SQL_API_FN
  db2gUpdateAlternateServerForDB (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gUpdateAltServerStruct
{
   db2Uint32 iDbAlias_len;
   char *piDbAlias;
   db2Uint32 iHostName_len;
   char *piHostName;
   db2Uint32 iPort_len;
   char *piPort;
} db2gUpdateAltServerStruct;
```

db2UpdateAlternateServerForDB API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2UpdateAltServerStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2UpdateAltServerStruct data structure parameters

piDbAlias
Input. A string containing an alias for the database.

piHostName
Input. A string containing the host name or the IP address of the node where the alternate server for the database resides. The host name is the name of the node that is known to the TCP/IP network. The maximum length of the host name is 255 characters. The IP address can be an IPv4 or an IPv6 address.

piPort Input. The port number of the alternate server database manager instance. The maximum length of the port number is 14 characters.

db2gUpdateAltServerStruct data structure specific parameters

iDbAlias_len
Input. The length in bytes of piDbAlias.

iHostName_len
Input. The length in bytes of piHostName.

iPort_len
Input. The length in bytes of piPort.

Usage notes

The API will only be applied to the system database directory.

The API should only be used on a server. If it is issued on a client, it will be ignored and warning SQL1889W will be issued.

If LDAP (Lightweight Directory Access Protocol) support is enabled on the current machine, the alternate server for the database will automatically be updated in the LDAP directory.

db2UpdateContact - Update the attributes of a contact

Updates the attributes of a contact. Contacts are users to whom notification messages can be sent. Contacts can be either defined locally on the system or in a global list. The setting of the DB2 administration server (DAS) configuration parameter contact_host determines whether the list is local or global.

Authorization

None

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2UpdateContact (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2UpdateContactData
{
   char *piUserid;
   char *piPassword;
   char *piContactName;
   db2Uint32 iNumAttribsUpdated;
   struct db2ContactAttrib *piAttribs;
} db2UpdateContactData;

typedef SQL_STRUCTURE db2ContactAttrib
{
   db2Uint32 iAttribID;
   char *piAttribValue;
} db2ContactAttrib;
```

db2UpdateContact API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2UpdateContactData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2UpdateContactData data structure parameters

piContactName
Input. Specifies the name of the contact to be updated.

iNumAttribsUpdated
Input. The number attributes to be updated.

piAttribs
Input. A pointer to the db2ContactAttrib structure.

db2ContactAttrib data structure parameters

iAttribID
Input. Specifies the contact attribute. Valid values are:

- DB2CONTACT_ADDRESS
- DB2CONTACT_TYPE
- DB2CONTACT_MAXPAGELEN
- DB2CONTACT_DESCRIPTION

piAttribValue
Input. The new value of the contact attribute.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2UpdateContactGroup - Update the attributes of a contact group

Updates the attributes of a contact group. A contact group contains a list of users to whom notification messages can be sent. Contact groups can be either defined locally on the system or in a global list. The setting of the DB2 administration server (DAS) configuration parameter contact_host determines whether the list is local or global.

Authorization

None.

Required connection

None.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2UpdateContactGroup (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2UpdateContactGroupData
{
   char *piUserid;
   char *piPassword;
   char *piGroupName;
   db2Uint32 iNumNewContacts;
   struct db2ContactTypeData *piNewContacts;
   db2Uint32 iNumDroppedContacts;
   struct db2ContactTypeData *piDroppedContacts;
   char *piNewDescription;
} db2UpdateContactGroupData;

typedef SQL_STRUCTURE db2ContactTypeData
{
   db2Uint32 contactType;
   char *pName;
} db2ContactTypeData;
```

db2UpdateContactGroup API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2ResetMonitorData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2UpdateContactGroupData data structure parameters

piUserid
Input. The user name.

piPassword
Input. The password for piUserid.

piGroupName
Input. The name of the contact group to update.

iNumNewContacts
Input. The number of new contacts to be added to the group

piNewContacts
Input. A pointer to the db2ContactTypeData structure.

iNumDroppedContacts
Input. The number of contacts in the group to be dropped.

piDroppedContacts
Input. A pointer to the db2ContactTypeData structure.

piNewDescription
Input. The new description for the group. Set this parameter to NULL if the old description should not be changed.

db2ContactTypeData data structure parameters

contactType
Specifies the type of contact. Valid values are:

- DB2CONTACT_SINGLE
- DB2CONTACT_GROUP

pName
The contact group name, or the contact name if contactType is set to DB2CONTACT_SINGLE.

Usage notes

This API is not supported on UNIX and Linux. However, you can access the same functionality through the SQL interface.

db2UpdateHealthNotificationList - Update the list of contacts to whom health alert notifications can be sent

Updates the contact list for notification about health alerts issued by an instance.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

Instance. If there is no instance attachment, a default instance attachment is created.

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2UpdateHealthNotificationList (
   db2Uint32 versionNumber,
   void * pParmStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2UpdateHealthNotificationListData
{
   db2Uint32 iNumUpdates;
   struct db2HealthNotificationListUpdate *piUpdates;
} db2UpdateHealthNotificationListData;

typedef SQL_STRUCTURE db2HealthNotificationListUpdate
{
   db2Uint32 iUpdateType;
   struct db2ContactTypeData *piContact;
} db2HealthNotificationListUpdate;

typedef SQL_STRUCTURE db2ContactTypeData
{
   db2Uint32 contactType;
   char *pName;
} db2ContactTypeData;
```

db2UpdateHealthNotificationList API parameters

versionNumber
Input. Specifies the version and release level of the structure passed as the second parameter pParmStruct.

pParmStruct
Input. A pointer to the db2UpdateHealthNotificationListData structure.

pSqlca
Output. A pointer to the sqlca structure.

db2UpdateHealthNotificationListData data structure parameters

iNumUpdates
Input. The number of updates.

piUpdates
Input. A pointer to the db2HealthNotificationListUpdate structure.

db2HealthNotificationListUpdate data structure parameters

iUpdateType
Input. Specifies the type of update. Valid values are:

- DB2HEALTHNOTIFICATIONLIST_ADD
- DB2HEALTHNOTIFICATIONLIST_DROP

piContact
Input. A pointer to the db2ContactTypeData structure.

db2ContactTypeData data structure parameters

contactType
Specifies the type of contact. Valid values are:

- DB2CONTACT_SINGLE
- DB2CONTACT_GROUP

pName
The contact group name, or the contact name if contactType is set to DB2CONTACT_SINGLE.

db2UtilityControl - Set the priority level of running utilities

Controls the priority level of running utilities. Can be used to throttle and unthrottle utility invocations.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

Instance

API include file

```
db2ApiDf.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2UtilityControl (
   db2Uint32 version,
   void * pUtilityControlStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2UtilityControlStruct
{
   db2Uint32 iID;
   db2Uint32 iAttribute;
   void *pioValue;
} db2UtilityControlStruct;

SQL_API_RC SQL_API_FN
  db2gUtilityControl (
   db2Uint32 version,
   void * pgUtilityControlStruct,
   struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2gUtilityControlStruct
{
   db2Uint32 iID;
   db2Uint32 iAttribute;
   void *pioValue;
} db2gUtilityControlStruct;
```

db2UtilityControl API parameters

version
Input. Specifies the version and release level of the structure passed in as the second parameter, pUtilityControlStruct.

pUtilityControlStruct
Input. A pointer to the db2UtilityControlStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2UtilityControlStruct data structure parameters

iId Input. Specifies the ID of the utility to modify.

iAttribute
Input. Specifies the attribute to modify. Valid values (defined in db2ApiDf header file, located in the include directory) are:

DB2UTILCTRL_PRIORITY_ATTRIB
Modify the throttling priority of the utility.

pioValue
Input. Specifies the new attribute value associated with the iAttribute parameter.

Note: If the iAttribute parameter is set to DB2UTILCTRL_PRIORITY_ATTRIB, then the pioValue parameter must point to a db2Uint32 containing the priority.

Usage notes

SQL1153N will be returned if there is no existing utility with the specified iId. This may indicate that the function was invoked with invalid arguments or that the utility has completed.

SQL1154N will be returned if the utility does not support throttling.

sqlabndx - Bind application program to create a package

Invokes the bind utility, which prepares SQL statements stored in the bind file generated by the precompiler, and creates a package that is stored in the database.

Scope

This API can be called from any database partition server in db2nodes.cfg. It updates the database catalogs on the catalog partition. Its effects are visible to all database partition servers.

Authorization

One of the following:

- sysadm or dbadm authority
- BINDADD privilege if a package does not exist and one of:
- IMPLICIT_SCHEMA authority on the database if the schema name of the package does not exist
- CREATEIN privilege on the schema if the schema name of the package exists

- ALTERIN privilege on the schema if the package exists
- BIND privilege on the package if it exists.

The user also needs all privileges required to compile any static SQL statements in the application. Privileges granted to groups are not used for authorization checking of static statements. If the user has sysadm authority, but not explicit privileges to complete the bind, the database manager grants explicit dbadm authority automatically.

Required connection

Database

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlabndx (
        _SQLOLDCHAR * pBindFileName,
        _SQLOLDCHAR * pMsgFileName,
        struct sqlopt * pBindOptions,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgbndx (
        unsigned short MsgFileNameLen,
        unsigned short BindFileNameLen,
        struct sqlca * pSqlca,
        struct sqlopt * pBindOptions,
        _SQLOLDCHAR * pMsgFileName,
        _SQLOLDCHAR * pBindFileName);
```

sqlabndx API parameters

pBindFileName

Input. A string containing the name of the bind file, or the name of a file containing a list of bind file names. The bind file names must contain the extension .bnd. A path for these files can be specified.

Precede the name of a bind list file with the at sign (@). For example, a fully qualified bind list file name might be:

```
/u/user1/bnd/@all.lst
```

The bind list file should contain one or more bind file names, and must have the extension .lst.

Precede all but the first bind file name with a plus symbol (+). The bind file names might be on one or more lines. For example, the bind list file `all.lst` might contain:

```
mybind1.bnd+mybind2.bnd+
mybind3.bnd+
mybind4.bnd
```

Path specifications on bind file names in the list file can be used. If no path is specified, the database manager takes path information from the bind list file.

pMsgFileName

Input. A string containing the destination for error, warning, and

informational messages. Can be the path and the name of an operating system file, or a standard device. If a file already exists, it is overwritten. If it does not exist, a file is created.

pBindOptions
Input. A structure used to pass bind options to the API. For more information about this structure, see SQLOPT.

pSqlca
Output. A pointer to the sqlca structure.

sqlgbndx API-specific parameters

pMsgFileName
Input. A string containing the destination for error, warning, and informational messages. Can be the path and the name of an operating system file, or a standard device. If a file already exists, it is overwritten. If it does not exist, a file is created.

BindFileNameLen
Input. Length in bytes of the pBindFileName parameter.

Usage notes

Binding can be done as part of the precompile process for an application program source file, or as a separate step at a later time. Use BIND when binding is performed as a separate process.

The name used to create the package is stored in the bind file, and is based on the source file name from which it was generated (existing paths or extensions are discarded). For example, a precompiled source file called myapp.sqc generates a default bind file called myapp.bnd and a default package name of MYAPP. (However, the bind file name and the package name can be overridden at precompile time by using the SQL_BIND_OPT and the SQL_PKG_OPT options of sqlaprep.)

BIND executes under the transaction that the user has started. After performing the bind, BIND issues a COMMIT (if bind is successful) or a ROLLBACK (if bind is unsuccessful) operation to terminate the current transaction and start another one.

Binding halts if a fatal error or more than 100 errors occur. If a fatal error occurs during binding, BIND stops binding, attempts to close all files, and discards the package.

Binding application programs have prerequisite requirements and restrictions beyond the scope of this manual. For example, an application cannot be bound from a Version 8 client to a Version 8 server, and then executed against a Version 7 server.

The Bind option types and values are defined in sql.h.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqlaintp - Get error message

Retrieves the message associated with an error condition specified by the sqlcode field of the sqlca structure.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlaintp (
        char * pBuffer,
        short BufferSize,
        short LineWidth,
        const char * pMsgFileName,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgintp (
        short BufferSize,
        short LineWidth,
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pBuffer);
```

sqlaintp API parameters

pBuffer
Output. A pointer to a string buffer where the message text is placed. If the message must be truncated to fit in the buffer, the truncation allows for the null string terminator character.

BufferSize
Input. Size, in bytes, of a string buffer to hold the retrieved message text.

LineWidth
Input. The maximum line width for each line of message text. Lines are broken on word boundaries. A value of zero indicates that the message text is returned without line breaks.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

One message is returned per call.

A new line (line feed, LF, or carriage return/line feed, CR/LF) sequence is placed at the end of each message.

If a positive line width is specified, new line sequences are inserted between words so that the lines do not exceed the line width.

If a word is longer than a line width, the line is filled with as many characters as will fit, a new line is inserted, and the remaining characters are placed on the next line.

In a multi-threaded application, sqlaintp must be attached to a valid context; otherwise, the message text for SQLCODE - 1445 cannot be obtained

Return codes

Code	Message
+i	Positive integer indicating the number of bytes in the formatted message. If this is greater than the buffer size input by the caller, the message is truncated.
-1	Insufficient memory available for message formatting services to function. The requested message is not returned.
-2	No error. The sqlca did not contain an error code (SQLCODE = 0).
-3	Message file inaccessible or incorrect.
-4	Line width is less than zero.
-5	Invalid sqlca, bad buffer address, or bad buffer length.

If the return code is -1 or -3, the message buffer will contain additional information about the problem.

REXX API syntax

```
GET MESSAGE INTO :msg [LINEWIDTH width]
```

REXX API parameters

msg REXX variable into which the text message is placed.

width Maximum line width for each line in the text message. The line is broken on word boundaries. If width is not given or set to 0, the message text returns without line breaks.

sqlaprep - Precompile application program

Processes an application program source file containing embedded SQL statements. A modified source file is produced containing host language calls for the SQL statements and, by default, a package is created in the database.

Scope

This API can be called from any database partition server in db2nodes.cfg. It updates the database catalogs on the catalog partition. Its effects are visible to all database partition servers.

Authorization

One of the following:

- sysadm or dbadm authority
- BINDADD privilege if a package does not exist and one of:
- IMPLICIT_SCHEMA authority on the database if the schema name of the package does not exist

- CREATEIN privilege on the schema if the schema name of the package exists
- ALTERIN privilege on the schema if the package exists
- BIND privilege on the package if it exists.

The user also needs all privileges required to compile any static SQL statements in the application. Privileges granted to groups are not used for authorization checking of static statements. If the user has sysadm authority, but not explicit privileges to complete the bind, the database manager grants explicit dbadm authority automatically.

Required connection

Database

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlaprep (
        _SQLOLDCHAR * pProgramName,
        _SQLOLDCHAR * pMsgFileName,
        struct sqlopt * pPrepOptions,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgprep (
        unsigned short MsgFileNameLen,
        unsigned short ProgramNameLen,
        struct sqlca * pSqlca,
        struct sqlopt * pPrepOptions,
        _SQLOLDCHAR * pMsgFileName,
        _SQLOLDCHAR * pProgramName);
```

sqlaprep API parameters

pProgramName

Input. A string containing the name of the application to be precompiled. Use the following extensions:

- .sqb: for COBOL applications
- .sqc: for C applications
- .sqC: for UNIX C++ applications
- .sqf: for FORTRAN applications
- .sqx: for C++ applications

When the TARGET option is used, the input file name extension does not have to be from this predefined list.

The preferred extension for C++ applications containing embedded SQL on UNIX based systems is sqC; however, the sqx convention, which was invented for systems that are not case sensitive, is tolerated by UNIX based systems.

pMsgFileName

Input. A string containing the destination for error, warning, and informational messages. Can be the path and the name of an operating system file, or a standard device. If a file already exists, it is overwritten. If it does not exist, a file is created.

pPrepOptions
Input. A structure used to pass precompile options to the API. For more information about this structure, see SQLOPT.

pSqlca
Output. A pointer to the sqlca structure.

sqlgprep API-specific parameters

MsgFileNameLen
Input. Length in bytes of the pMsgFileName parameter.

ProgramNameLen
Input. Length in bytes of the pProgramName parameter.

Usage notes

A modified source file is produced, which contains host language equivalents to the SQL statements. By default, a package is created in the database to which a connection has been established. The name of the package is the same as the program file name (minus the extension and folded to uppercase), up to a maximum of 8 characters.

Following connection to a database, sqlaprep executes under the transaction that was started. PRECOMPILE PROGRAM then issues a COMMIT or a ROLLBACK operation to terminate the current transaction and start another one.

Precompiling stops if a fatal error or more than 100 errors occur. If a fatal error does occur, PRECOMPILE PROGRAM stops precompiling, attempts to close all files, and discards the package.

The Precompile option types and values are defined in sql.h.

When using the PRECOMPILE command or sqlaprep API, the name of the package can be specified with the PACKAGE USING option. When using this option, up to 128 bytes may be specified for the package name. When this option is not used, the name of the package is generated by the precompiler. The name of the application program source file (minus extension and folded to uppercase) is used up to a maximum of 8 characters. The name generated will continue to have a maximum of 8 bytes to be compatible with previous versions of DB2.

REXX API syntax

```
This API can be called from REXX through the SQLDB2 interface.
```

sqlarbnd - Rebind package

Allows the user to recreate a package stored in the database without the need for a bind file.

Authorization

One of the following:
- sysadm or dbadm authority
- ALTERIN privilege on the schema
- BIND privilege on the package.

The authorization ID logged in the BOUNDBY column of the SYSCAT.PACKAGES system catalog table, which is the ID of the most recent binder of the package, is used as the binder authorization ID for the rebind, and for the default schema for table references in the package. Note that this default qualifier may be different from the authorization ID of the user executing the rebind request. REBIND will use the same bind options that were specified when the package was created.

Required connection

Database

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlarbnd (
        char * pPackageName,
        struct sqlca * pSqlca,
        struct sqlopt * pRebindOptions);

SQL_API_RC SQL_API_FN
  sqlgrbnd (
        unsigned short PackageNameLen,
        char * pPackageName,
        struct sqlca * pSqlca,
        struct sqlopt * pRebindOptions);
```

sqlarbnd API parameters

pPackageName
Input. A string containing the qualified or unqualified name that designates the package to be rebound. An unqualified package-name is implicitly qualified by the current authorization ID. This name does not include the package version. When specifying a package that has a version that is not the empty string, then the version-id must be specified using the SQL_VERSION_OPT rebind option.

pSqlca
Output. A pointer to the sqlca structure.

pRebindOptions
Input. A pointer to the SQLOPT structure, used to pass rebind options to the API. For more information about this structure, see SQLOPT.

sqlgrbnd API-specific parameters

PackageNameLen
Input. Length in bytes of the pPackageName parameter.

Usage notes

REBIND does not automatically commit the transaction following a successful rebind. The user must explicitly commit the transaction. This enables ″what if ″ analysis, in which the user updates certain statistics, and then tries to rebind the package to see what changes. It also permits multiple rebinds within a unit of work.

This API:

- Provides a quick way to recreate a package. This enables the user to take advantage of a change in the system without a need for the original bind file.fs. For example, if it is likely that a particular SQL statement can take advantage of a newly created index, REBIND can be used to recreate the package. REBIND can also be used to recreate packages after db2Runstats has been executed, thereby taking advantage of the new statistics.
- Provides a method to recreate inoperative packages. Inoperative packages must be explicitly rebound by invoking either the bind utility or the rebind utility. A package will be marked inoperative (the VALID column of the SYSCAT.PACKAGES system catalog will be set to X) if a function instance on which the package depends is dropped. The rebind conservative option is not supported for inoperative packages.
- Gives users control over the rebinding of invalid packages. Invalid packages will be automatically (or implicitly) rebound by the database manager when they are executed. This may result in a noticeable delay in the execution of the first SQL request for the invalid package. It may be desirable to explicitly rebind invalid packages, rather than allow the system to automatically rebind them, in order to eliminate the initial delay and to prevent unexpected SQL error messages which may be returned in case the implicit rebind fails. For example, following database migration, all packages stored in the database will be invalidated by the MIGRATE DATABASE command.. Given that this may involve a large number of packages, it may be desirable to explicitly rebind all of the invalid packages at one time. This explicit rebinding can be accomplished using BIND, REBIND, or the db2rbind tool.

The choice of whether to use BIND or REBIND to explicitly rebind a package depends on the circumstances. It is recommended that REBIND be used whenever the situation does not specifically require the use of BIND, since the performance of REBIND is significantly better than that of BIND. BIND must be used, however:

- When there have been modifications to the program (for example, when SQL statements have been added or deleted, or when the package does not match the executable for the program).
- When the user wishes to modify any of the bind options as part of the rebind. REBIND does not support any bind options. For example, if the user wishes to have privileges on the package granted as part of the bind process, BIND must be used, since it has an SQL_GRANT_OPT option.
- When the package does not currently exist in the database.
- When detection of all bind errors is desired. REBIND only returns the first error it detects, and then ends, whereas the BIND command returns the first 100 errors that occur during binding.

REBIND is supported by DB2 Connect.

If REBIND is executed on a package that is in use by another user, the rebind will not occur until the other user's logical unit of work ends, because an exclusive lock is held on the package's record in the SYSCAT.PACKAGES system catalog table during the rebind.

When REBIND is executed, the database manager recreates the package from the SQL statements stored in the SYSCAT.STATEMENTS system catalog table. If many versions with the same package number and creator exist, only one version can be bound at once. If not specified using the SQL_VERSION_OPT rebind option, the VERSION defaults to be "". Even if there is only one package with a name and

creator that matches the name and creator specified in the rebind request, it will not rebound unless its VERSION matches the VERSION specified explicitly or implicitly.

If REBIND encounters an error, processing stops, and an error message is returned.

The Explain tables are populated during REBIND if either SQL_EXPLSNAP_OPT or SQL_EXPLAIN_OPT have been set to YES or ALL (check EXPLAIN_SNAPSHOT and EXPLAIN_MODE columns in the catalog). The Explain tables used are those of the REBIND requester, not the original binder. The Rebind option types and values are defined in sql.h.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqlbctcq - Close a table space container query

Ends a table space container query request and frees the associated resources.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbctcq (
   struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgctcq (
   struct sqlca * pSqlca);
```

sqlbctcq API parameters

pSqlca
Output. A pointer to the sqlca structure.

sqlbctsq - Close a table space query

Ends a table space query request, and frees up associated resources.

Authorization

One of the following:
- sysadm
- sysctrl
- sysmaint
- dbadm
- load

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbctsq (
   struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgctsq (
   struct sqlca * pSqlca);
```

sqlbctsq API parameters

pSqlca
Output. A pointer to the sqlca structure.

sqlbftcq - Fetch the query data for rows in a table space container

Fetches a specified number of rows of table space container query data, each row consisting of data for a container.

Scope

In a partitioned database environment, only the table spaces on the current database partition are listed.

Authorization

One of the following:
- sysadm
- sysctrl
- sysmaint
- dbadm

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbftcq (
   struct sqlca * pSqlca,
   sqluint32 MaxContainers,
   struct SQLB_TBSCONTQRY_DATA * pContainerData,
   sqluint32 * pNumContainers);

SQL_API_RC SQL_API_FN
  sqlgftcq (
   struct sqlca * pSqlca,
   sqluint32 MaxContainers,
   struct SQLB_TBSCONTQRY_DATA * pContainerData,
   sqluint32 * pNumContainers);
```

sqlbftcq API parameters

pSqlca
Output. A pointer to the sqlca structure.

MaxContainers
Input. The maximum number of rows of data that the user allocated output area (pointed to by pContainerData) can hold.

pContainerData
Output. Pointer to the output area, a structure for query data. For more information about this structure, see SQLB-TBSCONTQRY-DATA. The caller of this API must allocate space for MaxContainers of these structures, and set pContainerData to point to this space. The API will use this space to return the table space container data.

pNumContainers
Output. Number of rows of output returned.

Usage notes

The user is responsible for allocating and freeing the memory pointed to by the pContainerData parameter. This API can only be used after a successful sqlbotcq call. It can be invoked repeatedly to fetch the list generated by sqlbotcq.

sqlbftpq - Fetch the query data for rows in a table space

Fetches a specified number of rows of table space query data, each row consisting of data for a table space.

Scope

In a partitioned database environment, only the table spaces on the current database partition are listed.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm
- load

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbftpq (
   struct sqlca * pSqlca,
   sqluint32 MaxTablespaces,
   struct SQLB_TBSPQRY_DATA * pTablespaceData,
   sqluint32 * pNumTablespaces);

SQL_API_RC SQL_API_FN
  sqlgftpq (
   struct sqlca * pSqlca,
   sqluint32 MaxTablespaces,
   struct SQLB_TBSPQRY_DATA * pTablespaceData,
   sqluint32 * pNumTablespaces);
```

sqlbftpq API parameters

pSqlca
Output. A pointer to the sqlca structure.

MaxTablespaces
Input. The maximum number of rows of data that the user allocated output area (pointed to by pTablespaceData) can hold.

pTablespaceData
Input and output. Pointer to the output area, a structure for query data. For more information about this structure, see SQLB-TBSPQRY-DATA. The caller of this API must:

- Allocate space for MaxTablespaces of these structures
- Initialize the structures
- Set TBSPQVER in the first structure to SQLB_TBSPQRY_DATA_ID
- Set pTablespaceData to point to this space. The API will use this space to return the table space data.

pNumTablespaces
Output. Number of rows of output returned.

Usage notes

The user is responsible for allocating and freeing the memory pointed to by the pTablespaceData parameter. This API can only be used after a successful sqlbotsq call. It can be invoked repeatedly to fetch the list generated by sqlbotsq.

sqlbgtss - Get table space usage statistics

Provides information on the space utilization of a table space.

Scope

In a partitioned database environment, only the table spaces on the current database partition are listed.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm
- load

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbgtss (
   struct sqlca * pSqlca,
   sqluint32 TablespaceId,
   struct SQLB_TBS_STATS * pTablespaceStats);

SQL_API_RC SQL_API_FN
  sqlggtss (
   struct sqlca * pSqlca,
   sqluint32 TablespaceId,
   struct SQLB_TBS_STATS * pTablespaceStats);
```

sqlbgtss API parameters

pSqlca
Output. A pointer to the sqlca structure.

TablespaceId
Input. ID of the single table space to be queried.

pTablespaceStats
Output. A pointer to a user-allocated SQLB_TBS_STATS structure. The information about the table space is returned in this structure.

Usage notes

See SQLB-TBS-STATS for information about the fields returned and their meaning.

sqlbmtsq - Get the query data for all table spaces

Provides a one-call interface to the table space query data. The query data for all table spaces in the database is returned in an array.

Scope

In a partitioned database environment, only the table spaces on the current database partition are listed.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm
- load

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbmtsq (
   struct sqlca * pSqlca,
   sqluint32 * pNumTablespaces,
   struct SQLB_TBSPQRY_DATA *** pppTablespaceData,
   sqluint32 reserved1,
   sqluint32 reserved2);

SQL_API_RC SQL_API_FN
  sqlgmtsq (
   struct sqlca * pSqlca,
   sqluint32 * pNumTablespaces,
   struct SQLB_TBSPQRY_DATA *** pppTablespaceData,
   sqluint32 reserved1,
   sqluint32 reserved2);
```

sqlbmtsq API parameters

pSqlca
Output. A pointer to the sqlca structure.

pNumTablespaces
Output. The total number of table spaces in the connected database.

pppTablespaceData
Output. The caller supplies the API with the address of a pointer. The space for the table space query data is allocated by the API, and a pointer to that space is returned to the caller. On return from the call, the pointer points to an array of SQLB_TBSPQRY_DATA pointers to the complete set of table space query data.

reserved1
Input. Always SQLB_RESERVED1.

reserved2
Input. Always SQLB_RESERVED2.

Usage notes

This API uses the lower level services, namely:

- sqlbotsq
- sqlbftpq

- sqlbctsq

to get all of the table space query data at once.

If sufficient memory is available, this function returns the number of table spaces, and a pointer to the memory location of the table space query data. It is the user's responsibility to free this memory with a call to sqlefmem.

If sufficient memory is not available, this function simply returns the number of table spaces, and no memory is allocated. If this should happen, use sqlbotsq, sqlbftpq, and sqlbctsq, to fetch less than the whole list at once.

sqlbotcq - Open a table space container query

Prepares for a table space container query operation, and returns the number of containers currently in the table space.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbotcq (
   struct sqlca * pSqlca,
   sqluint32 TablespaceId,
   sqluint32 * pNumContainers);

SQL_API_RC SQL_API_FN
  sqlgotcq (
   struct sqlca * pSqlca,
   sqluint32 TablespaceId,
   sqluint32 * pNumContainers);
```

sqlbotcq API parameters

pSqlca
Output. A pointer to the sqlca structure.

TablespaceId
Input. ID of the table space for which container data is desired. If the special identifier SQLB_ALL_TABLESPACES (in sqlutil.h) is specified, a complete list of containers for the entire database is produced.

pNumContainers
Output. The number of containers in the specified table space.

Usage notes

This API is normally followed by one or more calls to sqlbftcq, and then by one call to sqlbctcq.

An application can use the following APIs to fetch information about containers in use by table spaces:

- sqlbtcq

  Fetches a complete list of container information. The API allocates the space required to hold the information for all the containers, and returns a pointer to this information. Use this API to scan the list of containers for specific information. Using this API is identical to calling the three APIs below (sqlbotcq, sqlbftcq, sqlbctcq), except that this API automatically allocates the memory for the output information. A call to this API must be followed by a call to sqlefmem to free the memory.
- sqlbotcq
- sqlbftcq
- sqlbctcq

  These three APIs function like an SQL cursor, in that they use the OPEN/FETCH/CLOSE paradigm. The caller must provide the output area for the fetch. Unlike an SQL cursor, only one table space container query can be active at a time. Use this set of APIs to scan the list of table space containers for specific information. These APIs allows the user to control the memory requirements of an application (compared with sqlbtcq).

When sqlbotcq is called, a snapshot of the current container information is formed in the agent servicing the application. If the application issues a second table space container query call (sqlbtcq or sqlbotcq), this snapshot is replaced with refreshed information.

No locking is performed, so the information in the buffer may not reflect changes made by another application after the snapshot was generated. The information is not part of a transaction.

There is one snapshot buffer for table space queries and another for table space container queries. These buffers are independent of one another.

sqlbotsq - Open a table space query

Prepares for a table space query operation, and returns the number of table spaces currently in the database.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm
- load

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbotsq (
   struct sqlca * pSqlca,
   sqluint32 TablespaceQueryOptions,
   sqluint32 * pNumTablespaces);

SQL_API_RC SQL_API_FN
  sqlgotsq (
   struct sqlca * pSqlca,
   sqluint32 TablespaceQueryOptions,
   sqluint32 * pNumTablespaces);
```

sqlbotsq API parameters

pSqlca
Output. A pointer to the sqlca structure.

TablespaceQueryOptions
Input. Indicates which table spaces to process. Valid values (defined in sqlutil) are:

SQLB_OPEN_TBS_ALL
Process all the table spaces in the database.

SQLB_OPEN_TBS_RESTORE
Process only the table spaces that the user's agent is restoring.

pNumTablespaces
Output. The number of table spaces in the connected database.

Usage notes

This API is normally followed by one or more calls to sqlbftpq, and then by one call to sqlbctsq.

An application can use the following APIs to fetch information about the currently defined table spaces:

- sqlbstpq

  Fetches information about a given table space. Only one table space entry is returned (into a space provided by the caller). Use this API when the table space identifier is known, and information about only that table space is desired.
- sqlbmtsq

  Fetches information about all table spaces. The API allocates the space required to hold the information for all table spaces, and returns a pointer to this information. Use this API to scan the list of table spaces when searching for specific information. Using this API is identical to calling the three APIs below, except that this API automatically allocates the memory for the output information. A call to this API must be followed by a call to sqlefmem to free the memory.
- sqlbotsq

- sqlbftpq
- sqlbctsq

  These three APIs function like an SQL cursor, in that they use the OPEN/FETCH/CLOSE paradigm. The caller must provide the output area for the fetch. Unlike an SQL cursor, only one table space query may be active at a time. Use this set of APIs to scan the list of table spaces when searching for specific information. This set of APIs allows the user to control the memory requirements of an application (compared with sqlbmtsq).

When sqlbotsq is called, a snapshot of the current table space information is buffered in the agent servicing the application. If the application issues a second table space query call (sqlbmtsq or sqlbotsq), this snapshot is replaced with refreshed information.

No locking is performed, so the information in the buffer may not reflect more recent changes made by another application. The information is not part of a transaction.

There is one snapshot buffer for table space queries and another for table space container queries. These buffers are independent of one another.

sqlbstpq - Get information about a single table space

Retrieves information about a single currently defined table space.

Scope

In a partitioned database environment, only the table spaces on the current database partition are listed.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm
- load

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbstpq (
   struct sqlca * pSqlca,
   sqluint32 TablespaceId,
   struct SQLB_TBSPQRY_DATA * pTablespaceData,
   sqluint32 reserved);
```

```
SQL_API_RC SQL_API_FN
  sqlgstpq (
   struct sqlca * pSqlca,
   sqluint32 TablespaceId,
   struct SQLB_TBSPQRY_DATA * pTablespaceData,
   sqluint32 reserved);
```

sqlbstpq API parameters

pSqlca
Output. A pointer to the sqlca structure.

TablespaceId
Input. Identifier for the table space which is to be queried.

pTablespaceData
Input and output. Pointer to a user-supplied SQLB_TBSPQRY_DATA structure where the table space information will be placed upon return. The caller of this API must initialize the structure and set TBSPQVER to SQLB_TBSPQRY_DATA_ID (in sqlutil).

reserved
Input. Always SQLB_RESERVED1.

Usage notes

This API retrieves information about a single table space if the table space identifier to be queried is known. This API provides an alternative to the more expensive OPEN TABLESPACE QUERY, FETCH, and CLOSE combination of APIs, which must be used to scan for the desired table space when the table space identifier is not known in advance. The table space IDs can be found in the system catalogs. No agent snapshot is taken; since there is only one entry to return, it is returned directly.

sqlbstsc - Set table space containers

This API facilitates the provision of a redirected restore, in which the user is restoring a database, and a different set of operating system storage containers is desired or required. Use this API when the table space is in a storage definition pending or a storage definition allowed state. These states are possible during a restore operation, immediately prior to the restoration of database pages.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

Database

API include file

`sqlutil.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbstsc (
   struct sqlca * pSqlca,
   sqluint32 SetContainerOptions,
   sqluint32 TablespaceId,
   sqluint32 NumContainers,
   struct SQLB_TBSCONTQRY_DATA * pContainerData);

SQL_API_RC SQL_API_FN
  sqlgstsc (
   struct sqlca * pSqlca,
   sqluint32 SetContainerOptions,
   sqluint32 TablespaceId,
   sqluint32 NumContainers,
   struct SQLB_TBSCONTQRY_DATA * pContainerData);
```

sqlbstsc API parameters

pSqlca
Output. A pointer to the sqlca structure.

SetContainerOptions
Input. Use this field to specify additional options. Valid values (defined in sqlutil) are:

SQLB_SET_CONT_INIT_STATE
Redo alter table space operations when performing a roll forward.

SQLB_SET_CONT_FINAL_STATE
Ignore alter table space operations in the log when performing a roll forward.

TablespaceId
Input. Identifier for the table space which is to be changed.

NumContainers
Input. The number of rows the structure pointed to by pContainerData holds.

pContainerData
Input. Container specifications. Although the SQLB_TBSCONTQRY_DATA structure is used, only the contType, totalPages, name, and nameLen (for languages other than C) fields are used; all other fields are ignored.

Usage notes

This API is used in conjunction with db2Restore.

A backup of a database, or one or more table spaces, keeps a record of all the table space containers in use by the table spaces being backed up. During a restore, all containers listed in the backup are checked to see if they currently exist and are accessible. If one or more of the containers is inaccessible for any reason, the restore will fail. In order to allow a restore in such a case, the redirecting of table space containers is supported during the restore. This support includes adding, changing, or removing of table space containers. It is this API that allows the user to add, change or remove those containers.

Typical use of this API would involve the following sequence of actions:

1. Invoke db2Restore with CallerAction set to DB2RESTORE_RESTORE_STORDEF. The restore utility returns an sqlcode indicating that some of the containers are inaccessible.
2. Invoke sqlbstsc to set the table space container definitions with the SetContainerOptions parameter set to SQLB_SET_CONT_FINAL_STATE.
3. Invoke db2Restore a second time with CallerAction set to DB2RESTORE_CONTINUE.

The above sequence will allow the restore to use the new table space container definitions and will ignore table space add container operations in the logs when db2Rollforward is called after the restore is complete.

The user of this API should be aware that when setting the container list, there must be sufficient disk space to allow for the restore or rollforward operation to replace all of the original data into these new containers. If there is not sufficient space, such table spaces will be left in the recovery pending state until sufficient disk space is made available. A prudent Database Administrator will keep records of disk utilization on a regular basis. Then, when a restore or rollforward operation is needed, the required disk space will be known.

sqlbtcq - Get the query data for all table space containers

Provides a one-call interface to the table space container query data. The query data for all containers in a table space, or for all containers in all table spaces, is returned in an array.

Scope

In a partitioned database environment, only the table spaces on the current database partition are listed.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlbtcq (
   struct sqlca * pSqlca,
   sqluint32 TablespaceId,
   sqluint32 * pNumContainers,
   struct SQLB_TBSCONTQRY_DATA ** ppContainerData);

SQL_API_RC SQL_API_FN
```

```
sqlgtcq (
 struct sqlca * pSqlca,
 sqluint32 TablespaceId,
 sqluint32 * pNumContainers,
 struct SQLB_TBSCONTQRY_DATA ** ppContainerData);
```

sqlbtcq API parameters

pSqlca
Output. A pointer to the sqlca structure.

TablespaceId
Input. ID of the table space for which container data is desired, or a special ID, SQLB_ALL_TABLESPACES (defined in sqlutil), which produces a list of all containers for the entire database.

pNumContainers
Output. The number of containers in the table space.

ppContainerData
Output. The caller supplies the API with the address of a pointer to a SQLB_TBSCONTQRY_DATA structure. The space for the table space container query data is allocated by the API, and a pointer to that space is returned to the caller. On return from the call, the pointer to the SQLB_TBSCONTQRY_DATA structure points to the complete set of table space container query data.

Usage notes

This API uses the lower level services, namely:

- sqlbotcq
- sqlbftcq
- sqlbctcq

to get all of the table space container query data at once.

If sufficient memory is available, this function returns the number of containers, and a pointer to the memory location of the table space container query data. It is the user's responsibility to free this memory with a call to sqlefmem. If sufficient memory is not available, this function simply returns the number of containers, and no memory is allocated. If this should happen, use sqlbotcq, sqlbftcq, and sqlbctcq to fetch less than the whole list at once.

sqlcspqy - List DRDA indoubt transactions

Provides a list of transactions that are indoubt between the syncpoint manager partner connections. This API is being deprecated. Please see 'db2SpmListIndTrans API - List SPM Indoubt Transactions'.

Authorization

None

Required connection

Instance

API include file

```
sqlxa.h
```

API and data structure syntax

```
extern int SQL_API_FN sqlcspqy(SQLCSPQY_INDOUBT     **indoubt_data,
                               sqlint32 *indoubt_count,
                               struct sqlca *sqlca);
```

sqlcspqy API parameters

indoubt_data
Output. A pointer to the returned array.

indoubt_count
Output. The number of elements in the returned array.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

DRDA indoubt transactions occur when communication is lost between coordinators and participants in distributed units of work.

A distributed unit of work lets a user or application read and update data at multiple locations within a single unit of work. Such work requires a two-phase commit.

The first phase requests all the participants to prepare for commit. The second phase commits or rolls back the transactions. If a coordinator or participant becomes unavailable after the first phase then the distributed transactions are indoubt.

Before issuing the LIST DRDA INDOUBT TRANSACTIONS command, the application process must be connected to the Sync Point Manager (SPM) instance. Use the spm_name database manager configuration parameter as the dbalias on the CONNECT statement.

sqle_activate_db - Activate database

Activates the specified database and starts up all necessary database services, so that the database is available for connection and use by any application.

Scope

This API activates the specified database on all database partition servers. If one or more of these database partition servers encounters an error during activation of the database, a warning is returned. The database remains activated on all database partition servers on which the API has succeeded.

Note: If it is the coordinator partition or the catalog partition that encounters the error, the API returns a negative sqlcode, and the database will not be activated on any database partition server.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

None. Applications invoking ACTIVATE DATABASE cannot have any existing database connections.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqle_activate_db (
        char * pDbAlias,
        char * pUserName,
        char * pPassword,
        void * pReserved,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlg_activate_db (
        unsigned short DbAliasLen,
        unsigned short UserNameLen,
        unsigned short PasswordLen,
        char * pDbAlias,
        char * pUserName,
        char * pPassword,
        void * pReserved,
        struct sqlca * pSqlca);
```

sqle_activate_db API parameters

pDbAlias
Input. Pointer to the database alias name.

pUserName
Input. Pointer to the user ID starting the database. Can be NULL.

pPassword
Input. Pointer to the password for the user name. Can be NULL, but must be specified if a user name is specified.

pReserved
Reserved for future use.

pSqlca
Output. A pointer to the sqlca structure.

sqlg_activate_db API-specific parameters

DbAliasLen
Input. A 2-byte unsigned integer representing the length of the database alias name in bytes.

UserNameLen
Input. A 2-byte unsigned integer representing the length of the user name in bytes. Set to zero if no user name is supplied.

PasswordLen
Input. A 2-byte unsigned integer representing the length of the password in bytes. Set to zero if no password is supplied.

Usage notes

If a database has not been started, and a DB2 CONNECT TO (or an implicit connect) is encountered in an application, the application must wait while the database manager starts up the required database. In such cases, this first application spends time on database initialization before it can do any work. However, once the first application has started a database, other applications can simply connect and use it.

Database administrators can use ACTIVATE DATABASE to start up selected databases. This eliminates any application time spent on database initialization.

Databases initialized by ACTIVATE DATABASE can only be shut down by sqle_deactivate_db, or by db2InstanceStop. To obtain a list of activated databases, call db2GetSnapshot.

If a database was started by a DB2 CONNECT TO (or an implicit connect) and subsequently an ACTIVATE DATABASE is issued for that same database, then DEACTIVATE DATABASE must be used to shut down that database.

ACTIVATE DATABASE behaves in a similar manner to a DB2 CONNECT TO (or an implicit connect) when working with a database requiring a restart (for example, database in an inconsistent state). The database will be restarted before it can be initialized by ACTIVATE DATABASE.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqle_deactivate_db - Deactivate database

Stops the specified database.

Scope

In a partitioned database environment, this API deactivates the specified database on all database partition servers. If one or more of these database partition servers encounters an error, a warning is returned. The database will be successfully deactivated on some database partition servers, but may remain activated on the database partition servers encountering the error.

Note: If it is the coordinator partition or the catalog partition that encounters the error, the API returns a negative sqlcode, and the database will not be reactivated on any database partition server on which it was deactivated.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

None. Applications invoking DEACTIVATE DATABASE cannot have any existing database connections.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqle_deactivate_db (
        char * pDbAlias,
        char * pUserName,
        char * pPassword,
        void * pReserved,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlg_deactivate_db (
        unsigned short DbAliasLen,
        unsigned short UserNameLen,
        unsigned short PasswordLen,
        char * pDbAlias,
        char * pUserName,
        char * pPassword,
        void * pReserved,
        struct sqlca * pSqlca);
```

sqle_deactivate_db API parameters

pDbAlias
Input. Pointer to the database alias name.

pUserName
Input. Pointer to the user ID stopping the database. Can be NULL.

pPassword
Input. Pointer to the password for the user name. Can be NULL, but must be specified if a user name is specified.

pReserved
Reserved for future use.

pSqlca
Output. A pointer to the sqlca structure.

sqlg_deactivate_db API-specific parameters

DbAliasLen
Input. A 2-byte unsigned integer representing the length of the database alias name in bytes.

UserNameLen
Input. A 2-byte unsigned integer representing the length of the user name in bytes. Set to zero if no user name is supplied.

PasswordLen
Input. A 2-byte unsigned integer representing the length of the password in bytes. Set to zero if no password is supplied.

Usage notes

Databases initialized by ACTIVATE DATABASE can only be shut down by DEACTIVATE DATABASE. db2InstanceStop automatically stops all activated databases before stopping the database manager. If a database was initialized by ACTIVATE DATABASE, the last DB2 CONNECT RESET statement (counter equal 0) will not shut down the database; DEACTIVATE DATABASE must be used.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqleaddn - Add a database partition server to the partitioned database environment

Adds a new database partition server to the partitioned database environment. This API creates database partitions for all databases currently defined in the instance on the new database partition server. The user can specify the source database partition server for any system temporary table spaces to be created with the databases, or specify that no system temporary table spaces are to be created. The API must be issued from the database partition server that is being added, and can only be issued on a database partition server.

Scope

This API only affects the database partition server on which it is executed.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

`sqlenv.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleaddn (
        void * pAddNodeOptions,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
```

```
sqlgaddn (
      unsigned short addnOptionsLen,
      struct sqlca * pSqlca,
      void * pAddNodeOptions);
```

sqleaddn API parameters

pAddNodeOptions
Input. A pointer to the optional sqle_addn_options structure. This structure is used to specify the source database partition server, if any, of the system temporary table space definitions for all database partitions created during the add node operation. If not specified (that is, a NULL pointer is specified), the system temporary table space definitions will be the same as those for the catalog partition.

pSqlca
Output. A pointer to the sqlca structure.

sqlgaddn API-specific parameters

addnOptionsLen
Input. A 2-byte unsigned integer representing the length of the optional sqle_addn_options structure in bytes.

Usage notes

Before adding a new database partition server, ensure that there is sufficient storage for the containers that must be created for all existing databases on the system.

The add node operation creates an empty database partition on the new database partition server for every database that exists in the instance. The configuration parameters for the new database partitions are set to the default value.

If an add node operation fails while creating a database partition locally, it enters a clean-up phase, in which it locally drops all databases that have been created. This means that the database partitions are removed only from the database partition server being added (that is, the local database partition server). Existing database partitions remain unaffected on all other database partition servers. If this fails, no further clean up is done, and an error is returned.

The database partitions on the new database partition server cannot be used to contain user data until after the ALTER DATABASE PARTITION GROUP statement has been used to add the database partition server to a database partition group.

This API will fail if a create database or a drop database operation is in progress. The API can be called again once the operation has completed.

This API will fail if at any time in a database in the system a user table with an XML column had been, successfully or not, created or an XSR object had been, successfully or not, registered.

To determine whether or not a database is enabled for automatic storage, the sqleaddn API has to communicate with the catalog partition for each of the databases in the instance. If automatic storage is enabled then the storage path definitions are retrieved as part of that communication. Likewise, if system temporary table spaces are to be created with the database partitions, the sqleaddn API may have to communicate with another database partition server in the

partitioned database environment in order to retrieve the table space definitions. The start_stop_time database manager configuration parameter is used to specify the time, in minutes, by which the other database partition server must respond with the automatic storage and table space definitions. If this time is exceeded, the API fails. Increase the value of start_stop_time, and call the API again.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqleatcp - Attach to instance and change password

Enables an application to specify the node at which instance-level functions (CREATE DATABASE and FORCE APPLICATION, for example) are to be executed. This node may be the current instance (as defined by the value of the DB2INSTANCE environment variable), another instance on the same workstation, or an instance on a remote workstation. Establishes a logical instance attachment to the node specified, and starts a physical communications connection to the node if one does not already exist.

Note: This API extends the function of the sqleatin API by permitting the optional change of the user password for the instance being attached. The DB2 database system provides support for changing passwords on AIX, Linux and Windows operating systems.

Authorization

None

Required connection

This API establishes an instance attachment.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleatcp (
        char * pNodeName,
        char * pUserName,
        char * pPassword,
        char * pNewPassword,
        struct sqlca * pSqlca);
```

sqleatcp API parameters

pNodeName
Input. A string containing the alias of the instance to which the user wants to attach. This instance must have a matching entry in the local node directory. The only exception is the local instance (as specified by the DB2INSTANCE environment variable), which can be specified as the object of an attachment, but cannot be used as a node name in the node directory. May be NULL.

pUserName
Input. A string containing the user name under which the attachment is to be authenticated. May be NULL.

pPassword
Input. A string containing the password for the specified user name. May be NULL.

pNewPassword
Input. A string containing the new password for the specified user name. Set to NULL if a password change is not required.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

A node name in the node directory can be regarded as an alias for an instance.

If an attach request succeeds, the sqlerrmc field of the sqlca will contain 9 tokens separated by hexadecimal FF (similar to the tokens returned when a CONNECT request is successful):

1. Country/region code of the application server
2. Code page of the application server
3. Authorization ID
4. Node name (as specified on the API)
5. Identity and platform type of the server
6. Agent ID of the agent which has been started at the server
7. Agent index
8. Node number of the server
9. Number of database partitions if the server is a partitioned database server.

If the node name is a zero-length string or NULL, information about the current state of attachment is returned. If no attachment exists, sqlcode 1427 is returned. Otherwise, information about the attachment is returned in the sqlerrmc field of the sqlca (as outlined above).

If an attachment has not been made, instance-level APIs are executed against the current instance, specified by the DB2INSTANCE environment variable.

Certain functions (db2start, db2stop, and all directory services, for example) are never executed remotely. That is, they affect only the local instance environment, as defined by the value of the DB2INSTANCE environment variable.

If an attachment exists, and the API is issued with a node name, the current attachment is dropped, and an attachment to the new node is attempted.

Where the user name and password are authenticated, and where the password is changed, depend on the authentication type of the target instance.

The node to which an attachment is to be made can also be specified by a call to the sqlesetc API.

REXX API syntax

Calling this API directly from REXX is not supported. However, REXX programmers can utilize this function by calling the DB2 command line processor to execute the ATTACH command.

sqleatin - Attach to instance

Enables an application to specify the node at which instance-level functions (CREATE DATABASE and FORCE APPLICATION, for example) are to be executed. This node may be the current instance (as defined by the value of the DB2INSTANCE environment variable), another instance on the same workstation, or an instance on a remote workstation. Establishes a logical instance attachment to the node specified, and starts a physical communications connection to the node if one does not already exist.

Note: If a password change is required, use the sqleatcp API instead of the sqleatin API.

Authorization

None

Required connection

This API establishes an instance attachment.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleatin (
        char * pNodeName,
        char * pUserName,
        char * pPassword,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgatin (
        unsigned short PasswordLen,
        unsigned short UserNameLen,
        unsigned short NodeNameLen,
        struct sqlca * pSqlca,
        char * pPassword,
        char * pUserName,
        char * pNodeName);
```

sqleatin API parameters

pNodeName
Input. A string containing the alias of the instance to which the user wants to attach. This instance must have a matching entry in the local node directory. The only exception is the local instance (as specified by the DB2INSTANCE environment variable), which can be specified as the object of an attachment, but cannot be used as a node name in the node directory. Can be NULL.

pUserName
Input. A string containing the user name under which the attachment is to be authenticated. Can be NULL.

pPassword
Input. A string containing the password for the specified user name. Can be NULL.

pSqlca
Output. A pointer to the sqlca structure.

sqlgatin API-specific parameters

PasswordLen
Input. A 2-byte unsigned integer representing the length of the password in bytes. Set to zero if no password is supplied.

UserNameLen
Input. A 2-byte unsigned integer representing the length of the user name in bytes. Set to zero if no user name is supplied.

NodeNameLen
Input. A 2-byte unsigned integer representing the length of the node name in bytes. Set to zero if no node name is supplied.

Usage notes

Note: A node name in the node directory can be regarded as an alias for an instance.

If an attach request succeeds, the sqlerrmc field of the sqlca will contain 9 tokens separated by hexadecimal FF (similar to the tokens returned when a CONNECT request is successful):

1. Country/region code of the application server
2. Code page of the application server
3. Authorization ID
4. Node name (as specified on the API)
5. Identity and platform type of the server
6. Agent ID of the agent which has been started at the server
7. Agent index
8. Node number of the server
9. Number of database partitions if the server is a partitioned database server.

If the node name is a zero-length string or NULL, information about the current state of attachment is returned. If no attachment exists, sqlcode 1427 is returned. Otherwise, information about the attachment is returned in the sqlerrmc field of the sqlca (as outlined above).

If an attachment has not been made, instance-level APIs are executed against the current instance, specified by the DB2INSTANCE environment variable.

Certain functions (db2start, db2stop, and all directory services, for example) are never executed remotely. That is, they affect only the local instance environment, as defined by the value of the DB2INSTANCE environment variable.

If an attachment exists, and the API is issued with a node name, the current attachment is dropped, and an attachment to the new node is attempted.

Where the user name and password are authenticated depends on the authentication type of the target instance.

The node to which an attachment is to be made can also be specified by a call to the sqlesetc API.

REXX API syntax

```
ATTACH [TO nodename [USER username USING password]]
```

REXX API parameters

nodename
Alias of the instance to which the user wants to attach. This instance must have a matching entry in the local node directory. The only exception is the local instance (as specified by the DB2INSTANCE environment variable), which can be specified as the object of an attachment, but cannot be used as a node name in the node directory.

username
Name under which the user attaches to the instance.

password
Password used to authenticate the user name.

sqlecadb - Catalog a database in the system database directory

Stores database location information in the system database directory. The database can be located either on the local workstation or on a remote database partition server.

Scope

This API affects the system database directory. In a partitioned database environment, when cataloging a local database into the system database directory, this API must be called from a database partition server where the database resides.

Authorization

One of the following:

- SYSADM
- SYSCTRL

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlecadb (
        _SQLOLDCHAR * pDbName,
```

```
        _SQLOLDCHAR * pDbAlias,
        unsigned char Type,
        _SQLOLDCHAR * pNodeName,
        _SQLOLDCHAR * pPath,
        _SQLOLDCHAR * pComment,
        unsigned short Authentication,
        _SQLOLDCHAR * pPrincipal,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgcadb (
        unsigned short PrinLen,
        unsigned short CommentLen,
        unsigned short PathLen,
        unsigned short NodeNameLen,
        unsigned short DbAliasLen,
        unsigned short DbNameLen,
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pPrinName,
        unsigned short Authentication,
        _SQLOLDCHAR * pComment,
        _SQLOLDCHAR * pPath,
        _SQLOLDCHAR * pNodeName,
        unsigned char Type,
        _SQLOLDCHAR * pDbAlias,
        _SQLOLDCHAR * pDbName);
```

sqlecadb API parameters

pDbName
Input. A string containing the database name.

pDbAlias
Input. A string containing an alias for the database.

Type Input. A single character that designates whether the database is indirect, remote, or is cataloged via DCE. Valid values (defined in sqlenv.h) are:

SQL_INDIRECT
Specifies that the database resides at this instance.

SQL_REMOTE
Specifies that the database resides at another instance.

SQL_DCE
Specifies that the database is cataloged via DCE.

pNodeName
Input. A string containing the name of the database partition server where the database is located. May be NULL.

Note: If neither **pPath** nor **pNodeName** is specified, the database is assumed to be local, and the location of the database is assumed to be that specified in the database manager configuration parameter **dftdbpath**.

pPath

Input. A string which, on Linux and UNIX systems, specifies the name of the path on which the database being cataloged resides. Maximum length is 215 characters.

On the Windows operating system, this string specifies the letter of the drive on which the database being cataloged resides.

If a NULL pointer is provided, the default database path is assumed to be that specified by the database manager configuration parameter **dftdbpath**.

pComment

Input. A string containing an optional description of the database. A null string indicates no comment. The maximum length of a comment string is 30 characters.

Authentication

Input. Contains the authentication type specified for the database. Authentication is a process that verifies that the user is who he/she claims to be. Access to database objects depends on the user's authentication. Valid values (from sqlenv.h) are:

SQL_AUTHENTICATION_SERVER
Specifies that authentication takes place on the database partition server containing the target database.

SQL_AUTHENTICATION_CLIENT
Specifies that authentication takes place on the database partition server where the application is invoked.

SQL_AUTHENTICATION_KERBEROS
Specifies that authentication takes place using Kerberos Security Mechanism.

SQL_AUTHENTICATION_NOT_SPECIFIED
Authentication not specified.

SQL_AUTHENTICATION_SVR_ENCRYPT
Specifies that authentication takes place on the database partition server containing the target database, and that the authentication password is to be encrypted.

SQL_AUTHENTICATION_DATAENC
Specifies that authentication takes place on the database partition server containing the target database, and that connections must use data encryption.

SQL_AUTHENTICATION_GSSPLUGIN
Specifies that authentication takes place using an external GSS API-based plug-in security mechanism.

SQL_AUTHENTICATION_SVRENC_AESO
Specifies that authentication takes place on the database partition server containing the target database, and that the authentication userid and password are to be encrypted using an Advanced Encryption Standard (AES) encryption algorithm. This authentication type is available as of DB2 Version 9.5 Fix Pack 3.

This parameter can be set to SQL_AUTHENTICATION_NOT_SPECIFIED, except when cataloging a database that resides on a DB2 Version 1 server.

Specifying the authentication type in the database catalog results in a performance improvement during a connect.

pPrincipal

Input. A string containing the principal name of the DB2 server on which the database resides. This value should only be specified when **authentication** is SQL_AUTHENTICATION_KERBEROS.

pSqlca

Output. A pointer to the sqlca structure.

sqlgcadb API-specific parameters

PrinLen
Input. A 2-byte unsigned integer representing the length in bytes of the principal name. Set to zero if no principal is provided. This value should be nonzero only when **authentication** is specified as SQL_AUTHENTICATION_KERBEROS.

CommentLen
Input. A 2-byte unsigned integer representing the length in bytes of the comment. Set to 0 if no comment is provided.

PathLen
Input. A 2-byte unsigned integer representing the length in bytes of the path of the local database directory. Set to 0 if no path is provided.

NodeNameLen
Input. A 2-byte unsigned integer representing the length in bytes of the node name. Set to 0 if no node name is provided.

DbAliasLen
Input. A 2-byte unsigned integer representing the length in bytes of the database alias.

DbNameLen
Input. A 2-byte unsigned integer representing the length in bytes of the database name.

pPrinName
Input. A string containing the principal name of the DB2 server on which the database resides. This value should only be specified when **authentication** is SQL_AUTHENTICATION_KERBEROS.

Usage notes

Use CATALOG DATABASE to catalog databases located on local or remote nodes, recatalog databases that were uncataloged previously, or maintain multiple aliases for one database (regardless of database location).

DB2 automatically catalogs databases when they are created. It catalogs an entry for the database in the local database directory, and another entry in the system database directory. If the database is created from a remote client (or a client which is executing from a different instance on the same machine), an entry is also made in the system database directory at the client instance.

Databases created at the current instance (as defined by the value of the **DB2INSTANCE** environment variable) are cataloged as indirect. Databases created at other instances are cataloged as remote (even if they physically reside on the same machine).

CATALOG DATABASE automatically creates a system database directory if one does not exist. The system database directory is stored on the path that contains the database manager instance that is being used. The system database directory is maintained outside of the database. Each entry in the directory contains:

- Alias
- Authentication type
- Comment
- Database

- Entry type
- Local database directory (when cataloging a local database)
- Node name (when cataloging a remote database)
- Release information

If a database is cataloged with the **type** parameter set to SQL_INDIRECT, the value of the **authentication** parameter provided will be ignored, and the authentication in the directory will be set to SQL_AUTHENTICATION_NOT_SPECIFIED.

If directory caching is enabled, database, node, and DCS directory files are cached in memory. An application's directory cache is created during its first directory lookup. Since the cache is only refreshed when the application modifies any of the directory files, directory changes made by other applications may not be effective until the application has restarted. To refresh DB2's shared cache (server only), stop (db2stop) and then restart (db2start) the database manager. To refresh the directory cache for another application, stop and then restart that application.

REXX API syntax

```
CATALOG DATABASE dbname [AS alias] [ON path|AT NODE nodename]
[AUTHENTICATION authentication] [WITH "comment"]
CATALOG GLOBAL DATABASE db_global_name AS alias
USING DIRECTORY {DCE} [WITH "comment"]
```

REXX API parameters

dbname
Name of the database to be cataloged.

alias Alternate name for the database. If an alias is not specified, the database name is used as the alias.

path Path on which the database being cataloged resides.

nodename
Name of the remote workstation where the database being cataloged resides.

Note: If neither **path** nor **nodename** is specified, the database is assumed to be local, and the location of the database is assumed to be that specified in the database manager configuration parameter **dftdbpath**.

authentication
Place where authentication is to be done. Valid values are:

SERVER
Authentication occurs at the database partition server containing the target database. This is the default.

CLIENT
Authentication occurs at the database partition server where the application is invoked.

KERBEROS
Specifies that authentication takes place using Kerberos Security Mechanism.

NOT_SPECIFIED
Authentication not specified.

SVR_ENCRYPT
Specifies that authentication takes place on the database partition

server containing the target database, and that the authentication userid and password are to be encrypted.

DATAENC
Specifies that authentication takes place on the database partition server containing the target database, and that connections must use data encryption.

GSSPLUGIN
Specifies that authentication takes place using an external GSS API-based plug-in security mechanism.

SQL_AUTHENTICATION_SVRENC_AESO
Specifies that authentication takes place on the database partition server containing the target database, and that the authentication userid and password are to be encrypted using an AES encryption algorithm.

comment
Describes the database or the database entry in the system database directory. The maximum length of a comment string is 30 characters. A carriage return or a line feed character is not permitted. The comment text must be enclosed by double quotation marks.

db_global_name
The fully qualified name that uniquely identifies the database in the DCE name space.

DCE The global directory service being used.

REXX examples

```
call SQLDBS 'CATALOG GLOBAL DATABASE /.../cell1/subsys/database/DB3
AS dbtest USING DIRECTORY DCE WITH "Sample Database"'
```

sqlecran - Create a database on a database partition server

Creates a database only on the database partition server that calls the API. This API is not intended for general use. For example, it should be used with db2Restore if the database partition at a database partition server was damaged and must be recreated. Improper use of this API can cause inconsistencies in the system, so it should only be used with caution.

Note: If this API is used to recreate a database partition that was dropped (because it was damaged), the database at this database partition server will be in the restore-pending state. After recreating the database partition, the database must immediately be restored on this database partition server.

Scope

This API only affects the database partition server on which it is called.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

Instance. To create a database at another database partition server, it is necessary to first attach to that database partition server. A database connection is temporarily established by this API during processing.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlecran (
        char * pDbName,
        void * pReserved,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgcran (
        unsigned short reservedLen,
        unsigned short dbNameLen,
        struct sqlca * pSqlca,
        void * pReserved,
        char * pDbName);
```

sqlecran API parameters

pDbName
Input. A string containing the name of the database to be created. Must not be NULL.

pReserved
Input. A spare pointer that is set to null or points to zero. Reserved for future use.

pSqlca
Output. A pointer to the sqlca structure.

sqlgcran API-specific parameters

reservedLen
Input. Reserved for the length of pReserved.

dbNameLen
Input. A 2-byte unsigned integer representing the length of the database name in bytes.

Usage notes

When the database is successfully created, it is placed in restore-pending state. The database must be restored on this database partition server before it can be used.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqlecrea - Create database

Initializes a new database with an optional user-defined collating sequence, creates the three initial table spaces, creates the system tables, and allocates the recovery log.

Scope

In a partitioned database environment, this API affects all database partition servers that are listed in the db2nodes.cfg file.

The database partition server from which this API is called becomes the catalog partition for the new database.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

Instance. To create a database at another (remote) node, it is necessary to first attach to that node. A database connection is temporarily established by this API during processing.

API include file

sqlenv.h

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlecrea (
        char * pDbName,
        char * pLocalDbAlias,
        char * pPath,
        struct sqledbdesc * pDbDescriptor,
        SQLEDBTERRITORYINFO * pTerritoryInfo,
        char Reserved2,
        void * pDbDescriptorExt,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgcrea (
        unsigned short PathLen,
        unsigned short LocalDbAliasLen,
        unsigned short DbNameLen,
        struct sqlca * pSqlca,
        void * pReserved1,
        unsigned short Reserved2,
        SQLEDBTERRITORYINFO * pTerritoryInfo,
        struct sqledbdesc * pDbDescriptor,
        char * pPath,
        char * pLocalDbAlias,
        char * pDbName);
```

sqlecrea API parameters

pDbName
Input. A string containing the database name. This is the database name

that will be cataloged in the system database directory. Once the database has been successfully created in the server's system database directory, it is automatically cataloged in the system database directory with a database alias identical to the database name. Must not be NULL.

pLocalDbAlias
Input. A string containing the alias to be placed in the client's system database directory. Can be NULL. If no local alias is specified, the database name is the default.

pPath Input. On Linux and UNIX systems, specifies the path on which to create the database. If a path is not specified, the database is created on the default database path specified in the database manager configuration file (dftdbpath parameter). On the Windows operating system, specifies the letter of the drive on which to create the database. Can be NULL.

Note: For partitioned database environments, a database should not be created in an NFS-mounted directory. If a path is not specified, ensure that the dftdbpath database manager configuration parameter is not set to an NFS-mounted path (for example, on UNIX based systems, it should not specify the $HOME directory of the instance owner). The path specified for this API in a partitioned database environment cannot be a relative path.

pDbDescriptor
Input. A pointer to the database description block that is used when creating the database. The database description block can be used by you to supply values that are permanently stored in the configuration file of the database.

The supplied values are a collating sequence, a database comment, or a table space definition. The supplied value can be NULL if you do not want to supply any values. For information about the values that can be supplied through this parameter, see the SQLEDBDESC data structure topic.

pTerritoryInfo
Input. A pointer to the sqledbterritoryinfo structure, containing the locale and the code set for the database. Can be NULL. The default code set for a database is UTF-8 (Unicode). If a particular code set and territory is needed for a database, the desired code set and territory should be specified via the sqledbterritoryinfo structure. If this field is NULL, then one of the following is allowed as a collation value for the database (sqlcode 1083): NULL, SQL_CS_SYSTEM, SQL_CS_IDENTITY_16BIT, SQL_CS_UCA400_NO, SQL_CS_UCA400_LTH, SQL_CS_UCA400_LSK, or SQL_CS_UNICODE.

Reserved2
Input. Reserved for future use.

pDbDescriptorExt
Input. This parameter refers to an extended database description block (sqledbdescext) that is used when creating the database. The extended database description block controls automatic storage for a database, chooses a default page size for the database, and specifies values for new table space attributes that have been introduced. If set to null or zero, a default page size of 4 096 bytes is chosen for the database and automatic storage is enabled.

pSqlca
Output. A pointer to the sqlca structure.

sqlgcrea API-specific parameters

PathLen
Input. A 2-byte unsigned integer representing the length of the path in bytes. Set to zero if no path is provided.

LocalDbALiasLen
Input. A 2-byte unsigned integer representing the length of the local database alias in bytes. Set to zero if no local alias is provided.

DbNameLen
Input. A 2-byte unsigned integer representing the length of the database name in bytes.

Usage notes

CREATE DATABASE:

- Creates a database in the specified subdirectory. In a partitioned database environment, creates the database on all database partition servers listed in `db2nodes.cfg`, and creates a $DB2INSTANCE/NODExxxx directory under the specified subdirectory at each database partition server, where xxxx represents the local database partition server number. In a single-partition environment, creates a $DB2INSTANCE/NODE0000 directory under the specified subdirectory.
- Creates the system catalog tables and recovery log.
- Catalogs the database in the following database directories:
  - server's local database directory on the path indicated by pPath or, if the path is not specified, the default database path defined in the database manager system configuration file. A local database directory resides on each file system that contains a database.
  - server's system database directory for the attached instance. The resulting directory entry will contain the database name and a database alias.

    If the API was called from a remote client, the client's system database directory is also updated with the database name and an alias.
- Creates a system or a local database directory if neither exists. If specified, the comment and code set values are placed in both directories.
- Stores the specified code set, territory, and collating sequence. A flag is set in the database configuration file if the collating sequence consists of unique weights, or if it is the identity sequence.
- Creates the schemata called SYSCAT, SYSFUN, SYSIBM, and SYSSTAT with SYSIBM as the owner. The database partition server on which this API is called becomes the catalog partition for the new database. Two database partition groups are created automatically: IBMDEFAULTGROUP and IBMCATGROUP.
- Binds the previously defined database manager bind files to the database (these are listed in db2ubind.lst). If one or more of these files do not bind successfully, sqlecrea returns a warning in the SQLCA, and provides information about the binds that failed. If a bind fails, the user can take corrective action and manually bind the failing file. The database is created in any case. A schema called NULLID is implicitly created when performing the binds with CREATEIN privilege granted to PUBLIC, if the RESTRICTIVE option is not selected.
- Creates SYSCATSPACE, TEMPSPACE1, and USERSPACE1 table spaces. The SYSCATSPACE table space is only created on the catalog partition. All database partitions have the same table space definitions.
- Grants the following:

- DBADM, CONNECT, CREATETAB, BINDADD, CREATE_NOT_FENCED, IMPLICIT_SCHEMA, and LOAD authorities to the database creator
- CONNECT, CREATETAB, BINDADD, and IMPLICIT_SCHEMA authorities to PUBLIC
- USE privilege on the USERSPACE1 table space to PUBLIC
- SELECT privilege on each system catalog to PUBLIC
- BIND and EXECUTE privilege to PUBLIC for each successfully bound utility
- EXECUTE WITH GRANT privilege to PUBLIC on all functions in the SYSFUN schema.
- EXECUTE privilege to PUBLIC on all procedures in SYSIBM schema.

Note: If the RESTRICTIVE option is present, it causes the RESTRICT_ACCESS database configuration parameter to be set to YES and no privileges or authorities are automatically granted to PUBLIC. For more detailed information, see the RESTRICTIVE option of the CREATE DATABASE command.

With dbadm authority, one can grant these privileges to (and revoke them from) other users or PUBLIC. If another administrator with sysadm or dbadm authority over the database revokes these privileges, the database creator nevertheless retains them.

In a partitioned database environment, the database manager creates a subdirectory, $DB2INSTANCE/NODExxxx, under the specified or default path on all database partition servers. The xxxx is the node number as defined in the `db2nodes.cfg` file (that is, node 0 becomes NODE0000). Subdirectories SQL00001 through SQLnnnnn will reside on this path. This ensures that the database objects associated with different database partition servers are stored in different directories (even if the subdirectory $DB2INSTANCE under the specified or default path is shared by all database partition servers).

On Windows and AIX operating systems, the length of the code set name is limited to a maximum of 9 characters. For example, specify a code set name such as ISO885915 instead of ISO8859-15.

The sqlecrea API accepts a data structure called the Database Descriptor Block (SQLEDBDESC). You can define your own collating sequence within this structure.

Note: You can only define your own collating sequence for a single-byte database.

To specify a collating sequence for a database:

- Pass the desired SQLEDBDESC structure, or
- Pass a NULL pointer. The collating sequence of the operating system (based on the current locale code and the code page) is used. This is the same as specifying SQLDBCSS equal to SQL_CS_SYSTEM (0).

Execution of the CREATE DATABASE command will fail if the application is already connected to a database.

If the database description block structure is not set correctly, an error message is returned.

The most prominent value of the database description block must be set to the symbolic value SQLE_DBDESC_2 (defined in sqlenv). The following sample user-defined collating sequences are available in the host language include files:

sqle819a
If the code page of the database is 819 (ISO Latin/1), this sequence will cause sorting to be performed according to the host CCSID 500 (EBCDIC International).

sqle819b
If the code page of the database is 819 (ISO Latin/1),this sequence will cause sorting to be performed according to the host CCSID 037 (EBCDIC US English).

sqle850a
If the code page of the database is 850 (ASCII Latin/1), this sequence will cause sorting to be performed according to the host CCSID 500 (EBCDIC International).

sqle850b
If the code page of the database is 850 (ASCII Latin/1), this sequence will cause sorting to be performed according to the host CCSID 037 (EBCDIC US English).

sqle932a
If the code page of the database is 932 (ASCII Japanese), this sequence will cause sorting to be performed according to the host CCSID 5035 (EBCDIC Japanese).

sqle932b
If the code page of the database is 932 (ASCII Japanese), this sequence will cause sorting to be performed according to the host CCSID 5026 (EBCDIC Japanese).

The collating sequence specified during database creation cannot be changed later. It determines how character strings are compared. This affects the structure of indexes as well as the results of queries. In a Unicode database, the catalog tables and views are always created with the IDENTITY collation, regardless of the collation specified in the create database call. In a non-Unicode database, the catalog tables and views are created with the database collation.

Use sqlecadb to define different alias names for the new database.

The Configuration Advisor is called by default during the database creation process unless specifically told not to do so.

REXX API syntax

```
CREATE DATABASE dbname [ON path] [ALIAS dbalias]
[USING CODESET codeset TERRITORY territory]
[COLLATE USING {SYSTEM | IDENTITY | USER :udcs}]
[NUMSEGS numsegs] [DFT_EXTENT_SZ dft_extentsize]
[CATALOG TABLESPACE <tablespace_definition>]
[USER TABLESPACE <tablespace_definition>]
[TEMPORARY TABLESPACE <tablespace_definition>]
[WITH comment]


Where <tablespace_definition> stands for:
MANAGED BY {
SYSTEM USING :SMS_string |
DATABASE USING :DMS_string }
[ EXTENTSIZE number_of_pages ]
[ PREFETCHSIZE number_of_pages ]
[ OVERHEAD number_of_milliseconds ]
[ TRANSFERRATE number_of_milliseconds ]
```

REXX API parameters

dbname
Name of the database.

dbalias
Alias of the database.

path Path on which to create the database. If a path is not specified, the database is created on the default database path specified in the database manager configuration file (dftdbpath configuration parameter).

Note: For partitioned database environments, a database should not be created in an NFS-mounted directory. If a path is not specified, ensure that the dftdbpath database manager configuration parameter is not set to an NFS-mounted path (for example, on UNIX based systems, it should not specify the $HOME directory of the instance owner). The path specified for this API in a partitioned database environment cannot be a relative path.

codeset
Code set to be used for data entered into the database.

territory
Territory code (locale) to be used for data entered into the database.

SYSTEM
For non-Unicode databases, this is the default option, with the collating sequence based on the database territory. For Unicode databases, this option is equivalent to the IDENTITY option.

IDENTITY
Identity collating sequence, in which strings are compared byte for byte. This is the default for Unicode databases.

USER udcs
The collating sequence is specified by the calling application in a host variable containing a 256-byte string defining the collating sequence.

numsegs
Number of directories (table space containers) that will be created and used to store the database table files for any default SMS table spaces.

dft_extentsize
Specifies the default extent size for table spaces in the database.

SMS_string
A compound REXX host variable identifying one or more containers that will belong to the table space, and where the table space data will be stored. In the following, XXX represents the host variable name. Note that each of the directory names cannot exceed 254 bytes in length.

XXX.0 Number of directories specified

XXX.1 First directory name for SMS table space

XXX.2 Second directory name for SMS table space

XXX.3 and so on.

DMS_string
A compound REXX host variable identifying one or more containers that will belong to the table space, where the table space data will be stored, container sizes (specified in a number of 4KB pages) and types (file or device). The specified devices (not files) must already exist. In the

following, XXX represents the host variable name. Note that each of the container names cannot exceed 254 bytes in length.

XXX.0 Number of strings in the REXX host variable (number of first level elements)

XXX.1.1
Type of the first container (file or device)

XXX.1.2
First file name or device name

XXX.1.3
Size (in pages) of the first container

XXX.2.1
Type of the second container (file or device)

XXX.2.2
Second file name or device name

XXX.2.3
Size (in pages) of the second container

XXX.3.1
and so on.

EXTENTSIZE number_of_pages
Number of 4KB pages that will be written to a container before skipping to the next container.

PREFETCHSIZE number_of_pages
Number of 4KB pages that will be read from the table space when data prefetching is being performed.

OVERHEAD number_of_milliseconds
Number that specifies the I/O controller overhead, disk seek, and latency time in milliseconds.

TRANSFERRATE number_of_milliseconds
Number that specifies the time in milliseconds to read one 4 KB page into memory.

comment
Description of the database or the database entry in the system directory. Do not use a carriage return or line feed character in the comment. Be sure to enclose the comment text in double quotation marks. Maximum size is 30 characters.

sqlectnd - Catalog an entry in the node directory

Stores information in the node directory about the location of a DB2 server instance based on the communications protocol used to access that instance. The information is needed to establish a database connection or attachment between an application and a server instance.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlectnd (
        struct sqle_node_struct * pNodeInfo,
        void * pProtocolInfo,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgctnd (
        struct sqlca * pSqlca,
        struct sqle_node_struct * pNodeInfo,
        void * pProtocolInfo);
```

sqlectnd API parameters

pNodeInfo
Input. A pointer to a node directory structure.

pProtocolInfo
Input. A pointer to the protocol structure:

- SQLE-NODE-LOCAL
- SQLE-NODE-NPIPE
- SQLE-NODE-TCPIP

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

DB2 creates the node directory on the first call to this API if the node directory does not exist. On the Windows operating system, the node directory is stored in the directory of the instance being used. On UNIX based systems, it is stored in the DB2 install directory (sqllib, for example).

If directory caching is enabled, database, node, and DCS directory files are cached in memory. An application's directory cache is created during its first directory lookup. Since the cache is only refreshed when the application modifies any of the directory files, directory changes made by other applications may not be effective until the application has restarted. To refresh DB2's shared cache (server only), stop (db2stop command) and then restart (db2start command) the database manager. To refresh the directory cache for another application, stop and then restart that application.

REXX API syntax, option 1

```
CATALOG LOCAL NODE nodename INSTANCE instance_name [WITH comment]
```

REXX API parameters, option 1

nodename
Alias for the node to be cataloged.

instance_name
Name of the instance to be cataloged.

comment
An optional description associated with this node directory entry. Do not include a CR/LF character in a comment. Maximum length is 30 characters. The comment text must be enclosed by double quotation marks.

REXX API syntax, option 2

```
CATALOG NPIPE NODE nodename REMOTE computer_name INSTANCE instance_name
```

REXX API parameters, option 2

nodename
Alias for the node to be cataloged.

computer_name
The computer name of the node on which the target database resides.

instance_name
Name of the instance to be cataloged.

REXX API syntax, option 3

```
CATALOG TCPIP NODE nodename REMOTE hostname SERVER servicename
[WITH comment]
```

REXX API parameters, option 3

nodename
Alias for the node to be cataloged.

hostname
Host name or IPv4 address or IPv6 address of the node where the target database resides

servicename
Either the service name of the database manager instance on the remote node, or the port number associated with that service name.

comment
An optional description associated with this node directory entry. Do not include a CR/LF character in a comment. Maximum length is 30 characters. The comment text must be enclosed by double quotation marks.

REXX API syntax, option 4

```
CATALOG TCPIP4 NODE nodename REMOTE hostname SERVER servicename
[WITH comment]
```

REXX API parameters, option 4

nodename
Alias for the node to be cataloged.

hostname
Host name or IPv4 address or IPv6 address of the node where the target database resides

servicename
Either the service name of the database manager instance on the remote node, or the port number associated with that service name.

comment
An optional description associated with this node directory entry. Do not include a CR/LF character in a comment. Maximum length is 30 characters. The comment text must be enclosed by double quotation marks.

REXX API syntax, option 5

```
CATALOG TCPIP6 NODE nodename REMOTE hostname SERVER servicename
[WITH comment]
```

REXX API parameters, option 5

nodename
Alias for the node to be cataloged.

hostname
Host name or IPv4 address or IPv6 address of the node where the target database resides

servicename
Either the service name of the database manager instance on the remote node, or the port number associated with that service name.

comment
An optional description associated with this node directory entry. Do not include a CR/LF character in a comment. Maximum length is 30 characters. The comment text must be enclosed by double quotation marks.

sqledcgd - Change a database comment in the system or local database directory

Changes a database comment in the system database directory or the local database directory. New comment text can be substituted for text currently associated with a comment.

Scope

This API only affects the database partition server on which it is issued.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqledcgd (
        _SQLOLDCHAR * pDbAlias,
        _SQLOLDCHAR * pPath,
        _SQLOLDCHAR * pComment,
```

```
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgdcgd (
        unsigned short CommentLen,
        unsigned short PathLen,
        unsigned short DbAliasLen,
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pComment,
        _SQLOLDCHAR * pPath,
        _SQLOLDCHAR * pDbAlias);
```

sqledcgd API parameters

pDbAlias
Input. A string containing the database alias. This is the name that is cataloged in the system database directory, or the name cataloged in the local database directory if the path is specified.

pPath Input. A string containing the path on which the local database directory resides. If the specified path is a null pointer, the system database directory is used.

The comment is only changed in the local database directory or the system database directory on the database partition server on which the API is executed. To change the database comment on all database partition servers, run the API on every database partition server.

pComment
Input. A string containing an optional description of the database. A null string indicates no comment. It can also indicate no change to an existing database comment.

pSqlca
Output. A pointer to the sqlca structure.

sqlgdcgd API-specific parameters

CommentLen
Input. A 2-byte unsigned integer representing the length in bytes of the comment. Set to zero if no comment is provided.

PathLen
Input. A 2-byte unsigned integer representing the length in bytes of the path parameter. Set to zero if no path is provided.

DbAliasLen
Input. A 2-byte unsigned integer representing the length in bytes of the database alias.

Usage notes

New comment text replaces existing text. To append information, enter the old comment text, followed by the new text.

Only the comment for an entry associated with the database alias is modified. Other entries with the same database name, but with different aliases, are not affected.

If the path is specified, the database alias must be cataloged in the local database directory. If the path is not specified, the database alias must be cataloged in the system database directory.

REXX API syntax

```
CHANGE DATABASE database_alias COMMENT [ON path] WITH comment
```

REXX API parameters

database_alias
Alias of the database whose comment is to be changed.

To change the comment in the system database directory, it is necessary to specify the database alias.

If the path where the database resides is specified (with the path parameter), enter the name (not the alias) of the database. Use this method to change the comment in the local database directory.

path Path on which the database resides.

comment
Describes the entry in the system database directory or the local database directory. Any comment that helps to describe the cataloged database can be entered. The maximum length of a comment string is 30 characters. A carriage return or a line feed character is not permitted. The comment text must be enclosed by double quotation marks.

sqledpan - Drop a database on a database partition server

Drops a database at a specified database partition server. Can only be run in a partitioned database environment.

Scope

This API only affects the database partition server on which it is called.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None. An instance attachment is established for the duration of the call.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqledpan (
        char * pDbAlias,
        void * pReserved,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgdpan (
        unsigned short Reserved1,
```

```
unsigned short DbAliasLen,
struct sqlca * pSqlca,
void * pReserved2,
char * pDbAlias);
```

sqledpan API parameters

pDbAlias
Input. A string containing the alias of the database to be dropped. This name is used to reference the actual database name in the system database directory.

pReserved
Reserved. Should be NULL.

pSqlca
Output. A pointer to the sqlca structure.

sqlgdpan API-specific parameters

Reserved1
Reserved for future use.

DbAliasLen
Input. A 2-byte unsigned integer representing the length in bytes of the database alias.

pReserved2
A spare pointer that is set to null or points to zero. Reserved for future use.

Usage notes

Improper use of this API can cause inconsistencies in the system, so it should only be used with caution.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqledrpd - Drop database

Deletes the database contents and all log files for the database, uncatalogs the database, and deletes the database subdirectory.

Scope

By default, this API affects all database partition servers that are listed in the db2nodes.cfg file.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

Instance. It is not necessary to call ATTACH before dropping a remote database. If the database is cataloged as remote, an instance attachment to the remote node is established for the duration of the call.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqledrpd (
        _SQLOLDCHAR * pDbAlias,
        _SQLOLDCHAR * pReserved2,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgdrpd (
        unsigned short Reserved1,
        unsigned short DbAliasLen,
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pReserved2,
        _SQLOLDCHAR * pDbAlias);
```

sqledrpd API parameters

pDbAlias
Input. A string containing the alias of the database to be dropped. This name is used to reference the actual database name in the system database directory.

pReserved2
A spare pointer that is set to null or points to zero. Reserved for future use.

pSqlca
Output. A pointer to the sqlca structure.

sqlgdrpd API-specific parameters

Reserved1
Reserved for future use.

DbAliasLen
Input. A 2-byte unsigned integer representing the length in bytes of the database alias.

Usage notes

The sqledrpd API deletes all user data and log files. If the log files are needed for a roll-forward recovery after a restore operation, the files should be saved prior to calling this API.

The database must not be in use; all users must be disconnected from the database before the database can be dropped.

To be dropped, a database must be cataloged in the system database directory. Only the specified database alias is removed from the system database directory. If other aliases with the same database name exist, their entries remain. If the

database being dropped is the last entry in the local database directory, the local database directory is deleted automatically.

If this API is called from a remote client (or from a different instance on the same machine), the specified alias is removed from the client's system database directory. The corresponding database name is removed from the server's system database directory.

REXX API syntax

```
DROP DATABASE dbalias
```

REXX API parameters

dbalias
The alias of the database to be dropped.

sqledrpn - Check whether a database partition server can be dropped

Verifies whether a database partition server is being used by a database. A message is returned, indicating whether the database partition server can be dropped.

Scope

This API only affects the database partition server on which it is issued.

Authorization

One of the following:

- sysadm
- sysctrl

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqledrpn (
        unsigned short Action,
        void * pReserved,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgdrpn (
        unsigned short Reserved1,
        struct sqlca * pSqlca,
        void * pReserved2,
        unsigned short Action);
```

sqledrpn API parameters

Action
The action requested. The valid value is: SQL_DROPNODE_VERIFY

pReserved
Reserved. Should be NULL.

pSqlca
Output. A pointer to the sqlca structure.

sqlgdrpn API-specific parameters

Reserved1
Reserved for the length of pReserved2.

pReserved2
A spare pointer that is set to NULL or points to 0. Reserved for future use.

Usage notes

If a message is returned, indicating that the database partition server is not in use, use the db2stop command with DROP NODENUM to remove the entry for the database partition server from the db2nodes.cfg file, which removes the database partition server from the partitioned database environment.

If a message is returned, indicating that the database partition server is in use, the following actions should be taken:

1. The database partition server to be dropped will have a database partition on it for each database in the instance. If any of these database partitions contain data, redistribute the database partition groups that use these database partitions. Redistribute the database partition groups to move the data to database partitions that exist at database partition servers that are not being dropped.
2. After the database partition groups are redistributed, drop the database partition from every database partition group that uses it. To remove a database partition from a database partition group, you can use either the drop node option of the sqludrdt API or the ALTER DATABASE PARTITION GROUP statement.
3. Drop any event monitors that are defined on the database partition server.
4. Rerun sqledrpn to ensure that the database partition at the database partition server is no longer in use.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqledtin - Detach from instance

Removes the logical instance attachment, and terminates the physical communication connection if there are no other logical connections using this layer.

Authorization

None

Required connection

None. Removes an existing instance attachment.

API include file

`sqlenv.h`

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqledtin (
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgdtin (
        struct sqlca * pSqlca);
```

sqledtin API parameters

pSqlca
Output. A pointer to the sqlca structure.

REXX API syntax

```
DETACH
```

---

sqlefmem - Free the memory allocated by the sqlbtcq and sqlbmtsq API

Frees memory allocated by DB2 APIs on the caller's behalf. Intended for use with the sqlbtcq and sqlbmtsq APIs.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlefmem (
        struct sqlca * pSqlca,
        void * pBuffer);

SQL_API_RC SQL_API_FN
  sqlgfmem (
        struct sqlca * pSqlca,
        void * pBuffer);
```

sqlefmem API parameters

pSqlca
Output. A pointer to the sqlca structure

pBuffer
Input. Pointer to the memory to be freed.

sqlefrce - Force users and applications off the system

Forces local or remote users or applications off the system to allow for maintenance on a server. Attention: If an operation that cannot be interrupted (a database restore, for example) is forced, the operation must be successfully re-executed before the database becomes available.

Scope

This API affects all database partition servers that are listed in the db2nodes.cfg file.

In a partitioned database environment, this API does not have to be issued from the coordinator partition of the application being forced. This API can be issued from any database partition server in the partitioned database environment.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint

Required connection

Instance. To force users off a remote server, it is necessary to first attach to that server. If no attachment exists, this API is executed locally.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlefrce (
        sqlint32 NumAgentIds,
        sqluint32 * pAgentIds,
        unsigned short ForceMode,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgfrce (
        struct sqlca * pSqlca,
        unsigned short ForceMode,
        sqluint32 * pAgentIds,
        sqlint32 NumAgentIds);
```

sqlefrce API parameters

NumAgentIds

Input. An integer representing the total number of users to be terminated. This number should be the same as the number of elements in the array of agent IDs.

If this parameter is set to SQL_ALL_USERS (defined in sqlenv), all applications with either database connections or instance attachments are forced. If it is set to zero, an error is returned.

pAgentIds
Input. Pointer to an array of unsigned long integers. Each entry describes the agent ID of the corresponding database user.

ForceMode
Input. An integer specifying the operating mode of the sqlefrce API. Only the asynchronous mode is supported. This means that the API does not wait until all specified users are terminated before returning. It returns as soon as the API has been issued successfully, or an error occurs. As a result, there may be a short interval between the time the force application call completes and the specified users have been terminated.

This parameter must be set to SQL_ASYNCH (defined in sqlenv).

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The database manager remains active so that subsequent database manager operations can be handled without the need for db2start.

To preserve database integrity, only users who are idling or executing interruptible database operations can be forced off.

After a force command has been issued, the database will still accept requests to connect. Additional forces may be required to completely force all users off. The database system monitor functions are used to gather the agent IDs of the users to be forced.

When the force mode is set to SQL_ASYNCH (the only value permitted), the API immediately returns to the calling application.

Minimal validation is performed on the array of agent IDs to be forced. The user must ensure that the pointer points to an array containing the total number of elements specified. If NumAgentIds is set to SQL_ALL_USERS, the array is ignored.

When a user is forced off, a unit of work rollback is performed to ensure database consistency.

All users that can be forced will be forced. If one or more specified agent IDs cannot be found, sqlcode in the sqlca structure is set to 1230. An agent ID may not be found, for instance, if the user signs off between the time an agent ID is collected and sqlefrce is called. The user that calls this API is never forced off.

Agent IDs are recycled, and are used to force applications some time after being gathered by the database system monitor. When a user signs off, therefore, another user may sign on and acquire the same agent ID through this recycling process, with the result that the wrong user may be forced.

REXX API syntax

```
FORCE APPLICATION {ALL | :agentidarray} [MODE ASYNC]
```

REXX API parameters

ALL All applications will be disconnected. This includes applications that have database connections and applications that have instance attachments.

agentidarray
A compound REXX host variable containing the list of agent IDs to be terminated. In the following, XXX is the name of the host variable:

- XXX.0
Number of agents to be terminated

- XXX.1
First agent ID

- XXX.2
Second agent ID

- XXX.3
and so on.

ASYNC
The only mode currently supported means that sqlefrce does not wait until all specified applications are terminated before returning.

---

sqlegdad - Catalog a database in the database connection services (DCS) directory

Stores information about remote databases in the Database Connection Services (DCS) directory. These databases are accessed through an Application Requester (AR), such as DB2 Connect. Having a DCS directory entry with a database name matching a database name in the system database directory invokes the specified AR to forward SQL requests to the remote server where the database resides.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlegdad (
        struct sql_dir_entry * pDCSDirEntry,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlggdad (
        struct sqlca * pSqlca,
        struct sql_dir_entry * pDCSDirEntry);
```

sqlegdad API parameters

pDCSDirEntry
Input. A pointer to an sql_dir_entry (Database Connection Services directory) structure.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The DB2 Connect program provides connections to DRDA Application Servers such as:

- DB2 for OS/390 databases on System/370™ and System/390® architecture host computers
- DB2 for VM and VSE databases on System/370 and System/390 architecture host computers
- OS/400 databases on Application System/400® (AS/400®) host computers

The database manager creates a Database Connection Services directory if one does not exist. This directory is stored on the path that contains the database manager instance that is being used. The DCS directory is maintained outside of the database.

The database must also be cataloged as a remote database in the system database directory.

Note: If directory caching is enabled, database, node, and DCS directory files are cached in memory. An application's directory cache is created during its first directory lookup. Since the cache is only refreshed when the application modifies any of the directory files, directory changes made by other applications might not be effective until the application has restarted. To refresh DB2's shared cache (server only), stop (db2stop) and then restart (db2start) the database manager. To refresh the directory cache for another application, stop and then restart that application.

REXX API syntax

```
CATALOG DCS DATABASE dbname [AS target_dbname]
[AR arname] [PARMS parms] [WITH comment]
```

REXX API parameters

dbname
The local database name of the directory entry to be added.

target_dbname
The target database name.

arname
The application client name.

parms Parameter string. If specified, the string must be enclosed by double quotation marks.

comment
Description associated with the entry. Maximum length is 30 characters. Enclose the comment by double quotation marks.

sqlegdcl - End a database connection services (DCS) directory scan

Frees the resources that are allocated by the sqlegdsc API.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlegdcl (
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlggdcl (
        struct sqlca * pSqlca);
```

sqlegdcl API parameters

pSqlca
Output. A pointer to the sqlca structure.

REXX API syntax

```
CLOSE DCS DIRECTORY
```

sqlegdel - Uncatalog a database from the database connection services (DCS) directory

Deletes an entry from the Database Connection Services (DCS) directory.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlegdel (
        struct sql_dir_entry * pDCSDirEntry,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlggdel (
        struct sqlca * pSqlca,
        struct sql_dir_entry * pDCSDirEntry);
```

sqlegdel API parameters

pDCSDirEntry
Input/Output. A pointer to the Database Connection Services directory structure. Fill in the ldb field of this structure with the local name of the database to be deleted. The DCS directory entry with a matching local database name is copied to this structure before being deleted.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

DCS databases are also cataloged in the system database directory as remote databases that can be uncataloged using the sqleuncd API.

To recatalog a database in the DCS directory, use the sqlegdad API.

To list the DCS databases that are cataloged on a node, use the sqlegdsc, sqlegdgt, and sqlegdcl APIs.

If directory caching is enabled (using the dir_cache configuration parameter, database, node, and DCS directory files are cached in memory. An application's directory cache is created during its first directory lookup. Since the cache is only refreshed when the application modifies any of the directory files, directory changes made by other applications may not be effective until the application has restarted. To refresh DB2's shared cache (server only), stop (db2stop) and then restart (db2start) the database manager. To refresh the directory cache for another application, stop and then restart that application.

REXX API syntax

```
UNCATALOG DCS DATABASE dbname [USING :value]
```

REXX API parameters

dbname
The local database name of the directory entry to be deleted.

value A compound REXX host variable into which the directory entry information is returned. In the following, XXX represents the host variable name. If no name is given, the name SQLGWINF is used.

XXX.0 Number of elements in the variable (always 7)

XXX.1 RELEASE

XXX.2 LDB

XXX.3 TDB

XXX.4 AR

XXX.5 PARMS

XXX.6 COMMENT

XXX.7 RESERVED

sqlegdge - Get a specific entry in the database connection services (DCS) directory

Returns information for a specific entry in the Database Connection Services (DCS) directory.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlegdge (
        struct sql_dir_entry * pDCSDirEntry,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlggdge (
        struct sqlca * pSqlca,
        struct sql_dir_entry * pDCSDirEntry);
```

sqlegdge API parameters

pDCSDirEntry
Input/Output. Pointer to the Database Connection Services directory structure. Fill in the ldb field of this structure with the local name of the database whose DCS directory entry is to be retrieved.

The remaining fields in the structure are filled in upon return of this API.

pSqlca
Output. A pointer to the sqlca structure.

REXX API syntax

```
GET DCS DIRECTORY ENTRY FOR DATABASE dbname [USING :value]
```

REXX API parameters

dbname
Specifies the local database name of the directory entry to be obtained.

value A compound REXX host variable into which the directory entry information is returned. In the following, XXX represents the host variable name. If no name is given, the name SQLGWINF is used.

XXX.0 Number of elements in the variable (always 7)

XXX.1 RELEASE

XXX.2 LDB

XXX.3 TDB

XXX.4 AR

XXX.5 PARMS

XXX.6 COMMENT

XXX.7 RESERVED.

sqlegdgt - Get database connection services (DCS) directory entries

Transfers a copy of Database Connection Services (DCS) directory entries to a buffer supplied by the application.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlegdgt (
        short * pNumEntries,
        struct sql_dir_entry * pDCSDirEntries,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlggdgt (
        struct sqlca * pSqlca,
        short * pNumEntries,
        struct sql_dir_entry * pDCSDirEntries);
```

sqlegdgt API parameters

pNumEntries
Input/Output. Pointer to a short integer representing the number of entries to be copied to the caller's buffer. The number of entries actually copied is returned.

pDCSDirEntries
Output. Pointer to a buffer where the collected DCS directory entries will be held upon return of the API call. The buffer must be large enough to hold the number of entries specified in the pNumEntries parameter.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The sqlegdsc API, which returns the entry count, must be called prior to issuing GET DCS DIRECTORY ENTRIES.

If all entries are copied to the caller, the Database Connection Services directory scan is automatically closed, and all resources are released.

If entries remain, subsequent calls to this API should be made, or CLOSE DCS DIRECTORY SCAN should be called, to release system resources.

REXX API syntax

```
GET DCS DIRECTORY ENTRY [USING :value]
```

REXX API parameters

value A compound REXX host variable into which the directory entry information is returned. In the following, XXX represents the host variable name. If no name is given, the name SQLGWINF is used.

XXX.0 Number of elements in the variable (always 7)

XXX.1 RELEASE

XXX.2 LDB

XXX.3 TDB

XXX.4 AR

XXX.5 PARMS

XXX.6 COMMENT

XXX.7 RESERVED

sqlegdsc - Start a database connection services (DCS) directory scan

Stores a copy in memory of the Database Connection Services directory entries, and returns the number of entries. This is a snapshot of the directory at the time the directory is opened.

The copy is not updated if the directory itself changes after a call to this API. Use sqlegdgt API and sqlegdcl API to release the resources associated with calling this API.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlegdsc (
        short * pNumEntries,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlggdsc (
        struct sqlca * pSqlca,
        short * pNumEntries);
```

sqlegdsc API parameters

pNumEntries
Output. Address of a 2-byte area to which the number of directory entries is returned.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The caller of the scan uses the returned value pNumEntries to allocate enough memory to receive the entries. If a scan call is received while a copy is already held, the previous copy is released, and a new copy is collected.

REXX API syntax

```
OPEN DCS DIRECTORY
```

sqlegins - Get current instance

Returns the value of the DB2INSTANCE environment variable.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlegins (
        _SQLOLDCHAR * pInstance,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlggins (
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pInstance);
```

sqlegins API parameters

pInstance
Output. Pointer to a string buffer where the database manager instance name is placed. This buffer must be at least 9 bytes in length, including 1 byte for the null terminating character.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The value in the DB2INSTANCE environment variable is not necessarily the instance to which the user is attached.

To identify the instance to which a user is currently attached, call `sqleatin - Attach`, with null arguments except for the sqlca structure.

REXX API syntax

```
GET INSTANCE INTO :instance
```

REXX API parameters

instance
A REXX host variable into which the database manager instance name is to be placed.

sqleintr - Interrupt application requests

Stops a request. This API is called from a control break signal handler in an application. The control break signal handler can be the default, installed by sqleisig - Install Signal Handler, or a routine supplied by the programmer and installed using an appropriate operating system call.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_INTR
        sqleintr ( void );

SQL_API_RC SQL_API_FN
  sqlgintr (
        void);
```

sqleintr API parameters

None

Usage notes

No database manager APIs should be called from an interrupt handler except sqleintr. However, the system will not prevent it.

Any database transaction in a state of committing or rollback cannot be interrupted.

An interrupted database manager request returns a code indicating that it was interrupted.

The following table summarizes the effect of an interrupt operation on other APIs:

Table 9. INTERRUPT actions

Database activity	Action
BACKUP	Utility cancelled. Data on media may be incomplete.
BIND	Binding cancelled. Package creation rolled back.
COMMIT	None. COMMIT completes.
CREATE DATABASE/CREATE DATABASE AT NODE/ADD NODE/DROP NODE VERIFY	After a certain point, these APIs are not interruptible. If the interrupt call is received before this point, the database is not created. If the interrupt call is received after this point, it is ignored.
DROP DATABASE/DROP DATABASE AT NODE	None. The APIs complete.
EXPORT/IMPORT/ RUNSTATS	Utility cancelled. Database updates rolled back.
FORCE APPLICATION	None. FORCE APPLICATION completes.
LOAD	Utility cancelled. Data in table may be incomplete.
PREP	Precompile cancelled. Package creation rolled back.
REORGANIZE TABLE	The interrupt will be delayed until the copy is complete. The recreation of the indexes will be resume on the next attempt to access the table.
RESTORE	Utility cancelled. DROP DATABASE performed. Not applicable to table space level restore.
ROLLBACK	None. ROLLBACK completes.
Directory services	Directory left in consistent state. Utility function may or may not be performed.
SQL data definition statements	Database transactions are set to the state existing prior to invocation of the SQL statement.
Other SQL statements	Database transactions are set to the state existing prior to invocation ofthe SQL statement.

REXX API syntax

```
INTERRUPT
```

Examples

```
call SQLDBS 'INTERRUPT'
```

sqleisig - Install signal handler

Installs the default interrupt (usually Control-C and/or Control-Break) signal handler. When this default handler detects an interrupt signal, it resets the signal and calls sqleintr.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleisig (
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgisig (
        struct sqlca * pSqlca);
```

sqleisig API parameters

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

If an application has no signal handler, and an interrupt is received, the application is terminated. This API provides simple signal handling, and can be used if an application does not have extensive interrupt handling requirements.

The API must be called for the interrupt signal handler to function properly.

If an application requires a more elaborate interrupt handling scheme, a signal handling routine that can also call the sqleintr API can be developed. Use either the operating system call or the language-specific library signal function. The sqleintr API should be the only database manager operation performed by a customized signal handler. Follow all operating system programming techniques and practices to ensure that the previously installed signal handlers work properly.

REXX API syntax

```
INSTALL SIGNAL HANDLER
```

sqlemgdb - Migrate previous version of DB2 database to current version

Converts previous (Version 8.x or higher) versions of DB2 databases to current versions.

Authorization

sysadm

Required connection

This API establishes a database connection.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlemgdb (
        _SQLOLDCHAR * pDbAlias,
        _SQLOLDCHAR * pUserName,
        _SQLOLDCHAR * pPassword,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgmgdb (
        unsigned short PasswordLen,
        unsigned short UserNameLen,
        unsigned short DbAliasLen,
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pPassword,
        _SQLOLDCHAR * pUserName,
        _SQLOLDCHAR * pDbAlias);
```

sqlemgdb API parameters

pDbAlias
Input. A string containing the alias of the database that is cataloged in the system database directory.

pUserName
Input. A string containing the user name of the application. May be NULL.

pPassword
Input. A string containing the password of the supplied user name (if any). May be NULL.

pSqlca
Output. A pointer to the sqlca structure.

sqlgmgdb API-specific parameters

PasswordLen
Input. A 2-byte unsigned integer representing the length in bytes of the password. Set to zero when no password is supplied.

UserNameLen
Input. A 2-byte unsigned integer representing the length in bytes of the user name. Set to zero when no user name is supplied.

DbAliasLen
Input. A 2-byte unsigned integer representing the length in bytes of the database alias.

Usage notes

This API will only migrate a database to a newer version, and cannot be used to convert a migrated database to its previous version.

The database must be cataloged before migration.

REXX API syntax

```
MIGRATE DATABASE dbalias [USER username USING password]
```

REXX API parameters

dbalias
Alias of the database to be migrated.

username
User name under which the database is to be restarted.

password
Password used to authenticate the user name.

sqlencls - End a node directory scan

Frees the resources that are allocated by the sqlenops API.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlencls (
        unsigned short Handle,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgncls (
        unsigned short Handle,
        struct sqlca * pSqlca);
```

sqlencls API parameters

Handle
Input. Identifier returned from the associated OPEN NODE DIRECTORY SCAN API.

pSqlca
Output. A pointer to the sqlca structure.

REXX API syntax

```
CLOSE NODE DIRECTORY :scanid
```

REXX API parameters

scanid A host variable containing the scanid returned from the OPEN NODE DIRECTORY SCAN API.

sqlengne - Get the next node directory entry

Returns the next entry in the node directory after sqlenops - Open Node Directory Scan is called. Subsequent calls to this API return additional entries.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlengne (
        unsigned short Handle,
        struct sqleninfo ** ppNodeDirEntry,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgngne (
        unsigned short Handle,
        struct sqleninfo ** ppNodeDirEntry,
        struct sqlca * pSqlca);
```

sqlengne API parameters

Handle
Input. Identifier returned from sqlenops - Open Node Directory Scan.

ppNodeDirEntry
Output. Address of a pointer to an sqleninfo structure. The caller of this API does not have to provide memory for the structure, just the pointer. Upon return from the API, the pointer points to the next node directory entry in the copy of the node directory allocated by sqlenops - Open Node Directory Scan.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

All fields in the node directory entry information buffer are padded to the right with blanks.

The sqlcode value of sqlca is set to 1014 if there are no more entries to scan when this API is called.

The entire directory can be scanned by calling this API pNumEntries times.

REXX API syntax

```
GET NODE DIRECTORY ENTRY :scanid [USING :value]
```

REXX API parameters

scanid A REXX host variable containing the identifier returned from the OPEN NODE DIRECTORY SCAN API.

value A compound REXX host variable to which the node entry information is returned. If no name is given, the name SQLENINFO is used. In the following, XXX represents the host variable name (the corresponding field names are taken from the structure returned by the API):

XXX.0 Number of elements in the variable (always 16)

XXX.1 NODENAME

XXX.2 LOCALLU

XXX.3 PARTNERLU

XXX.4 MODE

XXX.5 COMMENT

XXX.6 RESERVED

XXX.7 PROTOCOL (protocol type)

XXX.9 RESERVED

XXX.10
SYMDESTNAME (symbolic destination name)

XXX.11
SECURITY (security type)

XXX.12
HOSTNAME

XXX.13
SERVICENAME

XXX.14
FILESERVER

XXX.15
OBJECTNAME

XXX.16
INSTANCE (local instance name).

sqlenops - Start a node directory scan

Stores a copy in memory of the node directory, and returns the number of entries. This is a snapshot of the directory at the time the directory is opened. This copy is not updated, even if the directory itself is changed later.

Call the sqlengne API to advance through the node directory and examine information about the node entries. Close the scan by calling the sqlencls API. This removes the copy of the directory from memory.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlenops (
        unsigned short * pHandle,
        unsigned short * pNumEntries,
        struct sqlca * pSqlca);
```

```
SQL_API_RC SQL_API_FN
  sqlgnops (
        unsigned short * pHandle,
        unsigned short * pNumEntries,
        struct sqlca * pSqlca);
```

sqlenops API parameters

pHandle
Output. Identifier returned from this API. This identifier must be passed to the sqlengne API and sqlencls API.

pNumEntries
Output. Address of a 2-byte area to which the number of directory entries is returned.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

Storage allocated by this API is freed by calling sqlencls - Close Node Directory Scan.

Multiple node directory scans can be issued against the node directory. However, the results may not be the same. The directory may change between openings.

There can be a maximum of eight node directory scans per process.

REXX API syntax

```
OPEN NODE DIRECTORY USING :value
```

REXX API parameters

value A compound REXX variable to which node directory information is returned. In the following, XXX represents the host variable name.

XXX.0 Number of elements in the variable (always 2)

XXX.1 Specifies a REXX host variable containing a number for scanid

XXX.2 The number of entries contained within the directory.

sqleqryc - Query client connection settings

Returns current connection settings for an application process. The sqle_conn_setting data structure is populated with the connection setting types and values.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleqryc (
        struct sqle_conn_setting * pConnectionSettings,
        unsigned short NumSettings,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgqryc (
        struct sqle_conn_setting * pConnectionSettings,
        unsigned short NumSettings,
        struct sqlca * pSqlca);
```

sqleqryc API parameters

pConnectionSettings
Input/Output. A pointer to an sqle_conn_setting structure, which specifies connection setting types and values. The user defines an array of NumSettings connection settings structures, and sets the type field of each element in this array to indicate one of the five possible connection settings options. Upon return, the value field of each element contains the current setting of the option specified.

NumSettings
Input. Any integer (from 0 to 7) representing the number of connection option values to be returned.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The connection settings for an application process can be queried at any time during execution.

If QUERY CLIENT is successful, the fields in the sqle_conn_setting structure will contain the current connection settings of the application process. If SET CLIENT has never been called, the settings will contain the values of the precompile options only if an SQL statement has already been processed; otherwise, they will contain the default values for the precompile options.

REXX API syntax

```
QUERY CLIENT INTO :output
```

REXX API parameters

output
A compound REXX host variable containing information about the current connection settings of the application process. In the following, XXX represents the host variable name.

XXX.1 Current connection setting for the CONNECTION type

XXX.2 Current connection setting for the SQLRULES

XXX.3 Current connection setting indicating which connections will be released when a COMMIT is issued.

XXX.4 Current connection setting of the SYNCPOINT option. The SYNCPOINT option is ignored and is available only for backward compatibility. Indicates whether a transaction manager should be used to enforce two-phase commit semantics, whether the database manager should ensure that there is only one database being updated when multiple databases are accessed within a single transaction, or whether neither of these options is to be used.

XXX.6 Current connection setting for deferred PREPARE.

sqleqryi - Query client information

Returns existing client information by populating the fields in the sqle_client_info data structure. Since this API permits specification of a database alias, an application can query client information associated with a specific connection. Returns null if the sqleseti API has not previously established a value.

If a specific connection is requested, this API returns the latest values for that connection. If all connections are specified, the API returns the values that are to be associated with all connections; that is, the values passed in the last call to sqleseti (specifying all connections).

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleqryi (
        unsigned short DbAliasLen,
        char * pDbAlias,
        unsigned short NumItems,
        struct sqle_client_info* pClient_Info,
        struct sqlca * pSqlca);
```

sqleqryi API parameters

DbAliasLen
Input. A 2-byte unsigned integer representing the length in bytes of the database alias. If a value greater than zero is provided, pDbAlias must point to the alias name. Returns the settings associated with the last call to sqleseti for this alias (or a call to sqleseti specifying a zero length alias). If zero is specified, returns the settings associated with the last call to sqleseti which specified a zero length alias.

pDbAlias
Input. A pointer to a string containing the database alias.

NumItems
Input. Number of entries being modified. The minimum value is 1.

pClient_Info
Input. A pointer to an array of NumItems sqle_client_info structures, each containing a type field indicating which value to return, and a pointer to the returned value. The area pointed to must be large enough to accommodate the value being requested.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The settings can be queried at any time during execution. If the API call is successful, the current settings are returned to the specified areas. Returns a length of zero and a null-terminated string (\0) for any fields that have not been set through a call to the sqleseti API.

sqlesact - Set accounting string

Provides accounting information that will be sent to a DRDA server with the application's next connect request.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlesact (
        char * pAccountingString,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgsact (
        unsigned short AccountingStringLen,
        char * pAccountingString,
        struct sqlca * pSqlca);
```

sqlesact API parameters

pAccountingString
Input. A string containing the accounting data.

pSqlca
Output. A pointer to the sqlca structure.

sqlgsact API-specific parameters

AccountingStringLen
Input. A 2-byte unsigned integer representing the length in bytes of the accounting string.

Usage notes

To send accounting data with a connect request, an application should call this API before connecting to a database. The accounting string can be changed before connecting to another database by calling the API again; otherwise, the value remains in effect until the end of the application. The accounting string can be at most SQL_ACCOUNT_STR_SZ (defined in sqlenv) bytes long; longer strings will be truncated. To ensure that the accounting string is converted correctly when transmitted to the DRDA server, use the characters A to Z, 0 to 9, the underscore (_) character and blank space.

sqlesdeg - Set the maximum runtime intra-partition parallelism level or degree for SQL statements

Sets the maximum run time degree of intra-partition parallelism for SQL statement execution for specified active applications. It has no effect on CREATE INDEX statement execution parallelism.

Scope

This API affects all database partition servers that are listed in the db2nodes.cfg file.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

Instance. To change the maximum run time degree of parallelism on a remote server, it is first necessary to attach to that server. If no attachment exists, the SET RUNTIME DEGREE statement fails.

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlesdeg (
        sqlint32 NumAgentIds,
        sqluint32 * pAgentIds,
        sqlint32 Degree,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgsdeg (
        struct sqlca * pSqlca,
        sqlint32 Degree,
        sqluint32 * pAgentIds,
        sqlint32 NumAgentIds);
```

sqlesdeg API parameters

NumAgentIds
Input. An integer representing the total number of active applications to

which the new degree value will apply. This number should be the same as the number of elements in the array of agent IDs.

If this parameter is set to SQL_ALL_USERS (defined in sqlenv), the new degree will apply to all active applications. If it is set to zero, an error is returned.

pAgentIds
Input. Pointer to an array of unsigned long integers. Each entry describes the agent ID of the corresponding application. To list the agent IDs of the active applications, use the db2GetSnapshot API.

Degree
Input. The new value for the maximum run time degree of parallelism. The value must be in the range 1 to 32767.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

The database system monitor functions are used to gather the agent IDs and degrees of active applications.

Minimal validation is performed on the array of agent IDs. The user must ensure that the pointer points to an array containing the total number of elements specified. If NumAgentIds is set to SQL_ALL_USERS, the array is ignored.

If one or more specified agent IDs cannot be found, the unknown agent IDs are ignored, and the function continues. No error is returned. An agent ID may not be found, for instance, if the user signs off between the time an agent ID is collected and the API is called.

Agent IDs are recycled, and are used to change the degree of parallelism for applications some time after being gathered by the database system monitor. When a user signs off, therefore, another user may sign on and acquire the same agent ID through this recycling process, with the result that the new degree of parallelism will be modified for the wrong user.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqlesetc - Set client connection settings

Specifies connection settings for the application. Use the sqle_conn_setting data structure to specify the connection setting types and values.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlesetc (
        struct sqle_conn_setting * pConnectionSettings,
        unsigned short NumSettings,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgsetc (
        struct sqle_conn_setting * pConnectionSettings,
        unsigned short NumSettings,
        struct sqlca * pSqlca);
```

sqlesetc API parameters

pConnectionSettings
Input. A pointer to the sqle_conn_setting structure, which specifies connection setting types and values. Allocate an array of NumSettings sqle_conn_setting structures. Set the type field of each element in this array to indicate the connection option to set. Set the value field to the desired value for the option.

NumSettings
Input. Any integer (from 0 to 7) representing the number of connection option values to set.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

If this API is successful, the connections in the subsequent units of work will use the connection settings specified. If this API is unsuccessful, the connection settings are unchanged.

The connection settings for the application can only be changed when there are no existing connections (for example, before any connection is established, or after RELEASE ALL and COMMIT).

Once the SET CLIENT API has executed successfully, the connection settings are fixed and can only be changed by again executing the SET CLIENT API. All corresponding precompiled options of the application modules will be overridden.

REXX API syntax

```
SET CLIENT USING :values
```

REXX API parameters

values A compound REXX host variable containing the connection settings for the application process. In the following, XXX represents the host variable name.

XXX.0 Number of connection settings to be established

XXX.1 Specifies how to set up the CONNECTION type. The valid values are:

1 Type 1 CONNECT

2 Type 2 CONNECT

XXX.2 Specifies how to set up the SQLRULES according to:

- Whether type 2 CONNECTs are to be processed according to the DB2 rules or the Standard (STD) rules based on ISO/ANS SQL92.
- How an application specifies the format of LOB columns in the result set.

DB2

- Permits the SQL CONNECT statement to switch the current connection to another established (*dormant*) connection.
- This default setting allows an application to specify whether LOB values or LOB locators are retrieved only during the first fetch request. Subsequent fetch requests must use the same format for the LOB columns.

STD

- Permits the SQL CONNECT statement to establish a *new* connection only. The SQL SET CONNECTION statement must be used to switch to a dormant connection.
- The application can change between retrieving LOB values and LOB locators with each fetch request. This means that cursors with one or more LOB columns cannot be blocked, regardless of the BLOCKING bind option setting.

XXX.3 Specifies how to set up the scope of disconnection to databases at commit. The valid values are:

EXPLICIT
Disconnect only those marked by the SQL RELEASE statement

CONDITIONAL
Disconnect only those that have no open WITH HOLD cursors

AUTOMATIC
Disconnect all connections

XXX.4 Specifies how to set up the coordination among multiple database connections during commits or rollbacks. The valid values are:

TWOPHASE
Use Transaction Manager (TM) to coordinate two-phase commits. The SYNCPOINT option is ignored and is available only for backward compatibility.

XXX.6 Specifies when to execute the PREPARE statement. The valid values are:

NO The PREPARE statement will be executed at the time it is issued

YES The PREPARE statement will not be executed until the corresponding OPEN, DESCRIBE, or EXECUTE statement is issued. However, the PREPARE INTO statement is not deferred

ALL Same as YES, except that the PREPARE INTO statement is also deferred

sqleseti - Set client information

Permits an application to set client information (by setting the fields in the sqle_client_info data structure) associated with a specific connection, provided a connection already exists.

In a TP monitor or 3-tier client/server application environment, there is a need to obtain information about the client, and not just the application server that is working on behalf of the client. By using this API, the application server can pass the client's user ID, workstation information, program information, and other accounting information to the DB2 server; otherwise, only the application server's information is passed, and that information is likely to be the same for the many client invocations that go through the same application server.

The application can elect to not specify an alias, in which case the client information will be set for all existing, as well as future, connections. This API will only permit information to be changed outside of a unit of work, either before any SQL is executed, or after a commit or a rollback. If the call is successful, the values for the connection will be sent at the next opportunity, grouped with the next SQL request sent on that connection; a successful call means that the values have been accepted, and that they will be propagated to subsequent connections.

This API can be used to establish values prior to connecting to a database, or it can be used to set or modify the values once a connection has been established.

Authorization

None

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleseti (
        unsigned short DbAliasLen,
        char * pDbAlias,
        unsigned short NumItems,
        struct sqle_client_info* pClient_Info,
        struct sqlca * pSqlca);
```

sqleseti API parameters

DbAliasLen

Input. A 2-byte unsigned integer representing the length in bytes of the database alias. If a value greater than zero is provided, **pDbAlias** must point to the alias name, and the settings will affect only the specified connection. If zero is specified, the settings will affect all existing and future connections.

pDbAlias
Input. A pointer to a string containing the database alias.

NumItems
Input. Number of entries being modified. The minimum value is 1.

pClient_Info
Input. A pointer to an array of **NumItems** sqle_client_info structures, each containing a type field indicating which value to set, the length of that value, and a pointer to the new value.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

If an alias name was provided, a connection to the alias must already exist, and all connections to that alias will inherit the changes. The information will be retained until the connection for that alias is broken. If an alias name was not provided, settings for all existing connections will be changed, and any future connections will inherit the changes. The information will be retained until the program terminates.

The field names represent guidelines for the type of information that can be provided. For example, a TP monitor application could choose to provide the TP monitor transaction ID along with the application name in the SQL_CLIENT_INFO_APPLNAM field. This would provide better monitoring and accounting on the DB2 server, where the DB2 transaction ID can be associated with the TP monitor transaction ID.

Currently this API will pass information to DB2 OS/390 Version 5 and higher, DB2 UDB Version 7 and higher, and DB2 i5/OS® V6R1 and higher. All information (except the accounting string) is displayed on the DISPLAY THREAD command, and will all be logged into the accounting records.

The data values provided with the API can also be accessed by SQL special register. The values in these registers are stored in the database code page. Data values provided with this API are converted to the database code page before being stored in the special registers. Any data value that exceeds the maximum supported size after conversion to the database code page will be truncated before being stored at the server. These truncated values will be returned by the special registers. The original data values will also be stored at the server and are not converted to the database code page. The unconverted values can be returned by calling the sqleqryi API.

Calling the sqleseti API in a CLI program before a connection will not work. Calling the sqleseti API in a CLI program after a connection has been established may result in unpredictable behavior. It is recommended that the corresponding CLI functions SQLSetConnectAttr() or SQLSetEnvAttr() be used instead.

sqleuncd - Uncatalog a database from the system database directory

Deletes an entry from the system database directory.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleuncd (
        _SQLOLDCHAR * pDbAlias,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlguncd (
        unsigned short DbAliasLen,
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pDbAlias);
```

sqleuncd API parameters

pDbAlias
Input. A string containing the database alias that is to be uncataloged.

pSqlca
Output. A pointer to the sqlca structure.

sqlguncd API-specific parameters

DbAliasLen
Input. A 2-byte unsigned integer representing the length in bytes of the database alias.

Usage notes

Only entries in the system database directory can be uncataloged. Entries in the local database directory can be deleted using the sqledrpd API.

To recatalog the database, use the sqlecadb API.

To list the databases that are cataloged on a node, use the db2DbDirOpenScan, db2DbDirGetNextEntry, and db2DbDirCloseScan APIs.

The authentication type of a database, used when communicating with an earlier server, can be changed by first uncataloging the database, and then cataloging it again with a different type.

If directory caching is enabled using the dir_cache configuration parameter, database, node, and DCS directory files are cached in memory. An application's directory cache is created during its first directory lookup. Since the cache is only refreshed when the application modifies any of the directory files, directory changes made by other applications may not be effective until the application has

restarted. To refresh DB2's shared cache (server only), stop (db2stop) and then restart (db2start) the database manager. To refresh the directory cache for another application, stop and then restart that application.

REXX API syntax

```
UNCATALOG DATABASE dbname
```

REXX API parameters

dbname
Alias of the database to be uncataloged.

sqleuncn - Uncatalog an entry from the node directory

Deletes an entry from the node directory.

Authorization

One of the following:

- sysadm
- sysctrl

Required connection

None

API include file

```
sqlenv.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleuncn (
        _SQLOLDCHAR * pNodeName,
        struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlguncn (
        unsigned short NodeNameLen,
        struct sqlca * pSqlca,
        _SQLOLDCHAR * pNodeName);
```

sqleuncn API parameters

pNodeName
Input. A string containing the name of the node to be uncataloged.

pSqlca
Output. A pointer to the sqlca structure.

sqlguncn API-specific parameters

NodeNameLen
Input. A 2-byte unsigned integer representing the length in bytes of the node name.

Usage notes

To recatalog the node, use the sqlectnd API.

To list the nodes that are cataloged, use the db2DbDirOpenScan, db2DbDirGetNextEntry, and db2DbDirCloseScan APIs.

If directory caching is enabled using the dir_cache configuration parameter, database, node, and DCS directory files are cached in memory. An application's directory cache is created during its first directory lookup. Since the cache is only refreshed when the application modifies any of the directory files, directory changes made by other applications may not be effective until the application has restarted. To refresh DB2's shared cache (server only), stop (db2stop) and then restart (db2start) the database manager. To refresh the directory cache for another application, stop and then restart that application.

REXX API syntax

```
UNCATALOG NODE nodename
```

REXX API parameters

nodename
Name of the node to be uncataloged.

sqlgaddr - Get the address of a variable

Places the address of a variable into another variable. This API is used in host programming languages, FORTRAN and COBOL, which do not provide pointer manipulation.

Authorization

None

Required connection

None

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlgaddr (
   char * pVariable,
   char ** ppOutputAddress);
```

sqlgaddr API parameters

pVariable
Input. Variable whose address is to be returned.

ppOutputAddress
Output. A 4-byte area into which the variable address is returned.

sqlgdref - Dereference an address

Copies data from a buffer that is defined by a pointer, into a variable that is directly accessible by the application. This API is used in host programming languages, FORTRAN and COBOL, which do not provide pointer manipulation. This API can be used to obtain results from APIs that return a pointer to the desired data.

Authorization

None

Required connection

None

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlgdref (
   unsigned int NumBytes,
   char * pTargetBuffer,
   char ** ppSourceBuffer);
```

sqlgdref API parameters

NumBytes
Input. An integer representing the number of bytes to be transferred.

pTargetBuffer
Output. Area into which the data are moved.

ppSourceBuffer
Input. A pointer to the area containing the desired data.

sqlgmcpy - Copy data from one memory area to another

Copies data from one memory area to another. This API is used in host programming languages, FORTRAN and COBOL, that do not provide memory block copy functions.

Authorization

None

Required connection

None

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlgmcpy (
   void * pTargetBuffer,
   const void * pSource,
   sqluint32 NumBytes);
```

sqlgmcpy API parameters

pTargetBuffer
Output. Area into which to move the data.

pSource
Input. Area from which to move the data.

NumBytes
Input. A 4-byte unsigned integer representing the number of bytes to be transferred.

sqlogstt - Get the SQLSTATE message

Retrieves the message text associated with an SQLSTATE value.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlogstt (
        char * pBuffer,
        short BufferSize,
        short LineWidth,
        char * pSqlstate);

SQL_API_RC SQL_API_FN
  sqlggstt (
        short BufferSize,
        short LineWidth,
        char * pSqlstate,
        char * pBuffer);
```

sqlogstt API parameters

pBuffer
Output. A pointer to a string buffer where the message text is to be placed. If the message must be truncated to fit in the buffer, the truncation allows for the null string terminator character.

BufferSize
Input. Size, in bytes, of a string buffer to hold the retrieved message text.

LineWidth
Input. The maximum line width for each line of message text. Lines are broken on word boundaries. A value of zero indicates that the message text is returned without line breaks.

pSqlstate
Input. A string containing the SQLSTATE for which the message text is to be retrieved. This field is alphanumeric and must be either five-digit (specific SQLSTATE) or two-digit (SQLSTATE class, first two digits of an SQLSTATE). This field does not need to be NULL-terminated if 5 digits are being passed in, but must be NULL-terminated if 2 digits are being passed.

Usage notes

One message is returned per call.

A LF/NULL sequence is placed at the end of each message.

If a positive line width is specified, LF/NULL sequences are inserted between words so that the lines do not exceed the line width.

If a word is longer than a line width, the line is filled with as many characters as will fit, a LF/NULL is inserted, and the remaining characters are placed on the next line.

Return codes

Code	Message
+i	Positive integer indicating the number of bytes in the formatted message. If this is greater than the buffer size input by the caller, the message is truncated.
-1	Insufficient memory available for message formatting services to function. The requested message is not returned.
-2	The SQLSTATE is in the wrong format. It must be alphanumeric and be either 2 or 5 digits in length.
-3	Message file inaccessible or incorrect.
-4	Line width is less than zero.
-5	Invalid sqlca, bad buffer address, or bad buffer length.

If the return code is -1 or -3, the message buffer will contain further information about the problem.

REXX API syntax

```
GET MESSAGE FOR SQLSTATE sqlstate INTO :msg [LINEWIDTH width]
```

REXX API parameters

sqlstate
The SQLSTATE for which the message text is to be retrieved.

msg REXX variable into which the message is placed.

width Maximum line width for each line of the message text. The line is broken on word boundaries. If a value is not specified, or this parameter is set to 0, the message text returns without line breaks.

sqluadau - Get current user's authorities

Reports the instance level and database level authorities of the current user from values found in the database manager configuration file and the authorization system catalog view (SYSCAT.DBAUTH) respectively. The instance level authorities reported are the ones that you can set in the sysadm_group, sysmaint_group and sysctrl_group database manager configuration parameters and the database level authorities are the ones that can be granted via the GRANT (Database Authorities) statement.

Note: This API is deprecated and the same functionality can be obtained by using AUTH_LIST_AUTHORITIES_FOR_AUTHID table function.

Authorization

None

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqluadau (
   struct sql_authorizations * pAuthorizations,
   struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgadau (
   struct sql_authorizations * pAuthorizations,
   struct sqlca * pSqlca);
```

sqluadau API parameters

pAuthorizations
Input or Output. Pointer to the sql_authorizations structure. This array of short integers indicates which authorizations the current user holds.

The first element in the structure, sql_authorizations_len, must be initialized to the size of the buffer being passed, prior to calling this API.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

Direct authorities are acquired by explicit commands that grant the authorities to a user ID. Indirect authorities are based on authorities acquired by the groups to which a user belongs.

Note: PUBLIC is a special group to which all users belong.

If there are no errors, each element of the sql_authorizations structure contains a 0 or a 1. A value of 1 indicates that the user holds that authorization; 0 indicates that the user does not.

REXX API syntax

```
GET AUTHORIZATIONS :value
```

REXX API parameters

value A compound REXX host variable to which the authorization level is returned. In the following, XXX represents the host variable name. Values are 0 for no, and 1 for yes.

XXX.0 Number of elements in the variable (always 18)

XXX.1 Direct SYSADM authority

XXX.2 Direct DBADM authority

XXX.3 Direct CREATETAB authority

XXX.4 Direct BINDADD authority

XXX.5 Direct CONNECT authority

XXX.6 Indirect SYSADM authority

XXX.7 Indirect DBADM authority

XXX.8 Indirect CREATETAB authority

XXX.9 Indirect BINDADD authority

XXX.10
Indirect CONNECT authority

XXX.11
Direct SYSCTRL authority

XXX.12
Indirect SYSCTRL authority

XXX.13
Direct SYSMAINT authority

XXX.14
Indirect SYSMAINT authority

XXX.15
Direct CREATE_NOT_FENC authority

XXX.16
Indirect CREATE_NOT_FENC authority

XXX.17
Direct IMPLICIT_SCHEMA authority

XXX.18
Indirect IMPLICIT_SCHEMA authority.

XXX.19
Direct LOAD authority.

XXX.20
Indirect LOAD authority.

sqludrdt - Redistribute data across a database partition group

Redistributes data across the database partitions in a database partition group. The current data distribution, whether it is uniform or skewed, can be specified. The redistribution algorithm selects the database partitions to be moved based on the current data distribution. This API does not support the NOT ROLLFORWARD RECOVERABLE option of the REDISTRIBUTE DATABASE PARTITION GROUP command.

This API can only be called from the catalog partition. Use the LIST DATABASE DIRECTORY command to determine which database partition server is the catalog partition for each database.

Scope

This API affects all database partitions in the database partition group.

Authorization

One of the following:

- sysadm
- sysctrl
- dbadm

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqludrdt (
   char * pNodeGroupName,
   char * pTargetPMapFileName,
   char * pDataDistFileName,
   SQL_PDB_NODE_TYPE * pAddList,
   unsigned short AddCount,
   SQL_PDB_NODE_TYPE * pDropList,
   unsigned short DropCount,
   unsigned char DataRedistOption,
   struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgdrdt (
   unsigned short NodeGroupNameLen,
   unsigned short TargetPMapFileNameLen,
   unsigned short DataDistFileNameLen,
   char * pNodeGroupName,
   char * pTargetPMapFileName,
   char * pDataDistFileName,
   SQL_PDB_NODE_TYPE * pAddList,
   unsigned short AddCount,
   SQL_PDB_NODE_TYPE * pDropList,
   unsigned short DropCount,
   unsigned char DataRedistOption,
   struct sqlca * pSqlca);
```

sqludrdt API parameters

pNodeGroupName
The name of the database partition group to be redistributed.

pTargetPMapFileName
The name of the file that contains the target distribution map. If a directory path is not specified as part of the file name, the current directory is used. This parameter is used when the DataRedistOption value is T. The file should be in character format and contain either 4 096 entries (for a multiple-partition database partition group) or 1 entry (for a single-partition database partition group). Entries in the file indicate node numbers. Entries can be in free format.

pDataDistFileName
The name of the file that contains input distribution information. If a directory path is not specified as part of the file name, the current directory is used. This parameter is used when the DataRedistOption value is U. The file should be in character format and contain 4 096 positive integer entries. Each entry in the file should indicate the weight of the corresponding database partition. The sum of the 4 096 values should be less than or equal to 4 294 967 295.

pAddList
The list of database partitions to add to the database partition group during the data redistribution. Entries in the list must be in the form: SQL_PDB_NODE_TYPE.

AddCount
The number of database partitions to add to the database partition group.

pDropList
The list of database partitions to drop from the database partition group during the data redistribution. Entries in the list must be in the form: SQL_PDB_NODE_TYPE.

DropCount
The number of database partitions to drop from the database partition group.

DataRedistOption
A single character that indicates the type of data redistribution to be done. Possible values are:

U Specifies to redistribute the database partition group to achieve a balanced distribution. If pDataDistFileName is null, the current data distribution is assumed to be uniform (that is, each database partition represents the same amount of data). If pDataDistFileName parameter is not null, the values in this file are assumed to represent the current data distribution. When the DataRedistOption is U, the pTargetPMapFileName parameter should be null. Database partitions specified in the add list are added, and database partitions specified in the drop list are dropped from the database partition group.

T Specifies to redistribute the database partition group using the pTargetPMapFileName parameter. For this option, the parameters, pDataDistFileName, pAddList, and pDropList should be null, and both the parameters, AddCount and DropCount must be zero.

C Specifies to continue a redistribution operation that failed. For this option, the parameters, pTargetPMapFileName, pDataDistFileName, pAddList, and pDropList should be null, and both the parameters, AddCount and DropCount must be zero.

R Specifies to roll back a redistribution operation that failed. For this

option, the parameters, pTargetPMapFileName, pDataDistFileName, pAddList, and pDropList should be null, and both the parameters, AddCount and DropCount must be zero.

pSqlca
Output. A pointer to the sqlca structure.

sqlgdrdt API-specific parameters

NodeGroupNameLen
The length of the name of the database partition group.

TargetPMapFileNameLen
The length of the name of the target distribution map file.

DataDistFileNameLen
The length of the name of the data distribution file.

Usage notes

When a redistribution operation is done, a message file is written to:

- The $HOME/sqllib/redist directory on UNIX based systems, using the following format for subdirectories and file name: database-name.nodegroup-name.timestamp.
- The $HOME\sqllib\redist\ directory on the Windows operating system, using the following format for subdirectories and file name: database-name\first-eight-characters-of-the-nodegroup-name\date\time.

The time stamp value is the time at which the API was called.

This utility performs intermittent COMMITs during processing.

Use the ALTER DATABASE PARTITION GROUP statement to add database partitions to a database partition group. This statement permits one to define the containers for the table spaces associated with the database partition group.

All packages having a dependency on a table that has undergone redistribution are invalidated. It is recommended to explicitly rebind such packages after the redistribute database partition group operation has completed. Explicit rebinding eliminates the initial delay in the execution of the first SQL request for the invalid package. The redistribute message file contains a list of all the tables that have undergone redistribution.

It is also recommended to update statistics by issuing the db2Runstats API after the redistribute database partition group operation has completed.

Database partition groups containing replicated summary tables or tables defined with the DATA CAPTURE CHANGES clause cannot be redistributed.

Redistribution is not allowed if there are user temporary table spaces with existing declared temporary tables in the database partition group.

REXX API syntax

This API can be called from REXX through the SQLDB2 interface.

sqlugrpn - Get the database partition server number for a row

Returns the database partition number and the database partition server number based on the distribution key values. An application can use this information to determine on which database partition server a specific row of a table is stored.

The partitioning data structure, sqlupi, is the input for this API. The structure can be returned by the sqlugtpi API. Another input is the character representations of the corresponding distribution key values. The output is a database partition number generated by the distribution strategy and the corresponding database partition server number from the distribution map. If the distribution map information is not provided, only the database partition number is returned. This can be useful when analyzing data distribution.

The database manager does not need to be running when this API is called.

Scope

This API must be invoked from a database partition server in the db2nodes.cfg file. This API should not be invoked from a client, since it could result in erroneous database partitioning information being returned due to differences in codepage and endianess between the client and the server.

Authorization

None

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlugrpn (
   unsigned short num_ptrs,
   unsigned char ** ptr_array,
   unsigned short * ptr_lens,
   unsigned short territory_ctrycode,
   unsigned short codepage,
   struct sqlupi * part_info,
   short * part_num,
   SQL_PDB_NODE_TYPE * node_num,
   unsigned short chklvl,
   struct sqlca * sqlca,
   short dataformat,
   void * pReserved1,
   void * pReserved2);

SQL_API_RC SQL_API_FN
  sqlggrpn (
   unsigned short num_ptrs,
   unsigned char ** ptr_array,
   unsigned short * ptr_lens,
   unsigned short territory_code,
   unsigned short codepage,
   struct sqlupi * part_info,
   short * part_num,
   SQL_PDB_NODE_TYPE * node_num,
   unsigned short chklvl,
```

```
struct sqlca * sqlca,
short dataformat,
void * pReserved1,
void * pReserved2);
```

sqlugrpn API parameters

num_ptrs
The number of pointers in ptr_array. The value must be the same as the one specified for the part_info parameter; that is, part_info->sqld.

ptr_array
An array of pointers that points to the character representations of the corresponding values of each part of the distribution key specified in part_info. If a null value is required, the corresponding pointer is set to null. For generated columns, this function does not generate values for the row. The user is responsible for providing a value that will lead to the correct partitioning of the row.

ptr_lens
An array of unsigned integers that contains the lengths of the character representations of the corresponding values of each part of the partitioning key specified in part_info.

territory_ctrycode
The country/region code of the target database. This value can also be obtained from the database configuration file using the GET DATABASE CONFIGURATION command.

codepage
The code page of the target database. This value can also be obtained from the database configuration file using the GET DATABASE CONFIGURATION command.

part_info
A pointer to the sqlupi structure.

part_num
A pointer to a 2-byte signed integer that is used to store the database partition number.

node_num
A pointer to an SQL_PDB_NODE_TYPE field used to store the node number. If the pointer is null, no node number is returned.

chklvl An unsigned integer that specifies the level of checking that is done on input parameters. If the value specified is zero, no checking is done. If any non-zero value is specified, all input parameters are checked.

sqlca Output. A pointer to the sqlca structure.

dataformat
Specifies the representation of distribution key values. Valid values are:

SQL_CHARSTRING_FORMAT
All distribution key values are represented by character strings. This is the default value.

SQL_IMPLIEDDECIMAL_FORMAT
The location of an implied decimal point is determined by the column definition. For example, if the column definition is DECIMAL(8,2), the value 12345 is processed as 123.45.

SQL_PACKEDDECIMAL_FORMAT
All decimal column distribution key values are in packed decimal format.

SQL_BINARYNUMERICS_FORMAT
All numeric distribution key values are in big-endian binary format.

pReserved1
Reserved for future use.

pReserved2
Reserved for future use.

Usage notes

Data types supported on the operating system are the same as those that can be defined as a distribution key.

Note: CHAR, VARCHAR, GRAPHIC, and VARGRAPHIC data types must be converted to the database code page before this API is called.

For numeric and datetime data types, the character representations must be at the code page of the respective system where the API is invoked.

If node_num is not null, the distribution map must be supplied; that is, pmaplen field in part_info parameter (part_info->pmaplen) is either 2 or 8192. Otherwise, SQLCODE -6038 is returned. The distribution key must be defined; that is, sqld field in part_info parameter (part_info->sqld) must be greater than zero. Otherwise, SQLCODE -2032 is returned.

If a null value is assigned to a non-nullable partitioning column, SQLCODE -6039 is returned.

All the leading blanks and trailing blanks of the input character string are stripped, except for the CHAR, VARCHAR, GRAPHIC, and VARGRAPHIC data types, where only trailing blanks are stripped.

sqlugtpi - Get table distribution information

Allows an application to obtain the distribution information for a table. The distribution information includes the distribution map and the column definitions of the distribution key. Information returned by this API can be passed to the sqlugrpn API to determine the database partition number and the database partition server number for any row in the table.

To use this API, the application must be connected to the database that contains the table for which distribution information is being requested.

Scope

This API can be executed on any database partition server defined in the db2nodes.cfg file.

Authorization

For the table being referenced, a user must have at least one of the following:

- sysadm authority
- dbadm authority
- CONTROL privilege
- SELECT privilege

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqlugtpi (
   unsigned char * tablename,
   struct sqlupi * part_info,
   struct sqlca * sqlca);

SQL_API_RC SQL_API_FN
  sqlggtpi (
   unsigned short tn_length,
   unsigned char * tablename,
   struct sqlupi * part_info,
   struct sqlca * sqlca);
```

sqlugtpi API parameters

tablename
The fully qualified name of the table.

part_info
A pointer to the sqlupi structure.

pSqlca
Output. A pointer to the sqlca structure.

sqlggtpi API-specific parameters

tn_length
A 2-byte unsigned integer with the length of the table name.

sqluvqdp - Quiesce table spaces for a table

Quiesces table spaces for a table. There are three valid quiesce modes: share, intent to update, and exclusive. There are three possible table space states resulting from the quiesce function:

- Quiesced: SHARE
- Quiesced: UPDATE
- Quiesced: EXCLUSIVE

Scope

In a single-partition database environment, this API quiesces all table spaces involved in a load operation in exclusive mode for the duration of the load. In a partitioned database environment, this API acts locally on a database partition. It quiesces only that portion of table spaces belonging to the database partition on which the load is performed.

Authorization

One of the following:

- sysadm
- sysctrl
- sysmaint
- dbadm
- load

Required connection

Database

API include file

```
sqlutil.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqluvqdp (
   char * pTableName,
   sqlint32 QuiesceMode,
   void * pReserved,
   struct sqlca * pSqlca);

SQL_API_RC SQL_API_FN
  sqlgvqdp (
   unsigned short TableNameLen,
   char * pTableName,
   sqlint32 QuiesceMode,
   void * pReserved,
   struct sqlca * pSqlca);
```

sqluvqdp API parameters

pTableName

Input. A string containing the table name as used in the system catalog. This may be a two-part name with the schema and the table name separated by a period (.). If the schema is not provided, the CURRENT SCHEMA will be used.

The table cannot be a system catalog table. This field is mandatory.

QuiesceMode

Input. Specifies the quiesce mode. Valid values (defined in sqlutil) are:

SQLU_QUIESCEMODE_SHARE
For share mode

SQLU_QUIESCEMODE_INTENT_UPDATE
For intent to update mode

SQLU_QUIESCEMODE_EXCLUSIVE
For exclusive mode

SQLU_QUIESCEMODE_RESET
To reset the state of the table spaces to normal if either of the following is true:

- The caller owns the quiesce
- The caller who sets the quiesce disconnects, creating a ″phantom quiesce″

SQLU_QUIESCEMODE_RESET_OWNED
To reset the state of the table spaces to normal if the caller owns the quiesce.

This field is mandatory.

pReserved
Reserved for future use.

pSqlca
Output. A pointer to the sqlca structure.

sqlgvqdp API-specific parameters

TableNameLen
Input. A 2-byte unsigned integer representing the length in bytes of the table name.

Usage notes

This API is not supported for declared temporary tables.

When the quiesce share request is received, the transaction requests intent share locks for the table spaces and a share lock for the table. When the transaction obtains the locks, the state of the table spaces is changed to QUIESCED SHARE. The state is granted to the quiescer only if there is no conflicting state held by other users. The state of the table spaces is recorded in the table space table, along with the authorization ID and the database agent ID of the quiescer, so that the state is persistent.

The table cannot be changed while the table spaces for the table are in QUIESCED SHARE state. Other share mode requests to the table and table spaces will be allowed. When the transaction commits or rolls back, the locks are released, but the table spaces for the table remain in QUIESCED SHARE state until the state is explicitly reset.

When the quiesce exclusive request is made, the transaction requests super exclusive locks on the table spaces, and a super exclusive lock on the table. When the transaction obtains the locks, the state of the table spaces changes to QUIESCED EXCLUSIVE. The state of the table spaces, along with the authorization ID and the database agent ID of the quiescer, are recorded in the table space table. Since the table spaces are held in super exclusive mode, no other access to the table spaces is allowed. The user who invokes the quiesce function (the quiescer), however, has exclusive access to the table and the table spaces.

When a quiesce update request is made, the table spaces are locked in intent exclusive (IX) mode, and the table is locked in update (U) mode. The state of the table spaces with the quiescer is recorded in the table space table.

There is a limit of five quiescers on a table space at any given time. Since QUIESCED EXCLUSIVE is incompatible with any other state, and QUIESCED UPDATE is incompatible with another QUIESCED UPDATE, the five quiescer limit, if reached, must have at least four QUIESCED SHARE and at most one QUIESCED UPDATE.

A quiescer can upgrade the state of a table space from a less restrictive state to a more restrictive one (for example, S to U, or U to X). If a user requests a state lower than one that is already held, the original state is returned. States are not downgraded.

The quiesced state of a table space must be reset explicitly by using SQLU_QUIESCEMODE_RESET.

REXX API syntax

```
QUIESCE TABLESPACES FOR TABLE table_name
{SHARE | INTENT TO UPDATE | EXCLUSIVE | RESET}
```

REXX API parameters

table_name
Name of the table as used in the system catalog. This may be a two-part name with the schema and the table name separated by a period (.). If the schema is not provided, the CURRENT SCHEMA will be used.

Chapter 5. Calling DB2 APIs in REXX

Use the SQLDBS routine to call DB2 APIs with the following syntax:

```
CALL SQLDBS 'command string'
```

If a DB2 API you want to use cannot be called using the SQLDBS routine, you can still call the API by calling the DB2 command line processor (CLP) from within the REXX application. However, because the DB2 CLP directs output either to the standard output device or to a specified file, your REXX application cannot directly access the output from the called DB2 API, nor can it easily make a determination as to whether the called API is successful or not. The SQLDB2 API provides an interface to the DB2 CLP that provides direct feedback to your REXX application on the success or failure of each called API by setting the compound REXX variable, SQLCA, after each call.

You can use the SQLDB2 routine to call DB2 APIs using the following syntax:

```
CALL SQLDB2 'command string'
```

where `'command string'` is a string that can be processed by the command-line processor (CLP).

Calling a DB2 API using SQLDB2 is equivalent to calling the CLP directly, except for the following:

- The call to the CLP executable is replaced by the call to SQLDB2 (all other CLP options and parameters are specified the same way).
- The REXX compound variable SQLCA is set after calling the SQLDB2 but is not set after calling the CLP executable.
- The default display output of the CLP is set to off when you call SQLDB2, whereas the display is set to on output when you call the CLP executable. Note that you can turn the display output of the CLP to on by passing the `+o` or the `-o-` option to the SQLDB2.

Because the only REXX variable that is set after you call SQLDB2 is the SQLCA, you only use this routine to call DB2 APIs that do not return any data other than the SQLCA and that are not currently implemented through the SQLDBS interface. Thus, only the following DB2 APIs are supported by SQLDB2:

- Activate Database
- Add Node
- Bind for DB2 Version 1[(1) (2)]
- Bind for DB2 Version 2 or 5[(1)]
- Create Database at Node
- Drop Database at Node
- Drop Node Verify
- Deactivate Database
- Deregister
- Load[(3)]
- Load Query
- Precompile Program[(1)]
- Rebind Package[(1)]
- Redistribute Database Partition Group
- Register
- Start Database Manager

- Stop Database Manager

Notes on DB2 APIs Supported by SQLDB2:

1. These commands require a CONNECT statement through the SQLDB2 interface. Connections using the SQLDB2 interface are not accessible to the SQLEXEC interface and connections using the SQLEXEC interface are not accessible to the SQLDB2 interface.
2. Is supported on Windows-based platforms through the SQLDB2 interface.
3. The optional output parameter, `poLoadInfoOut` for the Load API is not returned to the application in REXX.

Note: Although the SQLDB2 routine is intended to be used only for the DB2 APIs listed above, it can also be used for other DB2 APIs that are not supported through the SQLDBS routine. Alternatively, the DB2 APIs can be accessed through the CLP from within the REXX application.

Change Isolation Level

Changes the way that DB2 isolates data from other processes while a database is being accessed. This API can only be called from a REXX application.

Authorization

None

Required connection

None

REXX API syntax

```
CHANGE SQLISL TO {RR|CS|UR|RS|NC}
```

REXX API parameters

RR Repeatable read.

CS Cursor stability. This is the default.

UR Uncommitted read.

RS Read stability.

NC No commit.

Chapter 6. Indoubt transaction management APIs

Databases can be used in a distributed transaction processing (DTP) environment.

A set of APIs is provided for tool writers to perform heuristic functions on indoubt transactions when the resource owner (such as the database administrator) cannot wait for the Transaction Manager (TM) to perform the *re-sync* action. This condition may occur if, for example, the communication line is broken, and an indoubt transaction is tying up needed resources. For the database manager, these resources include locks on tables and indexes, log space, and storage used by the transaction. Each indoubt transaction also decreases, by one, the maximum number of concurrent transactions that could be processed by the database manager.

The heuristic APIs have the capability to query, commit, and roll back indoubt transactions, and to cancel transactions that have been heuristically committed or rolled back, by removing the log records and releasing log pages.

Attention: The heuristic APIs should be used with caution and only as a last resort. The TM should drive the re-sync events. If the TM has an operator command to start the re-sync action, it should be used. If the user cannot wait for a TM-initiated re-sync, heuristic actions are necessary.

Although there is no set way to perform these actions, the following guidelines may be helpful:

- Use the db2XaListIndTrans function to display the indoubt transactions. They have a status = 'P' (prepared), and are not connected. The *gtrid* portion of an *xid* is the global transaction ID that is identical to that in other resource managers (RM) that participate in the global transaction.
- Use knowledge of the application and the operating environment to identify the other participating RMs.
- If the transaction manager is CICS, and the only RM is a CICS® resource, perform a heuristic rollback.
- If the transaction manager is not CICS, use it to determine the status of the transaction that has the same *gtrid* as does the indoubt transaction.
- If at least one RM has committed or rolled back, perform a heuristic commit or a rollback.
- If they are all in the prepared state, perform a heuristic rollback.
- If at least one RM is not available, perform a heuristic rollback.

If the transaction manager is available, and the indoubt transaction is due to the RM not being available in the second phase, or in an earlier re-sync, the DBA should determine from the TM's log what action has been taken against the other RMs, and then do the same. The *gtrid* is the matching key between the TM and the RMs.

Do not execute sqlxhfrg unless a heuristically committed or rolled back transaction happens to cause a log full condition. The forget function releases the log space occupied by this indoubt transaction. If a transaction manager eventually performs a re-sync action for this indoubt transaction, the TM could make the wrong decision to commit or to roll back other RMs, because no record was found in this RM. In general, a missing record implies that the RM has rolled back.

db2XaGetInfo - Get information for a resource manager

Extracts information for a particular resource manager once an xa_open call has been made.

Authorization

Instance - SPM name connection

Required Connection

Database

API include file

```
sqlxa.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2XaGetInfo(db2Uint32 versionNumber,
               void * pParmStruct,
               struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2XaGetInfoStruct
{
   db2int32 iRmid;
   struct sqlca         oLastSqlca;
} db2XaGetInfoStruct;
```

db2XaGetInfo API Parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2XaGetInfoStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2XaGetInfoStruct data structure parameters

iRmid
Input. Specifies the resource manager for which information is required.

oLastSqlca
Output. Contains the sqlca for the last XA API call.

Note: Only the sqlca that resulted from the last failing XA API can be retrieved.

db2XaListIndTrans - List indoubt transactions

Provides a list of all indoubt transactions for the currently connected database.

Scope

This API only affects the database partition on which it is issued.

Authorization

None

Required connection

Database

API include file

```
sqlxa.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  db2XaListIndTrans (
       db2Uint32 versionNumber,
       void * pParmStruct,
       struct sqlca * pSqlca);

typedef SQL_STRUCTURE db2XaListIndTransStruct
{
   db2XaRecoverStruct * piIndoubtData;
   db2Uint32 iIndoubtDataLen;
   db2Uint32 oNumIndoubtsReturned;
   db2Uint32 oNumIndoubtsTotal;
   db2Uint32 oReqBufferLen;
} db2XaListIndTransStruct;

typedef SQL_STRUCTURE db2XaRecoverStruct{
   sqluint32 timestamp;
   SQLXA_XID xid;
   char dbalias[SQLXA_DBNAME_SZ];
   char applid[SQLXA_APPLID_SZ];
   char sequence_no[SQLXA_SEQ_SZ];
   char auth_id[SQLXA_USERID_SZ];
   char log_full;
   char connected;
   char indoubt_status;
   char originator;
   char reserved[8];
   sqluint32 rmn;
   rm_entry rm_list[SQLXA_MAX_FedRM];
   } db2XaRecoverStruct;

typedef SQL_STRUCTURE rm_entry
{
  char name[SQLQG_MAX_SERVER_NAME_LEN];
  SQLXA_XID xid;
} rm_entry;
```

db2XaListIndTrans API parameters

versionNumber
Input. Specifies the version and release level of the structure passed in as the second parameter, pParmStruct.

pParmStruct
Input. A pointer to the db2XaListIndTransStruct structure.

pSqlca
Output. A pointer to the sqlca structure.

db2XaListIndTransStruct data structure parameters

piIndoubtData
Input. A pointer to the application supplied buffer where indoubt data will be returned. The indoubt data is in db2XaRecoverStruct format. The application can traverse the list of indoubt transactions by using the size of the db2XaRecoverStruct structure, starting at the address provided by this parameter.

If the value is NULL, DB2 will calculate the size of the buffer required and return this value in oReqBufferLen. oNumIndoubtsTotal will contain the total number of indoubt transactions. The application may allocate the required buffer size and issue the API again.

iIndoubtDataLen
Input. Size of the buffer pointed to by piIndoubtData parameter in bytes.

oNumIndoubtsReturned
Output. The number of indoubt transaction records returned in the buffer specified by pIndoubtData.

oNumIndoubtsTotal
Output. The Total number of indoubt transaction records available at the time of API invocation. If the piIndoubtData buffer is too small to contain all the records, oNumIndoubtsTotal will be greater than the total for oNumIndoubtsReturned. The application may reissue the API in order to obtain all records.

Note: This number may change between API invocations as a result of automatic or heuristic indoubt transaction resynchronization, or as a result of other transactions entering the indoubt state.

oReqBufferLen
Output. Required buffer length to hold all indoubt transaction records at the time of API invocation. The application can use this value to determine the required buffer size by calling the API with pIndoubtData set to NULL. This value can then be used to allocate the required buffer, and the API can be issued with pIndoubtData set to the address of the allocated buffer.

Note: The required buffer size may change between API invocations as a result of automatic or heuristic indoubt transaction resynchronization, or as a result of other transactions entering the indoubt state. The application may allocate a larger buffer to account for this.

db2XaRecoverStruct data structure parameters

timestamp
Output. Specifies the time when the transaction entered the indoubt state.

xid Output. Specifies the XA identifier assigned by the transaction manager to uniquely identify a global transaction.

dbalias
Output. Specifies the alias of the database where the indoubt transaction is found.

applid
Output. Specifies the application identifier assigned by the database manager for this transaction.

sequence_no
Output. Specifies the sequence number assigned by the database manager as an extension to the applid.

auth_id
Output. Specifies the authorization ID of the user who ran the transaction.

log_full
Output. Indicates whether or not this transaction caused a log full condition. Valid values are:

SQLXA_TRUE
This indoubt transaction caused a log full condition.

SQLXA_FALSE
This indoubt transaction did not cause a log full condition.

connected
Indicates whether an application is connected.

Possible values for CONNECTED (defined in sqlxa) are:

SQLXA_TRUE
True. The transaction is undergoing normal syncpoint processing, and is waiting for the second phase of the two-phase commit.

SQLXA_FALSE
False. The transaction was left indoubt by an earlier failure, and is now waiting for re-sync from a transaction manager.

indoubt_status
Output. Indicates the status of this indoubt transaction. Valid values are:

- SQLXA_TS_PREP
The transaction is prepared. The connected parameter can be used to determine whether the transaction is waiting for the second phase of normal commit processing or whether an error occurred and resynchronization with the transaction manager is required.

- SQLXA_TS_HCOM
The transaction has been heuristically committed.

- SQLXA_TS_HROL
The transaction has been heuristically rolled back.

- SQLXA_TS_MACK
The transaction is missing commit acknowledgement from a node in a partitioned database.

- SQLXA_TS_END
The transaction has ended at this database. This transaction may be re-activated, committed, or rolled back at a later time. It is also possible that the transaction manager encountered an error and the transaction will not be completed. If this is the case, this transaction requires heuristic actions, because it may be holding locks and preventing other applications from accessing data.

When the originator parameter is set to the value SQLXA_ORIG_FXA, valid values for the indoubt_status parameter (defined in sqlxa.h located in the include directory) are:

SQLXA_TS_MFCACK
Indicates that the transaction is missing commit acknowledgement from one or more federated data sources.

SQLXA_TS_MFRACK
Indicates that the transaction is missing rollback acknowledgement from one or more federated data sources.

originator
Identifies the origin of an indoubt transaction.

Possible values for ORIGINATOR (defined in sqlxa.h located in the include directory) are:

SQLXA_ORIG_PE
Transaction originated by DB2 in MPP environment.

SQLXA_ORIG_XA
Transaction originated by XA.

SQLXA_ORIG_FXA
Transaction originated in the second phase of the federated two-phase commit process. It indicates that this transaction has entered the second phase of the two-phase commit protocol, however one or more federated data sources cannot complete the second phase or cannot communicate with the federated server.

reserved
The first byte is used to indicate the type of indoubt transaction: 0 indicates RM, and 1 indicates TM.

rmn Output. Number of federated data sources that failed to commit or rollback a transaction.

rm_list
Output. List of failed federated data source entries, each of which contains a server name and a xid.

rm_entry data structure parameters

name Output. Name of a federated data source.

xid Output. Specifies the XA identifier assigned by the federated database to a federated data source to uniquely identify a federated transaction.

Usage notes

SQLXA_MAX_FEDRM is defined to be 16. Most federated transactions involve less than 10 data sources. If more than 16 federated data sources fail to commit or rollback in a transaction, only 16 of them will be returned by the db2XaListIndTrans API for this indoubt transaction. For a non-federated indoubt transaction, rmn parameter will be set to 0, indicating that the indoubt transaction involves no federated data sources.

If a federated indoubt transaction involves more than 16 failed federated data sources, when the heuristic processing is invoked, all the data sources (regardless of whether they are returned by the db2XaListIndTrans API) will commit or roll back the indoubt transaction. Any federated data source that successfully committed or rolled back the indoubt transaction will be removed from the list of failed federated data sources for the federated indoubt transaction. On the next call to the db2XaListIndTrans API, only federated data sources that still failed to commit or roll back the indoubt transaction will remain in the list for the federated indoubt transaction.

To obtain the list of data sources in a federated indoubt transaction, you must compile applications using DB2 Version 9.1 header files and pass in a version number db2Version900 or higher (for later releases) to the db2XaListIndTrans API. If you pass in a lower version number, the API will still return a list of indoubt transactions, but federated data source information will be excluded. Regardless, the version of the header file used by the application must be in sync with the version number passed to the API. Otherwise, the results will be unpredictable.

A typical application will perform the following steps after setting the current connection to the database or to the partitioned database coordinator node:

1. Call db2XaListIndTrans with piIndoubtData set to NULL. This will return values in oReqBufferLen and oNumIndoubtsTotal.
2. Use the returned value in oReqBufferLen to allocate a buffer. This buffer may not be large enough if there are additional indoubt transactions because the initial invocation of this API to obtain oReqBufferLen. The application may provide a buffer larger than oReqBufferLen.
3. Determine if all indoubt transaction records have been obtained. This can be done by comparing oNumIndoubtsReturned to oNumIndoubtsTotal. If oNumIndoubtsTotal is greater than oNumIndoubtsReturned, the application can repeat the above steps.

sqlxhfrg - Forget transaction status

Permits the resource manager to release resources held by a heuristically completed transaction (that is, one that has been committed or rolled back heuristically). You might call this API after heuristically committing or rolling back an indoubt XA transaction.

Authorization

None

Required connection

Database

API include file

```
sqlxa.h
```

API and data structure syntax

```
extern int SQL_API_FN sqlxhfrg(
   SQLXA_XID *pTransId,
   struct sqlca *pSqlca
   );
```

sqlxhfrg API parameters

pTransId
Input. XA identifier of the transaction to be heuristically forgotten, or removed from the database log.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

Only transactions with a status of heuristically committed or rolled back can have the FORGET operation applied to them.

sqlxphcm - Commit an indoubt transaction

Commits an indoubt transaction (that is, a transaction that is prepared to be committed). If the operation succeeds, the transaction's state becomes heuristically committed.

Scope

This API only affects the node on which it is issued.

Authorization

None

Required connection

Database

API include file

```
sqlxa.h
```

API and data structure syntax

```
extern int SQL_API_FN sqlxphcm(
   int exe_type,
   SQLXA_XID *pTransId,
   struct sqlca *pSqlca
   );
```

sqlxphcm API parameters

exe_type
Input. If EXE_THIS_NODE is specified, the operation is executed only at this node.

pTransId
Input. XA identifier of the transaction to be heuristically committed.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

Only transactions with a status of prepared can be committed. Once heuristically committed, the database manager remembers the state of the transaction until the sqlxhfrg API is called.

sqlxphrl - Roll back an indoubt transaction

Rolls back an indoubt transaction (that is, a transaction that has been prepared). If the operation succeeds, the transaction's state becomes heuristically rolled back.

Scope

This API only affects the node on which it is issued.

Authorization

None

Required connection

Database

API include file

```
sqlxa.h
```

API and data structure syntax

```
extern int SQL_API_FN sqlxphrl(
   int exe_type,
   SQLXA_XID *pTransId,
   struct sqlca *pSqlca
   );
```

sqlxphrl API parameters

exe_type
Input. If EXE_THIS_NODE is specified, the operation is executed only at this node.

pTransId
Input. XA identifier of the transaction to be heuristically rolled back.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

Only transactions with a status of prepared or idle can be rolled back. Once heuristically rolled back, the database manager remembers the state of the transaction until the sqlxhfrg API is called.

Chapter 7. Threaded applications with concurrent access

sqleAttachToCtx - Attach to context

Makes the current thread use a specified context. All subsequent database calls made on this thread will use this context. If more than one thread is attached to a given context, access is serialized for these threads, and they share a commit scope.

Scope

The scope of this API is limited to the immediate process.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleAttachToCtx (
        void * pCtx,
        void * reserved,
        struct sqlca * pSqlca);
```

sqleAttachToCtx API parameters

pCtx Input. A valid context previously allocated by sqleBeginCtx.

reserved
Reserved for future use. Must be set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

sqleBeginCtx - Create and attach to an application context

Creates an application context, or creates and then attaches to an application context. More than one application context can be created. Each context has its own commit scope. Different threads can attach to different contexts (see the sqleAttachToCtx API). Any database API calls made by such threads will not be serialized with one another.

Scope

The scope of this API is limited to the immediate process.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleBeginCtx (
        void ** ppCtx,
        sqlint32 lOptions,
        void * reserved,
        struct sqlca * pSqlca);
```

sqleBeginCtx API parameters

ppCtx Output. A data area allocated out of private memory for the storage of context information.

lOptions
Input. Valid values are:

SQL_CTX_CREATE_ONLY
The context memory will be allocated, but there will be no attachment.

SQL_CTX_BEGIN_ALL
The context memory will be allocated, and then a call to sqleAttachToCtx will be made for the current thread. If this option is used, the ppCtx parameter can be NULL. If the thread is already attached to a context, the call will fail.

reserved
Reserved for future use. Must be set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

sqleDetachFromCtx - Detach from context

Detaches the context being used by the current thread. The context will be detached only if an attach to that context has previously been made.

Scope

The scope of this API is limited to the immediate process.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleDetachFromCtx (
        void * pCtx,
        void * reserved,
        struct sqlca * pSqlca);
```

sqleDetachFromCtx API parameters

pCtx Input. A valid context previously allocated by sqleBeginCtx.

reserved
Reserved for future use. Must be set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

---

sqleEndCtx - Detach from and free the memory associated with an application context

Frees all memory associated with a given context.

Scope

The scope of this API is limited to the immediate process.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleEndCtx (
        void ** ppCtx,
        sqlint32 lOptions,
        void * reserved,
        struct sqlca * pSqlca);
```

sqleEndCtx API parameters

ppCtx Output. A data area in private memory (used for the storage of context information) that is freed.

lOptions
Input. Valid values are:

SQL_CTX_FREE_ONLY
The context memory will be freed only if a prior detach has been done.

Note: pCtx must be a valid context previously allocated by sqleBeginCtx.

SQL_CTX_END_ALL
If necessary, a call to sqleDetachFromCtx will be made before the memory is freed.

Note: A detach will be done even if the context is still in use. If this option is used, the ppCtx parameter can be NULL, but if passed, it must be a valid context previously allocated by sqleBeginCtx. A call to sqleGetCurrentCtx will be made, and the current context freed from there.

reserved
Reserved for future use. Must be set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

If a database connection exists, or the context has been attached by another thread, this call will fail.

Note: If a context calls an API that establishes an instance attachment (for example, db2CfgGet, it is necessary to detach from the instance using sqledtin before calling sqleEndCtx.

sqleGetCurrentCtx - Get current context

Returns the current context associated with a thread.

Scope

The scope of this API is limited to the immediate process.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleGetCurrentCtx (
        void ** ppCtx,
        void * reserved,
        struct sqlca * pSqlca);
```

sqleGetCurrentCtx API parameters

ppCtx Output. A data area allocated out of private memory for the storage of context information.

reserved
Reserved for future use. Must be set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

sqleInterruptCtx - Interrupt context

Interrupts the specified context.

Scope

The scope of this API is limited to the immediate process.

Authorization

None

Required connection

Database

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleInterruptCtx (
        void * pCtx,
        void * reserved,
        struct sqlca * pSqlca);
```

sqleInterruptCtx API parameters

pCtx Input. A valid context previously allocated by sqleBeginCtx.

reserved
Reserved for future use. Must be set to NULL.

pSqlca
Output. A pointer to the sqlca structure.

Usage notes

During processing, this API:

- Switches to the context that has been passed in
- Sends an interrupt
- Switches to the original context
- Exits.

sqleSetTypeCtx - Set application context type

Sets the application context type. This API should be the first database API called inside an application.

Scope

The scope of this API is limited to the immediate process.

Authorization

None

Required connection

None

API include file

```
sql.h
```

API and data structure syntax

```
SQL_API_RC SQL_API_FN
  sqleSetTypeCtx (
        sqlint32 lOptions);
```

sqleSetTypeCtx API parameters

lOptions
Input. Valid values are:

SQL_CTX_ORIGINAL
All threads will use the same context, and concurrent access will be blocked. This is the default if none of these APIs is called.

SQL_CTX_MULTI_MANUAL
All threads will use separate contexts, and it is up to the application to manage the context for each thread. See

- sqleBeginCtx API
- sqleAttachToCtx API
- sqleDetachFromCtx API
- sqleEndCtx API

The following restrictions/changes apply when this option is used:

- When termination is normal, automatic COMMIT at process termination is disabled. All outstanding transactions are rolled back, and all COMMITs must be done explicitly.
- sqleintr API interrupts all contexts. To interrupt a specific context, use sqleInterruptCtx.

Usage notes

This API must be called before any other database call, and only the first call is effective.

Chapter 8. DB2 database system plug-ins for customizing database management

DB2 database products come with plug-in interfaces that you and third-party vendors can use to customize certain database management functions.

Currently, DB2 database systems have three types of plug-ins:

- Security plug-ins for customizing DB2 database system authentication and group membership lookup behavior
- Backup and restore plug-ins for backing up and restoring data onto devices that are not supported by backup and restore facilities provided by DB2 database systems
- Compression plug-in for compressing and decompressing backup images

The functionalities provided through the above three plug-ins come with DB2 database system products, however if you want to customize or augment DB2 database system behavior then you can write your own plug-in or purchase one from a vendor.

Each plug-in is a dynamically loadable library of APIs and data structures. The prototypes for the APIs and data structures are provided by DB2 database systems and the implementation is provided by the vendor. DB2 database systems provide the implementations for some of the APIs and data structures. For a list of plug-in APIs and data structures that are implemented by DB2 database systems, refer to the individual plug-in topic. The implementation is in the form of a shared library on UNIX systems and a DLL on Windows platforms. For the actual location of where DB2 database systems look for a particular plug-in, refer to the individual plug-in topic.

A plug-in API differs from a DB2 API (for example, db2Export, db2Backup) in two ways. First, the implementation for a plug-in API, in most cases, is provided by the vendor. Whereas the implementation for a DB2 API is provided by DB2. Second, a plug-in API is called by DB2 whereas a DB2 API is called by the user from a client application. So if a plug-in API topic lists a parameter as input then it means that DB2 fills in a value for the parameter and if the parameter is listed as output then the vendor's implementation of the API is responsible for filling in a value for the parameter.

Enabling plug-ins

Deploying a group retrieval plug-in

To customize the DB2 security system's group retrieval behavior, you can develop your own group retrieval plug-in or buy one from a third party.

After you acquire a group retrieval plug-in that is suitable for your database management system, you can deploy it.

- To deploy a group retrieval plug-in on the database server, perform the following steps:
  1. Copy the group retrieval plug-in library into the server's group plug-in directory.

2. Update the database manager configuration parameter *group_plugin* with the name of the plug-in.

- To deploy a group retrieval plug-in on database clients, perform the following steps:
  1. Copy the group retrieval plug-in library in the client's group plug-in directory.
  2. On the database client, update the database manager configuration parameter *group_plugin* with the name of the plug-in.

Deploying a user ID/password plug-in

To customize the DB2 security system's user ID/password authentication behavior, you can develop your own user ID/password authentication plug-ins or buy one from a third party.

Depending on their intended usage, all user ID-password based authentication plug-ins must be placed in either the client plug-in directory or the server plug-in directory. If a plug-in is placed in the client plug-in directory, it will be used both for local authorization checking and for validating the client when it attempts to connect with the server. If the plug-in is placed in the server plug-in directory, it will be used for handling incoming connections to the server and for checking whether an authorization ID exists and is valid whenever the GRANT statement is issued without specifying either the keyword USER or GROUP. In most situations, user ID/password authentication requires only a server-side plug-in. It is possible, though generally deemed less useful, to have only a client user ID/password plug-in. It is possible, though quite unusual to require matching user ID/password plug-ins on both the client and the server.

Note: You must stop the DB2 server or any applications using the plug-ins before you deploy a *new* version of an *existing* plug-in. Undefined behavior including traps will occur if a process is still using a plug-in when a new version (with the same name) is copied over it. This restriction is not in effect when you deploy a plugin for the first time or when the plug-in is not in use.

After you acquire user ID/password authentication plug-ins that are suitable for your database management system, you can deploy them.

- To deploy a user ID/password authentication plug-in on the database server, perform the following steps on the database server:
  1. Copy the user ID/password authentication plug-in library in the server plug-in directory.
  2. Update the database manager configuration parameter *srvcon_pw_plugin* with the name of the server plug-in. This plug-in is used by the server when it is handling CONNECT and ATTACH requests.
  3. Either:
     - Set the database manager configuration parameter *srvcon_auth* to the CLIENT, SERVER, SERVER_ENCRYPT, DATA_ENCRYPT, or DATA_ENCRYPT_CMP authentication type. Or:
     - Set the database manager configuration parameter *srvcon_auth* to NOT_SPECIFIED and set *authentication* to CLIENT, SERVER, SERVER_ENCRYPT, DATA_ENCRYPT, or DATA_ENCRYPT_CMP authentication type.
- To deploy a user ID/password authentication plug-in on database clients, perform the following steps on each client:

1. Copy the user ID/password authentication plug-in library in the client plug-in directory.
2. Update the database manager configuration parameter *clnt_pw_plugin* with the name of the client plug-in. This plug-in is loaded and called regardless of where the authentication is being done, not only when the database configuration parameter, *authentication* is set to CLIENT.

- For local authorization on a client, server, or gateway using a user ID/password authentication plug-in, perform the following steps on each client, server, or gateway:
  1. Copy the user ID/password authentication plug-in library in the client plug-in directory on the client, server, or gateway.
  2. Update the database manager configuration parameter *clnt_pw_plugin* with the name of the plug-in.
  3. Set the *authentication* database manager configuration parameter to CLIENT, SERVER, SERVER_ENCRYPT, DATA_ENCRYPT, or DATA_ENCRYPT_CMP.

Deploying a GSS-API plug-in

To customize the DB2 security system's authentication behavior, you can develop your own authentication plug-ins using the GSS-API, or buy one from a third party.

In the case of plug-in types other than Kerberos, you must have matching plug-in names on the client and the server along with the same plug-in type. The plug-ins on the client and server need not be from the same vendor, but they must generate and consume compatible GSS-API tokens. Any combination of Kerberos plug-ins deployed on the client and the server is acceptable since Kerberos plug-ins are standardized. However, different implementations of less standardized GSS-API mechanisms, such as *x.509* certificates, might only be partially compatible with DB2 database systems. Depending on their intended usage, all GSS-API authentication plug-ins must be placed in either the client plug-in directory or the server plug-in directory. If a plug-in is placed in the client plug-in directory, it will be used for local authorization checking and when a client attempts to connect with the server. If the plug-in is placed in the server plug-in directory, it will be used for handling incoming connections to the server and for checking whether an authorization ID exists and is valid whenever the GRANT statement is issued without specifying either the keyword USER or GROUP.

Note: You must stop the DB2 server or any applications using the plug-ins before you deploy a *new* version of an *existing* plug-in. Undefined behavior including traps will occur if a process is still using a plug-in when a new version (with the same name) is copied over it. This restriction is not in effect when you deploy a plugin for the first time or when the plug-in is not in use.

After you acquire GSS-API authentication plug-ins that are suitable for your database management system, you can deploy them.

- To deploy a GSS-API authentication plug-in on the database server, perform the following steps on the server:
  1. Copy the GSS-API authentication plug-in library in the server plug-in directory. You can copy numerous GSS-API plug-ins into this directory.
  2. Update the database manager configuration parameter *srvcon_gssplugin_list* with an ordered, comma-delimited list of the names of the plug-ins installed in the GSS-API plug-in directory.
  3. Either:

– Setting the database manager configuration parameter *srvcon_auth* to GSSPLUGIN or GSS_SERVER_ENCRYPT is a way to enable the server to use GSSAPI PLUGIN authentication method. Or:
– Setting the database manager configuration parameter *srvcon_auth* to NOT_SPECIFIED and setting *authentication* to GSSPLUGIN or GSS_SERVER_ENCRYPT is a way to enable the server to use GSSAPI PLUGIN authentication method.

- To deploy a GSS-API authentication plug-in on database clients, perform the following steps on each client:
  1. Copy the GSS-API authentication plug-in library in the client plug-in directory. You can copy numerous GSS-API plug-ins into this directory. The client selects a GSS-API plug-in for authentication during a CONNECT or ATTACH operation by picking the first GSS-API plug-in contained in the server's plug-in list that is available on the client.
  2. Optional: Catalog the databases that the client will access, indicating that the client will only accept a GSS-API authentication plug-in as the authentication mechanism. For example:

     ```
     CATALOG DB testdb AT NODE testnode AUTHENTICATION GSSPLUGIN
     ```
- For local authorization on a client, server, or gateway using a GSS-API authentication plug-in, perform the following steps:
  1. Copy the GSS-API authentication plug-in library in the client plug-in directory on the client, server, or gateway.
  2. Update the database manager configuration parameter *local_gssplugin* with the name of the plug-in.
  3. Set the *authentication* database manager configuration parameter to GSSPLUGIN, or GSS_SERVER_ENCRYPT.

Deploying a Kerberos plug-in

To customize the DB2 security system's Kerberos authentication behavior, you can develop your own Kerberos authentication plug-ins or buy one from a third party. Note that the Kerberos security plug-in will not support IPv6.

Note: You must stop the DB2 server or any applications using the plug-ins before you deploy a *new* version of an *existing* plug-in. Undefined behavior including traps will occur if a process is still using a plug-in when a new version (with the same name) is copied over it. This restriction is not in effect when you deploy a plugin for the first time or when the plug-in is not in use.

After you acquire Kerberos authentication plug-ins that are suitable for your database management system, you can deploy them.

- To deploy a Kerberos authentication plug-in on the database server, perform the following steps on the server:
  1. Copy the Kerberos authentication plug-in library in the server plug-in directory.
  2. Update the database manager configuration parameter **srvcon_gssplugin_list**, which is presented as an ordered, comma delimited list, to include the Kerberos server plug-in name. Only one plug-in in this list can be a Kerberos plug-in. If this list is blank and **authentication** is set to KERBEROS or KRB_SVR_ENCRYPT, the default DB2 Kerberos plug-in: IBMkrb5 will be used.
  3. If necessary, set the **srvcon_auth** database manager configuration parameter to override the current authentication type. If the **srvcon_auth** database

manager configuration parameter is not set, the DB2 database manager uses the value of the **authentication** configuration parameter. If the **authentication** configuration parameter is currently set to any of the following authentication types, you can deploy and use a Kerberos plug-in:

- KERBEROS
- KRB_SERVER_ENCRYPT
- GSSPLUGIN
- GSS_SERVER_ENCRYPT

If you need to override the current authentication type, set the **srvcon_auth** configuration parameter to one of the following authentication types:

- KERBEROS
- KRB_SERVER_ENCRYPT
- GSSPLUGIN
- GSS_SERVER_ENCRYPT

- To deploy a Kerberos authentication plug-in on database clients, perform the following steps on each client:
  1. Copy the Kerberos authentication plug-in library in the client plug-in directory.
  2. Update the database manager configuration parameter **clnt_krb_plugin** with the name of the Kerberos plug-in. If **clnt_krb_plugin** is blank, DB2 assumes that the client cannot use Kerberos authentication. This setting is only appropriate when the server cannot support plug-ins. If both the server and the client support security plug-ins, the default server plug-in, *IBMkrb5* would be used over the client value of **clnt_krb_plugin**. For local authorization on a client, server, or gateway using a Kerberos authentication plug-in, perform the following steps:
     a. Copy the Kerberos authentication plug-in library in the client plug-in directory on the client, server, or gateway.
     b. Update the database manager configuration parameter **clnt_krb_plugin** with the name of the plug-in.
     c. Set the **authentication** database manager configuration parameter to KERBEROS, or KRB_SERVER_ENCRYPT.
  3. Optional: Catalog the databases that the client will access, indicating that the client will only use a Kerberos authentication plug-in. For example:

```
CATALOG DB testdb AT NODE testnode AUTHENTICATION KERBEROS
        TARGET PRINCIPAL service/host@REALM
```

Note: For platforms supporting Kerberos, the `IBMkrb5` library will be present in the client plug-in directory. DB2 will recognize this library as a valid GSS-API plug-in, because Kerberos plug-ins are implemented using GSS-API plug-in.

Writing security plug-ins

How DB2 loads security plug-ins

Each plug-in library must contain an initialization function with a specific name determined by the plug-in type:

- Server side authentication plug-in: `db2secServerAuthPluginInit()`
- Client side authentication plug-in: `db2secClientAuthPluginInit()`
- Group plug-in: `db2secGroupPluginInit()`

This function is known as the plug-in initialization function. The plug-in initialization function initializes the specified plug-in and provides DB2 with information that it requires to call the plug-in's functions. The plug-in initialization function accepts the following parameters:

- The highest version number of the function pointer structure that the DB2 instance invoking the plugin can support
- A pointer to a structure containing pointers to all the APIs requiring implementation
- A pointer to a function that adds log messages to the db2diag.log file
- A pointer to an error message string
- The length of the error message

The following is a function signature for the initialization function of a group retrieval plug-in:

```
SQL_API_RC SQL_API_FN db2secGroupPluginInit(
  db2int32 version,
  void *group_fns,
  db2secLogMessage *logMessage_fn,
  char **errormsg,
  db2int32  *errormsglen);
```

Note: If the plug-in library is compiled as C++, all functions must be declared with: `extern "C"`. DB2 relies on the underlying operating system dynamic loader to handle the C++ constructors and destructors used inside of a C++ user-written plug-in library.

The initialization function is the only function in the plug-in library that uses a prescribed function name. The other plug-in functions are referenced through function pointers returned from the initialization function. Server plug-ins are loaded when the DB2 server starts. Client plug-ins are loaded when required on the client. Immediately after DB2 loads a plug-in library, it will resolve the location of this initialization function and call it. The specific task of this function is as follows:

- Cast the functions pointer to a pointer to an appropriate functions structure
- Fill in the pointers to the other functions in the library
- Fill in the version number of the function pointer structure being returned

DB2 can potentially call the plug-in initialization function more than once. This situation can occur when an application dynamically loads the DB2 client library, unloads it, and reloads it again, then performs authentication functions from a plug-in both before and after reloading. In this situation, the plug-in library might not be unloaded and then re-loaded; however, this behavior varies depending on the operating system.

Another example of DB2 issuing multiple calls to a plug-in initialization function occurs during the execution of stored procedures or federated system calls, where the database server can itself act as a client. If the client and server plug-ins on the database server are in the same file, DB2 could call the plug-in initialization function twice.

If the plug-in detects that `db2secGroupPluginInit` is called more than once, it should handle this event as if it was directed to terminate and reinitialize the plug-in library. As such, the plug-in initialization function should do the entire cleanup tasks that a call to `db2secPluginTerm` would do before returning the set of function pointers again.

On a DB2 server running on a UNIX or Linux-based operating system, DB2 can potentially load and initialize plug-in libraries more than once in different processes.

Restrictions for developing security plug-in libraries

Following are the restrictions for developing plug-in libraries.

C-linkage
Plug-in libraries must be linked with C-linkage. Header files providing the prototypes, data structures needed to implement the plug-ins, and error code definitions are provided for C/C++ only. Functions that DB2 will resolve at load time must be declared with extern ″C″ if the plug-in library is compiled as C++.

.NET common language runtime is not supported
The .NET common language runtime (CLR) is not supported for compiling and linking source code for plug-in libraries.

Signal handlers
Plug-in libraries must not install signal handlers or change the signal mask, because this will interfere with DB2's signal handlers. Interfering with the DB2 signal handlers could seriously interfere with DB2's ability to report and recover from errors, including traps in the plug-in code itself. Plug-in libraries should also never throw C++ exceptions, as this can also interfere with DB2's error handling.

Thread-safe
Plug-in libraries must be thread-safe and re-entrant. The plug-in initialization function is the only API that is not required to be re-entrant. The plug-in initialization function could potentially be called multiple times from different processes; in which case, the plug-in will cleanup all used resources and reinitialize itself.

Exit handlers and overriding standard C library and operating system calls
Plug-in libraries should not override standard C library or operating system calls. Plug-in libraries should also not install exit handlers or `pthread_atfork` handlers. The use of exit handlers is not recommended because they could be unloaded before the program exits.

Library dependencies
On Linux or UNIX, the processes that load the plug-in libraries can be `setuid` or `setgid`, which means that they will not be able to rely on the `$LD_LIBRARY_PATH`, `$SHLIB_PATH`, or `$LIBPATH` environment variables to find dependent libraries. Therefore, plug-in libraries should not depend on additional libraries, unless any dependant libraries are accessible through other methods, such as the following:

- By being in `/lib` or `/usr/lib`
- By having the directories they reside in being specified OS-wide (such as in the `ld.so.conf` file on Linux)
- By being specified in the `RPATH` in the plug-in library itself

This restriction is not applicable to Windows operating systems.

Symbol collisions
When possible, plug-in libraries should be compiled and linked with any available options that reduce the likelihood of symbol collisions, such as those that reduce unbound external symbolic references. For example, use of the ″-Bsymbolic″ linker option on HP, Solaris, and Linux can help

prevent problems related to symbol collisions. However, for plug-ins written on AIX, do not use the "-brtl" linker option explicitly or implicitly.

32-bit and 64-bit applications

32-bit applications must use 32-bit plug-ins. 64-bit applications must use 64-bit plug-ins. Refer to the topic about 32-bit and 64-bit considerations for more details.

Text strings

Input text strings are not guaranteed to be null-terminated, and output strings are not required to be null-terminated. Instead, integer lengths are given for all input strings, and pointers to integers are given for lengths to be returned.

Passing authorization ID parameters

An authorization ID (authid) parameter that DB2 passes into a plug-in (an input authid parameter) will contain an upper-case authid, with padded blanks removed. An authid parameter that a plug-in returns to DB2 (an output authid parameter) does not require any special treatment, but DB2 will fold the authid to upper-case and pad it with blanks according to the internal DB2 standard.

Size limits for parameters

The plug-in APIs use the following as length limits for parameters:

```
#define DB2SEC_MAX_AUTHID_LENGTH 255
#define DB2SEC_MAX_USERID_LENGTH 255
#define DB2SEC_MAX_USERNAMESPACE_LENGTH 255
#define DB2SEC_MAX_PASSWORD_LENGTH 255
#define DB2SEC_MAX_DBNAME_LENGTH 128
```

A particular plug-in implementation may require or enforce smaller maximum lengths for the authorization IDs, user IDs, and passwords. In particular, the operating system authentication plug-ins supplied with DB2 database systems are restricted to the maximum user, group and namespace length limits enforced by the operating system for cases where the operating system limits are lower than those stated above.

Security plug-in library extensions in AIX

On AIX systems, security plug-in libraries can have a file name extension of *.a* or *.so*. The mechanism used to load the plug-in library depends on which extension is used:

- Plug-in libraries with a file name extension of *.a* are assumed to be archives containing shared object members. These members must be named *shr.o* (32-bit) or *shr64.o* (64-bit). A single archive can contain both the 32-bit and 64-bit members, allowing it to be deployed on both types of platforms.

  For example, to build a 32-bit archive style plug-in library:

  ```
  xlc_r -qmkshrobj -o shr.o MyPlugin.c -bE:MyPlugin.exp
  ar rv MyPlugin.a shr.o
  ```

- Plug-in libraries with a file name extension of *.so* are assumed to be dynamically loadable shared objects. Such an object is either 32-bit or 64-bit, depending on the compiler and linker options used when it was built. For example, to build a 32-bit plug-in library:

  ```
  xlc_r -qmkshrobj -o MyPlugin.so MyPlugin.c -bE:MyPlugin.exp
  ```

On all platforms other than AIX, security plug-in libraries are always assumed to be dynamically loadable shared objects.

Restrictions on security plug-ins

The following are restrictions on the use of security plug-ins:

DB2 database family support restrictions

You cannot use a GSS-API plug-in to authenticate connections between DB2 clients on Linux, UNIX, and Windows and another DB2 family servers such as DB2 for z/OS. You also cannot authenticate connections from another DB2 database family product, acting as a client, to a DB2 server on Linux, UNIX, or Windows.

If you use a DB2 client on Linux, UNIX, or Windows to connect to other DB2 database family servers, you can use client-side user ID/password plug-ins (such as the IBM-shipped operating system authentication plug-in), or you can write your own user ID/password plug-in. You can also use the built-in Kerberos plug-ins, or implement your own.

With a DB2 client on Linux, UNIX, or Windows, you should not catalog a database using the GSSPLUGIN authentication type.

Restrictions on the AUTHID identifier. Version 9.5, and later, of the DB2 database system allows you to have an 128-byte authorization ID, but when the authorization ID is interpreted as an operating system user ID or group name, the operating system naming restrictions apply (for example, a limitation to 8 or 30 character user IDs and 30 character group names). Therefore, while you can grant an 128-byte authorization ID, it is not possible to connect as a user that has that authorization ID. If you write your own security plugin, you should be able to take full advantage of the extended sizes for the authorization ID. For example, you can give your security plugin a 30-byte user ID and it can return an 128-byte authorization ID during authentication that you are able to connect with.

WebSphere® Federation Server support restrictions

DB2 II does not support the use of delegated credentials from a GSS_API plug-in to establish outbound connections to data sources. Connections to data sources must continue to use the CREATE USER MAPPING command.

Database Administration Server support restrictions

The DB2 Administration Server (DAS) does not support security plug-ins. The DAS only supports the operating system authentication mechanism.

Security plug-in problem and restriction for DB2 clients (Windows)

When developing security plug-ins that will be deployed in DB2 clients on Windows operating systems, do not unload any auxiliary libraries in the plug-in termination function. This restriction applies to all types of client security plug-ins, including group, user ID and password, Kerberos, and GSS-API plug-ins. Since these termination APIs such as db2secPluginTerm, db2secClientAuthPluginTerm and db2secServerAuthPluginTerm are not called on any Windows platform, you need to do the appropriate resource cleanup.

This restriction is related to cleanup issues associated with the unloading of DLLs on Windows.

Loading plug-in libraries on AIX with extension of .a or .so

On AIX, security plug-in libraries can have a file name extension of `.a` or `.so`. The mechanism used to load the plug-in library depends on which extension is used:

- Plug-in libraries with a file name extension of `.a`

  Plug-in libraries with file name extensions of .a are assumed to be archives containing shared object members. These members must be named `shr.o` (32-bit) or `shr64.o` (64-bit). A single archive can contain both the 32-bit and 64-bit members, allowing it to be deployed on both types of platforms.

  For example, to build a 32-bit archive style plug-in library:

  ```
  xlc_r -qmkshrobj -o shr.o MyPlugin.c -bE:MyPlugin.exp
  ar rv MyPlugin.a shr.o
  ```

- Plug-in libraries with a file name extension of `.so`

  Plug-in libraries with file name extensions of .so are assumed to be dynamically loadable shared objects. Such an object is either 32-bit or 64-bit, depending on the compiler and linker options used when it was built. For example, to build a 32-bit plug-in library:

  ```
  xlc_r -qmkshrobj -o MyPlugin.so MyPlugin.c -bE:MyPlugin.exp
  ```

On all platforms other than AIX, security plug-in libraries are always assumed to be dynamically loadable shared objects.

GSS-API security plug-ins do not support message encryption and signing

Message encryption and signing is not available in GSS-API security plug-ins.

Return codes for security plug-ins

All security plug-in APIs must return an integer value to indicate the success or failure of the execution of the API. A return code value of 0 indicates that the API ran successfully. All negative return codes, with the exception of -3, -4, and -5, indicate that the API encountered an error.

All negative return codes returned from the security-plug-in APIs are mapped to SQLCODE -1365, SQLCODE -1366, or SQLCODE -30082, with the exception of return codes with the -3, -4, or -5. The values -3, -4, and -5 are used to indicate whether or not an authorization ID represents a valid user or group.

All the security plug-in API return codes are defined in db2secPlugin.h, which can be found in the DB2 include directory: SQLLIB/include.

Details regarding all of the security plug-in return codes are presented in the following table:

Table 10. Security plug-in return codes

Return code	Define value	Meaning	Applicable APIs
0	`DB2SEC_PLUGIN_OK`	The plug-in API executed successfully.	All
-1	`DB2SEC_PLUGIN_UNKNOWNERROR`	The plug-in API encountered an unexpected error.	All

Table 10. Security plug-in return codes (continued)

Return code	Define value	Meaning	Applicable APIs
-2	DB2SEC_PLUGIN_BADUSER	The user ID passed in as input is not defined.	db2secGenerateInitialCred db2secValidatePassword db2secRemapUserid db2secGetGroupsForUser
-3	DB2SEC_PLUGIN _INVALIDUSERORGROUP	No such user or group.	db2secDoesAuthIDExist db2secDoesGroupExist
-4	DB2SEC_PLUGIN _USERSTATUSNOTKNOWN	Unknown user status. This is not treated as an error by DB2; it is used by a GRANT statement to determine if an authid represents a user or an operating system group.	db2secDoesAuthIDExist
-5	DB2SEC_PLUGIN _GROUPSTATUSNOTKNOWN	Unknown group status. This is not treated as an error by DB2; it is used by a GRANT statement to determine if an authid represents a user or an operating system group.	db2secDoesGroupExist
-6	DB2SEC_PLUGIN_UID_EXPIRED	User ID expired.	db2secValidatePassword db2GetGroupsForUser db2secGenerateInitialCred
-7	DB2SEC_PLUGIN_PWD_EXPIRED	Password expired.	db2secValidatePassword db2GetGroupsForUser db2secGenerateInitialCred
-8	DB2SEC_PLUGIN_USER_REVOKED	User revoked.	db2secValidatePassword db2GetGroupsForUser
-9	DB2SEC_PLUGIN _USER_SUSPENDED	User suspended.	db2secValidatePassword db2GetGroupsForUser
-10	DB2SEC_PLUGIN_BADPWD	Bad password.	db2secValidatePassword db2secRemapUserid db2secGenerateInitialCred
-11	DB2SEC_PLUGIN _BAD_NEWPASSWORD	Bad new password.	db2secValidatePassword db2secRemapUserid
-12	DB2SEC_PLUGIN _CHANGEPASSWORD _NOTSUPPORTED	Change password not supported.	db2secValidatePassword db2secRemapUserid db2secGenerateInitialCred
-13	DB2SEC_PLUGIN_NOMEM	Plug-in attempt to allocate memory failed due to insufficient memory.	All
-14	DB2SEC_PLUGIN_DISKERROR	Plug-in encountered a disk error.	All

Table 10. Security plug-in return codes (continued)

Return code	Define value	Meaning	Applicable APIs
-15	DB2SEC_PLUGIN_NOPERM	Plug-in attempt to access a file failed because of wrong permissions on the file.	All
-16	DB2SEC_PLUGIN_NETWORKERROR	Plug-in encountered a network error.	All
-17	DB2SEC_PLUGIN _CANTLOADLIBRARY	Plug-in is unable to load a required library.	db2secGroupPluginInit db2secClientAuthPluginInit db2secServerAuthPluginInit
-18	DB2SEC_PLUGIN_CANT _OPEN_FILE	Plug-in is unable to open and read a file for a reason other than missing file or inadequate file permissions.	All
-19	DB2SEC_PLUGIN_FILENOTFOUND	Plug-in is unable to open and read a file, because the file is missing from the file system.	All
-20	DB2SEC_PLUGIN _CONNECTION_DISALLOWED	The plug-in is refusing the connection because of the restriction on which database is allowed to connect, or the TCP/IP address cannot connect to a specific database.	All server-side plug-in APIs.
-21	DB2SEC_PLUGIN_NO_CRED	GSS API plug-in only: initial client credential is missing.	db2secGetDefaultLoginContext db2secServerAuthPluginInit
-22	DB2SEC_PLUGIN_CRED_EXPIRED	GSS API plug-in only: client credential has expired.	db2secGetDefaultLoginContext db2secServerAuthPluginInit
-23	DB2SEC_PLUGIN _BAD_PRINCIPAL_NAME	GSS API plug-in only: the principal name is invalid.	db2secProcessServer PrincipalName
-24	DB2SEC_PLUGIN _NO_CON_DETAILS	This return code is returned by the db2secGetConDetails callback (for example, from DB2 to the plug-in) to indicate that DB2 is unable to determine the client's TCP/IP address.	db2secGetConDetails
-25	DB2SEC_PLUGIN _BAD_INPUT_PARAMETERS	Some parameters are not valid or are missing when plug-in API is called.	All
-26	DB2SEC_PLUGIN _INCOMPATIBLE_VER	The version of the APIs reported by the plug-in is not compatible with DB2.	db2secGroupPluginInit db2secClientAuthPluginInit db2secServerAuthPluginInit
-27	DB2SEC_PLUGIN_PROCESS_LIMIT	Insufficient resources are available for the plug-in to create a new process.	All

Table 10. Security plug-in return codes (continued)

Return code	Define value	Meaning	Applicable APIs
-28	DB2SEC_PLUGIN_NO_LICENSES	The plug-in encountered a user license problem. A possibility exists that the underlying mechanism license has reached the limit.	All

Error message handling for security plug-ins

When an error occurs in a security plug-in API, the API can return an ASCII text string in the errormsg field to provide a more specific description of the problem than the return code.

For example, the errormsg string can contain "File /home/db2inst1/mypasswd.txt does not exist." DB2 will write this entire string into the DB2 administration notification log, and will also include a truncated version as a token in some SQL messages. Because tokens in SQL messages can only be of limited length, these messages should be kept short, and important variable portions of these messages should appear at the front of the string. To aid in debugging, consider adding the name of the security plug-in to the error message.

For non-urgent errors, such as password expired errors, the errormsg string will only be dumped when the DIAGLEVEL database manager configuration parameter is set at 4.

The memory for these error messages must be allocated by the security plug-in. Therefore, the plug-ins must also provide an API to free this memory: db2secFreeErrormsg.

The errormsg field will only be checked by DB2 if an API returns a non-zero value. Therefore, the plug-in should not allocate memory for this returned error message if there is no error.

At initialization time a message logging function pointer, logMessage_fn, is passed to the group, client, and server plug-ins. The plug-ins can use the function to log any debugging information to db2diag.log. For example:

```
// Log an message indicate init successful
(*(logMessage_fn))(DB2SEC_LOG_CRITICAL,
                   "db2secGroupPluginInit successful",
                    strlen("db2secGroupPluginInit successful"));
```

For more details about each parameter for the db2secLogMessage function, refer to the initialization API for each of the plug-in types.

Calling sequences for the security plug-in APIs

These are the main scenarios in which the DB2 database manager will call security plug-in APIs:

- On a client for a database connection (implicit and explicit)
  - CLIENT
  - Server based (SERVER, SERVER_ENCRYPT, DATA_ENCRYPT)
  - GSSAPI and Kerberos

- On a client, server, or gateway for local authorization
- On a server for a database connection
- On a server for a grant statement
- On a server to get a list of groups to which an authorization ID belongs

Note: The DB2 database servers treat database actions requiring local authorizations, such as db2start, db2stop, and db2trc like client applications.

For each of these operations, the sequence with which the DB2 database manager calls the security plug-in APIs is different. Following are the sequences of APIs called by the DB2 database manager for each of these scenarios.

CLIENT - implicit

When the user-configured authentication type is CLIENT, the DB2 client application will call the following security plug-in APIs:

- `db2secGetDefaultLoginContext();`
- `db2secValidatePassword();`
- `db2secFreetoken();`

For an implicit authentication, that is, when you connect without specifying a particular user ID or password, the `db2secValidatePassword` API is called if you are using a user ID/password plug-in. This API permits plug-in developers to prohibit implicit authentication if necessary.

CLIENT - explicit

On an explicit authentication, that is, when you connect to a database in which both the user ID and password are specified, if the *authentication* database manager configuration parameter is set to CLIENT the DB2 client application will call the following security plug-in APIs multiple times if the implementation requires it:

- `db2secRemapUserid();`
- `db2secValidatePassword();`
- `db2secFreeToken();`

Server based (SERVER, SERVER_ENCRYPT, DATA_ENCRYPT) - implicit

On an implicit authentication, when the client and server have negotiated user ID/password authentication (for instance, when the *srvcon_auth* parameter at the server is set to SERVER; SERVER_ENCRYPT, DATA_ENCRYPT, or DATA_ENCRYPT_CMP), the client application will call the following security plug-in APIs:

- `db2secGetDefaultLoginContext();`
- `db2secFreeToken();`

Server based (SERVER, SERVER_ENCRYPT, DATA_ENCRYPT) - explicit

On an explicit authentication, when the client and server have negotiated userid/password authentication (for instance, when the srvcon_auth parameter at the server is set to SERVER; SERVER_ENCRYPT, DATA_ENCRYPT, or DATA_ENCRYPT_CMP), the client application will call the following security plug-in APIs:

- `db2secRemapUserid();`

GSSAPI and Kerberos - implicit

On an implicit authentication, when the client and server have negotiated GSS-API or Kerberos authentication (for instance, when the *srvcon_auth* parameter at the server is set to KERBEROS; KRB_SERVER_ENCRYPT, GSSPLUGIN, or GSS_SERVER_ENCRYPT), the client application will call

the following security plug-in APIs. (The call to gss_init_sec_context() will use GSS_C_NO_CREDENTIAL as the input credential.)

- `db2secGetDefaultLoginContext();`
- `db2secProcessServerPrincipalName();`
- `gss_init_sec_context();`
- `gss_release_buffer();`
- `gss_release_name();`
- `gss_delete_sec_context();`
- `db2secFreeToken();`

With multi-flow GSS-API support, `gss_init_sec_context()` can be called multiple times if the implementation requires it.

GSSAPI and Kerberos - explicit

If the negotiated authentication type is GSS-API or Kerberos, the client application will call the following security plug-in APIs for GSS-API plug-ins in the following sequence. These APIs are used for both implicit and explicit authentication unless otherwise stated.

- `db2secProcessServerPrincipalName();`
- `db2secGenerateInitialCred();` (For explicit authentication only)
- `gss_init_sec_context();`
- `gss_release_buffer ();`
- `gss_release_name();`
- `gss_release_cred();`
- `db2secFreeInitInfo();`
- `gss_delete_sec_context();`
- `db2secFreeToken();`

The API `gss_init_sec_context()` may be called multiple times if a mutual authentication token is returned from the server and the implementation requires it.

On a client, server, or gateway for local authorization

For a local authorization, the DB2 command being used will call the following security plug-in APIs:

- `db2secGetDefaultLoginContext();`
- `db2secGetGroupsForUser();`
- `db2secFreeToken();`
- `db2secFreeGroupList();`

These APIs will be called for both user ID/password and GSS-API authentication mechanisms.

On a server for a database connection

For a database connection on the database server, the DB2 agent process or thread will call the following security plug-in APIs for the user ID/password authentication mechanism:

- `db2secValidatePassword();` Only if the *authentication* database configuration parameter is not CLIENT
- `db2secGetAuthIDs();`
- `db2secGetGroupsForUser();`
- `db2secFreeToken();`
- `db2secFreeGroupList();`

For a CONNECT to a database, the DB2 agent process or thread will call the following security plug-in APIs for the GSS-API authentication mechanism:

- `gss_accept_sec_context();`
- `gss_release_buffer();`
- `db2secGetAuthIDs();`
- `db2secGetGroupsForUser();`
- `gss_delete_sec_context();`
- `db2secFreeGroupListMemory();`

On a server for a GRANT statement

For a GRANT statement that does not specify the USER or GROUP keyword, (for example, "`GRANT CONNECT ON DATABASE TO user1`"), the DB2 agent process or thread must be able to determine if `user1` is a user, a group, or both. Therefore, the DB2 agent process or thread will call the following security plug-in APIs:

- `db2secDoesGroupExist();`
- `db2secDoesAuthIDExist();`

On a server to get a list of groups to which an authid belongs

From your database server, when you need to get a list of groups to which an authorization ID belongs, the DB2 agent process or thread will call the following security plug-in API with only the authorization ID as input:

- `db2secGetGroupsForUser();`

There will be no token from other security plug-ins.

Security plug-ins

Authentication for the DB2 database system is done using *security plug-ins*. A security plug-in is a dynamically-loadable library that provides authentication security services.

The DB2 database system provides the following types of plug-ins:

- Group retrieval plug-in: retrieves group membership information for a given user.
- Client authentication plug-in: manages authentication on a DB2 client.
- Server authentication plug-in: manages authentication on a DB2 server.

DB2 supports two mechanisms for plug-in authentication:

User ID/password authentication

This involves authentication using a user ID and password. The following authentication types are implemented using user ID/password authentication plug-ins:

- CLIENT
- SERVER
- SERVER_ENCRYPT
- DATA_ENCRYPT
- DATA_ENCRYPT_CMP

These authentication types determine how and where authentication of a user occurs. The authentication type used depends on the authentication type specified by the *authentication* database manager configuration

parameter. If the SRVCON_AUTH parameter is specified it takes precedence over AUTHENTICATION when dealing with connect or attach operations.

GSS-API authentication
GSS-API is formally known as *Generic Security Service Application Program Interface, Version 2* (IETF RFC2743) and *Generic Security Service API Version 2: C-Bindings* (IETF RFC2744). Kerberos authentication is also implemented using GSS-API. The following authentication types are implemented using GSS-API authentication plug-ins:

- KERBEROS
- GSSPLUGIN
- KRB_SERVER_ENCRYPT
- GSS_SERVER_ENCRYPT

KRB_SERVER_ENCRYPT and GSS_SERVER_ENCRYPT support both GSS-API authentication and user ID/password authentication; however, GSS-API authentication is the preferred authentication type.

Note: Authentication types determine how and where a user is authenticated. To use a particular authentication type, update the authentication database manager configuration parameter.

Each of the plug-ins can be used independently or in conjunction with one or more of the other plug-ins. For example, you might only use a server authentication plug-in and assume the DB2 defaults for client and group authentication. Alternatively, you might have only a group or client authentication plug-in. The only situation where both a client and server plug-in are required is for GSS-API authentication plug-ins.

The default behavior is to use a user ID/password plug-in that implements an operating-system-level mechanism for authentication. In previous releases, the default behavior is to directly use operating-system-level authentication without a plug-in implementation. Client-side Kerberos support is available on Solaris, AIX, Windows, and Linux operating systems. For Windows platforms, Kerberos support is enabled by default.

DB2 database systems include sets of plug-ins for group retrieval, user ID/password authentication, and for Kerberos authentication. With the security plug-in architecture you can customize DB2 client and server authentication behavior by either developing your own plug-ins, or buying plug-ins from a third party.

Deployment of security plug-ins on DB2 clients

DB2 clients can support one group plug-in, one user ID/password authentication plug-in, and will negotiate with the DB2 server for a particular GSS-API plug-in. This negotiation consists of a scan by the client of the DB2 server's list of implemented GSS-API plug-ins for the first authentication plug-in name that matches an authentication plug-in implemented on the client. The server's list of plug-ins is specified in the *srvcon_gssplugin_list* database manager configuration parameter value, which contains the names of all of the plug-ins that are implemented on the server. The following figure portrays the security plug-in infrastructure on a DB2 client.

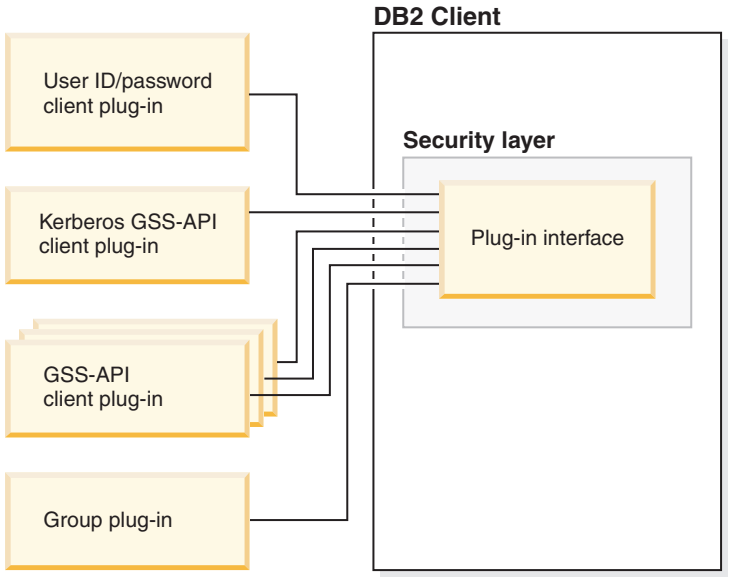

Figure 1. Deploying Security Plug-ins on DB2 Clients

Deployment of security plug-ins on DB2 servers

DB2 servers can support one group plug-in, one user ID/password authentication plug-in, and multiple GSS-API plug-ins. The multiple GSS-API plug-ins are specified in the *srvcon_gssplugin_list* database manager configuration parameter value as a list. Only one GSS-API plug-in in this list can be a Kerberos plug-in.

In addition to server-side security plug-ins, you might also need to deploy client authorization plug-ins on your database server. When you run instance-level operations like db2start and db2trc, the DB2 database manager performs authorization checking for these operations using client authentication plug-ins. Therefore, you should install the client authentication plug-in that corresponds to the server plug-in that is specified by the *authentication* database manager configuration parameter. There is a main distinction between *authentication* and *srvcon_auth*. Specifically, they could be set to different values to cause one mechanism to be used to authenticate database connections and another mechanism to be used for local authorization. The most common usage is *srvcon_auth* set as GSSPLUGIN and *authentication* set as SERVER. If you do not use client authentication plug-ins on the database server, instance level operations such as db2start will fail. For example, if the authentication type is SERVER and no user-supplied client plug-in is used, the DB2 database system will use the IBM-shipped default client operating-system plug-in. The following figure portrays the security plug-in infrastructure on a DB2 server.

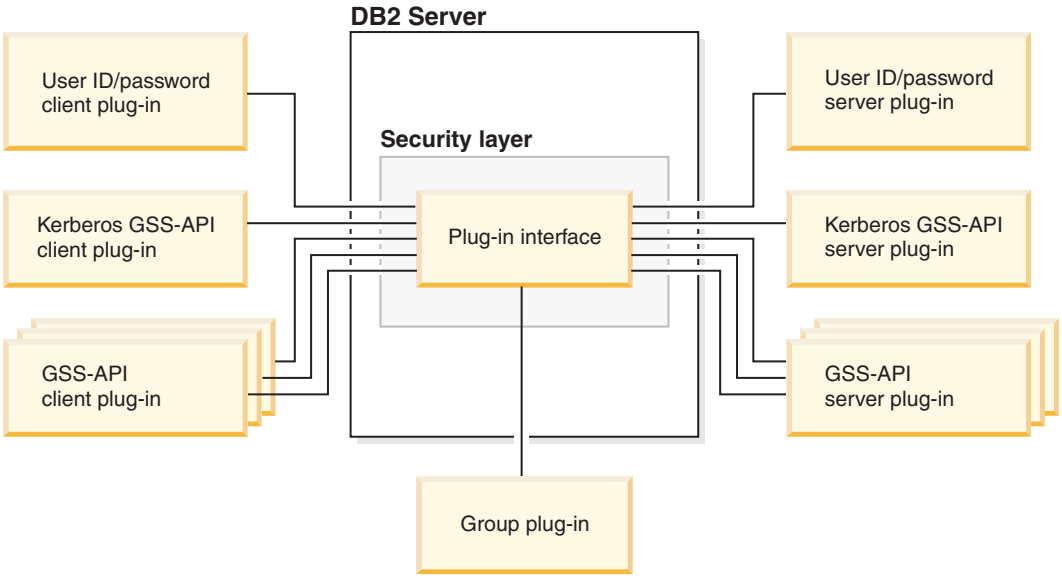

Figure 2. Deploying Security Plug-ins on DB2 Servers

Note: The integrity of your DB2 database system installation can be compromised if the deployment of security plug-ins are not adequately coded, reviewed, and tested. The DB2 database system takes precaution against many common types of failures, but it cannot guarantee complete integrity when user-written security plug-ins are deployed.

Enabling security plug-ins

The system administrator can specify the names of the plug-ins to use for each authentication mechanism by updating certain plug-in-related database manager configuration parameters. If these parameters are null, they will default to the DB2-supplied plug-ins for group retrieval, user ID/password management, or Kerberos (if authentication is set to Kerberos -- on the server). DB2 does not provide a default GSS-API plug-in. Therefore, if system administrators specify an authentication type of GSSPLUGIN in *authentication* parameter, they must also specify a GSS-API authentication plug-in in *srvcon_gssplugin_list*.

How DB2 loads security plug-ins

All of the supported plug-ins identified by the database manager configuration parameters are loaded when the database manager starts.

The DB2 client will load a plug-in appropriate for the security mechanism negotiated with the server during connect or attach operations. It is possible that a client application can cause multiple security plug-ins to be concurrently loaded and used. This situation can occur, for example, in a threaded program that has concurrent connections to different databases from different instances.

Actions other than connect or attach operations require authorization (such as updating the database manager configuration, starting and stopping the database manager, turning DB2 trace on and off) as well. For such actions, the DB2 client program will load a plug-in specified in another database manager configuration parameter. If *authentication* is set to GSSPLUGIN, DB2 database manager will use the plug-in specified by *local_gssplugin*. If *authentication* is set to KERBEROS, DB2

database manager will use the plug-in specified by *clnt_krb_plugin*. Otherwise, DB2 database manager will use the plug-in specified by *clnt_pw_plugin*.

Security plug-ins APIs can be called from either an IPv4 platform or an IPv6 platform. An IPv4 address is a 32-bit address which has a readable form a.b.c.d, where each of a-d represents a decimal number from 0-255. An IPv6 address is a 128 bit address of the form a:b:c:d:e:f:g:h, where each of a-h represents 4 hex digits.

Developing security plug-ins

If you are developing a security plug-in, you need to implement the standard authentication functions that DB2 database manager will use. If you are using your own customized security plug-in, you can use a user ID of up to 255 characters on a connect statement issued through the CLP or a dynamic SQL statement. For the available types of plug-ins, the functionality you will need to implement is as follows:

Group retrieval
Gets the list of groups to which a user belongs.

User ID/password authentication

- Identifies the default security context (client only).
- Validates and optionally changes a password.
- Determines if a given string represents a valid user (server only).
- Modifies the user ID or password provided on the client before it is sent to the server (client only).
- Returns the DB2 authorization ID associated with a given user.

GSS-API authentication

- Implements the required GSS-API functions.
- Identifies the default security context (client only).
- Generates initial credentials based on a user ID and password and optionally changes password (client only).
- Creates and accepts security tickets.
- Returns the DB2 authorization ID associated with a given GSS-API security context.

Security plug-in library locations

After you acquire your security plug-ins (either by developing them yourself, or purchasing them from a third party), copy them to specific locations on your database server.

DB2 clients looks for client-side user authentication plug-ins in the following directory:

- UNIX 32-bit: `$DB2PATH/security32/plugin/client`
- UNIX 64-bit: `$DB2PATH/security64/plugin/client`
- WINDOWS 32-bit and 64-bit: `$DB2PATH\security\plugin\`*`instance name`*`\client`

Note: On Windows-based platforms, the subdirectories *instance name* and *client* are not created automatically. The instance owner has to manually create them.

The DB2 database manager looks for server-side user authentication plug-ins in the following directory:

- UNIX 32-bit: $DB2PATH/security32/plugin/server
- UNIX 64-bit: $DB2PATH/security64/plugin/server
- WINDOWS 32-bit and 64-bit: $DB2PATH\security\plugin*instance name*\server

Note: On Windows-based platforms, the subdirectories *instance name* and *server* are not created automatically. The instance owner has to manually create them.

The DB2 database manager looks for group plug-ins in the following directory:

- UNIX 32-bit: $DB2PATH/security32/plugin/group
- UNIX 64-bit: $DB2PATH/security64/plugin/group
- WINDOWS 32-bit and 64-bit: $DB2PATH\security\plugin*instance name*\group

Note: On Windows-based platforms, the subdirectories *instance name* and *group* are not created automatically. The instance owner has to manually create them.

Security plug-in naming conventions

Security plug-in libraries must have a platform-specific file name extension. Security plug-in libraries written in C or C++ must have a platform-specific file name extension:

- Windows: .dll
- AIX: .a or .so, and if both extensions exist, .a extension is used.
- Linux, HP IPF and Solaris: .so
- HPUX on PA-RISC: .sl or .so, and if both extensions exist, .sl extension is used.

Note: Users can also develop security plug-ins with the DB2 Universal JDBC Driver.

For example, assume you have a security plug-in library called MyPlugin. For each supported operating system, the appropriate library file name follows:

- Windows 32-bit: MyPlugin.dll
- Windows 64-bit: MyPlugin64.dll
- AIX 32 or 64-bit: MyPlugin.a or MyPlugin.so
- SUN 32 or 64-bit, Linux 32 or 64 bit, HP 32 or 64 bit on IPF: MyPlugin.so
- HP-UX 32 or 64-bit on PA-RISC: MyPlugin.sl or MyPlugin.so

Note: The suffix ″64″ is only required on the library name for 64-bit Windows security plug-ins.

When you update the database manager configuration with the name of a security plug-in, use the full name of the library without the ″64″ suffix and omit both the file extension and any qualified path portion of the name. Regardless of the operating system, a security plug-in library called MyPlugin would be registered as follows:

```
UPDATE DBM CFG USING CLNT_PW_PLUGIN MyPlugin
```

The security plug-in name is case sensitive, and must exactly match the library name. DB2 database systems use the value from the relevant database manager configuration parameter to assemble the library path, and then uses the library path to load the security plug-in library.

To avoid security plug-in name conflicts, you should name the plug-in using the authentication method used, and an identifying symbol of the firm that wrote the

plug-in. For instance, if the company Foo, Inc. wrote a plug-in implementing the authentication method FOOsomemethod, the plug-in could have a name like FOOsomemethod.dll.

The maximum length of a plug-in name (not including the file extension and the ″64″ suffix) is limited to 32 bytes. There is no maximum number of plug-ins supported by the database server, but the maximum length of the comma-separated list of plug-ins in the database manager configuration is 255 bytes. Two defines located in the include file sqlenv.h identifies these two limits:

```
#define SQL_PLUGIN_NAME_SZ     32     /* plug-in name */
#define SQL_SRVCON_GSSPLUGIN_LIST_SZ 255 /* GSS API plug-in list */
```

The security plug-in library files must have the following file permissions:

- Owned by the instance owner.
- Readable by all users on the system.
- Executable by all users on the system.

Security plug-in support for two-part user IDs

The DB2 database manager on Windows supports the use of two-part user IDs, and the mapping of two-part user IDs to two-part authorization IDs.

For example, consider a Windows operating system two-part user ID composed of a domain and user ID such as: MEDWAY\pieter. In this example, MEDWAY is a domain and pieter is the user name. In DB2 database systems, you can specify whether this two-part user ID should be mapped to either a one-part authorization ID or a two-part authorization ID.

The mapping of a two-part user ID to a two-part authorization ID is supported, but is not the default behavior. By default, both one-part user IDs and two-part user IDs map to one-part authorization IDs. The mapping of a two-part user ID to a two-part authorization ID is supported, but is not the default behavior.

The default mapping of a two-part user ID to a one-part user ID allows a user to connect to the database using:

```
db2 connect to db user MEDWAY\pieter using pw
```

In this situation, if the default behavior is used, the user ID MEDWAY\pieter is resolved to the authorization ID PIETER. If the support for mapping a two-part user ID to a two-part authorization ID is enabled, the authorization ID would be MEDWAY\PIETER.

To enable DB2 to map two-part user IDs to two-part authorization IDs, DB2 supplies two sets of authentication plug-ins:

- One set exclusively maps a one-part user ID to a one-part authorization ID and maps a two-part user-ID to a one-part authorization ID.
- Another set maps both one-part user ID or two-part user ID to a two-part authorization ID.

If a user name in your work environment can be mapped to multiple accounts defined in different locations (such as local account, domain account, and trusted domain accounts), you can specify the plug-ins that enable two-part authorization ID mapping.

It is important to note that a one-part authorization ID, such as, `PIETER` and a two-part authorization ID that combines a domain and a user ID like `MEDWAY\pieter` are functionally distinct authorization IDs. The set of privileges associated with one of these authorization IDs can be completely distinct from the set of privileges associated with the other authorization ID. Care should be taken when working with one-part and two-part authorization IDs.

The following table identifies the kinds of plug-ins supplied by DB2 database systems, and the plug-in names for the specific authentication implementations.

Table 11. DB2 security plug-ins

Authentication type	Name of one-part user ID plug-in	Name of two-part user ID plug-in
User ID/password (client)	IBMOSauthclient	IBMOSauthclientTwoPart
User ID/password (server)	IBMOSauthserver	IBMOSauthserverTwoPart
Kerberos	IBMkrb5	IBMkrb5TwoPart

Note: On Windows 64-bit platforms, the characters ″64″ are appended to the plug-in names listed here.

When you specify an authentication type that requires a user ID/password or Kerberos plug-in, the plug-ins that are listed in the ″Name of one-part user ID plug-in″ column in the previous table are used by default.

To map a two-part user ID to a two-part authorization ID, you must specify that the two-part plug-in, which is not the default plug-in, be used. Security plug-ins are specified at the instance level by setting the security related database manager configuration parameters as follows:

For server authentication that maps two-part user IDs to two-part authorization IDs, you must set:

- `srvcon_pw_plugin` to `IBMOSauthserverTwoPart`
- `clnt_pw_plugin` to `IBMOSauthclientTwoPart`

For client authentication that maps two-part user IDs to two-part authorization IDs, you must set:

- `srvcon_pw_plugin` to `IBMOSauthserverTwoPart`
- `clnt_pw_plugin` to `IBMOSauthclientTwoPart`

For Kerberos authentication that maps two-part user IDs to two-part authorization IDs, you must set:

- `srvcon_gssplugin_list` to `IBMOSkrb5TwoPart`
- `clnt_krb_plugin` to `IBMkrb5TwoPart`

The security plug-in libraries accept two-part user IDs specified in a Microsoft® Windows Security Account Manager compatible format. For example, in the format: *domain\user ID*. Both the domain and user ID information will be used by the DB2 authentication and authorization processes at connection time.

You should consider implementing the two-part plug-ins when creating new databases to avoid conflicts with one-part authorization IDs in existing databases. New databases that use two-part authorization IDs must be created in a separate instance from databases that use single-part authorization IDs.

Security plug-in API versioning

The DB2 database system supports version numbering of the security plug-in APIs. These version numbers are integers starting with 1 for DB2 UDB, Version 8.2.

The version number that DB2 passes to the security plug-in APIs is the highest version number of the API that DB2 can support, and corresponds to the version number of the structure. If the plug-in can support a higher API version, it must return function pointers for the version that DB2 has requested. If the plug-in only supports a lower version of the API, the plug-in should fill in function pointers for the lower version. In either situation, the security plug-in APIs should return the version number for the API it is supporting in the version field of the functions structure.

For DB2, the version numbers of the security plug-ins will only change when necessary (for example, when there are changes to the parameters of the APIs). Version numbers will not automatically change with DB2 release numbers.

32-bit and 64-bit considerations for security plug-ins

In general, a 32-bit DB2 instance uses the 32-bit security plug-in and a 64-bit DB2 instance uses the 64-bit security plug-in. However, on a 64-bit instance, DB2 supports 32-bit applications, which require the 32-bit plug-in library.

A database instance where both the 32-bit and the 64-bit applications can run is known as a hybrid instance. If you have a hybrid instance and intend to run 32-bit applications, ensure that the required 32-bit security plug-ins are available in the 32-bit plug-in directory. For 64-bit DB2 instances on Linux and UNIX operating systems, excluding Linux on IPF, the directories `security32` and `security64` appear. For a 64-bit DB2 instance on Windows on X64 or IPF, both 32-bit and 64-bit security plug-ins are located in the same directory, but 64-bit plug-in names have a suffix, ″64″.

If you want to migrate from a 32-bit instance to a 64-bit instance, you should obtain versions of your security plug-ins that are recompiled for 64-bit.

If you acquired your security plug-ins from a vendor that does not supply 64-bit plug-in libraries, you can implement a 64-bit stub that executes a 32-bit application. In this situation, the security plug-in is an external program rather than a library.

Security plug-in problem determination

Problems with security plug-ins are reported in two ways: through SQL errors and through the administration notification log.

Following are the SQLCODE values related to security plug-ins:

- SQLCODE -1365 is returned when a plug-in error occurs during db2start or db2stop.
- SQLCODE -1366 is returned whenever there is a local authorization problem.
- SQLCODE -30082 is returned for all connection-related plug-in errors.

The administration notification log is a good resource for debugging and administrating security plug-ins. To see the administration notification log on UNIX, check `sqllib/db2dump/`*`instance name`*`.nfy`. To see the administration notification log on Windows operating systems, use the Event Viewer tool. The Event Viewer tool can be found by navigating from the Windows operating system

"Start" button to `Settings -> Control Panel -> Administrative Tools -> Event Viewer`. Following are the administration notification log values related to security plug-ins:

- 13000 indicates that a call to a GSS-API security plug-in API failed with an error, and returned an optional error message.

  ```
  SQLT_ADMIN_GSS_API_ERROR (13000)
  Plug-in "plug-in name" received error code "error code" from
  GSS API  "gss api name" with the error message "error message"
  ```

- 13001 indicates that a call to a DB2 security plug-in API failed with an error, and returned an optional error message.

  ```
  SQLT_ADMIN_PLUGIN_API_ERROR(13001)
  Plug-in "plug-in name" received error code "error code" from DB2
  security plug-in API "gss api name" with the error message
  "error message"
  ```

- 13002 indicates that DB2 failed to unload a plug-in.

  ```
  SQLT_ADMIN_PLUGIN_UNLOAD_ERROR (13002)
  Unable to unload plug-in "plug-in name". No further action required.
  ```

- 13003 indicates a bad principal name.

  ```
  SQLT_ADMIN_INVALID_PRIN_NAME (13003)
  The principal name "principal name" used for "plug-in name"
  is invalid. Fix the principal name.
  ```

- 13004 indicates that the plug-in name is not valid. Path separators (On UNIX "/" and on Windows "\") are not allowed in the plug-in name.

  ```
  SQLT_ADMIN_INVALID_PLGN_NAME (13004)
  The plug-in name "plug-in name" is invalid. Fix the plug-in name.
  ```

- 13005 indicates that the security plug-in failed to load. Ensure the plug-in is in the correct directory and that the appropriate database manager configuration parameters are updated.

  ```
  SQLT_ADMIN_PLUGIN_LOAD_ERROR (13005)
  Unable to load plug-in "plug-in name". Verify the plug-in existence and
  directory where it is located is correct.
  ```

- 13006 indicates that an unexpected error was encountered by a security plug-in. Gather all the db2support information, if possible capture a db2trc, and then call IBM support for further assistance.

  ```
  SQLT_ADMIN_PLUGIN_UNEXP_ERROR (13006)
  Plug-in encountered unexpected error. Contact IBM Support for further assistance.
  ```

Note: If you are using security plug-ins on a Windows 64-bit database server and are seeing a load error for a security plug-in, see the topics about 32-bit and 64-bit considerations and security plug-in naming conventions. The 64-bit plug-in library requires the suffix "64" on the library name, but the entry in the security plug-in database manager configuration parameters should not indicate this suffix.

Security plug-in APIs

To enable you to customize the DB2 database system authentication and group membership lookup behavior, the DB2 database system provides APIs that you can use to modify existing plug-in modules or build new security plug-in modules.

When you develop a security plug-in module, you need to implement the standard authentication or group membership lookup functions that the DB2 database manager will invoke. For the three available types of plug-in modules, the functionality you need to implement is as follows:

Group retrieval
Retrieves group membership information for a given user and determines if a given string represents a valid group name.

User ID/password authentication
Authentication that identifies the default security context (client only), validates and optionally changes a password, determines if a given string represents a valid user (server only), modifies the user ID or password provided on the client before it is sent to the server (client only), returns the DB2 authorization ID associated with a given user.

GSS-API authentication
Authentication that implements the required GSS-API functions, identifies the default security context (client side only), generates initial credentials based on user ID and password, and optionally changes password (client side only), creates and accepts security tickets, and returns the DB2 authorization ID associated with a given GSS-API security context.

The following are the definitions for terminology used in the descriptions of the plug-in APIs.

Plug-in
A dynamically loadable library that DB2 will load to access user-written authentication or group membership lookup functions.

Implicit authentication
A connection to a database without specifying a user ID or a password.

Explicit authentication
A connection to a database in which both the user ID and password are specified.

Authid
An internal ID representing an individual or group to which authorities and privileges within the database are granted. Internally, a DB2 authid is folded to upper-case and is a minimum of 8 characters (blank padded to 8 characters). Currently, DB2 requires authids, user IDs, passwords, group names, namespaces, and domain names that can be represented in 7-bit ASCII.

Local authorization
Authorization that is local to the server or client that implements it, that checks if a user is authorized to perform an action (other than connecting to the database), such as starting and stopping the database manager, turning DB2 trace on and off, or updating the database manager configuration.

Namespace
A collection or grouping of users within which individual user identifiers must be unique. Common examples include Windows domains and Kerberos Realms. For example, within the Windows domain ″usa.company.com″ all user names must be unique. For example, ″user1@usa.company.com″. The same user ID in another domain, as in the case of ″user1@canada.company.com″, however refers to a different person. A fully qualified user identifier includes a user ID and namespace pair; for example, ″user@domain.name″ or ″domain\user″.

Input Indicates that DB2 will fill in the value for the security plug-in API parameter.

Output

Indicates that the security plug-in API will fill in the value for the API parameter.

APIs for group retrieval plug-ins

For the group retrieval plug-in module, you need to implement the following APIs:

- `db2secGroupPluginInit`

  Note: The db2secGroupPluginInit API takes as input a pointer, `*logMessage_fn`, to an API with the following prototype:

  ```
  SQL_API_RC (SQL_API_FN db2secLogMessage)
  (
  db2int32 level,
  void    *data,
  db2int32 length
  );
  ```

  The db2secLogMessage API allows the plug-in to log messages to db2diag.log for debugging or informational purposes. This API is provided by the DB2 database system, so you need not implement it.

- `db2secPluginTerm`
- `db2secGetGroupsForUser`
- `db2secDoesGroupExist`
- `db2secFreeGroupListMemory`
- `db2secFreeErrormsg`
- The only API that must be resolvable externally is `db2secGroupPluginInit`. This API will take a `void *` parameter, which should be cast to the type:

  ```
  typedef struct db2secGroupFunctions_1
  {
  db2int32 version;
  db2int32 plugintype;
  SQL_API_RC (SQL_API_FN * db2secGetGroupsForUser)
  (
  const char *authid,
  db2int32    authidlen,
  const char *userid,
  db2int32    useridlen,
  const char *usernamespace,
  db2int32    usernamespacelen,
  db2int32    usernamespacetype,
  const char *dbname,
  db2int32    dbnamelen,
  const void *token,
  db2int32    tokentype,
  db2int32    location,
  const char *authpluginname,
  db2int32    authpluginnamelen,
  void      **grouplist,
  db2int32   *numgroups,
  char      **errormsg,
  db2int32   *errormsglen
  );

  SQL_API_RC (SQL_API_FN * db2secDoesGroupExist)
  (
  const char *groupname,
  db2int32    groupnamelen,
  char      **errormsg,
  db2int32   *errormsglen
  );
  ```

```
SQL_API_RC (SQL_API_FN * db2secFreeGroupListMemory)
(
void     *ptr,
char    **errormsg,
db2int32 *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secFreeErrormsg)
(
char *msgtobefree
);

SQL_API_RC (SQL_API_FN * db2secPluginTerm)
(
char    **errormsg,
db2int32 *errormsglen
);

} db2secGroupFunctions_1;
```

The db2secGroupPluginInit API assigns the addresses for the rest of the externally available functions.

Note: The _1 indicates that this is the structure corresponding to version 1 of the API. Subsequent interface versions will have the extension _2, _3, and so on.

db2secDoesGroupExist API - Check if group exists

Determines if an authid represents a group.

If the groupname exists, the API must be able to return the value DB2SEC_PLUGIN_OK, to indicate success. It must also be able to return the value DB2SEC_PLUGIN_INVALIDUSERORGROUP if the group name is not valid. It is permissible for the API to return the value DB2SEC_PLUGIN_GROUPSTATUSNOTKNOWN if it is impossible to determine if the input is a valid group. If an invalid group (DB2SEC_PLUGIN_INVALIDUSERORGROUP) or group not known (DB2SEC_PLUGIN_GROUPSTATUSNOTKNOWN) value is returned, DB2 might not be able to determine whether the authid is a group or user when issuing the GRANT statement without the keywords USER and GROUP, which would result in the error SQLCODE -569, SQLSTATE 56092 being returned to the user.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secDoesGroupExist)
                      ( const char *groupname,
                        db2int32 groupnamelen,
                        char      **errormsg,
                        db2int32 *errormsglen );
```

db2secDoesGroupExist API parameters

groupname
Input. An authid, upper-cased, with no trailing blanks.

groupnamelen
Input. Length in bytes of the groupname parameter value.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secDoesGroupExist API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secFreeErrormsg API - Free error message memory

Frees the memory used to hold an error message from a previous API call. This is the only API that does not return an error message. If this API returns an error, DB2 will log it and continue.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secFreeErrormsg)
                      ( char *errormsg );
```

db2secFreeErrormsg API parameters

msgtofree
Input. A pointer to the error message allocated from a previous API call.

db2secFreeGroupListMemory API - Free group list memory

Frees the memory used to hold the list of groups from a previous call to db2secGetGroupsForUser API.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secFreeGroupListMemory)
                      ( void *ptr,
                        char      **errormsg,
                        db2int32 *errormsglen );
```

db2secFreeGroupListMemory API parameters

ptr Input. Pointer to the memory to be freed.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secFreeGroupListMemory API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in the errormsg parameter.

db2secGetGroupsForUser API - Get list of groups for user

Returns the list of groups to which a user belongs.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secGetGroupsForUser)
                      ( const char *authid,
                        db2int32 authidlen,
                        const char *userid,
                        db2int32 useridlen,
                        const char *usernamespace,
                        db2int32 usernamespacelen,
                        db2int32 usernamespacetype,
                        const char *dbname,
                        db2int32 dbnamelen,
                        void *token,
                        db2int32 tokentype,
                        db2int32 location,
                        const char *authpluginname,
```

```
db2int32 authpluginnamelen,
void      **grouplist,
db2int32 *numgroups,
char      **errormsg,
db2int32 *errormsglen );
```

db2secGetGroupsForUser API parameters

authid Input. This parameter value is an SQL authid, which means that DB2 converts it to an uppercase character string with no trailing blanks. DB2 will always provide a non-null value for the authid parameter. The API must be able to return a list of groups to which the authid belongs without depending on the other input parameters. It is permissible to return a shortened or empty list if this cannot be determined.

If a user does not exist, the API must return the return code DB2SEC_PLUGIN_BADUSER. DB2 does not treat the case of a user not existing as an error, since it is permissible for an authid to not have any groups associated with it. For example, the db2secGetAuthids API can return an authid that does not exist on the operating system. The authid is not associated with any groups, however, it can still be assigned privileges directly.

If the API cannot return a complete list of groups using only the authid, then there will be some restrictions on certain SQL functions related to group support. For a list of possible problem scenarios, refer to the Usage notes section in this topic.

authidlen
Input. Length in bytes of the authid parameter value. The DB2 database manager always provides a non-zero value for the authidlen parameter.

userid Input. This is the user ID corresponding to the authid. When this API is called on the server in a non-connect scenario, this parameter will not be filled by DB2.

useridlen
Input. Length in bytes of the userid parameter value.

usernamespace
Input. The namespace from which the user ID was obtained. When the user ID is not available, this parameter will not be filled by the DB2 database manager.

usernamespacelen
Input. Length in bytes of the usernamespace parameter value.

usernamespacetype
Input. The type of namespace. Valid values for the usernamespacetype parameter (defined in db2secPlugin.h) are:

- DB2SEC_NAMESPACE_SAM_COMPATIBLE Corresponds to a username style like domain\myname
- DB2SEC_NAMESPACE_USER_PRINCIPAL Corresponds to a username style like myname@domain.ibm.com

Currently, the DB2 database system only supports the value DB2SEC_NAMESPACE_SAM_COMPATIBLE. When the user ID is not available, the usernamespacetype parameter is set to the value DB2SEC_USER_NAMESPACE_UNDEFINED (defined in db2secPlugin.h).

dbname
Input. Name of the database being connected to. This parameter can be NULL in a non-connect scenario.

dbnamelen
Input. Length in bytes of the dbname parameter value. This parameter is set to 0 if dbname parameter is NULL in a non-connect scenario.

token Input. A pointer to data provided by the authentication plug-in. It is not used by DB2. It provides the plug-in writer with the ability to coordinate user and group information. This parameter might not be provided in all cases (for example, in a non-connect scenario), in which case it will be NULL. If the authentication plug-in used is GSS-API based, the token will be set to the GSS-API context handle (gss_ctx_id_t).

tokentype
Input. Indicates the type of data provided by the authentication plug-in. If the authentication plug-in used is GSS-API based, the token will be set to the GSS-API context handle (gss_ctx_id_t). If the authentication plug-in used is user ID/password based, it will be a generic type. Valid values for the tokentype parameter (defined in db2secPlugin.h) are:

- `DB2SEC_GENERIC`: Indicates that the token is from a user ID/password based plug-in.
- `DB2SEC_GSSAPI_CTX_HANDLE`: Indicates that the token is from a GSS-API (including Kerberos) based plug-in.

location
Input. Indicates whether DB2 is calling this API on the client side or server side. Valid values for the location parameter (defined in db2secPlugin.h) are:

- `DB2SEC_SERVER_SIDE`: The API is to be called on the database server.
- `DB2SEC_CLIENT_SIDE`: The API is to be called on a client.

authpluginname
Input. Name of the authentication plug-in that provided the data in the token. The db2secGetGroupsForUser API might use this information in determining the correct group memberships. This parameter might not be filled by DB2 if the authid is not authenticated (for example, if the authid does not match the current connected user).

authpluginnamelen
Input. Length in bytes of the authpluginname parameter value.

grouplist
Output. List of groups to which the user belongs. The list of groups must be returned as a pointer to a section of memory allocated by the plug-in containing concatenated varchars (a varchar is a character array in which the first byte indicates the number of bytes following it). The length is an unsigned char (1 byte) and that limits the maximum length of a groupname to 255 characters. For example, ″\006GROUP1\ 007MYGROUP\008MYGROUP3″. Each group name should be a valid DB2 authid. The memory for this array must be allocated by the plug-in. The plug-in must therefore provide an API, such as the db2secFreeGroupListMemory API that DB2 will call to free the memory.

numgroups
Output. The number of groups contained in the grouplist parameter.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secGetGroupsForUser API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

Usage notes

The following is a list of scenarios when problems can occur if an incomplete group list is returned by this API to DB2:

- Embedded SQL application with DYNAMICRULES BIND (or DEFINEDBIND or INVOKEDBIND if the packages are running as a standalone application). DB2 checks for SYSADM membership and the application will fail if it is dependent on the implicit DBADM authority granted by being a member of the SYSADM group.
- Alternate authorization is provided in CREATE SCHEMA statement. Group lookup will be performed against the AUTHORIZATION NAME parameter if there are nested CREATE statements in the CREATE SCHEMA statement.
- Embedded SQL applications with DYNAMICRULES DEFINERUN/ DEFINEBIND and the packages are running in a routine context. DB2 checks for SYSADM membership of the routine definer and the application will fail if it is dependent on the implicit DBADM authority granted by being a member of the SYSADM group.
- Processing a jar file in an MPP environment. In an MPP environment, the jar processing request is sent from the coordinator node with the session authid. The catalog node received the requests and process the jar files based on the privilege of the session authid (the user executing the jar processing requests).
  - Install jar file. The session authid needs to have one of the following rights: SYSADM, DBADM, or CREATEIN (implicit or explicit on the jar schema). The operation will fail if the above rights are granted to group containing the session authid, but not explicitly to the session authid or if only SYSADM is held, since SYSADM membership is determined by membership in the group defined by a database configuration parameter.
  - Remove jar file. The session authid needs to have one of the following rights rights: SYSADM, DBADM, or DROPIN (implicit or explicit on the jar schema), or is the definer of the jar file. The operation will fail if the above rights are granted to group containing the session authid, but not explicitly to the session authid, and if the session authid is not the definer of the jar file or if only SYSADM is held since SYSADM membership is determined by membership in the group defined by a database configuration parameter.
  - Replace jar file. This is same as removing the jar file, followed by installing the jar file. Both of the above apply.
- Regenerate views. This is triggered by the ALTER TABLE, ALTER COLUMN, SET DATA TYPE VARCHAR/VARGRAPHIC statements, or during migration. The DB2 database manager checks for SYSADM membership of the view definer. The application will fail if it is dependent on the implicit DBADM authority granted by being a member of the SYSADM group.
- When SET SESSION_USER statement is issued. Subsequent DB2 operations are run under the context of the authid specified by this statement. These operations will fail if the privileges required are owned by one of the SESSION_USER's group is not explicitly granted to the SESSION_USER authid.

db2secGroupPluginInit API - Initialize group plug-in

Initialization API, for the group-retrieval plug-in, that the DB2 database manager calls immediately after loading the plug-in.

API and data structure syntax

```
SQL_API_RC SQL_API_FN db2secGroupPluginInit
                              ( db2int32 version,
                                void *group_fns,
                                db2secLogMessage *logMessage_fn,
                                char     **errormsg,
                                db2int32 *errormsglen );
```

db2secGroupPluginInit API parameters

version

Input. The highest version of the API supported by the instance loading that plugin. The value DB2SEC_API_VERSION (in db2secPlugin.h) contains the latest version number of the API that the DB2 database manager currently supports.

group_fns

Output. A pointer to the db2secGroupFunctions_<version_number> (also known as group_functions_<version_number>) structure. The db2secGroupFunctions_<version_number> structure contains pointers to the APIs implemented for the group-retrieval plug-in. In future, there might be different versions of the APIs (for example, db2secGroupFunctions_<version_number>), so the group_fns parameter is cast as a pointer to the db2secGroupFunctions_<version_number> structure corresponding to the version the plug-in has implemented. The first parameter of the group_functions_<version_number> structure tells DB2 the version of the APIs that the plug-in has implemented. Note: The casting is done only if the DB2 version is higher or equal to the version of the APIs that the plug-in has implemented. The version number represents the version of the APIs implemented by the plugin, and the pluginType should be set to DB2SEC_PLUGIN_TYPE_GROUP.

logMessage_fn

Input. A pointer to the db2secLogMessage API, which is implemented by the DB2 database system. The db2secGroupPluginInit API can call the db2secLogMessage API to log messages to db2diag.log for debugging or informational purposes. The first parameter (level) of db2secLogMessage API specifies the type of diagnostic errors that will be recorded in the db2diag.log file and the last two parameters respectively are the message string and its length. The valid values for the first parameter of dbesecLogMessage API (defined in db2secPlugin.h) are:

- `DB2SEC_LOG_NONE`: (0) No logging
- `DB2SEC_LOG_CRITICAL`: (1) Severe Error encountered
- `DB2SEC_LOG_ERROR`: (2) Error encountered
- `DB2SEC_LOG_WARNING`: (3) Warning
- `DB2SEC_LOG_INFO`: (4) Informational

The message text will show up in the diag.log only if the value of the 'level' parameter of the db2secLogMessage API is less than or equal to the diaglevel database manager configuration parameter. So for example, if you use the `DB2SEC_LOG_INFO` value, the message text will only show up in the db2diag.log if the diaglevel database manager configuration parameter is set to 4.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secGroupPluginInit API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secPluginTerm - Clean up group plug-in resources

Frees resources used by the group-retrieval plug-in.

This API is called by the DB2 database manager just before it unloads the group-retrieval plug-in. It should be implemented in a manner that it does a proper cleanup of any resources the plug-in library holds, for instance, free any memory allocated by the plug-in, close files that are still open, and close network connections. The plug-in is responsible for keeping track of these resources in order to free them. This API is not called on any Windows platform.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secPluginTerm)
                      ( char      **errormsg,
                        db2int32 *errormsglen );
```

db2secPluginTerm API parameters

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secPluginTerm API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

APIs for user ID/password authentication plug-ins

For the user ID/password plug-in module, you need to implement the following client-side APIs:

- `db2secClientAuthPluginInit`

  Note: The db2secClientAuthPluginInit API takes as input a pointer, `*logMessage_fn`, to an API with the following prototype:

  ```
  SQL_API_RC (SQL_API_FN db2secLogMessage)
  (
  db2int32 level,
  void    *data,
  db2int32 length
  );
  ```

  The db2secLogMessage API allows the plug-in to log messages to db2diag.log for debugging or informational purposes. This API is provided by the DB2 database system, so you need not implement it.
- `db2secClientAuthPluginTerm`
- `db2secGenerateInitialCred` (Only used for gssapi)
- `db2secRemapUserid` (Optional)

- db2secGetDefaultLoginContext
- db2secValidatePassword
- db2secProcessServerPrincipalName (This is only for GSS-API)
- db2secFreeToken (Functions to free memory held by the DLL)
- db2secFreeErrormsg
- db2secFreeInitInfo
- The only API that must be resolvable externally is db2secClientAuthPluginInit. This API will take a void * parameter, which should be cast to either:

```
typedef struct db2secUseridPasswordClientAuthFunctions_1
{
db2int32 version;
db2int32 plugintype;

SQL_API_RC (SQL_API_FN * db2secGetDefaultLoginContext)
(
char        authid[DB2SEC_MAX_AUTHID_LENGTH],
db2int32   *authidlen,
char        userid[DB2SEC_MAX_USERID_LENGTH],
db2int32   *useridlen,
db2int32    useridtype,
char        usernamespace[DB2SEC_MAX_USERNAMESPACE_LENGTH],
db2int32   *usernamespacelen,
db2int32   *usernamespacetype,
const char *dbname,
db2int32    dbnamelen,
void      **token,
char      **errormsg,
db2int32   *errormsglen
);
/* Optional */
SQL_API_RC (SQL_API_FN * db2secRemapUserid)
(
char        userid[DB2SEC_MAX_USERID_LENGTH],
db2int32   *useridlen,
char        usernamespace[DB2SEC_MAX_USERNAMESPACE_LENGTH],
db2int32   *usernamespacelen,
db2int32   *usernamespacetype,
char        password[DB2SEC_MAX_PASSWORD_LENGTH],
db2int32   *passwordlen,
char        newpassword[DB2SEC_MAX_PASSWORD_LENGTH],
db2int32   *newpasswordlen,
const char *dbname,
db2int32    dbnamelen,
char      **errormsg,
db2int32   *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secValidatePassword)
(
const char *userid,
db2int32    useridlen,
const char *usernamespace,
db2int32    usernamespacelen,
db2int32    usernamespacetype,
const char *password,
db2int32    passwordlen,
const char *newpassword,
db2int32    newpasswordlen,
const char *dbname,
db2int32    dbnamelen,
db2Uint32   connection_details,
void      **token,
char      **errormsg,
```

```
db2int32   *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secFreeToken)
(
void     **token,
char     **errormsg,
db2int32  *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secFreeErrormsg)
(
char *errormsg
);

SQL_API_RC (SQL_API_FN * db2secClientAuthPluginTerm)
(
char     **errormsg,
db2int32  *errormsglen
);
}
```

or

```
typedef struct db2secGssapiClientAuthFunctions_1
{
db2int32 version;
db2int32 plugintype;

SQL_API_RC (SQL_API_FN * db2secGetDefaultLoginContext)
(
char        authid[DB2SEC_MAX_AUTHID_LENGTH],
db2int32   *authidlen,
char        userid[DB2SEC_MAX_USERID_LENGTH],
db2int32   *useridlen,
db2int32    useridtype,
char        usernamespace[DB2SEC_MAX_USERNAMESPACE_LENGTH],
db2int32   *usernamespacelen,
db2int32   *usernamespacetype,
const char *dbname,
db2int32    dbnamelen,
void      **token,
char      **errormsg,
db2int32   *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secProcessServerPrincipalName)
(
const void *data,
gss_name_t *gssName,
char      **errormsg,
db2int32   *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secGenerateInitialCred)
(
const char    *userid,
db2int32       useridlen,
const char    *usernamespace,
db2int32       usernamespacelen,
db2int32       usernamespacetype,
const char    *password,
db2int32       passwordlen,
const char    *newpassword,
db2int32       newpasswordlen,
const char    *dbname,
db2int32       dbnamelen,
```

```
gss_cred_id_t *pGSSCredHandle,
void         **initInfo,
char         **errormsg,
db2int32      *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secFreeToken)
(
void      *token,
char     **errormsg,
db2int32  *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secFreeErrormsg)
(
char *errormsg
);


SQL_API_RC (SQL_API_FN * db2secFreeInitInfo)
(
void      *initInfo,
char     **errormsg,
db2int32  *errormsglen
);

SQL_API_RC (SQL_API_FN * db2secClientAuthPluginTerm)
(
char     **errormsg,
db2int32  *errormsglen
);

/* GSS-API specific functions -- refer to db2secPlugin.h
   for parameter list*/

  OM_uint32 (SQL_API_FN * gss_init_sec_context )(<parameter list>);
  OM_uint32 (SQL_API_FN * gss_delete_sec_context )(<parameter list>);
  OM_uint32 (SQL_API_FN * gss_display_status )(<parameter list>);
  OM_uint32 (SQL_API_FN * gss_release_buffer )(<parameter list>);
  OM_uint32 (SQL_API_FN * gss_release_cred )(<parameter list>);
  OM_uint32 (SQL_API_FN * gss_release_name )(<parameter list>);
  }
```

You should use the db2secUseridPasswordClientAuthFunctions_1 structure if you are writing an user ID/password plug-in. If you are writing a GSS-API (including Kerberos) plug-in, you should use the db2secGssapiClientAuthFunctions_1 structure.

For the user ID/password plug-in library, you will need to implement the following server-side APIs:

- db2secServerAuthPluginInit

  The db2secServerAuthPluginInit API takes as input a pointer, *logMessage_fn, to the db2secLogMessage API, and a pointer, *getConDetails_fn, to the db2secGetConDetails API with the following prototypes:

```
SQL_API_RC (SQL_API_FN db2secLogMessage)
(
db2int32 level,
void    *data,
db2int32 length
);

SQL_API_RC (SQL_API_FN db2secGetConDetails)
```

```
(
db2int32    conDetailsVersion,
const void *pConDetails
);
```

The db2secLogMessage API allows the plug-in to log messages to db2diag.log for debugging or informational purposes. The db2secGetConDetails API allows the plug-in to obtain details about the client that is trying to attempt to have a database connection. Both the db2secLogMessage API and db2secGetConDetails API are provided by the DB2 database system, so you do not need to implement them. The db2secGetConDetails API in turn, takes as its second parameter,`pConDetails`, a pointer to one of the following structures:

db2sec_con_details_1:

```
typedef struct db2sec_con_details_1
{
  db2int32  clientProtocol;
  db2Uint32 clientIPAddress;
  db2Uint32 connect_info_bitmap;
  db2int32  dbnameLen;
  char      dbname[DB2SEC_MAX_DBNAME_LENGTH + 1];
} db2sec_con_details_1;
```

db2sec_con_details_2:

```
typedef struct db2sec_con_details_2
{
  db2int32  clientProtocol;     /* See SQL_PROTOCOL_ in sqlenv.h */
  db2Uint32 clientIPAddress;    /* Set if protocol is TCPIP4     */
  db2Uint32 connect_info_bitmap;
  db2int32  dbnameLen;
  char dbname[DB2SEC_MAX_DBNAME_LENGTH + 1];
  db2Uint32 clientIP6Address[4];/* Set if protocol is TCPIP6     */
} db2sec_con_details_2;
```

db2sec_con_details_3:

```
typedef struct db2sec_con_details_3
{
  db2int32 clientProtocol; /* See SQL_PROTOCOL_ in sqlenv.h */
  db2Uint32 clientIPAddress; /* Set if protocol is TCPIP4 */
  db2Uint32 connect_info_bitmap;
  db2int32 dbnameLen;
  char dbname[DB2SEC_MAX_DBNAME_LENGTH + 1];
  db2Uint32 clientIP6Address[4];/* Set if protocol is TCPIP6 */
  db2Uint32 clientPlatform; /* SQLM_PLATFORM_* from sqlmon.h */
  db2Uint32 _reserved[16];
} db2sec_con_details_3;
```

The possible values for `conDetailsVersion` are DB2SEC_CON_DETAILS_VERSION_1, DB2SEC_CON_DETAILS_VERSION_2, and DB2SEC_CON_DETAILS_VERSION_3 representing the version of the API.

Note: While using db2sec_con_details_1, db2sec_con_details_2, or db2sec_con_details_3, consider the following:

– Existing plugins that are using the db2sec_con_details_1 structure and the DB2SEC_CON_DETAILS_VERSION_1 value will continue to work as they did with Version 8.2 when calling the db2GetConDetails API. If this API is called on an IPv4 platform, the client IP address is returned in the clientIPAddress field of the structure. If this API is called on an IPv6 platform,a value of 0 is returned in the clientIPAddress field. To retrieve the client IP address on an IPv6 platform, the security plug-in code should be changed to use either the db2sec_con_details_2 structure and the DB2SEC_CON_DETAILS_VERSION_2

value, or the db2sec_con_details_3 structure and the DB2SEC_CON_DETAILS_VERSION_3 value .

– New plugins should use the db2sec_con_details_3 structure and the DB2SEC_CON_DETAILS_VERSION_3 value. If the db2secGetConDetails API is called on an IPv4 platform, the client IP address is returned in the clientIPAddress field of the db2sec_con_details_3 structure and if the API is called on an IPv6 platform the client IP address is returned in the clientIP6Address field of the db2sec_con_details_3 structure. The *clientProtocol* field of the connection details structure will be set to one of SQL_PROTOCOL_TCPIP (IPv4, with v1 of the structure), SQL_PROTOCOL_TCPIP4 (IPv4, with v2 of the structure) or SQL_PROTOCOL_TCPIP6 (IPv6, with v2 or v3 of the structure).

– The structure db2sec_con_details_3 is identical to the structure db2sec_con_details_2 except that it contains an additional field (*clientPlatform*) that identifies the client platform type (as reported by the communication layer) using platform type constants defined in sqlmon.h, such as SQLM_PLATFORM_AIX.

- `db2secServerAuthPluginTerm`
- `db2secValidatePassword`
- `db2secGetAuthIDs`
- `db2secDoesAuthIDExist`
- `db2secFreeToken`
- `db2secFreeErrormsg`
- The only API that must be resolvable externally is `db2secServerAuthPluginInit`. This API will take a `void *` parameter, which should be cast to either:

```
typedef struct db2secUseridPasswordServerAuthFunctions_1
{
db2int32 version;
db2int32 plugintype;

  /* parameter lists left blank for readability
    see above for parameters */
SQL_API_RC (SQL_API_FN * db2secValidatePassword)(<parameter list>);
SQL_API_RC (SQL_API_FN * db2secGetAuthIDs)(<parameter list);
SQL_API_RC (SQL_API_FN * db2secDoesAuthIDExist)(<parameter list>);
SQL_API_RC (SQL_API_FN * db2secFreeToken)(<parameter list>);
SQL_API_RC (SQL_API_FN * db2secFreeErrormsg)(<parameter list>);
SQL_API_RC (SQL_API_FN * db2secServerAuthPluginTerm)();
} userid_password_server_auth_functions;
```

or

```
typedef struct db2secGssapiServerAuthFunctions_1
{
db2int32 version;
db2int32 plugintype;
gss_buffer_desc serverPrincipalName;
gss_cred_id_t ServerCredHandle;
SQL_API_RC (SQL_API_FN * db2secGetAuthIDs)(<parameter list);
SQL_API_RC (SQL_API_FN * db2secDoesAuthIDExist)(<parameter list>);
SQL_API_RC (SQL_API_FN * db2secFreeErrormsg)(<parameter list>);
SQL_API_RC (SQL_API_FN * db2secServerAuthPluginTerm)();

/* GSS-API specific functions
refer to db2secPlugin.h for parameter list*/
OM_uint32 (SQL_API_FN * gss_accept_sec_context )(<parameter list>);
OM_uint32 (SQL_API_FN * gss_display_name )(<parameter list>);
OM_uint32 (SQL_API_FN * gss_delete_sec_context )(<parameter list>);
OM_uint32 (SQL_API_FN * gss_display_status )(<parameter list>);
```

```
OM_uint32 (SQL_API_FN * gss_release_buffer )(<parameter list>);
OM_uint32 (SQL_API_FN * gss_release_cred )(<parameter list>);
OM_uint32 (SQL_API_FN * gss_release_name )(<parameter list>);

} gssapi_server_auth_functions;
```

You should use the db2secUseridPasswordServerAuthFunctions_1 structure if you are writing an user ID/password plug-in. If you are writing a GSS-API (including Kerberos) plug-in, you should use the db2secGssapiServerAuthFunctions_1 structure.

db2secClientAuthPluginInit API - Initialize client authentication plug-in

Initialization API, for the client authentication plug-in, that the DB2 database manager calls immediately after loading the plug-in.

API and data structure syntax

```
SQL_API_RC SQL_API_FN db2secClientAuthPluginInit
                            ( db2int32 version,
                              void *client_fns,
                              db2secLogMessage *logMessage_fn,
                              char    **errormsg,
                              db2int32 *errormsglen );
```

db2secClientAuthPluginInit API parameters

version

Input. The highest version number of the API that the DB2 database manager currently supports. The DB2SEC_API_VERSION value (in db2secPlugin.h) contains the latest version number of the API that DB2 currently supports.

client_fns

Output. A pointer to memory provided by the DB2 database manager for a db2secGssapiClientAuthFunctions_<version_number> structure (also known as gssapi_client_auth_functions_<version_number>), if GSS-API authentication is used, or a db2secUseridPasswordClientAuthFunctions_<version_number> structure (also known as userid_password_client_auth_functions_<version_number>), if userid/password authentication is used. The db2secGssapiClientAuthFunctions_<version_number> structure and db2secUseridPasswordClientAuthFunctions_<version_number> structure respectively contain pointers to the APIs implemented for the GSS-API authentication plug-in and userid/password authentication plug-in. In future versions of DB2, there might be different versions of the APIs, so the client_fns parameter is cast as a pointer to the gssapi_client_auth_functions_<version_number> structure corresponding to the version the plug-in has implemented.

The first parameter of the gssapi_client_auth_functions_<version_number> structure or the userid_password_client_auth_functions_<version_number> structure tells the DB2 database manager the version of the APIs that the plug-in has implemented.

Note: The casting is done only if the DB2 version is higher or equal to the version of the APIs that the plug-in has implemented.

Inside the gssapi_server_auth_functions_<version_number> or userid_password_server_auth_functions_<version_number> structure, the plugintype parameter should be set to one of DB2SEC_PLUGIN_TYPE_USERID_PASSWORD, DB2SEC_PLUGIN_TYPE_GSSAPI, or DB2SEC_PLUGIN_TYPE_KERBEROS. Other values can be defined in future versions of the API.

logMessage_fn
Input. A pointer to the db2secLogMessage API, which is implemented by the DB2 database manager. The db2secClientAuthPluginInit API can call the db2secLogMessage API to log messages to db2diag.log for debugging or informational purposes. The first parameter (level) of db2secLogMessage API specifies the type of diagnostic errors that will be recorded in the db2diag.log file and the last two parameters respectively are the message string and its length. The valid values for the first parameter of dbesecLogMessage API (defined in db2secPlugin.h) are:

- DB2SEC_LOG_NONE (0) No logging
- DB2SEC_LOG_CRITICAL (1) Severe Error encountered
- DB2SEC_LOG_ERROR (2) Error encountered
- DB2SEC_LOG_WARNING (3) Warning
- DB2SEC_LOG_INFO (4) Informational

The message text will show up in db2diag.log only if the value of the 'level' parameter of the db2secLogMessage API is less than or equal to the diaglevel database manager configuration parameter. For example, if you use the DB2SEC_LOG_INFO value, the message text will only appear in db2diag.log if the diaglevel database manager configuration parameter is set to 4.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secClientAuthPluginInit API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secClientAuthPluginTerm API - Clean up client authentication plug-in resources

Frees resources used by the client authentication plug-in.

This API is called by the DB2 database manager just before it unloads the client authentication plug-in. It should be implemented in a manner that it does a proper cleanup of any resources the plug-in library holds, for instance, free any memory allocated by the plug-in, close files that are still open, and close network connections. The plug-in is responsible for keeping track of these resources in order to free them. This API is not called on any Windows platform.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secClientAuthPluginTerm)
                      ( char     **errormsg,
                        db2int32 *errormsglen);
```

db2secClientAuthPluginTerm API parameters

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secClientAuthPluginTerm API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secDoesAuthIDExist - Check if authentication ID exists

Determines if the authid represents an individual user (for example, whether the API can map the authid to an external user ID).

The API should return the value DB2SEC_PLUGIN_OK if it is successful - the authid is valid, DB2SEC_PLUGIN_INVALID_USERORGROUP if it is not valid, or DB2SEC_PLUGIN_USERSTATUSNOTKNOWN if the authid existence cannot be determined.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secDoesAuthIDExist)
                      ( const char *authid,
                        db2int32 authidlen,
                        char       **errormsg,
                        db2int32 *errormsglen );
```

db2secDoesAuthIDExist API parameters

authid Input. The authid to validate. This is upper-cased, with no trailing blanks.

authidlen
Input. Length in bytes of the authid parameter value.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secDoesAuthIDExist API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length of the error message string in errormsg parameter.

db2secFreeInitInfo API - Clean up resources held by the db2secGenerateInitialCred

Frees any resources allocated by the db2secGenerateInitialCred API. This can include, for example, handles to underlying mechanism contexts or a credential cache created for the GSS-API credential cache.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secFreeInitInfo)
                      ( void *initinfo,
                        char     **errormsg,
                        db2int32 *errormsglen);
```

db2secFreeInitInfo API parameters

initinfo
Input. A pointer to data that is not known to the DB2 database manager.

The plug-in can use this memory to maintain a list of resources that are allocated in the process of generating the credential handle. These resources are freed by calling this API.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secFreeInitInfo API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secFreeToken API - Free memory held by token

Frees the memory held by a token. This API is called by the DB2 database manager when it no longer needs the memory held by the token parameter.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secFreeToken)
                      ( void *token,
                        char       **errormsg,
                        db2int32 *errormsglen );
```

db2secFreeToken API parameters

token Input. Pointer to the memory to be freed.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secFreeToken API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secGenerateInitialCred API - Generate initial credentials

Obtains the initial GSS-API credentials based on the user ID and password that are passed in. For Kerberos, this is the ticket-granting ticket (TGT). The credential handle that is returned in pGSSCredHandle parameter is the handle that is used with the gss_init_sec_context API and must be either an INITIATE or BOTH credential. The db2secGenerateInitialCred API is only called when a user ID, and possibly a password are supplied. Otherwise, the DB2 database manager specifies the value GSS_C_NO_CREDENTIAL when calling the gss_init_sec_context API to signify that the default credential obtained from the current login context is to be used.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secGenerateInitialCred)
                      ( const char *userid,
                        db2int32 useridlen,
                        const char *usernamespace,
                        db2int32 usernamespacelen,
                        db2int32 usernamespacetype,
                        const char *password,
                        db2int32 passwordlen,
                        const char *newpassword,
                        db2int32 newpasswordlen,
                        const char *dbname,
```

```
db2int32 dbnamelen,
gss_cred_id_t *pGSSCredHandle,
void          **InitInfo,
char          **errormsg,
db2int32 *errormsglen );
```

db2secGenerateInitialCred API parameters

userid Input. The user ID whose password is to be verified on the database server.

useridlen
Input. Length in bytes of the userid parameter value.

usernamespace
Input. The namespace from which the user ID was obtained.

usernamespacelen
Input. Length in bytes of the usernamespace parameter value.

usernamespacetype
Input. The type of namespace.

password
Input. The password to be verified.

passwordlen
Input. Length in bytes of the password parameter value.

newpassword
Input. A new password if the password is to be changed. If no change is requested, the newpassword parameter is set to NULL. If it is not NULL, the API should validate the old password before setting the password to its new value. The API does not have to honour a request to change the password, but if it does not, it should immediately return with the return value DB2SEC_PLUGIN_CHANGEPASSWORD_NOTSUPPORTED without validating the old password.

newpasswordlen
Input. Length in bytes of the newpassword parameter value.

dbname
Input. The name of the database being connected to. The API is free to ignore this parameter, or the API can return the value DB2SEC_PLUGIN_CONNECTION_DISALLOWED if it has a policy of restricting access to certain databases to users who otherwise have valid passwords.

dbnamelen
Input. Length in bytes of the dbname parameter value.

pGSSCredHandle
Output. Pointer to the GSS-API credential handle.

InitInfo
Output. A pointer to data that is not known to DB2. The plug-in can use this memory to maintain a list of resources that are allocated in the process of generating the credential handle. The DB2 database manager calls the db2secFreeInitInfo API at the end of the authentication process, at which point these resources are freed. If the db2secGenerateInitialCred API does not need to maintain such a list, then it should return NULL.

errormsg
Output. A pointer to the address of an ASCII error message string allocated

by the plug-in that can be returned in this parameter if the db2secGenerateInitialCred API execution is not successful.

Note: For this API, error messages should not be created if the return value indicates a bad user ID or password. An error message should only be returned if there is an internal error in the API that prevented it from completing properly.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secGetAuthIDs API - Get authentication IDs

Returns an SQL authid for an authenticated user. This API is called during database connections for both user ID/password and GSS-API authentication methods.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secGetAuthIDs)
                       ( const char *userid,
                         db2int32 useridlen,
                         const char *usernamespace,
                         db2int32 usernamespacelen,
                         db2int32 usernamespacetype,
                         const char *dbname,
                         db2int32 dbnamelen,
                         void      **token,
                         char SystemAuthID[DB2SEC_MAX_AUTHID_LENGTH],
                         db2int32 *SystemAuthIDlen,
                         char InitialSessionAuthID[DB2SEC_MAX_AUTHID_LENGTH],
                         db2int32 *InitialSessionAuthIDlen,
                         char username[DB2SEC_MAX_USERID_LENGTH],
                         db2int32 *usernamelen,
                         db2int32 *initsessionidtype,
                         char      **errormsg,
                         db2int32 *errormsglen );
```

db2secGetAuthIDs API parameters

userid Input. The authenticated user. This is usually not used for GSS-API authentication unless a trusted context is defined to permit switch user operations without authentication. In those situations, the user name provided for the switch user request is passed in this parameter.

useridlen
Input. Length in bytes of the userid parameter value.

usernamespace
Input. The namespace from which the user ID was obtained.

usernamespacelen
Input. Length in bytes of the usernamespace parameter value.

usernamespacetype
Input. Namespacetype value. currently, the only supported namespace type value is DB2SEC_NAMESPACE_SAM_COMPATIBLE (corresponds to a username style like domain\myname).

dbname
Input. The name of the database being connected to. The API can ignore this, or it can return differing authids when the same user connects to different databases. This parameter can be NULL.

dbnamelen
Input. Length in bytes of the dbname parameter value. This parameter is set to 0 if dbname parameter is NULL.

token Input or output. Data that the plug-in might pass to the db2secGetGroupsForUser API. For GSS-API, this is a context handle (gss_ctx_id_t). Ordinarily, token is an input-only parameter and its value is taken from the db2secValidatePassword API. It can also be an output parameter when authentication is done on the client and therefore db2secValidatePassword API is not called. In environments where a trusted context is defined that allows switch user operations without authentication, the db2secGetAuthIDs API must be able to accommodate receiving a NULL value for this token parameter and be able to derive a system authorization ID based on the userid and useridlen input parameters above.

SystemAuthID
Output. The system authorization ID that corresponds to the ID of the authenticated user. The size is 255 bytes, but the DB2 database manager currently uses only up to (and including) 30 bytes.

SystemAuthIDlen
Output. Length in bytes of the SystemAuthID parameter value.

InitialSessionAuthID
Output. Authid used for this connection session. This is usually the same as the SystemAuthID parameter but can be different in some situations, for instance, when issuing a SET SESSION AUTHORIZATION statement. The size is 255 bytes, but the DB2 database manager currently uses only up to (and including) 30 bytes.

InitialSessionAuthIDlen
Output. Length in bytes of the InitialSessionAuthID parameter value.

username
Output. A username corresponding to the authenticated user and authid. This will only be used for auditing and will be logged in the ″User ID″ field in the audit record for CONNECT statement. If the API does not fill in the username parameter, the DB2 database manager copies it from the userid.

usernamelen
Output. Length in bytes of the username parameter value.

initsessionidtype
Output. Session authid type indicating whether or not the InitialSessionAuthid parameter is a role or an authid. The API should return one of the following values (defined in db2secPlugin.h):

- DB2SEC_ID_TYPE_AUTHID (0)
- DB2SEC_ID_TYPE_ROLE (1)

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secGetAuthIDs API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secGetDefaultLoginContext API - Get default login context

Determines the user associated with the default login context, in other words, determines the DB2 authid of the user invoking a DB2 command without explicitly specifying a user ID (either an implicit authentication to a database, or a local authorization). This API must return both an authid and a user ID.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secGetDefaultLoginContext)
                       ( char authid[DB2SEC_MAX_AUTHID_LENGTH],
                         db2int32 *authidlen,
                         char userid[DB2SEC_MAX_USERID_LENGTH],
                         db2int32 *useridlen,
                         db2int32 useridtype,
                         char usernamespace[DB2SEC_MAX_USERNAMESPACE_LENGTH],
                         db2int32 *usernamespacelen,
                         db2int32 *usernamespacetype,
                         const char *dbname,
                         db2int32 dbnamelen,
                         void      **token,
                         char      **errormsg,
                         db2int32 *errormsglen );
```

db2secGetDefaultLoginContext API parameters

authid Output. The parameter in which the authid should be returned. The returned value must conform to DB2 authid naming rules, or the user will not be authorized to perform the requested action.

authidlen
Output. Length in bytes of the authid parameter value.

userid Output. The parameter in which the user ID associated with the default login context should be returned.

useridlen
Output. Length in bytes of the userid parameter value.

useridtype
Input. Indicates if the real or effective user ID of the process is being specified. On Windows, only the real user ID exists. On UNIX and Linux, the real user ID and effective user ID can be different if the `uid` user ID for the application is different than the ID of the user executing the process. Valid values for the userid parameter (defined in db2secPlugin.h) are:

DB2SEC_PLUGIN_REAL_USER_NAME
Indicates that the real user ID is being specified.

DB2SEC_PLUGIN_EFFECTIVE_USER_NAME
Indicates that the effective user ID is being specified.

Note: Some plug-in implementations might not distinguish between the real and effective userid. In particular, a plug-in that does not use the UNIX or Linux identity of the user to establish the DB2 authorization ID can safely ignore this distinction.

usernamespace
Output. The namespace of the user ID.

usernamespacelen
Output. Length in bytes of the usernamespace parameter value. Under the limitation that the usernamespacetype parameter must be set to the value

DB2SEC_NAMESPACE_SAM_COMPATIBLE (defined in db2secPlugin.h), the maximum length currently supported is 15 bytes.

usernamespacetype
Output. Namespacetype value. Currently, the only supported namespace type is DB2SEC_NAMESPACE_SAM_COMPATIBLE (corresponds to a username style like domain\myname).

dbname
Input. Contains the name of the database being connected to, if this call is being used in the context of a database connection. For local authorization actions or instance attachments, this parameter is set to NULL.

dbnamelen
Input. Length in bytes of the dbname parameter value.

token Output. This is a pointer to data allocated by the plug-in that it might pass to subsequent authentication calls in the plug-in, or possibly to the group retrieval plug-in. The structure of this data is determined by the plug-in writer.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secGetDefaultLoginContext API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secProcessServerPrincipalName API - Process service principal name returned from server

Processes the service principal name returned from the server and returns the principal name in the gss_name_t internal format to be used with the gss_init_sec_context API. The db2secProcessServerPrincipalName API also processes the service principal name cataloged with the database directory when Kerberos authentication is used. Ordinarily, this conversion uses the gss_import_name API. After the context is established, the gss_name_t object is freed through the call to gss_release_name API. The db2secProcessServerPrincipalName API returns the value DB2SEC_PLUGIN_OK if gssName parameter points to a valid GSS name; a DB2SEC_PLUGIN_BAD_PRINCIPAL_NAME error code is returned if the principal name is invalid.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secProcessServerPrincipalName)
                      ( const char *name,
                        db2int32 namelen,
                        gss_name_t *gssName,
                        char       **errormsg,
                        db2int32 *errormsglen );
```

db2secProcessServerPrincipalName API parameters

name Input. Text name of the service principal in GSS_C_NT_USER_NAME format; for example, service/host@REALM.

namelen
Input. Length in bytes of the name parameter value.

gssName
Output. Pointer to the output service principal name in the GSS-API internal format.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secProcessServerPrincipalName API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secRemapUserid API - Remap user ID and password

This API is called by the DB2 database manager on the client side to remap a given user ID and password (and possibly new password and usernamespace) to values different from those given at connect time. The DB2 database manager only calls this API if a user ID and a password are supplied at connect time. This prevents a plug-in from remapping a user ID by itself to a user ID/password pair. This API is optional and is not called if it is not provided or implemented by the security plug-in.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secRemapUserid)
                       ( char userid[DB2SEC_MAX_USERID_LENGTH],
                         db2int32 *useridlen,
                         char usernamespace[DB2SEC_MAX_USERNAMESPACE_LENGTH],
                         db2int32 *usernamespacelen,
                         db2int32 *usernamespacetype,
                         char password[DB2SEC_MAX_PASSWORD_LENGTH],
                         db2int32 *passwordlen,
                         char newpasswd[DB2SEC_MAX_PASSWORD_LENGTH],
                         db2int32 *newpasswdlen,
                         const char *dbname,
                         db2int32 dbnamelen,
                         char      **errormsg,
                         db2int32 *errormsglen);
```

db2secRemapUserid API parameters

userid Input or output. The user ID to be remapped. If there is an input user ID value, then the API must provide an output user ID value that can be the same or different from the input user ID value. If there is no input user ID value, then the API should not return an output user ID value.

useridlen
Input or output. Length in bytes of the userid parameter value.

usernamespace
Input or output. The namespace of the user ID. This value can optionally be remapped. If no input parameter value is specified, but an output value is returned, then the usernamespace will only be used by the DB2 database manager for CLIENT type authentication and is disregarded for other authentication types.

usernamespacelen
Input or output. Length in bytes of the usernamespace parameter value. Under the limitation that the usernamespacetype parameter must be set to the value DB2SEC_NAMESPACE_SAM_COMPATIBLE (defined in db2secPlugin.h), the maximum length currently supported is 15 bytes.

usernamespacetype
Input or output. Old and new namespacetype value. Currently, the only supported namespace type value is DB2SEC_NAMESPACE_SAM_COMPATIBLE (corresponds to a username style like domain\myname).

password
Input or output. As an input, it is the password that is to be remapped. As an output it is the remapped password. If an input value is specified for this parameter, the API must be able to return an output value that differs from the input value. If no input value is specified, the API must not return an output password value.

passwordlen
Input or output. Length in bytes of the password parameter value.

newpasswd
Input or output. As an input, it is the new password that is to be set. As an output it is the confirmed new password.

Note: This is the new password that is passed by the DB2 database manager into the newpassword parameter of the db2secValidatePassword API on the client or the server (depending on the value of the authentication database manager configuration parameter). If a new password was passed as input, then the API must be able to return an output value and it can be a different new password. If there is no new password passed in as input, then the API should not return an output new password.

newpasswdlen
Input or output. Length in bytes of the newpasswd parameter value.

dbname
Input. Name of the database to which the client is connecting.

dbnamelen
Input. Length in bytes of the dbname parameter value.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secRemapUserid API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secServerAuthPluginInit - Initialize server authentication plug-in

Initialization API, for the server authentication plug-in, that the DB2 database manager calls immediately after loading the plug-in. In the case of GSS-API, the plug-in is responsible for filling in the server's principal name in the serverPrincipalName parameter inside the gssapi_server_auth_functions structure at initialization time and providing the server's credential handle in the serverCredHandle parameter inside the gssapi_server_auth_functions structure. The freeing of the memory allocated to hold the principal name and the credential handle must be done by the db2secServerAuthPluginTerm API by calling the gss_release_name and gss_release_cred APIs.

API and data structure syntax

```
SQL_API_RC SQL_API_FN db2secServerAuthPluginInit
                              ( db2int32 version,
                                void *server_fns,
                                db2secGetConDetails *getConDetails_fn,
                                db2secLogMessage *logMessage_fn,
                                char               **errormsg,
                                db2int32 *errormsglen );
```

db2secServerAuthPluginInit API parameters

version

Input. The highest version number of the API that the DB2 database manager currently supports. The DB2SEC_API_VERSION value (in db2secPlugin.h) contains the latest version number of the API that the DB2 database manager currently supports.

server_fns

Output. A pointer to memory provided by the DB2 database manager for a db2secGssapiServerAuthFunctions_<version_number> structure (also known as gssapi_server_auth_functions_<version_number>), if GSS-API authentication is used, or a db2secUseridPasswordServerAuthFunctions_<version_number> structure (also known as userid_password_server_auth_functions_<version_number>), if userid/password authentication is used. The db2secGssapiServerAuthFunctions_<version_number> structure and db2secUseridPasswordServerAuthFunctions_<version_number> structure respectively contain pointers to the APIs implemented for the GSS-API authentication plug-in and userid/password authentication plug-in.

The server_fns parameter is cast as a pointer to the gssapi_server_auth_functions_<version_number> structure corresponding to the version the plug-in has implemented. The first parameter of the gssapi_server_auth_functions_<version_number> structure or the userid_password_server_auth_functions_<version_number> structure tells theDB2 database manager the version of the APIs that the plug-in has implemented.

Note: The casting is done only if the DB2 version is higher or equal to the version of the APIs that the plug-in has implemented.

Inside the gssapi_server_auth_functions_<version_number> or userid_password_server_auth_functions_<version_number> structure, the plugintype parameter should be set to one of DB2SEC_PLUGIN_TYPE_USERID_PASSWORD, DB2SEC_PLUGIN_TYPE_GSSAPI, or DB2SEC_PLUGIN_TYPE_KERBEROS. Other values can be defined in future versions of the API.

getConDetails_fn

Input. Pointer to the db2secGetConDetails API, which is implemented by DB2. The db2secServerAuthPluginInit API can call the db2secGetConDetails API in any one of the other authentication APIs to obtain details related to the database connection. These details include information about the communication mechanism associated with the connection (such as the IP address, in the case of TCP/IP), which the plug-in writer might need to reference when making authentication decisions. For example, the plug-in could disallow a connection for a

particular user, unless that user is connecting from a particular IP address. The use of the db2secGetConDetails API is optional.

If the db2secGetConDetails API is called in a situation not involving a database connection, it returns the value DB2SEC_PLUGIN_NO_CON_DETAILS, otherwise, it returns 0 on success.

The db2secGetConDetails API takes two input parameters; pConDetails, which is a pointer to the db2sec_con_details_<version_number> structure, and conDetailsVersion, which is a version number indicating which db2sec_con_details structure to use. Possible values are DB2SEC_CON_DETAILS_VERSION_1 when db2sec_con_details1 is used or DB2SEC_CON_DETAILS_VERSION_2 when db2sec_con_details2. The recommended version number to use is DB2SEC_CON_DETAILS_VERSION_2.

Upon a successful return, the db2sec_con_details structure (either db2sec_con_details1 or db2sec_con_details2) will contain the following information:

- The protocol used for the connection to the server. The listing of protocol definitions can be found in the file sqlenv.h (located in the include directory) (SQL_PROTOCOL_*). This information is filled out in the clientProtocol parameter.
- The TCP/IP address of the inbound connect to the server if the clientProtocol is SQL_PROTOCOL_TCPIP or SQL_PROTOCOL_TCPIP4. This information is filled out in the clientIPAddress parameter.
- The database name the client is attempting to connect to. This will not be set for instance attachments. This information is filled out in the dbname and dbnameLen parameters.
- A connection information bit-map that contains the same details as documented in the connection_details parameter of the db2secValidatePassword API. This information is filled out in the connect_info_bitmap parameter.
- The TCP/IP address of the inbound connect to the server if the clientProtocol is SQL_PROTOCOL_TCPIP6. This information is filled out in the clientIP6Address parameter and it is only available if DB2SEC_CON_DETAILS_VERSION_2 is used for db2secGetConDetails API call.

logMessage_fn

Input. A pointer to the db2secLogMessage API, which is implemented by the DB2 database manager. The db2secClientAuthPluginInit API can call the db2secLogMessage API to log messages to db2diag.log for debugging or informational purposes. The first parameter (level) of db2secLogMessage API specifies the type of diagnostic errors that will be recorded in the db2diag.log file and the last two parameters respectively are the message string and its length. The valid values for the first parameter of dbesecLogMessage API (defined in db2secPlugin.h) are:

DB2SEC_LOG_NONE (0)
No logging

DB2SEC_LOG_CRITICAL (1)
Severe Error encountered

DB2SEC_LOG_ERROR (2)
Error encountered

DB2SEC_LOG_WARNING (3)
Warning

DB2SEC_LOG_INFO (4)
Informational

The message text will show up in db2diag.log only if the value of the 'level' parameter of the db2secLogMessage API is less than or equal to the diaglevel database manager configuration parameter.

So for example, if you use the DB2SEC_LOG_INFO value, the message text will only show up in the db2diag.log if the diaglevel database manager configuration parameter is set to 4.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secServerAuthPluginInit API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secServerAuthPluginTerm API - Clean up server authentication plug-in resources

Frees resources used by the server authentication plug-in. This API is called by the DB2 database manager just before it unloads the server authentication plug-in. It should be implemented in a manner that it does a proper cleanup of any resources the plug-in library holds, for instance, free any memory allocated by the plug-in, close files that are still open, and close network connections. The plug-in is responsible for keeping track of these resources in order to free them. This API is not called on any Windows platform.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secServerAuthPluginTerm)
                      ( char     **errormsg,
                        db2int32 *errormsglen );
```

db2secServerAuthPluginTerm API parameters

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secServerAuthPluginTerm API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

db2secValidatePassword API - Validate password

Provides a method for performing user ID and password style authentication during a database connect operation.

Note: When the API is run on the client side, the API code is run with the privileges of the user executing the CONNECT statement. This API will only be called on the client side if the authentication configuration parameter is set to CLIENT.

When the API is run on the server side, the API code is run with the privileges of the instance owner.

The plug-in writer should take the above into consideration if authentication requires special privileges (such as root level system access on UNIX).

This API must return the value DB2SEC_PLUGIN_OK (success) if the password is valid, or an error code such as DB2SEC_PLUGIN_BADPWD if the password is invalid.

API and data structure syntax

```
SQL_API_RC ( SQL_API_FN *db2secValidatePassword)
                       ( const char *userid,
                         db2int32 useridlen,
                         const char *usernamespace,
                         db2int32 usernamespacelen,
                         db2int32 usernamespacetype,
                         const char *password,
                         db2int32 passwordlen,
                         const char *newpasswd,
                         db2int32 newpasswdlen,
                         const char *dbname,
                         db2int32 dbnamelen,
                         db2Uint32 connection_details,
                         void      **token,
                         char      **errormsg,
                         db2int32 *errormsglen );
```

db2secValidatePassword API parameters

userid Input. The user ID whose password is to be verified.

useridlen
Input. Length in bytes of the userid parameter value.

usernamespace
Input. The namespace from which the user ID was obtained.

usernamespacelen
Input. Length in bytes of the usernamespace parameter value.

usernamespacetype
Input. The type of namespace. Valid values for the usernamespacetype parameter (defined in db2secPlugin.h) are:

- `DB2SEC_NAMESPACE_SAM_COMPATIBLE` Corresponds to a username style like domain\myname
- `DB2SEC_NAMESPACE_USER_PRINCIPAL` Corresponds to a username style like myname@domain.ibm.com

Currently, the DB2 database system only supports the value DB2SEC_NAMESPACE_SAM_COMPATIBLE. When the user ID is not available, the usernamespacetype parameter is set to the value DB2SEC_USER_NAMESPACE_UNDEFINED (defined in db2secPlugin.h).

password
Input. The password to be verified.

passwordlen
Input. Length in bytes of the password parameter value.

newpasswd
Input. A new password, if the password is to be changed. If no change is

requested, this parameter is set to NULL. If this parameter is not NULL, the API should validate the old password before changing it to the new password. The API does not have to fulfill a request to change the password, but if it does not, it should immediately return with the return value DB2SEC_PLUGIN_CHANGEPASSWORD_NOTSUPPORTED without validating the old password.

newpasswdlen
Input. Length in bytes of the newpasswd parameter value.

dbname
Input. The name of the database being connected to. The API is free to ignore the dbname parameter, or it can return the value DB2SEC_PLUGIN_CONNECTIONREFUSED if it has a policy of restricting access to certain databases to users who otherwise have valid passwords. This parameter can be NULL.

dbnamelen
Input. Length in bytes of the dbname parameter value. This parameter is set to 0 if dbname parameter is NULL.

connection_details
Input. A 32-bit parameter of which 3 bits are currently used to store the following information:

- The rightmost bit indicates whether the source of the user ID is the default from the db2secGetDefaultLoginContext API, or was explicitly provided during the connect.
- The second-from-right bit indicates whether the connection is local (using Inter Process Communication (IPC) or a connect from one of the nodes in the db2nodes.cfg in the partitioned database environment), or remote (through a network or loopback). This gives the API the ability to decide whether clients on the same machine can connect to the DB2 server without a password. Due to the default operating-system-based user ID/password plugin, local connections are permitted without a password from clients on the same machine (assuming the user has connect privileges).
- The third-from-right bit indicates whether the DB2 database manager is calling the API from the server side or client side.

The bit values are defined in db2secPlugin.h:

- `DB2SEC_USERID_FROM_OS` (0x00000001) Indicates that the user ID is obtained from OS and not explicitly given on the connect statement.
- `DB2SEC_CONNECTION_ISLOCAL` (0x00000002) Indicates a local connection.
- `DB2SEC_VALIDATING_ON_SERVER_SIDE` (0x0000004) Indicates whether the DB2 database manager is calling from the server side or client side to validate password. If this bit value is set, then the DB2 database manager is calling from server side; otherwise, it is calling from the client side.

The DB2 database system default behavior for an implicit authentication is to allow the connection without any password validation. However, plug-in developers have the option to disallow implicit authentication by returning a DB2SEC_PLUGIN_BADPASSWORD error.

token Input. A pointer to data which can be passed as a parameter to subsequent API calls during the current connection. Possible APIs that might be called include db2secGetAuthIDs API and db2secGetGroupsForUser API.

errormsg
Output. A pointer to the address of an ASCII error message string allocated by the plug-in that can be returned in this parameter if the db2secValidatePassword API execution is not successful.

errormsglen
Output. A pointer to an integer that indicates the length in bytes of the error message string in errormsg parameter.

Required APIs and definitions for GSS-API authentication plug-ins

Following is a complete list of GSS-APIs required for the DB2 security plug-in interface.

The supported APIs follow these specifications: *Generic Security Service Application Program Interface, Version 2* (IETF RFC2743) and *Generic Security Service API Version 2: C-Bindings* (IETF RFC2744). Before implementing a GSS-API based plug-in, you should have a complete understanding of these specifications.

Table 12. Required APIs and Definitions for GSS-API authentication plug-ins

Name		Description
Client-side APIs	`gss_init_sec_context`	Initiate a security context with a peer application.
Server-side APIs	`gss_accept_sec_context`	Accept a security context initiated by a peer application.
Server-side APIs	`gss_display_name`	Convert an internal format name to text.
Common APIs	`gss_delete_sec_context`	Delete an established security context.
Common APIs	`gss_display_status`	Obtain the text error message associated with a GSS-API status code.
Common APIs	`gss_release_buffer`	Delete a buffer.
Common APIs	`gss_release_cred`	Release local data structures associated with a GSS-API credential.
Common APIs	`gss_release_name`	Delete internal format name.
Required definitions	`GSS_C_DELEG_FLAG`	Requests delegation.
Required definitions	`GSS_C_EMPTY_BUFFER`	Signifies that the `gss_buffer_desc` does not contain any data.
Required definitions	`GSS_C_GSS_CODE`	Indicates a GSS major status code.
Required definitions	`GSS_C_INDEFINITE`	Indicates that the mechanism does not support context expiration.
Required definitions	`GSS_C_MECH_CODE`	Indicates a GSS minor status code.
Required definitions	`GSS_C_MUTUAL_FLAG`	Mutual authentication requested.
Required definitions	`GSS_C_NO_BUFFER`	Signifies that the `gss_buffer_t` variable does not point to a valid `gss_buffer_desc` structure.
Required definitions	`GSS_C_NO_CHANNEL_BINDINGS`	No communication channel bindings.
Required definitions	`GSS_C_NO_CONTEXT`	Signifies that the `gss_ctx_id_t` variable does not point to a valid context.
Required definitions	`GSS_C_NO_CREDENTIAL`	Signifies that `gss_cred_id_t` variable does not point to a valid credential handle.

Table 12. Required APIs and Definitions for GSS-API authentication plug-ins (continued)

Name		Description
Required definitions	`GSS_C_NO_NAME`	Signifies that the `gss_name_t` variable does not point to a valid internal name.
Required definitions	`GSS_C_NO_OID`	Use default authentication mechanism.
Required definitions	`GSS_C_NULL_OID_SET`	Use default mechanism.
Required definitions	`GSS_S_COMPLETE`	API completed successfully.
Required definitions	`GSS_S_CONTINUE_NEEDED`	Processing is not complete and the API must be called again with the reply token received from the peer.

Restrictions for GSS-API authentication plug-ins

The following is a list of restrictions for GSS-API authentication plug-ins.

- The default security mechanism is always assumed; therefore, there is no OID consideration.
- The only GSS services requested in `gss_init_sec_context()` are mutual authentication and delegation. The DB2 database manager always requests a ticket for delegation, but does not use that ticket to generate a new ticket.
- Only the default context time is requested.
- Context tokens from `gss_delete_sec_context()` are not sent from the client to the server and vice-versa.
- Anonymity is not supported.
- Channel binding is not supported
- If the initial credentials expire, the DB2 database manager does not automatically renew them.
- The GSS-API specification stipulates that even if `gss_init_sec_context()` or `gss_accept_sec_context()` fail, either function must return a token to send to the peer. However, because of DRDA limitations, the DB2 database manager only sends a token if `gss_init_sec_context()` fails and generates a token on the first call.

Security plug-in samples

UNIX and Linux directories: The 'C' samples are located in sqllib/samples/security/plugins and the JCC GSS-API plugin samples (.java) are located in sqllib/samples/java/jdbc

Windows directory: The 'C' samples are located in sqllib\samples\security\plugins and the JCC GSS-API plugin samples (.java) are located in sqllib\samples\java\jdbc

Table 13. Security plug-in sample program files

Sample program name	Program description
combined.c	Combined userid/password authentication and group lookup sample.
group_file.c	Simple file-based group management plug-in sample.

Table 13. Security plug-in sample program files (continued)

Sample program name	Program description
gssapi_simple.c	Basic GSS-API authentication plug-in sample (both client and server).
IBMLDAPauthclient.c	Implements a client side DB2 security plugin that interacts with an LDAP user registry
IBMLDAPauthserver.c	Implements a server side DB2 security plugin that interacts with an LDAP user registry.
IBMLDAPconfig.c	Contains functions related to finding and parsing the configuration file for a DB2 LDAP security plugin.
IBMLDAPgroups.c	Implements a DB2 security plugin for LDAP-based group lookup
IBMLDAPutils.c	Contains utility functions used in the DB2 LDAP security plugin
IBMLDAPutils.h	LDAP security plugin header file
JCCKerberosPlugin.java	Implement a GSS-API Plugin that does Kerberos authentication using IBM DB2 Universal Driver.
JCCKerberosPluginTest.java	Use JCCKerberosPlugin to get a DB2 Connection using IBM DB2 Universal Driver.
JCCSimpleGSSPlugin.java	Implement a GSS-API Plugin that does userid and password checking using IBM DB2 Universal Driver.
JCCSimpleGSSContext.java	Implement a GSSContext to be used by JCCSimpleGSSPlugin
JCCSimpleGSSCredential.java	Implement a GSSCredential to be used by JCCSimpleGSSPlugin
JCCSimpleGSSException.java	Implement a GSSException to be used by JCCSimpleGSSPlugin
JCCSimpleGSSName.java	Implement a GSSName to be used by JCCSimpleGSSPlugin
JCCSimpleGSSPluginTest.java	Use JCCSimpleGSSPlugin to get a DB2 Connection using IBM DB2 Universal Driver.

DB2 APIs for backup and restore to storage managers

DB2 provides an interface that can be used by third-party media management products to store and retrieve data for backup and restore operations and log files. This interface is designed to augment the backup, restore, and log archiving data targets of diskette, disk, tape, and Tivoli Storage Manager, that are supported as a standard part of DB2.

These third-party media management products will be referred to as vendor products in the remainder of this section.

DB2 defines a set of API prototypes that provide a general purpose data interface to backup, restore, and log archiving that can be used by many vendors. These APIs are to be provided by the vendor in a shared library on UNIX based systems, or DLL on the Windows operating system. When the APIs are invoked by DB2, the shared library or DLL specified by the calling backup, restore, or log archiving routine is loaded and the APIs provided by the vendor are called to perform the required tasks.

Sample files demonstrating the DB2 vendor functionality are located on UNIX platforms in the sqllib/samples/BARVendor directory, and on Windows in the sqllib\samples\BARVendor directory.

The following are the definitions for terminology used in the descriptions of the backup and restore vendor storage plug-in APIs.

Backup and restore vendor storage plug-in
A dynamically loadable library that DB2 will load to access user-written backup and restore APIs for vendor products.

Input Indicates that DB2 will fill in the value for the backup and restore vendor storage plug-in API parameter.

Output
Indicates that the backup and restore vendor storage plug-in API will fill in the value for the API parameter.

db2VendorGetNextObj - Get next object on device

This API is called after a query has been set up (using the sqluvint API) to get the next object (image or archived log file) that matches the search criteria. Only one search for either images or log files can be set up at one time.

Authorization

None

Required connection

Database.

API include file

db2VendorApi.h

API and data structure syntax

```
int db2VendorGetNextObj ( void                          * vendorCB,
                          struct db2VendorQueryInfo     * queryInfo,
                          struct Return_code            * returnCode);

typedef struct db2VendorQueryInfo
{
   db2Uint64 sizeEstimate;
   db2Uint32 type;
   SQL_PDB_NODE_TYPE dbPartitionNum;
   db2Uint16 sequenceNum;
   char db2Instance[SQL_INSTNAME_SZ + 1];
   char dbname[SQL_DBNAME_SZ + 1];
   char dbalias[SQL_ALIAS_SZ + 1];
   char timestamp[SQLU_TIME_STAMP_LEN + 1];
   char filename[DB2VENDOR_MAX_FILENAME_SZ + 1];
   char owner[DB2VENDOR_MAX_OWNER_SZ + 1];
   char mgmtClass[DB2VENDOR_MAX_MGMTCLASS_SZ + 1];
   char oldestLogfile[DB2_LOGFILE_NAME_LEN + 1];
} db2VendorQueryInfo;
```

db2VendorGetNextObj API parameters

vendorCB
Input. Pointer to space allocated by the vendor library.

queryInfo
Output. Pointer to a db2VendorQueryInfo structure to be filled in by the vendor library.

returnCode
Output. The return code from the API call.

db2VendorQueryInfo data structure parameters

sizeEstimate
Specifies the estimated size of the object.

type Specifies the image type if the object is a backup image.

dbPartitionNum
Specifies the number of the database partition that the object belongs to.

sequenceNum
Specifies the file extension for the backup image. Valid only if the object is a backup.

db2Instance
Specifies the name of the instance that the object belongs to.

dbname
Specifies the name of the database that the object belongs to.

dbalias
Specifies the alias of the database that the object belongs to.

timestamp
Specifies the time stamp used to identify the backup image. Valid only if the object is a backup image.

filename
Specifies the name of the object if the object is a load copy image or an archived log file.

owner Specifies the owner of the object.

mgmtClass
Specifies the management class the object was stored under (used by TSM).

oldestLogfile
Specifies the oldest log file stored with a backup image.

Usage notes

Not all parameters will pertain to each object or each vendor. The mandatory parameters that need to be filled out are db2Instance, dbname, dbalias, timestamp (for images), filename (for logs and load copy images), owner, sequenceNum (for images) and dbPartitionNum. The remaining parameters will be left for the specific vendors to define. If a parameter does not pertain, then it should be initialized to "" for strings and 0 for numeric types.

Return codes

The following table lists all possible return codes for this API.

Table 14. db2VendorGetNextObj API return codes

Number	Return code	Explanation
2	SQLUV_COMM_ERROR	Communication error with device - Failure.

Table 14. db2VendorGetNextObj API return codes (continued)

Number	Return code	Explanation
4	SQLUV_INV_ACTION	Invalid action requested or combination of input parameters results in an operation that is not possible - Failure.
5	SQLUV_NO_DEV_AVAIL	No device is available for use at the moment - Failure.
6	SQLUV_OBJ_NOT_FOUND	No object found to delete - Failure.
12	SQLUV_INV_DEV_HANDLE	Invalid device handle - Failure.
14	SQLUV_END_OF_DATA	No more query objects to return - Success.
18	SQLUV_DEV_ERROR	Device error - Failure.
19	SQLUV_WARNING	Warning, see return code - Success.
21	SQLUV_MORE_DATA	More query objects to return - Success.
25	SQLUV_IO_ERROR	I/O error - Failure.
30	SQLUV_UNEXPECTED_ERROR	A severe error encountered - Failure.

db2VendorQueryApiVersion - Get the supported level of the vendor storage API

Determines which level of the vendor storage API is supported by the backup and restore vendor storage plug-in. If the specified vendor storage plug-in is not compatible with DB2, then it will not be used.

If a vendor storage plug-in does not have this API implemented for logs, then it cannot be used and DB2 will report an error. This will not affect images that currently work with existing vendor libraries.

Authorization

None

Required connection

Database.

API include file

```
db2VendorApi.h
```

API and data structure syntax

```
void db2VendorQueryApiVersion ( db2Uint32  * supportedVersion );
```

db2VendorQueryApiVersion API parameters

supportedVersion
Output. Returns the version of the vendor storage API the vendor library supports.

Usage notes

This API will be called before any other vendor storage APIs are invoked.

sqluvdel - Delete committed session

Deletes committed sessions from a vendor device.

Authorization

None

Required connection

Database

API include file

```
sqluvend.h
```

API and data structure syntax

```
int sqluvdel ( struct Init_input *in,
               struct Init_output *vendorDevData,
               struct Return_code *return_code);
```

sqluvdel API parameters

in Input. Space allocated for Init_input and Return_code.

vendorDevData
Output. Structure containing the output returned by the vendor device.

return_code
Output. Return code from the API call. The object pointed to by the Init_input structure is deleted.

Usage notes

If multiple sessions are opened, and some sessions are committed, but one of them fails, this API is called to delete the committed sessions. No sequence number is specified; sqluvdel is responsible for finding all of the objects that were created during a particular backup operation, and deleting them. Information in the Init_input structure is used to identify the output data to be deleted. The call to sqluvdel is responsible for establishing any connection or session that is required to delete a backup object from the vendor device. If the return code from this call is SQLUV_DELETE_FAILED, DB2 does not notify the caller, because DB2 returns the first fatal failure and ignores subsequent failures. In this case, for DB2 to have called the sqluvdel API, an initial fatal error must have occurred.

Return codes

Table 15. Valid return codes for sqluvdel and resulting database server action

Literal in header file	Description	Probable next call
SQLUV_OK	Operation successful	No further calls
SQLUV_DELETE_FAILED	Delete request failed	No further calls

sqluvend - Unlink a vendor device and release its resources

Unlinks a vendor device and frees all of its related resources. All unused resources (for example, allocated space and file handles) must be released before the sqluvend API call returns to DB2.

Authorization

None

Required connection

Database

API include file

```
sqluvend.h
```

API and data structure syntax

```
int sqluvend ( sqlint32             action,
               void *hdle,
               struct Init_output *in_out,
               struct Return_code *return_code);
```

sqluvend API parameters

action Input. Used to commit or abort the session:

- SQLUV_COMMIT (0 = to commit)
- SQLUV_ABORT (1 = to abort)

hdle Input. Pointer to the Init_output structure.

in_out Output. Space for Init_output de-allocated. The data has been committed to stable storage for a backup if action is to commit. The data is purged for a backup if the action is to abort.

return_code
Output. The return code from the API call.

Usage notes

This API is called for each session that has been opened. There are two possible action codes:

Commit
Output of data to this session, or the reading of data from the session, is complete.

For a write (backup) session, if the vendor returns to DB2 with a return code of SQLUV_OK, DB2 assumes that the output data has been appropriately saved by the vendor product, and can be accessed if referenced in a later sqluvint call.

For a read (restore) session, if the vendor returns to DB2 with a return code of SQLUV_OK, the data should not be deleted, because it may be needed again. If the vendor returns SQLUV_COMMIT_FAILED, DB2 assumes that there are problems with the entire backup or restore operation. All active sessions are terminated by sqluvend calls with action

= SQLUV_ABORT. For a backup operation, committed sessions receive a sqluvint, sqluvdel, and sqluvend sequence of calls.

Abort A problem has been encountered by DB2, and there will be no more reading or writing of data to the session.

For a write (backup) session, the vendor should delete the partial output data set, and use a SQLUV_OK return code if the partial output is deleted. DB2 assumes that there are problems with the entire backup. All active sessions are terminated by sqluvend calls with action = SQLUV_ABORT, and committed sessions receive a sqluvint, sqluvdel, and sqluvend sequence of calls.

For a read (restore) session, the vendor should not delete the data (because it may be needed again), but should clean up and return to DB2 with a SQLUV_OK return code. DB2 terminates all the restore sessions by sqluvend calls with action = SQLUV_ABORT. If the vendor returns SQLUV_ABORT_FAILED to DB2, the caller is not notified of this error, because DB2 returns the first fatal failure and ignores subsequent failures. In this case, for DB2 to have called sqluvend with action = SQLUV_ABORT, an initial fatal error must have occurred.

Return codes

Table 16. Valid Return Codes for sqluvend and Resulting DB2 Action

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_OK	Operation successful	No further calls	Free all memory allocated for this session and terminate.
SQLUV_COMMIT_FAILED	Commit request failed.	No further calls	Free all memory allocated for this session and terminate.
SQLUV_ABORT_FAILED	Abort request failed.	No further calls	

sqluvget - Read data from a vendor device

After a vendor device has been initialized with the sqluvint API, DB2 calls this API to read from the device during a restore operation.

Authorization

None

Required connection

Database

API include file

`sqluvend.h`

API and data structure syntax

```
int sqluvget ( void * hdle,
               struct Data *data,
               struct Return_code *return_code);
```

sqluvget API parameters

hdle Input. Pointer to space allocated for the Data structure (including the data buffer) and Return_code.

data Input or output. A pointer to the Data structure.

return_code
Output. The return code from the API call.

Usage notes

This API is used by the restore utility.

Return codes

Table 17. Valid Return Codes for sqluvget and Resulting DB2 Action

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_OK	Operation successful.	sqluvget	DB2 processes the data
SQLUV_COMM_ERROR	Communication error with device.	sqluvend, action = SQLU_ABORT (see note below	The session will be terminated.
SQLUV_INV_ACTION	Invalid action is requested.	sqluvend, action = SQLU_ABORT (see note below	The session will be terminated.
SQLUV_INV_DEV_HANDLE	Invalid device handle.	sqluvend, action = SQLU_ABORT (see note below	The session will be terminated.
SQLUV_INV_BUFF_SIZE	Invalid buffer size specified.	sqluvend, action = SQLU_ABORT (see note below	The session will be terminated.
SQLUV_DEV_ERROR	Device error.	sqluvend, action = SQLU_ABORT (see note below	The session will be terminated.
SQLUV_WARNING	Warning. This should not be used to indicate end-of- media to DB2; use SQLUV_ENDOFMEDIA or SQLUV_ENDOFMEDIA_NO _DATA for this purpose.However, device not ready conditions can be indicated using this return code.	sqluvget, or sqluvend, action= SQLU_ABORT	
SQLUV_LINK_NOT_EXIST	No link currently exists	sqluvend, action = SQLU_ABORT (see note below	The session will be terminated.
SQLUV_MORE_DATA	Operation successful; more data available.	sqluvget	
SQLUV_ENDOFMEDIA_NO_ DATA	End of media and 0 bytes read (for example, end of tape).	sqluvend	

Table 17. Valid Return Codes for sqluvget and Resulting DB2 Action (continued)

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_ENDOFMEDIA	End of media and > 0 bytes read (for example, end of tape).	sqluvend	DB2 processes the data, and then handles the end-of-media condition.
SQLUV_IO_ERROR	I/O error.	sqluvend, action = SQLU_ABORT (see note below	The session will be terminated.

Note: Next call: If the next call is an sqluvend, action = SQLU_ABORT, this session and all other active sessions will be terminated.

sqluvint - Initialize and link to a vendor device

Provides information for initializing a vendor device and for establishing a logical link between DB2 and the vendor device.

Authorization

None

Required connection

Database

API include file

```
sqluvend.h
```

API and data structure syntax

```
int sqluvint ( struct Init_input *in,
               struct Init_output *out,
               struct Return_code *return_code);
```

sqluvint API parameters

in Input. Structure that contains information provided by DB2 to establish a logical link with the vendor device.

out Output. Structure that contains the output returned by the vendor device.

return_code
Output. Structure that contains the return code to be passed to DB2, and a brief text explanation.

Usage notes

For each media I/O session, DB2 will call this API to obtain a device handle. If for any reason, the vendor storage API encounters an error during initialization, it will indicate it via a return code. If the return code indicates an error, DB2 may choose to terminate the operation by calling the sqluvend API. Details on possible return codes, and the DB2 reaction to each of these, is contained in the return codes table (see table below).

The Init_input structure contains elements that can be used by the vendor product to determine if the backup or restore can proceed:

size_HI_order and size_LOW_order
This is the estimated size of the backup. They can be used to determine if the vendor devices can handle the size of the backup image. They can be used to estimate the quantity of removable media that will be required to hold the backup. It might be beneficial to fail at the first sqluvint call if problems are anticipated.

req_sessions
The number of user requested sessions can be used in conjunction with the estimated size and the prompting level to determine if the backup or restore operation is possible.

prompt_lvl
The prompting level indicates to the vendor if it is possible to prompt for actions such as changing removable media (for example, put another tape in the tape drive). This might suggest that the operation cannot proceed since there will be no way to prompt the user. If the prompting level is WITHOUT PROMPTING and the quantity of removable media is greater than the number of sessions requested, DB2 will not be able to complete the operation successfully.

DB2 names the backup being written or the restore to be read via fields in the DB2_info structure. In the case of an action = SQLUV_READ, the vendor product must check for the existence of the named object. If it cannot be found, the return code should be set to SQLUV_OBJ_NOT_FOUND so that DB2 will take the appropriate action.

After initialization is completed successfully, DB2 will continue by calling other data transfer APIs, but may terminate the session at any time with an sqluvend call.

Return codes

Table 18. Valid Return Codes for sqluvint and Resulting DB2 Action

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_OK	Operation successful.	sqluvput, sqluvget (see comments)	If action = SQLUV_WRITE, the next call will be to the sqluvput API (to BACKUP data). If action = SQLUV_READ, verify the existence of the named object prior to returning SQLUV_OK; the next call will be to the sqluvget API to restore data.
SQLUV_LINK_EXIST	Session activated previously.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_COMM_ERROR	Communication error with device.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.

Table 18. Valid Return Codes for sqluvint and Resulting DB2 Action (continued)

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_INV_VERSION	The DB2 and vendor products are incompatible	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_INV_ACTION	Invalid action is requested. This could also be used to indicate that the combination of parameters results in an operation which is not possible.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_NO_DEV_AVAIL	No device is available for use at the moment.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_OBJ_NOT_FOUND	Object specified cannot be found. This should be used when the action on the sqluvint call is ″R″ (read) and the requested object cannot be found based on the criteria specified in the DB2_info structure.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_OBJS_FOUND	More than 1 object matches the specified criteria. This will result when the action on the sqluvint call is ″R″ (read) and more than one object matches the criteria in the DB2_info structure.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_INV_USERID	Invalid userid specified.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_INV_PASSWORD	Invalid password provided.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_INV_OPTIONS	Invalid options encountered in the vendor options field.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.

Table 18. Valid Return Codes for sqluvint and Resulting DB2 Action (continued)

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_INIT_FAILED	Initialization failed and the session is to be terminated.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_DEV_ERROR	Device error.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_MAX_LINK_GRANT	Max number of links established.	sqluvput, sqluvget (see comments).	This is treated as a warning by DB2. The warning tells DB2 not to open additional sessions with the vendor product, because the maximum number of sessions it can support has been reached (note: this could be due to device availability). If action = SQLUV_WRITE (BACKUP), the next call will be to sqluvput API. If action = SQLUV_READ, verify the existence of the named object prior to returning SQLUV_MAX_LINK_ GRANT; the next call will be to the sqluvget API to restore data.
SQLUV_IO_ERROR	I/O error.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.
SQLUV_NOT_ENOUGH_ SPACE	There is not enough space to store the entire backup image; the size estimate is provided as a 64-bit value in bytes.	No further calls.	Session initialization fails. Free up memory allocated for this session and terminate. A sqluvend API call will not be received, since the session was never established.

sqluvput - Write data to a vendor device

After a vendor device has been initialized with the sqluvint API, DB2 calls this API to write to the device during a backup operation.

Authorization

None

Required connection

Database

API include file

```
sqluvend.h
```

API and data structure syntax

```
int sqluvput ( void *hdle,
               struct Data *data,
               struct Return_code *return_code);
```

sqluvput API parameters

hdle Input. Pointer to space allocated for the DATA structure (including the data buffer) and Return_code.

data Output. Data buffer filled with data to be written out.

return_code
Output. The return code from the API call.

Usage notes

This API is used by the backup utility.

Return codes

Table 19. Valid Return Codes for sqluvput and Resulting DB2 Action

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_OK	Operation successful.	sqluvput or sqluvend, if complete (for example, DB2 has no more data)	Inform other processes of successful operation.
SQLUV_COMM_ERROR	Communication error with device.	sqluvend, action = SQLU_ABORT (see note below).	The session will be terminated.
SQLUV_INV_ACTION	Invalid action is requested.	sqluvend, action = SQLU_ABORT (see note below).	The session will be terminated.
SQLUV_INV_DEV_HANDLE	Invalid device handle.	sqluvend, action = SQLU_ABORT (see note below).	The session will be terminated.
SQLUV_INV_BUFF_SIZE	Invalid buffer size specified.	sqluvend, action = SQLU_ABORT (see note below).	The session will be terminated.
SQLUV_ENDOFMEDIA	End of media reached, for example, end of tape.	sqluvend	
SQLUV_DATA_RESEND	Device requested to have buffer sent again.	sqluvput	DB2 will retransmit the last buffer. This will only be done once.
SQLUV_DEV_ERROR	Device error.	sqluvend, action = SQLU_ABORT (see note below).	The session will be terminated.

Table 19. Valid Return Codes for sqluvput and Resulting DB2 Action (continued)

Literal in Header File	Description	Probable Next Call	Other Comments
SQLUV_WARNING	Warning. This should not be used to indicate end-of-media to DB2; use SQLUV_ENDOFMEDIA for this purpose. However, device not ready conditions can be indicated using this return code.	sqluvput	
SQLUV_LINK_NOT_EXIST	No link currently exists.	sqluvend, action = SQLU_ABORT (see note below).	The session will be terminated.
SQLUV_IO_ERROR	I/O error.	sqluvend, action = SQLU_ABORT (see note below).	The session will be terminated.

Note: Next call: If the next call is an sqluvend, action = SQLU_ABORT, this session and all other active sessions will be terminated. Committed sessions are deleted with an sqluvint, sqluvdel, and sqluvend sequence of calls.

DB2_info

Contains information about the DB2 product and the database that is being backed up or restored. This structure is used to identify DB2 to the vendor device and to describe a particular session between DB2 and the vendor device. It is passed to the backup and restore vendor storage plug-in as part of the Init_input data structure.

Table 20. Fields in the DB2_info Structure.

Field Name	Data Type	Description
DB2_id	char	An identifier for the DB2 product. Maximum length of the string it points to is 8 characters.
version	char	The current version of the DB2 product. Maximum length of the string it points to is 8 characters.
release	char	The current release of the DB2 product. Set to NULL if it is insignificant. Maximum length of the string it points to is 8 characters.
level	char	The current level of the DB2 product. Set to NULL if it is insignificant. Maximum length of the string it points to is 8 characters.
action	char	Specifies the action to be taken. Maximum length of the string it points to is 1 character.

Table 20. Fields in the DB2_info Structure. (continued)

Field Name	Data Type	Description
filename	char	The file name used to identify the backup image. If it is NULL, the server_id, db2instance, dbname, and timestamp will uniquely identify the backup image. Maximum length of the string it points to is 255 characters.
server_id	char	A unique name identifying the server where the database resides. Maximum length of the string it points to is 8 characters.
db2instance	char	The db2instance ID. This is the user ID invoking the command. Maximum length of the string it points to is 8 characters.
type	char	Specifies the type of backup being taken or the type of restore being performed. The following are possible values: When action is SQLUV_WRITE: 0 - full database backup 3 - table space level backup When action is SQLUV_READ: 0 - full restore 3 - online table space restore 4 - table space restore 5 - history file restore
dbname	char	The name of the database to be backed up or restored. Maximum length of the string it points to is 8 characters.
alias	char	The alias of the database to be backed up or restored. Maximum length of the string it points to is 8 characters.
timestamp	char	The time stamp used to identify the backup image. Maximum length of the string it points to is 26 characters.

Table 20. Fields in the DB2_info Structure. (continued)

Field Name	Data Type	Description
sequence	char	Specifies the file extension for the backup image. For write operations, the value for the first session is 1 and each time another session is initiated with an sqluvint call, the value is incremented by 1. For read operations, the value is always zero. Maximum length of the string it points to is 3 characters.
obj_list	struct sqlu_gen_list	Reserved for future use.
max_bytes_per_txn	sqlint32	Specifies to the vendor in bytes, the transfer buffer size specified by the user.
image_filename	char	Reserved for future use.
reserve	void	Reserved for future use.
nodename	char	Name of the node at which the backup was generated.
password	char	Password for the node at which the backup was generated.
owner	char	ID of the backup originator.
mcNameP	char	Management class.
nodeNum	SQL_PDB_NODE_TYPE	Node number. Numbers greater than 255 are supported by the vendor interface.

Note: All char data type fields are null-terminated strings.

The filename, or server_id, db2instance, type, dbname and timestamp uniquely identifies the backup image. The sequence number, specified by sequence, identifies the file extension. When a backup image is to be restored, the same values must be specified to retrieve the backup image. Depending on the vendor product, if filename is used, the other parameters may be set to NULL, and vice versa.

API and data structure syntax

```
typedef struct DB2_info
{
  char *DB2_id;
  char *version;
  char *release;
  char *level;
  char *action;
  char *filename;
  char *server_id;
  char *db2instance;
  char *type;
  char *dbname;
  char *alias;
```

```
  char *timestamp;
  char *sequence;
  struct sqlu_gen_list
                 *obj_list;
  sqlint32 max_bytes_per_txn;
  char *image_filename;
  void *reserve;
  char *nodename;
  char *password;
  char *owner;
  char *mcNameP;
  SQL_PDB_NODE_TYPE nodeNum;
} DB2_info ;
```

Vendor_info

Contains information, returned to DB2 as part of the Init_output structure, identifying the vendor and the version of the vendor device.

Table 21. Fields in the Vendor_info Structure.

Field Name	Data Type	Description
vendor_id	char	An identifier for the vendor. Maximum length of the string it points to is 64 characters.
version	char	The current version of the vendor product. Maximum length of the string it points to is 8 characters.
release	char	The current release of the vendor product. Set to NULL if it is insignificant. Maximum length of the string it points to is 8 characters.
level	char	The current level of the vendor product. Set to NULL if it is insignificant. Maximum length of the string it points to is 8 characters.
server_id	char	A unique name identifying the server where the database resides. Maximum length of the string it points to is 8 characters.
max_bytes_per_txn	sqlint32	The maximum supported transfer buffer size. Specified by the vendor, in bytes. This is used only if the return code from the vendor initialize API is SQLUV_BUFF_SIZE, indicating that an invalid buffer size wasspecified.

Table 21. Fields in the Vendor_info Structure. (continued)

Field Name	Data Type	Description
num_objects_in_backup	sqlint32	The number of sessions that were used to make a complete backup. This is used to determine when all backup images have been processed during a restore operation.
reserve	void	Reserved for future use.

Note: All char data type fields are NULL-terminated strings.

API and data structure syntax

```
typedef struct Vendor_info
{
  char *vendor_id;
  char *version;
  char *release;
  char *level;
  char *server_id;
  sqlint32 max_bytes_per_txn;
  sqlint32 num_objects_in_backup;
  void *reserve;
} Vendor_info;
```

Init_input

Contains information provided by DB2 to set up and to establish a logical link with a vendor device. This data structure is used by DB2 to send information to the backup and restore vendor storage plug-in through the sqluvint and sqluvdel APIs.

Table 22. Fields in the Init_input Structure.

Field Name	Data Type	Description
DB2_session	struct DB2_info	A description of the session from the perspective of DB2.
size_options	unsigned short	The length of the options field. When using the DB2 backup or restore function, the data in this field is passed directly from the VendorOptionsSize parameter.
size_HI_order	sqluint32	High order 32 bits of DB size estimate in bytes; total size is 64 bits.
size_LOW_order	sqluint32	Low order 32 bits of DB size estimate in bytes; total size is 64 bits.

Table 22. Fields in the Init_input Structure. (continued)

Field Name	Data Type	Description
options	void	This information is passed from the application when the backup or the restore function is invoked. This data structure must be flat; in other words, no level of indirection is supported. Byte-reversal is not done, and the code page for this data is not checked. When using the DB2 backup or restore function, the data in this field is passed directly from the pVendorOptions parameter.
reserve	void	Reserved for future use.
prompt_lvl	char	Prompting level requested by the user when a backup or a restore operation was invoked. Maximum length of the string it points to is 1 character. This field is a NULL-terminated string.
num_sessions	unsigned short	Number of sessions requested by the user when a backup or a restore operation was invoked.

API and data structure syntax

```
typedef struct Init_input
{
   struct DB2_info *DB2_session;
   unsigned short   size_options;
   sqluint32 size_HI_order;
   sqluint32 size_LOW_order;
   void *options;
   void *reserve;
   char *prompt_lvl;
   unsigned short   num_sessions;
} Init_input;
```

Init_output

Contains a control block for the session and information returned by the backup and restore vendor storage plug-in to DB2. This data structure is used by the sqluvint and sqluvdel APIs.

Table 23. Fields in the Init_output Structure

Field Name	Data Type	Description
vendor_session	struct Vendor_info	Contains information to identify the vendor to DB2.
pVendorCB	void	Vendor control block.
reserve	void	Reserved for future use.

API and data structure syntax

```
typedef struct Init_output
{
   struct Vendor_info * vendor_session;
   void               * pVendorCB;
   void               * reserve;
} Init_output ;
```

Data

Contains data transferred between DB2 and a vendor device. This structure is used by the sqluvput API when data is being written to the vendor device and by the sqluvget API when data is being read from the vendor device.

Table 24. Fields in the Data Structure

Field Name	Data Type	Description
obj_num	sqlint32	The sequence number assigned by DB2 during a backup operation.
buff_size	sqlint32	The size of the buffer.
actual_buff_size	sqlint32	The actual number of bytes sent or received. This must not exceed buff_size.
dataptr	void	Pointer to the data buffer. DB2 allocates space for the buffer.
reserve	void	Reserved for future use.

API and data structure syntax

```
typedef struct Data
{
   sqlint32 obj_num;
   sqlint32 buff_size;
   sqlint32 actual_buff_size;
   void *dataptr;
   void *reserve;
} Data;
```

Return_code

Contains the return code for and a short explanation of the error being returned to DB2 by the backup and restore vendor storage plug-in. This data structure is used by all the vendor storage plug-in APIs.

Table 25. Fields in the Return_code Structure

Field Name	Data Type	Description
return_code (see note below)	sqlint32	Return code from the vendor API.
description	char	A short description of the return code.
reserve	void	Reserved for future use.

Note: This is a vendor-specific return code that is not the same as the value returned by various DB2 APIs. See the individual API descriptions for the return codes that are accepted from vendor products.

API and data structure syntax

```
typedef struct Return_code
{
        sqlint32 return_code;
        char description[SQLUV_COMMENT_LEN];
        void *reserve;
} Return_code;
```

DB2 APIs for using compression with backup and restore operations

DB2 provides APIs that can be used by third-party compression products to compress and decompress backup images. This interface is designed to augment or replace the compression library that is supported as a standard part of DB2. The compression plug-in interface can be used with the backup and restore DB2 APIs or the backup and restore plug-ins for vendor storage devices.

DB2 defines a set of API prototypes that provide a general purpose interface for compression and decompression that can be used by many vendors. These APIs are to be provided by the vendor in a shared library on Linux and UNIX systems, or DLL on the Windows operating system. When the APIs are invoked by DB2, the shared library or DLL specified by the calling backup or restore routine is loaded and the APIs provided by the vendor are called to perform the required tasks.

Operational overview

Eight APIs are defined to interface DB2 and the vendor product:

- InitCompression - Initialize the compression library
- GetSavedBlock - Get vendor block for backup image
- Compress - Compress a block of data
- GetMaxCompressedSize - Estimate largest possible buffer size
- TermCompression - Terminate the compression library
- InitDecompression - Initialize the decompression library
- Decompress - Decompress a block of data
- TermDecompression - Terminate the decompression library

DB2 will provide the definition for the COMPR_DB2INFO structure; the vendor will provide definitions for each of the other structures and APIs for using compression with backup and restore. The structures, prototypes, and constants are defined in the file sqlucompr.h, which is shipped with DB2.

DB2 will call these APIs, and they should be provided by the vendor product in a shared library on Linux and UNIX systems, or in a DLL on the Windows operating system.

Note: The shared library or DLL code will be run as part of the database engine code. Therefore, it must be reentrant and thoroughly debugged. An errant function might compromise data integrity of the database.

Sample calling sequence

For backup, the following sequence of calls is issued by DB2 for each session:

```
InitCompression
```

followed by 0 to 1

```
GetMaxCompressedSize
Compress
```

followed by 1

```
TermCompress
```

For restore, the sequence of calls for each session is:

```
InitDecompression
```

followed by 1 to n

```
Decompress
```

followed by 1

```
TermCompression
```

Compression plug-in interface return codes

The following are the return codes that the APIs might return. Except where specified, DB2 will terminate the backup or restore when any non-zero return code is returned.

```
SQLUV_OK
```

0

Operation succeeded

```
SQLUV_BUFFER_TOO_SMALL
```

100

Target buffer is too small. When indicated on backup, the tgtAct field shall indicate the estimated size required to compress the object. DB2 will retry the operation with a buffer at least as large as specified. When indicated on restore, the operation will fail.

```
SQLUV_PARTIAL_BUFFER
```

101

A buffer was partially compressed. When indicated on backup, the srcAct field shall indicate the actual amount of data actually compressed and the tgtAct field shall indicate the actual size of the compressed data. When indicated on restore, the operation will fail.

```
SQLUV_NO_MEMORY
```

102

Out of memory

```
SQLUV_EXCEPTION
```

103

A signal or exception was raised in the code.
SQLUV_INTERNAL_ERROR

104

An internal error was detected.

The difference between SQLUV_BUFFER_TOO_SMALL and SQLUV_PARTIAL_BUFFER is that when SQLUV_PARTIAL_BUFFER is returned, DB2 will consider the data in the output buffer to be valid.

COMPR_CB

This structure is used internally by the plug-in library as the control block. It contains data used internally by compression and decompression APIs. DB2 passes this structure to each call it makes to the plug-in library, but all aspects of the structure are left up to the library, including the definition of the structure's parameters and memory management of the structure.

API and data structure syntax

```
struct COMPR_CB;
```

COMPR_DB2INFO

Describes the DB2 environment. DB2 allocates and defines this structure and passes it in as a parameter to the InitCompression and InitDecompression APIs. This structure describes the database being backed up or restored and gives details about the DB2 environment where the operation is occurring. The dbalias, instance, node, catnode, and timestamp parameters are used to name the backup image.

API and data structure syntax

```
struct COMPR_DB2INFO {
   char tag[16];
   db2Uint32 version;
   db2Uint32 size;
   char dbalias[SQLU_ALIAS_SZ+1];
   char instance[SQL_INSTNAME_SZ+1];
   SQL_PDB_NODE_TYPE node;
   SQL_PDB_NODE_TYPE catnode;
   char timestamp[SQLU_TIME_STAMP_LEN+1];
   db2Uint32 bufferSize;
   db2Uint32 options;
   db2Uint32 bkOptions;
   db2Uint32 db2Version;
   db2Uint32 platform;
   db2int32 comprOptionsByteOrder;
   db2Uint32 comprOptionsSize;
   void *comprOptions;
   db2Uint32 savedBlockSize;
   void *savedBlock;
};
```

COMPR_DB2INFO data structure parameters

tag Used as an eye catcher for the structure. This is always set to the string "COMPR_DB2INFO \0".

version
Indicates which version of the structure is being used so APIs can indicate the presence of additional fields. Currently, the version is 1. In the future there may be more parameters added to this structure.

size Specifies the size of the COMPR_DB2INFO structure in bytes.

dbalias
Database alias. For restore operations, dbalias refers to the alias of the source database.

instance
Instance name.

node Node number.

catnode
Catalog node number.

timestamp
The timestamp of the image being backed up or restored.

bufferSize
Specifies the size of a transfer buffer (in 4K pages).

options
The iOptions parameter specified in the db2Backup API or the db2Restore API.

bkOptions
For restore operations, specifies the iOptions parameter that was used in the db2Backup API when the backup was created. For backup operations, it is set to zero.

db2Version
Specifies the version of the DB2 engine.

platform
Specifies the platform on which the DB2 engine is running. The value will be one of the ones listed in sqlmon.h (located in the include directory).

comprOptionsByteOrder
Specifies the byte-order used on the client where the API is being run. DB2 will do no interpretation or conversion of the data passed through as comprOptions, so this field should be used to determine whether the data needs to be byte reversed before being used. Any conversion must be done by the plug-in library itself.

comprOptionsSize
Specifies the value of the piComprOptionsSize parameter in the db2Backup and db2Restore APIs.

comprOptions
Specifies the value of the piComprOptions parameter in the db2Backup and db2Restore APIs.

savedBlockSize
Size in bytes of savedBlock.

savedBlock
DB2 allows the plug-in library to save an arbitrary block of data in the backup image. If such a block of data was saved with a particular backup, it will be returned in these fields on the restore operation. For backup operations, these fields are set to zero.

COMPR_PIINFO

This structure is used by the plug-in library to describe itself to DB2. This structure is allocated and initialized by DB2, and the key fields are filled in by the plug-in library on the InitCompression API call.

API and data structure syntax

```
struct COMPR_PIINFO {
   char tag[16];
   db2Uint32 version;
   db2Uint32 size;
   db2Uint32 useCRC;
   db2Uint32 useGran;
   db2Uint32 useAllBlocks;
   db2Uint32 savedBlockSize;
};
```

COMPR_PIINFO data structure parameters

tag Used as an eye catcher for the structure. (It is set by DB2.) This is always set to the string `"COMPR_PIINFO  \0"`.

version
Indicates which version of the structure is being used so APIs can indicate the presence of additional fields. Currently, the version is 1.

(It is set by DB2.) In the future there may be more fields added to this structure.

size Indicates the size of the COMPR_PIINFO structure (in bytes). (It is set by DB2.)

useCRC
DB2 allows compression plug-ins to use a 32-bit CRC or checksum value to validate the integrity of the data being compressed and decompressed.

If the library uses such a check, it will set this field to 1. Otherwise, it will set the field to 0.

useGran
If the compression routine is able to compress data in arbitrarily-sized increments, the library will set this field to 1. If the compression routine compresses data only in byte-sized increments, the library will set this field to 0. See the description of the srcGran parameter of Compress API for details of the implications of setting this indicator.

For restore operations, this parameter is ignored.

useAllBlocks
Specifies whether DB2 should back up a compressed block of data that is larger than the original uncompressed block. By default, DB2 will store data uncompressed if the compressed version is larger, but under some circumstances the plug-in library will want to have the compressed data backed up anyway. If DB2 is to save the compressed version of the data for all blocks, the library will set this value to 1. If DB2 is to save the compressed version of the data only when it is smaller than the original data, the library will set this value to 0. For restore operations, this field is ignored.

savedBlockSize
DB2 allows the plug-in library to save an arbitrary block of data in the backup image. If such a block of data is to be saved with a particular

backup, the library will set this parameter to the size of the block to be allocated for this data. (The actual data will be passed to DB2 on a subsequent API call.) If no data is to be saved, the plug-in library will set this parameter to zero. For restore operations, this parameter is ignored.

Compress - Compress a block of data

Compress a block of data. The src parameter points to a block of data that is srcLen bytes in size. The tgt parameter points to a buffer that is tgtSize bytes in size. The plug-in library compresses the data at address src and writes the compressed data to the buffer at address tgt. The actual amount of uncompressed data that was compressed is stored in srcAct. The actual size of the compressed data is returned as tgtAct.

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int Compress(
      struct COMPR_CB *pCB,
      const char *src,
      db2int32 srcSize,
      db2Uint32 srcGran,
      char *tgt,
      db2int32 tgtSize,
      db2int32 *srcAct,
      db2int32 *tgtAct,
      db2Uint32 *tgtCRC);
```

Compress API parameters

pCB Input. This is the control block that was returned by the InitCompression API call.

src Input. Pointer to the block of data to be compressed.

srcLen Input. Size in bytes of the block of data to be compressed.

srcGran
Input. If the library returned a value of 1 for piInfo->useGran, srcGran specifies the log2 of the page size of the data. (For example, if the page size of the data is 4096 bytes, srcGran is 12.) The library ensures that the amount of data actually compressed (srcAct) is an exact multiple of this page size. If the library sets the useGran flag, DB2 is able to use a more efficient algorithm for fitting the compressed data into the backup image. This means that both the performance of the plug-in will be better and that the compressed backup image will be smaller. If the library returned a value of 0 for piInfo->srcGran, the granularity is 1 byte.

tgt Input and output. Target buffer for compressed data. DB2 will supply this target buffer and the plug-in will compress the data at src and write compressed data here.

tgtSize
Input. Size in bytes of the target buffer.

srcAct Output. Actual amount in bytes of uncompressed data from src that was compressed.

tgtAct Output. Actual amount in bytes of compressed data stored in tgt.

tgtCRC
Output. If the library returned a value of 1 for piInfo->useCRC, the CRC value of the uncompressed block is returned as tgtCRC. If the library returned a value of 0 for piInfo->useCRC, tgtCRC will be a null pointer.

Decompress - Decompress a block of data

Decompresses a block of data. The src parameter points to a block of data that is srcLen bytes in size. The tgt parameter points to a buffer that is tgtSize bytes in size. The plug-in library decompresses the data at address src and writes the uncompressed data to the buffer at address tgt. The actual size of the uncompressed data is returned as tgtLen. If the library returned a value of 1 for piInfo->useCRC, the CRC of the uncompressed block is returned as tgtCRC. If the library returned a value of 0 for piInfo->useCRC, tgtLen will be a null pointer.

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int Decompress(
      struct COMPR_CB *pCB,
      const char *src,
      db2int32 srcSize,
      char *tgt,
      db2int32 tgtSize,
      db2int32 *tgtLen,
      db2Uint32 *tgtCRC);
```

Decompress API parameters

pCB Input. This is the control block that was returned by the InitDecompression API call.

src Input. Pointer to the block of data to be decompressed.

srcLen Input. Size in bytes of the block of data to be decompressed.

tgt Input and output. Target buffer for decompressed data. DB2 will supply this target buffer and the plug-in will decompress the data at src and write decompressed data here.

tgtSize
Input. Size in bytes of the target buffer.

tgtLen Output. Actual amount in bytes of decompressed data stored in tgt.

tgtCRC
Output. If the library returned a value of 1 for piInfo->useCRC, the CRC value of the uncompressed block is returned as tgtCRC. If the library returned a value of 0 for piInfo->useCRC, tgtCRC will be a null pointer.

GetMaxCompressedSize - Estimate largest possible buffer size

Estimates the size of the largest possible buffer required to compress a block of data. srcLen indicates the size of a block of data about to be compressed. The library returns the theoretical maximum size of the buffer after compression as tgtLen.

DB2 will use the value returned as tgtLen to optimize its use of memory internally. The penalty for not calculating a value or for calculating an incorrect value is that DB2 will have to call the Compress API more than once for a single block of data, or that it may waste memory from the utility heap. DB2 will still create the backup correctly, regardless of the values returned.

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int GetMaxCompressedSize(
      struct COMPR_CB *pCB,
      db2Uint32 srcLen);
```

GetMaxCompressedSize API parameters

pCB Input. This is the control block that was returned by the InitCompression API call.

srcLen Input. Size in bytes of a block of data about to be compressed.

GetSavedBlock - Get the vendor of block data for the backup image

Gets the vendor-specific block of data to be saved with the backup image. If the library returned a non-zero value for piInfo->savedBlockSize, DB2 will call GetSavedBlock using that value as blockSize. The plug-in library writes data of the given size to the memory referenced by data. This API will be called during initial data processing by the first db2bm process for backup only. Even if parallelism > 1 is specified in the db2Backup API, this API will be called only once per backup.

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int GetSavedBlock(
      struct COMPR_CB *pCB,
      db2Uint32 blockSize,
      void *data);
```

GetSavedBlock API parameters

pCB Input. This is the control block that was returned by the InitCompression API call.

blocksize
Input. This is the size of the block that was returned in piInfo->savedBlockSize by the InitCompression API call.

data Output. This is the vendor-specific block of data to be saved with the backup image.

InitCompression - Initialize the compression library

Initializes the compression library. DB2 will pass the db2Info and piInfo structures. The library will fill in the appropriate parameters of piInfo, and will allocate pCB and return a pointer to the allocated memory.

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int InitCompression(
      const struct COMPR_DB2INFO
                        *db2Info,
      struct COMPR_PIINFO
                        *piInfo,
      struct COMPR_CB  **pCB);
```

InitCompression API parameters

db2Info
Input. Describes the database being backed up and gives details about the DB2 environment where the operation is occuring.

piInfo Output. This structure is used by the plug-in library to describe itself to DB2. It is allocated and initialized by DB2 and the key parameters are filled in by the plug-in library.

pCB Output. This is the control block used by the compression library. The plug-in library is responsible for memory management of the structure.

InitDecompression - Initialize the decompression library

Initializes the decompression library. DB2 will pass the db2Info structure. The library will allocate pCB and return a pointer to the allocated memory.

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int InitDecompression(
      const struct COMPR_DB2INFO
                        *db2Info,
      struct COMPR_CB  **pCB);
```

InitDecompression API parameters

db2Info
Input. Describes the database being backed up and gives details about the DB2 environment where the operation is occuring.

pCB Output. This is the control block used by the decompression library. The plug-in library is responsible for memory management of the structure.

TermCompression - Stop the compression library

Terminates the compression library. The library will free the memory used for pCB.

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int TermCompression(
      struct COMPR_CB *pCB);
```

TermCompression API parameters

pCB Input. This is the control block that was returned by the InitCompression API call.

TermDecompression - Stop the decompression library

Terminates the decompression library. The library will free the memory used for pCB. All the memory used internally by the compression APIs will be managed by the library. The plug-in library will also manage memory used by the COMPR_CB structure. DB2 will manage the memory used for the data buffers (the src and tgt parameters in the compression APIs).

Authorization

None

Required connection

None

API include file

```
sqlucompr.h
```

API and data structure syntax

```
int TermDecompression(
      struct COMPR_CB *pCB);
```

TermDecompression API parameters

pCB Input. This is the control block that was returned by the InitDecompression API call.

Chapter 9. Data structures used by APIs

db2HistoryData

This structure is used to return information after a call to the db2HistoryGetEntry API.

Table 26. Fields in the db2HistoryData structure

Field name	Data type	Description
ioHistDataID	char(8)	An 8-byte structure identifier and ″eye-catcher″ for storage dumps. The only valid value is SQLUHINF. No symbolic definition for this string exists.
oObjectPart	db2Char	The first 14 characters are a time stamp with format *yyyymmddhhmmss*, indicating when the operation was begun. The next 3 characters are a sequence number. Each backup operation can result in multiple entries in this file when the backup image is saved in multiple files or on multiple tapes. The sequence number allows multiple locations to be specified. Restore and load operations have only a single entry in this file, which corresponds to sequence number ″001″ of the corresponding backup. The time stamp, combined with the sequence number, must be unique.
oEndTime	db2Char	A time stamp with format *yyyymmddhhmmss*, indicating when the operation was completed.
oFirstLog	db2Char	The earliest log file ID (ranging from S0000000 to S9999999): • Required to apply rollforward recovery for an online backup • Required to apply rollforward recovery for an offline backup • Applied after restoring a full database or table space level backup that was current when the load started.
oLastLog	db2Char	The latest log file ID (ranging from S0000000 to S9999999): • Required to apply rollforward recovery for an online backup • Required to apply rollforward recovery to the current point in time for an offline backup • Applied after restoring a full database or table space level backup that was current when the load operation finished (will be the same as **oFirstLog** if roll forward recovery is not applied).
oID	db2Char	Unique backup or table identifier.
oTableQualifier	db2Char	Table qualifier.
oTableName	db2Char	Table name.

Table 26. Fields in the db2HistoryData structure (continued)

Field name	Data type	Description
oLocation	db2Char	For backups and load copies, this field indicates where the data has been saved. For operations that require multiple entries in the file, the sequence number defined by **oObjectPart** parameter identifies which part of the backup is found in the specified location. For restore and load operations, the location always identifies where the first part of the data restored or loaded (corresponding to sequence ″001″ for multi-part backups) has been saved. The data in **oLocation** is interpreted differently, depending on **oDeviceType** parameter: • For disk or diskette (D or K), a fully qualified file name. • For tape (T), a volume label. • For TSM (A and F), the vendor library name/path that did the backup. • For user exit or other (U or O), free form text.
oComment	db2Char	Free form text comment.
oCommandText	db2Char	Command text, or DDL.
oLastLSN	SQLU_LSN	Last log sequence number.
oEID	Structure	Unique entry identifier.
poEventSQLCA	Structure	Result sqlca of the recorded event.
poTablespace	db2Char	A list of table space names.
iNumTablespaces	db2Uint32	Number of entries in the **poTablespace** list that are available for use by the db2HistoryGetEntry API.
oNumTablespaces	db2Uint32	Number of entries in the **poTablespace** list that were used by the db2HistoryGetEntry API. Each table space backup contains one or more table spaces. Each table space restore operation replaces one or more table spaces. If this field is not zero (indicating a table space level backup or restore), the next lines in this file contain the name of the table space backed up or restored, represented by an 18-character string. One table space name appears on each line.
oOperation	char	See Table 27 on page 483.
oObject	char	Granularity of the operation: D for full database, P for table space, T for table, R for range partition and I for index.
oOptype	char	See Table 28 on page 483.
oStatus	char	Entry status: A for active; I for inactive; E for expired; D for deleted; and X for do not delete.
oDeviceType	char	Device type. This field determines how the **oLocation** field is interpreted: A for TSM, C for client, D for disk, F for snapshot backup, K for diskette, L for local, O for other (for other vendor device support), P for pipe, Q for cursor, S for server, T for tape, and U for user exit.

Table 27. Valid **oOperation** *values in the db2HistoryData structure*

Value	Description	C definition	COBOL/FORTRAN definition
A	add table space	DB2HISTORY_OP_ADD_ TABLESPACE	DB2HIST_OP_ADD_ TABLESPACE
B	backup	DB2HISTORY_OP_BACKUP	DB2HIST_OP_BACKUP
C	load copy	DB2HISTORY_OP_LOAD_COPY	DB2HIST_OP_LOAD_COPY
D	dropped table	DB2HISTORY_OP_DROPPED_ TABLE	DB2HIST_OP_DROPPED_ TABLE
F	rollforward	DB2HISTORY_OP_ROLLFWD	DB2HIST_OP_ROLLFWD
G	reorganize table	DB2HISTORY_OP_REORG	DB2HIST_OP_REORG
L	load	DB2HISTORY_OP_LOAD	DB2HIST_OP_LOAD
N	rename table space	DB2HISTORY_OP_REN_ TABLESPACE	DB2HIST_OP_REN_ TABLESPACE
O	drop table space	DB2HISTORY_OP_DROP_ TABLESPACE	DB2HIST_OP_DROP_ TABLESPACE
Q	quiesce	DB2HISTORY_OP_QUIESCE	DB2HIST_OP_QUIESCE
R	restore	DB2HISTORY_OP_RESTORE	DB2HIST_OP_RESTORE
T	alter table space	DB2HISTORY_OP_ALT_ TABLESPACE	DB2HIST_OP_ALT_TBS
U	unload	DB2HISTORY_OP_UNLOAD	DB2HIST_OP_UNLOAD
X	log archive	DB2HISTORY_OP_ARCHIVE_ LOG	DB2HIST_OP_ARCHIVE_LOG

Table 28. Valid **oOptype** *values in the db2HistData structure*

oOperation	oOptype	Description	C/COBOL/FORTRAN definition
B	F N I O D E	offline, online, incremental offline, incremental online, delta offline, delta online	DB2HISTORY_OPTYPE_OFFLINE, DB2HISTORY_OPTYPE_ONLINE, DB2HISTORY_OPTYPE_INCR_OFFLINE, DB2HISTORY_OPTYPE_INCR_ONLINE, DB2HISTORY_OPTYPE_DELTA_OFFLINE, DB2HISTORY_OPTYPE_DELTA_ONLINE
F	E P	end of logs, point in time	DB2HISTORY_OPTYPE_EOL, DB2HISTORY_OPTYPE_PIT
G	F N	offline, online	DB2HISTORY_OPTYPE_OFFLINE, DB2HISTORY_OPTYPE_ONLINE
L	I R	insert, replace	DB2HISTORY_OPTYPE_INSERT, DB2HISTORY_OPTYPE_REPLACE
Q	S U X Z	quiesce share, quiesce update, quiesce exclusive, quiesce reset	DB2HISTORY_OPTYPE_SHARE, DB2HISTORY_OPTYPE_UPDATE, DB2HISTORY_OPTYPE_EXCL, DB2HISTORY_OPTYPE_RESET
R	F N I O R	offline, online, incremental offline, incremental online, rebuild	DB2HISTORY_OPTYPE_OFFLINE, DB2HISTORY_OPTYPE_ONLINE, DB2HISTORY_OPTYPE_INCR_OFFLINE, DB2HISTORY_OPTYPE_INCR_ONLINE, DB2HISTORY_OPTYPE_REBUILD
T	C R	add containers, rebalance	DB2HISTORY_OPTYPE_ADD_CONT, DB2HISTORY_OPTYPE_REB

Table 28. Valid **oOptype** *values in the db2HistData structure (continued)*

oOperation	oOptype	Description	C/COBOL/FORTRAN definition
X	N P M F 1 2	archive log command, primary log path, mirror log path, archive fail path, log archive method 1, log archive method 2	DB2HISTORY_OPTYPE_ARCHIVE_CMD, DB2HISTORY_OPTYPE_PRIMARY, DB2HISTORY_OPTYPE_MIRROR, DB2HISTORY_OPTYPE_ARCHFAIL, DB2HISTORY_OPTYPE_ARCH1, DB2HISTORY_OPTYPE_ARCH2

Table 29. Fields in the db2HistoryEID structure

Field name	Data type	Description
ioNode ioHID	SQL_PDB_NODE_TYPE db2Uint32	Node number. Local history file entry ID.

API and data structure syntax

```
typedef SQL_STRUCTURE db2HistoryData
{
   char ioHistDataID[8];
   db2Char oObjectPart;
   db2Char oEndTime;
   db2Char oFirstLog;
   db2Char oLastLog;
   db2Char oID;
   db2Char oTableQualifier;
   db2Char oTableName;
   db2Char oLocation;
   db2Char oComment;
   db2Char oCommandText;
   SQLU_LSN oLastLSN;
   db2HistoryEID oEID;
   struct sqlca *poEventSQLCA;
   struct db2Char *poTablespace;
   db2Uint32 iNumTablespaces;
   db2Uint32 oNumTablespaces;
   char oOperation;
   char oObject;
   char oOptype;
   char oStatus;
   char oDeviceType;
} db2HistoryData;

typedef SQL_STRUCTURE db2Char
{
   char *pioData;
   db2Uint32 iLength;
   db2Uint32 oLength;
} db2Char;

typedef SQL_STRUCTURE db2HistoryEID
{
   SQL_PDB_NODE_TYPE ioNode;
   db2Uint32 ioHID;
} db2HistoryEID;
```

db2Char data structure parameters

pioData

A pointer to a character data buffer. If NULL, no data will be returned.

iLength
Input. The size of the **pioData** buffer.

oLength
Output. The number of valid characters of data in the **pioData** buffer.

db2HistoryEID data structure parameters

ioNode
This parameter can be used as either an input or output parameter. Indicates the node number.

ioHID This parameter can be used as either an input or output parameter. Indicates the local history file entry ID.

sql_authorizations

Note: This structure is deprecated as it is used only for backward compatibility for sqluadau() API.

This structure is used to return information after a call to the sqluadau API. The data type of all fields is SMALLINT. The first half of the following table contains authorities granted directly to a user. The second half of the table contains authorities granted to the groups to which a user belongs.

Table 30. Fields in the SQL_AUTHORIZATIONS Structure

Field Name	Description
SQL_AUTHORIZATIONS_LEN	Size of structure.
SQL_SYSADM_AUTH	SYSADM authority.
SQL_SYSCTRL_AUTH	SYSCTRL authority.
SQL_SYSMAINT_AUTH	SYSMAINT authority.
SQL_DBADM_AUTH	DBADM authority.
SQL_CREATETAB_AUTH	CREATETAB authority.
SQL_CREATET_NOT_FENC_AUTH	CREATE_NOT_FENCED authority.
SQL_BINDADD_AUTH	BINDADD authority.
SQL_CONNECT_AUTH	CONNECT authority.
SQL_IMPLICIT_SCHEMA_AUTH	IMPLICIT_SCHEMA authority.
SQL_LOAD_AUTH	LOAD authority.
SQL_SYSADM_GRP_AUTH	User belongs to a group which holds SYSADM authority.
SQL_SYSCTRL_GRP_AUTH	User belongs to a group which holds SYSCTRL authority.
SQL_SYSMAINT_GRP_AUTH	User belongs to a group which holds SYSMAINT authority.
SQL_DBADM_GRP_AUTH	User belongs to a group which holds DBADM authority.
SQL_CREATETAB_GRP_AUTH	User belongs to a group which holds CREATETAB authority.
SQL_CREATE_NON_FENC_GRP_AUTH	User belongs to a group which holds CREATE_NOT_FENCED authority.

Table 30. Fields in the SQL_AUTHORIZATIONS Structure (continued)

Field Name	Description
SQL_BINDADD_GRP_AUTH	User belongs to a group which holds BINDADD authority.
SQL_CONNECT_GRP_AUTH	User belongs to a group which holds CONNECT authority.
SQL_IMPLICIT_SCHEMA_GRP_AUTH	User belongs to a group which holds IMPLICIT_SCHEMA authority.
SQL_LOAD_GRP_AUTH	User belongs to a group which holds LOAD authority.
SQL_CREATE_EXT_RTN_AUTH	CREATE_EXTERNAL_ROUTINE authority.
SQL_CREATE_EXT_RTN_GRP_AUTH	User belongs to a group which holds CREATE_EXTERNAL_ROUTINE authority.
SQL_QUIESCE_CONNECT_AUTH	QUIESCE CONNECT authority.
SQL_QUIESCE_CONNECT_GRP_AUTH	User belongs to a group which holds QUIESCE CONNECT authority.
SQL_SECURITY_ADMIN_AUTH	SECADM authority.
SQL_SECURITY_ADMIN_GRP_AUTH	User belongs to a group which holds SECADM authority.
SQL_SYSMON_AUTH	SYSMON authority.
SQL_SYSMON_GRP_AUTH	User belongs to a group which holds SYSMON authority.

Note: SYSADM, SYSMAINT, SYSMON and SYSCTRL are only indirect authorities and cannot be granted directly to the user. They are available only through the groups to which the user belongs.

API and data structure syntax

```
SQL_STRUCTURE sql_authorizations
{
   short sql_authorizations_len;
   short sql_sysadm_auth;
   short sql_dbadm_auth;
   short sql_createtab_auth;
   short sql_bindadd_auth;
   short sql_connect_auth;
   short sql_sysadm_grp_auth;
   short sql_dbadm_grp_auth;
   short sql_createtab_grp_auth;
   short sql_bindadd_grp_auth;
   short sql_connect_grp_auth;
   short sql_sysctrl_auth;
   short sql_sysctrl_grp_auth;
   short sql_sysmaint_auth;
   short sql_sysmaint_grp_auth;
   short sql_create_not_fenc_auth;
   short sql_create_not_fenc_grp_auth;
   short sql_implicit_schema_auth;
   short sql_implicit_schema_grp_auth;
   short sql_load_auth;
   short sql_load_grp_auth;
   short sql_create_ext_rtn_auth;
   short sql_create_ext_rtn_grp_auth;
   short sql_quiesce_connect_auth;
   short sql_quiesce_connect_grp_auth;
   short sql_security_admin_auth;
```

```
   short sql_security_admin_grp_auth;
   short sql_library_admin_auth;
   short sql_library_admin_grp_auth;
   short sql_sysmon_auth;
   short sql_sysmon_grp_auth;
};
```

COBOL Structure

```
* File: sqlutil.cbl
01 SQL-AUTHORIZATIONS.
    05 SQL-AUTHORIZATIONS-LEN PIC S9(4) COMP-5.
    05 SQL-SYSADM-AUTH        PIC S9(4) COMP-5.
    05 SQL-DBADM-AUTH         PIC S9(4) COMP-5.
    05 SQL-CREATETAB-AUTH     PIC S9(4) COMP-5.
    05 SQL-BINDADD-AUTH       PIC S9(4) COMP-5.
    05 SQL-CONNECT-AUTH       PIC S9(4) COMP-5.
    05 SQL-SYSADM-GRP-AUTH    PIC S9(4) COMP-5.
    05 SQL-DBADM-GRP-AUTH     PIC S9(4) COMP-5.
    05 SQL-CREATETAB-GRP-AUTH PIC S9(4) COMP-5.
    05 SQL-BINDADD-GRP-AUTH   PIC S9(4) COMP-5.
    05 SQL-CONNECT-GRP-AUTH   PIC S9(4) COMP-5.
    05 SQL-SYSCTRL-AUTH       PIC S9(4) COMP-5.
    05 SQL-SYSCTRL-GRP-AUTH   PIC S9(4) COMP-5.
    05 SQL-SYSMAINT-AUTH      PIC S9(4) COMP-5.
    05 SQL-SYSMAINT-GRP-AUTH  PIC S9(4) COMP-5.
    05 SQL-CREATE-NOT-FENC-AUTH PIC S9(4) COMP-5.
    05 SQL-CREATE-NOT-FENC-GRP-AUTH PIC S9(4) COMP-5.
    05 SQL-IMPLICIT-SCHEMA-AUTH PIC S9(4) COMP-5.
    05 SQL-IMPLICIT-SCHEMA-GRP-AUTH PIC S9(4) COMP-5.
    05 SQL-LOAD-AUTH PIC S9(4) COMP-5.
    05 SQL-LOAD-GRP-AUTH PIC S9(4) COMP-5.
*
```

sql_dir_entry

This structure is used by the DCS directory APIs.

Table 31. Fields in the SQL-DIR-ENTRY Structure

Field Name	Data Type	Description
STRUCT_ID RELEASE CODEPAGE COMMENT LDB TDB AR PARM	SMALLINT SMALLINT SMALLINT CHAR(30) CHAR(8) CHAR(18) CHAR(32) CHAR(512)	Structure identifier. Set to SQL_DCS_STR_ID (defined in sqlenv). Release version (assigned by the API). Code page for comment. Optional description of the database. Local name of the database; must match database alias in system database directory. Actual name of the database. Name of the application client. Contains transaction program prefix, transaction program name, SQLCODE mapping file name, and disconnect and security option.

Note: The character fields passed in this structure must be null terminated or blank filled up to the length of the field.

API and data structure syntax

```
SQL_STRUCTURE sql_dir_entry
{
        unsigned short         struct_id;
        unsigned short         release;
        unsigned short         codepage;
        _SQLOLDCHAR comment[SQL_CMT_SZ + 1];
        _SQLOLDCHAR ldb[SQL_DBNAME_SZ + 1];
        _SQLOLDCHAR tdb[SQL_LONG_NAME_SZ + 1];
        _SQLOLDCHAR ar[SQL_AR_SZ + 1];
        _SQLOLDCHAR parm[SQL_PARAMETER_SZ + 1];
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQL-DIR-ENTRY.
    05 STRUCT-ID             PIC 9(4) COMP-5.
    05 RELEASE-LVL           PIC 9(4) COMP-5.
    05 CODEPAGE              PIC 9(4) COMP-5.
    05 COMMENT               PIC X(30).
    05 FILLER                PIC X.
    05 LDB                   PIC X(8).
    05 FILLER                PIC X.
    05 TDB                   PIC X(18).
    05 FILLER                PIC X.
    05 AR                    PIC X(32).
    05 FILLER                PIC X.
    05 PARM                  PIC X(512).
    05 FILLER                PIC X.
    05 FILLER                PIC X(1).
*
```

SQLB_TBS_STATS

This structure is used to return additional table space statistics to an application program.

Table 32. Fields in the SQLB-TBS-STATS Structure

Field Name	Data Type	Description
TOTALPAGES	INTEGER	Total operating system space occupied by the table space (in 4KB pages). For DMS, this is the sum of the container sizes (including overhead). For SMS, this is the sum of all file space used for the tables stored in this table space. This is the only piece of information returned for SMS table spaces; the other fields are set to this value or zero.
USEABLEPAGES	INTEGER	For DMS, equal to TOTALPAGES minus (overhead plus partial extents). For SMS, equal to TOTALPAGES.
USEDPAGES	INTEGER	For DMS, the total number of pages in use. For SMS, equal to TOTALPAGES.
FREEPAGES	INTEGER	For DMS, equal to USEABLEPAGES minus USEDPAGES. For SMS, not applicable.
HIGHWATERMARK	INTEGER	For DMS, the high water mark is the current ″end″ of the table space address space. In other words, the page number of the first free extent following the last allocated extent of a table space.

Note: This is not a ″high water mark″, but rather a ″current water mark″, since the value can decrease. For SMS, this is not applicable.

During a table space rebalance, the number of useable pages will include pages for the newly added container, but these new pages will not be reflected in the number of free pages until the rebalance is complete. When a table space rebalance is not taking place, the number of used pages plus the number of free pages will equal the number of useable pages.

API and data structure syntax

```
SQL_STRUCTURE SQLB_TBS_STATS
{
   sqluint32 totalPages;
   sqluint32 useablePages;
   sqluint32 usedPages;
   sqluint32 freePages;
   sqluint32 highWaterMark;
};
```

COBOL Structure

```
* File: sqlutil.cbl
01 SQLB-TBS-STATS.
    05 SQL-TOTAL-PAGES        PIC 9(9) COMP-5.
    05 SQL-USEABLE-PAGES      PIC 9(9) COMP-5.
    05 SQL-USED-PAGES         PIC 9(9) COMP-5.
    05 SQL-FREE-PAGES         PIC 9(9) COMP-5.
    05 SQL-HIGH-WATER-MARK    PIC 9(9) COMP-5.
*
```

SQLB_TBSCONTQRY_DATA

This structure is used to return container data to an application program.

Table 33. Fields in the SQLB-TBSCONTQRY-DATA Structure

Field Name	Data Type	Description
ID	INTEGER	Container identifier.
NTBS	INTEGER	Always 1.
TBSID	INTEGER	Table space identifier.
NAMELEN	INTEGER	Length of the container name (for languages other than C).
NAME	CHAR(256)	Container name.
UNDERDBDIR	INTEGER	Either 1 (container is under the DB directory) or 0 (container is not under the DB directory)
CONTTYPE	INTEGER	Container type.
TOTALPAGES	INTEGER	Total number of pages occupied by the table space container.
USEABLEPAGES	INTEGER	For DMS, TOTALPAGES minus overhead. For SMS, equal to TOTALPAGES.

Table 33. Fields in the SQLB-TBSCONTQRY-DATA Structure (continued)

Field Name	Data Type	Description
OK	INTEGER	Either 1 (container is accessible) or 0 (container is inaccessible). Zero indicates an abnormal situation that usually requires the attention of the database administrator.

Possible values for CONTTYPE (defined in sqlutil) are:

SQLB_CONT_PATH
Specifies a directory path (SMS only).

SQLB_CONT_DISK
Specifies a raw device (DMS only).

SQLB_CONT_FILE
Specifies a file (DMS only).

API and data structure syntax

```
SQL_STRUCTURE SQLB_TBSCONTQRY_DATA
{
   sqluint32 id;
   sqluint32 nTbs;
   sqluint32 tbsID;
   sqluint32 nameLen;
   char name[SQLB_MAX_CONTAIN_NAME_SZ];
   sqluint32 underDBDir;
   sqluint32 contType;
   sqluint32 totalPages;
   sqluint32 useablePages;
   sqluint32 ok;
};
```

COBOL Structure

```
* File: sqlutbcq.cbl
01 SQLB-TBSCONTQRY-DATA.
    05 SQL-ID                PIC 9(9) COMP-5.
    05 SQL-N-TBS             PIC 9(9) COMP-5.
    05 SQL-TBS-ID            PIC 9(9) COMP-5.
    05 SQL-NAME-LEN          PIC 9(9) COMP-5.
    05 SQL-NAME              PIC X(256).
    05 SQL-UNDER-DBDIR       PIC 9(9) COMP-5.
    05 SQL-CONT-TYPE         PIC 9(9) COMP-5.
    05 SQL-TOTAL-PAGES       PIC 9(9) COMP-5.
    05 SQL-USEABLE-PAGES     PIC 9(9) COMP-5.
    05 SQL-OK                PIC 9(9) COMP-5.
*
```

SQLB_TBSPQRY_DATA

This structure is used to return table space data to an application program.

Table 34. Fields in the SQLB-TBSPQRY-DATA Structure

Field Name	Data Type	Description
TBSPQVER	CHAR(8)	Structure version identifier.
ID	INTEGER	Internal identifier for the table space.

Table 34. Fields in the SQLB-TBSPQRY-DATA Structure (continued)

Field Name	Data Type	Description
NAMELEN	INTEGER	Length of the table space name.
NAME	CHAR(128)	Null-terminated name of the table space.
TOTALPAGES	INTEGER	Number of pages specified by CREATE TABLESPACE (DMS only).
USEABLEPAGES	INTEGER	TOTALPAGES minus overhead (DMS only). This value is rounded down to the next multiple of 4KB.
FLAGS	INTEGER	Bit attributes for the table space.
PAGESIZE	INTEGER	Page size (in bytes) of the table space. Currently fixed at 4KB.
EXTSIZE	INTEGER	Extent size (in pages) of the table space.
PREFETCHSIZE	INTEGER	Prefetch size.
NCONTAINERS	INTEGER	Number of containers in the table space.
TBSSTATE	INTEGER	Table space states.
LIFELSN	CHAR(6)	Time stamp identifying the origin of the table space.
FLAGS2	INTEGER	Bit attributes for the table space.
MINIMUMRECTIME	CHAR(27)	Earliest point in time that may be specified by point-in-time table space rollforward.
STATECHNGOBJ	INTEGER	If TBSSTATE is SQLB_LOAD_PENDING or SQLB_DELETE_PENDING, the object ID in table space STATECHANGEID that caused the table space state to be set. Otherwise zero.
STATECHNGID	INTEGER	If TBSSTATE is SQLB_LOAD_PENDING or SQLB_DELETE_PENDING, the table space ID of the object STATECHANGEOBJ that caused the table space state to be set. Otherwise zero.

Table 34. Fields in the SQLB-TBSPQRY-DATA Structure (continued)

Field Name	Data Type	Description
NQUIESCERS	INTEGER	If TBSSTATE is SQLB_QUIESCED_SHARE, UPDATE, or EXCLUSIVE, the number of quiescers of the table space and the number of entries in QUIESCERS.
QUIESCER	Array of SQLB_QUIESCER_ DATA structures	Each array entry consists of the quiesce data for a quiesced object.
FSCACHING	UNSIGNED CHAR	File system caching policy to support Direct I/O. This is a 31-bit field.
RESERVED	CHAR(31)	Reserved for future use.

Possible values for FLAGS (defined in sqlutil) are:

SQLB_TBS_SMS
System Managed Space

SQLB_TBS_DMS
Database Managed Space

SQLB_TBS_ANY
All types of permanent data. Regular table space.

SQLB_TBS_LONG
All types of permanent data. Large table space.

SQLB_TBS_SYSTMP
System temporary data.

SQLB_TBS_USRTMP
User temporary data.

Possible values for TBSSTATE (defined in sqlutil) are:

SQLB_NORMAL
Normal

SQLB_QUIESCED_SHARE
Quiesced: SHARE

SQLB_QUIESCED_UPDATE
Quiesced: UPDATE

SQLB_QUIESCED_EXCLUSIVE
Quiesced: EXCLUSIVE

SQLB_LOAD_PENDING
Load pending

SQLB_DELETE_PENDING
Delete pending

SQLB_BACKUP_PENDING
Backup pending

SQLB_ROLLFORWARD_IN_PROGRESS
Roll forward in progress

SQLB_ROLLFORWARD_PENDING
Roll forward pending

SQLB_RESTORE_PENDING
Restore pending

SQLB_DISABLE_PENDING
Disable pending

SQLB_REORG_IN_PROGRESS
Reorganization in progress

SQLB_BACKUP_IN_PROGRESS
Backup in progress

SQLB_STORDEF_PENDING
Storage must be defined

SQLB_RESTORE_IN_PROGRESS
Restore in progress

SQLB_STORDEF_ALLOWED
Storage may be defined

SQLB_STORDEF_FINAL_VERSION
Storage definition is in 'final' state

SQLB_STORDEF_CHANGED
Storage definition was changed prior to roll forward

SQLB_REBAL_IN_PROGRESS
DMS rebalancer is active

SQLB_PSTAT_DELETION
Table space deletion in progress

SQLB_PSTAT_CREATION
Table space creation in progress.

Possible values for FLAGS2 (defined in sqlutil) are:

SQLB_STATE_SET
For service use only.

API and data structure syntax

```
SQL_STRUCTURE SQLB_TBSPQRY_DATA
{
   char tbspqver[SQLB_SVERSION_SIZE];
   sqluint32 id;
   sqluint32 nameLen;
   char name[SQLB_MAX_TBS_NAME_SZ];
   sqluint32 totalPages;
   sqluint32 useablePages;
   sqluint32 flags;
   sqluint32 pageSize;
   sqluint32 extSize;
   sqluint32 prefetchSize;
   sqluint32 nContainers;
   sqluint32 tbsState;
   char lifeLSN[6];
   char pad[2];
   sqluint32 flags2;
   char minimumRecTime[SQL_STAMP_STRLEN+1];
```

```
   char pad1[1];
   sqluint32 StateChngObj;
   sqluint32 StateChngID;
   sqluint32 nQuiescers;
   struct SQLB_QUIESCER_DATA quiescer[SQLB_MAX_QUIESCERS];
   unsigned char   fsCaching;
   char reserved[31];
};

SQL_STRUCTURE SQLB_QUIESCER_DATA
{
   sqluint32 quiesceId;
   sqluint32 quiesceObject;
};
```

SQLB_QUIESCER_DATA data structure parameters

pad Reserved. Used for structure alignment and should not be populated by user data.

pad1 Reserved. Used for structure alignment and should not be populated by user data.

quiesceId
Input. ID of the table space that the quiesced object was created in.

quiesceObject
Input. Object ID of the quiesced object.

COBOL Structure

```
* File: sqlutbsp.cbl
01 SQLB-TBSPQRY-DATA.
    05 SQL-TBSPQVER          PIC X(8).
    05 SQL-ID                PIC 9(9) COMP-5.
    05 SQL-NAME-LEN          PIC 9(9) COMP-5.
    05 SQL-NAME              PIC X(128).
    05 SQL-TOTAL-PAGES       PIC 9(9) COMP-5.
    05 SQL-USEABLE-PAGES     PIC 9(9) COMP-5.
    05 SQL-FLAGS             PIC 9(9) COMP-5.
    05 SQL-PAGE-SIZE         PIC 9(9) COMP-5.
    05 SQL-EXT-SIZE          PIC 9(9) COMP-5.
    05 SQL-PREFETCH-SIZE     PIC 9(9) COMP-5.
    05 SQL-N-CONTAINERS      PIC 9(9) COMP-5.
    05 SQL-TBS-STATE         PIC 9(9) COMP-5.
    05 SQL-LIFE-LSN          PIC X(6).
    05 SQL-PAD               PIC X(2).
    05 SQL-FLAGS2            PIC 9(9) COMP-5.
    05 SQL-MINIMUM-REC-TIME  PIC X(26).
    05 FILLER                PIC X.
    05 SQL-PAD1              PIC X(1).
    05 SQL-STATE-CHNG-OBJ    PIC 9(9) COMP-5.
    05 SQL-STATE-CHNG-ID     PIC 9(9) COMP-5.
    05 SQL-N-QUIESCERS       PIC 9(9) COMP-5.
    05 SQL-QUIESCER OCCURS 5 TIMES.
        10 SQL-QUIESCE-ID    PIC 9(9) COMP-5.
        10 SQL-QUIESCE-OBJECT PIC 9(9) COMP-5.
    05 SQL-FSCACHING         PIC X(1).
    05 SQL-RESERVED          PIC X(31).
*
```

SQLCA

The SQL communications area (SQLCA) structure is used by the database manager to return error information to an application program. This structure is updated after every API call and SQL statement issued.

Language syntax

C Structure

```
/* File: sqlca.h */
/* Structure: SQLCA */
/* ... */
SQL_STRUCTURE  sqlca
{
  _SQLOLDCHAR    sqlcaid[8];
  sqlint32       sqlcabc;
  #ifdef DB2_SQL92E
  sqlint32       sqlcade;
  #else
  sqlint32       sqlcode;
  #endif
  short          sqlerrml;
  _SQLOLDCHAR    sqlerrmc[70];
  _SQLOLDCHAR    sqlerrp[8];
  sqlint32       sqlerrd[6];
  _SQLOLDCHAR    sqlwarn[11];
  #ifdef DB2_SQL92E
  _SQLOLDCHAR    sqlstat[5];
  #else
  _SQLOLDCHAR    sqlstate[5];
  #endif
};
/* ... */
```

COBOL Structure

```
* File: sqlca.cbl
01 SQLCA SYNC.
    05 SQLCAID PIC X(8) VALUE "SQLCA   ".
    05 SQLCABC PIC S9(9) COMP-5 VALUE 136.
    05 SQLCODE PIC S9(9) COMP-5.
    05 SQLERRM.
    05 SQLERRP PIC X(8).
    05 SQLERRD OCCURS 6 TIMES PIC S9(9) COMP-5.
    05 SQLWARN.
        10 SQLWARN0 PIC X.
        10 SQLWARN1 PIC X.
        10 SQLWARN2 PIC X.
        10 SQLWARN3 PIC X.
        10 SQLWARN4 PIC X.
        10 SQLWARN5 PIC X.
        10 SQLWARN6 PIC X.
        10 SQLWARN7 PIC X.
        10 SQLWARN8 PIC X.
        10 SQLWARN9 PIC X.
        10 SQLWARNA PIC X.
    05 SQLSTATE PIC X(5).
*
```

sqlchar

This structure is used to pass variable length data to the database manager.

Table 35. Fields in the SQLCHAR Structure

Field Name	Data Type	Description
LENGTH	SMALLINT	Length of the character string pointed to by DATA.
DATA	CHAR(n)	An array of characters of length LENGTH.

API and data structure syntax

```
SQL_STRUCTURE sqlchar
{
        short length;
        _SQLOLDCHAR data[1];
};
```

COBOL Structure

This is not defined in any header file. The following is an example that shows how to define the structure in COBOL:

```
* Replace maxlen with the appropriate value:
01 SQLCHAR.
49 SQLCHAR-LEN  PIC S9(4) COMP-5.
49 SQLCHAR-DATA PIC X(maxlen).
```

SQLDA

The SQL descriptor area (SQLDA) structure is a collection of variables that is required for execution of the SQL DESCRIBE statement. The SQLDA variables are options that can be used with the PREPARE, OPEN, FETCH, EXECUTE, and CALL statements.

An SQLDA communicates with dynamic SQL; it can be used in a DESCRIBE statement, modified with the addresses of host variables, and then reused in a FETCH statement.

SQLDAs are supported for all languages, but predefined declarations are provided only for C, REXX, FORTRAN, and COBOL.

The meaning of the information in an SQLDA depends on its use. In PREPARE and DESCRIBE, an SQLDA provides information to an application program about a prepared statement. In OPEN, EXECUTE, FETCH, and CALL, an SQLDA describes host variables.

Language syntax

C Structure

```
/* File: sqlda.h */
/* Structure: SQLDA */
/* ... */
SQL_STRUCTURE  sqlda
{
  _SQLOLDCHAR    sqldaid[8];
```

```
  long           sqldabc;
  short          sqln;
  short          sqld;
  struct sqlvar  sqlvar[1];
};
/* ... */
```

```
/* File: sqlda.h */
/* Structure: SQLVAR */
/* ... */
SQL_STRUCTURE  sqlvar
{
  short          sqltype;
  short          sqllen;
  _SQLOLDCHAR   *SQL_POINTER sqldata;
  short         *SQL_POINTER sqlind;
  struct sqlname sqlname;
};
/* ... */
```

```
/* File: sqlda.h */
/* Structure: SQLNAME */
/* ... */
SQL_STRUCTURE  sqlname
{
  short          length;
  _SQLOLDCHAR    data[30];
};
/* ... */
```

```
/* File: sqlda.h */
/* Structure: SQLVAR2 */
/* ... */
SQL_STRUCTURE  sqlvar2
{
  union sql8bytelen len;
  char *SQL_POINTER sqldatalen;
  struct sqldistinct_type sqldatatype_name;
};
/* ... */
```

```
/* File: sqlda.h */
/* Structure: SQL8BYTELEN */
/* ... */
union sql8bytelen
{
  long        reserve1[2];
  long        sqllonglen;
};
/* ... */
```

```
/* File: sqlda.h */
/* Structure: SQLDISTINCT-TYPE */
/* ... */
SQL_STRUCTURE  sqldistinct_type
{
  short          length;
  char           data[27];
  char           reserved1[3];
};
/* ... */
```

COBOL Structure

```
* File: sqlda.cbl
01 SQLDA SYNC.
    05 SQLDAID PIC X(8) VALUE "SQLDA  ".
    05 SQLDABC PIC S9(9) COMP-5.
    05 SQLN PIC S9(4) COMP-5.
    05 SQLD PIC S9(4) COMP-5.
```

```
    05 SQLVAR-ENTRIES OCCURS 0 TO 1489 TIMES
        10 SQLVAR.
        10 SQLVAR2 REDEFINES SQLVAR.
*
```

sqldcol

This structure is used to pass variable column information to the db2Export, db2Import, and db2Load APIs.

Table 36. Fields in the SQLDCOL Structure

Field Name	Data Type	Description
DCOLMETH	SMALLINT	A character indicating the method to be used to select columns within the data file.
DCOLNUM	SMALLINT	The number of columns specified in the array DCOLNAME .
DCOLNAME	Array	An array of DCOLNUM sqldcoln structures.

The valid values for DCOLMETH (defined in sqlutil) are:

SQL_METH_N
Names. When importing or loading, use the column names provided via this structure to identify the data to import or load from the external file. The case of these column names must match the case of the corresponding names in the system catalogs. When exporting, use the column names provided via this structure as the column names in the output file.

The dcolnptr pointer of each element of the dcolname array points to an array of characters, of length dcolnlen bytes, that make up the name of a column to be imported or loaded. The dcolnum field, which must be positive, indicates the number of elements in the dcolname array.

This method is invalid if the external file does not contain column names (DEL or ASC format files, for example).

SQL_METH_P
Positions. When importing or loading, use starting column positions provided via this structure to identify the data to import or load from the external file. This method is not valid when exporting data.

The dcolnptr pointer of each element of the dcolname array is ignored, while the dcolnlen field contains a column position in the external file. The dcolnum field, which must be positive, indicates the number of elements in the dcolname array.

The lowest valid column position value is 1 (indicating the first column), and the highest valid value depends on the external file type. Positional selection is not valid for import of ASC files.

SQL_METH_L
Locations. When importing or loading, use starting and ending column positions provided via this structure to identify the data to import or load from the external file. This method is not valid when exporting data.

The dcolnptr field of the first element of the dcolname array points to an sqlloctab structure, which consists of an array of sqllocpair structures. The number of elements in this array is determined by the dcolnum field of the sqldcol structure, which must be positive. Each element in the array is a pair of 2-byte integers that indicate where the column begins and ends. The first element of each location pair is the byte within the file where the column begins, and the second element is the byte where the column ends. The first byte position within a row in the file is considered byte position 1. The columns can overlap.

SQL_METH_D

Default. When importing or loading DEL and IXF files, the first column of the file is loaded or imported into the first column of the table, and so on. When exporting, the default names are used for the columns in the external file.

The dcolnum and dcolname fields of the sqldcol structure are both ignored, and the columns from the external file are taken in their natural order.

A column from the external file can be used in the array more than once. It is not necessary to use every column from the external file.

Table 37. Fields in the SQLDCOLN Structure

Field Name	Data Type	Description
DCOLNLEN	SMALLINT	Length of the data pointed to by DCOLNPTR.
DCOLNPTR	Pointer	Pointer to a data element determined by DCOLMETH.

Note: The DCOLNLEN and DCOLNPTR fields are repeated for each column specified.

Table 38. Fields in the SQLLOCTAB Structure

Field Name	Data Type	Description
LOCPAIR	Array	An array of sqllocpair structures.

Table 39. Fields in the SQLLOCPAIR Structure

Field Name	Data Type	Description
BEGIN_LOC	SMALLINT	Starting position of the column data in the external file.
END_LOC	SMALLINT	Ending position of the column data in the external file.

API and data structure syntax

```
SQL_STRUCTURE sqldcol
{
   short dcolmeth;
   short dcolnum;
   struct sqldcoln dcolname[1];
};
```

```
SQL_STRUCTURE sqldcoln
{
   short dcolnlen;
   char *dcolnptr;
};

SQL_STRUCTURE sqlloctab
{
   struct sqllocpair locpair[1];
};

SQL_STRUCTURE sqllocpair
{
   short begin_loc;
   short end_loc;
};
```

COBOL Structure

```
* File: sqlutil.cbl
01 SQL-DCOLDATA.
    05 SQL-DCOLMETH           PIC S9(4) COMP-5.
    05 SQL-DCOLNUM            PIC S9(4) COMP-5.
    05 SQLDCOLN OCCURS 0 TO 255 TIMES DEPENDING ON SQL-DCOLNUM.
        10 SQL-DCOLNLEN       PIC S9(4) COMP-5.
        10 FILLER             PIC X(2).
        10 SQL-DCOLN-PTR      USAGE IS POINTER.
*


* File: sqlutil.cbl
01 SQL-LOCTAB.
    05 SQL-LOC-PAIR OCCURS 1 TIMES.
        10 SQL-BEGIN-LOC      PIC S9(4) COMP-5.
        10 SQL-END-LOC        PIC S9(4) COMP-5.
*
```

sqle_addn_options

This structure is used to pass information to the sqleaddn API.

Table 40. Fields in the SQLE-ADDN-OPTIONS Structure

Field Name	Data Type	Description
SQLADDID	CHAR	An "eyecatcher" value which must be set to SQLE_ADDOPTID_V51.

Table 40. Fields in the SQLE-ADDN-OPTIONS Structure (continued)

Field Name	Data Type	Description
TBLSPACE_TYPE	sqluint32	Specifies the type of system temporary table space definitions to be used for the node being added. See below for values. Note: This option is ignored for system temporary table spaces that are defined to use automatic storage (that is system temporary table spaces that were created with the MANAGED BY AUTOMATIC STORAGE clause of the CREATE TABLESPACE statement or where no MANAGED BY CLAUSE was specified at all). For these table spaces, there is no way to defer container creation or choose to create a set of containers like they are defined on another partition. Containers will automatically be assigned by the database manager based on the storage paths that are associated with the database.
TBLSPACE_NODE	SQL_PDB_NODE_TYPE	Specifies the node number from which the system temporary table space definitions should be obtained. The node number must exist in the db2nodes.cfg file, and is only used if the tblspace_type field is set to SQLE_TABLESPACES_LIKE_NODE.

Valid values for TBLSPACE_TYPE (defined in sqlenv) are:

SQLE_TABLESPACES_NONE
Do not create any system temporary table spaces.

SQLE_TABLESPACES_LIKE_NODE
The containers for the system temporary table spaces should be the same as those for the specified node.

SQLE_TABLESPACES_LIKE_CATALOG
The containers for the system temporary table spaces should be the same as those for the catalog node of each database.

API and data structure syntax

```
SQL_STRUCTURE sqle_addn_options
{
        char sqladdid[8];
        sqluint32 tblspace_type;
        SQL_PDB_NODE_TYPE tblspace_node;
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQLE-ADDN-OPTIONS.
    05 SQLADDID              PIC X(8).
```

```
    05 SQL-TBLSPACE-TYPE      PIC 9(9) COMP-5.
    05 SQL-TBLSPACE-NODE      PIC S9(4) COMP-5.
    05 FILLER                 PIC X(2).
*
```

sqle_client_info

This structure is used to pass information to the sqleseti and sqleqryi APIs. This structure specifies:

- The type of information being set or queried
- The length of the data being set or queried
- A pointer to either:
  - An area that will contain the data being set
  - An area of sufficient length to contain the data being queried

Applications can specify the following types of information:

- Client user ID being set or queried. A maximum of 255 characters can be set, although servers can truncate this to some platform-specific value.

  Note: This user ID is for identification purposes only, and is not used for any authorization.
- Client workstation name being set or queried. A maximum of 255 characters can be set, although servers can truncate this to some platform-specific value.
- Client application name being set or queried. A maximum of 255 characters can be set, although servers can truncate this to some platform-specific value.
- Client current package path being set or queried. A maximum of 255 characters can be set, although servers can truncate this to some platform-specific value.
- Client program ID being set or queried. A maximum of 80 characters can be set, although servers can truncate this to some platform-specific value.
- Client accounting string being set or queried. A maximum of 200 characters can be set, although servers can truncate this to some platform-specific value.

  Note: The information can be set using the sqlesact API. However, sqlesact does not permit the accounting string to be changed once a connection exists, whereas sqleseti allows the accounting information to be changed for future, as well as already established, connections.

Table 41. Fields in the SQLE-CLIENT-INFO Structure

Field Name	Data Type	Description
TYPE	sqlint32	Setting type.
LENGTH	sqlint32	Length of the value. On sqleseti calls, the length can be between zero and the maximum length defined for the type. A length of zero indicates a null value. On sqleqryi calls, the length is returned, but the area pointed to by pValue must be large enough to contain the maximum length for the type. A length of zero indicates a null value.
PVALUE	Pointer	Pointer to an application-allocated buffer that contains the specified value. The data type of this value is dependent on the type field.

The valid entries for the SQLE-CLIENT-INFO TYPE element and the associated descriptions for each entry are listed below:

Table 42. Connection Settings

Type	Data Type	Description
SQLE_CLIENT_INFO_USERID	CHAR(255)	The user ID for the client. Some servers may truncate the value. For example, DB2 for z/OS servers support up to length 16. This user ID is for identification purposes only, and is not used for any authorization.
SQLE_CLIENT_INFO_WRKSTNNAME	CHAR(255)	The workstation name for the client. Some servers may truncate the value. For example, DB2 for z/OS servers support up to length 18.
SQLE_CLIENT_INFO_APPLNAME	CHAR(255)	The application name for the client. Some servers may truncate the value. For example, DB2 for z/OS servers support up to length 32.
SQLE_CLIENT_INFO_PROGRAMID	CHAR(80)	The program identifier for the client. Once this element is set, DB2 Universal Database for z/OS Version 8 associates this identifier with any statements inserted into the dynamic SQL statement cache. This element is only supported for applications accessing DB2 UDB for z/OS Version 8.
SQLE_CLIENT_INFO_ACCTSTR	CHAR(200)	The accounting string for the client. Some servers may truncate the value. For example, DB2 for z/OS servers support up to length 200.
SQLE_CLIENT_INFO_AUTOCOMMIT	CHAR(1)	The autocommit setting of the client. It can be set to SQLE_CLIENT_AUTOCOMMIT_ON or SQLE_CLIENT_AUTOCOMMIT_OFF.

Note: These field names are defined for the C programming language. There are similar names for FORTRAN and COBOL, which have the same semantics.

API and data structure syntax

```
SQL_STRUCTURE sqle_client_info
{
        unsigned short         type;
        unsigned short         length;
        char *pValue;
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQLE-CLIENT-INFO.
    05 SQLE-CLIENT-INFO-ITEM OCCURS 4 TIMES.
        10 SQLE-CLIENT-INFO-TYPE   PIC S9(4) COMP-5.
        10 SQLE-CLIENT-INFO-LENGTH PIC S9(4) COMP-5.
        10 SQLE-CLIENT-INFO-VALUE  USAGE IS POINTER.
*
```

sqle_conn_setting

This structure is used to specify connection setting types and values for the sqleqryc and sqlesetc APIs.

Table 43. Fields in the SQLE-CONN-SETTING Structure

Field Name	Data Type	Description
TYPE VALUE	SMALLINT SMALLINT	Setting type. Setting value.

The valid entries for the SQLE-CONN-SETTING TYPE element and the associated descriptions for each entry are listed below (defined in sqlenv and sql):

Table 44. Connection Settings

Type	Value	Description
SQL_CONNECT_TYPE	SQL_CONNECT_1 SQL_CONNECT_2	Type 1 CONNECTs enforce the single database per unit of work semantics of older releases, also known as the rules for remote unit of work (RUOW). Type 2 CONNECTs support the multiple databases per unit of work semantics of DUOW.
SQL_RULES	SQL_RULES_DB2 SQL_RULES_STD	Enable the SQL CONNECT statement to switch the current connection to an established (dormant) connection. Permit only the establishment of a new connection through the SQL CONNECT statement. The SQL SET CONNECTION statement must be used to switch the current connection to a dormant connection.
SQL_DISCONNECT	SQL_DISCONNECT_EXPL SQL_DISCONNECT_COND SQL_DISCONNECT_AUTO	Removes those connections that have been explicitly marked for release by the SQL RELEASE statement at commit. Breaks those connections that have no open WITH HOLD cursors at commit, and those that have been marked for release by the SQL RELEASE statement. Breaks all connections at commit.

Table 44. Connection Settings (continued)

Type	Value	Description
SQL_DEFERRED_PREPARE	SQL_DEFERRED_PREPARE_NO SQL_DEFERRED_PREPARE_YES SQL_DEFERRED_PREPARE_ALL	The PREPARE statement will be executed at the time it is issued. Execution of the PREPARE statement will be deferred until the corresponding OPEN, DESCRIBE, or EXECUTE statement is issued. The PREPARE statement will not be deferred if it uses the INTO clause, which requires an SQLDA to be returned immediately. However, if the PREPARE INTO statement is issued for a cursor that does not use any parameter markers, the processing will be optimized by pre-OPENing the cursor when the PREPARE is executed. Same as YES, except that a PREPARE INTO statement which contains parameter markers is deferred. If a PREPARE INTO statement does not contain parameter markers, pre-OPENing of the cursor will still be performed. If the PREPARE statement uses the INTO clause to return an SQLDA, the application must not reference the content of this SQLDA until the OPEN, DESCRIBE, or EXECUTE statement is issued and returned.
SQL_CONNECT_NODE	Between 0 and 999, or the keyword SQL_CONN_CATALOG_NODE.	Specifies the node to which a connect is to be made. Overrides the value of the environment variable DB2NODE. For example, if nodes 1, 2, and 3 are defined, the client only needs to be able to access one of these nodes. If only node 1 containing databases has been cataloged, and this parameter is set to 3, the next connect attempt will result in a connection at node 3, after an initial connection at node 1.
SQL_ATTACH_NODE	Between 0 and 999.	Specifies the node to which an attach is to be made. Overrides the value of the environment variable DB2NODE. For example, if nodes 1, 2, and 3 are defined, the client only needs to be able to access one of these nodes. If only node 1 containing databases has been cataloged, and this parameter is set to 3, then the next attach attempt will result in an attachment at node 3, after an initial attachment at node 1.

Note: These field names are defined for the C programming language. There are similar names for FORTRAN and COBOL, which have the same semantics.

API and data structure syntax

```
SQL_STRUCTURE sqle_conn_setting
{
        unsigned short         type;
        unsigned short         value;
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQLE-CONN-SETTING.
    05 SQLE-CONN-SETTING-ITEM OCCURS 7 TIMES.
        10 SQLE-CONN-TYPE  PIC S9(4) COMP-5.
        10 SQLE-CONN-VALUE PIC S9(4) COMP-5.
*
```

sqle_node_local

This structure is used to catalog local nodes for the sqlectnd API.

Table 45. Fields in the SQLE-NODE-LOCAL Structure

Field Name	Data Type	Description
INSTANCE_NAME	CHAR(8)	Name of an instance.

Note: The character fields passed in this structure must be null terminated or blank filled up to the length of the field.

API and data structure syntax

```
SQL_STRUCTURE sqle_node_local
{
        char instance_name[SQL_INSTNAME_SZ+1];
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQL-NODE-LOCAL.
    05 SQL-INSTANCE-NAME      PIC X(8).
    05 FILLER                 PIC X.
*
```

sqle_node_npipe

This structure is used to catalog named pipe nodes for the sqlectnd API.

Table 46. Fields in the SQLE-NODE-NPIPE Structure

Field Name	Data Type	Description
COMPUTERNAME	CHAR(15)	Computer name.
INSTANCE_NAME	CHAR(8)	Name of an instance.

Note: The character fields passed in this structure must be null terminated or blank filled up to the length of the field.

API and data structure syntax

```
SQL_STRUCTURE sqle_node_npipe
{
        char computername[SQL_COMPUTERNAME_SZ+1];
        char instance_name[SQL_INSTNAME_SZ+1];
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQL-NODE-NPIPE.
    05 COMPUTERNAME           PIC X(15).
    05 FILLER                 PIC X.
    05 INSTANCE-NAME          PIC X(8).
    05 FILLER                 PIC X.
*
```

sqle_node_struct

This structure is used to catalog nodes for the sqlectnd API.

Note: NetBIOS is no longer supported. SNA, including its APIs APPC, APPN, and CPI-C, is also no longer supported. If you use these protocols, you must re-catalog your nodes and databases using a supported protocol such as TCP/IP. References to these protocols should be ignored.

Table 47. Fields in the SQLE-NODE-STRUCT Structure

Field Name	Data Type	Description
STRUCT_ID	SMALLINT	Structure identifier.
CODEPAGE	SMALLINT	Code page for comment.
COMMENT	CHAR(30)	Optional description of the node.
NODENAME	CHAR(8)	Local name for the node where the database is located.
PROTOCOL	CHAR(1)	Communications protocol type.

Note: The character fields passed in this structure must be null terminated or blank filled up to the length of the field.

Valid values for PROTOCOL (defined in sqlenv) are:

- SQL_PROTOCOL_APPC
- SQL_PROTOCOL_APPN
- SQL_PROTOCOL_CPIC
- SQL_PROTOCOL_LOCAL
- SQL_PROTOCOL_NETB
- SQL_PROTOCOL_NPIPE
- SQL_PROTOCOL_SOCKS
- SQL_PROTOCOL_TCPIP

API and data structure syntax

```
SQL_STRUCTURE sqle_node_struct
{
        unsigned short struct_id;
        unsigned short codepage;
        _SQLOLDCHAR comment[SQL_CMT_SZ + 1];
        _SQLOLDCHAR nodename[SQL_NNAME_SZ + 1];
        unsigned char  protocol;
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQL-NODE-STRUCT.
    05 STRUCT-ID             PIC 9(4) COMP-5.
    05 CODEPAGE              PIC 9(4) COMP-5.
    05 COMMENT               PIC X(30).
    05 FILLER                PIC X.
    05 NODENAME              PIC X(8).
    05 FILLER                PIC X.
    05 PROTOCOL              PIC X.
    05 FILLER                PIC X(1).
*
```

sqle_node_tcpip

This structure is used to catalog TCP/IP nodes for the sqlectnd API.

Note: To catalog a TCP/IP, TCP/IPv4 or TCP/IPv6 node, set the PROTOCOL type in the node directory structure to SQL_PROTOCOL_TCPIP, SQL_PROTOCOL_TCPIP4 or SQL_PROTOCOL_TCPIP6 respectively in the SQLE-NODE-STRUCT structure before calling the sqlectnd API. To catalog a TCP/IP or TCP/IPv4 SOCKS node, set the PROTOCOL type in the node directory structure to SQL_PROTOCOL_SOCKS or SQL_PROTOCOL_SOCKS4 respectively in the SQLE-NODE-STRUCT structure before calling the sqlectnd API. SOCKS is not supported on IPv6. For example, SQL_PROTOCOL_SOCKS with an IPv6 address is not supported.

Table 48. Fields in the SQLE-NODE-TCPIP Structure

Field Name	Data Type	Description
HOSTNAME	CHAR(255)	Hostname or IP address on which the DB2 server instance resides. The type of IP address accepted depends on the protocol selected.
SERVICE_NAME	CHAR(14)	TCP/IP service name or associated port number of the DB2 server instance.

Note: The character fields passed in this structure must be null terminated or blank filled up to the length of the field.

API and data structure syntax

```
SQL_STRUCTURE sqle_node_tcpip
{
        _SQLOLDCHAR hostname[SQL_HOSTNAME_SZ+1];
        _SQLOLDCHAR service_name[SQL_SERVICE_NAME_SZ+1];
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQL-NODE-TCPIP.
    05 HOSTNAME              PIC X(255).
    05 FILLER                PIC X.
    05 SERVICE-NAME          PIC X(14).
    05 FILLER                PIC X.
*
```

sqledbdesc

The Database Description Block (SQLEDBDESC) structure can be used during a call to the sqlecrea API to specify permanent values for database attributes. These attributes include database comment, collating sequences, and table space definitions.

Table 49. Fields in the SQLEDBDESC Structure

Field Name	Data Type	Description
SQLDBDID	CHAR(8)	A structure identifier and ″eye-catcher″ for storage dumps. It is a string of eight bytes that must be initialized with the value of SQLE_DBDESC_2 (defined in sqlenv). The contents of this field are validated for version control.
SQLDBCCP	INTEGER	The code page of the database comment. This value is no longer used by the database manager.
SQLDBCSS	INTEGER	A value indicating the source of the database collating sequence. See below for values. Note: Specify SQL_CS_NONE to specify that the collating sequence for the database is IDENTITY (which implements a binary collating sequence). SQL_CS_NONE is the default.

Table 49. Fields in the SQLEDBDESC Structure (continued)

Field Name	Data Type	Description
SQLDBUDC	CHAR(256)	If SQLDBCSS is set to SQL_CS_USER, the *n*th byte of this field contains the sort weight of the code point whose underlying decimal representation is n in the code page of the database. If SQLDBCSS is set to SQL_CS_UNICODE, this field contains the language-aware or locale-sensitive UCA-based collation name (a NULL terminated string up to 128 bytes in length). If SQLDBCSS is not equal to SQL_CS_USER or SQL_CS_UNICODE, this field is ignored.
SQLDBCMT	CHAR(30)	The comment for the database.
SQLDBSGP	INTEGER	Reserved field. No longer used.
SQLDBNSG	SHORT	A value that indicates the number of file segments to be created in the database. The minimum value for this field is 1 and the maximum value for this field is 256. If a value of -1 is supplied, this field will default to 1. Note: SQLDBNSG set to zero produces a default for Version 1 compatibility.
SQLTSEXT	INTEGER	A value, in 4KB pages, which indicates the default extent size for each table space in the database. The minimum value for this field is 2 and the maximum value for this field is 256. If a value of -1 is supplied, this field will default to 32.
SQLCATTS	Pointer	A pointer to a table space description control block, SQLETSDESC, which defines the catalog table space. If null, a default catalog table space based on the values of SQLTSEXT and SQLDBNSG will be created.

Table 49. Fields in the SQLEDBDESC Structure (continued)

Field Name	Data Type	Description
SQLUSRTS	Pointer	A pointer to a table space description control block, SQLETSDESC, which defines the user table space. If null, a default user table space based on the values of SQLTSEXT and SQLDBNSG will be created.
SQLTMPTS	Pointer	A pointer to a table space description control block, SQLETSDESC, which defines the system temporary table space. If null, a default system temporary table space based on the values of SQLTSEXT and SQLDBNSG will be created.

The table space description block structure (SQLETSDESC) is used to specify the attributes of any of the three initial table spaces.

Table 50. Fields in the SQLETSDESC Structure

Field Name	Data Type	Description
SQLTSDID	CHAR(8)	A structure identifier and ″eye-catcher″ for storage dumps. It is a string of eight bytes that must be initialized with the value of SQLE_DBTSDESC_1 (defined in sqlenv). The contents of this field are validated for version control.
SQLEXTNT	INTEGER	Table space extent size, in 4 KB pages. If a value of -1 is supplied, this field will default to the current value of the dft_extent_sz configuration parameter.
SQLPRFTC	INTEGER	Table space prefetch size, in 4 KB pages. If a value of -1 is supplied, this field will default to the current value of the dft_prefetch_sz configuration parameter.

Table 50. Fields in the SQLETSDESC Structure (continued)

Field Name	Data Type	Description
SQLFSCACHING	UNSIGNED CHAR	File system caching. If a value of 1 is supplied, file system caching will be OFF for the current table space. If a value of 0 is supplied, file system caching will be ON for the current table space. Specify 2 to indicate the default setting. In this case, file system caching will be OFF on AIX, Linux, Solaris, and Windows except on AIX JFS, Linux on System z™, Solaris non-VxFS for SMS temporary table space files, and for SMS Large Object files or Large Files. File system caching will be ON for all other platforms.
SQLPOVHD	DOUBLE	Table space I/O overhead, in milliseconds. If a value of -1 is supplied, this field will default to an internal database manager value (currently 24.1 ms) that could change with future releases.
SQLTRFRT	DOUBLE	Table space I/O transfer rate, in milliseconds. If a value of -1 is supplied, this field will default to an internal database manager value (currently 0.9 ms) that could change with future releases.
SQLTSTYP	CHAR(1)	Indicates whether the table space is system-managed or database-managed. See below for values.
SQLCCNT	SMALLINT	Number of containers being assigned to the table space. Indicates how many SQLCTYPE/SQLCSIZE/ SQLCLEN/SQLCONTR values follow.
CONTAINR	Array	An array of sqlccnt SQLETSCDESC structures.

Table 51. Fields in the SQLETSCDESC Structure

Field Name	Data Type	Description
SQLCTYPE	CHAR(1)	Identifies the type of this container. See below for values.

Table 51. Fields in the SQLETSCDESC Structure (continued)

Field Name	Data Type	Description
SQLCSIZE	INTEGER	Size of the container identified in SQLCONTR, specified in 4KB pages. Valid only when SQLTSTYP is set to SQL_TBS_TYP_DMS.
SQLCLEN	SMALLINT	Length of following SQLCONTR value.
SQLCONTR	CHAR(256)	Container string.

Valid values for SQLDBCSS (defined in sqlenv) are:

SQL_CS_SYSTEM
For non-Unicode databases, this is the default option, with the collating sequence based on the database territory. For Unicode databases, this option is equivalent to the IDENTITY option. If you pass a NULL pointer, the collating sequence of the operating system (based on the current locale code and the code page) is used. This is the same as specifying SQLDBCSS equal to SQL_CS_SYSTEM (0).

SQL_CS_USER
Collation sequence is specified by the 256-byte weight table supplied by the user. Each weight in the table is one byte in length.

SQL_CS_NONE
Identity collating sequence, in which strings are compared byte for byte. This is the default for Unicode databases.

SQL_CS_COMPATABILITY
Use pre-Version collating sequence.

SQL_CS_SYSTEM_NLSCHAR
Collating sequence from system using the NLS version of compare routines for character types. This value can only be specified when creating a Thai TIS620-1 database.

SQL_CS_USER_NLSCHAR
Collation sequence is specified by the 256-byte weight table supplied by the user. Each weight in the table is one byte in length. This value can only be specified when creating a Thai TIS620-1 database.

SQL_CS_IDENTITY_16BIT
CESU-8 (Compatibility Encoding Scheme for UTF-16: 8-Bit) collation sequence as specified by the Unicode Technical Report #26, available at the Unicode Consortium web site (www.unicode.org). This value can only be specified when creating a Unicode database.

SQL_CS_UCA400_NO
UCA (Unicode Collation Algorithm) collation sequence based on the Unicode Standard version 4.0.0 with normalization implicitly set to 'on'. Details of the UCA can be found in the Unicode Technical Standard #10 available at the Unicode Consortium web site (www.unicode.org). This value can only be specified when creating a Unicode database.

SQL_CS_UCA400_LSK
The UCA (Unicode Collation Algorithm) collation sequence that is based on the Unicode Standard version 4.0.0 but will sort Slovakian characters in the appropriate order. Details of the UCA can be found in the Unicode

Technical Standard #10, which is available at the Unicode Consortium Web site (www.unicode.org). This value can only be specified when creating a Unicode database.

SQL_CS_UCA400_LTH
UCA (Unicode Collation Algorithm) collation sequence based on the Unicode Standard version 4.0.0, with sorting of all Thai characters according to the Royal Thai Dictionary order. Details of the UCA can be found in the Unicode Technical Standard #10 available at the Unicode Consortium web site (www.unicode.org). This value can only be specified when creating a Unicode database.

SQL_CS_UNICODE

Collating sequence is language-based for a Unicode database. The specific collation name is specified in the SQLDBUDC field and must be terminated with a 0x00 byte. The collation name can identify any language-aware collation as defined in ″Language-aware collations for Unicode data″ or any locale-sensitive UCA-based collation identified in ″Unicode Collation Algorithm based collations″.

For example, to use collation equivalent to US English in code page 819, set SQLDBCSS to SQL_CS_UNICODE and SQLDBUDC to SYSTEM_819_US.

Note: When CREATE DATABASE is performed against a server earlier than Version 9.5, this option cannot be used. By default, a Unicode database on such a server will be created with SYSTEM collation.

Valid values for SQLTSTYP (defined in sqlenv) are:

SQL_TBS_TYP_SMS
System managed

SQL_TBS_TYP_DMS
Database managed

Valid values for SQLCTYPE (defined in sqlenv) are:

SQL_TBSC_TYP_DEV
Device. Valid only when SQLTSTYP = SQL_TBS_TYP_DMS.

SQL_TBSC_TYP_FILE
File. Valid only when SQLTSTYP = SQL_TBS_TYP_DMS.

SQL_TBSC_TYP_PATH
Path (directory). Valid only when SQLTSTYP = SQL_TBS_TYP_SMS.

API and data structure syntax

```
SQL_STRUCTURE sqledbdesc
{
        _SQLOLDCHAR sqldbdid[8];
        sqlint32 sqldbccp;
        sqlint32 sqldbcss;
        unsigned char  sqldbudc[SQL_CS_SZ];
        _SQLOLDCHAR sqldbcmt[SQL_CMT_SZ+1];
        _SQLOLDCHAR pad[1];
        sqluint32 sqldbsgp;
        short sqldbnsg;
        char pad2[2];
        sqlint32 sqltsext;
        struct SQLETSDESC *sqlcatts;
```

```
        struct SQLETSDESC *sqlusrts;
        struct SQLETSDESC *sqltmpts;
};

SQL_STRUCTURE SQLETSDESC
{
        char sqltsdid[8];
        sqlint32 sqlextnt;
        sqlint32 sqlprftc;
        double sqlpovhd;
        double sqltrfrt;
        char sqltstyp;
        unsigned char  sqlfscaching;
        short sqlccnt;
        struct SQLETSCDESC containr[1];
};

SQL_STRUCTURE SQLETSCDESC
{
        char sqlctype;
        char pad1[3];
        sqlint32 sqlcsize;
        short sqlclen;
        char sqlcontr[SQLB_MAX_CONTAIN_NAME_SZ];
        char pad2[2];
};
```

sqledbdesc structure parameters

pad1 Reserved. Used for structure alignment and should not to be populated by user data.

pad2 Reserved. Used for structure alignment and should not to be populated by user data.

SQLETSCDESC structure parameters

pad1 Reserved. Used for structure alignment and should not to be populated by user data.

pad2 Reserved. Used for structure alignment and should not to be populated by user data.

COBOL Structure

```
* File: sqlenv.cbl
01 SQLEDBDESC.
    05 SQLDBDID              PIC X(8).
    05 SQLDBCCP              PIC S9(9) COMP-5.
    05 SQLDBCSS              PIC S9(9) COMP-5.
    05 SQLDBUDC              PIC X(256).
    05 SQLDBCMT              PIC X(30).
    05 FILLER                PIC X.
    05 SQL-PAD               PIC X(1).
    05 SQLDBSGP              PIC 9(9) COMP-5.
    05 SQLDBNSG              PIC S9(4) COMP-5.
    05 SQL-PAD2              PIC X(2).
    05 SQLTSEXT              PIC S9(9) COMP-5.
    05 SQLCATTS              USAGE IS POINTER.
    05 SQLUSRTS              USAGE IS POINTER.
    05 SQLTMPTS              USAGE IS POINTER.
*


* File: sqletsd.cbl
01 SQLETSDESC.
    05 SQLTSDID              PIC X(8).
```

```
    05 SQLEXTNT               PIC S9(9) COMP-5.
    05 SQLPRFTC               PIC S9(9) COMP-5.
    05 SQLPOVHD               USAGE COMP-2.
    05 SQLTRFRT               USAGE COMP-2.
    05 SQLTSTYP               PIC X.
    05 SQL-PAD1               PIC X.
    05 SQLCCNT                PIC S9(4) COMP-5.
    05 SQL-CONTAINR OCCURS 001 TIMES.
        10 SQLCTYPE           PIC X.
        10 SQL-PAD1           PIC X(3).
        10 SQLCSIZE           PIC S9(9) COMP-5.
        10 SQLCLEN            PIC S9(4) COMP-5.
        10 SQLCONTR           PIC X(256).
        10 SQL-PAD2           PIC X(2).
*


* File: sqlenv.cbl
01 SQLETSCDESC.
    05 SQLCTYPE               PIC X.
    05 SQL-PAD1               PIC X(3).
    05 SQLCSIZE               PIC S9(9) COMP-5.
    05 SQLCLEN                PIC S9(4) COMP-5.
    05 SQLCONTR               PIC X(256).
    05 SQL-PAD2               PIC X(2).
*
```

sqledbdescext

The extended database description block (sqledbdescext) structure is used during a call to the sqlecrea API to specify permanent values for database attributes. The extended database description block enables automatic storage for a database, chooses a default page size for the database, or specifies values for new table space attributes that have been introduced. This structure is used in addition to, not instead of, the database description block (sqledbdesc) structure.

If this structure is not passed to the sqlecrea API, the following behavior is used:

- Automatic storage is enabled for the database
- The default page size for the database is 4096 bytes (4 KB)
- If relevant, DB2 database systems determine the value of the extended table space attributes automatically

API and data structure syntax

```
SQL_STRUCTURE sqledbdescext
{
        sqluint32 sqlPageSize;
        struct sqleAutoStorageCfg *sqlAutoStorage;
        struct SQLETSDESCEXT *sqlcattsext;
        struct SQLETSDESCEXT *sqlusrtsext;
        struct SQLETSDESCEXT *sqltmptsext;
        void *reserved;
};

SQL_STRUCTURE sqleAutoStorageCfg
{
        char sqlEnableAutoStorage;
        char pad[3];
        sqluint32 sqlNumStoragePaths;
        char **sqlStoragePaths;
};

SQL_STRUCTURE SQLETSDESCEXT
```

```
{
        sqlint64 sqlInitSize;
        sqlint64 sqlIncreaseSize;
        sqlint64 sqlMaximumSize;
        char sqlAutoResize;
        char sqlInitSizeUnit;
        char sqlIncreaseSizeUnit;
        char sqlMaximumSizeUnit;
};

SQL_STRUCTURE sqledboptions
{
        void *piAutoConfigInterface;
        sqlint32 restrictive;
        void *reserved;
};
```

sqledbdescext data structure parameters

Table 52. Fields in the sqledbdescext structure

Field name	Data type	Description
SQLPAGESIZE	sqluint32	Specifies the page size of the default buffer pool as well as the initial table spaces (SYSCATSPACE, TEMPSPACE1, USERSPACE1) when the database is created. The value given also represents the default page size for all future CREATE BUFFERPOOL and CREATE TABLESPACE statements. See the information that follows this table for values.
SQLAUTOSTORAGE	Pointer	A pointer to an automatic storage configuration structure. This pointer enables or disables automatic storage for the database. If a pointer is given, automatic storage may be enabled or disabled. If NULL, automatic storage is enabled and a single storage path is assumed with a value determined by the `dbpath` passed in, or the database manager configuration parameter, `dftdbpath`.
SQLCATTSEXT	Pointer	A pointer to an extended table space description control block (SQLETSDESCEXT) for the system catalog table space, which defines additional attributes to those found in SQLETSDESC. If NULL, the database manager determines the value of these attributes automatically (if relevant).
SQLUSRTSEXT	Pointer	A pointer to an extended table space description control block (SQLETSDESCEXT) for the user table space, which defines additional attributes to those found in SQLETSDESC. If NULL, the database manager determines the value of these attributes automatically (if relevant).
SQLTMPTSEXT	Pointer	A pointer to an extended table space description control block (SQLETSDESCEXT) for the system temporary table space, which defines additional attributes to those found in SQLETSDESC. If NULL, the database manager determines the value of these attributes automatically (if relevant).

Table 52. Fields in the sqledbdescext structure (continued)

Field name	Data type	Description
RESERVED	Pointer	A pointer to a database options control block (sqledboptions).

Valid values for SQLPAGESIZE (defined in sqlenv) are:

SQL_PAGESIZE_4K
Default page size for the database is 4 096 bytes.

SQL_PAGESIZE_8K
Default page size for the database is 8 192 bytes.

SQL_PAGESIZE_16K
Default page size for the database is 16 384 bytes.

SQL_PAGESIZE_32K
Default page size for the database is 32 768 bytes.

Automatic storage configuration (sqleAutoStorageCfg) data structure parameters

The automatic storage configuration (sqleAutoStorageCfg) structure can be used during a call to the sqlecrea API. It is an element of the sqledbdescext structure, and it specifies whether or not automatic storage is enabled for the database.

Table 53. Fields in the sqleAutoStorageCfg Structure

Field name	Data type	Description
SQLENABLEAUTOSTORAGE	CHAR(1)	Specifies whether or not automatic storage is enabled for the database. See the information that follows this table for values.
SQLNUMSTORAGEPATHS	sqluint32	A value indicating the number of storage paths being pointed to by the SQLSTORAGEPATHS array. If the value is 0, the SQLSTORAGEPATHS pointer must be NULL. The maximum number of storage paths is 128 (SQL_MAX_STORAGE_PATHS).
SQLSTORAGEPATHS	Pointer	An array of string pointers that point to storage paths. The number of pointers in the array is reflected by SQLNUMSTORAGEPATHS. Set SQLSTORAGEPATHS to NULL if there are no storage paths being provided (in which case, SQLNUMSTORAGEPATHS must be set to 0). The maximum length of each path is 175 characters.

Valid values for SQLENABLEAUTOSTORAGE (defined in sqlenv) are:

SQL_AUTOMATIC_STORAGE_NO
Automatic storage is disabled for the database. When this value is used, SQLNUMSTORAGEPATHS must be set to 0 and SQLSTORAGEPATHS must be set to NULL.

SQL_AUTOMATIC_STORAGE_YES
Automatic storage is enabled for the database. The storage paths used for automatic storage are specified using the SQLSTORAGEPATHS pointer. If this pointer is NULL, then a single storage path is assumed with a value determined by database manager configuration parameter dftdbpath.

SQL_AUTOMATIC_STORAGE_DFT
The database manager determines whether or not automatic storage is enabled. Currently, the choice is made based on the SQLSTORAGEPATHS pointer. If this pointer is NULL, automatic storage is not enabled, otherwise it is enabled. The default value is equivalent to SQL_AUTOMATIC_STORAGE_YES.

Extended table space description block (SQLETSDESCEXT) structure parameters

The extended table space description block (SQLETSDESCEXT) structure is used to specify the attributes for the three initial table spaces. This structure is used in addition to, not instead of, the Table Space Description Block (SQLETSDESC) structure.

Table 54. Fields in the SQLETSDESCEXT Structure

Field name	Data type	Description
SQLINITSIZE	sqlint64	Defines the initial size of each table space that uses automatic storage. This field is only relevant for regular or large automatic storage table spaces. Use a value of SQL_TBS_AUTOMATIC_INITSIZE for other table space types or if the intent is to have DB2 automatically determine an initial size. Note: The actual value used by the database manager may be slightly smaller or larger than what was specified. This action is taken to keep sizes consistent across containers in the table space and the value provided may not allow for that consistency.
SQLINCREASESIZE	sqlint64	Defines the size that the database manager automatically increases the table space by when the table space becomes full. This field is only relevant for table spaces that have auto-resize enabled. Use a value of SQL_TBS_AUTOMATIC_INCSIZE if auto-resize is disabled or if the intent is to have the database manager determine the size increase automatically. Note: The actual value used by the database manager may be slightly smaller or larger than what was specified. This action is taken to keep sizes consistent across containers in the table space and the value provided may not allow for that consistency.

Table 54. Fields in the SQLETSDESCEXT Structure (continued)

Field name	Data type	Description
SQLMAXIMUMSIZE	sqlint64	Defines the maximum size to which the database manager automatically increases the table space. Alternately, a value of SQL_TBS_NO_MAXSIZE can be used to specify that the maximum size is ″unlimited″, in which case the table space can grow to the architectural limit for the table space or until a ″filesystem full″ condition is encountered. This field is only relevant for table spaces that have auto-resize enabled. Use a value of SQL_TBS_AUTOMATIC_MAXSIZE if auto-resize is disabled or if the intent is to have the database manager determine the maximum size automatically. Note: The actual value used by the database manager may be slightly smaller or larger than what was specified. This action is taken to keep sizes consistent across containers in the table space and the value provided may not allow for that consistency.
SQLAUTORESIZE	CHAR(1)	Specifies whether auto-resize is enabled for the table space or not. See the information that follows this table for values.
SQLINITSIZEUNIT	CHAR(1)	If relevant, indicates whether SQLINITSIZE is being provided in bytes, kilobytes, megabytes, or gigabytes. See the information that follows this table for values.
SQLINCREASESIZEUNIT	CHAR(1)	If relevant, indicates whether SQLINCREASESIZE is being provided in bytes, kilobytes, megabytes, gigabytes, or as a percentage. See the information that follows this table for values.
SQLMAXIMUMSIZEUNIT	CHAR(1)	If relevant, indicates whether SQLMAXIMUMSIZE is being provided in bytes, kilobytes, megabytes, or gigabytes. See the information that follows this table for values.

Valid values for SQLAUTORESIZE (defined in sqlenv) are:

SQL_TBS_AUTORESIZE_NO
Auto-resize is disabled for the table space. This value can only be specified for database-managed space (DMS) table spaces or automatic storage table spaces.

SQL_TBS_AUTORESIZE_YES
Auto-resize is enabled for the table space. This value can only be specified for database-managed space (DMS) table spaces or automatic storage table spaces.

SQL_TBS_AUTORESIZE_DFT
The database manager determines whether or not auto-resize is enabled based on the table space type: auto-resize is turned off for database-managed space (DMS) table spaces and on for automatic storage

table spaces. Use this value for system-managed space (SMS) table spaces since auto-resize is not applicable for that type of table space.

Valid values for SQLINITSIZEUNIT, SQLINCREASESIZEUNIT and SQLMAXIMUMSIZEUNIT (defined in sqlenv) are:

SQL_TBS_STORAGE_UNIT_BYTES
The value specified in the corresponding size field is in bytes.

SQL_TBS_STORAGE_UNIT_KILOBYTES
The value specified in the corresponding size field is in kilobytes (1 kilobyte = 1 024 bytes).

SQL_TBS_STORAGE_UNIT_MEGABYTES
The value specified in the corresponding size field is in megabytes (1 megabyte = 1 048 576 bytes)

SQL_TBS_STORAGE_UNIT_GIGABYTES
The value specified in the corresponding size field is in gigabytes (1 gigabyte = 1 073 741 824 bytes)

SQL_TBS_STORAGE_UNIT_PERCENT
The value specified in the corresponding size field is a percentage (valid range is 1 to 100). This value is only valid for SQLINCREASESIZEUNIT.

sqledboptions data structure parameters

piAutoConfigInterface
Input. A pointer to db2AutoConfigInterface structure which contains information that serves as input for the Configuration Advisor

restrictive
The setting of the restrictive field is stored in the RESTRICT_ACCESS database configuration parameter and will affect all future migrations of this database. That is, when a database is migrated to a subsequent release of DB2, the migration utility checks the RESTRICT_ACCESS database configuration parameter setting to determine whether the restrictive set of default actions needs to be applied to any new objects (for example, new system catalog tables) introduced in the new DB2 release.

The valid values (defined in the sqlenv header file, which is located in the include directory) for this parameter are:

SQL_DB_RESTRICT_ACCESS_NO or SQL_DB_RESTRICT_ACCESS_DFT
Indicates that the database is to be created not using the restrictive set of default actions. This setting will result in the following privileges granted to PUBLIC:

- CREATETAB privilege
- BINDADD privilege
- CONNECT privilege
- IMPLSCHEMA privilege
- EXECUTE with GRANT privilege on all procedures in schema SQLJ
- EXECUTE with GRANT privilege on all functions and procedures in schema SYSPROC
- BIND privilege on all packages created in the NULLID schema

- EXECUTE privilege on all packages created in the NULLID schema
- CREATEIN privilege on schema SQLJ
- CREATEIN privilege on schema NULLID
- USE privilege on table space USERSPACE1
- SELECT privilege on the SYSIBM catalog tables
- SELECT privilege on the SYSCAT catalog views
- SELECT privilege on the SYSSTAT catalog views
- UPDATE privilege on the SYSSTAT catalog views

SQL_DB_RESTRICT_ACCESS_YES
Indicates that the database is to be created using the restrictive set of default actions. This means that the grant actions listed above under SQL_DB_RESTRICT_ACCESS_NO do not occur.

reserved
Reserved for future use.

sqledbterritoryinfo

This structure is used to provide code set and territory options to the sqlecrea API.

Table 55. Fields in the SQLEDBTERRITORYINFO Structure

Field Name	Data Type	Description
SQLDBCODESET	CHAR(9)	Database code set.
SQLDBLOCALE	CHAR(5)	Database territory.

API and data structure syntax

```
SQL_STRUCTURE sqledbcountryinfo
{
        char sqldbcodeset[SQL_CODESET_LEN + 1];
        char sqldblocale[SQL_LOCALE_LEN + 1];
};
typedef SQL_STRUCTURE sqledbcountryinfo SQLEDBTERRITORYINFO;
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQLEDBTERRITORYINFO.
    05 SQLDBCODESET          PIC X(9).
    05 FILLER                PIC X.
    05 SQLDBLOCALE           PIC X(5).
    05 FILLER                PIC X.
*
```

sqleninfo

This structure returns information after a call to the sqlengne API.

Note: NetBIOS is no longer supported. SNA, including its APIs APPC, APPN, and CPI-C, is also no longer supported. If you use these protocols, you must re-catalog your nodes and databases using a supported protocol such as TCP/IP. References to these protocols should be ignored.

Table 56. Fields in the SQLENINFO Structure

Field Name	Data Type	Description
NODENAME	CHAR(8)	Used for the NetBIOS protocol; the nname of the node where the database is located (valid in system directory only)
LOCAL_LU	CHAR(8)	Used for the APPN protocol; local logical unit.
PARTNER_LU	CHAR(8)	Used for the APPN protocol; partner logical unit.
MODE	CHAR(8)	Used for the APPN protocol; transmission service mode.
COMMENT	CHAR(30)	The comment associated with the node.
COM_CODEPAGE	SMALLINT	The code page of the comment. This field is no longer used by the database manager.
ADAPTER	SMALLINT	Used for the NetBIOS protocol; the local network adapter.
NETWORKID	CHAR(8)	Used for the APPN protocol; network ID.
PROTOCOL	CHAR(1)	Communications protocol.
SYM_DEST_NAME	CHAR(8)	Used for the APPC protocol; the symbolic destination name.
SECURITY_TYPE	SMALLINT	Used for the APPC protocol; the security type. See below for values.
HOSTNAME	CHAR(255)	Used for the TCP/IP protocol; the name of the TCP/IP host or IPv4 or IPv6 address on which the DB2 server instance resides.
SERVICE_NAME	CHAR(14)	Used for the TCP/IP protocol; the TCP/IP service name or associated port number of the DB2 server instance.
FILESERVER	CHAR(48)	Used for the IPX/SPX protocol; the name of the NetWare file server where the DB2 server instance is registered.

Table 56. Fields in the SQLENINFO Structure (continued)

Field Name	Data Type	Description
OBJECTNAME	CHAR(48)	The database manager server instance is represented as the object, objectname, on the NetWare file server. The server's IPX/SPX internetwork address is stored and retrieved from this object.
INSTANCE_NAME	CHAR(8)	Used for the local and NPIPE protocols; the name of the server instance.
COMPUTERNAME	CHAR(15)	Used by the NPIPE protocol; the server node's computer name.
SYSTEM_NAME	CHAR(21)	The DB2 system name of the remote server.
REMOTE_INSTNAME	CHAR(8)	The name of the DB2 server instance.
CATALOG_NODE_TYPE	CHAR	Catalog node type.
OS_TYPE	UNSIGNED SHORT	Identifies the operating system of the server.

Note: Each character field returned is blank filled up to the length of the field.

Valid values for SECURITY_TYPE (defined in sqlenv) are:

- SQL_CPIC_SECURITY_NONE
- SQL_CPIC_SECURITY_SAME
- SQL_CPIC_SECURITY_PROGRAM

API and data structure syntax

```
SQL_STRUCTURE sqleninfo
{
        _SQLOLDCHAR nodename[SQL_NNAME_SZ];
        _SQLOLDCHAR local_lu[SQL_LOCLU_SZ];
        _SQLOLDCHAR partner_lu[SQL_RMTLU_SZ];
        _SQLOLDCHAR mode[SQL_MODE_SZ];
        _SQLOLDCHAR comment[SQL_CMT_SZ];
        unsigned short com_codepage;
        unsigned short adapter;
        _SQLOLDCHAR networkid[SQL_NETID_SZ];
        _SQLOLDCHAR protocol;
        _SQLOLDCHAR sym_dest_name[SQL_SYM_DEST_NAME_SZ];
        unsigned short security_type;
        _SQLOLDCHAR hostname[SQL_HOSTNAME_SZ];
        _SQLOLDCHAR service_name[SQL_SERVICE_NAME_SZ];
        char fileserver[SQL_FILESERVER_SZ];
        char objectname[SQL_OBJECTNAME_SZ];
        char instance_name[SQL_INSTNAME_SZ];
        char computername[SQL_COMPUTERNAME_SZ];
        char system_name[SQL_SYSTEM_NAME_SZ];
        char remote_instname[SQL_REMOTE_INSTNAME_SZ];
        _SQLOLDCHAR catalog_node_type;
        unsigned short os_type;
```

```
        _SQLOLDCHAR chgpwd_lu[SQL_RMTLU_SZ];
        _SQLOLDCHAR transpn[SQL_TPNAME_SZ];
        _SQLOLDCHAR lanaddr[SQL_LANADDRESS_SZ];
};
```

COBOL Structure

```
* File: sqlenv.cbl
01 SQLENINFO.
    05 SQL-NODE-NAME          PIC X(8).
    05 SQL-LOCAL-LU           PIC X(8).
    05 SQL-PARTNER-LU         PIC X(8).
    05 SQL-MODE               PIC X(8).
    05 SQL-COMMENT            PIC X(30).
    05 SQL-COM-CODEPAGE       PIC 9(4) COMP-5.
    05 SQL-ADAPTER            PIC 9(4) COMP-5.
    05 SQL-NETWORKID          PIC X(8).
    05 SQL-PROTOCOL           PIC X.
    05 SQL-SYM-DEST-NAME      PIC X(8).
    05 FILLER                 PIC X(1).
    05 SQL-SECURITY-TYPE      PIC 9(4) COMP-5.
    05 SQL-HOSTNAME           PIC X(255).
    05 SQL-SERVICE-NAME       PIC X(14).
    05 SQL-FILESERVER         PIC X(48).
    05 SQL-OBJECTNAME         PIC X(48).
    05 SQL-INSTANCE-NAME      PIC X(8).
    05 SQL-COMPUTERNAME       PIC X(15).
    05 SQL-SYSTEM-NAME        PIC X(21).
    05 SQL-REMOTE-INSTNAME    PIC X(8).
    05 SQL-CATALOG-NODE-TYPE  PIC X.
    05 SQL-OS-TYPE            PIC 9(4) COMP-5.
*
```

sqlfupd

This structure passes information about database configuration files and the database manager configuration file.

Table 57. Fields in the SQLFUPD Structure

Field Name	Data Type	Description
TOKEN	UINT16	Specifies the configuration value to return or update.
PTRVALUE	Pointer	A pointer to an application allocated buffer that holds the data specified by TOKEN.

Valid data types for the token element are:

Uint16
Unsigned 2-byte integer

Sint16
Signed 2-byte integer

Uint32
Unsigned 4-byte integer

Sint32
Signed 4-byte integer

Uint64
Unsigned 8-byte integer

float 4-byte floating-point decimal

char(n)
String of length n (not including null termination).

Valid entries for the SQLFUPD token element are listed below:

Table 58. Updatable Database Configuration Parameters

Parameter Name	Token	Token Value	Data Type
alt_collate	SQLF_DBTN_ALT_COLLATE	809	Uint32
app_ctl_heap_sz	SQLF_DBTN_APP_CTL_HEAP_SZ	500	Uint16
appgroup_mem_sz	SQLF_DBTN_APPGROUP_MEM_SZ	800	Uint32
applheapsz	SQLF_DBTN_APPLHEAPSZ	51	Uint16
archretrydelay	SQLF_DBTN_ARCHRETRYDELAY	828	Uint16
• auto_maint • auto_db_backup • auto_tbl_maint • auto_runstats • auto_stats_prof • auto_prof_upd • auto_reorg	• SQLF_DBTN_AUTO_MAINT • SQLF_DBTN_AUTO_DB_BACKUP • SQLF_DBTN_AUTO_TBL_MAINT • SQLF_DBTN_AUTO_RUNSTATS • SQLF_DBTN_AUTO_STATS_PROF • SQLF_DBTN_AUTO_PROF_UPD • SQLF_DBTN_AUTO_REORG	• 831 • 833 • 835 • 837 • 839 • 844 • 841	Uint16
autorestart	SQLF_DBTN_AUTO_RESTART	25	Uint16
avg_appls	SQLF_DBTN_AVG_APPLS	47	Uint16
blk_log_dsk_ful	SQLF_DBTN_BLK_LOG_DSK_FUL	804	Uint16
catalogcache_sz	SQLF_DBTN_CATALOGCACHE_SZ	56	Sint32
chngpgs_thresh	SQLF_DBTN_CHNGPGS_THRESH	38	Uint16
database_memory	SQLF_DBTN_DATABASE_MEMORY	803	Uint64
dbheap	SQLF_DBTN_DB_HEAP	58	Uint64
db_mem_thresh	SQLF_DBTN_DB_MEM_THRESH	849	Uint16
dft_degree	SQLF_DBTN_DFT_DEGREE	301	Sint32
dft_extent_sz	SQLF_DBTN_DFT_EXTENT_SZ	54	Uint32
dft_loadrec_ses	SQLF_DBTN_DFT_LOADREC_SES	42	Sint16
dft_mttb_types	SQLF_DBTN_DFT_MTTB_TYPES	843	Uint32
dft_prefetch_sz	SQLF_DBTN_DFT_PREFETCH_SZ	40	Sint16
dft_queryopt	SQLF_DBTN_DFT_QUERYOPT	57	Sint32
dft_refresh_age	SQLF_DBTN_DFT_REFRESH_AGE	702	char(22)
dft_sqlmathwarn	SQLF_DBTN_DFT_SQLMATHWARN	309	Sint16
discover	SQLF_DBTN_DISCOVER	308	Uint16
dlchktime	SQLF_DBTN_DLCHKTIME	9	Uint32
dyn_query_mgmt	SQLF_DBTN_DYN_QUERY_MGMT	604	Uint16
failarchpath	SQLF_DBTN_FAILARCHPATH	826	char(243)
groupheap_ratio	SQLF_DBTN_GROUPHEAP_RATIO	801	Uint16

Table 58. Updatable Database Configuration Parameters (continued)

Parameter Name	Token	Token Value	Data Type
hadr_local_host	SQLF_DBTN_HADR_LOCAL_HOST	811	char(256)
hadr_local_svc	SQLF_DBTN_HADR_LOCAL_SVC	812	char(41)
hadr_remote_host	SQLF_DBTN_HADR_REMOTE_HOST	813	char(256)
hadr_remote_inst	SQLF_DBTN_HADR_REMOTE_INST	815	char(9)
hadr_remote_svc	SQLF_DBTN_HADR_REMOTE_SVC	814	char(41)
hadr_syncmode	SQLF_DBTN_HADR_SYNCMODE	817	Uint32
hadr_timeout	SQLF_DBTN_HADR_TIMEOUT	816	Sint32
indexrec	SQLF_DBTN_INDEXREC	30	Uint16
locklist	SQLF_DBTN_LOCK_LIST	704	Uint64
locktimeout	SQLF_DBTN_LOCKTIMEOUT	34	Sint16
logarchmeth1	SQLF_DBTN_LOGARCHMETH1	822	Uint16
logarchmeth2	SQLF_DBTN_LOGARCHMETH2	823	Uint16
logarchopt1	SQLF_DBTN_LOGARCHOPT1	824	char(243)
logarchopt2	SQLF_DBTN_LOGARCHOPT2	825	char(243)
logbufsz	SQLF_DBTN_LOGBUFSZ	33	Uint16
logfilsiz	SQLF_DBTN_LOGFIL_SIZ	92	Uint32
logindexbuild	SQLF_DBTN_LOGINDEXBUILD	818	Uint32
logprimary	SQLF_DBTN_LOGPRIMARY	16	Uint16
logretain	SQLF_DBTN_LOG_RETAIN	23	Uint16
logsecond	SQLF_DBTN_LOGSECOND	17	Uint16
max_log	SQLF_DBTN_MAX_LOG	807	Uint16
maxappls	SQLF_DBTN_MAXAPPLS	6	Uint16
maxfilop	SQLF_DBTN_MAXFILOP	3	Uint16
maxlocks	SQLF_DBTN_MAXLOCKS	15	Uint16
max_log	SQLF_DBTN_MAX_LOG	807	Uint16
mincommit	SQLF_DBTN_MINCOMMIT	32	Uint16
mirrorlogpath	SQLF_DBTN_MIRRORLOGPATH	806	char(242)
newlogpath	SQLF_DBTN_NEWLOGPATH	20	char(242)
num_db_backups	SQLF_DBTN_NUM_DB_BACKUPS	601	Uint16
num_freqvalues	SQLF_DBTN_NUM_FREQVALUES	36	Uint16
num_iocleaners	SQLF_DBTN_NUM_IOCLEANERS	37	Uint16
num_ioservers	SQLF_DBTN_NUM_IOSERVERS	39	Uint16
num_log_span	SQLF_DBTN_NUM_LOG_SPAN	808	Uint16
num_quantiles	SQLF_DBTN_NUM_QUANTILES	48	Uint16
numarchretry	SQLF_DBTN_NUMARCHRETRY	827	Uint16
overflowlogpath	SQLF_DBTN_OVERFLOWLOGPATH	805	char(242)
pckcachesz	SQLF_DBTN_PCKCACHE_SZ	505	Uint32
rec_his_retentn	SQLF_DBTN_REC_HIS_RETENTN	43	Sint16
self_tuning_mem	SQLF_DBTN_SELF_TUNING_MEM	848	Uint16

Table 58. Updatable Database Configuration Parameters (continued)

Parameter Name	Token	Token Value	Data Type
seqdetect	SQLF_DBTN_SEQDETECT	41	Uint16
sheapthres_shr	SQLF_DBTN_SHEAPTHRES_SHR	802	Uint32
softmax	SQLF_DBTN_SOFTMAX	5	Uint16
sortheap	SQLF_DBTN_SORT_HEAP	52	Uint32
stat_heap_sz	SQLF_DBTN_STAT_HEAP_SZ	45	Uint32
stmtheap	SQLF_DBTN_STMTHEAP	53	Uint16
trackmod	SQLF_DBTN_TRACKMOD	703	Uint16
tsm_mgmtclass	SQLF_DBTN_TSM_MGMTCLASS	307	char(30)
tsm_nodename	SQLF_DBTN_TSM_NODENAME	306	char(64)
tsm_owner	SQLF_DBTN_TSM_OWNER	305	char(64)
tsm_password	SQLF_DBTN_TSM_PASSWORD	501	char(64)
userexit	SQLF_DBTN_USER_EXIT	24	Uint16
util_heap_sz	SQLF_DBTN_UTIL_HEAP_SZ	55	Uint32
vendoropt	SQLF_DBTN_VENDOROPT	829	char(242)

The bits of SQLF_DBTN_AUTONOMIC_SWITCHES indicate the default settings for a number of auto-maintenance configuration parameters. The individual bits making up this composite parameter are:

```
Default => Bit 1 on  (xxxx xxxx xxxx xxx1): auto_maint
           Bit 2 off (xxxx xxxx xxxx xx0x): auto_db_backup
           Bit 3 on  (xxxx xxxx xxxx x1xx): auto_tbl_maint
           Bit 4 on  (xxxx xxxx xxxx 1xxx): auto_runstats
           Bit 5 off (xxxx xxxx xxx0 xxxx): auto_stats_prof
           Bit 6 off (xxxx xxxx xx0x xxxx): auto_prof_upd
           Bit 7 off (xxxx xxxx x0xx xxxx): auto_reorg
           Bit 8 off (xxxx xxxx 0xxx xxxx): auto_storage
           Bit 9 off (xxxx xxx0 xxxx xxxx): auto_stmt_stats
                        0    0    0    D

Maximum => Bit 1 on  (xxxx xxxx xxxx xxx1): auto_maint
           Bit 2 off (xxxx xxxx xxxx xx1x): auto_db_backup
           Bit 3 on  (xxxx xxxx xxxx x1xx): auto_tbl_maint
           Bit 4 on  (xxxx xxxx xxxx 1xxx): auto_runstats
           Bit 5 off (xxxx xxxx xxx1 xxxx): auto_stats_prof
           Bit 6 off (xxxx xxxx xx1x xxxx): auto_prof_upd
           Bit 7 off (xxxx xxxx x1xx xxxx): auto_reorg
           Bit 8 off (xxxx xxxx 1xxx xxxx): auto_storage
           Bit 9 off (xxxx xxx1 xxxx xxxx): auto_stmt_stats
                        0    1    F    F
```

Valid values for indexrec (defined in sqlutil.h):

- SQLF_INX_REC_SYSTEM (0)
- SQLF_INX_REC_REFERENCE (1)
- SQLF_INX_REC_RESTART (2)

Valid values for logretain (defined in sqlutil.h):

- SQLF_LOGRETAIN_NO (0)
- SQLF_LOGRETAIN_RECOVERY (1)
- SQLF_LOGRETAIN_CAPTURE (2)

Table 59. Non-updatable Database Configuration Parameters

Parameter Name	Token	Token Value	Data Type
backup_pending	SQLF_DBTN_BACKUP_PENDING	112	Uint16
codepage	SQLF_DBTN_CODEPAGE	101	Uint16
codeset	SQLF_DBTN_CODESET	120	char(9) (see note 1 below)
collate_info	SQLF_DBTN_COLLATE_INFO	44	char(260)
country/region	SQLF_DBTN_COUNTRY	100	Uint16
database_consistent	SQLF_DBTN_CONSISTENT	111	Uint16
database_level	SQLF_DBTN_DATABASE_LEVEL	124	Uint16
log_retain_status	SQLF_DBTN_LOG_RETAIN_STATUS	114	Uint16
loghead	SQLF_DBTN_LOGHEAD	105	char(12)
logpath	SQLF_DBTN_LOGPATH	103	char(242)
multipage_alloc	SQLF_DBTN_MULTIPAGE_ALLOC	506	Uint16
numsegs	SQLF_DBTN_NUMSEGS	122	Uint16
release	SQLF_DBTN_RELEASE	102	Uint16
restore_pending	SQLF_DBTN_RESTORE_PENDING	503	Uint16
rollfwd_pending	SQLF_DBTN_ROLLFWD_PENDING	113	Uint16
territory	SQLF_DBTN_TERRITORY	121	char(5) (see note 2 below)
user_exit_status	SQLF_DBTN_USER_EXIT_STATUS	115	Uint16

Note:

1. char(17) on HP-UX, Solaris and Linux operating systems.
2. char(33) on HP-UX, Solaris and Linux operating systems.

Valid entries for the SQLFUPD token element are listed below:

Table 60. Updatable Database Manager Configuration Parameters

Parameter Name	Token	Token Value	Data Type
agent_stack_sz	SQLF_KTN_AGENT_STACK_SZ	61	Uint16
agentpri	SQLF_KTN_AGENTPRI	26	Sint16
aslheapsz	SQLF_KTN_ASLHEAPSZ	15	Uint32
audit_buf_sz	SQLF_KTN_AUDIT_BUF_SZ	312	Sint32
authentication	SQLF_KTN_AUTHENTICATION	78	Uint16
catalog_noauth	SQLF_KTN_CATALOG_NOAUTH	314	Uint16
clnt_krb_plugin	SQLF_KTN_CLNT_KRB_PLUGIN	812	char(33)
clnt_pw_plugin	SQLF_KTN_CLNT_PW_PLUGIN	811	char(33)
comm_bandwidth	SQLF_KTN_COMM_BANDWIDTH	307	float
conn_elapse	SQLF_KTN_CONN_ELAPSE	508	Uint16
cpuspeed	SQLF_KTN_CPUSPEED	42	float

Table 60. Updatable Database Manager Configuration Parameters (continued)

Parameter Name	Token	Token Value	Data Type
dft_account_str	SQLF_KTN_DFT_ACCOUNT_STR	28	char(25)
dft_monswitches	SQLF_KTN_DFT_MONSWITCHES	29	Uint16
dft_mon_bufpool	SQLF_KTN_DFT_MON_BUFPOOL	33	Uint16
dft_mon_lock	SQLF_KTN_DFT_MON_LOCK	34	Uint16
dft_mon_sort	SQLF_KTN_DFT_MON_SORT	35	Uint16
dft_mon_stmt	SQLF_KTN_DFT_MON_STMT	31	Uint16
dft_mon_table	SQLF_KTN_DFT_MON_TABLE	32	Uint16
dft_mon_timestamp	SQLF_KTN_DFT_MON_ TIMESTAMP	36	Uint16
dft_mon_uow	SQLF_KTN_DFT_MON_UOW	30	Uint16
dftdbpath	SQLF_KTN_DFTDBPATH	27	char(215)
diaglevel	SQLF_KTN_DIAGLEVEL	64	Uint16
diagpath	SQLF_KTN_DIAGPATH	65	char(215)
dir_cache	SQLF_KTN_DIR_CACHE	40	Uint16
discover	SQLF_KTN_DISCOVER	304	Uint16
discover_inst	SQLF_KTN_DISCOVER_INST	308	Uint16
fcm_num_buffers	SQLF_KTN_FCM_NUM_BUFFERS	503	Uint32
fcm_num_channels	SQLF_KTN_FCM_NUM_CHANNELS	902	Uint32
fed_noauth	SQLF_KTN_FED_NOAUTH	806	Uint16
federated	SQLF_KTN_FEDERATED	604	Sint16
federated_async	SQLF_KTN_FEDERATED_ASYNC	849	Sint32
fenced_pool	SQLF_KTN_FENCED_POOL	80	Sint32
group_plugin	SQLF_KTN_GROUP_PLUGIN	810	char(33)
health_mon	SQLF_KTN_HEALTH_MON	804	Uint16
indexrec	SQLF_KTN_INDEXREC	20	Uint16
instance_memory	SQLF_KTN_INSTANCE_MEMORY	803	Uint64
intra_parallel	SQLF_KTN_INTRA_PARALLEL	306	Sint16
java_heap_sz	SQLF_KTN_JAVA_HEAP_SZ	310	Sint32
jdk_path	SQLF_KTN_JDK_PATH	311	char(255)
keepfenced	SQLF_KTN_KEEPFENCED	81	Uint16
local_gssplugin	SQLF_KTN_LOCAL_GSSPLUGIN	816	char(33)
max_connections	SQLF_DBTN_MAX_CONNECTIONS	802	Sint32
max_connretries	SQLF_KTN_MAX_CONNRETRIES	509	Uint16
max_coordagents	SQLF_KTN_MAX_COORDAGENTS	501	Sint32
max_querydegree	SQLF_KTN_MAX_QUERYDEGREE	303	Sint32
max_time_diff	SQLF_KTN_MAX_TIME_DIFF	510	Uint16
mon_heap_sz	SQLF_KTN_MON_HEAP_SZ	79	Uint16
notifylevel	SQLF_KTN_NOTIFYLEVEL	605	Sint16
num_initagents	SQLF_KTN_NUM_INITAGENTS	500	Uint32
num_initfenced	SQLF_KTN_NUM_INITFENCED	601	Sint32

Table 60. Updatable Database Manager Configuration Parameters (continued)

Parameter Name	Token	Token Value	Data Type
num_poolagents	SQLF_KTN_NUM_POOLAGENTS	502	Sint32
numdb	SQLF_KTN_NUMDB	6	Uint16
query_heap_sz	SQLF_KTN_QUERY_HEAP_SZ	49	Sint32
resync_interval	SQLF_KTN_RESYNC_INTERVAL	68	Uint16
rqrioblk	SQLF_KTN_RQRIOBLK	1	Uint16
sheapthres	SQLF_KTN_SHEAPTHRES	21	Uint32
spm_log_file_sz	SQLF_KTN_SPM_LOG_FILE_SZ	90	Sint32
spm_log_path	SQLF_KTN_SPM_LOG_PATH	313	char(226)
spm_max_resync	SQLF_KTN_SPM_MAX_RESYNC	91	Sint32
spm_name	SQLF_KTN_SPM_NAME	92	char(8)
srvcon_auth	SQLF_KTN_SRVCON_AUTH	815	Uint16
srvcon_gssplugin_list	SQLF_KTN_SRVCON_GSSPLUGIN_ LIST	814	char(256)
srv_plugin_mode	SQLF_KTN_SRV_PLUGIN_MODE	809	Uint16
srvcon_pw_plugin	SQLF_KTN_SRVCON_PW_PLUGIN	813	char(33)
start_stop_time	SQLF_KTN_START_STOP_TIME	511	Uint16
svcename	SQLF_KTN_SVCENAME	24	char(14)
sysadm_group	SQLF_KTN_SYSADM_GROUP	39	char(16)
sysctrl_group	SQLF_KTN_SYSCTRL_GROUP	63	char(16)
sysmaint_group	SQLF_KTN_SYSMAINT_GROUP	62	char(16)
sysmon_group	SQLF_KTN_SYSMON_GROUP	808	char(30)
tm_database	SQLF_KTN_TM_DATABASE	67	char(8)
tp_mon_name	SQLF_KTN_TP_MON_NAME	66	char(19)
trust_allclnts	SQLF_KTN_TRUST_ALLCLNTS	301	Uint16
trust_clntauth	SQLF_KTN_TRUST_CLNTAUTH	302	Uint16
util_impact_lim	SQLF_KTN_UTIL_IMPACT_LIM	807	Uint32

Note: The configuration parameters `maxagents` and `maxcagents` are deprecated. In a future release, these configuration parameters may be removed completely.

Valid values for authentication (defined in sqlenv.h):

- SQL_AUTHENTICATION_SERVER (0)
- SQL_AUTHENTICATION_CLIENT (1)
- SQL_AUTHENTICATION_DCS (2)
- SQL_AUTHENTICATION_DCE (3)
- SQL_AUTHENTICATION_SVR_ENCRYPT (4)
- SQL_AUTHENTICATION_DCS_ENCRYPT (5)
- SQL_AUTHENTICATION_DCE_SVR_ENC (6)
- SQL_AUTHENTICATION_KERBEROS (7)
- SQL_AUTHENTICATION_KRB_SVR_ENC (8)
- SQL_AUTHENTICATION_GSSPLUGIN (9)
- SQL_AUTHENTICATION_GSS_SVR_ENC (10)

- SQL_AUTHENTICATION_DATAENC (11)
- SQL_AUTHENTICATION_DATAENC_CMP (12)
- SQL_AUTHENTICATION_NOT_SPEC (255)

SQLF_KTN_DFT_MONSWITCHES is a Uint16 parameter, the bits of which indicate the default monitor switch settings. This allows for the specification of a number of parameters at once. The individual bits making up this composite parameter are:

- Bit 1 (xxxx xxx1): dft_mon_uow
- Bit 2 (xxxx xx1x): dft_mon_stmt
- Bit 3 (xxxx x1xx): dft_mon_table
- Bit 4 (xxxx 1xxx): dft_mon_buffpool
- Bit 5 (xxx1 xxxx): dft_mon_lock
- Bit 6 (xx1x xxxx): dft_mon_sort
- Bit 7 (x1xx xxxx): dft_mon_timestamp

Valid values for discover (defined in sqlutil.h):

- SQLF_DSCVR_KNOWN (1)
- SQLF_DSCVR_SEARCH (2)

Valid values for indexrec (defined in sqlutil.h):

- SQLF_INX_REC_SYSTEM (0)
- SQLF_INX_REC_REFERENCE (1)
- SQLF_INX_REC_RESTART (2)

Valid values for trust_allclnts (defined in sqlutil.h):

- SQLF_TRUST_ALLCLNTS_NO (0)
- SQLF_TRUST_ALLCLNTS_YES (1)
- SQLF_TRUST_ALLCLNTS_DRDAONLY (2)

Table 61. Non-updatable Database Manager Configuration Parameters

Parameter Name	Token	Token Value	Data Type
nodetype	SQLF_KTN_NODETYPE	100	Uint16
release	SQLF_KTN_RELEASE	101	Uint16

Valid values for nodetype (defined in sqlutil.h):

- SQLF_NT_STANDALONE (0)
- SQLF_NT_SERVER (1)
- SQLF_NT_REQUESTOR (2)
- SQLF_NT_STAND_REQ (3)
- SQLF_NT_MPP (4)
- SQLF_NT_SATELLITE (5)

API and data structure syntax

```
SQL_STRUCTURE sqlfupd
{
   unsigned short  token;
   char *ptrvalue;
};
```

COBOL Structure

```
* File: sqlutil.cbl
01 SQL-FUPD.
    05 SQL-TOKEN             PIC 9(4) COMP-5.
    05 FILLER                PIC X(2).
    05 SQL-VALUE-PTR         USAGE IS POINTER.
*
```

sqllob

This structure is used to represent a LOB data type in a host programming language.

Table 62. Fields in the sqllob structure

Field name	Data type	Description
length	sqluint32	Length in bytes of the data parameter.
data	char(1)	Data being passed in.

API and data structure syntax

```
SQL_STRUCTURE sqllob
{
        sqluint32 length;
        char data[1];
};
```

sqlma

The SQL monitor area (SQLMA) structure is used to send database monitor snapshot requests to the database manager. It is also used to estimate the size (in bytes) of the snapshot output.

Table 63. Fields in the SQLMA Structure

Field Name	Data Type	Description
OBJ_NUM	INTEGER	Number of objects to be monitored.
OBJ_VAR	Array	An array of sqlm_obj_struct structures containing descriptions of objects to be monitored. The length of the array is determined by OBJ_NUM.

Table 64. Fields in the SQLM-OBJ-STRUCT Structure

Field Name	Data Type	Description
AGENT_ID	INTEGER	The application handle of the application to be monitored. Specified only if OBJ_TYPE requires an agent_id (application handle). To retrieve a health snapshot with full collection information, specify SQLM_HMON_OPT_COLL_FULL in this field.

Table 64. Fields in the SQLM-OBJ-STRUCT Structure (continued)

Field Name	Data Type	Description
OBJ_TYPE	INTEGER	The type of object to be monitored.
OBJECT	CHAR(128)	The name of the object to be monitored. Specified only if OBJ_TYPE requires a name, such as appl_id, or a database alias.

Valid values for OBJ_TYPE (defined in the sqlmon header file, found in the include directory) are:

SQLMA_DB2
Instance related information.

SQLMA_DBASE
Database related information for a particular database. If you use the SQLMA_DBASE value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_APPL
Application information for an application that matches the provided application ID. If you use the SQLMA_APPL value, you must provide an application ID in the object parameter of sqlm_obj_struct structure.

SQLMA_AGENT_ID
Application information for an application that matches the provided agent ID. If you use the SQLMA_AGENT_ID value, you must provide an agent ID in the agent_id parameter of sqlm_obj_struct structure.

SQLMA_DBASE_TABLES
Table information for a particular database. If you use the SQLMA_DBASE_TABLES value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DBASE_APPLS
Application information for all applications connected to a particular database. If you use the SQLMA_DBASE_APPLS value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DBASE_APPLINFO
Summary application information for connections to a particular database. If you use the SQLMA_DBASE_APPLINFO value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DBASE_LOCKS
List of locks held on a particular database. If you use the SQLMA_DBASE_LOCKS value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_APPL_LOCKS
List of locks held by an application with the matching application ID. If you use the SQLMA_APPL_LOCKS value, you must provide an application ID in the object parameter of sqlm_obj_struct structure.

SQLMA_APPL_LOCKS_AGENT_ID
List of locks held by an application with the matching agent ID. If you use the SQLMA_APPL_LOCKS_AGENT_ID value, you must provide an agent ID in the agent_id parameter of sqlm_obj_struct structure.

SQLMA_DBASE_ALL
Database information for all active databases in the instance.

SQLMA_APPL_ALL
Application information for all database connections in the instance.

SQLMA_APPLINFO_ALL
Summary application information for all connections to the instance.

SQLMA_DCS_APPLINFO_ALL
List of Database Connection Services (DCS) connections to the instance.

SQLMA_DYNAMIC_SQL
Dynamic SQL statement information for a particular database. If you use the SQLMA_DYNAMIC_SQL value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DCS_DBASE
Information for a particular Database Connection Services (DCS) database. If you use the SQLMA_DCS_DBASE value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DCS_DBASE_ALL
Information for all active Database Connection Services (DCS) databases.

SQLMA_DCS_APPL_ALL
Database Connection Services (DCS) application information for all connections.

SQLMA_DCS_APPL
Database Connection Services (DCS) application information for an application that matches the provided application ID. If you use the SQLMA_DCS_APPL value, you must provide an application ID in the object parameter of sqlm_obj_struct structure.

SQLMA_DCS_APPL_HANDLE
Database Connection Services (DCS) application information for an application that matches the provided agent ID. If you use the SQLMA_DCS_APPL_HANDLE value, you must provide an agent ID in the agent_id parameter of sqlm_obj_struct structure.

SQLMA_DCS_DBASE_APPLS
Database Connection Services (DCS) application information for all active connections to a particular database. If you use the SQLMA_DCS_DBASE_APPLS value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DBASE_TABLESPACES
Table space information for a particular database. If you use the SQLMA_DBASE_TABLESPACES value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DBASE_BUFFERPOOLS
Bufferpool information for a particular database. If you use the SQLMA_DBASE_BUFFERPOOLS value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_BUFFERPOOLS_ALL
Information for all bufferpools.

SQLMA_DBASE_REMOTE
Remote access information for a particular federated database. If you use the SQLMA_DBASE_REMOTE value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_DBASE_REMOTE_ALL
Remote access information for all federated databases.

SQLMA_DBASE_APPLS_REMOTE
Remote access information for an application connected to a particular federated database. If you use the SQLMA_DBASE_APPLS_REMOTE value, you must provide the database name in the object parameter of sqlm_obj_struct structure.

SQLMA_APPL_REMOTE_ALL
Remote access information for all applications.

API and data structure syntax

```
typedef struct sqlma
{
   sqluint32 obj_num;
   sqlm_obj_struct obj_var[1];
}sqlma;

typedef struct sqlm_obj_struct
{
   sqluint32 agent_id;
   sqluint32 obj_type;
   _SQLOLDCHAR object[SQLM_OBJECT_SZ];
}sqlm_obj_struct;
```

COBOL Structure

```
* File: sqlmonct.cbl
01 SQLMA.
    05 OBJ-NUM                 PIC 9(9) COMP-5.
    05 OBJ-VAR OCCURS 0 TO 100 TIMES DEPENDING ON OBJ-NUM.
        10 AGENT-ID             PIC 9(9) COMP-5.
        10 OBJ-TYPE             PIC 9(9) COMP-5.
        10 OBJECT               PIC X(128).
*
```

sqlopt

This structure is used to pass bind options to the sqlabndx API, precompile options to the sqlaprep API, and rebind options to the sqlarbnd API.

Table 65. Fields in the SQLOPT Structure

Field Name	Data Type	Description
HEADER	Structure	An sqloptheader structure.
OPTION	Array	An array of sqloptions structures. The number of elements in this array is determined by the value of the allocated field of the header.

Table 66. Fields in the SQLOPTHEADER Structure

Field Name	Data Type	Description
ALLOCATED	INTEGER	Number of elements in the option array of the sqlopt structure.
USED	INTEGER	Number of elements in the option array of the sqlopt structure actually used. This is the number of option pairs (TYPE and VAL) supplied.

Table 67. Fields in the SQLOPTIONS Structure

Field Name	Data Type	Description
TYPE VAL	INTEGER INTEGER	Bind/precompile/rebind option type. Bind/precompile/rebind option value.

Note: The TYPE and VAL fields are repeated for each bind, precompile, or rebind option specified.

API and data structure syntax

```
SQL_STRUCTURE sqlopt
{
   SQL_STRUCTURE sqloptheader header;
   SQL_STRUCTURE sqloptions   option[1];
};

SQL_STRUCTURE sqloptheader
{
   sqluint32 allocated;
   sqluint32 used;
};

SQL_STRUCTURE sqloptions
{
   sqluint32 type;
   sqluintptr val;
};
```

COBOL Structure

```
* File: sql.cbl
01 SQLOPT.
    05 SQLOPTHEADER.
        10 ALLOCATED   PIC 9(9) COMP-5.
        10 USED        PIC 9(9) COMP-5.
    05 SQLOPTIONS OCCURS 1 TO 50 DEPENDING ON ALLOCATED.
        10 SQLOPT-TYPE        PIC 9(9) COMP-5.
        10 SQLOPT-VAL         PIC 9(9) COMP-5.
        10 SQLOPT-VAL-PTR     REDEFINES SQLOPT-VAL
*
```

SQLU_LSN

This union, used by the db2ReadLog API, contains the definition of the log sequence number. A log sequence number (LSN) represents a relative byte address within the database log. All log records are identified by this number. An LSN represents the byte offset of the log record from the beginning of the database log.

Table 68. Fields in the SQLU-LSN Union

Field Name	Data Type	Description
lsnChar	Array of UNSIGNED CHAR	Specifies the 6-member character array log sequence number.
lsnWord	Array of UNSIGNED SHORT	Specifies the 3-member short array log sequence number.

API and data structure syntax

```
typedef union SQLU_LSN
{
   unsigned char   lsnChar[6];
   unsigned short  lsnWord[3];
} SQLU_LSN;
```

sqlu_media_list

This structure is used to pass information to the db2Load API.

Table 69. Fields in the SQLU-MEDIA-LIST Structure

Field Name	Data Type	Description
MEDIA_TYPE	CHAR(1)	A character indicating media type.
SESSIONS	INTEGER	Indicates the number of elements in the array pointed to by the target field of this structure.
TARGET	Union	This field is a pointer to one of four types of structures. The type of structure pointed to is determined by the value of the media_type field. For more information on what to provide in this field, see the appropriate API.
FILLER	CHAR(3)	Filler used for proper alignment of data structure in memory.

Table 70. Fields in the SQLU-MEDIA-LIST-TARGETS Structure

Field Name	Data Type	Description
MEDIA	Pointer	A pointer to an sqlu_media_entry structure.
VENDOR	Pointer	A pointer to an sqlu_vendor structure.
LOCATION	Pointer	A pointer to an sqlu_location_entry structure.
PSTATEMENT	Pointer	A pointer to an sqlu_statement_entry structure.
PREMOTEFETCH	Pointer	A pointer to an sqlu_remotefetch_entry structure

Table 71. Fields in the SQLU-MEDIA-ENTRY Structure

Field Name	Data Type	Description
RESERVE_LEN MEDIA_ENTRY	INTEGER CHAR(215)	Length of the media_entry field. For languages other than C. Path for a backup image used by the backup and restore utilities.

Table 72. Fields in the SQLU-VENDOR Structure

Field Name	Data Type	Description
RESERVE_LEN1	INTEGER	Length of the shr_lib field. For languages other than C.
SHR_LIB	CHAR(255)	Name of a shared library supplied by vendors for storing or retrieving data.
RESERVE_LEN2	INTEGER	Length of the filename field. For languages other than C.
FILENAME	CHAR(255)	File name to identify the load input source when using a shared library.

Table 73. Fields in the SQLU-LOCATION-ENTRY Structure

Field Name	Data Type	Description
RESERVE_LEN	INTEGER	Length of the location_entry field. For languages other than C.
LOCATION_ENTRY	CHAR(256)	Name of input data files for the load utility.

Table 74. Fields in the SQLU-STATEMENT-ENTRY Structure

Field Name	Data Type	Description
LENGTH	INTEGER	Length of the data field.
PDATA	Pointer	Pointer to the SQL query.

Table 75. Fields in the SQLU-REMOTEFETCH-ENTRY Structure

Field Name	Data Type	Description
pDatabaseName	Pointer	Source Database Name.
iDatabaseNameLen	INTEGER	Source Database Name Length
pUserID	Pointer	Pointer to UserID.
iUserIDLen	INTEGER	UserID Length.
pPassword	Pointer	Pointer to Password.
iPasswordLen	INTEGER	Password Length.
pTableSchema	Pointer	Pointer to schema of source table.
iTableSchemaLen	INTEGER	Schema Length.
pTableName	Pointer	Pointer to name of source table.
iTableNameLen	INTEGER	Source table name Length.
pStatement	Pointer	Pointer to name of statement.
iStatementLen	INTEGER	Statement Length.
pIsolationLevel	Pointer	Pointer to isolation level (default CS).

Valid values for MEDIA_TYPE (defined in sqlutil) are:

SQLU_LOCAL_MEDIA
Local devices (tapes, disks, or diskettes)

SQLU_SERVER_LOCATION
Server devices (tapes, disks, or diskettes; load only). Can be specified only for the piSourceList parameter.

SQLU_CLIENT_LOCATION
Client devices (files or named pipes). Can be specified only for the piSourceList parameter or the piLobFileList parameter.

SQLU_SQL_STMT
SQL query (load only). Can be specified only for the piSourceList parameter.

SQLU_TSM_MEDIA
TSM

SQLU_XBSA_MEDIA
XBSA

SQLU_OTHER_MEDIA
Vendor library

SQLU_REMOTEFETCH
Remote Fetch media (load only). Can be specified only for the piSourceList parameter.

SQLU_DISK_MEDIA
Disk (for vendor APIs only)

SQLU_DISKETTE_MEDIA
Diskette (for vendor APIs only)

SQLU_NULL_MEDIA
Null (generated internally by the DB2 database)

SQLU_TAPE_MEDIA
Tape (for vendor APIs only).

SQLU_PIPE_MEDIA
Named pipe (for vendor APIs only)

API and data structure syntax

```
typedef SQL_STRUCTURE sqlu_media_list
{
   char media_type;
   char filler[3];
   sqlint32 sessions;
   union sqlu_media_list_targets target;
} sqlu_media_list;

union sqlu_media_list_targets
{
   struct sqlu_media_entry *media;
   struct sqlu_vendor *vendor;
   struct sqlu_location_entry *location;
   struct sqlu_statement_entry *pStatement;
   struct sqlu_remotefetch_entry *pRemoteFetch;
};

typedef SQL_STRUCTURE sqlu_media_entry
{
```

```
   sqluint32 reserve_len;
   char media_entry[SQLU_DB_DIR_LEN+1];
} sqlu_media_entry;

typedef SQL_STRUCTURE sqlu_vendor
{
   sqluint32 reserve_len1;
   char shr_lib[SQLU_SHR_LIB_LEN+1];
   sqluint32 reserve_len2;
   char filename[SQLU_SHR_LIB_LEN+1];
} sqlu_vendor;

typedef SQL_STRUCTURE sqlu_location_entry
{
   sqluint32 reserve_len;
   char location_entry[SQLU_MEDIA_LOCATION_LEN+1];
} sqlu_location_entry;

typedef SQL_STRUCTURE sqlu_statement_entry
{
   sqluint32 length;
   char *pEntry;
} sqlu_statement_entry;

typedef SQL_STRUCTURE sqlu_remotefetch_entry
{
   char *pDatabaseName;
   sqluint32 iDatabaseNameLen;
   char *pUserID;
   sqluint32 iUserIDLen;
   char *pPassword;
   sqluint32 iPasswordLen;
   char *pTableSchema;
   sqluint32 iTableSchemaLen;
   char *pTableName;
   sqluint32 iTableNameLen;
   char *pStatement;
   sqluint32 iStatementLen;
   sqlint32 *pIsolationLevel;
   sqluint32 *piEnableParallelism;
} sqlu_remotefetch_entry;
```

COBOL Structure

```
* File: sqlutil.cbl
01 SQLU-MEDIA-LIST.
    05 SQL-MEDIA-TYPE         PIC X.
    05 SQL-FILLER             PIC X(3).
    05 SQL-SESSIONS           PIC S9(9) COMP-5.
    05 SQL-TARGET.
        10 SQL-MEDIA          USAGE IS POINTER.
        10 SQL-VENDOR         REDEFINES SQL-MEDIA
        10 SQL-LOCATION       REDEFINES SQL-MEDIA
        10 SQL-STATEMENT      REDEFINES SQL-MEDIA
        10 FILLER             REDEFINES SQL-MEDIA
*


* File: sqlutil.cbl
01 SQLU-MEDIA-ENTRY.
    05 SQL-MEDENT-LEN         PIC 9(9) COMP-5.
    05 SQL-MEDIA-ENTRY        PIC X(215).
    05 FILLER                 PIC X.
*


* File: sqlutil.cbl
```

```
01 SQLU-VENDOR.
    05 SQL-SHRLIB-LEN         PIC 9(9) COMP-5.
    05 SQL-SHR-LIB            PIC X(255).
    05 FILLER                 PIC X.
    05 SQL-FILENAME-LEN       PIC 9(9) COMP-5.
    05 SQL-FILENAME           PIC X(255).
    05 FILLER                 PIC X.
*


* File: sqlutil.cbl
01 SQLU-LOCATION-ENTRY.
    05 SQL-LOCATION-LEN       PIC 9(9) COMP-5.
    05 SQL-LOCATION-ENTRY     PIC X(255).
    05 FILLER                 PIC X.
*


* File: sqlutil.cbl
01 SQLU-STATEMENT-ENTRY.
    05 SQL-STATEMENT-LEN       PIC 9(9) COMP-5.
    05 SQL-STATEMENT-ENTRY     USAGE IS POINTER.
*
```

SQLU_RLOG_INFO

This structure contains information about the status of calls to the db2ReadLog API; and to the database log.

Table 76. Fields in the SQLU-RLOG-INFO Structure

Field Name	Data Type	Description
initialLSN	SQLU_LSN	Specifies the LSN value of the first log record that is written after the first database CONNECT statement is issued. For more information, see SQLU-LSN.
firstReadLSN	SQLU_LSN	Specifies the LSN value of the first log record read.
lastReadLSN	SQLU_LSN	Specifies the LSN value of the last log record read.
curActiveLSN	SQLU_LSN	Specifies the LSN value of the current (active) log.
logRecsWritten	sqluint32	Specifies the number of log records written to the buffer.
logBytesWritten	sqluint32	Specifies the number of bytes written to the buffer.

API and data structure syntax

```
typedef SQL_STRUCTURE SQLU_RLOG_INFO
{
   SQLU_LSN initialLSN;
   SQLU_LSN firstReadLSN;
   SQLU_LSN lastReadLSN;
   SQLU_LSN curActiveLSN;
   sqluint32 logRecsWritten;
   sqluint32 logBytesWritten;
} SQLU_RLOG_INFO;
```

sqlupi

This structure is used to store partitioning information, such as the distribution map and the distribution key of a table.

Table 77. Fields in the SQLUPI Structure

Field Name	Data Type	Description
PMAPLEN	INTEGER	The length of the distribution map in bytes. For a single-node table, the value is sizeof(SQL_PDB_NODE_TYPE). For a multi-node table, the value is SQL_PDB_MAP_SIZE * sizeof(SQL_PDB_NODE_TYPE).
PMAP	SQL_PDB_NODE_TYPE	The distribution map.
SQLD	INTEGER	The number of used SQLPARTKEY elements; that is, the number of key parts in a distribution key.
SQLPARTKEY	Structure	The description of a distribution column in a distribution key. The maximum number of distribution columns is SQL_MAX_NUM_PART_KEYS.

The following table shows the SQL data types and lengths for the SQLUPI data structure. The SQLTYPE column specifies the numeric value that represents the data type of an item.

Table 78. SQL Data Types and Lengths for the SQLUPI Structure

Data type	SQLTYPE (Nulls Not Allowed)	SQLTYPE (Nulls Allowed)	SQLLEN	AIX
Date	384	385	Ignored	Yes
Time	388	389	Ignored	Yes
Timestamp	392	393	Ignored	Yes
Variable-length character string	448	449	Length of the string	Yes
Fixed-length character string	452	453	Length of the string	Yes
Long character string	456	457	Ignored	No
Null-terminated character string	460	461	Length of the string	Yes
Floating point	480	481	Ignored	Yes
Decimal	484	485	Byte 1 = precision Byte 2 = scale	Yes
Large integer	496	497	Ignored	Yes
Small integer	500	501	Ignored	Yes

Table 78. SQL Data Types and Lengths for the SQLUPI Structure (continued)

Data type	SQLTYPE (Nulls Not Allowed)	SQLTYPE (Nulls Allowed)	SQLLEN	AIX
Variable-length graphic string	464	465	Length in double- byte characters	Yes
Fixed-length graphic string	468	469	Length in double- byte characters	Yes
Long graphic string	472	473	Ignored	No

sqlpartkey data structure parameter descriptions

sqltype
Input. Data type of the distribution key.

sqllen Input. Data length of the distribution key.

API and data structure syntax

```
SQL_STRUCTURE sqlupi
{
   unsigned short  pmaplen;
   SQL_PDB_NODE_TYPE pmap[SQL_PDB_MAP_SIZE];
   unsigned short  sqld;
   struct sqlpartkey sqlpartkey[SQL_MAX_NUM_PART_KEYS];
};

SQL_STRUCTURE sqlpartkey
{
   unsigned short  sqltype;
   unsigned short  sqllen;
};
```

SQLXA_XID

This structure is used by the transaction APIs to identify XA transactions. sqlxhfrg, sqlxphcm, sqlxphrl, sqlcspqy and db2XaListIndTrans APIs constitute the transaction APIs group. These APIs are used for the management of indoubt transactions.

Table 79. Fields in the SQLXA-XID Structure

Field Name	Data Type	Description
FORMATID	INTEGER	XA format ID.
GTRID_LENGTH	INTEGER	Length of the global transaction ID.
BQUAL_LENGTH	INTEGER	Length of the branch identifier.
DATA	CHAR[128]	GTRID, followed by BQUAL and trailing blanks, for a total of 128 bytes.

Note: The maximum size for GTRID and BQUAL is 64 bytes each.

API and data structure syntax

```
struct sqlxa_xid_t {
  sqlint32 formatID;
  sqlint32 gtrid_length;
  sqlint32 bqual_length;
  char data[SQLXA_XIDDATASIZE];
  } ;
typedef struct sqlxa_xid_t SQLXA_XID;
```

Appendix A. Precompiler customization APIs

Precompiler customization APIs

A set of documented APIs to enable other application development tools to implement precompiler support for DB2 directly within their products. For example, IBM COBOL on AIX uses this interface. Information on the set of Precompiler Services APIs is available from the PDF file, `prepapi.pdf`, at the following web site:

`http://www.ibm.com/software/data/db2/udb/support/manualsv9.html`

Appendix B. DB2 log records

DB2 log records

This section describes the structure of the DB2 log records returned by the db2ReadLog API when the `iFilterOption` input value `DB2READLOG_FILTER_ON` is specified. Only propagated log records are returned when this value is used. Only propagated log records are documented. All other log records are intended for IBM internal use only and are therefore not documented.

All DB2 log records begin with a log manager header. This header includes the total log record size, the log record type, and transaction-specific information. It does not include information about accounting, statistics, traces, or performance evaluation. For more information, see "Log manager header" on page 551.

Log records are uniquely identified by a log sequence number (LSN). The LSN represents a relative byte address, within the database log, for the first byte of the log record. It marks the offset of the log record from the beginning of the database log.

The log records written by a single transaction are uniquely identifiable by a field in the log record header. The unique transaction identifier is a six-byte field that increments by one whenever a new transaction is started. All log records written by a single transaction contain the same identifier.

When a transaction performs writable work against a table with DATA CAPTURE CHANGES on, or invokes a log writing utility, the transaction is marked as propagatable. Only propagatable transactions have their transaction manager log records marked as propagatable.

Table 80. DB2 Log Records

Type	Record Name	Description
Data Manager	"Initialize table log record" on page 567	New permanent table creation.
Data Manager	"Import replace (truncate) log record" on page 568	Import replace activity.
Data Manager	"Activate not logged initially log record" on page 568	Alter table activity that includes the ACTIVATE NOT LOGGED INITIALLY clause.
Data Manager	"Rollback insert log record" on page 569	Rollback row insert.
Data Manager	"Reorg table log record" on page 569	REORG committed.
Data Manager	"Create index, drop index log records" on page 570	Index activity.
Data Manager	"Create table, drop table, rollback create table, rollback drop table log records" on page 570	Table activity.
Data Manager	"Alter table attribute log record" on page 570	Propagation, check pending, and append mode activity.

Table 80. DB2 Log Records (continued)

Type	Record Name	Description
Data Manager	"Alter table add columns, rollback add columns log record" on page 571	Adding columns to existing tables.
Data Manager	"Alter column attribute log record" on page 572	Columns activity.
Data Manager	"Undo alter column attribute log record" on page 572	Column activity.
Data Manager	"Insert record, rollback delete record, rollback update record log records" on page 572	Table record activity.
Data Manager	"Insert record to empty page, delete record to empty page, rollback delete record to empty page, rollback insert record to empty page log records" on page 576	Multidimensional clustered (MDC) table activity.
Data Manager	"Update record log record" on page 577	Row updates where storage location not changed.
Data Manager	"Rename of a table or schema log record" on page 577	Table or schema name activity.
Data Manager	"Undo rename of a table or schema log record" on page 578	Table or schema name activity.
Long Field Manager	"Add/delete/non-update long field record log records" on page 561	Long field record activity.
Transaction Manager	"Normal commit log record" on page 553	Transaction commits.
Transaction Manager	"Heuristic commit log record" on page 554	Indoubt transaction commits.
Transaction Manager	"MPP coordinator commit log record" on page 554	Transaction commits. This is written on a coordinator node for an application that performs updates on at least one subordinator node.
Transaction Manager	"MPP subordinator commit log record" on page 555	Transaction commits. This is written on a subordinator node.
Transaction Manager	"Normal abort log record" on page 555	Transaction aborts.
Transaction Manager	"Heuristic abort log record" on page 556	Indoubt transaction aborts.
Transaction Manager	"Local pending list log record" on page 556	Transaction commits with a pending list existing.
Transaction Manager	"Global pending list log record" on page 557	Transaction commits (two-phase) with a pending list existing.
Transaction Manager	"XA prepare log record" on page 557	XA transaction preparation in two-phase commit environments.

Table 80. DB2 Log Records (continued)

Type	Record Name	Description
Transaction Manager	"MPP subordinator prepare log record" on page 558	MPP transaction preparation in two-phase commit environments. This log record only exists on subordinator node.
Transaction Manager	"TM prepare log record" on page 559	Coordinated transaction preparation as part of a two-phase commit, where the database is acting as the TM database.
Transaction Manager	"Backout free log record" on page 559	Marks the end of a backout free interval. The backout free interval is a set of log records that is not to be compensated if the transaction aborts.
Transaction Manager	"Application information log record" on page 559	Information about the application that started the transaction.
Transaction Manager	"Federated Prepare Log Record" on page 560	Information about the federated resource manager involved in the transaction.
Utility Manager	"Migration begin log record" on page 562	Catalog migration starts.
Utility Manager	"Migration end log record" on page 563	Catalog migration completes.
Utility Manager	"Load start log record" on page 563	Table load starts.
Utility Manager	"Backup end log record" on page 563	Backup activity completes.
Utility Manager	"Table space rolled forward log record" on page 564	Table space rollforward completes.
Utility Manager	"Table space roll forward to point in time starts log record" on page 564	Marks the beginning of a table space rollforward to a point in time.
Utility Manager	"Table space roll forward to point in time ends log record" on page 564	Marks the end of a table space rollforward to a point in time.

Log manager header

All DB2 log records begin with a log manager header. This header contains information detailing the log record and transaction information of the log record writer.

Note: A log record of type 'i' is an informational log record only. It will be ignored by DB2 during rollforward, rollback, and crash recovery.

Table 81. Log Manager Log Record Header (LogManagerLogRecordHeader)

Description	Type	Offset (Bytes)
Length of the entire log record	int	0(4)
Type of log record (See Table 82 on page 552.)	short	4(2)

Table 81. Log Manager Log Record Header (LogManagerLogRecordHeader) (continued)

Description	Type	Offset (Bytes)
Log record general flag[1]	short	6(2)
Log Sequence Number of the previous log record written by this transaction. It is used to chain log records by transaction. If the value is 0000 0000 0000, this is the first log record written by the transaction.	SQLU_LSN[2]	8(6)
Unique transaction identifier	SQLU_TID[3]	14(6)
Log Sequence Number of the log record for this transaction prior to the log record being compensated. (Note: For compensation and backout free log records only.)	SQLU_LSN	20(6)
Log Sequence Number of the log record for this transaction being compensated. (Note: For propagatable compensation log records only.)	SQLU_LSN	26(6)
Total Length for Log Manager Log Record Header: • *Non Compensation: 20 bytes* • *Compensation: 26 bytes* • *Propagatable Compensation: 32 bytes*		

Note:

1. Log record general flag constants

```
Redo Always                                          0x0001
Propagatable                                         0x0002
Temp Table                                           0x0004
Tablespace rollforward undo                          0x0008
Singular transaction (no commit/rollback)            0x0010
Conditionally Recoverable                            0x0080
Tablespace rollforward at check constraint process   0x0100
```

2. Log Sequence Number (LSN)

```
A unique log record identifier representing the relative byte address
of the log record within the database log.

SQLU_LSN: union { unsigned char  [6] ;
                  unsigned short [3] ;
                  }
```

3. Transaction Identifier (TID)

```
A unique log record identifier representing the transaction.

SQLU_TID: union { unsigned char  [6] ;
                  unsigned short [3] ;
                  }
```

4. Record ID (RID)

```
A unique number identifying the position of a record.
RID: Page number  char [4];
slot number  char [2];
```

Table 82. Log Manager Log Record Header Log Type Values and Definitions

Value	Definition
0x0041	Normal abort
0x0042	Backout free

Table 82. Log Manager Log Record Header Log Type Values and Definitions (continued)

Value	Definition
0x0043	Compensation
0x0049	Heuristic abort
0x004A	Load start
0x004E	Normal log record
0x004F	Backup end
0x0051	Global pending list
0x0052	Redo
0x0055	Undo
0x0056	Migration begin
0x0057	Migration end
0x0069	Information only
0x006F	Backup start
0x0071	Table Space Roll Forward to Point in Time Ends
0x007B	MPP prepare
0x007C	XA prepare
0x007D	Transaction Manager (TM) prepare
0x0084	Normal commit
0x0085	MPP subordinate commit
0x0086	MPP coordinator commit
0x0087	Heuristic commit
0x0089	Table Space Roll Forward to Point in Time Starts
0x008A	Local pending list
0x008B	Application information

Transaction manager log records

The transaction manager produces log records signifying the completion of transaction events (for example, commit or rollback). The time stamps in the log records are in Coordinated Universal Time (UTC), and mark the time (in seconds) since January 01, 1970.

Normal commit log record

This log record is written for a transaction in a single-node environment, or in a multiple nodes environment, while the transaction only affects one node. The log record is written when a transaction commits after one of the following events:

1. A user has issued a COMMIT
2. An implicit commit occurs during a CONNECT RESET

Table 83. Normal Commit Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)

Table 83. Normal Commit Log Record Structure (continued)

Description	Type	Offset (Bytes)
Time transaction committed	sqluint64	20 (8)
Authorization identifier length [1] (if the log record is marked as propagatable)	unsigned short	28 (2)
Authorization identifier of the application[1] (if the log record is marked as propagatable)	char [ ]	30 (variable[2])
Total length: 30 bytes plus variable propagatable (28 bytes nonpropagatable)		

Note:

1. If the log record is marked as propagatable
2. Variable based on Authorization identifier length

Heuristic commit log record

This log record is written when an indoubt transaction is committed.

Table 84. Heuristic Commit Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time transaction committed	sqluint64	20 (8)
Authorization identifier length [1] (if the log record is marked as propagatable)	unsigned short	28 (2)
Authorization identifier of the application[1] (if the log record is marked as propagatable)	char [ ]	30 (variable[2])
Total length: 30 bytes plus variable propagatable (28 bytes nonpropagatable)		

Note:

1. If the log record is marked as propagatable
2. Variable based on authorization identifier length

MPP coordinator commit log record

This log record is written on a coordinator node for an application that performs updates on at least one subordinator node.

Table 85. MPP Coordinator Commit Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time transaction committed	sqluint64	20 (8)
MPP identifier of the transaction	SQLP_GXID	28 (20)
Maximum node number	unsigned short	48 (2)

Table 85. MPP Coordinator Commit Log Record Structure (continued)

Description	Type	Offset (Bytes)
TNL	unsigned char [ ]	50 (max node number/8 + 1)
Authorization identifier length [1] (if the log record is marked as propagatable)	unsigned short	variable (2)
Authorization identifier of the application[1] (if the log record is marked as propagatable)	char [ ]	variable (variable[2])
Total length: variable		

Note:

1. TNL defines the nodes except for the coordinator node that involved in a transaction
2. Variable based on authorization identifier length

MPP subordinator commit log record

This log record is written on a subordinator node in MPP.

Table 86. MPP Subordinator Commit Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time transaction committed	sqluint64	20 (8)
MPP identifier of the transaction	SQLP_GXID	28 (20)
Reserved	unsigned short	48 (2)
Authorization identifier length [1] (if the log record is marked as propagatable)	unsigned short	50 (2)
Authorization identifier of the application[2] (if the log record is marked as propagatable)	char [ ]	52 (variable[3])
Total length: 48 bytes plus variable		

Note:

1. This is the current database partition number if the transaction is on one database partition only, otherwise it is the coordinator partition number.
2. If the log record is marked as propagatable
3. Variable based on authorization identifier length

Normal abort log record

This log record is written when a transaction aborts after one of the following events:

- A user has issued a ROLLBACK

- A deadlock occurs
- An implicit rollback occurs during crash recovery
- An implicit rollback occurs during ROLLFORWARD recovery.

Table 87. Normal Abort Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Authorization identifier length [1] (if the log record is marked as propagatable)	unsigned short	20 (2)
Authorization identifier of the application[1] (if the log record is marked as propagatable)	char [ ]	22 (variable[2])
Total ength: 22 bytes plus variable propagatable (20 bytes nonpropagatable)		

Note:

1. If the log record is marked as propagatable
2. Variable based on authorization identifier length

Heuristic abort log record

This log record is written when an indoubt transaction is aborted.

Table 88. Heuristic Abort Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Authorization identifier length [1] (if the log record is marked as propagatable)	unsigned short	20 (2)
Authorization identifier of the application[1] (if the log record is marked as propagatable)	char [ ]	22 (variable[2])
Total length: 22 bytes plus variable propagatable (20 bytes nonpropagatable)		

Note:

1. If the log record is marked as propagatable
2. Variable based on authorization identifier length

Local pending list log record

This log record is written if a transaction commits and a pending list exists. The pending list is a linked list of non-recoverable operations (such as deletion of a file) that can only be performed when the user/application issues a COMMIT. The variable length structure contains the pending list entries.

Table 89. Local Pending List Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)

Table 89. Local Pending List Log Record Structure (continued)

Description	Type	Offset (Bytes)
Time transaction committed	sqluint64	20 (8)
Authorization identifier length[1]	unsigned short	28 (2)
Authorization identifier of the application[1]	char [ ]	30 (variable)[2]
Pending list entries	variable	variable (variable)
Total Length: 30 bytes plus variables propagatable (28 bytes plus pending list entries non-propagatable)		

Note:

1. If the log record is marked as propagatable
2. Variable based on Authorization identifier length

Global pending list log record

This log record is written if a transaction involved in a two-phase commit commits, and a pending list exists. The pending list contains non-recoverable operations (such as deletion of a file) that can only be performed when the user/application issues a COMMIT. The variable length structure contains the pending list entries.

Table 90. Global Pending List Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Authorization identifier length[1]	unsigned short	20 (2)
Authorization identifier of the application[1]	char [ ]	22 (variable)[2]
Global pending list entries	variable	variable (variable)
Total Length: 22 bytes plus variables propagatable (20 bytes plus pending list entries non-propagatable)		

Note:

1. If the log record is marked as propagatable
2. Variable based on Authorization identifier length

XA prepare log record

This log record is written for XA transactions in a single-node environment, or on the coordinator node in MPP. It is only used for XA applications. The log record is written to mark the preparation of the transaction as part of a two-phase commit. The XA prepare log record describes the application that started the transaction, and is used to recreate an indoubt transaction.

Table 91. XA Prepare Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time transaction prepared	sqluint64	20 (8)

Table 91. XA Prepare Log Record Structure (continued)

Description	Type	Offset (Bytes)
Log space used by transaction	sqluint64	28 (8)
Transaction Node List Size	sqluint32	36 (4)
Transaction Node List	unsigned char [ ]	40 (variable)
Reserve	sqluint32	variable (2)
XA identifier of the transaction	SQLXA_XID[1]	variable (140)
Synclog information	variable	variable (variable)
Total length: 182 bytes plus variables		

Note: 1. For details on the SQLXA_XID log record type, see "SQLXA_XID" on page 544.

MPP subordinator prepare log record

This log record is written for MPP transactions on subordinator nodes. The log record is written to mark the preparation of the transaction as part of a two-phase commit. The MPP subordinator prepare log record describes the application that started the transaction, and is used to recreate an indoubt transaction.

Table 92. MPP Subordinator Prepare Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time Transaction Prepared	sqluint64	20 (8)
Log space used by transaction	sqluint64	28 (8)
Coordinator LSN	SQLP_LSN	36 (6)
Padding	char [ ]	42 (2)
MPP identifier of the transaction	SQLP_GXID[1]	44 (20)
Total Length: 64 bytes plus variable		

Note: 1.The SQLP-GXID log record is used to identify transactions in MPP environment.

Table 93. Fields in the SQLP-GXID Structure

Field Name	Data Type	Description
FORMATID	INTEGER	GXID format ID
GXID_LENGTH	INTEGER	Length of GXID
BQAL_LENGTH	INTEGER	Length of the branch identifier
DATA	CHAR(8)	First 2 bytes contain the node number; remainder is the transaction ID

TM prepare log record

This log record is written for DB2 coordinated transactions in a single-partition database environment or on the coordinator partition in MPP, where the database is acting as the TM database. The log record is written to mark the preparation of the transaction as part of a two-phase commit.

Table 94. TM Prepare Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time transaction prepared	sqluint64	20 (8)
Log space used by transaction	sqluint64	28 (8)
Transaction Node List Size	sqluint32	36 (4)
Transaction Node List	unsigned char [ ]	40 (variable)
Reserve	sqluint32	variable (2)
XA identifier of the transaction	SQLXA_XID	variable (140)
Synclog information	variable	variable (variable)
Total length: 182 bytes plus variables		

Backout free log record

This log record is used to mark the end of a backout free interval. The backout free interval is a set of log records that is not to be compensated if the transaction aborts. This log record contains a 6-byte log sequence number (*complsn*, stored in the log record header starting at offset 20). Under certain scenarios, the backout free log record also contains log data, starting at offset 26, which is same as the data logged in corresponding data manager log records. When this log record is read during rollback (following an aborted transaction), *complsn* marks the next log record to be compensated.

Table 95. Backout free Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Complsn	SQLP_LSN	20 (6)
Log data[1]	variable	variable
Total Length: 26 bytes plus variables		

Note: 1. Only applied in certain scenarios, and when used, the length of the entire log record in the log header is more than 26 bytes.

Application information log record

This log record contains information about the application that started this transaction.

Table 96. Application Information Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)

Table 96. Application Information Log Record Structure (continued)

Description	Type	Offset (Bytes)
Transaction Start Time	sqluint32	20 (4)
Reserved	char[ ]	24 (16)
Code page	sqluint32	40 (4)
Application Name Length	sqluint32	44 (4)
Application Name	char [ ]	48 (variable)
Application Identifier Length	sqluint32	variable (4)
Application Identifier	char [ ]	variable (variable)
Sequence Number Length	sqluint32	variable (4)
Sequence Number	char [ ]	variable (variable)
Database Alias Used by Client Length	sqluint32	variable (4)
Database Alias Used by Client	char [ ]	variable (variable)
Authorization Identifier Length	sqluint32	variable (4)
Authorization Identifier	char [ ]	variable (variable)
Total Length: 64 bytes plus variables		

Federated Prepare Log Record

This log record contains information about the federated resource managers that were involved in the transaction.

Table 97. Federated Prepare Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Number of Resource Managers	sqluint32	20 (4)
Authorization Identifier Length	sqluint16	24 (2)
Encrypted Password Length	sqluint16	26 (2)
Authorization Identifier	char [128]	28 (128)
Encrypted Password	char [255]	156 (255)
Resource Manager Entries	variable	411 (variable)
Total Length: 411 bytes plus variables		

Long field manager log records

Long field manager log records are written only if a database is configured with LOG RETAIN on or USEREXITS enabled. They are written whenever long field data is inserted, deleted, or updated.

Note: LOB manager log records are not propagatable, and are therefore not documented.

To conserve log space, long field data inserted into tables is not logged if the database is configured for circular logging. In addition, when a long field value is updated, the before image is shadowed and not logged.

All long field manager log records begin with a header.

All long field manager log record offsets are from the end of the log manager log record header.

When a table has been altered to capture LONG VARCHAR OR LONG VARGRAPHIC columns (by specifying INCLUDE LONGVAR COLUMNS on the ALTER TABLE statement):

- The long field manager will write the appropriate long field log record.
- When long field data is updated, the update is treated as a delete of the old long field value, followed by an insert of the new value. To determine whether or not a Delete/Add Long Field Record is associated with an update operation on the table the original operation value would be logged to the Long Field Manager Log Record.
- When tables with long field columns are updated, but the long field columns themselves are not updated, a Non-update Long Field Record is written.
- The Delete Long Field Record and the Non-update Long Field Record are information only log records.

Table 98. Long Field Manager Log Record Header (LongFieldLogRecordHeader)

Description	Type	Offset (Bytes)
Originator code (component identifier = 3)	unsigned char	0 (1)
Operation type (See Table 99.)	unsigned char	1 (1)
Table space identifier	unsigned short	2 (2)
Object identifier	unsigned short	4 (2)
Parent table space identifier[1]	unsigned short	6 (2)
Parent object identifier[2]	unsigned short	8 (2)
Total Length: 10 bytes		

Note:

1. Table space ID of the data object
2. Object ID of the data object

Table 99. Long Field Manager Log Record Header Operation Type Values and Definitions

Value	Definition
113	Add Long Field Record
114	Delete Long Field Record
115	Non-Update Long Field Record

Add/delete/non-update long field record log records

These log records are written whenever long field data is inserted, deleted, or updated. The length of the data is rounded up to the next 512-byte boundary.

Table 100. Add/Delete/Non-update Long Field Record Log Record Structure

Description	Type	Offset (Bytes)
Log header	LongFieldLogRecordHeader	0 (10)
Internal	Internal	10 (1)
Original operation type[1]	char	11 (1)
Column identifier[2]	unsigned short	12 (2)
Long field length[3]	unsigned short	14 (2)
File offset[4]	sqluint32	16 (4)
Long field data	char[ ]	20 (variable)

Note:

1. Original operation type

   ```
   1     Insert
   2     Delete
   4     Update
   ```

2. The column number that the log record is applied to. Column number starts from 0.
3. Long field data length in 512-byte sectors (actual data length is recorded as the first 4 bytes of long field descriptor (LF descriptor), which is logged in the following insert/delete/update log record as part of formatted user data record). The value of this field is always positive.

   The long field manager never writes log records for zero length long field data that is being inserted, deleted, or updated.
4. 512-byte sector offset into long field object where data is to be located.

Utility manager log records

The utility manager produces log records associated with the following DB2 utilities:

- Migration
- Load
- Backup
- Table space rollforward.

The log records signify the beginning or the end of the requested activity. Only propagatable log records for these utilities are documented.

Migration begin log record

This log record is associated with the beginning of catalog migration.

Table 101. Migration Begin Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Migration start time	char[ ]	20 (10)
Migrate from release	unsigned short	30 (2)
Migrate to release	unsigned short	32 (2)
Total Length: 34 bytes		

Migration end log record

This log record is associated with the successful completion of catalog migration.

Table 102. Migration End Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Migration end time	char[ ]	20 (10)
Migrate to release	unsigned short	30 (2)
Total Length: 32 bytes		

Load start log record

This log record is associated with the beginning of a load.

It is the only Load log record that is propagatable. It is written at the beginning of the Load phase. This log record should not be confused with other types of Load Start records written at the beginning of a Setup phase which is not propagatable.

For the purpose of log record propogation, it is recommended that after reading a Log Start log record you not continue to propogate log records for the specific table to a target table. After a Load Start log record, all propagatable log records that belong to the table being loaded can be ignored regardless of the transaction boundary, until such a time that a cold restart has taken place. A cold restart is required to synchronize the source and target tables.

Table 103. Load Start Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Log record identifier	sqluint32	20 (4)
Pool identifier	unsigned short	24 (2)
Object identifier	unsigned short	26 (2)
Flag	sqluint32	28 (4)
Object pool list	variable	32 (variable)
Total length: 32 bytes plus variable		

Backup end log record

This log record is associated with the end of a successful backup.

Table 104. Backup End Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Backup end time	sqluint64	20 (8)
Total Length: 28 bytes		

Table space rolled forward log record

This log record is associated with table space ROLLFORWARD recovery. It is written for each table space that is successfully rolled forward.

Table 105. Table Space Rolled Forward Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Table space identifier	sqluint32	20 (4)
Total length: 24 bytes		

Table space roll forward to point in time starts log record

This log record is associated with table space ROLLFORWARD recovery. It marks the beginning of a table space roll forward to a point in time.

Table 106. Table Space Roll Forward to Point in Time Starts Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time stamp for this log record	sqluint64	20 (8)
Time stamp to which table spaces are being rolled forward	sqluint32	28 (4)
Number of pools being rolled forward	sqluint32	32 (4)
Total length: 36 bytes		

Table space roll forward to point in time ends log record

This log record is associated with table space ROLLFORWARD recovery. It marks the end of a table space roll forward to a point in time.

Table 107. Table Space Roll Forward to Point in Time Ends Log Record Structure

Description	Type	Offset (Bytes)
Log header	LogManagerLogRecordHeader	0 (20)
Time stamp for this log record	sqluint64	20 (8)
Time stamp to which table spaces were rolled forward	sqluint32	28 (4)
A flag whose value is `TRUE` if the roll forward was successful, or `FALSE` if the roll forward was cancelled.	sqluint32	32 (4)
Total length: 36 bytes		

Two timestamp fields are required to provide adequate precision so that event log event timing can be differentiated. The first timestamp uses 8 bytes to indicate the time when the log was written to a precision of seconds. The first 4 bytes of this timestamp indicate the seconds portion. Since many actions can take place in one

second, to understand the ordering of events it is necessary to have further precision. The second timestamp field provides 4 bytes that are used to represent nanoseconds. If the log record timestamps of two log records are identical, the additional 4 byte timestamp field can be used to determine the ordering of the associated log events.

Data manager log records

Data manager log records are the result of DDL, DML, or Utility activities.

There are two types of data manager log records:

- Data Management System (DMS) logs have a component identifier of 1 in their header.
- Data Object Manager (DOM) logs have a component identifier of 4 in their header.

Table 108. DMS Log Record Header Structure (DMSLogRecordHeader)

Description	Type	Offset (Bytes)
Component identifier (=1)	unsigned char	0(1)
Function identifier (See Table 109.)	unsigned char	1(1)
Table identifiers		
Table space identifier	unsigned short	2(2)
Table identifier	unsigned short	4(2)
Total Length: 6 bytes		

Table 109. DMS Log Record Header Structure Function Identifier Values and Definitions

Value	Definition
102	Add columns to table
104	Undo add columns
110	Undo insert record
111	Undo delete record
112	Undo update record
113	Alter column
115	Undo alter column
122	Rename a schema or table
123	Undo rename a schema or table
124	Alter table attribute
128	Initialize table
131	Undo insert record to empty page
161	Delete record
162	Insert record
163	Update record
164	Delete record to empty page
165	Insert record to empty page
166	Undo delete record to empty page

Table 109. DMS Log Record Header Structure Function Identifier Values and Definitions (continued)

Value	Definition
167	Insert multiple records
168	Undo insert multiple records

Table 110. DOM Log Record Header Structure (DOMLogRecordHeader)

Description	Type	Offset (Bytes)
Component identifier (=4)	unsigned char	0(1)
Function identifier (See Table 111.)	unsigned char	1(1)
Object identifiers		
Table space identifier	unsigned short	2(2)
Object identifier	unsigned short	4(2)
Table identifiers		
Table space identifier	unsigned short	6(2)
Table identifier	unsigned short	8(2)
Object type	unsigned char	10(1)
Flags	unsigned char	11(1)
Total Length: 12 bytes		

Table 111. DOM Log Record Header Structure Function Identifier Values and Definitions

Value	Definition
2	Create index
3	Drop index
4	Drop table
5	Undo drop table
11	Truncate table (import replace)
12	Activate NOT LOGGED INITIALLY
35	Reorg table
101	Create table
130	Undo create table

Note: All data manager log record offsets are from the end of the log manager record header.

All log records whose function identifier short name begins with `UNDO` are log records written during the UNDO or ROLLBACK of the action in question.

The ROLLBACK can be a result of:

- The user issuing the ROLLBACK transaction statement
- A deadlock causing the ROLLBACK of a selected transaction
- The ROLLBACK of uncommitted transactions following a crash recovery

- The ROLLBACK of uncommitted transactions following a RESTORE and ROLLFORWARD of the logs.

Initialize table log record

The initialize table log record is written when a new permanent table is being created; it signifies table initialization. This record appears after any log records that creates the DATA and Block Map storage objects, and before any log records that create the LF and LOB storage objects. This is a Redo log record. The function ID is 128.

Table 112. Initialize Table Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
File create LSN	SQLU_LSN	6(8)
Internal	Internal	14(74)
Table description length	sqluint32	88(4)
Table description record	variable	92(variable)
Total Length: 92 bytes plus table description record length		

Table 113. Table description record

Description	Type	Offset (Bytes)
record type	unsigned char	0(1)
Internal	Internal	1(1)
number of columns	unsigned short	2(2)
array of column descriptor	variable long	variable
Total length: 4 bytes plus the array of column descriptor length		

Table Description Record: column descriptor array

(number of columns) * 8, where each element of the array contains:

- field type (unsigned short, 2 bytes)

```
SMALLINT     0x0000
INTEGER      0x0001
DECIMAL      0x0002
DOUBLE       0x0003
REAL         0x0004
BIGINT       0x0005
DECFLOAT64   0x0006
DECFLOAT128  0x0007
CHAR         0x0100
VARCHAR      0x0101
LONG VARCHAR 0x0104
DATE         0x0105
TIME         0x0106
TIMESTAMP    0x0107
BLOB         0x0108
CLOB         0x0109
STRUCT       0x010D
XMLTYPE      0x0112
GRAPHIC      0x0200
VARGRAPH     0x0201
LONG VARG    0x0202
DBCLOB       0x0203
```

- length (2 bytes)

- If BLOB, CLOB, or DBCLOB, this field is not used. For the maximum length of this field, see the array that follows the column descriptor array.
- If not DECIMAL, length is the maximum length of the field (short).
- If PACKED DECIMAL: Byte 0, unsigned char, precision (total length) Byte 1, unsigned char, scale (fraction digits).

- null flag (unsigned short, 2 bytes)
  - mutually exclusive: allows nulls, or does not allow nulls
  - valid options: no default, type default, user default, generated, or compress type default

```
ISNULL                  0x0001
NONULLS                 0x0002
TYPE_DEFAULT            0x0004
USER_DEFAULT            0x0008
GENERATED               0x0040
COMPRESS_SYSTEM_DEFAULT 0x0080
```

- field offset (unsigned short, 2 bytes) This is the offset from the start of the fixed-length portion of user record to where the field's fixed value can be found.

Table Description Record: LOB column descriptor array

(number of LOB, CLOB, and DBCLOB fields) * 12, where each element of the array contains:

- length (MAX LENGTH OF FIELD, sqluint32, 4 bytes)
- reserved (internal, sqluint32, 4 bytes)
- log flag (IS COLUMN LOGGED, sqluint32. 4 bytes)

The first LOB, CLOB, or DBCLOB encountered in the column descriptor array uses the first element in the LOB descriptor array. The second LOB, CLOB, or DBCLOB encountered in the column descriptor array uses the second element in the LOB descriptor array, and so on.

Import replace (truncate) log record

The import replace (truncate) log record is written when an IMPORT REPLACE action is being executed. This record indicates the re-initialization of the table (no user records, new life LSN). The table identifiers in the log header identify the table being truncated (IMPORT REPLACE). This is a normal log record. The function ID is 11.

Table 114. Import Replace (Truncate) Log Record Structure

Description	Type	Offset (Bytes)
Log header	DOMLogRecordHeader	0(12)
Internal	Internal	12(variable)
Total Length: 12 bytes plus variable length		

Activate not logged initially log record

The activate not logged initially log record is written when a user issues an ALTER TABLE statement that includes the ACTIVATE NOT LOGGED INITIALLY clause. This is a normal log record. This is function ID 12.

Table 115. Active Not Logged Initially Log Record Structure

Description	Type	Offset (Bytes)
Log header	DOMLogRecordHeader	0(12)
Internal	Internal	12(4)
Long Tablespace ID*	unsigned short	16(2)
Index Tablespace ID*	unsigned short	18(2)
Index Object ID	unsigned short	20(2)
LF Object ID	unsigned short	22(2)
LOB Object ID	unsigned short	24(2)
XML Object ID	unsigned short	26(2)
Total Length: 28 bytes		

** Same as Table Space Identifiers in the DOM header; it is a unique identifier for each table space defined in the database.*

Rollback insert log record

The rollback insert log record is written when an insert row action (INSERT RECORD) is rolled back. This is a Compensation log record. The function ID is 110.

Table 116. Rollback Insert Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Internal	Internal	6(2)
Record Length	unsigned short	8(2)
Free space	unsigned short	10(2)
RID	char[]	12(6)
Total Length: 16 bytes		

Reorg table log record

The reorg table log record is written when the REORG utility has committed to completing the reorganization of a table. This is a Normal log record. The function ID is 35.

Table 117. Reorg Table Log Record Structure

Description	Type	Offset (Bytes)
Log header	DOMLogRecordHeader	0(12)
Internal	variable	12(476)
Index token[1]	unsigned short	488(2)
Temporary table space ID[2]	unsigned short	490(2)
Long temporary table space ID	unsigned short	492(2)
Total Length: 494 bytes		

Note:

1. If the value of the index token is not 0, it is the index by which the reorg is clustered (clustering index).
2. If the value of the temporary table space IDis not 0, it is the system temporary table space that was used to build the reorganized table.

Create index, drop index log records

These log records are written when indexes are created or dropped. The two elements of the log record are:

- The index root page, which is an internal identifier
- The index token, which is equivalent to the `IID` column in SYSIBM.SYSINDEXES. If the value for this element is 0, the log record represents an action on an internal index, and is not related to any user index.

This is a normal log record. The function ID is either 2 (create index) or 3 (drop index).

Table 118. Create Index, Drop Index Log Records Structure

Description	Type	Offset (Bytes)
Log header	DOMLogRecordHeader	0(12)
Internal	Internal	12(2)
Index token	unsigned short	14(2)
Index root page	sqluint32	16(4)
Total Length: 20 bytes		

Create table, drop table, rollback create table, rollback drop table log records

These log records are written when the DATA object for a permanent table is created or dropped. For creation of an MDC table, there is also a create table log record for creation of the Block Map object. The DATA object (and block Map object if applicable) is created during a CREATE TABLE operation, and prior to table initialization (Initialize Table). Create table and drop table are normal log records. Rollback create table and rollback drop table are Compensation log records. The function ID is either 101 (create table), 4 (drop table), 130 (rollback create table), or 5 (rollback drop table).

Table 119. Create Table, Drop Table, Rollback Create Table, Rollback Drop Table Log Records Structure

Description	Type	Offset (Bytes)
Log header	DOMLogRecordHeader	0(12)
Internal	variable	12(72)
Total Length: 84 bytes		

Alter table attribute log record

The alter table attribute log record is written when the state of a table is changed using the ALTER TABLE statement or as a result of adding or validating constraints. This can be a Normal or Compensation log record. The function ID is 124.

Table 120. Alter Table Attribute, Undo Alter Table Attribute

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Alter bit (attribute) mask	sqluint64	6(8)
Alter bit (attribute) values	sqluint64	14(8)
Total Length: 22 bytes		

Attribute Bits

```
0x00000001   Propagation
0x00000002   Check Pending
0x00000010   Value Compression
0x00010000   Append Mode
0x00200000   LF Propagation
```

All other bits are for internal use.

If one of the bits above is present in the alter bit mask, then this attribute of the table is being altered. To determine the new value of the table attribute (0 = OFF and 1 = ON), check the corresponding bit in the alter bit value.

Alter table add columns, rollback add columns log record

The alter table add columns log record is written when the user is adding columns to an existing table using an ALTER TABLE statement. Complete information on the old columns and new columns is logged.

- Column count elements represent the old number of columns and the new total number of columns.
- The parallel arrays contain information about the columns defined in the table. The old parallel array defines the table prior to the ALTER TABLE statement, while the new parallel array defines the table resulting from ALTER TABLE statement.
- Each parallel array consists of:
  - One 8-byte element for each column.
  - If there are any LOB columns, one 12 byte element for each LOB column. This follows the array of 8 byte elements.

Alter table add columns is a Normal log record. Rollback add columns is a Compensation log record. The function IDs are 102 (add column) or 104 (undo add column).

Table 121. Alter Table Add Columns, Rollback Add Columns Log Records Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordheader	0(6)
Internal	Internal	6(2)
Old column count	sqluint32	8(4)
New column count	sqluint32	12(4)
Old parallel arrays[1]	variable	16(variable)
New parallel arrays	variable	variable(variable)
Total Length: 16 bytes plus 2 sets of parallel arrays.		

Array Elements:

1. The lengths of the elements in this array are defined as follows:
   - If the element is a column descriptor, the element length is 8 bytes.
   - If the element is a LOB column descriptor, the element length is 12 bytes.

For information about the column descriptor array or the LOB column descriptor array, see the description following Table 113 on page 567).

Alter column attribute log record

The function ID is 113.

Table 122. Alter Column Attribute Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordheader	0(6)
Column ID	unsigned short	6(2)
Old column definition	Column descriptor[1]	8(8)
New column definition	Column descriptor[1]	16(8)
Total Length: 24 bytes plus record length.		

[1]For a description of the column descriptor array, see the description following Table 113 on page 567).

Undo alter column attribute log record

The function ID is 115.

Table 123. Undo Alter Column Attribute Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Column ID	unsigned short	6(2)
Old column definition	Column descriptor[1]	8(8)
New column definition	Column descriptor[1]	16(8)
Total Length: 24 bytes plus record length.		

[1]For a description of the column descriptor array, see the description following Table 113 on page 567).

Insert record, rollback delete record, rollback update record log records

These log records are written when rows are inserted into a table, or when a deletion or update is rolled back. Insert Record and Delete Record log records can also be generated during an update, if the location of the record being updated must be changed to accommodate the modified record data. Insert Record log records are Normal log records. Rollback Delete records and rollback update records are Compensation log records. The function IDs are 162 (insert), 111 (rollback delete), or 112 (rollback update).

Table 124. Insert Record, Rollback Delete Record, Rollback Update Record Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Internal	Internal	6(2)
Record Length	unsigned short	8(2)
Free space	unsigned short	10(2)
RID	char[]	12(6)
Record offset	unsigned short	18(2)
Record header and data	variable	20(variable)
Total Length: 20 bytes plus record length		

Following are details about the record header and data:

Record header

- 4 bytes
- Record type (unsigned char, 1 byte).
- Reserved (char, 1 byte)
- Record length (unsigned short, 2 bytes)

Record

- Variable length
- Record type (unsigned char, 1 byte).
- Reserved (char, 1 byte)
- The rest of the record is dependent upon the record type and the table descriptor record defined for the table.
- The following fields apply to user data records with record type having the 1 bit set:
  - Fixed length (unsigned short, 2 bytes). This is the length of the fixed length section of the data row.
  - Formatted record (all of the fixed length columns, followed by the variable length columns).
- The following fields apply to user data records with record type having the 2 bit set:
  - Number of columns (unsigned short, 2 bytes). This is the number of columns in the data portion of the data row. See "Formatted user data record for table with VALUE COMPRESSION" on page 575.

    Note: the offset array will contain 1 + the number of columns.
  - Formatted record (offset array, followed by the data columns).

A user record is specified completely by the following characteristics:

1. Outer record type is 0, or
2. Outer record type is 0x10, or
3. Outer record type has the 0x04 bit set and
1. Inner record type has the 0x01 bit set, or
2. Inner record type has the 0x02 bit set.

Note: Row compression and data capture are not compatible.

Formatted user data record for a table without VALUE COMPRESSION

For records formatted without VALUE COMPRESSION, all fields contain a fixed-length portion. In addition, there are eight field types that have variable length parts:

- VARCHAR
- LONG VARCHAR
- BLOB
- CLOB
- VARGRAPHIC
- LONG VARG
- DBCLOB

The length of the fixed portion of the different field types can be determined as follows:

- DECIMAL

  This field is a standard packed decimal in the form: *nnnnnn...s*. The length of the field is: (precision + 2)/2. The sign nibble (s) is xC for positive (+), and xD or xB for negative (-).
- SMALLINT INTEGER BIGINT DOUBLE REAL CHAR GRAPHIC

  The length field in the element for this column in the table descriptor record contains the fixed length size of the field.
- DATE

  This field is a 4-byte packed decimal in the form: *yyyymmdd*. For example, April 3, 1996 is represented as x'19960403'.
- TIME

  This field is a 3-byte packed decimal in the form: *hhmmss*. For example, 1:32PM is represented as x'133200'.
- TIMESTAMP

  This field is a 10-byte packed decimal in the form: *yyyymmddhhmmssuuuuuu* (DATE | TIME | microseconds).
- VARCHAR LONG VARCHAR BLOB CLOB VARGRAPHIC LONG VARG DBCLOB

  The length of the fixed portion of all the variable length fields is 4.

The following sections describe the location of the fixed portion of each field within the formatted record.

The table descriptor record describes the column format of the table. It contains an array of column structures, whose elements represent field type, field length, null flag, and field offset. The latter is the offset from the beginning of the formatted record, where the fixed length portion of the field is located.

Table 125. Table Descriptor Record Structure

record type	number of columns	column structure • field type • length • null flag • field offset	LOB information

Note: For more information, see the description following Table 112 on page 567.

For columns that are nullable (as specified by the null flag), there is an additional byte following the fixed length portion of the field. This byte contains one of two values:

- NOT NULL (0x00)
- NULL (0x01)

If the null flag within the formatted record for a column that is nullable is set to 0x00, there is a valid value in the fixed length data portion of the record. If the null flag value is 0x01, the data field value is NULL.

The formatted user data record contains the table data that is visible to the user. It is formatted as a fixed length record, followed by a variable length section.

Table 126. Formatted User Data Record Structure for table without VALUE COMPRESSION

record type	length of fixed section	fixed length section	variable data section

Note: For more information, see the description following Table 124 on page 573.

All variable field types have a 4-byte fixed data portion in the fixed length section (plus a null flag, if the column is nullable). The first 2 bytes (short) represent the offset from the beginning of the fixed length section, where the variable data is located. The next 2 bytes (short) specify the length of the variable data referenced by the offset value.

Formatted user data record for table with VALUE COMPRESSION

Records formatted with VALUE COMPRESSION consist of the offset array and the data portion. Each entry in the array is a 2-byte offset to the corresponding column data in the data portion. The number of column data in the data portion can be found in the record header, and the number of entries in the offset array is one plus the number of column data that exists in the data portion.

1. Compressed column values consume only one byte of disk space which is used for attribute byte. The attribute byte indicates that the column data is compressed, for example, the data value is known but is not stored on disk. The high bit (0x8000) in the offset is used to indicate that the accessed data is an attribute byte. (Only 15 bits are used to represent the offset of the corresponding column data.)
2. For regular column data, the column data follows the offset array. There will not be any attribute byte or any length indicator present.
3. Accessed data can take two different values if it is an attribute byte:
   •

```
NULL   0x01   (Value is NULL)
```

-
```
COMPRESSED SYSTEM DEFAULT   0x80   (Value is equal to the system default)
```

4. The length of column data is the difference between the current offset and the offset of the next column.

Table 127. Formatted User Data Record Structure for table with VALUE COMPRESSION

record type	number of column in data portion	offset array	data portion

Note: For more information, see the description following Table 124 on page 573.

Insert record to empty page, delete record to empty page, rollback delete record to empty page, rollback insert record to empty page log records

These log records are written when the table is a multidimensional clustered (MDC) table. The Insert Record To Empty Page log record is written when a record is inserted and it is the first record on a page, where that page is not the first page of a block. This log record logs the insert to the page, as well as the update of a bit on the first page of the block, indicating that that page is no longer empty. The Delete Record To Empty Page log record is written when the last record is deleted from a page, where that page is not the first page of a block. This log record logs the delete from the page, as well as the update of a bit on the first page of the block, indicating that the page is empty. Insert Record to Empty Page log records and Delete Record to Empty Page log records are Normal log records. Rollback Delete Record log records and Rollback Insert Record log records are Compensation log records. The function IDs are 165 (insert record to empty page), 164 (delete record to empty page), 166 (rollback delete record to empty page), or 131 (rollback insert record to empty page).

Table 128. Rollback Insert Record to Empty Page

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Internal	Internal	6(2)
Record length	unsigned short	8(2)
Free space	unsigned short	10(2)
RID	char[]	12(6)
Internal	Internal	18(2)
First page of the block	sqluint32	20(4)
Total length: 24 bytes		

Table 129. Insert Record to Empty Page, Rollback Delete Record to Empty Page, Delete Record to Empty page

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Internal	Internal	6(2)
Record Length	unsigned short	8(2)
Free space	unsigned short	10(2)
RID	char[]	12(6)

Table 129. Insert Record to Empty Page, Rollback Delete Record to Empty Page, Delete Record to Empty page (continued)

Description	Type	Offset (Bytes)
Internal	Internal	18(2)
First page of the block	sqluint32	20(4)
Record offset	unsigned short	24(2)
Record header and data	variable	26(variable)
Total Length: 26 bytes plus Record length		

Note: For Record Header and Data Details, see the description following Table 124 on page 573.

Update record log record

The update record log record is written when a row is updated and its storage location remains the same. There are two available record formats; they are identical to the insert record (also the same as the delete log record) log records (see "Insert record, rollback delete record, rollback update record log records" on page 572). One contains the *pre*-update image of the row being updated; the other contains the *post*-update image of the row being updated. This is a normal log record. The function ID is 163.

Table 130. Update Record Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Internal	Internal	6(2)
New Record Length	unsigned short	8(2)
Free space	unsigned short	10(2)
RID	char[]	12(6)
Record offset	unsigned short	18(2)
Old record header and data	variable	20(variable)
Log header	DMSLogRecordHeader	variable(6)
Internal	Internal	variable(2)
Old Record Length	unsigned short	variable(2)
Free space	unsigned short	variable(2)
RID	char[]	variable(6)
Record offset	unsigned short	variable(2)
New record header and data	variable	variable(variable)
Total Length: 40 bytes plus 2 Record lengths		

Rename of a table or schema log record

The Rename of a Table Schema Log Record is written when a table or schema name is modified. This is function ID 122.

Table 131. Rename of a Table or Schema Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Total Length: 6 bytes		

The Rename of a Table or Schema Log Record does not contain information regarding the old and new names of a table or schema object. Separate insert, update, and delete log records associated with operations on the system catalog tables are generated when a table or schema renaming takes place.

Undo rename of a table or schema log record

The Undo Rename of a Table Schema Log Record is written when a table or schema name modification is rolled back. This is function ID 123.

Table 132. Undo Rename of a Table or Schema Log Record Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Total Length: 6 bytes		

The Rename of a Table or Schema Log Record does not contain information regarding the old and new names of a table or schema object. Separate insert, update, and delete log records associated with operations on the system catalog tables are generated when a table or schema renaming takes place.

Insert multiple records, undo insert multiple records

These log records are written when multiple rows are inserted into the same page of a table. Rollback insert multiple record is a compensation log record. The function IDs are 167 and 168.

Table 133. Insert Multiple Records Structure

Description	Type	Offset (Bytes)
Log header	DMSLogRecordHeader	0(6)
Padding	char[]	6(2)
Number of records	unsigned short	8(2)
Free space	unsigned short	10(2)
Sum of record lengths	unsigned short	12(2)
Variable part length	unsigned short	14(2)
Pool page number	sqluint32	16(4)
Record descriptions or rollback descriptions See Table 134 on page 579 and Table 135 on page 579.	variable	20(variable)
Total Length: 20 bytes plus record length		

Table 134. Records descriptions (one for each record)

Description	Type	Offset (Bytes)
RID	unsigned char[6]	0(6)
Record offset	unsigned short	6(2)
Record header and data	variable	8(variable)
Total Length: 8 bytes plus record length		

Table 135. Rollback descriptions (one for each record)

Description	Type	Offset (Bytes)
RID	unsigned char[6]	0(6)
Record offset	unsigned short	6(2)
Total Length: 8 bytes		

For record header and data details, see the description following Table 124 on page 573.

Appendix C. Overview of the DB2 technical information

DB2 technical information is available through the following tools and methods:

- *DB2 Information Center*
  - Topics (Task, concept and reference topics)
  - Help for DB2 tools
  - Sample programs
  - Tutorials
- DB2 books
  - PDF files (downloadable)
  - PDF files (from the DB2 PDF DVD)
  - printed books
- Command line help
  - Command help
  - Message help

Note: The *DB2 Information Center* topics are updated more frequently than either the PDF or the hard-copy books. To get the most current information, install the documentation updates as they become available, or refer to the *DB2 Information Center* at ibm.com®.

You can access additional DB2 technical information such as technotes, white papers, and IBM Redbooks® publications online at ibm.com. Access the DB2 Information Management software library site at http://www.ibm.com/software/data/sw-library/.

Documentation feedback

We value your feedback on the DB2 documentation. If you have suggestions for how to improve the DB2 documentation, send an email to db2docs@ca.ibm.com. The DB2 documentation team reads all of your feedback, but cannot respond to you directly. Provide specific examples wherever possible so that we can better understand your concerns. If you are providing feedback on a specific topic or help file, include the topic title and URL.

Do not use this email address to contact DB2 Customer Support. If you have a DB2 technical issue that the documentation does not resolve, contact your local IBM service center for assistance.

If you would like to help IBM make the IBM Information Management products easier to use, take the Consumability Survey: http://www.ibm.com/software/data/info/consumability-survey/.

DB2 technical library in hardcopy or PDF format

The following tables describe the DB2 library available from the IBM Publications Center at www.ibm.com/shop/publications/order. English DB2 Version 9.5 manuals in PDF format and translated versions can be downloaded from www.ibm.com/support/docview.wss?rs=71&uid=swg2700947.

Although the tables identify books available in print, the books might not be available in your country or region.

The form number increases each time a manual is updated. Ensure that you are reading the most recent version of the manuals, as listed below.

Note: The *DB2 Information Center* is updated more frequently than either the PDF or the hard-copy books.

Table 136. DB2 technical information

Name	Form Number	Available in print	Last updated
Administrative API Reference	SC23-5842-02	Yes	April, 2009
Administrative Routines and Views	SC23-5843-02	No	April, 2009
Call Level Interface Guide and Reference, Volume 1	SC23-5844-02	Yes	April, 2009
Call Level Interface Guide and Reference, Volume 2	SC23-5845-02	Yes	April, 2009
Command Reference	SC23-5846-02	Yes	April, 2009
Data Movement Utilities Guide and Reference	SC23-5847-02	Yes	April, 2009
Data Recovery and High Availability Guide and Reference	SC23-5848-02	Yes	April, 2009
Data Servers, Databases, and Database Objects Guide	SC23-5849-02	Yes	April, 2009
Database Security Guide	SC23-5850-02	Yes	April, 2009
Developing ADO.NET and OLE DB Applications	SC23-5851-02	Yes	April, 2009
Developing Embedded SQL Applications	SC23-5852-02	Yes	April, 2009
Developing Java™ Applications	SC23-5853-02	Yes	April, 2009
Developing Perl and PHP Applications	SC23-5854-02	No	April, 2009
Developing User-defined Routines (SQL and External)	SC23-5855-02	Yes	April, 2009
Getting Started with Database Application Development	GC23-5856-02	Yes	April, 2009
Getting Started with DB2 installation and administration on Linux and Windows	GC23-5857-02	Yes	April, 2009
Internationalization Guide	SC23-5858-02	Yes	April, 2009

Table 136. DB2 technical information (continued)

Name	Form Number	Available in print	Last updated
Message Reference, Volume 1	GI11-7855-01	No	April, 2009
Message Reference, Volume 2	GI11-7856-01	No	April, 2009
Migration Guide	GC23-5859-02	Yes	April, 2009
Net Search Extender Administration and User's Guide	SC23-8509-02	Yes	April, 2009
Partitioning and Clustering Guide	SC23-5860-02	Yes	April, 2009
Query Patroller Administration and User's Guide	SC23-8507-01	Yes	April, 2009
Quick Beginnings for IBM Data Server Clients	GC23-5863-02	No	April, 2009
Quick Beginnings for DB2 Servers	GC23-5864-02	Yes	April, 2009
Spatial Extender and Geodetic Data Management Feature User's Guide and Reference	SC23-8508-02	Yes	April, 2009
SQL Reference, Volume 1	SC23-5861-02	Yes	April, 2009
SQL Reference, Volume 2	SC23-5862-02	Yes	April, 2009
System Monitor Guide and Reference	SC23-5865-02	Yes	April, 2009
Text Search Guide	SC23-5866-01	Yes	April, 2009
Troubleshooting Guide	GI11-7857-02	No	April, 2009
Tuning Database Performance	SC23-5867-02	Yes	April, 2009
Visual Explain Tutorial	SC23-5868-00	No	
What's New	SC23-5869-02	Yes	April, 2009
Workload Manager Guide and Reference	SC23-5870-02	Yes	April, 2009
pureXML Guide	SC23-5871-02	Yes	April, 2009
XQuery Reference	SC23-5872-02	No	April, 2009

Table 137. DB2 Connect-specific technical information

Name	Form Number	Available in print	Last updated
Quick Beginnings for DB2 Connect Personal Edition	GC23-5839-02	Yes	April, 2009
Quick Beginnings for DB2 Connect Servers	GC23-5840-02	Yes	April, 2009
DB2 Connect User's Guide	SC23-5841-02	Yes	April, 2009

Table 138. Information Integration technical information

Name	Form Number	Available in print	Last updated
Information Integration: Administration Guide for Federated Systems	SC19-1020-01	Yes	March, 2008
Information Integration: ASNCLP Program Reference for Replication and Event Publishing	SC19-1018-02	Yes	March, 2008
Information Integration: Configuration Guide for Federated Data Sources	SC19-1034-01	No	
Information Integration: SQL Replication Guide and Reference	SC19-1030-01	Yes	March, 2008
Information Integration: Introduction to Replication and Event Publishing	SC19-1028-01	Yes	March, 2008

Ordering printed DB2 books

If you require printed DB2 books, you can buy them online in many but not all countries or regions. You can always order printed DB2 books from your local IBM representative. Keep in mind that some softcopy books on the *DB2 PDF Documentation* DVD are unavailable in print. For example, neither volume of the *DB2 Message Reference* is available as a printed book.

Printed versions of many of the DB2 books available on the DB2 PDF Documentation DVD can be ordered for a fee from IBM. Depending on where you are placing your order from, you may be able to order books online, from the IBM Publications Center. If online ordering is not available in your country or region, you can always order printed DB2 books from your local IBM representative. Note that not all books on the DB2 PDF Documentation DVD are available in print.

Note: The most up-to-date and complete DB2 documentation is maintained in the DB2 Information Center at http://publib.boulder.ibm.com/infocenter/db2luw/v9r5.

To order printed DB2 books:

- To find out whether you can order printed DB2 books online in your country or region, check the IBM Publications Center at http://www.ibm.com/shop/publications/order. You must select a country, region, or language to access publication ordering information and then follow the ordering instructions for your location.
- To order printed DB2 books from your local IBM representative:
  1. Locate the contact information for your local representative from one of the following Web sites:
     - The IBM directory of world wide contacts at www.ibm.com/planetwide
     - The IBM Publications Web site at http://www.ibm.com/shop/publications/order. You will need to select your country, region, or

language to the access appropriate publications home page for your location. From this page, follow the "About this site" link.

2. When you call, specify that you want to order a DB2 publication.
3. Provide your representative with the titles and form numbers of the books that you want to order. For titles and form numbers, see "DB2 technical library in hardcopy or PDF format" on page 581.

Displaying SQL state help from the command line processor

DB2 returns an SQLSTATE value for conditions that could be the result of an SQL statement. SQLSTATE help explains the meanings of SQL states and SQL state class codes.

To invoke SQL state help, open the command line processor and enter:

```
? 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, and `? 08` displays help for the 08 class code.

Accessing different versions of the DB2 Information Center

For DB2 Version 9.5 topics, the DB2 Information Center URL is http://publib.boulder.ibm.com/infocenter/db2luw/v9r5/

For DB2 Version 9 topics, the DB2 Information Center URL is http://publib.boulder.ibm.com/infocenter/db2luw/v9/

For DB2 Version 8 topics, go to the Version 8 Information Center URL at: http://publib.boulder.ibm.com/infocenter/db2luw/v8/

Displaying topics in your preferred language in the DB2 Information Center

The DB2 Information Center attempts to display topics in the language specified in your browser preferences. If a topic has not been translated into your preferred language, the DB2 Information Center displays the topic in English.

- To display topics in your preferred language in the Internet Explorer browser:
  1. In Internet Explorer, click the **Tools** —> **Internet Options** —> **Languages...** button. The Language Preferences window opens.
  2. Ensure your preferred language is specified as the first entry in the list of languages.
     - To add a new language to the list, click the **Add...** button.

       Note: Adding a language does not guarantee that the computer has the fonts required to display the topics in the preferred language.
     - To move a language to the top of the list, select the language and click the **Move Up** button until the language is first in the list of languages.
  3. Clear the browser cache and then refresh the page to display the DB2 Information Center in your preferred language.
- To display topics in your preferred language in a Firefox or Mozilla browser:

1. Select the button in the **Languages** section of the **Tools** —> **Options** —> **Advanced** dialog. The Languages panel is displayed in the Preferences window.
2. Ensure your preferred language is specified as the first entry in the list of languages.
   - To add a new language to the list, click the **Add...** button to select a language from the Add Languages window.
   - To move a language to the top of the list, select the language and click the **Move Up** button until the language is first in the list of languages.
3. Clear the browser cache and then refresh the page to display the DB2 Information Center in your preferred language.

On some browser and operating system combinations, you might have to also change the regional settings of your operating system to the locale and language of your choice.

Updating the DB2 Information Center installed on your computer or intranet server

If you have installed the DB2 Information Center locally, you can obtain and install documentation updates from IBM.

Updating your locally-installed *DB2 Information Center* requires that you:

1. Stop the *DB2 Information Center* on your computer, and restart the Information Center in stand-alone mode. Running the Information Center in stand-alone mode prevents other users on your network from accessing the Information Center, and allows you to apply updates. Non-Administrative and Non-Root *DB2 Information Centers* always run in stand-alone mode. .
2. Use the update feature to see what updates are available. If there are updates that you would like to install, you can use the update feature to obtain and install them.

   Note: If your environment requires installing the *DB2 Information Center* updates on a machine that is not connected to the internet, you have to mirror the update site to a local file system using a machine that is connected to the internet and has the *DB2 Information Center* installed. If many users on your network will be installing the documentation updates, you can reduce the time required for individuals to perform the updates by also mirroring the update site locally and creating a proxy for the update site.
   If update packages are available, use the update feature to get the packages. However, the update feature is only available in stand-alone mode.
3. Stop the stand-alone Information Center, and restart the *DB2 Information Center* on your computer.

Note: On Windows Vista, the commands listed below must be run as an administrator. To launch a command prompt or graphical tool with full administrator privileges, right-click on the shortcut and then select **Run as administrator**.

To update the *DB2 Information Center* installed on your computer or intranet server:

1. Stop the *DB2 Information Center*.
   - On Windows, click **Start** → **Control Panel** → **Administrative Tools** → **Services**. Then right-click on **DB2 Information Center** service and select **Stop**.

- On Linux, enter the following command:
  ```
  /etc/init.d/db2icdv95 stop
  ```

2. Start the Information Center in stand-alone mode.
   - On Windows:
     a. Open a command window.
     b. Navigate to the path where the Information Center is installed. By default, the *DB2 Information Center* is installed in the *Program_files*\IBM\DB2 Information Center\Version 9.5 directory, where *Program_files* represents the location of the Program Files directory.
     c. Navigate from the installation directory to the doc\bin directory.
     d. Run the help_start.bat file:
        ```
        help_start.bat
        ```
   - On Linux:
     a. Navigate to the path where the Information Center is installed. By default, the *DB2 Information Center* is installed in the /opt/ibm/db2ic/V9.5 directory.
     b. Navigate from the installation directory to the doc/bin directory.
     c. Run the help_start script:
        ```
        help_start
        ```

   The systems default Web browser launches to display the stand-alone Information Center.
3. Click the **Update** button ( ). On the right hand panel of the Information Center, click **Find Updates**. A list of updates for existing documentation displays.
4. To initiate the installation process, check the selections you want to install, then click **Install Updates**.
5. After the installation process has completed, click **Finish**.
6. Stop the stand-alone Information Center:
   - On Windows, navigate to the installation directory's doc\bin directory, and run the help_end.bat file:
     ```
     help_end.bat
     ```

     Note: The help_end batch file contains the commands required to safely terminate the processes that were started with the help_start batch file. Do not use `Ctrl-C` or any other method to terminate help_start.bat.
   - On Linux, navigate to the installation directory's doc/bin directory, and run the help_end script:
     ```
     help_end
     ```

     Note: The help_end script contains the commands required to safely terminate the processes that were started with the help_start script. Do not use any other method to terminate the help_start script.
7. Restart the *DB2 Information Center*.
   - On Windows, click **Start** → **Control Panel** → **Administrative Tools** → **Services**. Then right-click on **DB2 Information Center** service and select **Start**.
   - On Linux, enter the following command:
     ```
     /etc/init.d/db2icdv95 start
     ```

The updated *DB2 Information Center* displays the new and updated topics.

DB2 tutorials

The DB2 tutorials help you learn about various aspects of DB2 products. Lessons provide step-by-step instructions.

Before you begin

You can view the XHTML version of the tutorial from the Information Center at http://publib.boulder.ibm.com/infocenter/db2help/.

Some lessons use sample data or code. See the tutorial for a description of any prerequisites for its specific tasks.

DB2 tutorials

To view the tutorial, click on the title.

"pureXML™" in *pureXML Guide*
Set up a DB2 database to store XML data and to perform basic operations with the native XML data store.

"Visual Explain" in *Visual Explain Tutorial*
Analyze, optimize, and tune SQL statements for better performance using Visual Explain.

DB2 troubleshooting information

A wide variety of troubleshooting and problem determination information is available to assist you in using DB2 database products.

DB2 documentation
Troubleshooting information can be found in the DB2 Troubleshooting Guide or the Database fundamentals section of the DB2 Information Center. There you will find information on how to isolate and identify problems using DB2 diagnostic tools and utilities, solutions to some of the most common problems, and other advice on how to solve problems you might encounter with your DB2 database products.

DB2 Technical Support Web site
Refer to the DB2 Technical Support Web site if you are experiencing problems and want help finding possible causes and solutions. The Technical Support site has links to the latest DB2 publications, TechNotes, Authorized Program Analysis Reports (APARs or bug fixes), fix packs, and other resources. You can search through this knowledge base to find possible solutions to your problems.

Access the DB2 Technical Support Web site at http://www.ibm.com/software/data/db2/support/db2_9/

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Index

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Z

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