

IBM Db2 Analytics Accelerator for z/OS
7.5.14

User's Guide



Note

Before you use this information and the product it supports, read the information in [“Notices” on page 297](#).

Eighteenth Edition, December 2025

This edition applies to version 7.5.14 (December 2025) of IBM® Db2® Analytics Accelerator for z/OS® (product number 5697-DA7), and to all subsequent releases and modifications until otherwise indicated in new editions. This edition replaces SH12-7101-16. Changes to this edition are marked with a vertical bar.

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About this book

This book provides information about the following subjects:

- General information on components and objects used by IBM Db2 Analytics Accelerator for z/OS
- Conditions for query acceleration with IBM Db2 Analytics Accelerator for z/OS (supported queries, data types, functions, limitations, and so on)
- Connecting to a data server
- Adding accelerators
- Adding and maintaining tables for query acceleration with IBM Db2 Analytics Accelerator for z/OS
- Configuring and activating system traces
- Adding, removing, activating, and deactivating individual accelerators
- Component updates

Audience

This book is intended for database professionals and database administrators who need to complete the following tasks with IBM Db2 Analytics Accelerator for z/OS:

- Accelerate Db2 for z/OS queries with IBM Db2 Analytics Accelerator for z/OS
- Complete administration tasks with the help of one of the supported administration clients:
 - IBM Db2 Analytics Accelerator Studio
 - IBM Data Server Manager

What's new in version 7.5?

IBM Db2 Analytics Accelerator for z/OS Version 7.5 is a major upgrade that provides powerful new features:

- IBM Integrated Synchronization for incremental update processing
- Multi-node installations of Db2 Analytics Accelerator on Z with increased processing power for massive workloads

Enhancements in this release

For enhancements in this or previous follow-up releases, see the [What's new](#) document.

Accessibility features

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

The following list includes the major accessibility features in IBM Db2 Analytics Accelerator Studio:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers

The IBM Db2 Analytics Accelerator for z/OS documentation in IBM Documentation and its related publications are accessibility-enabled.

Keyboard navigation

In addition to the standard navigation keys of your operating system, this product uses keyboard shortcuts and controls of the Eclipse framework. For more information about these features:

1. Go to <https://www.eclipse.org/documentation/>.
2. Open the information center of one of the recent Eclipse releases, such as <https://help.eclipse.org/2019-12/index.jsp>.
3. Search for the article *Navigating the user interface using the keyboard*.

Interface information

The Eclipse framework supports the JAWS screen reader software. If you are facing difficulties in getting JAWS to read out table column headers, see the following articles in a recent Eclipse information center:

- *Accessibility features in textual editors*
- *Tips for making user interfaces accessible*

How to access these articles is described under “[Keyboard navigation](#)” on page xiii.

IBM and accessibility

See the [IBM Human Ability and Accessibility Center](#) for more information about the commitment that IBM has to accessibility.

Chapter 1. Introduction

IBM Db2 Analytics Accelerator for z/OS is a query accelerator capable of reducing response times for Db2 for z/OS queries by an order of magnitude.

IBM Db2 Analytics Accelerator for z/OS integrates deeply into your existing Db2 for z/OS environment and can process very large amounts of data. The addition of IBM Db2 Analytics Accelerator for z/OS makes Db2 for z/OS a truly universal database management system with optimum performance characteristics for transactional and analytical applications.

You can use the following graphical front-ends or administration clients to administer IBM Db2 Analytics Accelerator for z/OS:

- IBM Db2 Analytics Accelerator Studio
- IBM Data Server Manager

These client applications offer functions for the configuration and administration, as well as analytical tools that collect performance metrics or troubleshooting information.

This chapter provides an overview of the basic tasks that can be completed with either administration client.

Connecting to a data server

IBM Db2 Analytics Accelerator for z/OS needs access to your data servers to read the database catalogs and invoke the stored procedures for the accelerators. To connect to a database server, you must complete the tasks that are described in this section.

Database connection profiles

Your administration client connects to your Db2 for z/OS data server using Java™ Database Connectivity (JDBC), like other database clients. The configuration parameters for accessing a Db2 for z/OS data server are stored in database connection profiles. Create a database connection profile for each Db2 for z/OS data server with an accelerator.

Related tasks

[Creating a database connection profile](#)

Create a database connection profile to gain access to a Db2 subsystem on a database server. A Db2 subsystem houses one or more databases, in which the source data for query acceleration (schemas and tables) is kept.

Connecting to a database

You can easily connect to a database (called Db2 subsystem in Db2 for z/OS) from your administration client.

Adding accelerators

When a connection to a Db2 subsystem has been established through one of your database connection profiles, you can see all currently deployed accelerators.

In IBM Db2 Analytics Accelerator Studio, the accelerators are listed in the **Object List Editor**. You access the Object List Editor from the **Accelerator Perspective** in IBM Db2 Analytics Accelerator Studio.

In IBM Data Server Manager, the accelerators are listed in the **Accelerator** view, which is accessible from the ADMINISTER submenu of the main menu.

To connect a newly installed accelerator, use the **Add Accelerator** wizard, which is available in either administration client.

Related tasks

[Completing the authentication using the Add Accelerator wizard](#)

To complete the authentication, you specify the IP address, the port number, and the pairing code in the **Add Accelerator** wizard.

Defining the data to load into an accelerator

Defining the data to load into an accelerator basically means selecting the proper tables. However, you also need to complete a number of related sub-tasks. This section lists all required tasks in the correct order.

Related concepts

[Distribution keys](#)

A distribution key determines how tables rows are distributed among the available working nodes. IBM Db2 Analytics Accelerator for z/OS selects a suitable distribution key automatically when tables are loaded. The distribution varies between the two extremes: an even distribution (called random distribution) without the use of a key and a maximally skewed distribution that uses a distribution key.

[Organizing keys](#)

Organizing key also have an impact on the query response time. When choosing an organizing key, you select columns by means of which you group the rows of an accelerator-shadow table within the data slices on the worker nodes. This creates grouped segments or blocks of rows with equal or nearby values in the columns selected as organizing keys. If an incoming SQL query references one of the organizing key columns in a range or equality predicate, the query can run much faster because entire blocks can be skipped. It is not necessary to scan the entire accelerator-shadow table. Thus the time needed for disk output operations related to the query is drastically reduced.

[How to select tables for query acceleration](#)

Selecting the proper tables for a query to be accelerated is basically simple: You need to define the tables that are referenced by the query. Slightly more thought needs to be spent on the choice of proper distribution keys and organizing keys.

Related tasks

[Specifying or changing a distribution key or organizing keys](#)

Distribution and organizing keys have a considerable impact on the query response time.

Selecting the proper tables

In choosing the proper tables, you determine the data to be queried. For each Db2 for z/OS table that you select, a corresponding table is created on one or more accelerators. These tables are called accelerator-shadow tables.

Accelerator-shadow tables are not necessarily copies of their originals. Often, they contain fewer columns than the tables they stem from because columns with unsupported data types are excluded. Accelerator-shadow tables must be filled with data before they can be queried. This is done in a later step (see loading accelerator-shadow tables).

Important: The only type of Db2 for z/OS tables you can select are base tables. The following types of tables are *not* supported, and therefore cannot be selected:

- Db2 for z/OS views
- Auxiliary tables
- XML tables
- Materialized query tables (MQTs)

Related tasks

[Defining tables on an accelerator](#)

Using the **Add Tables to Accelerator** or the **Select Tables to Add** wizard, you can define accelerator-shadow tables on an accelerator.

Checking the table size

When you select a table for an accelerator in the **Add Tables** wizard, your administration client displays the table size. This table size is calculated on the basis of the values in the CARDF and AVGWLEN columns of the SYSIBM.SYSTABLES table. Thus the metrics come from Db2 for z/OS. Comparing this size with the available disk space on your accelerator, you can roughly assess how much space the table will occupy on your accelerator. However, Db2 for z/OS and the accelerator use completely different compression algorithms, so the size of a table in Db2 might differ from the size of the same table on the accelerator.

Working with accelerator-shadow tables

To populate, maintain, and control accelerator-shadow tables, you complete the tasks that are described here.

Loading data into selected tables

To enable users to run accelerated queries against selected database tables, you must load the empty tables that you previously added to the accelerator with data. In doing so, you create a snapshot copy of your existing Db2 for z/OS data on the accelerator.

The Db2 Optimizer calculates the expected response times for incoming queries. If an accelerator can process a query against the selected tables faster than the database management system, the query is routed to the accelerator and evaluated against the populated accelerator-shadow tables.

You can reload accelerator-shadow tables, and, under certain conditions, also reload selected partitions of such tables. Doing so replaces the current data with a more recent snapshot, resulting in an update. When you reload tables or partitions, the accelerator automatically detects the tables and partitions that changed since the last load. This way, you can avoid loading the same data twice. The load wizard shows the load status for each table or partition and recommends maintenance activities.

Related concepts

[Updating accelerator tables continually](#)

The incremental update function of IBM Db2 Analytics Accelerator for z/OS allows you to update accelerator-shadow tables continually. Changes to the data in original Db2 for z/OS tables are thus propagated to the corresponding target tables with a high frequency and just a brief delay. This way, query results from an accelerator are always extracted from recent, close-to-real-time data.

Related tasks

[Loading tables](#)

Successful queries against accelerator-shadow tables are possible only if the tables contain data. Therefore, you must load the tables after their definition (empty structure) has been copied to the accelerator.

Enabling tables for query acceleration

Query acceleration can be switched on and off for each accelerator-shadow table. This allows you to do maintenance work on a particular table while query acceleration remains active for other tables on the same accelerator.

Disabling query acceleration for a table

Disabling a table, you can prevent accelerated queries against this table. This might be necessary when a query must be run against very recent data, which has not yet been copied to the accelerator.

Enabling tables for incremental updates

The incremental update function allows you to automatically update accelerator-shadow tables in an ongoing process. Updates to DB2® tables are then propagated to the corresponding tables on the accelerator with little delay, so that accelerated queries will always “hit” very recent data. You have to mark the tables that you want to include in this process.

Disabling incremental updates

Disabling incremental updates excludes tables from the incremental update process.

Archiving partition or table data

If table partitions in Db2 for z/OS contain data that is no longer updated (historical data), you can use the High Performance Storage Saver to move this data to an accelerator to free up costly storage on your Db2 for z/OS data server. A positive side-effect is that query processing and table maintenance become faster because the remaining data consists of fewer table rows and indexes require fewer entries.

Removing tables

If tables are no longer needed for queries, you can use the removal function in your administration client to remove the accelerator-shadow tables from the accelerator.

Related tasks

[Removing tables from an accelerator](#)

Follow the steps in this topic to remove accelerator-shadow tables from an accelerator.

Order in which to complete tasks

See a diagram that shows the order of the most common tasks.

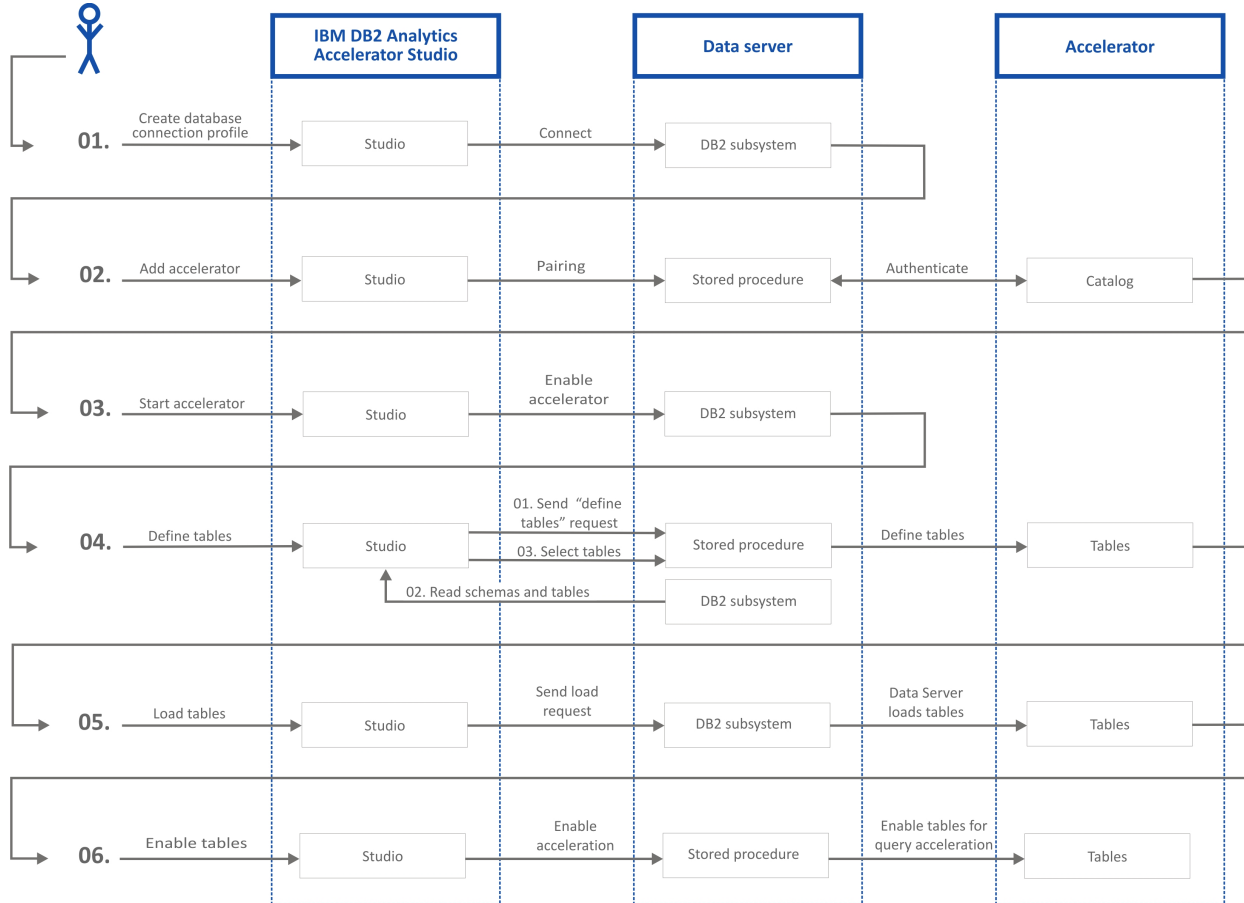


Figure 1. Administration tasks in the overall process flow

Chapter 2. Basic concepts

Get familiar with the basic concepts of IBM Db2 Analytics Accelerator for z/OS.

Accelerator

IBM Db2 Analytics Accelerator for z/OS consists of a high-performance hardware platform and an optimized database query engine. These components work together to support a variety of data analysis and business reporting tasks.

The high-performance query processing capabilities are embedded in a “shared nothing” architecture, which means that each worker node is able to process data independently, without network traffic or communication between the nodes. Hence there is hardly a contention for shared resources.

Each query is processed in parallel by all worker nodes, with each node processing a portion of each accelerator-shadow table. These portions are called *data slices*. The accelerator-shadow tables are thus horizontally partitioned because each worker node processes a data slice of each table.

Static SQL query support

Static SQL query support means that you can accelerate SQL queries that are embedded within Db2 for z/OS application programs.

Static SQL queries are prepared at the time the application program is bound as a package in Db2 for z/OS, that is, before the execution of the application in Db2. To accelerate static SQL queries within these application programs, you must BIND or REBIND the Db2 package for that application and specify a new bind option that requests static query acceleration.

Accelerator-shadow table

An accelerator-shadow table represents a table in your database. When you define accelerator-shadow tables in your administration client, you instruct IBM Db2 Analytics Accelerator for z/OS to copy the definition of that table (an empty table) to an accelerator.

Queries including this table are then routed to the accelerator provided that the requirements for query redirection are met. A query can only be routed to an accelerator if the query refers to a subset or all of the tables on the accelerator.

Restriction: A table can be added to multiple accelerators, but an accelerated query using that table can run only on one accelerator at a time.

In addition, a query can only be accelerated if all tables that are referenced by the query reside on the same accelerator, if the accelerator-shadow tables are loaded, and if query acceleration is enabled for these tables. A query can reference tables indirectly if the table references a view or a table alias. For example, if the query references a view that joins two tables, both tables must be present on the accelerator.

When tables are added to an accelerator, Db2 for z/OS keeps track of these accelerator-shadow tables in its system catalog. The system table entries enable the optimizer of the database management system to complete the following tasks:

- Query matching, that is, comparing an incoming query with the information stored in the system tables to check whether the query can be handled by IBM Db2 Analytics Accelerator for z/OS.
- Query evaluation, that is, calculating the estimated query response time. If a performance gain can be predicted, the query is sent to IBM Db2 Analytics Accelerator for z/OS. If not, the query is handled by the database management system itself.

If a table contains columns with unsupported data types, these columns will not be included in the corresponding accelerator-shadow table. All other columns will be copied. So the job of defining a table

will be completed even if some columns do not fulfill the criteria. However, queries that address columns with unsupported data types will not be accelerated.

Remember: The only Db2 for z/OS tables you can define as accelerator-shadow tables are base tables. The following types of Db2 for z/OS tables are *not* supported, and therefore cannot be used:

- Db2 for z/OS views
- Auxiliary tables
- XML tables
- Materialized query tables (MQTs)

Related tasks

Defining tables on an accelerator

Using the **Add Tables to Accelerator** or the **Select Tables to Add**wizard, you can define accelerator-shadow tables on an accelerator.

How to select tables for query acceleration

Selecting the proper tables for a query to be accelerated is basically simple: You need to define the tables that are referenced by the query. Slightly more thought needs to be spent on the choice of proper distribution keys and organizing keys.

Suppose that you want to accelerate the following query, which extracts the total number of items and the total amount of money paid by each customer from a set of sales tables. The query does not reach infinitely into the past; rather, it considers just the orders that were received after a certain date. The results will be grouped by customer number.

Note: The O_TOTALPRICE column denotes the total price per order. It is not the total price that is calculated by the query.

Query:

```
SELECT SUM(L_QUANTITY), SUM(O_TOTALPRICE), O_CUSTKEY
FROM TPCH.LINEITEM L JOIN TPCH.ORDERS O on L.L_ORDERKEY = O.O_ORDERKEY
WHERE O.O_ORDERDATE > '01.01.1994' GROUP BY O.O_CUSTKEY;
```

The query references the following tables:

- LINEITEM (L)
- ORDERS (O)

You would thus define these tables on the accelerator.

The query contains the following join predicate (join condition):

```
L.L_ORDERKEY = O.O_ORDERKEY
```

Suppose that O.O_ORDERKEY is a primary key and that the L table uses this key as a foreign key (L.L_ORDERKEY). To enable colocated joins, which lead to shorter query response times, the columns of accelerator-shadow tables must be on the same processing node. In order to achieve this, you would thus use O.O_ORDERKEY and L.L_ORDERKEY as distribution keys. Hence you would specify O.O_ORDERKEY as the distribution key for O and L.L_ORDERKEY as the distribution key for L.

Furthermore, the query contains the condition

```
WHERE O.O_ORDERDATE > '01.01.1994'
```

The O.O_ORDERDATE column makes a good candidate for an organizing key because its selection as a key of this type will group table rows with the same shipment date together. All rows with the same shipment date will be organized in blocks or clusters. When the query “encounters” a value that does not fulfill the condition, it can skip an entire block rather than individual rows. This decreases the time that is needed for scans of accelerator-shadow tables, and thus further decreases the query response time.

Access plan graph

If you are unsure whether the query refers to views or aliases rather than actual tables, you can display the access plan graph of the query.

In the access plan graph for this example, you can see that TPCH.LINEITEM and TPCH.ORDERS are tables because they appear in the access plan graph. Views and aliases are not represented in access plan graphs. See [Figure 2 on page 9](#).

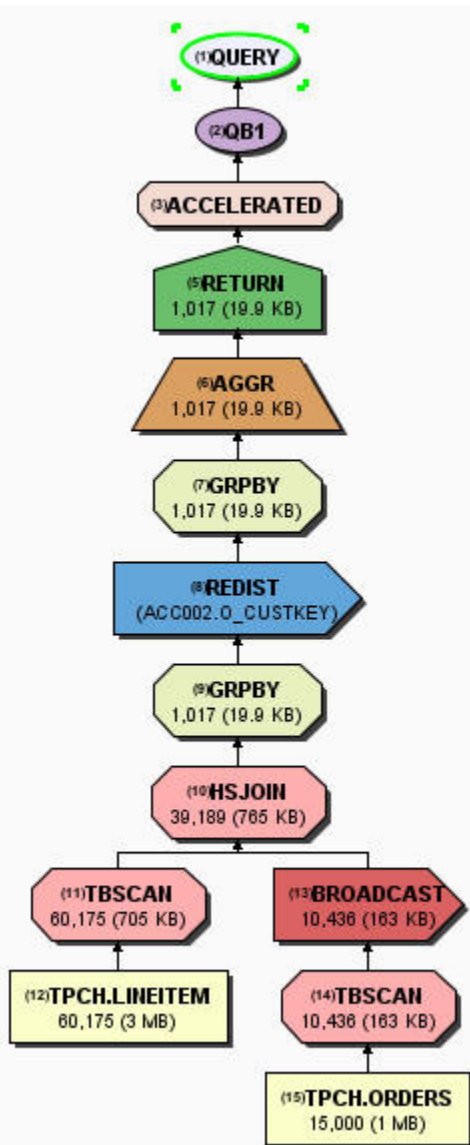


Figure 2. Access plan graph of the query in the example

Related concepts

[Defining the data to load into an accelerator](#)

Defining the data to load into an accelerator basically means selecting the proper tables. However, you also need to complete a number of related sub-tasks. This section lists all required tasks in the correct order.

Related information

[Graphing the access plan for a query](#)

Distribution keys

A distribution key determines how tables rows are distributed among the available working nodes. IBM Db2 Analytics Accelerator for z/OS selects a suitable distribution key automatically when tables are loaded. The distribution varies between the two extremes: an even distribution (called random distribution) without the use of a key and a maximally skewed distribution that uses a distribution key.

Random distribution

A distribution that is based on random numbers, which serve as input for a distribution algorithm. The output of this algorithm are numbers that identify data slices. Hence the rows to be processed can be assigned to certain data slices, which can be seen as chunks of data to be processed by the individual working nodes. The final result is a more or less even distribution across the working nodes.

Use of a distribution key (hash partitioning)

The accelerator uses a hash function on the key columns to determine the working node that receives a table row. Rows with equal hash values are distributed to the same working node.

Impact of the distribution key on the query performance

Parallel processing works best if the table rows to be processed are evenly distributed across the worker nodes. If the rows of a table that is referenced by a query are unevenly distributed, the worker nodes with fewer rows have to wait for the node with the biggest number of rows to finish processing. However, if your queries involve joins of big tables (100 million to billions of rows), and the rows of these accelerator-shadow tables are scattered across the working nodes even though they are evenly distributed in terms of quantity, you can easily spend much more time on data redistributions and broadcasts than you actually gain by the advantage of an even distribution.

Impact of distribution key on join performance

When two tables are joined, the query runs fastest if the matched rows of both accelerator-shadow tables reside on the same working node (collocated join). A collocated join is instigated by selecting the join columns as the distribution key for both tables.

However, if an accelerator-shadow table F1 is joined with two or more other tables D1, ... Dn using different join keys, you can only locate one of the pairs (F1-D1, F1-D2, ..., F1-Dn) on the same node because you can only select one of the join columns in table F1 as the distribution key for F1. In this case, the product will colocate the biggest tables.

Best practices for selecting distribution keys

Follow these guidelines when using distribution keys:

- For fact tables and the largest dimension tables, specify a distribution key. For all other tables, start with the default (random distribution).
- Prefer single-column distribution keys to multiple-column keys.
- Select a column as the distribution key that distributes the table rows as evenly as possible across the worker nodes, that is, select primary keys or columns with a unique index. Do not specify columns that only have a small number of distinct values. For example, Boolean values like *male* and *female* would place the table rows on two of the worker nodes only.
- When joining two large tables, try to colocate the tables by specifying the join columns as the distribution key for both tables. Note that to instigate a collocated join, the data types of the join columns in both tables must match.
- In general, do not specify a date, time, or timestamp column as the distribution key. Such keys would also distribute the table rows evenly across the worker nodes, but many queries restrict the number of result rows by a range predicate on the date, time, or timestamp column. For example, a query retrieving revenue figures from last month only would be processed on a single worker node if a column MONTH was selected as the distribution key because rows with equal values in this column would all be assigned to the same data slice.

- Although adverse to the goal of faster query acceleration, a distribution key on the primary key or unique constraint of a table helps if you must update tables continually. Therefore, decide what is more important to you: query performance or the latency of incremental updates. The accelerator automatically picks a distribution key when you enable incremental updates for a table unless you have defined a distribution key by yourself.

Related tasks

Setting a distribution key for accelerator-only tables

A distribution key for accelerator-only tables is set as part of the CREATE TABLE ... IN ACCELERATOR statement that creates the accelerator-only table.

Organizing keys

Organizing key also have an impact on the query response time. When choosing an organizing key, you select columns by means of which you group the rows of an accelerator-shadow table within the data slices on the worker nodes. This creates grouped segments or blocks of rows with equal or nearby values in the columns selected as organizing keys. If an incoming SQL query references one of the organizing key columns in a range or equality predicate, the query can run much faster because entire blocks can be skipped. It is not necessary to scan the entire accelerator-shadow table. Thus the time needed for disk output operations related to the query is drastically reduced.

Organizing keys allow the query engine to identify the disk regions (addressable storage blocks on the disk) that contain the clusters of rows relevant to a query.

Best practices for selecting organizing keys

- In general, the accelerator should be able to process your queries with adequate performance so that organizing keys are not needed. However, the use of an organizing key, particularly on large fact tables can result in table scan performance gains by multiple orders of magnitude.
- An organizing key has no effect if the table is too small. The **Organized** column in the **Accelerator** view reflects this by not showing a value for the degree of organization (percentage).
- Organizing keys work best on large tables (with millions or more records), under the condition that your queries restrict on column values that are rather scattered across the table. For example, if a query restricts on a set of product IDs and customer IDs from a table of sales records in which the records are presorted by the date on which a record was added, the customer ID column and the product ID column would make good candidates for an organizing key. These keys would have the effect that records with the same customer ID and product ID are grouped together, leading to the table scan performance benefits described earlier.

Since restrictions on summary columns in dimension tables are, in many cases, automatically pushed down to the join column of a fact table, organizing keys on such columns in the fact table can be very beneficial.

An organizing key is also recommended if your history of data records reaches back into the past for an extended period, but the majority of your queries, in using a range predicate on a fact-table timestamp column or a parent attribute in a joined dimension, requires a constrained range of dates.

Example:

```
SELECT ... FROM ... WHERE TRANSACTION_DATE BETWEEN (<date1>, <date2>)
```

In this example, the TRANSACTION_DATE column would make a good organizing key.

As additional columns are chosen as organizing keys, the benefit of predicates on column subsets is reduced. Four keys are the allowed maximum. However, there is hardly a need to select more than three.

- Organizing keys are also useful the more frequently the columns that you specified as keys are used in query predicates, alone or in combination, and if the column cardinality is high (that is, if the columns have many different values).

- For organizing keys to have a positive effect on the table-scan performance, a query does not have to reference all the columns that have been defined as organizing keys. It is enough if just one of these columns is addressed in a query predicate. However, the benefit is higher if all columns are used because this means that the relevant rows are kept in a smaller number of disk regions.

Tables states

A table can go through various states while it is being processed by IBM Db2 Analytics Accelerator for z/OS. The meaning of these states is explained here. In addition, it is shown which operation you can run on a table in a particular state. Finally, a diagram shows the possible shifts from one state to another (state transitions).

Table states are displayed in your administration client, in the **Last Load** column. In IBM Db2 Analytics Accelerator Studio, you find this column in the **Accelerator** view (**Tables** section). In IBM Data Server Manager, the column is in the list of tables. A table can be in one of the following states:

FederatedTableOperational

This state is related to federated table access. It is shown if the state is retrieved by the referencing Db2 subsystem. If the state is retrieved by the remote Db2 subsystem, you see one of the following states instead:

- *Loaded*
- *ReplicationInProgress*
- *SchemaModificationInProgress*
- *LoadInProgress*

For more information, see [“Federated access” on page 237](#).

InitialLoadPending

State after the definition of an accelerator-shadow table on the accelerator, which indicates that the table must be loaded with data.

InitialLoadInProgress

State that indicates the loading of an empty accelerator-shadow table or the reloading of an accelerator-shadow table that was in the *Error* state.

Loaded

The load process has been finished.

This state also indicates that no other operation is currently running on the table, that is, no replication, no schema change, no change of distribution or organizing keys, no archiving.

LoadInProgress

State that indicates the reloading of an accelerator-shadow table.

Operational

This is a state used by accelerator-only tables. It means that the table is ready for processing, which is roughly comparable with the *Loaded* state of accelerator-shadow tables. See [“Accelerator-only tables and in-database transformation” on page 19](#) for more information.

SchemaModificationInProgress

The schema of a table is being modified. This happens when you change distribution key or organizing key columns.

ReplicationInProgress

The table data is currently being synchronized by the incremental update function.

SelectPermissionRevoked

This state is related to federated table access. It occurs when access to a remote table has been revoked by an administrator of the remote (owning) Db2 subsystem. For more information, see [“Federated access” on page 237](#).

ArchivingInProgress

Db2 table data (data partitions) is being archived on an accelerator.

Error

State that indicates a processing error. It requires a reload of the table.

Unknown

The table state cannot be determined. This usually indicates a severe error. Contact [IBM support](#).

Possible operations

Table 1 on page 13 shows which operations you can run on a table in a particular state.

Table 1. Possible operations on a table depending on its state				
Table state	Enable or disable query acceleration	Load or update	Schema modification	Remove
<i>FederatedTableOperational</i>	No	No. Load request are tolerated, but no data is loaded. You must load the remote (original) table rather than the referencing table.	No. You can only the schema of a remote (original) table, but not the schema of a referencing table.	Yes
<i>InitialLoadPending</i>	No	Yes. The entire accelerator-shadow table is loaded or reloaded. Partition lists are ignored.	Yes	Yes
<i>InitialLoadInProgress</i>	No	No	No	Yes
<i>Loaded</i>	Yes	Yes	Yes	Yes
<i>LoadInProgress</i>	No	No	No	Yes
<i>Operational</i>	No	Yes. However, load requests must be started by an external tool, such as the Db2 Analytics Accelerator Loader..	No	Yes

Table 1. Possible operations on a table depending on its state (continued)

Table state	Enable or disable query acceleration	Load or update	Schema modification	Remove
<i>SchemaModificationInProgress</i>	Yes, However, you can only enable query acceleration if the table was in state Loaded or ReplicationInProgress before. Disabling query acceleration is possible irrespective of the state a table was in before.	No	No	Yes
<i>ReplicationInProgress</i>	Yes	Yes	Yes	Yes
<i>ArchivingInProgress</i>	Yes	No	No	Yes. However, you can only remove a table in this state if you set the force attribute on the XML entry for that table in the input string of the stored procedure. Also see the note under this table.
<i>Error</i>	No	Yes. The entire accelerator-shadow table is loaded or reloaded. Partition lists are ignored.	Yes	Yes

Table 1. Possible operations on a table depending on its state (continued)				
Table state	Enable or disable query acceleration	Load or update	Schema modification	Remove
<i>Unknown</i>	No	No	No	Yes

Note: If a table has been archived by the High Performance Storage Saver, which means that a duplicate exists, you must always set the **force** attribute to remove that table. It does not matter what state that table is in. Hence the requirement to use the **force** attribute does not only apply to tables in the *ArchivingInProgress* state.

State transitions

Figure 3 on page 16 shows the state transitions that are possible.

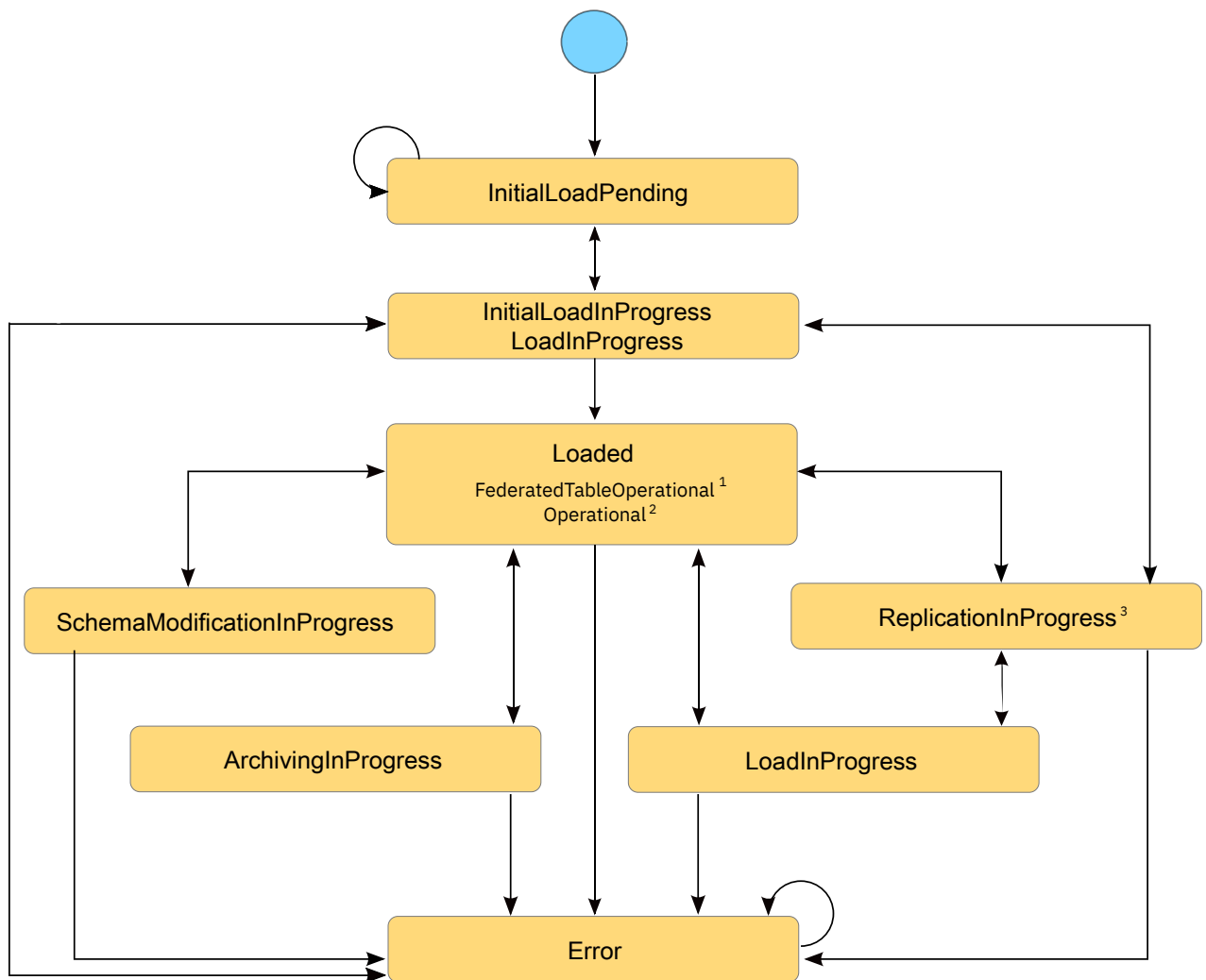


Figure 3. Possible table state transitions

¹ This state might be shown for referencing accelerator-only tables in connection with a federated access configuration. See the state definition at the beginning of this article.

² This state is shown for accelerator-only tables that are ready for processing. See the state definition at the beginning of this article.

³ A state transition from *ReplicationInProgress* to *InitialLoadInProgress* is not possible. Only a transition in the opposite direction is.

Related concepts

[Accelerator view in IBM Db2 Analytics Accelerator Studio](#)

To show the tables on an accelerator, view the query history, or access various other functions, double-click an accelerator name in the **Object List Editor**, which opens the related **Accelerator** view.

[Accelerator view in IBM Data Server Manager](#)

See a brief description of the status information and the function buttons on the **Accelerator** view of IBM Data Server Manager.

IBM Db2 Analytics Accelerator for z/OS system table entries

When you select tables for query acceleration, information about these tables is added to the IBM Db2 Analytics Accelerator for z/OS system tables in the Db2 for z/OS catalog of the connected subsystem. Each entry (system table row) serves as a link between Db2 and the table on the accelerator. An entry contains, among other information, the table name.

Chapter 3. Advanced concepts

The advanced concepts are related to more sophisticated features of IBM Db2 Analytics Accelerator for z/OS.

Accelerator-archive tables

These are table partitions or entire tables whose data was moved to an archive on an accelerator by the High-Performance Storage Saver. Moving table data saves storage space on IBM Z®.

You can move partitions or entire tables (all partitions of a table) to an archive on an accelerator if the tables were previously defined on the accelerator (that is, if accelerator-shadow tables of these tables exist). As part of the move, the original Db2 data is deleted. The table space containing the tables or partitions in Db2 is set to a persistent (permanent) read-only state so that the original tables can no longer be updated or otherwise modified.

To be able to recover the data in an emergency case, an image copy is also created as part of the move. The recovery function of the High-Performance Storage Saver uses the image copies to restore the data to its original location in Db2. The High-Performance Storage Saver is used for historical data that is no longer actively used or maintained.

Normally, the data in accelerator-archive tables is not included in accelerated queries. However, you can set the parameter `GET_ACCEL_ARCHIVE = YES` to include it. This can be done at multiple levels: You can set `GET_ACCEL_ARCHIVE = YES` as a ZPARM, as a special register, as a bind option for static SQL, or as a connection property for Java Database Connectivity (JDBC) or Open Database Connectivity (ODBC) connections.

Mind that the `CURRENT QUERY ACCELERATION` special register must also be set, or otherwise the moved data cannot be accessed.

Related concepts

[Freeing up storage in Db2 for z/OS](#)

The High Performance Storage Saver archives data of table partitions in Db2 for z/OS to an accelerator. The resulting tables are called accelerator-archive tables. Moving data that is no longer actively used (historical data) to a less expensive storage device, you can free up costly storage space on your database server.

Accelerator-only tables and in-database transformation

Accelerator-only tables are tables that do not originate from Db2 base tables. Their data exists only on an accelerator. Data in accelerator-only tables can only be modified by data-manipulation (DML) statements (INSERT, UPDATE, and DELETE). With accelerator-only tables, you can do in-database transformation (IDT) in a more efficient way.

Queries and data-manipulation statements against accelerator-only tables are always routed to an accelerator. If a SQL statement does not satisfy the conditions for acceleration, the statement fails. Furthermore, DML statements that are run on an accelerator can only manipulate data in accelerator-only tables.

Accelerator-only tables are useful for statistics and analytic tools that employ temporary data for reports because the high velocity of execution allows these tools to gather all required data quickly. Since the data in these tables can be modified fast, they are also ideal for data-preparation tasks that must be completed before the data can be used for predictive modeling.

Use accelerator-only tables if you want to accelerate queries that access previously calculated, interim result sets. To take full advantage of the product's high-speed capabilities, store all your interim results in accelerator-only tables. This allows subsequent queries or data transformations to process all relevant data on the accelerator.

To create an accelerator-only table, you submit a CREATE TABLE statement in Db2 that uses the IN ACCELERATOR <acceleratorname> clause. To create a high-availability accelerator-only table, you first have to define a group of accelerators in the SYSIBM.LOCATIONS table. See the following example:

```
INSERT INTO SYSIBM.LOCATIONS (LOCATION, LINKNAME, DBALIAS)
VALUES ('ACCLGRP1', 'DSNACCELERATORALIAS', 'ACCEL1 ACCEL2');
```

This SQL statement defines the group ACCLGRP1 in SYSIBM.LOCATIONS. The group contains two accelerators, ACCEL1 and ACCEL2.

If you specify the group name as the target accelerator for the accelerator-only table in the CREATE TABLE statement, the table will be defined on all the accelerators in the group.

Accelerator-only tables are registered in the Db2 catalog with a type of 'D'.

Important: Data manipulation (DML) statements, such as INSERT, UPDATE, or DELETE, will only be executed on a single accelerator within a commit scope. To keep the high-availability accelerator-only tables in sync on all accelerators, you must execute the same set of DML statements on all the accelerators in the group. To run DML statements on high-availability accelerator-only tables, set the CURRENT ACCELERATOR special register.

Accelerator-only tables cannot be loaded by the SYSPROC.ACCEL_LOAD_TABLES stored procedure or by the corresponding function in your administration client. You have to use INSERT statements. These can be submitted from interactive client interfaces (SPUFI, IBM Data Studio, RUN SQL submenu in IBM Data Server Manager), or from client application programs using ODBC, JDBC or static SQL. It is possible to transfer many rows in a single batch or transaction (multi-row insert). However, the multi-row insert support is limited to client application programs and cannot be used interactively.

Important:

The use of accelerator-only tables brings extra workloads to your accelerators that compete for the same resources, such as CPU, disk, and system memory. This might impact the stability of your production environment.

Conventional in-database transformation versus in-database transformation with accelerator-only tables

A conventional approach to in-database transformation might consist of the following steps:

1. CREATE TABLE T1 ...;
2. INSERT INTO T1 SELECT ... FROM T0 ...;
3. SELECT ... FROM T1 ...;
4. DROP TABLE T1;

Step “1” on page 20 creates an interim table. Interim results that were calculated on the basis of the data in T0 are stored in table T1 (see step “2” on page 20). In step “3” on page 20, a second query reads the interim table T1 to calculate the final result. In step “4” on page 20, the interim table T1 is dropped because it is no longer needed.

To accelerate the steps above, create table T1 in step “1” on page 20 as an accelerator-only table. This accelerates the final (second) query and avoids the movement of data in Db2, which occupies considerable processing resources if T1 is large. If T1 is an accelerator-only table, the INSERT statement in step “2” on page 20 is run on the accelerator rather than in Db2. You also omit the duplication of table T1 in Db2 because you do not need to run IBM Db2 Analytics Accelerator stored procedures to define, load, and enable table T1 on the accelerator. This is a big advantage because many extract-transform-and-load (ETL) tools that generate data transformation statements automatically do not support stored procedure calls. Using accelerator-only tables, you have to modify the statements generated by these tools only slightly to end up with accelerated in-database transformation steps that do not require stored procedure calls.

Before running the following modified steps, you must define, load and enable acceleration for table T0 on the accelerator by using the IBM Db2 Analytics Accelerator stored procedures or the corresponding

functions in your administration client. This is just a one-time preparation step. Then you continue with the following steps:

1. CREATE TABLE Q1.T1 ... IN ACCELERATOR ... IN DATABASE ...;
2. INSERT INTO Q1.T1 SELECT ... FROM T0 ...;
3. SELECT ... FROM Q1.T1 ...;
4. DROP TABLE Q1.T1;

Notes:

1. Depending on your situation, you might want to keep the accelerator-only table for later use and run step “4” on page 21 at a later time.
2. In contrast to temporary tables, accelerator-only tables are much more like normal Db2 tables. It is therefore recommended that you create these tables in an authorized database by using a CREATE TABLE statement with the IN DATABASE clause. Otherwise, accelerator-only tables are created in an implicit database, just like normal Db2 tables. You might also want to add an explicit schema qualifier to the table name.

The following examples consist of extended data transformations that use more than one interim table. They show how to change conventional Db2 statements to arrive at an accelerated solution to in-database-transformation. The left column shows the conventional approach. The right column shows the in-database-transformation steps that include accelerator-only tables.

Example 1

The Db2 tables T1, T2 and T3 already exist. The conventional approach uses two declared global temporary tables to store the interim results.

Table 2. Example 1: Declared global temporary tables versus accelerator-only tables		
	Conventional approach (Db2)	Accelerator-only tables
One-time preparation	N/A	Define and load the tables T1, T2 and T3 on accelerator ACCEL1 by using stored procedures or the corresponding functions in your administration client.
Step 2	<pre> DECLARE GLOBAL TEMPORARY TABLE SESSION.TEMP1 (C11 CHAR(2), ...) ON COMMIT PRESERVE ROWS; INSERT INTO SESSION.TEMP1 SELECT ... FROM T1 ...; DECLARE GLOBAL TEMPORARY TABLE SESSION.TEMP2 (C21 CHAR(2), ...) ON COMMIT PRESERVE ROWS; INSERT INTO SESSION.TEMP2 SELECT ... FROM T2 ...; SELECT ... FROM FROM SESSION.TEMP1 ... SESSION.TEMP2 ... T3 ...; DROP TABLE SESSION.TEMP1; DROP TABLE SESSION.TEMP2; </pre>	<pre> SET CURRENT QUERY ACCELERATION = ALL; CREATE DATABASE DBTEMP; CREATE TABLE TEMP1 (C11 CHAR(2), ...) IN ACCELERATOR ACCEL1 IN DATABASE DBTEMP; INSERT INTO TEMP1 SELECT ... FROM T1 ...; CREATE TABLE TEMP2 (C21 CHAR(2), ...) IN ACCELERATOR ACCEL1 IN DATABASE DBTEMP; INSERT INTO TEMP2 SELECT ... FROM T2 ...; SELECT ... FROM FROM TEMP1 ... TEMP2 ... T3 ...; DROP TABLE TEMP1; DROP TABLE TEMP2; DROP DATABASE DBTEMP; </pre>

Example 2

The Db2 tables T1 and T2 already exist. The final transformation result is stored in the existing Db2 table T3. The conventional approach uses two declared global temporary tables to store the interim transformation results.

Table 3. Example 2: Declared global temporary tables versus accelerator-only tables		
	Conventional approach (Db2)	Accelerator-only tables
One-time preparation	N/A	Define and load the tables T1 and T2 on accelerator ACCEL1 by using stored procedures or the corresponding functions in your administration client.
Step 2	<pre> DECLARE GLOBAL TEMPORARY TABLE SESSION.TEMP1 (C11 CHAR(2), ...) ON COMMIT PRESERVE ROWS; INSERT INTO SESSION.TEMP1 SELECT ... FROM T1 ...; DECLARE GLOBAL TEMPORARY TABLE SESSION.TEMP2 (C21 CHAR(2), ...) ON COMMIT PRESERVE ROWS; INSERT INTO SESSION.TEMP2 SELECT ... FROM SESSION.TEMP1 ...; INSERT INTO T3 SELECT ... FROM FROM SESSION.TEMP2 ... T2 ...; DROP TABLE SESSION.TEMP1; DROP TABLE SESSION.TEMP2; </pre>	<pre> SET CURRENT QUERY ACCELERATION = ALL; CREATE DATABASE DBTEMP; CREATE TABLE TEMP1 (C11 CHAR(2), ...) IN ACCELERATOR ACCEL1 IN DATABASE DBTEMP; INSERT INTO TEMP1 SELECT ... FROM T1 ...; CREATE TABLE TEMP2 (C21 CHAR(2), ...) IN ACCELERATOR ACCEL1 IN DATABASE DBTEMP; INSERT INTO TEMP2 SELECT ... FROM TEMP1 ...; INSERT INTO T3 SELECT ... FROM FROM TEMP1 ... T2 ...; DROP TABLE TEMP1; DROP TABLE TEMP2; DROP DATABASE DBTEMP; </pre>

Notes:

- Bear in mind that alternative constructs, such as declared global temporary tables, which can exist in Db2, but not on an accelerator, cannot be accelerated by IBM Db2 Analytics Accelerator.
- It is not possible to create image copies of accelerator-only tables because these tables do not hold any data in Db2. You can only recover the data from their original sources, which is why accelerator-only tables should be used only for temporary data.
- For information on how to create an accelerator-only table using the CREATE TABLE command or the restrictions governing the use of these tables, follow the **Related information** link at the end of this topic.
- When you submit a CREATE TABLE statement to create an accelerator-only table, the statement is committed in Db2 for z/OS before the corresponding action is completed on the accelerator. That is, there is a brief period during which the table is listed in the Db2 catalog, but not in the accelerator catalog. If you run the SYSPROC.ACCEL_GET_TABLES_INFO stored procedure during that time, the integrity status ViolatedOnAccelerator is reported for that table in the result set. (In IBM Db2 Analytics Accelerator Studio, you see the error icon next to the table name in the **Tables** section of the **Accelerator** view. In IBM Data Server Manager, you find a similar indicator. If you move the mouse pointer over the icon, the integrity status is displayed in a fly-over help window.)

Related concepts

[Distribution keys](#)

A distribution key determines how tables rows are distributed among the available working nodes. IBM Db2 Analytics Accelerator for z/OS selects a suitable distribution key automatically when tables are loaded. The distribution varies between the two extremes: an even distribution (called random distribution) without the use of a key and a maximally skewed distribution that uses a distribution key.

Configuring Db2 for z/OS for the acceleration of dynamic SQL queries

To make Db2 for z/OS route dynamic SQL queries to an accelerator, you must enable acceleration by using the CURRENT QUERY ACCELERATION special register. Alternatively, you can set the QUERY_ACCELERATION ZPARM in Db2 for z/OS. This also applies to queries against accelerator-only tables.

Configuring Db2 for z/OS for the acceleration of static SQL queries

To accelerate static SQL queries, use the QUERYACCELERATION and GETACCELARCHIVE bind option for Db2 packages.

Related tasks

Setting a distribution key for accelerator-only tables

A distribution key for accelerator-only tables is set as part of the CREATE TABLE ... IN ACCELERATOR statement that creates the accelerator-only table.

Related reference

Restrictions of accelerator-only tables

Here is a summary of the restrictions that exist for accelerator-only tables.

Impact of special register, ZPARM, or bind option settings on accelerator-only tables

SQL statements that reference accelerator-only tables can only be executed on an accelerator. However, certain combinations of special register and ZPARM settings might prohibit the execution of a statement on an accelerator. The same is true for the QUERYACCELERATION bind option for static SQL queries. The table in this section shows how these settings affect the statement execution.

Related information

CREATE TABLE statement

Workload balancing

Workload balancing can be described as follows: If more than one accelerator is connected to a Db2 subsystem, and the tables that are referenced in a query are defined on more than one of these accelerators, IBM Db2 Analytics Accelerator for z/OS automatically picks the accelerator with the lowest utilization for processing.

Product behavior

Workload balancing is possible between both types of version 7.5 accelerators: accelerators on an IBM Integrated Analytics System and Db2 Analytics Accelerator on Z accelerators. It is now even possible to benefit from workload balancing if different product versions are used, such as a version 5.1 and a version 7.5 accelerator that are attached to the same Db2 subsystem.

Asynchronous result fetching

Asynchronous fetching is a method to improve the fetch performance for queries that return large result sets. Especially for queries that are executed from local applications, such as DSNTIAUL, the fetch performance of large result sets can be drastically reduced by asynchronous fetching.

Asynchronous fetching is turned off by default because it impacts the performance of certain queries negatively. Generally, a negative impact can be observed if the spill-to-disk method is used to fetch large result sets. Queries executed by remote applications with a slow fetching mechanism often benefit from the spill-to-disk method.

For an assessment of your queries with regard to the performance of large result set fetching, contact IBM support. IBM support will enable asynchronous fetching for you if this is advisable.

Chapter 4. Conditions for query routing to an accelerator

Queries can be routed to an accelerator only if certain conditions are met. There are also adverse conditions that prohibit query acceleration. Both types of conditions are discussed in this section.

A query can be routed to an accelerator if the following general conditions are met:

1. The accelerator is in an operational mode and has been started.
2. Db2 for z/OS has been configured so that the query will be routed to a connected accelerator provided that this query meets all other conditions.
3. The accelerator supports the SQL expressions that are used in the query.
4. All data that is referenced by the query, such as the contents of tables and views, is available on one and the same accelerator. To satisfy this condition, the accelerator must have been loaded with the data in question.

Related information

[DB2 11 for z/OS: SYSIBM.DSN_PROFILE_ATTRIBUTES](#)

Configuring Db2 for z/OS for the acceleration of dynamic SQL queries

To make Db2 for z/OS route dynamic SQL queries to an accelerator, you must enable acceleration by using the CURRENT QUERY ACCELERATION special register. Alternatively, you can set the QUERY_ACCELERATION ZPARM in Db2 for z/OS. This also applies to queries against accelerator-only tables.

The value of the QUERY_ACCELERATION ZPARM provides the default setting for the CURRENT QUERY ACCELERATION special register. Both, the ZPARM and the special register accept the following values:

1 (NONE)

No routing of dynamic SQL queries to an accelerator. Queries will be processed by Db2 for z/OS only (inhouse query processing).

2 (ENABLE)

A dynamic SQL query will be routed to an accelerator if it fulfills all required conditions. An incoming query is tested against a set of heuristics, which include the table size and a response time estimate based on cost information from the SYSIBM.DSN_PROFILE_ATTRIBUTES table. Both tests ensure that a query will only be routed to an accelerator if the query can be expected to run faster than in Db2 for z/OS. However, if an error occurs while the query is being processed by the accelerator, Db2 for z/OS will return a negative SQLCODE to the application and query processing will stop.

3 (ENABLE WITH FAILBACK)

Dynamic queries are accelerated only if Db2 for z/OS determines that it is advantageous to do so. If an accelerator returns an error during the PREPARE phase or when first opening (OPEN) the query, the query is processed by Db2 for z/OS rather than sent to the accelerator. If the accelerator returns an error during a FETCH operation or a subsequent OPEN operation, Db2 for z/OS returns an error to the user and the query ends abnormally.

4 (ELIGIBLE)

Dynamic queries are accelerated if they are eligible for acceleration. Db2 for z/OS does not use cost information to determine whether to accelerate the queries. Queries that are not eligible for acceleration are executed by Db2 for z/OS. If an accelerator fails while a query is running, or if the accelerator returns an error, Db2 for z/OS returns a negative SQL code to the application.

5 (ALL)

A dynamic query will always be routed to an accelerator, no matter if it fulfills the conditions or not. If processing cannot start or continue because an incoming query fails to fulfill all the conditions for

accelerated query processing, Db2 for z/OS returns a negative SQLCODE to the application and query processing ends abruptly. That is, the query will not be processed at all.

Exceptions:

- If a dynamic query cannot be processed by IBM Db2 Analytics Accelerator because the tables do not exist on the accelerator, the query usually fails with an error message (-4742, reason code 12). However, such a query is processed by Db2 for z/OS if it references tables with the following qualifiers only:
 - SYSIBM
 - SYSACCEL
 - DB2GSE
 - SYSXSR
 - DGT
- Dynamic queries whose top query block is pruned, and which therefore return an empty result set, are processed by Db2 for z/OS. To check whether a query falls into this category, follow these steps:
 1. Explain the query using the DB2 EXPLAIN function. Use the following special register setting in the SQL statement:

```
SET CURRENT QUERY ACCELERATION = NONE
```

2. Check the PLAN_TABLE. If the top query block has been pruned, the entry for the query block shows PRUNED in the QBLOCK_TYPE column and no value in the ACCESTYPE column.

A query against an accelerator-only table can only succeed if the CURRENT QUERY ACCELERATION special register is set to a value other than NONE. There is no difference to accelerator-shadow tables in this respect. However, this does not affect data-definition (DDL) statements, such as CREATE TABLE or DROP TABLE. DDL statements are executed regardless of the special register or ZPRAM setting.

To enable query routing to an accelerator on the Db2 side, you issue the following SQL statement:

```
SET CURRENT QUERY ACCELERATION = ENABLE
```

FAILBACK processing

If you specify SET CURRENT QUERY ACCELERATION = ENABLE WITH FAILBACK, the query is returned to Db2 for processing if an error occurs during the PREPARE phase. This is the time before the query is actually routed to the accelerator, and during which the heuristics are tested. A query is also returned if an error was caused by an accelerator failure, a network failure, a network connection timeout, or a similar error. Errors immediately following the initial OPEN request of a query usually fall into this category.

Restrictions:

FAILBACK processes are not started if one of the following conditions applies:

- Query results have already been returned. This holds true even if the results are not complete.
- Query routing to an accelerator fails although the same query could be routed successfully before.
- Queries do not qualify for routing to an accelerator. Such queries are prepared and executed in Db2, regardless of the setting of the CURRENT QUERY ACCELERATION special register.

Settings resulting from the preparation phase are stored in the Db2 Dynamic Statement Cache. This allows the query engine to skip the preparation phase when a query comes in for the second time. However, this is also often the reason for not returning a query to Db2 for z/OS in case of an error. If you assume that this has happened, invalidate the Dynamic Statement Cache and rerun the query.

Configuring Db2 for z/OS for the acceleration of static SQL queries

To accelerate static SQL queries, use the QUERYACCELERATION and GETACCELARCHIVE bind option for Db2 packages.

Important:

- The acceleration bind option QUERYACCELERATION applies to cursor queries and the SELECT portion of the SQL INSERT from SELECT statement. The SQL SELECT INTO statement can also be bound for acceleration.
- The functions and behavior of the acceleration bind option QUERYACCELERATION for static queries is the same as the comparable existing acceleration special register CURRENT QUERY ACCELERATION and CURRENT GET ACCEL ARCHIVE that is used for dynamic query acceleration, except that the Db2 decision to accelerate a static query and bind it for acceleration occurs at BIND or REBIND PACKAGE time, and not at query execution time when the application is run. The special registers do not affect the binding or the execution of static queries; instead, the new bind option is used to determine acceleration behavior for static queries.
- The accelerator need not be started at BIND or REBIND PACKAGE time for the static query to be bound for acceleration. However, you must start the accelerator before you run the application that executes the static query.

Table 4. Bind options for static SQL queries	
QUERYACCELERATION	GETACCELARCHIVE
Binds static SQL queries for execution on an accelerator	Includes or excludes partition data that was archived by the High Performance Storage Saver from accelerated static SQL queries

Table 4. Bind options for static SQL queries (continued)

QUERYACCELERATION	GETACCELARCHIVE
<p>Settings:</p> <p>1 (NONE) No static query in the application is bound for acceleration or will be accelerated when the application is run.</p> <p>2 (ENABLE) A static query is bound for acceleration if it satisfies the acceleration criteria, including the cost and heuristics criteria. The query is routed to an accelerator when the application is run. If the static query does not satisfy the acceleration criteria, the query is bound for an execution in DB2.</p> <p>In the following cases, DB2 returns a negative SQL code for the query to the application:</p> <ul style="list-style-type: none"> • If a failure occurs while executing the accelerated static query on the accelerator • If the accelerator returns an error for the query • If the accelerator is not started and DB2 cannot route the static query to the accelerator for execution <p>3 (ENABLEWITHFAILBACK) Same as ENABLE, except for the following cases:</p> <ul style="list-style-type: none"> • The accelerator returns an error. • The accelerator fails on the first OPEN request for the accelerated static query. • The accelerator is not active or started when the first OPEN occurs. <p>In either of these cases, DB2 does not return a negative SQL code (accelerator failure) to the application, but executes a "failback" operation. That is, a temporary statement-level incremental bind of the query is performed, and the query is run in DB2. No "failback" to DB2 is possible after a successful OPEN request.</p>	<p>Settings:</p> <p>NO No static query is bound to retrieve archived partition data from the accelerator. If the static query is not bound for acceleration, it will be bound to run in DB2. If the static query is bound for acceleration because the bind option QUERYACCELERATION was specified, the query is routed to the accelerator when the application is run, but the query will only retrieve <i>active</i> data from the accelerator and ignore any data archived by the High Performance Storage Saver.</p> <p>YES If the bind option QUERYACCELERATION is also specified and the static query references a table from which data has been archived by the High Performance Storage Saver, one of the following courses of action is taken:</p> <ul style="list-style-type: none"> • If the static query satisfies the acceleration criteria (as specified by QUERYACCELERATION), the query is bound for acceleration, and when the application is run, the query includes the archived data in the query. • If the static query cannot be bound for acceleration because it does not satisfy the criteria, DB2 fails to complete the BIND or REBIND PACKAGE operation and returns an error message for that query.

Table 4. Bind options for static SQL queries (continued)

QUERYACCELERATION	GETACCELARCHIVE
<p>4 (ELIGIBLE) A static query is bound for acceleration if the query meets the basic acceleration criteria, regardless of cost or heuristics, and the query will be routed to the accelerator when the application is run.</p> <p>5 (ALL) All static queries in the application are to be bound for acceleration and routed to the accelerator when the application is run. If DB2 determines that a static query cannot be bound to run on the accelerator, and the query references a base table or view, DB2 fails to complete the BIND or REBIND PACKAGE operation with an error message for that query. No error message is returned for Declared Global Temp Tables (DGTs) and Created Global Temp Tables (CGTs) because these tables cannot be accelerated.</p>	

The bind option is supported for:

- BIND, BIND COPY, and REBIND PACKAGE (local and remote)
- BIND DEPLOY (for SQLPL procedures)
- ALTER PROCEDURE and ALTER FUNCTION for native SQLPL procedures and SQLPL scalar functions
- CREATE PROCEDURE and CREATE FUNCTION for native SQLPL procedures and SQLPL scalar functions

The bind option is not supported for:

- ALTER TRIGGER
- CREATE TRIGGER
- REBIND TRIGGER PACKAGE

Important: The default value of the bind option is *option not specified*. The default is not taken from the comparable Db2 installation system parameter (ZPARMs) QUERY_ACCELERATION.

- The default value for both new bind options is *option not specified*. The default for the bind options is not taken from the comparable DB2 installation system parameters (ZPARMs) QUERY_ACCELERATION and GET_ACCEL_ARCHIVE.
- For INSERT, UPDATE, DELETE, and SELECT statements that address accelerator-only tables, the QUERYACCELERATION bind option must be set to ENABLE or ELIGIBLE. If you specify ALL, the operation fails and an SQLCODE is returned.
- If you submit a CREATE, DROP, or COMMIT statement against an accelerator-only table together with an INSERT, UPDATE, DELETE, or SELECT statement (against the same table) in the same thread, the table does not come into existence during the bind phase. However, the current implementation requires that all referenced tables are defined and enabled for query acceleration during the bind phase.

As a workaround, you can use the VALIDATE(RUN) bind option, which binds the INSERT, UPDATE, DELETE, or SELECT statement incrementally at execution time. However, this usually does not give you the optimum performance. Therefore, consider running the static CREATE statement in a separate thread before running the INSERT, UPDATE, DELETE, or SELECT statement.

The bind option can also be used for the acceleration of dynamic queries. If specified, it sets the initial value in the same manner as the comparable special register CURRENT QUERY_ACCELERATION when

the application is run, provided that the special register has not already been set explicitly before the invocation of that application. The value of the bind option is then used as the special register value for dynamic queries in that application, so that you do not have to add an explicit SET statement to the application for the acceleration special register.

Mind that you cannot use the bind options for dynamic queries under the following conditions:

- Dynamic and static queries are started from the same application or script.
- Both types of queries work on the same or share a number of tables.
- You want to accelerate the dynamic queries, but not the static queries.

In this case, you must use explicit SET statements to set the special registers in your application or script. This is because the bind options would also lead to an acceleration of the static queries. Special registers, on the other hand, have no effect on static queries.

1. Db2 installation system parameter QUERY_ACCELERATION and GET_ACCEL_ARCHIVE
2. Bind option value if specified (QUERYACCELERATION and GETACCELARCHIVE)
3. Explicit SET statement for the special register

As with the acceleration of dynamic queries and the use of the acceleration special register, the use of the bind option requires you to set ACCEL (Db2 ZPARM) to a value other than NONE to enable the Db2 subsystem for query routing to an accelerator.

Supported queries

A set of conditions must be fulfilled before an accelerator can handle a query.

A query needs to fulfill the following conditions to qualify for acceleration:

Main query expression must be **SELECT** or **"INSERT FROM SELECT"** statement

A query can be accelerated if the principal expression used by the query is a SELECT statement or an "INSERT FROM SELECT" statement. In the latter case, only the SELECT part of the query is accelerated.

Note: To enable support for "INSERT FROM SELECT" statements, set the QUERY_ACCEL_OPTIONS parameter (a ZPARM) to the value 2. For more information, see *Installing Db2 libraries with IBM Db2 Analytics Accelerator for z/OS support* in the *IBM Db2 Analytics Accelerator for z/OS: Installation Guide*.

Queries must be read-only

The query must be defined as read-only. The criteria for read-only queries are documented in the subsection *Read-only cursors* of the topic *DECLARE CURSOR* in the Db2 for z/OS documentation. A link is provided under **Related information** at the end of this topic.

Tip: If a query is not considered a read-only query by Db2 for z/OS, but you want the query to run on an accelerator, you can add the FOR READ ONLY clause to the SQL of the query.

Only certain cursor definitions are allowed

If the query is submitted by an application and introduces a cursor definition by means of the DECLARE CURSOR statement, then this cursor must be a read-only cursor that is neither a scrollable cursor, nor a rowset cursor that is declared by a remote application, such as an SQL statement submitted from the Db2 CLI for Windows. However, read-only rowset cursors are supported if they are declared by local applications (such as SPUFI or local stored procedure calls) in the following contexts:

- As part of a DELCARE CURSOR statement, for example:

```
EXEC SQL DECLARE DYN1 CURSOR WITH ROWSET POSITIONING FOR STMT1;
```

- As an attribute in a PREPARE statement, for example:

```

STMTSTR = 'SELECT COLI2,COLI8,COLI4,COLI2'
          || 'FROM NTZTB01'
          || ' WHERE 1=1'
          || ' ORDER BY COLI2'
          || ' FOR FETCH ONLY';

ATTRSTR = 'WITH ROWSET POSITIONING';

EXEC SQL PREPARE STMT1 ATTRIBUTES :ATTRSTR FROM :STMTSTR;

```

- In a rowset-positioned FETCH operation, for example:

```

DCL AINT2A(07) BIN FIXED(15);
DCL AINT2B(07) BIN FIXED(15);
DCL AINT4B(07) BIN FIXED(31);
DCL AINT8B(07) BIN FIXED(63);

EXEC SQL FETCH NEXT ROWSET FROM DYN1 FOR :NROWS ROWS INTO
      :AINT2A,:AINT8B, :AINT4B, :AINT2B;

```

- When #SET MULT_FETCH is used as an instruction for the DSNTEP4 program, for example:

```

//SYSIN DD *
--#SET MULT_FETCH 7
SET CURRENT_QUERY ACCELERATION = ALL;
SELECT COLI2, COLI8, COLI4, COLI2 FROM ADMF001.NTZTB01
WHERE 1=1 FOR FETCH ONLY;

```

Plans must use packages

Plans for query processing must use packages rather than database request modules (DBRMs).

Outermost SELECT statement must not reference masked columns

A query against a table with masked (access-restricted) columns can be accelerated as long as the outermost SELECT statement of the query references unmasked columns only. The following sample queries exemplify this.

Assume for both examples that the SSN column in the CUSTOMERS table is masked.

Examples of queries that work

- The following query works because the masked column SSN is not selected. It just serves as a condition in the WHERE-clause.

```
SELECT FIRSTNAME, LASTNAME FROM CUSTOMERS WHERE SSN < 4711
```

- This query can be accelerated because its outermost SELECT statement references the column Y.FULLNAME, which is the result of combining the two unmasked columns CUSTOMERS.FIRSTNAME and CUSTOMERS.LASTNAME:

```

SELECT Y.FULLNAME
FROM TABLE
  (SELECT RIGHT(SSN, 4), FIRSTNAME + ' ' + LASTNAME
   FROM CUSTOMERS
   ) AS Y(SSNPART, FULLNAME)
FOR READ ONLY;

```

Examples of queries that will be rejected

- This query will be rejected because a masked column (SSN) is selected in the only (and thus outermost) SELECT statement:

```
SELECT FIRSTNAME, LASTNAME, SSN FROM CUSTOMERS
```

- The following query cannot be accelerated because the outermost SELECT statement references the column SSNPART of the common table Y, which is not accessible as it is derived from the

masked column CUSTOMERS.SSN. If you submitted this query, you would receive SQL code -4742 and reason code 15.

```
SELECT Y.SSNPART
FROM TABLE
(SELECT RIGHT(SSN, 4), FIRSTNAME + ' ' + LASTNAME
FROM CUSTOMERS
) AS Y(SSNPART, FULLNAME)
FOR READ ONLY;
```

Favorable classification needed

Db2 classifies each query based on its own set of heuristics. To be eligible for acceleration, the query must be classified as favorable. For a query classified in this way, Db2 “expects” a much shorter query response time if the query is routed to an accelerator.

DRDA is required

DRDA[®] is used for the transmission of the query from Db2 to the accelerator. Therefore, DRDA must be configured and started on any Db2 subsystem that connects to the accelerator.

Related information

[DECLARE CURSOR](#)

Supported data types

See this overview of supported Db2 data types, corresponding accelerator database types, ranges, and hints at restrictions.

Numeric data types

Table 5. Numeric data types				
Db2 for z/OS type	Accelerator database type	Range Db2 for z/OS	Range accelerator database	Comment
SMALLINT	SMALLINT (INT2)	-32768 to +32767	-32768 to +32767	
INTEGER	INTEGER (INT, INT4)	-2147483648 to +2147483647	-2147483648 to +2147483647	
BIGINT	BIGINT (INT8)	-9223372036854775808 to +9223372036854775807	-9223372036854775808 to +9223372036854775807	
REAL	REAL	$\sim -7.2 * 10^{+75}$ to $-5.4 * 10^{-79}$ or $\sim +5.4 * 10^{-79}$ to $+7.2 * 10^{+75}$	$\sim -3.4 * 10^{+38}$ to $-1.18 * 10^{-38}$ or $\sim 1.18 * 10^{-38}$ to $+3.4 * 10^{+38}$	For details, see “Differences in floating-point error tolerances” on page 73

Table 5. Numeric data types (continued)				
Db2 for z/OS type	Accelerator database type	Range Db2 for z/OS	Range accelerator database	Comment
DECFLOAT	DECFLOAT	Precision of 34 or 16 digits (default is 34) 10^{-6143} to 10^{+6144} or 10^{-383} to 10^{+384}	Precision of 34 or 16 digits (default is 34) 10^{-6143} to 10^{+6144} or 10^{-383} to 10^{+384}	See Note under this table.
DOUBLE	DOUBLE	$\sim -7.2 * 10^{+75}$ to $-5.4 * 10^{-79}$ or $\sim +5.4 * 10^{-79}$ to $+7.2 * 10^{+75}$	$\sim -1.79 * 10^{+308}$ to $-3.40 * 10^{-308}$ or $\sim +3.4 * 10^{-308}$ to $+1.79 * 10^{+308}$	For details, see “Differences in floating-point error tolerances” on page 73
DECIMAL(<i>precision</i> , <i>scale</i>)	NUMERIC(<i>precision</i> , <i>scale</i>)	Max. precision 31	Max. precision 31	

Note on DECFLOAT: During tests, the extreme values at either end of the range could not be loaded into accelerator-only tables, which hints at a general problem with very low and very high values in this context. However, there was no problem loading the extreme values into regular accelerator-shadow tables-

See also the entry for the ROUND function in [Restrictions](#).

Date, time, and timestamp data types

Table 6. Date, time, and timestamp data types				
Db2 for z/OS type	Accelerator database type	Range Db2 for z/OS	Range accelerator database	Comment
DATE	DATE	0001-01-01 to 9999-12-31	0001-01-01 to 9999-12-31	The use of DATE = LOCAL is not supported.
TIME	TIME	00:00:00.000000000000 to 24:00:00.000000000000	00:00:00.000000000000 to 24:00:00.000000000000	The use of TIME = LOCAL is not supported. The database on the accelerator supports the same precision as Db2 for z/OS (up to 12 fractional digits). A truncation of values is therefore not necessary.

Table 6. Date, time, and timestamp data types (continued)

Db2 for z/OS type	Accelerator database type	Range Db2 for z/OS	Range accelerator database	Comment
TIMESTAMP	TIMESTAMP	Date portion: 0001-01-01 to 9999-12-31 Time portion: 00:00:00.000000000 to 24:00:00.000000000	Date portion: 0001-01-01 to 9999-12-31 Time portion: 00:00:00.000000000 to 24:00:00.000000000	<p>Some timestamp formats are supported by Db2 for z/OS, but not by the accelerator database:</p> <ul style="list-style-type: none"> • 2004-02-15T11.34.56 • 2004-02-15 11.34.56 <p>Important: If values are formatted in any of the formats shown above and stored as characters, Db2 for z/OS cannot prevent these values from being sent to an accelerator. Errors will be the result.</p> <p>Timestamps with timezone specifications are not supported, to the effect that:</p> <ul style="list-style-type: none"> • SQL queries that require TIMESTAMP with a timezone specification as the result data type are not routed to an accelerator. • Timestamps with timezone constants are not accepted. • Functions and special registers that are related to timestamps with timezone specifications are not accepted.

String data types

Only the following combinations of coded character set identifiers (CCSIDs) and subtypes are allowed in string expressions:

Table 7. Supported combinations of CCSIDs and subtypes

CCSID	Allowed character subtypes	Comment
ASCII (for example 819; there are numerous others)	SBCS	An ASCII table cannot be added to an accelerator if it is part of a Db2 subsystem with a setting of mixed=yes. This holds true even if the table does not contain any multi-byte (or mixed) data.
EBCDIC (for example 37; there are numerous others)	SBCS MIXED (partially supported) DBCS (graphic, partially supported)	

Table 7. Supported combinations of CCSIDs and subtypes (continued)

CCSID	Allowed character subtypes	Comment
UNICODE (367, 1208, 1200)	SBCS (367) MIXED (1208) DBCS (1200)	

Table 8. String data types

Db2 for z/OS type	Accelerator database type	Supported CCSIDs	Comment
BINARY	BINARY	N/A	
VARBINARY	VARBINARY	N/A	The maximum length in Db2 for z/OS is 32704 bytes. In the accelerator database, it is 32592 bytes. If a string exceeds the limit of 32592, it is truncated.
CHAR FOR SBCS DATA	CHAR	ASCII EBCDIC UNICODE (367)	
VARCHAR FOR SBCS DATA	VARCHAR	ASCII EBCDIC UNICODE (367)	The maximum length in Db2 for z/OS is 32704. In the accelerator database, it is 32592. If a string exceeds the limit of 32592, it is truncated. Important: If you make use of the schema change feature, the maximum string length for VARCHAR that is supported by the accelerator database is only 32560 bytes. For more information, see <i>Schema changes</i> in the <i>IBM Db2 Analytics Accelerator for z/OS: Installation Guide</i>
CHAR FOR MIXED DATA	CHAR	UNICODE (1208) EBCDIC (partially supported)	
VARCHAR FOR MIXED DATA	VARCHAR	UNICODE (1208) EBCDIC (partially supported)	
CHAR FOR BIT DATA	CHAR FOR BIT DATA	ASCII (single-byte only) EBCDIC UNICODE (1208)	
VARCHAR FOR BIT DATA	VARCHAR FOR BIT DATA	ASCII (single-byte only) EBCDIC UNICODE (1208)	

Table 8. String data types (continued)

Db2 for z/OS type	Accelerator database type	Supported CCSIDs	Comment
GRAPHIC	GRAPHIC	UNICODE (1200) EBCDIC	<p>This type is fully supported for EBCDIC and UNICODE tables.</p> <p>Important: If your Db2 subsystem is set to MIXED=NO, and you use the GRAPHIC() function on a single-byte (SBCS) CHAR column, the query will fail when it is routed to an accelerator.</p>
VARGRAPHIC	VARGRAPHIC	UNICODE (1200) EBCDIC	<p>This type is fully supported for EBCDIC and UNICODE tables.</p> <p>The maximum length in Db2 for z/OS is 16352. In the accelerator database, it is 16296. An accelerator table load operation aborts when a string exceeds the limit of the accelerator database.</p> <p>Important:</p> <ul style="list-style-type: none"> • If you make use of the schema change feature, the maximum string length for VARGRAPHIC that is supported by the accelerator database is only 16280 bytes. For more information, see <i>Schema changes</i> in the <i>IBM Db2 Analytics Accelerator for z/OS: Installation Guide</i>. • If your Db2 subsystem is set to MIXED=NO, and you use the GRAPHIC() function on a single-byte (SBCS) VARCHAR column, the query will fail when it is routed to an accelerator.

ROWID data type

The ROWID data type is to uniquely and permanently identify rows in a table. A ROWID value can be used to access a table row directly. The ROWID data type is supported by IBM Db2 Analytics Accelerator. However, consider the following limitation:

Two formats of ROWIDs exist: an *external* format and an *internal* format. The external format consists of the internal format plus several hexadecimal strings. Db2 for z/OS can handle both formats, but stores just the internal format. Since the internal format is stored, this is also what is loaded into the corresponding accelerator-shadow tables.

ROWID columns can be used like any other column, as, for example, in queries like:

```
SELECT <ROWID> FROM <table>;
```

, where <ROWID> is supposed to be a column containing ROWIDs. In cases like this, Db2 for z/OS returns the longer, external format. The query would work in the same way if it were accelerated, but the

accelerator would return the internal format because it cannot translate or otherwise infer the external format from the internal values.

In addition, the values in ROWID columns can be used in WHERE predicates for direct row access, as in queries like:

```
SELECT * FROM <table> WHERE ROWID = ROWID(X'...')
```

Inside the parentheses of the ROWID(X'...') expression, you can use both, the external or the internal format, if the query is processed by Db2 for z/OS.

However, the same query can be accelerated only if the internal format is used, for the same reason as in the previous example: The accelerator "understands" just the internal format.

Notes:

- For some complex queries (including OUTER JOIN expressions and views, for example), Db2 for z/OS requires the external ROWID format. Such queries cannot be accelerated.
- ROWID expressions can also be used in INSERT INTO ... SELECT FROM statements, where just the SELECT portion of the query is accelerated.
- You cannot add columns with the ROWID data type to accelerator-only tables. If you try to include a column definition of that sort in a CREATE TABLE ... IN ACCELERATOR statement, Db2 for z/OS returns SQL Code -4747.
- To use ROWID expressions in accelerated static SQL queries, first rebind the static application or package with the Db2 bind option QUERYACCELERATION. Use a value other than NONE. For more details, see *Configuring Db2 for z/OS for the acceleration of static SQL queries* (link at the end of this topic) and the Db2 for z/OS documentation.

Related concepts

[Conditions that prevent query routing to an accelerator](#)

Db2 for z/OS does not route a query to an accelerator if any of the following conditions applies.

[Configuring Db2 for z/OS for the acceleration of static SQL queries](#)

To accelerate static SQL queries, use the QUERYACCELERATION and GETACCELARCHIVE bind option for Db2 packages.

Supported SQL functions and expressions

See which aggregate functions and scalar functions are supported by IBM Db2 Analytics Accelerator.

Supported aggregate functions

IBM Db2 Analytics Accelerator supports all aggregate functions, except for the XMLAGG function.

The following aggregate functions are supported even if they are used in combination with the DISTINCT or UNIQUE keyword:

- STDDEV
- STDDEV_SAMP
- VARIANCE
- VARIANCE_SAMP

Note: However, restrictions exist if you use these keywords. See [Table 9 on page 38](#).

Table 9. Restrictions on aggregate functions, keywords and expressions

Function, keyword or expression	Restriction
<ul style="list-style-type: none"> DISTINCT UNIQUE 	<p>If the DISTINCT or UNIQUE keyword is applied to string values with trailing blanks, IBM Db2 Analytics Accelerator might cut off the trailing blanks from the resulting values. Example:</p> <pre>SELECT DISTINCT N_S_VCHR CONCAT ' ' FROM MATRIX.MBCS_EBCDIC;</pre> <p>The SQL code specifies that a space character or blank is to be added at the end of each value retrieved. Now see some of the rows returned by this query, once by Db2 for z/OS, and once by IBM Db2 Analytics Accelerator:</p> <p>Db2 for z/OS:</p> <ol style="list-style-type: none"> [] (four blanks) [HIJ] (two blanks at end of string) [!"#\$%&\/] (one blank at end of string) <p>IBM Db2 Analytics Accelerator:</p> <ol style="list-style-type: none"> [] (empty string) [HIJ] (no blanks at end of string) [!"#\$%&\/] (no blanks at end of string)
<ul style="list-style-type: none"> LISTAGG 	<p>When multiple tables are joined, the result can differ when LISTAGG runs on an accelerator instead of Db2 for z/OS. To guarantee the same result from both environments, you can use an ORDER BY clause in a unique sort-key expression. This approach ensures that the result set is the always the same. However, the order of rows in the result can still differ, unless the statement also specifies a unique GROUP BY clause for the sort-key expression.</p>

Supported scalar functions

In addition, IBM Db2 Analytics Accelerator supports a variety of scalar functions and the CAST specification.

If restrictions exist for a function in [Table 10 on page 38](#), the function is marked with an asterisk(*). The restrictions are described in [Table 11 on page 40](#).

Table 10. Supported scalar functions and specifications

Function name	Function name	Function name	Function name
• ABS	• DIGITS	• MOD	• TIME (see Table 11 on page 40)
• ADD_MONTHS	• DOUBLE_PRECISION (also DOUBLE, FLOAT)	• MONTH	• TIMESTAMP (see Table 11 on page 40)
• BINARY	• EXP	• MONTHS_BETWEEN	• TIMESTAMPDIFF

Table 10. Supported scalar functions and specifications (continued)

Function name	Function name	Function name	Function name
• BIGINT	• EXTRACT (see Table 11 on page 40)	• MULTIPLY_ALT	• TIMESTAMP_FORMAT (also TO_DATE; see Table 11 on page 40)
• BITAND (see Table 11 on page 40)	• FLOAT	• NEXT_DAY	• TIMESTAMP_ISO (see Table 11 on page 40)
• BITANDNOT	• FLOOR	• NEXT_WEEK	• TO_NUMBER (DECFLOAT_ FORMAT)
• BITNOT	• GRAPHIC (see Table 11 on page 40)	• NEXT_MONTH	• TRANSLATE (see Table 11 on page 40)
• BITOR	• HASH (see Table 11 on page 40) Note: Support for HASH is available after you apply the fix for Db2 for z/OS APAR PH66617.	• NEXT_QUARTER	• TRIM (also with two arguments; see Table 11 on page 40)
• BITXOR	• HASH_SHA256 Note: Support for HASH_SHA256 is available after you apply the fix for Db2 for z/OS APAR PH66617.	• NORMALIZE_DECFLOAT	• TRUNCATE(see Table 11 on page 40)
• CEILING	• HOUR (see Table 11 on page 40)	• NULLIF	• UPPER (UCASE) (see Table 11 on page 40)
• CAST specification (see Table 11 on page 40)	• HEX (see Table 11 on page 40)	• NVL	• VALUE
• CHAR (see Table 11 on page 40)	• IFNULL	• POSITION	• VARBINARY
• CHARACTER_LENGTH	• DOUBLE_PRECISION (also DOUBLE, FLOAT)	• POSSTR	• VARCHAR
• COALESCE	• INTEGER (INT)	• POWER (see Table 11 on page 40)	• VARCHAR9 (see Table 11 on page 40)
• COMPARE_DECFLOAT (see Table 11 on page 40)	• JULIAN_DAY (see Table 11 on page 40)	• QUARTER (see Table 11 on page 40)	• VARCHAR_FORMAT (TO_CHAR; see Table 11 on page 40)
• CONCAT (see Table 11 on page 40)	• LAST_DAY	• RADIANS	• VARGRAPHIC (see Table 11 on page 40)
• CORR	• LEFT (see Table 11 on page 40)	• RAND (see Table 11 on page 40)	• WEEK (see Table 11 on page 40)
• COVAR	• LENGTH	• REAL	• WEEK_ISO (see Table 11 on page 40)
• COVAR_SAMP	• LN	• REPEAT	• YEAR

Table 10. Supported scalar functions and specifications (continued)

Function name	Function name	Function name	Function name
• DATE (see Table 11 on page 40)	• LOCATE (see Table 11 on page 40)	• REPLACE	
• DAY	• LOCATE_IN_STRING (see Table 11 on page 40)	• RIGHT (see Table 11 on page 40)	
• DAYOFMONTH	• LOG10	• ROUND (see Table 11 on page 40)	
• DAYOFWEEK	• LOG	• ROWID (see Table 11 on page 40)	
• DAYOFWEEK_ISO (see Table 11 on page 40)	• LOWER (LCASE) (see Table 11 on page 40)	• RPAD	
• DAYOFYEAR (see Table 11 on page 40)	• LPAD (see Table 11 on page 40)	• RTRIM (also with two arguments)	
• DAYS	• LTRIM (also with two arguments)	• SECOND (see Table 11 on page 40)	
• DECFLOAT (see Table 11 on page 40)	• MAX (GREATEST)	• SIGN (see Table 11 on page 40)	
• DECFLOAT_FORMAT (TO_NUMBER)	• MEDIAN	• SMALLINT	
• DECIMAL	• MICROSECOND	• SPACE	
• DECODE (also with two arguments)	• MIDNIGHT_SECONDS (see Table 11 on page 40)	• SQRT	
• BITXOR	• MIN (also LEAST)	• SUBSTR	
• DEGREES	• MINUTE (see Table 11 on page 40)	• SUBSTRING (see Table 11 on page 40)	

Table 11. Restrictions

Function, keyword, or expression	Restriction
• BITAND	The lowest possible BIGINT value (-9223372036854775808) at any argument position returns a result data type of DECFLOAT(34) rather than BIGINT, as in Db2 for z/OS). For any other valid input value, the result data type is BIGINT.

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> • CAST specification 	<p>Restrictions exist if you want to use CAST expressions to convert string data types and, by specifying the string unit, determine the number of bytes to be used for the representation of characters in the resulting strings:</p> <p>CAST TO CHAR If the string unit is CODEUNITS16 or CODEUNITS32, IBM Db2 Analytics Accelerator might return a different number of trailing blanks than Db2 for z/OS.</p> <p>CAST TO GRAPHIC Allowed string units are CODEUNITS16 and CODEUNITS32. When compared with the output from Db2 for z/OS, IBM Db2 Analytics Accelerator might return a different number of trailing blanks.</p> <p>CAST TO VARGRAPHIC Allowed string units are CODEUNITS16 and CODEUNITS32.</p> <p>See also “Strings as time values and their conversion” on page 65.</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> CHAR 	<ul style="list-style-type: none"> If the string unit is CODEUNITS16 or CODEUNITS32, IBM Db2 Analytics Accelerator might return a different number of trailing blanks than Db2 for z/OS. If a string of space characters is requested in a query, the CHAR function always returns strings with a length of 255, no matter which string length is specified in the query. Suppose, for example, that a table with the name TMP contains strings consisting of (subsequent) space characters. If you run a query like <pre>SELECT CHAR(SPACE(20)) FROM TMP;</pre> you will find blank strings with a length of 255 rather than a length of 20 in the results. If the function is used to retrieve a substring of a multibyte string, so that it will split a multibyte-character, Db2 for z/OS returns the correct byte-code of the split character, whereas IBM Db2 Analytics Accelerator replaces this portion of the byte-code with blanks. You can avoid this by using the <i>length</i> argument (OCTETS, CODEUNITS16, or CODEUNITS32). <p>Suppose, for example, that you run the following query to retrieve the first five bytes of the string M A M A , consisting of full-width Latin capital letters. Each character is represented by three bytes. The mode of representation is UTF-8.</p> <pre>SELECT HEX(CHAR(' M A M A ',5));</pre> <p>To illustrate the differences in the outputs, the HEX function is used:</p> <p>Result in Db2 for z/OS: EFBCADEFBC</p> <p>This value represents the first letter 'M' (in full) and the first two bytes of the first letter 'A'.</p> <p>Result returned by accelerator: EFBCAD2020</p> <p>This value represents the first letter 'M' (in full) and two blanks instead of the first two bytes of the letter 'A'.</p> <p>You could specify OCTETS as the length argument to avoid this problem:</p> <pre>SELECT HEX(CHAR(' M A M A ',5,OCTETS));</pre> <p>The result would then be EFBCADEFBC in both cases.</p>
<ul style="list-style-type: none"> CONCAT 	<p>If the result data type is VARCHAR, the maximum length of a result string is limited to 4000 characters.</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> DATE 	<ul style="list-style-type: none"> Db2 accepts an argument in the format <code>yyyynnn</code> as input for the DATE function. IBM Db2 Analytics Accelerator does not accept this format and therefore issues an error. If the DATE function is used on numeric expressions, it is converted to <code>DATE(to_date('0000-12-31','YYYY-MM-DD')+trunc(numeric_exp))</code> during query routing to an accelerator. If the <code>numeric_exp</code> result is a negative number, IBM Db2 Analytics Accelerator adds BC to the date. An error is returned when the converted scalar function is evaluated in Db2.
<ul style="list-style-type: none"> DAYOFWEEK_ISO DAYOFYEAR JULIAN_DAY MIDNIGHT_SECONDS QUARTER TIMESTAMP_ISO WEEK WEEK_ISO 	<ul style="list-style-type: none"> If Db2 for z/OS is configured to use a local DATE format (DATE=LOCAL on DSNTIP4 panel) and a query uses a DATE constant as an argument for any of these functions, the query is not accelerated, and SQLCODE -4742 is returned. Queries containing the DAYOFWEEK_ISO, DAYOFYEAR, JULIAN_DAY, QUARTER, TIMESTAMP_ISO, or WEEK_ISO function fail with SQLCODE=-443 under the following conditions: <ol style="list-style-type: none"> The query includes the clause <code>FETCH FIRST n ROWS</code>. Any of the functions mentioned before uses string representations of U.S. or European date formats as arguments. <p>The same applies to queries containing MIDNIGHT_SECONDS, except that string representations of European date formats are allowed.</p> Queries containing the TIMESTAMP_ISO function fail during the attempt to route them to an accelerator if string representations of TIME values are used as arguments.
<ul style="list-style-type: none"> COMPARE_DECFLOAT 	<p>Since the database engine on the accelerator does not support DECFLOAT constants (see entry for DECFLOAT), the values to be compared are interpreted as floating-point numbers (DOUBLE), which results in a loss of precision for big numbers. This loss of precision might cause a value shift that leads to deviating comparison results. Consider the following cases:</p> <pre>COMPARE_DECFLOAT(0.123456789012345678901E-187, 1.234567890123456789010E-188), COMPARE_DECFLOAT(0.123456789012345678901E-185, 1.234567890123456789010E-188), COMPARE_DECFLOAT(0.123456789012345678901E-187, 1.234567890123456789010E-185)</pre> <p>The output of these comparisons is different, depending on where they are executed:</p> <p>Db2 for z/OS: '2','2','1'</p> <p>IBM Db2 Analytics Accelerator: '0','2','1'</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> • DECFLOAT 	<ul style="list-style-type: none"> • The database engine on the accelerator does not check, and therefore does not necessarily preserve the scale of the original Db2 for z/OS values. Db2 for z/OS defines the scale as the number of digits to the right of the decimal point. For example, 0.03E3 might be returned as 0.3E2. As long as the value is numerically accurate according to the IEEE754 specification, it is considered to be correct. • Different representations of the same numerical value (for example 1E2, 100, and 10E1) also have slightly different representations in memory and the database engine on the accelerator rarely normalizes these values. If the database is a row store, the values are not normalized at all. If it is a columnar store, normalization might occur more often, especially if a GROUP BY operation is performed on the values. However, you can never rely on the normalization of differently represented values. • The database engine on the accelerator does not support DECFLOAT constants. If the accelerator receives a DECFLOAT constant from Db2 for z/OS, and the value of this constant is within the range of DOUBLE values accepted by the database engine, the value is interpreted as DOUBLE, and the accelerator might return a value with a different precision. If a received value is not within the range of DOUBLE, SQL code -405 or -410 is returned. For example: <ul style="list-style-type: none"> – SQLCODE = -405, ERROR: THE NUMERIC CONSTANT 1.0E-308 CANNOT BE USED AS SPECIFIED BECAUSE IT IS OUT OF RANGE ... – SQLCODE = -410, ERROR: A NUMERIC VALUE 1234.5678901234567890123456E-55 IS TOO LONG, OR IT HAS A VALUE THAT IS NOT WITHIN THE RANGE OF ITS DATA TYPE ... • Db2 for z/OS and the database engine of IBM Db2 Analytics Accelerator compute different DECFLOAT values if one of the operands is Infinity (∞) and none of the other operands are of the type <i>not a number</i> (NaN). Signaling (sNaN) values are also counted as NaN. <p>In the majority of these cases, Db2 for z/OS returns NaN as the result, whereas IBM Db2 Analytics Accelerator returns positive or negative Infinity.</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> DISTINCT UNIQUE 	<p>If the DISTINCT or UNIQUE keyword is applied to string values with trailing blanks, IBM Db2 Analytics Accelerator might cut off the trailing blanks from the resulting values. Example:</p> <pre>SELECT DISTINCT N_S_VCHR CONCAT ' ' FROM MATRIX.MBCS_EBCDIC;</pre> <p>The SQL code specifies that a space character or blank is to be added at the end of each value retrieved. Now see some of the rows returned by this query, once by Db2 for z/OS, and once by IBM Db2 Analytics Accelerator:</p> <p>Db2 for z/OS:</p> <ol style="list-style-type: none"> [] (four blanks) [HIJ] (two blanks at end of string) [!"#\$%&\/] (one blank at end of string) <p>IBM Db2 Analytics Accelerator:</p> <ol style="list-style-type: none"> [] (empty string) [HIJ] (no blanks at end of string) [!"#\$%&\/] (no blanks at end of string)
<ul style="list-style-type: none"> GRAPHIC 	<p>If the string unit is CODEUNITS16 or CODEUNITS32, IBM Db2 Analytics Accelerator might return a different number of trailing blanks than Db2 for z/OS.</p>
<ul style="list-style-type: none"> HASH 	<p>The syntax of the HASH built-in function is HASH(expression, algorithm), in which the value of algorithm can be 0, 1 or 2. If this function is included in a Db2 for z/OS SQL query, the query is eligible for routing to an accelerator only if the value of algorithm is 2.</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction				
<ul style="list-style-type: none"> • HEX 	<p>The following restrictions exist for the HEX scalar function:</p> <ul style="list-style-type: none"> • A CHAR value is returned by Db2 for z/OS. If the query is accelerated by IBM Db2 Analytics Accelerator, the function returns a VARCHAR value. • The function reverses the byte order of the character values in the results if the function is processed by IBM Db2 Analytics Accelerator on an IBM Integrated Analytics System. This is because the query originates from a big-endian system Db2 for z/OS, but is processed by a little-endian system (IBM Integrated Analytics System). <p>Db2 Analytics Accelerator on Z, which is deployed on a big-endian system, returns the same value as Db2 for z/OS.</p> <p>Example of a reverse-order result returned by IBM Db2 Analytics Accelerator on IBM Integrated Analytics System:</p> <pre>SELECT HEX(NATIONKEY) FROM TEST.NATION WHERE NATIONKEY = 41308488 WITH UR;</pre> <table> <tr> <td>Result returned by Db2 for z/OS or Db2 Analytics Accelerator on Z:</td><td>02765148</td></tr> <tr> <td>Result returned by IBM Db2 Analytics Accelerator on IBM Integrated Analytics System:</td><td>48517602</td></tr> </table>	Result returned by Db2 for z/OS or Db2 Analytics Accelerator on Z:	02765148	Result returned by IBM Db2 Analytics Accelerator on IBM Integrated Analytics System:	48517602
Result returned by Db2 for z/OS or Db2 Analytics Accelerator on Z:	02765148				
Result returned by IBM Db2 Analytics Accelerator on IBM Integrated Analytics System:	48517602				
<ul style="list-style-type: none"> • LEFT • LPAD • RIGHT 	<p>Result deviations can occur if input strings contain multibyte or graphic EBCDIC characters.</p>				
<ul style="list-style-type: none"> • LOCATE • LOCATE_IN_STRING 	<p>Result deviations can occur under the following conditions:</p> <ul style="list-style-type: none"> • Input strings contain multibyte or graphic characters and the search begins in the middle of the string. • A string unit (OCTETS, CODEUNITS16, or CODEUNITS32) is not specified. 				

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> LCASE LOWER UCASE UPPER 	<ul style="list-style-type: none"> If a string argument contains characters with diacritical marks, Db2 for z/OS does not deliver the expected result, but IBM Db2 Analytics Accelerator does. For example: <pre>CREATE TABLE XYZ.TMP (A GRAPHIC(64), B GRAPHIC(64) NOT NULL) CCSID UNICODE; INSERT INTO XYZ.TMP VALUES ('Ü', 'Ü'); SELECT LOWER(B) XYZ.TMP;</pre> <p>Db2 for z/OS: Returns Ü, same as before because characters with diacritical marks are not converted.</p> <p>IBM Db2 Analytics Accelerator: Returns ü (correct result). Reason: The string argument is converted before the function is executed.</p> Accelerated queries might return different results (including invalid values) or an error with SQLCODE=-171, SQLSTATE=42815 if any of these functions is applied to EBCDIC or ASCII data. For example, take the following query, which returns invalid values: <pre>SELECT UCASE('µ~stuvwxyz', 'De_CH') FROM SINGLE_EBCDIC;</pre> <p>The query is supposed to find the string 'µ~stuvwxyz' in a table containing single-byte EBCDIC data and convert the resulting strings to uppercase. The Swiss variant of the German character set is used.</p> <p>Depending on where the query is run, the following values are returned:</p> <p>Db2 for z/OS: µ~STUVWXYZ (correct result)</p> <p>Accelerator: <unprintable symbol>~STUVWXYZ (incorrect result)</p> If the second argument is a string consisting of space characters only, the query is not accelerated. For example, the query: <pre>SELECT UPPER('abc', ' ') FROM schema.table;</pre> <p>is run in Db2 for z/OS. If the setting of the CURRENT QUERY ACCELERATION special register or QUERY_ACCELERATION ZPARM does not allow this, the query fails with SQLCODE -4742 and REASON_CODE=11.</p> If a German locale setting is used as an argument of the UPPER function, such as DE_DE, instances of the lower sharp s character (ß) are converted to SS. This might lead to an SQL error (SQLCODE -171) because the conversion changes the length of the CHAR or VARCHAR character string. <p>If you omit the locale setting, the ß character is preserved.</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> LCASE LOWER UCASE UPPER (continued)	<ul style="list-style-type: none"> Result deviations can occur if input strings contain multibyte or graphic EBCDIC characters. Db2 for z/OS and IBM Db2 Analytics Accelerator return different length values if any of these functions is applied to GRAPHIC data. For example: <pre>CREATE TABLE TMP (A GRAPHIC(64), B GRAPHIC(64) NOT NULL) CCSID UNICODE; INSERT INTO TMP VALUES ('a','b');</pre> <p>After that, you run the following query:</p> <pre>SELECT LENGTH(UPPER(B)) FROM TMP;</pre> <p>Depending on where the query is run, the following values are returned:</p> <p>Db2 for z/OS: 64</p> <p>Accelerator: 192</p> <p>The reason is that the accelerator uses a different result data type, that is, CHAR(192) instead of GRAPHIC(64).</p>
<ul style="list-style-type: none"> POWER 	If the argument data type is BIGINT, the result data type will be cast to DOUBLE.
<ul style="list-style-type: none"> RAND 	Supported without a parameter only.
<ul style="list-style-type: none"> ROWID 	In Db2 for z/OS, two types of ROWID values exist: the longer, external type, and the shorter internal type. If a query references ROWID values and these values are in the external format, the values are converted to the internal format when the query is routed to an accelerator because IBM Db2 Analytics Accelerator can handle the internal type only. The internal ROWID type is also what the accelerator returns in the query results. If you have an application that relies on the external ROWID type to be returned, do not accelerate the query.
<ul style="list-style-type: none"> ROUND 	If ROUND works on a numerical expression of type DECFLOAT, and the rounding would result in a range underflow or overflow, Db2 for z/OS returns positive or negative Infinity ($-\infty$ or $+\infty$), whereas IBM Db2 Analytics Accelerator returns <i>not a number</i> (NaN).
<ul style="list-style-type: none"> SIGN 	If the data type of an input argument is DECIMAL, the result must be cast to this type.
<ul style="list-style-type: none"> STRIP 	Result deviations can occur if input strings (in fields or columns) contain graphic EBCDIC characters.
<ul style="list-style-type: none"> SUBSTRING 	SUBSTRING is supported only if the expression refers to character or graphic data types.

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> • <code>TIMESTAMP</code> • <code>TIMESTAMP_FORMAT</code> • <code>TO_DATE</code> 	<p>Some string literals with a dash (-) or space character () as the separator (delimiter) between the date and the time portion and a period (.) or colon (:) to separate hours, minutes, and seconds are not supported or only partially supported as function arguments:</p> <p>Examples:</p> <ul style="list-style-type: none"> • <code>yyyy-mm-dd[hh.mm.ss[.nnnnnn]]</code> (space character before hh; period to separate hours, minutes, and seconds). This format is not supported. • <code>yyyy-mm-dd[-hh:mm:ss[.nnnnnn]]</code> (dash before hh; colon to separate hours, minutes, and seconds). This format is supported by the current version of IBM Db2 Analytics Accelerator, but only in connection with Db2 12 for z/OS or later. <p>See also “Dates in TIMESTAMP expressions” on page 65.</p>
<ul style="list-style-type: none"> • <code>TRANSLATE</code> 	<ul style="list-style-type: none"> • If the arguments are of data type <code>CHAR</code> or <code>VARCHAR</code>, the corresponding characters in the to-string expression and the from-string expression must have the same number of bytes (except in the case of a zero-length string). This means, for example, that you cannot convert a single-byte character to a multibyte character, or a multibyte character to a single-byte character. The padding character (<code>pad-char-exp</code> argument) cannot be the first byte of a valid multibyte character. If it is, error -171 is returned. • Result deviations can occur if arguments contain multibyte characters.
<ul style="list-style-type: none"> • <code>TRUNCATE</code> 	<p>You cannot use the <code>TRUNCATE</code> function on accelerator-only tables.</p>
<ul style="list-style-type: none"> • <code>TRIM</code> 	<p>Result deviations can occur if input strings contain multibyte or graphic EBCDIC characters.</p>
<ul style="list-style-type: none"> • <code>UPPER</code> • <code>UCASE</code> 	<p>See <code>LOWER/LCASE</code>.</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
<ul style="list-style-type: none"> • VARCHAR9 	<p>Result deviations can occur if the VARCHAR9 function is used to convert DECIMAL values to strings:</p> <ul style="list-style-type: none"> • When compared with the results returned by Db2 for z/OS, an accelerated query might show a leading blank in the results. For example: <pre>SELECT VARCHAR9(13.1) FROM TABLE_1</pre> gives you the following results: <p>Db2 for z/OS: 13.1</p> <p>IBM Db2 Analytics Accelerator 13.1 (leading blank)</p> <p>In accordance with these results, the length function also returns different values:</p> <pre>SELECT LENGTH(VARCHAR9(13.1)) FROM TABLE_1</pre> <p>Db2 for z/OS: 4</p> <p>IBM Db2 Analytics Accelerator: 5</p> • When compared with the results returned by Db2 for z/OS, an accelerated query might show leading zeros (0s) in places where the result value does not require all of the formatted digits. For example, if 1.0 is one of the values returned by the following query: <pre>SELECT VARCHAR9(DECIMAL(col1,7,5)) FROM TABLE_1</pre> you get the following results: <p>Db2 for z/OS: 1.00000</p> <p>IBM Db2 Analytics Accelerator 01.00000 (leading zero)</p>

Table 11. Restrictions (continued)

Function, keyword, or expression	Restriction
• VARCHAR_FORMAT	<p>The following date and timestamp formats are not supported:</p> <ul style="list-style-type: none"> • FF [n] - fractional seconds (000000-999999) The optional number <i>n</i> is used to specify the number of digits to include in the return value. Valid values for <i>n</i> are the integers from 1-12. The default is 6. • ID - ISO day of the week (1-7) The value 1 represents Monday. The value 7 represents Sunday. • IYYY - ISO year (0000-9999) The last four digits of the year based on the ISO week that is returned. • NNNNNN - microseconds (000000-999999) This format is equivalent to FF6. • RR - last two digits of the year (00-99) • SSSSS - seconds since the previous midnight

Unsupported scalar functions

Table 12. Unsupported scalar functions

• ACOS	• CCSID_ENCODING	• DIFFERENCE	• MQ <xxx>	• SCORE	• TOTALORDER
• ASCII	• CLOB	• EBCDIC_CHR	• NORMALIZE_STRING	• SIN	• TRUNC_TIMESTAMP
• ASCII_CHR	• COLLATION_KEY	• EBCDIC_STR	• OVERLAY	• SINH	• UNICODE
• ASCII_STR	• COS	• ENCRYPT_TDES	• QUANTIZE	• SOA <xxx>	• UNICODE_STR
• ASIN	• COSH	• GENERATE_UNIQUE	• PACK	• SOUNDEX	• VERIFY_GROUP_FOR_USER
• ATAN	• CONTAINS	• GETHINT	• RAISE_ERROR	• TAN	• VERIFY_ROLE_FOR_USER
• ATAN2	• DBCLOB	• GETVARIABLE	• RID	• TANH	• VERIFY_TRUSTED_CONTENT_FOR_USER
• ATANH	• DECFLOAT_SORTKEY	• IDENTITY_VAL_LOCAL	• ROUND_TIMESTAMP	• TIMESTAMP_ADD	• <xxx>XML<xxx>
• BLOB	• DECRYPT <xxx>	• INSERT		• TIMESTAMP_TZ	

Supported functions of the database engine

The product's database engine offers a range of aggregate functions and online analytical processing (OLAP) functions. The latter are frequently called built-in functions. A subset of these functions is supported. That is, you can use these functions in your SQL queries, and they will be processed if the query can be accelerated. A list of the supported functions is provided here.

General information

- To use any of these functions, the QUERY_ACCELERATION special register must be set to ALL, ENABLE, or ELIGIBLE.
- All functions listed here can be referenced in a database view.
- None of the functions can be specified as the source function of a user-defined function (UDF). Trying to do so results in SQLCODE -120.
- Db2 for z/OS verifies just the validity of the parameter data types. All other processing, including the validation, is done by the database engine of the accelerator.
- Some of the functions listed here are available as OLAP functions and as aggregate functions, but most of them are OLAP only. If a function is also available as an aggregate function, you find a link to an external description. All OLAP functions are externally described in a single topic. A link is provided at the bottom.

Note: The following list makes frequent use of the term *OLAP window*. An online analytical processing window (OLAP window) can be seen as the scope or range of values preceding or succeeding the current value. The selected window serves as the basis for the calculation.

ADD_DAYS

The ADD_DAYS function returns a datetime value that represents the first argument plus a specified number of days.

Result data type

TIMESTAMP

More information

[ADD_DAYS scalar function](#)

BTRIM

The BTRIM function removes the characters that are specified in a trim string from the beginning and end of a source string.

Result data type

Depends on the source string; VARCHAR, CLOB, VARGRAPHIC, or DBCLOB

More information

[BTRIM scalar function](#)

CUME_DIST

This is a distribution function that returns a cumulative distribution of a row within an OLAP window, expressed as a value between 0.0 and 1.0.

Result computation

The number of rows preceding or at the same level as the current row in the OLAP window is divided by the total number of rows in the OLAP window. The result cannot be NULL.

Result data type

DECFLOAT(34)

More information

[CUME_DIST aggregate function](#)

DAYS_BETWEEN

The DAYS_BETWEEN function returns the number of full days between the specified arguments.

Result data type

INTEGER

More information

[DAYS_BETWEEN scalar function](#)

FIRST_VALUE

This function returns the expression value for the first row in an OLAP window.

Result computation

If IGNORE NULLS is specified, all rows where the expression value for the row is the null value are not considered in the calculation. If IGNORE NULLS is specified and all values in the OLAP window are null, FIRST_VALUE returns the null value.

LAG

This function returns the expression value for the row at *offset* rows *before* the current row. The offset must be a positive integer constant.

Result computation

An offset value of 0 means the current row. If a *window-partition-clause* is specified, *offset* means offset rows before the current row and within the current partition. If *offset* is not specified, the value 1 is used.

If *default-value* (which can be an expression) is specified, it will be returned if the offset goes beyond the scope of the current partition. Otherwise, the null value is returned.

If IGNORE NULLS is specified, all rows where the expression value for the row is the null value are not considered in the calculation. If IGNORE NULLS is specified and all rows are null, *default-value* is returned. If *default-value* was not specified, the null value is returned.

LAST_VALUE

This function returns the expression value for the last row in an OLAP window.

Result computation

If IGNORE NULLS is specified, all rows where the expression value for the row is the null value are not considered in the calculation. If IGNORE NULLS is specified and all values in the OLAP window are null, FIRST_VALUE returns the null value.

LEAD

This function returns the expression value for the row at *offset* rows *after* the current row.

Result computation

An offset value of 0 means the current row. If a *window-partition-clause* is specified, *offset* means offset rows before the current row and within the current partition. If *offset* is not specified, the value 1 is used.

If *default-value* (which can be an expression) is specified, it will be returned if the offset goes beyond the scope of the current partition. Otherwise, the null value is returned.

If IGNORE NULLS is specified, all rows where the expression value for the row is the null value are not considered in the calculation. If IGNORE NULLS is specified and all rows are null, *default-value* is returned. If *default-value* was not specified, the null value is returned.

NEXT_MONTH

The NEXT_MONTH function returns the first day of the next month after the specified date.

Result data type

DATE

More information

[NEXT_MONTH scalar function](#)

NTH_VALUE

This function returns the expression value for the *n*throw in an OLAP window.

Result computation

Db2 for z/OS does not support the following keywords :

- FROM FIRST
- FROM LAST

- RESPECT NULLS
- IGNORE NULLS

If you specify any of these, SQLCODE -199 is returned. Hence you can only use this function without these keywords. The database engine of the accelerator executes the function with default settings, which equates to specifying FROM FIRST RESPECT NULLS.

NTILE

This function returns the quantile rank of a row. If the argument can be null, the result can be null. If the argument is null, the result is the null value. The result is the quantile rank, which is associated with the current row. Equivalent sort keys are not considered when rows are divided into quantiles. Rows with equivalent sort keys can be assigned to different quantiles based on the non-deterministic order of these sort keys. Therefore, NTILE is a non-deterministic function.

Result computation

The NTILE function computes the quantile rank of a row by dividing the ordered rows within the OLAP window into *num-tiles* quantiles and returns a value between 1 and $MIN(n, num-tiles)$, where *n* is the number of rows within the OLAP window. If *n* is evenly divisible by *num-tiles*, the rows in the OLAP window are grouped into *num-tiles* quantiles, each containing $n/num-tiles$ rows. Otherwise, each of the quantiles 1 through $MOD(n, num-tiles)$ is assigned $n/num-tiles + 1$ rows while each of the quantiles $MOD(n, num-tiles) + 1$ through *num-tiles* is assigned $n/num-tiles$ rows.

Result data type

DECFLOAT(34)

PERCENT_RANK

This is a distribution function that returns a relative percentile rank of a row within an OLAP window, expressed as a value between 0.0 and 1.0.

Result computation

If the number of rows in the OLAP window is greater than 1, the result is the *RANK of the current row in the OLAP window - 1* divided by the *total number of rows in the OLAP window - 1*.

If the number of rows in the OLAP window is less than or equal to 1, the result is 0.0.

More information

[PERCENT_RANK aggregate function](#)

RATIO_TO_REPORT

This function returns the ratio of an *argument* to the *sum of the arguments* in an OLAP partition.

Result computation

The division is always executed by using the DECFLOAT(34) data type. If the argument can be null, the result can be null; if the argument is null, the result is the null value.

Result data type

DECFLOAT(34)

REGEXP_COUNT

This scalar function returns a number that says how many times a regular expression pattern can be found in a string.

More information

[REGEXP_COUNT scalar function](#)

REGEXP_INSTR

This scalar function returns the starting or ending position of the matched substring, depending on the value of the *return_option* argument.

More information

[REGEXP_INSTR scalar function](#)

REGEXP_LIKE

This scalar function returns an INTEGER value indicating if the regular expression pattern is found in a string. The function can be used only where a predicate is supported.

Result data type

The result of this function is cast to an INTEGER value of 0 or 1, where 0 is *false*, and 1 is *true*. This is because Db2 for z/OS currently does not support Boolean functions or data types.

More information

[REGEXP_LIKE scalar function](#)

REGEXP_REPLACE

This scalar function returns a modified version of the source string, in which matching occurrences of the regular expression pattern are replaced with the specified replacement string.

Result data type

The length of the result buffer is 32672 bytes if a replacement string is specified. If a replacement string is not specified, the result buffer length is the same as the input buffer length, except for the following data types:

Data type	Result buffer length in Bytes
Numeric	42
DATE	10
TIME	8
TIMESTAMP	32

More information

[REGEXP_REPLACE scalar function](#)

REGEXP_SUBSTR

This scalar function returns one occurrence of a substring that matches the regular expression pattern.

Result data type

The result buffer length is the same as the input buffer length, except for the following data types:

Data type	Result buffer length in Bytes
Numeric	42
DATE	10
TIME	8
TIMESTAMP	32

More information

[REGEXP_SUBSTR scalar function](#)

Regression functions

In addition to the functions in listed in the previous section, IBM Db2 Analytics Accelerator supports the following regression functions of the database engine:

REGR_AVGX

This function returns a quantity that can be used to compute various diagnostic statistics needed for the evaluation of the quality and statistical validity of the regression model. Of the two expressions you provide as arguments, REGR_AVGX returns the average of the second expression.

Result data type

DECFLOAT(34) or DOUBLE

More information

[Regression functions \(REGR_AVGX, REGR_AVGY, REGR_COUNT, ...\)](#)

REGR_AVGY

This function returns a quantity that can be used to compute various diagnostic statistics needed for the evaluation of the quality and statistical validity of the regression model. Of the two expressions you provide as arguments, REGR_AVGY returns the average of the first expression.

Result data type

DECFLOAT(34) or DOUBLE

More information

[Regression functions \(REGR_AVGX, REGR_AVGY, REGR_COUNT, ...\)](#)

REGR_COUNT

The REGR_COUNT function returns the number of non-null number pairs used to fit the regression line.

Result data type

INTEGER

More information

[Regression functions \(REGR_AVGX, REGR_AVGY, REGR_COUNT, ...\)](#)

REGR_INTERCEPT (REGR_ICPT)

The REGR_INTERCEPT (or REGR_ICPT) function returns the y-intercept of the regression line (b in the equation $y = a * x + b$)

Result data type

DECFLOAT(34) or DOUBLE

More information

[Regression functions \(REGR_AVGX, REGR_AVGY, REGR_COUNT, ...\)](#)

REGR_R2

The REGR_R2 function returns the coefficient of determination (*R-square* or *goodness-of-fit*) for the regression.

Result data type

DECFLOAT(34) or DOUBLE

More information

[Regression functions \(REGR_AVGX, REGR_AVGY, REGR_COUNT, ...\)](#)

REGR_SLOPE

The REGR_SLOPE function returns the slope of the line (a in the equation $y = a * x + b$).

Result data type

DECFLOAT(34) or DOUBLE

More information

[Regression functions \(REGR_AVGX, REGR_AVGY, REGR_COUNT, ...\)](#)

REGR_SXX

This function returns a quantity that can be used to compute various diagnostic statistics needed for the evaluation of the quality and statistical validity of the regression model. Of the two expressions you provide as arguments, REGR_SXX returns the REGR_COUNT of both expressions multiplied by the VARIANCE of the second expression.

Result data type

DECFLOAT(34) or DOUBLE

More information

[Regression functions \(REGR_AVGX, REGR_AVGY, REGR_COUNT, ...\)](#)

REGR_SXY

This function returns a quantity that can be used to compute various diagnostic statistics needed for the evaluation of the quality and statistical validity of the regression model. Of the two expressions you provide as arguments, REGR_SXY returns the REGR_COUNT of both expressions multiplied by the COVARIANCE of both expressions.

Result data type

DECFLOAT(34) or DOUBLE

More information**Regression functions (REGR_AVGX, REGR_AVGY, REGR_COUNT, ...)****REG_SYY**

This function returns a quantity that can be used to compute various diagnostic statistics needed for the evaluation of the quality and statistical validity of the regression model. Of the two expressions you provide as arguments, REGR_SYY returns the REGR_COUNT of both expressions multiplied by the VARIANCE of the first expression.

Result data type

DECFLOAT(34) or DOUBLE

More information**Regression functions (REGR_AVGX, REGR_AVGY, REGR_COUNT, ...)****Related information**[OLAP specification](#)

Supported special registers

IBM Db2 Analytics Accelerator supports most Db2 special registers. During SQL routing to an accelerator, these special registers are replaced with the equivalent functions of the accelerator database or with a literal string containing the register's value at the time of statement execution. In some cases, this leads to different query results.

The following special registers are supported by the function substitution feature of the accelerator database:

- CURRENT ACCELERATOR
- CURRENT APPLICATION COMPATIBILITY
- CURRENT APPLICATION ENCODING SCHEME
- CURRENT CLIENT_ACCTNG
- CURRENT CLIENT_APPLNAME
- CURRENT CLIENT_CORR_TOKEN
- CURRENT CLIENT_WRKSTNNAME
- CURRENT DATE

Replaced with the function DATE(CURRENT DATE) on the accelerator.

- CURRENT DEBUG MODE
- CURRENT DECFLOAT ROUNDING MODE
- CURRENT DEGREE
- CURRENT EXPLAIN MODE
- CURRENT GET_ACCEL_ARCHIVE
- CURRENT LOCALE LC_CTYPE
- CURRENT MAINTAINED TABLE TYPES FOR OPTIMIZATION
- CURRENT MEMBER
- CURRENT OPTIMIZATION HINT
- CURRENT PACKAGE PATH
- CURRENT PACKAGESET
- CURRENT PATH
- CURRENT PRECISION
- CURRENT QUERY ACCELERATION

- CURRENT QUERY ACCELERATION WAITFOR DATA
- CURRENT REFRESH AGE
- CURRENT ROUTINE VERSION
- CURRENT RULES
- CURRENT SCHEMA
- CURRENT SERVER
- CURRENT SQLID
- CURRENT TEMPORAL BUSINESS_TIME
- CURRENT TEMPORAL SYSTEM_TIME
- CURRENT TIME

Replaced with the function TIME(CURRENT TIME) on the accelerator.

Restriction: Microseconds are not returned in the query results. A zero is displayed in the positions where you would expect microseconds.

- CURRENT TIMESTAMP

Replaced with the function TIMESTAMP(CURRENT TIMESTAMP) on the accelerator.

Restriction: Microseconds are not returned in the query results. A zero is displayed in the positions where you would expect microseconds.

- SESSION_USER
- SESSION TIME ZONE

Most of the remaining special registers are supported through literal string substitution in the SQL. For example, a reference to CURRENT SQLID will be replaced in the SQL with the literal string value from that register before the SQL is submitted to the database engine of the accelerator for processing.

Conditions that prevent query routing to an accelerator

Db2 for z/OS does not route a query to an accelerator if any of the following conditions applies.

- You use a distributed data facility (DDF) client, such as an Open Database Connectivity (ODBC) client, that does not support *level 8* of the IBM Distributed Relational Database Architecture (DRDA).
- The encoding scheme of an SQL statement is M because the tables use different encoding schemes, or the query contains an expression that explicitly relates to a coded character set identifier (CCSID), for example, a cast specification with a CCSID option.
- The FROM clause of the query specifies a data-change-table-reference, or, in other words, the query is selected from a FINAL TABLE or from an OLD TABLE.
- The query contains a string expression (including columns) with an unsupported subtype. See [Table 7 on page 34](#).
- The query contains an expression with an unsupported result data type or subtype. See [“Supported data types” on page 32](#).
- The query refers to a column that uses a field procedure (FIELDPROC).
- The query uses a special register other than:
 - CURRENT DATE
 - CURRENT TIME
 - CURRENT TIMESTAMP
- A LOCAL date format is used, that is, one or more of the following conditions apply:
 1. The query contains a CHAR function in which LOCAL is specified as the second argument.
 2. The query contains a date or time expression and the DATE FORMAT field of the DSNTIP4 installation panel specifies LOCAL.

3. Application programs that process SQL on Db2 for z/OS have been precompiled with the DATE(LOCAL) option.

Exception: You can enable LOCAL date expressions in the format dd/mm/yyyy or yyyyymmdd (with two space characters at the end) by including the QUERY_ACCEL_OPTIONS ZPARM value 4 or 7. For more information, see *Installing Db2 libraries with IBM Db2 Analytics Accelerator for z/OS support* in the *IBM Db2 Analytics Accelerator for z/OS: Installation Guide*.

- The query contains a sequence expression (NEXTVAL or PREVVAL).
- The query contains a user-defined function (UDF) other than an inline SQL scalar UDF (for more information, see https://www.ibm.com/support/knowledgecenter/en/SSEPEK_12.0.0/sqlref/src/tpc/db2z_sql_createfuncinlinesqlscalar.html).

However, queries inside a compiled SQL scalar UDF can be routed to an accelerator if the UDF is defined with a QUERY ACCELERATION option other than NONE (for more information, see https://www.ibm.com/support/knowledgecenter/en/SSEPEK_12.0.0/sqlref/src/tpc/db2z_sql_createfunctionsqscalar.html).

- The query contains a ROW CHANGE expression
- The query contains a string constant that is longer than 16000 characters.
- A new column name is referenced in a sort-key expression, for example:

```
SELECT C1+1 AS X, C1+2 AS Y FROM T WHERE ... ORDER BY X+Y;
```

- The query uses a DAY function where the argument of the function specifies a duration.
- The query uses a TRANSLATE function with only two arguments.
- The query uses one of the following scalar functions and one or more of its arguments contain a parameter marker or a scalar fullselect:
 - LOCATE
 - MICROSECOND
 - MIDNIGHT_SECONDS
 - TRANSLATE
- The query uses a table function, such as ADMIN_TASK_LIST or ADMIN_TASK_STATUS.
- The query uses an unsupported scalar function. See [Table 12 on page 51](#)
- The GET_ACCEL_ARCHIVE special register is set to the value YES (meaning that archived data will be included in the query) and the query references a table that has the value C in the ARCHIVE column of the SYSACCEL.SYSACCELRTABLES catalog table. A value of A or C indicates that the table data has been archived on an accelerator. The value C means that the archived data is not stored on the accelerator that is supposed to process the query. In other words, the active query data and the archived data are not located on the same accelerator. To process the query successfully, the ARCHIVE column must show the value A or no value. The value A indicates that both, the active data and the archived data, are located on the same accelerator.
- The instruction to process “SELECT FROM ... INSERT INTO ... ” statements (ZPARM QUERY_ACCEL_OPTIONS includes the value 2) is ignored if the target table uses an encoding scheme that is different from the encoding scheme of the tables in the SELECT statement.
- A *static* SQL query that includes a FOR SYSTEM_TIME ... or FOR BUSINESS_TIME ... is not routed to an accelerator if one of the following bind options (value YES, default) is used.

Table 13. Unsupported bind options	
Clause	Bind option (value YES, which is the default)
<ul style="list-style-type: none"> – FOR BUSINESS_TIME AS OF – FOR BUSINESS_TIME FROM ... TO ... – FOR BUSINESS_TIME BETWEEN ... AND... 	<ul style="list-style-type: none"> – BUSTIMESENSITIVE – BUSINESS_TIME SENSITIVE
<ul style="list-style-type: none"> – FOR SYSTEM_TIME AS OF – FOR SYSTEM_TIME FROM ... TO ... – FOR SYSTEM_TIME BETWEEN ... AND ... 	<ul style="list-style-type: none"> – SYSTIMESENSITIVE – SYSTEM_TIME SENSITIVE

In cases like this, you receive error message -4742 with reason code 18.

Related concepts

EXPLAIN information

After creating the necessary EXPLAIN tables, you can analyze queries by invoking the Db2 EXPLAIN function. The analysis shows whether a query can be accelerated, indicates the reason for a failure, and gives a response time estimate. The outcome of the analysis can also be visualized in an access plan graph.

Isolation levels

Db2 isolation levels are ignored by IBM Db2 Analytics Accelerator.

Every table on an accelerator has its counterpart. That is, the table has been derived from a table that resides in Db2 for z/OS. Accelerator-only tables are an exception. An accelerator-shadow table is thus a copy of a projection of a Db2 table. In most cases, the projection is the Db2 table itself. Columns of the original Db2 table are excluded from the projection only if a column uses an unsupported data type.

You can change a Db2 table practically at any time by means of INSERT, UPDATE, or DELETE operations, mass imports (LOAD), and schema modifications (selected DDL). In this version of IBM Db2 Analytics Accelerator for z/OS, changes to a DB2 table are propagated automatically to the associated accelerator-shadow table only if the incremental update feature is used. If incremental updates are not enabled, you must update the accelerator-shadow tables manually in order to synchronize the table data. You can start the update from your administration client or run the SYSPROC.ACCEL_LOAD_TABLES stored procedure for this purpose.

The update of accelerator-shadow tables is an asynchronous process, that is, there is no guarantee that the data in the Db2 tables and the data in the accelerator-shadow tables are always in sync. Even with incremental updates, a certain degree of latency is involved, which means that tables on an accelerator are updated somewhat later than the original DB2 tables. Therefore, the result set that a query returns when it is processed by Db2 might differ from the result set that the same query produces when it is processed by IBM Db2 Analytics Accelerator. This implies that isolation levels set for Db2 data are ignored or must be ignored by applications that send queries to IBM Db2 Analytics Accelerator. Result sets that are returned by IBM Db2 Analytics Accelerator do not necessarily comply with any isolation level setting.

To ensure data consistency on a relatively safe level, update accelerator-shadow tables immediately before you run the query and choose an appropriate lock scope so that the affected Db2 tables cannot be altered during the update. This, however, still does not guarantee that the results of an accelerated query will show the latest changes because the lock might prevent or postpone an update of the original Db2 table data.

If you use the incremental update function, you have the following options to ensure that accelerator data is up-to-date:

- Include the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure in your query execution logic. This stored procedure can be run with the special command **<waitForReplication>**. This option prevents that the procedure returns a result set before the latest committed changes have been replicated. Hence you can be relatively sure that your query operates on recent data if you run it after the stored procedure returns a result set.

Note: The **<waitForReplication>** command is not available if IBM Integrated Synchronization is used to implement the incremental update function.

- A more advanced approach is the use of the CURRENT QUERY ACCELERATION WAITFORDATA special register. This special register ensures that a query is not executed before all committed changes have been replicated.

If the most recent table changes must be reflected in the result set, set the CURRENT QUERY ACCELERATION special register to the value NONE. This means that the query is executed by Db2 and will not be accelerated.

Related concepts

Updating accelerator tables continually

The incremental update function of IBM Db2 Analytics Accelerator for z/OS allows you to update accelerator-shadow tables continually. Changes to the data in original Db2 for z/OS tables are thus propagated to the corresponding target tables with a high frequency and just a brief delay. This way, query results from an accelerator are always extracted from recent, close-to-real-time data.

Related tasks

Loading tables

Successful queries against accelerator-shadow tables are possible only if the tables contain data. Therefore, you must load the tables after their definition (empty structure) has been copied to the accelerator.

Incompatibilities between Db2 for z/OS and IBM Db2 Analytics Accelerator

In the list of incompatibilities, you find explanations for execution errors or different query results that Db2 for z/OS and IBM Db2 Analytics Accelerator might return for the same query.

Data types

See how IBM Db2 Analytics Accelerator handles certain Db2 data types:

FLOAT

The FLOAT data type is an approximate data type. The result can be different due to platform differences (hexadecimal floating-point numbers (HFP) versus IEEE754 floating-point numbers) or other internal handling differences. This applies to expressions that return FLOAT data and to expressions that contain a FLOAT data-type argument.

Related concepts

Differences in floating-point error tolerances

For queries that involve floating-point aggregates, you can expect IBM Db2 Analytics Accelerator for z/OS to produce results that are different from those delivered by inhouse Db2 for z/OS processing.

Division and multiplication of decimal values

During the division or multiplication of decimal values, Db2 for z/OS might truncate operand values if at least one of the operands is defined with a precision greater than 15. If that happens, the result of the calculation will be imprecise or wrong. IBM Db2 Analytics Accelerator does not truncate operand values internally, so the results will be more precise.

Example: Consider the following query:

```
CREATE TABLE TEST_TABLE(
D_DECIMAL_4_2 DECIMAL(4,2),
```

```

D_DECIMAL_17_2 DECIMAL(17,2),
D_DECIMAL_30_6 DECIMAL(30,6)
);
INSERT INTO TEST_TABLE VALUES(3.5, 3.5, 0.5);
INSERT INTO TEST_TABLE VALUES(1.5, 1.5, 1.5);

SELECT D_DECIMAL_17_2/D_DECIMAL_30_6, D_DECIMAL_17_2*D_DECIMAL_30_6
FROM TEST_TABLE;

SELECT D_DECIMAL_4_2/D_DECIMAL_30_6, D_DECIMAL_4_2*D_DECIMAL_30_6
FROM TEST_TABLE;

```

Db2 for z/OS returns results as follows:

- For the first calculation in the query:

```

+-----+
| ? | 1.5 |
| 1 | 1.5 |
+-----+

```

- For the second calculation in the query:

```

+-----+
| ? | 1.75 |
| 1.5 | 2.25 |
+-----+

```

The question mark (?) means that an overflow has occurred (division by zero) because Db2 for z/OS has internally reduced the value 0.5 to 0.

IBM Db2 Analytics Accelerator would have returned the correct results, which are the same for both calculations in the query:

```

+-----+
| 7 | 1.75 |
| 1 | 2.25 |
+-----+

```

The truncation problem is discussed in subsections of the *Arithmetic with two decimal operands* topic of the SQL reference in the Db2 11 for z/OS Documentation. A link to this topic is provided under **Related information**.

Related information

[Arithmetic with two decimal operands](#)

Encoding issues

Consider the following points when you have to deal with Unicode SQL statements, multibyte (mixed) data in connection with parameter markers, and multibyte or double-byte EBCDIC columns.

Unicode SQL statements

Generally, when a UNICODE-encoded SQL statement contains characters or strings (as a literal, host variable, or parameter marker) that refer to a single-byte-encoded EBCDIC column, then Db2 tries to convert these strings to EBCDIC. Sometimes, such a string cannot be converted properly because it contains invalid UNICODE characters or characters that do not exist in the target EBCDIC code page. In such cases, the results of the SQL operation and the SQLCODE returned by the accelerator might be different from those returned by Db2 for z/OS with regard to the following aspects:

- Queries might return a different number of rows.
- SQLCODE 0 might be returned instead of the SQL warning codes +331 or +335.
- Different substitution characters might be put into returned or inserted strings.
- Returned or inserted strings or substitution characters might be different if multiple encoding is enabled on the accelerator.

Mixed data and parameter markers

If a Db2 subsystem is set up to contain mixed data (mixed=yes), that is, if differently encoded data is allowed to coexist, and the coded character set identifier (CCSID) is not specified for parameter markers in a query, the query might return incorrect results.

The LIKE operator in connection with binary wildcard characters

Depending on the system executing a query (Db2 for z/OS or IBM Db2 Analytics Accelerator), the query might not return any results or wrong results if the LIKE operator is used in combination with a *binary* wildcard character (%) or (_). The reason for that is that both systems expect a different binary encoding of the wildcard characters.

Db2 for z/OS

Valid binary encodings of the wildcard characters are bx '6c ' for the percent sign (%) and bx '6d ' for the underscore character (_).

IBM Db2 Analytics Accelerator

Valid binary encodings of the wildcard characters are X '25 ' for the percent sign (%) and X '5F ' for the underscore character (_).

This means, for example, that if a query uses bx '6c ' to refer to the percent sign as a wildcard character, Db2 for z/OS will return the expected result, but IBM Db2 Analytics Accelerator will not.

On the contrary, if an expression like `SELECT COL FROM TABLE WHERE COL LIKE BINARY('A%')` is encountered, IBM Db2 Analytics Accelerator will give you the expected result, but Db2 for z/OS will not.

Exception handling

When an exception, such as a buffer overflow, a division by zero, or an out-of-range value occurs, Db2 returns the value NULL combined with a +802 warning, provided that the faulty expression is in the outermost SELECT statement and affects only one row. This is also called *friendly arithmetic*. IBM Db2 Analytics Accelerator will always issue an error in cases like these.

Maximum row length

The maximum row length for a table on an accelerator is 1048319 bytes. If the combined length of all column fields in a Db2 table exceeds this limit, you cannot define that table on the accelerator.

Predicate evaluation

Db2 tolerates SQL errors during predicate evaluation as long as the error has no impact on the result of the evaluation. IBM Db2 Analytics Accelerator, on the contrary, always returns an error. This rule applies to predicates consisting of multiple terms (an SQL error in a predicate consisting of only one term cannot be tolerated). An SQL error in a predicate does not influence the outcome of the predicate evaluation if it does not matter whether the error makes the predicate logically *true* or *false*. For example, if the predicate is a conjunction of terms as in `P1 AND P2`, and the evaluation of P1 results in an SQL error, then this error does not influence the outcome if P2 evaluates to *false* because both, *true AND P2* and *false AND P2*, evaluate to *false*. Table 14 on page 63 shows all relevant permutations for two-term predicates (E = error, T = true, F = false). Values in parentheses indicate that the P2 term is not evaluated if an evaluation of P1 already yields the result of the entire predicate evaluation.

Table 14. Relevant combinations of two-term predicates			
P1	P2	P1 AND P2	P1 OR P2
E	E	E	E
E	T	E	T
E	F	F	E

Table 14. Relevant combinations of two-term predicates (continued)			
P1	P2	P1 AND P2	P1 OR P2
T	E	E	(T)
F	E	(F)	E

The reason for choosing this evaluation method is that Db2 sometimes changes the order of term evaluation internally. The change is not announced or reported, and therefore goes unnoticed. Depending on the order of term evaluation, Db2 returns an error in one case, but not the other.

The behavior is very similar for the CASE and DECODE functions. These are basically SQL implementations of IF ... THEN ... ELSE constructs and exist in Db2 and IBM Db2 Analytics Accelerator. Db2 will ignore a wrongly defined option as long as it can select a correct one that evaluates to true. IBM Db2 Analytics Accelerator, on the other hand, will first check all available options, and return an error if one of these is not correctly defined. In the latter case, it does not matter whether selecting one of the correctly defined options would have led to a correct result.

SQL issues

In a grouping select, the HAVING clause can only reference expressions that are single-valued within a group. That is, you can only reference group fields, aggregates, or single-valued expressions that are derived from group fields or aggregates (which must include constants).

Time and date values

Time and date constructs in the accelerator database often differ from the constructs used by Db2 for z/OS, so that values and expressions must be converted. The conversion is often accompanied by limitations.

24:00:00 conversion

This product supports the Db2 for z/OS time representation 24.00.00 for midnight (end of day) in TIME and TIMESTAMP columns or SQL expressions. There is no need to set up a conversion.

However, although the time 24:00:00 is accepted as a valid time, it is never returned by the accelerator as the result of a time addition or subtraction. This holds true even if the time added or subtracted is 0 (seconds, minutes, or hours) or 24 hours: The result will always be 00:00:00. Db2 for z/OS will return 24:00:00 in these cases.

Suppose you have a table TEST with a timestamp column C1. You insert just the following value into the column: 9999-12-01-24.00.00.000000000000. Now you run the following query, which includes a simple calculation:

```
SELECT C1 - 1 MONTH,C1 FROM TEST
```

That is, you want to retrieve the values from C1, but one month is to be deducted from each value. Since there is just one value, you will see only one record in the query results. But note the difference depending on where the query was executed:

Db2 for z/OS

```
9999-11-01-24.00.00.000000000000
```

IBM Db2 Analytics Accelerator

```
9999-11-02-00.00.00.000000000000
```

As you can see, Db2 for z/OS gives you 24:00, end of day, on the 1st of November, but IBM Db2 Analytics Accelerator gives you 00:00, beginning of the next day (2nd of November). Both values mean exactly the same, but there is a difference in the representation.

Dates in TIMESTAMP expressions

If a date is supplied as the only argument to a TIMESTAMP expression, for example `TIMESTAMP (DATE (' 2015-12-31 '))`, Db2 for z/OS returns a timestamp with a time portion that shows no fractional seconds, whereas IBM Db2 Analytics Accelerator returns fractional seconds with a precision of six digits:

Db2 for z/OS	2015-12-31 00:00:00
IBM Db2 Analytics Accelerator	2015-12-31 00:00:00.000000

You can circumvent this problem by supplying the date as a string value, for example `TIMESTAMP (' 2015-12-31 ')` because this gives the same return value in both systems, that is:

2015-12-31 00:00:00.000000

Strings as time values and their conversion

For some scalar functions, such as `TIME`, Db2 accepts a time value, a timestamp, and also a string representation of times and timestamps. When Db2 evaluates the scalar function, it first checks whether a value can be interpreted as a time. If this fails, it tries to interpret the value as a timestamp. The corresponding accelerator functions do not accept string values. During query conversion, the content of a string is not evaluated. Instead, it is always cast to a time value. If the string represents a valid time format on the accelerator, IBM Db2 Analytics Accelerator processes the query. Otherwise, if the string represents a timestamp, it returns an error. A workaround is to cast the string explicitly to a timestamp in the query.

Affected functions:

- `CAST` (if the operation converts the string to a Db2 `TIME` value)
- `EXTRACT(HOUR FROM <arg>)`
- `EXTRACT(MINUTE FROM <arg>)`
- `HOUR`
- `MIDNIGHT_SECONDS`
- `MINUTE`
- `SECOND`
- `TIME`

Trailing blanks

Trailing blanks cause incorrect results under the following conditions:

- The result data type of an SQL expression is `VARCHAR` or `VARGRAPHIC` (as with `LEFT`, `LTRIM`, `REPLACE`, `RIGHT`, or `TRIM` for example).
- The original values returned as `VARCHAR` or `VARGRAPHIC` contain trailing blanks.
- A `GROUP BY` clause is used to sort the results on the `VARCHAR` or `VARGRAPHIC` column.

Important: If you use the `UNION` keyword to merge the results of distinct `SELECT` statements, then this operation is internally realized by using `GROUP BY` clauses. That is, you might see incorrect results even though your query does not contain a `GROUP BY` clause.

Queries of this type return incorrect results because the accelerator uses column-organized tables for performance reasons. The columnar engine used for these tables removes trailing blanks from `VARCHAR` or `VARGRAPHIC` values that are sorted by a `GROUP BY` clause. If the original values are of varying length and contain trailing blanks, the blanks are removed when the rewritten query is executed. Hence the grouped values in the column-organized table do not contain trailing blanks, and the length calculation will inevitably lead to deviating results.

GROUP BY example

```
SELECT <varchar_col> || 'a' FROM <table> GROUP BY <varchar_field>
```

In the first part of the query, the letter a is added to each value of a VARCHAR column at the end. The result data type is also VARCHAR. If the original values contain trailing blanks, and the first part of the query is run on its own, you see the following, different outputs depending on where the query is run:

Db2 for z/OS:

```
<varchar_value> a
```

That is, the trailing blanks are preserved for each value in the column.

IBM Db2 Analytics Accelerator:

```
<varchar_value>a
```

The trailing blanks are removed by the accelerator.

The second part of the query adds a GROUP BY clause to the first part. The outputs of the entire query differ as follows:

Db2 for z/OS:

- <varchar_value> a
- <varchar_value>a

Db2 for z/OS returns both possibilities for each grouped value.

IBM Db2 Analytics Accelerator:

```
<varchar_value>a
```

IBM Db2 Analytics Accelerator returns just the values without the trailing blanks.

UNION example

```
((SELECT "ACC001"."COL1", "ACC001"."COL2", "ACC001"."COL3"  
FROM "DWAXXYZ"."TB12345-0136008" ACC001  
WHERE "ACC001"."COL1"<2)  
UNION  
(SELECT "ACC002"."COL1", "ACC002"."COL2", "ACC002"."COL3"  
FROM "DWAXXYZ"."TB12345-0136008" ACC002  
WHERE "ACC002"."COL1"<2)) WITH UR
```

In this example, the UNION keyword is used to merge the results of two SELECT queries, each of these against a copy of the same table. The copies exist on different accelerators. One of these accelerators is an IBM Db2 Analytics Accelerator for z/OS Version 5.1.x accelerator, the other a version 7.x.x accelerator.

The version 5.1.x accelerator returns column values with the same number of trailing blanks as Db2 for z/OS. However, the version 7.x.x accelerator returns column values with fewer or no trailing blanks.

Remember: In general, queries are internally rewritten, so that they might contain a GROUP BY clause even though no such clause was given in the original query. In this case, the number of trailing blanks extracted from VARCHAR or VARGRAPHIC columns can be different depending on where the query is run.

Incompatibilities related to IBM InfoSphere Change Data Capture for z/OS

You might encounter execution errors or deviating query results when you use the incremental update function. Some of these errors or result deviations are due to incompatibilities between Db2 for z/OS, IBM Db2 Analytics Accelerator for z/OS, and IBM InfoSphere Change Data Capture for z/OS. The following section deals with these incompatibilities.

IBM InfoSphere Change Data Capture for z/OS is the main software component for CDC-based incremental updates.

All incompatibilities that are listed in the section [“Incompatibilities between Db2 for z/OS and IBM Db2 Analytics Accelerator”](#) on page 61 also apply to IBM InfoSphere Change Data Capture for z/OS.

In addition, incompatibilities that affect the regular load function of the product (the SYSPROC.ACCEL_LOAD_TABLES stored procedure) also affect the incremental update function. However, the following exceptions exist when IBM InfoSphere Change Data Capture for z/OS transfers data to tables on an accelerator:

- Values of VARCHAR FOR MIXED and VARGRAPHIC columns that exceed 16000 characters are cut off when they are received by IBM Db2 Analytics Accelerator for z/OS. Mind that unlike Db2 for z/OS, IBM InfoSphere Change Data Capture for z/OS does not issue a warning or error message in cases like this.
- If you run product versions 5 and 7 in parallel, be aware that a column data type supported by one version might not be supported by the other. Since the CDC capture engine is the same for both versions, it is unable to differentiate between version 5 and version 7 accelerators. Hence you might be able to update a table on a version 5 accelerator without problems, but receive an error when you try to update the same table on a version 7 accelerator.

Restrictions of accelerator-only tables

Here is a summary of the restrictions that exist for accelerator-only tables.

Current limitations

The use of accelerator-only tables brings extra workloads to your accelerators that compete for the same resources, such as CPU, disk, and system memory. This might impact the stability of your production environment.

Data-definition (DDL) statements

The following restrictions exist for data-definition statements and accelerator-only tables:

- The IN ACCELERATOR clause can be used only once in a statement.
- A CREATE TABLE must not contain a materialized query definition if the table is an accelerator-only table.
- A CREATE MASK statement must not define a mask for an accelerator-only table.
- A CREATE PERMISSION statement must not define a column permission for an accelerator-only table.
- A DECLARE GLOBAL TEMPORARY TABLE statement must not reference an accelerator-only table.
- A CREATE TRIGGER or ALTER TRIGGER statement must not reference an accelerator-only table in the body of the trigger.
- A CREATE TRIGGER or ALTER TRIGGER statement with an INSTEAD OF clause must not reference a view that references an accelerator-only table in the body of the trigger.
- An ALTER TABLE statement is not allowed if the table is an accelerator-only table.
- An ALTER TABLESPACE statement is not allowed if the table space contains accelerator-only tables.
- A DROP TABLESPACE statement fails if the table space contains accelerator-only tables. You must first drop the accelerator-only tables by using a DROP TABLE statement.
- The DROP DATABASE statement does not behave as expected:
 - If you create an accelerator-only table without specifying a database, the table is created in the default database as usual, but a DROP DATABASE statement does not remove that database.
 - A DROP DATABASE statement does not remove a database and the tables therein if some of the tables are accelerator-only tables. To remove such a database, first remove all accelerator-only tables by using separate DROP TABLE statements, and then the database.
- A RENAME TABLE statement fails if the table is an accelerator-only table.
- A LOCK TABLE statement must not refer to an accelerator-only table.
- A CREATE INDEX statement fails if the table to be indexed is an accelerator-only table.

- A `CREATE SYNONYM` statement fails if the synonym is for an accelerator-only table.
- You cannot create more than one accelerator-only table in a single transaction. The following example does not work:

```
CREATE TABLE AOT1 ... IN ACCELERATOR ...
CREATE TABLE AOT2 ... IN ACCELERATOR ...
COMMIT;
```

This example, on the other hand, does work:

```
CREATE TABLE AOT1 ... IN ACCELERATOR ...
COMMIT;
CREATE TABLE AOT2 ... IN ACCELERATOR ...
COMMIT;
```

In addition, the following clauses or keywords cannot be used in DDL statements that refer to accelerator-only tables:

Table 15. Unsupported clauses and keywords			
APPEND	AS FULLSELECT ¹	AUDIT	BUFFERPOOL
CHECK	COMPRESS	DATA CAPTURE	DSSIZE
EDITPROC	FIELDPROC	FOREIGN KEY	GENERATED
HASH	IMPLICITLY HIDDEN	IN TABLESPACE	INLINE LENGTH
LIKE	LOGGED	MEMBER CLUSTER	NOT LOGGED
PARTITION BY	PERIOD	PRIMARY KEY	TRACKMOD
UNIQUE INDEX	VALIDPROC	VOLATILE	WITH DEFAULT

Other SQL statements

The following statements are not allowed:

- You cannot run an `INSERT INTO <accelerator-only table> SELECT ... FROM ...` statement if the `SELECT` part of the statement references a normal Db2 table that has no loaded counterpart on the accelerator. The statements succeeds only if the `SELECT` part references one or more tables on the same accelerator as the accelerator-only table.
- You cannot submit an `UPDATE` statement against table columns that serve as distribution keys.
- You cannot insert values directly into a decimal column of an accelerator-only table if these values are the result of a division where the dividend, the divisor, or both are decimals. However, the operation works if the division is part of the `SELECT` portion in an `INSERT INTO ... SELECT FROM ...` statement.
- A local application such as a COBOL program, which was developed with RRSF (DSNRLI), cannot use the following command syntax for inserting values into an accelerator-only table:

```
INSERT INTO VALUES (...);
```

Such a statement fails and the following message is returned:

```
SQLCODE 4742 RC24: The DDL or DML statement cannot be offloaded because the
connection to the accelerator server does not allow updates.
```

This error occurs if you run an *RRSAF attach or direct execution*, such as `//RUN EXEC PGM=.`

Workaround:

¹ The restriction for the `AS FULLSELECT` clause is limited to the `CREATE TABLE` statement. It does work with other statements that reference an accelerator-only table, such as the `CREATE VIEW` statement.

- Use the CAF interface to run `INSERT INTO VALUES (...)` statements.
- To insert values from the IKJEFT01 panel, you can use the following syntax:

```
//SYSTSIN DD *
DSN SYSTEM(!DSN!)
  RUN PROGRAM(pgmname) PLAN(plnname) -
    LIB('hlq.RUNLIB.LOAD') -
    PARMS('parm1 parm2 parm3')
END
```

Restrictions on data types, column types, and code pages

Note that restrictions that apply to certain data types in general also apply to the use of these types in accelerator-only tables. In addition to that, the following restrictions exist for data types, column types, and code pages (CCSIDs), or are especially noteworthy:

- The column names in an accelerator-only table must not start with a tilde (~) followed by an underscore (_) character.
- The CHAR FOR BIT DATA and VARCHAR FOR BIT DATA data types are not supported in accelerator-only tables if the environment has been set up for the use of mixed data (ZPARM MIXED=YES).
- You cannot define a large-object (LOB) column for an accelerator-only table.
- You cannot define a security label column for an accelerator-only table.

Stored procedures

Some of the IBM Db2 Analytics Accelerator stored procedures do not work on accelerator-only tables:

SYSPROC.ACCEL_ADD_TABLES

Submit a `CREATE TABLE ... IN ACCELERATOR` statement instead.

SYSPROC.ACCEL_REMOVE_TABLES

Submit a suitable `DROP TABLE` statement instead.

SYSPROC.ACCEL_SET_TABLES_REPLICATION

Accelerator-only tables cannot be enabled for incremental updates.

SYSPROC.ACCEL_ARCHIVE_TABLES

You cannot archive partitions of accelerator-only tables because accelerator-only tables are not partitioned.

SYSPROC.ACCEL_RESTORE_ARCHIVE_TABLES

Since you cannot archive partitions of accelerator-only tables, you can neither restore archived partitions.

SYSPROC.ACCEL_SET_TABLES_ACCELERATION

You cannot disable acceleration on accelerator-only tables because they exist on an accelerator only, and thus must be enabled for acceleration.

Database limitations

In general, all limitations of the database on the IBM Integrated Analytics System also apply to accelerator-only tables.

Different results

Results obtained by running the same query against a normal Db2 table and an accelerator-only table might differ under the following conditions:

- One of the tables that are specified in the query contains a CHAR column in Unicode or in a mixed format, and the column values are padded with blank characters.
- An INSERT statement for DECIMAL values fails with a numeric data overflow error if the allowed maximum of 31 digits is exceeded, as in the following example:

```
INSERT INTO table ('decimal(31,0)_column')
VALUES (9999999999999999999999999999999.9);
```

The value to be inserted here has a total length of 32. Compare the result that IBM Db2 Analytics Accelerator returns with the result that Db2 for z/OS would return if this were an INSERT statement for a regular Db2 table:

IBM Db2 Analytics Accelerator:

You receive an out-of-range error message:

[illegible]

Db2 for z/OS:

Db2 for z/OS truncates such values:

999999999999999999999999999999999999.

Rollback behavior of high-availability accelerator-only tables

A high-availability accelerator-only table is an accelerator-only table that exists on multiple accelerators. If you create or drop such a table, and later reverse the transaction (rollback), you have to consider the side-effects, as these are different from the effects that occur when you perform the same operations on an accelerator-only table that exists on a single accelerator only.

The rollback behavior for an accelerator-only table on a single accelerator is as you would expect:

- A CREATE followed by a ROLLBACK removes the entry from the Db2 for z/OS catalog table SYSIBM.SYSTABLES and also removes the accelerator-only table from the accelerator.
- A DROP followed by a ROLLBACK restores the catalog entry and the accelerator-only table.

However, the behavior is different if you run exactly the same commands on a high-availability accelerator-only table:

- A CREATE followed by a ROLLBACK removes the catalog entry from Db2 for z/OS, but might leave orphaned accelerator-only tables on the accelerators.
- A ROLLBACK command that follows a DROP command is ignored by Db2 for z/OS to prevent an orphaned catalog entry in SYSIBM.SYSTABLES.

A two-phase commit between Db2 for z/OS and an accelerator is not supported. This means that a commit is required after each transaction on an accelerator that involves an accelerator-only table. It also means that only a single accelerator-only table can be created or dropped during a single transaction. There is an implicit commit after each transaction on an accelerator. As a result, the accelerator transactions cannot be reversed or rolled back.

The catalogs of Db2 for z/OS and the accelerators, on the other hand, are always consistent when you create or drop accelerator-only tables because each such step requires a single transaction on the accelerators.

Newer Db2 features

Some newer features, which were introduced with DB2 11 for z/OS, are not supported by IBM Db2 Analytics Accelerator. Other new features are either fully supported, or their use is restricted. Read on to find out about the details.

General

The EXPLAIN reason codes that hint at routing errors in connection with features introduced with newer Db2 for z/OS versions are the codes 11, 15, and 17.

Reason code 11 covers unsupported expressions, data types, and so on, while reason code 15 is a general reason code for all errors that are not covered by reason code 11. Reason code 17 is returned if you try to process a query with an INSERT statement, but have not set the QUERY ACCEL OPTIONS parameter

accordingly. For more information about the QUERY_ACCEL_OPTIONS parameter, see *Installing Db2 libraries with IBM Db2 Analytics Accelerator support* in the *IBM Db2 Analytics Accelerator for z/OS: Installation Guide*

Access control of columns or rows

IBM Db2 Analytics Accelerator handles columns with access control or Db2 tables with row access control as follows:

- Columns with access control are ignored when the corresponding accelerator-shadow table is loaded.
- Tables for which row access control has been defined cannot be added to an accelerator.
- If a query references a column for which a column mask has been activated, the query is not routed to an accelerator.

Cross-loading of tables

When a LOAD DATA INCURSOR ... INTO statement is used, the query inherits the setting of the CURRENT QUERY ACCELERATION special register. Hence queries are automatically routed to an accelerator if this has been enabled by the CURRENT QUERY ACCELERATION special register.

Cross-loading is not supported if the CURRENT GET_ACCEL_ARCHIVE special register is set. Hence queries with this setting cannot be accelerated in a cross-loading context.

CURRENT EXPLAIN MODE special register

Query routing to an accelerator works for queries that use the CURRENT EXPLAIN MODE special register if the special register is set to the value YES or EXPLAIN. Meaning of these settings:

CURRENT EXPLAIN MODE = YES

Enables the Db2 EXPLAIN facility and causes EXPLAIN information to be inserted into the EXPLAIN tables for eligible dynamic SQL statements after preparing and executing the statement. Dynamic SQL statements are hence compiled and executed normally.

CURRENT EXPLAIN MODE = EXPLAIN

Enables the Db2 EXPLAIN facility and captures EXPLAIN information for eligible dynamic SQL statement after preparing the statement. Note that with setting, a dynamic statement or query will not be executed, except for the SET clauses that it might contain.

New OLAP functions

IBM Db2 Analytics Accelerator supports the following moving aggregate functions:

- AVG
- CORRELATION (see **Notes**)
- COUNT
- COUNT_BIG
- COVARIANCE (see **Notes**)
- COVARIANCE_SAMP (see **Notes**)
- MAX
- MIN
- STDDEV
- SUM
- VARIANCE (VARIANCE_SAMP)

Notes:

- The result data type that IBM Db2 Analytics Accelerator returns for the CORRELATION, COVARIANCE, and COVARIANCE_SAMP functions is DOUBLE, and not DECFLOAT, as in Db2 for z/OS. This results in a loss of precision.

- Queries that use the previously mentioned moving aggregate functions are not accelerated if the window-aggregation-group clause specifies just a group-end clause, for example:

```
SELECT C1, C2, C3, SUM(C2)
OVER (ORDER BY C3 ROWS UNBOUNDED FOLLOWING)
FROM <table>
ORDER BY 1,2,3,4;
```

Temporal tables

. Queries referencing temporal tables usually contain the following expressions or clauses:

- FOR SYSTEM_TIME AS OF
- FOR SYSTEM_TIME FROM ... TO ...
- FOR SYSTEM_TIME BETWEEN ... AND ...
- FOR BUSINESS_TIME AS OF
- FOR BUSINESS_TIME FROM ... TO ...
- FOR BUSINESS_TIME BETWEEN ... AND ...

Restriction: A *static* SQL query that includes a FOR SYSTEM_TIME ... or FOR BUSINESS_TIME ... is not routed to an accelerator if one of the following bind options (value YES, default) is used.

Table 16. Unsupported bind options	
Clause	Bind option (value YES, which is the default)
<ul style="list-style-type: none"> • FOR BUSINESS_TIME AS OF • FOR BUSINESS_TIME FROM ... TO ... • FOR BUSINESS_TIME BETWEEN ... AND... 	<ul style="list-style-type: none"> • BUSTIMESENSITIVE • BUSINESS_TIME SENSITIVE
<ul style="list-style-type: none"> • FOR SYSTEM_TIME AS OF • FOR SYSTEM_TIME FROM ... TO ... • FOR SYSTEM_TIME BETWEEN ... AND ... 	<ul style="list-style-type: none"> • SYSTIMESENSITIVE • SYSTEM_TIME SENSITIVE

In cases like this, you receive error message -4742 with reason code 18.

Timestamps

The portion that denotes fractional seconds in timestamps can have up to twelve digits in Db2 for z/OS and also in the database of the accelerator. Hence IBM Db2 Analytics Accelerator fully supports this format. That is, values are not truncated as in earlier versions of IBM Db2 Analytics Accelerator for z/OS.

Restrictions: Timestamps with timezone specifications are not supported, to the effect that:

- SQL queries that require TIMESTAMP with a timezone specification as the result data type are not routed to an accelerator.
- Timestamps with timezone constants are not accepted.
- Functions and special registers that are related to timestamps with timezone specifications are not accepted.

Note: If a string constant or expression is used in connection with timestamps, such as string_col = timestamp_col, the query is routed to IBM Db2 Analytics Accelerator regardless of the content of the string expression because the string constant or expression is not validated. This might cause a run-time error during query execution if the string column contains unsupported timestamp values or formats.

Global variables

Db2 11 for z/OS introduced the concept of global variables, which can be created, instantiated, accessed, and modified by applications. Global variables are named memory variables that you can access and

modify through SQL statements. Global variables enable you to share relational data between SQL statements without the need for an application to transfer data. A global variable is associated with a specific application context, and contains a value that is unique to the scope of that context.

Global variables are not supported by IBM Db2 Analytics Accelerator. A query that contains a global variable statement is hence not routed to an accelerator.

Furthermore, the `CURRENT_QUERY_ACCELERATION` special register cannot be set to the value of a global variable.

Support for the array data type in SQL PL, CALL, and Java

An array consists of an ordered set of elements of a single built-in data type. Db2 offers limited support for arrays within SQL to provide more options for routines and data access code.

Arrays can be defined as parameters and variables for SQL routines. In addition, arrays can be passed from one procedure to another as arguments for the **IN** and **OUT** parameters, function parameters, or as a function return value. Db2 for z/OS supports both, ordinary arrays and associative arrays. Ordinary arrays have a defined upper limit, while associative array do not have such a limit. When the array data type is used in a query, the query is not routed to an accelerator.

Aliases and synonyms

An alias is an alternative name for an object, such as a Db2 table, a Db2 view, or another Db2 alias. It can be used to reference an object wherever that object can be referenced directly. Synonyms are similar to aliases, but are supported only for compatibility with previous releases. Synonyms will be deprecated in a future release. Db2 for z/OS extends the support for aliases, so that these can be defined for sequence objects, and also provides support for *public aliases*. IBM Db2 Analytics Accelerator does not support aliases if these are used in a sequence object.

SQL grouping sets and supergroups

Important: Contrary to the statement in prior versions of this documentation, grouping sets and supergroups are currently not supported by any IBM Db2 Analytics Accelerator for z/OS Version 7 product.

Related concepts

[EXPLAIN information](#)

After creating the necessary EXPLAIN tables, you can analyze queries by invoking the Db2 EXPLAIN function. The analysis shows whether a query can be accelerated, indicates the reason for a failure, and gives a response time estimate. The outcome of the analysis can also be visualized in an access plan graph.

Differences in floating-point error tolerances

For queries that involve floating-point aggregates, you can expect IBM Db2 Analytics Accelerator for z/OS to produce results that are different from those delivered by inhouse Db2 for z/OS processing.

Reason

You know that the same query processed twice by Db2 for z/OS can give you different results. This is due to the fact that the results depend on the order in which the rows or tuples are processed. It is not possible to determine the order that Db2 will choose beforehand.

In the case of IBM Db2 Analytics Accelerator for z/OS, another sort of result deviation occurs, which is caused by the different methods of representation for floating-point numbers. Db2 for z/OS uses hexadecimal floating-point (HFP) numbers, whereas IBM Db2 Analytics Accelerator for z/OS uses IEEE754 floating-point numbers.

When a query is routed from Db2 for z/OS to IBM Db2 Analytics Accelerator for z/OS, all processing takes place on the accelerator.

The main difference between these two methods is the base or radix of the exponential part. HFP uses a base of 16. IEEE754 uses a base of 2. The base of 16 requires the exponent of HFP numbers to be increased in steps of 4 during the calculation of an aggregate. IEEE754 numbers, on the other hand, need to be increased just in steps of 1. The multiplier in front of the exponent (mantissa) of an HFP number loses 4 bits at the right end each time the exponent is increased. The mantissa of IEEE754 numbers loses just 1 bit. The difference in error thus lies in the difference of three bits, and the amount per step depends on the values of these. If the values of the three bits are all zero, the error difference is also zero. If all values are 1, the difference in error is maximized. Because of the lower exponential increase per step, IEEE754 is the more precise method of representation.

Whether the difference in precision matters much mainly depends on the number of rows or tuples (n) used for floating-point aggregates. Naturally, if n gets higher, the result deviation or error increases, too. How high the total deviation will be is hard to quantify as it further depends on the type of the mathematical function that is used (compare, for example, a simple addition with an operation that takes the square of each number involved).

Important: In contrast to HFP numbers of the type REAL in Db2 for z/OS, which might range from $-7.2E+75$ to $+7.2E+75$, IEEE754 is only capable of processing REAL floating point numbers between $-3.4E+38$ and $3.4E+38$. This means that it is not possible to load an accelerator-shadow table with REAL values outside the range of $-3.4E+38$ to $3.4E+38$.

Also bear in mind that HFP and IEEE754 have different minimum and maximum values for REAL and DOUBLE numbers:

Table 17. Minimum and maximum REAL and DOUBLE values (HFP and IEEE754)				
	HFP (Db2 for z/OS)		IEEE754 (IBM Db2 Analytics Accelerator for z/OS)	
	REAL	DOUBLE	REAL	DOUBLE
Min.				
Max.				
Min. positive				
Max. negative				

Chapter 5. Administration clients

Different administration clients are available for the administration of the product: IBM Db2 Analytics Accelerator Studio, IBM Data Server Manager, and IBM Unified Experience for z/OS.

IBM Db2 Analytics Accelerator Studio is a plugin for IBM Data Studio, which allows you to administer IBM Db2 Analytics Accelerator for z/OS. IBM Data Studio is a classic workstation application, in the sense that it must be installed on all client workstations connecting to your data server.

IBM Data Server Manager and IBM Unified Experience for z/OS are multi-purpose web applications, which can also be used to administer IBM Db2 Analytics Accelerator for z/OS. Because they are web applications that come with their own web server, it is sufficient to install these applications on a single computer within your company network. As long as client workstations can connect to this computer over the network, they can use IBM Data Server Manager or IBM Unified Experience for z/OS for the administration of IBM Db2 Analytics Accelerator for z/OS.

IBM Data Server Manager and IBM Unified Experience for z/OS are easier to maintain because updates must be installed in one place only, and need not be rolled out to a number of client workstations.

Instead of using one of the supported administration clients, you can also control and operate the product by using Db2 commands and the stored procedures that come with the product. You can also use a z/OS-based REST interface called IBM Db2 Analytics Accelerator Administration Services that is provided as part of IBM Unified Management Server for z/OS.

Launching a function from an administration client causes the client to connect to your data server, which in turn calls a stored procedure that executes the corresponding command on the accelerator. The accelerator is thus always controlled and maintained indirectly via the data server.

In most cases, you do not have to change existing database applications to use IBM Db2 Analytics Accelerator. If an accelerator has been properly deployed and tables have been added to the accelerator, queries that come from database applications are usually routed automatically from your data server to the accelerator provided that this results in shorter response times.

See the following diagram:

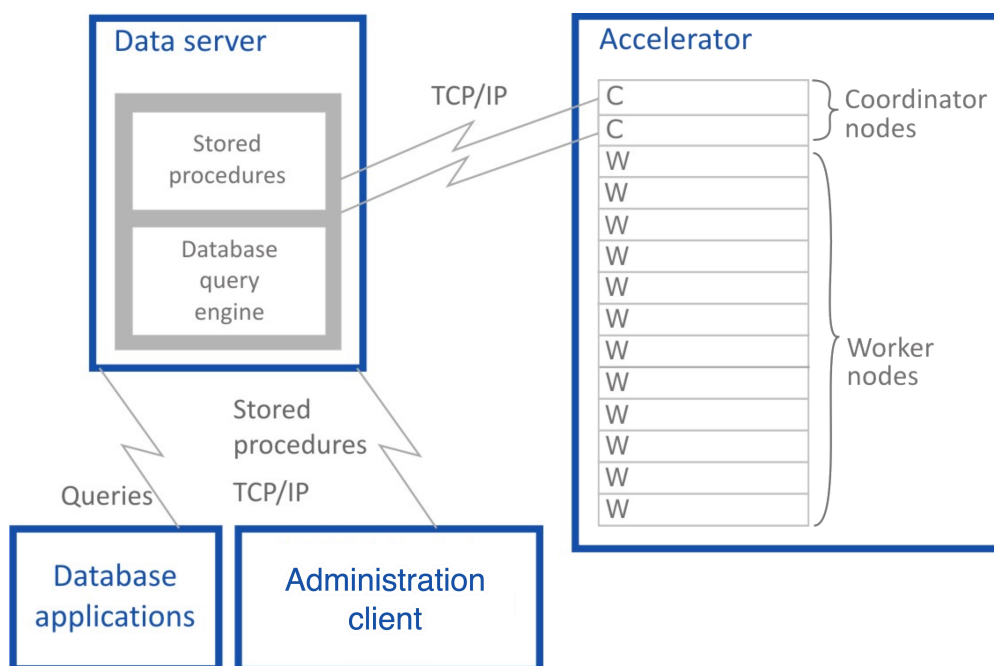


Figure 4. IBM Db2 Analytics Accelerator setup

Interface elements of IBM Db2 Analytics Accelerator Studio

Here is a brief description of the interface elements that show IBM Db2 Analytics Accelerator Studio functionality.

Note: When you start IBM Db2 Analytics Accelerator Studio for the first time, you see the **Welcome** screen. To see the main window of IBM Db2 Analytics Accelerator Studio with the principal functions and controls, just close the **Welcome** screen by clicking the cross-shaped icon on the tab of the **Welcome** screen (usually positioned on the upper left).

Menu bar

When IBM Db2 Analytics Accelerator Studio has been opened, specific menus or menu choices are added to the menu bar of the Accelerator perspective. In addition, some standard menu choices of the Data perspective might have a different effect when IBM Db2 Analytics Accelerator Studio is loaded.

Edit > Select All

Selects all elements in the currently active view.

Window > Open Perspective > Other > Accelerator

Opens the Accelerator perspective, which shows IBM Db2 Analytics Accelerator Studio (if it has been installed).

Window > Reset Perspective

Restores all default views of IBM Db2 Analytics Accelerator Studio to their default size and position in the IBM Data Studio main window.

Window > Show View

Opens a submenu that allows you to reopen a currently closed IBM Db2 Analytics Accelerator Studio view.

Help > Welcome > Overview > IBM Db2 Analytics Accelerator Studio

Opens the *Introduction* topic in the online help system.

Help > Welcome > First Steps > Demonstration Videos

Opens the *Demonstration videos* topic in the online help system, which lists the available videos. Clicking a link starts the playback of a video.

Help > Welcome > Workbench

Closes the **Welcome** screen and displays the main view of IBM Db2 Analytics Accelerator Studio.

Administration Explorer

The **Administration Explorer** shows your database connection profiles and various objects like schemas, tables, and stored procedures that are defined in the database catalogs of your data servers.

The **Administration Explorer** is the navigation tree that you can see in [Figure 5 on page 77](#). It is usually located on the left-hand side.

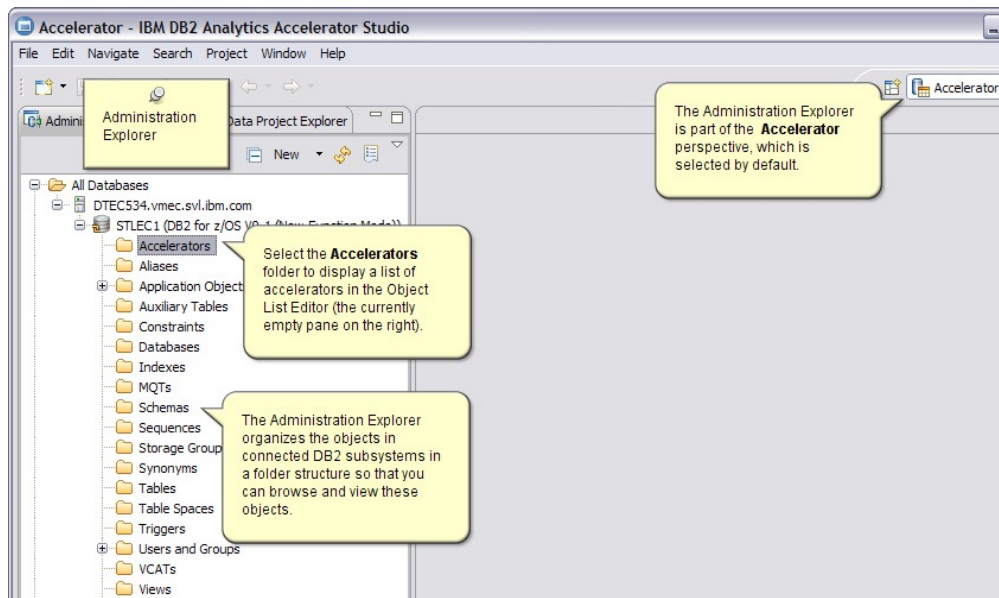


Figure 5. Administration Explorer

Menus

Depending on your selection in the **Administration Explorer**, the menu (right-click action) offers the following menu choices specific to IBM Db2 Analytics Accelerator for z/OS:

An existing database connection profile

When you right-click an existing database connection profile, you can select the following items from the menu:

Connect

Connects to the database that is referred to in the profile. You are asked for the password of the logon user if the option **Save password** is not selected in the profile.

Disconnect

Disconnects an active database connection.

Ping

Issues a **ping** command to check whether the network connection to the database server works.

Manage Connection

Gives you access to a submenu from which you can rename, delete, or copy (duplicate) the selected profile.

Properties

Opens the **Properties** sheet of the existing profile so that you can edit it.

Folders

When a database server has been connected to, you can see the various objects on that server, which are organized in folders. Most folders pertain to database objects that are created or configured in Db2 for z/OS. An exception is the **Accelerators** folder, which pertains to IBM Db2 Analytics Accelerator for z/OS only.

Accelerators folder

Selecting the **Accelerators** folder opens the **Object List Editor** in the main view (pane on the right).

The context menu of the **Accelerators** folder offers the following choices:

Add Accelerator

Starts the **Add Accelerator** wizard, which allows you to add an accelerator to the system configuration.

Add Virtual Accelerator

Starts the **Add Virtual Accelerator** wizard, which allows you to add a virtual accelerator to the system configuration.

Important: Virtual accelerators are a feature of earlier versions of IBM Db2 Analytics Accelerator for z/OS. They are not supported by IBM Db2 Analytics Accelerator for z/OS Version 7.

Save Trace

Opens the **Save Trace** window, in which you can select the trace information that you want to save and either save it to a file or submit it to IBM.

Refresh

Refreshes the list of accelerators in the Object List Editor (right pane).

Object List Editor

Apart from various other functions, the Object List Editor contains a table with an entry for each accelerator that has been configured. The **Object List Editor** opens when you select the **Accelerators** folder in the **Administration Explorer**.

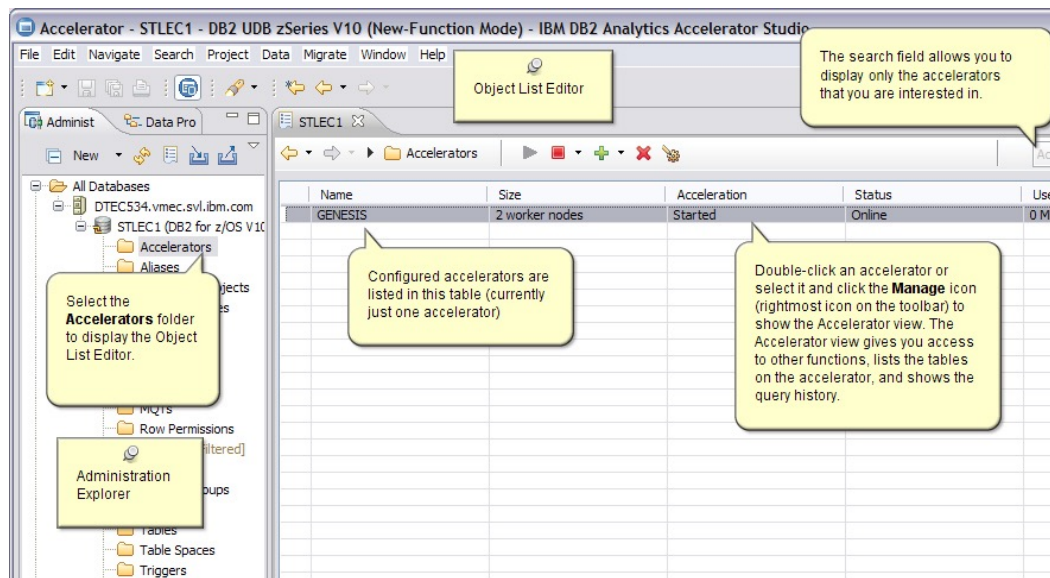


Figure 6. Object List Editor

Buttons in the Object List Editor

On top of the table in the **Object List Editor**, you find the following buttons:



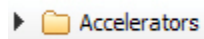
The arrow pointing to the left returns to the previous display in the **Object List Editor**.

The downward-pointing arrow allows you to select a particular earlier display from a list.



To switch forward to a display in the Object List Editor that was opened later than the current one.

The downward-pointing arrow allows you to select a particular later display from a list.



To change the type of object that is currently displayed in the Object List Editor. The currently selected type is displayed to the right of the twistie (here: accelerators).



To enable the selected accelerator in Db2 for z/OS.

Notes:

- Multiple selections are not possible here. You can enable only one accelerator at a time.
- If the accelerator is attached to a Db2 data sharing group, acceleration is enabled for all members of the group.



To disable the selected accelerator in Db2 for z/OS.

The downward-pointing arrow on the right opens a menu from which you can select the following choices:

Stop

Same as clicking the button on the toolbar

Stop Force

A function that disables the selected accelerator immediately, that is, without waiting for the completion of not yet finished queries.

Notes:

- Multiple selections are not possible here. You can disable only one accelerator at a time.
- If the accelerator is attached to a Db2 data sharing group, acceleration is disabled for all members of the group.



To remove the selected accelerator from the system configuration.

Note: Multiple selections are not possible here. You can remove only one accelerator at a time.



To open the **Accelerator** view for the selected accelerator, in which you can define, remove, enable, or disable accelerator-shadow tables and invoke various other functions.

Clicking this button has the same effect as double-clicking an accelerator name in the table of the **Object List Editor**.

Note: Multiple selections are not possible here. You can only open the **Accelerator** view for one accelerator at a time.



To open the monitoring view for the selected accelerator. The monitoring view offers graphical displays of various usage metrics, such as the system utilization, the number of parallel tasks running on an accelerator, the disk space occupied by the data on the accelerator as claimed by the connected Db2 subsystems, as well as the replication throughput and the replication latency.

The icon with the downward-pointing arrow allows you to select a trace file that contains these usage metrics, so the data in the trace file is presented graphically.

The search field makes it easier to find particular accelerators if the list is long. Type the names of accelerators in this field, either fully or partially and press Enter. The table will display just those accelerators bearing or starting with that name.

Column information

The table in the **Object List Editor** provides various information about the accelerators, such as:

Name

Name of an accelerator

Size

Size of an accelerator, that is, its number of worker nodes (3, 6, or 12).

Acceleration

Whether acceleration has been *started* or *stopped* for the Db2 subsystem that is associated with an accelerator.

Note: The status of an accelerator cannot not been determined if acceleration has been stopped for a Db2 subsystem.

Status

Current status or state that an accelerator is in. The following states are possible:

Cluster Is Initializing

Interim state that is shown when a new software version is applied. When this process has finished, the accelerator goes to *Fully Operational*.

Fully Operational

Ready to be enabled in Db2 for z/OS.

Online

Ready for processing.

Running

The accelerator is processing queries.

Stopping

Interim state that is shown when you click the **Stop** button or issue the **STOP -ACCEL** command from Db2 for z/OS. During the *Stopping* phase, already started queries are completed.

Stopped

The accelerator is currently disabled in Db2 for z/OS.

Unknown

The current status of the accelerator cannot be determined.

Used Space

Overall size of the accelerator-shadow tables on an accelerator

Active Queries

The number of queries that is currently being processed on an accelerator

Replication

Indicates whether the incremental update function is enabled for this accelerator in the DB2 subsystem. Possible values:

Disabled

The incremental update function has not been configured for this accelerator and is therefore not available.

Error

The incremental update function has been configured, but an error occurred. In most cases, this means that a component cannot be reached. Therefore, it cannot be started or controlled. The event log might provide useful information about the root cause of the error.

Started

The incremental update function is running and updates are applied to accelerator-shadow tables that have been included in the process.

Stopped

The incremental update function is available and accelerator-shadow tables have been included in the process. However, the function is not running right now.

Accelerator view in IBM Db2 Analytics Accelerator Studio

To show the tables on an accelerator, view the query history, or access various other functions, double-click an accelerator name in the **Object List Editor**, which opens the related **Accelerator** view.

Administration Explorer

- All Databases
 - 198.51.100.18
 - AB1CDZ5 (Db2 for z/OS 12 (New)
 - Accelerators
 - Tables

Accelerator: XYZABC4 @ AB1CDZ5

Acceleration: Started [Stop](#) Credentials valid since: 2/25/20, 8:59 PM [Update](#) [Encryption details](#)

Status: Online Trace: DEFAULT / OFF [Configure](#) [Save](#)

Used space: 108 GB of 983 GB Active queries: 0 (0 queued)

Replication: Error [Start](#) [Stop](#) Replication latency: N/A [Show events](#)

Monitoring

Queries: Successful: 142 Failed: 0

Queue: Avg. wait time: 0 ms

CPU cost: Query execution: 3.72 s Data maintenance: 43 s Replication: N/A

About

z/OS

Stored Procedures: 7.5.0.20191120-1025

Server

Accelerator server: 7.5.0.201912021546

Access server: 11.4.10387

Db2 Level: 11.5.1.0 [Build s1910171200]

Serial number: 177226

Replication Engine: 11.4.0.2 [Build Release Release_5128]

Accelerator Container: ibmdashdb/localv11.5.1.0-20191114-1551-local-s390x

Appliance software: 7.5.0.20191203-1317

[Configure additional ports](#)

Client

Studio: 7.5.0.201911260732 [Check for updates](#)

Tables (155 of 155 loaded / 155 of 155 enabled for acceleration)

[Add...](#) [Refresh](#) [Acceleration](#) [Storage Server](#) [List Tasks](#) [Federation](#)

Name like	Name	Size	Acceleration	Last Load	Replication Since	Distribution
>	HLOIDBCL	1 MB	1 of 1	1 of 1 tables	-	-
>	HLOIVPDB	1 MB	1 of 1	1 of 1 tables	-	-
>	Q	2 MB	1 of 1	1 of 1 tables	-	-
>	TPCDS00	2.09 ...	24 of 24	24 of 24 tables	0 of 24 tables	0 of 24
>	ZDW01	182 ...	13 of 13	13 of 13 tables	1 of 13 tables	0 of 13
>	ZDW02	202 ...	10 of 10	10 of 10 tables	1 of 10 tables	0 of 10

Query Monitoring

[Show SQL...](#) [Show Plan...](#) [Re-Run](#) [Cancel](#) View: All Queries Show: All By Start Time Run

Name like: type filter text

SQL Text	Time	State	Wait Time	Execution Time
SELECT * FROM MIKESTAFFSEQ FOR FETCH ONLY	3/19/20, 8:40:08 AM	Successful	0 seconds	0 seconds
SELECT * FROM MIKESTAFFSEQ FOR FETCH ONLY	3/19/20, 8:39:51 AM	Successful	0 seconds	0 seconds
select sum(balance) from customer where state <> 'NY'	3/19/20, 6:35:27 AM	Successful	0 seconds	0 seconds
select sum(balance) from customer where state <> 'NY'	3/19/20, 6:34:51 AM	Successful	0 seconds	0 seconds
SELECT 'CUSTOMER', 'BRANCH', 'NAME1', 'NAME2', 'ADDRESS1', 'ADDRE...	3/18/20, 4:31:36 AM	Successful	0 seconds	0 seconds
SELECT * FROM CUSTOMER	3/18/20, 4:29:50 AM	Successful	0 seconds	0 seconds

Figure 7. Accelerator view

Status information and functional links

The header of the **Accelerator** view contains status information and links to related functions.

Table 18. Header information

Label	Description
Acceleration	<p>Whether the accelerator is currently enabled in Db2 for z/OS. To change the current status, click Start or Stop.</p> <p>If the accelerator is attached to a Db2 data sharing group, the behavior is different. The status <i>Started</i> is displayed if acceleration has been started for at least one member of the data sharing group. Other statuses are shown only if the status is the same for all members of the data sharing group. If the status of individual members is different, a warning icon is displayed.</p> <p>If you move the mouse pointer over the displayed status or the warning icon, a pop-up window shows the acceleration status for all members of the data sharing group.</p> <p>An additional functional link labeled Change is displayed for data sharing groups. Clicking it opens a window in which you can change the acceleration status of each member in the data sharing group.</p>
Status	<p>The status of the accelerator hardware.</p> <p>If the accelerator is attached to a Db2 data sharing group, you can move the mouse pointer over the status information to display the status of each member in the data sharing group.</p>
Used space	<p>The amount of disk space that is taken up by the tables, in proportion to the available space on the accelerator.</p> <p>This is the space allocated in the file system of the accelerator for the table spaces of the connected Db2 subsystem. Currently, these table spaces can only grow. So if you have removed tables from the accelerator that have used space before, then this size is a high watermark that may include free space in the table spaces for this subsystem. This free space can be reused when you add additional tables from this Db2 subsystem to the accelerator or when existing tables grow. However, the free space cannot be used by other Db2 subsystems paired with the same accelerator because these Db2 subsystems have their own table spaces. The free space can be given back to the operating system when you remove the pairing between the current Db2 subsystem and the accelerator. This action will remove the table spaces for this subsystem.</p>
Replication	<p>Only visible if incremental updates are configured. A status of Started indicates that the incremental update process is running for tables included in the process. Stopped indicates that the incremental update process has been suspended. To change the current status, click Start or Stop.</p>
Credentials valid since	<p>Shows the date on which the last authentication of the accelerator took place. To renew the authentication, click Update.</p>
Encryption details	<p>If you click the Encryption details, the Encryption Details window opens, which shows information about the use of encryption for the selected accelerator. This includes the status of hard-disk encryption, the status of encryption of data in motion, a list of encrypted IPsec tunnels (IP connections), and a list of the certificates that are used.</p>
Trace	<p>Shows the trace profiles for the accelerator and the stored procedures that are currently in use. To change a profile, click Configure. To change the settings for the saving of trace information to a file, click Save.</p>
Active queries	<p>The number of accelerated queries that are currently being processed. In parentheses, you see the number of queued queries.</p>

Table 18. Header information (continued)

Label	Description
Replication latency	<p>Only visible if incremental updates are configured. This is not the case in Figure 7 on page 81. The value indicates how much the incremental update function is lagging behind. Possible values:</p> <p>Stopped Incremental updates have been stopped for the entire accelerator.</p> <p>Low It will take less than three minutes to propagate recent changes to the corresponding accelerator-shadow tables.</p> <p>Medium Recent changes to the original DB2 tables will be propagated to the corresponding accelerator-shadow tables within three and six minutes.</p> <p>High It will take six minutes or longer to apply recent changes to DB2 tables to the corresponding accelerator-shadow tables.</p> <p>See Note on replication latency.</p> <p>When you move the mouse pointer over the latency value in IBM Db2 Analytics Accelerator Studio, a pop-up window shows the following information:</p> <p>Target Agent Operations completed by the incremental update function.</p> <p>Inserts Number of row inserts in accelerator-shadow tables that have been included in the incremental update process.</p> <p>Deletes Number of row deletions from accelerator-shadow tables that have been included in the incremental update process.</p> <p>Remember:</p> <ul style="list-style-type: none"> • An UPDATE is a DELETE followed by an INSERT, so these two figures account for all incremental updates that have been applied. • Since an UPDATE in DB2 is a DELETE followed by an INSERT on the accelerator side, the values can be different from those in Db2 for z/OS (see Source Agent). Furthermore, multiple operations on a single row within a short time might be reported as just one single operation. • If a load operation is in progress and lock mode Row has been selected, the original DB2 tables are not locked during the load. Hence it is possible to INSERT new rows into the DB2 tables even though a load is taking place. If incremental updates are enabled for the same tables, the incremental update function stores these new rows in the spill queue until the load has finished, and applies these changes thereafter (draining the spill queue). In the course of a drain, a DELETE and an INSERT operation is carried out for each row in the affected accelerator-shadow tables. The DELETE deletes the row that was inserted by the previous load operation, and the INSERT adds this row again (applies the latest change) . This has the effect that the number Deletes increases in cases like this. <p>Clicking Show events opens the event viewer, which keeps a record of all transactions that are related to incremental updates.</p>

Note on replication latency: The *replication latency* is disclosed through different channels, at different points in time. Sometimes, it is calculated by different systems. Values are reported:

- In the **Accelerator** view as described in the previous table
- When you run the Db2 command -DIS ACCEL(<name>) DETAIL
- In trace files:

```
<Event id="61098" timestamp="2018-11-28 18:07:51" level="W" addressee="0" >
  The current replication latency of XXXXXs on DB2 location ADB2K04 (subscription
  DWE9PLVY)
  has exceeded the threshold of 3600s.
</Event>
```

- In the status monitoring counter Q8STCRL
- As a result of running the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure in connection with the <getAcceleratorInfo> parameter.

These systems or reporting channels are not synced, so deviating values are inevitable. Deviations can be considerable, depending the channel that is tapped and on the time when this is done. Stick to one reporting channel if you need to compare latency values.

Table 19. Header information (continued)	
Label	Description
Replication latency	<p>Source Agent Number of data changes to relevant Db2 for z/OS tables (tables for which accelerator-shadow tables have been defined and that are included in the incremental update process).</p> <p>Inserts Number of row inserts in the relevant Db2 for z/OS tables.</p> <p>Updates Number of updates to rows in the relevant Db2 for z/OS tables.</p> <p>Deletes Number of row deletions from the relevant Db2 for z/OS tables.</p> <p>Latency Repetition of the Replication latency value.</p> <p>Clicking Show events opens the event viewer, which keeps a record of all transactions that are related to incremental updates.</p>

Monitoring

The **Monitoring** section provides the following information:

Table 20. Information in the Monitoring section	
Label	Description
Queries	<p>Metrics related to queries since the start of the currently viewed accelerator, divided into the following categories:</p> <p>Successful Number of queries that ran successfully</p> <p>Failed Number of queries that failed</p>
Queue	<p>Metrics related to queuing since the start of the currently viewed accelerator:</p> <p>Avg. wait time Average time that queries had to stay in the queue. The basis for the calculation is all queries that were processed during the last minute.</p>

Table 20. Information in the **Monitoring** section (continued)

Label	Description
CPU Cost	<p>CPU time that was used since the start of the currently viewed accelerator, with regard to the connected Db2 subsystem. The total CPU time is divided into the following categories:</p> <p>Query execution CPU time needed for query processing</p> <p>Data maintenance CPU time needed for load and High Performance Storage Saver operations</p> <p>Replication CPU time needed for incremental updates</p>

About

The following information is displayed in the **About** section:

Table 21. Information in the **About** section

Label	Description	Information blocks	Description
z/OS	Information about components on the z/OS data server	Stored procedures	The currently installed version of the IBM Db2 Analytics Accelerator stored procedures
Server	Information about software components that are installed on the IBM Integrated Analytics System or as part of your Db2 Analytics Accelerator on Z	Accelerator server	The version of the accelerator software that is currently in use.
		Level	The current version of the database run by your accelerator.
Access Server	Only visible if incremental updates are configured. This is the version of the CDC Access Server, the central component in the incremental update process, which manages the list of subscriptions (incremental update requests) and controls the agents involved in the process.		
Replication engine	Only visible if incremental updates are configured. This is the version of the CDC Apply Agent, which propagates data changes to the IBM Integrated Analytics System, according to the instructions received from the CDC Access Server.	Unicode sort order	Only visible if the connected DB2 subsystem or data sharing group is a DB2 11 for z/OS database. The value reflects the sort order that was selected for tables on the accelerator. Possible values are UTF-8 binary and UTF-16 binary . The choice has an impact on how supplementary Unicode characters are sorted in query results.

Table 21. Information in the **About** section (continued)

Label	Description	Information blocks	Description
Client	Information about your IBM Db2 Analytics Accelerator Studio installation	Studio	The currently installed version of IBM Db2 Analytics Accelerator Studio. Click Check for Updates to look for a newer version.

Tables

The **Tables** section in the **Accelerator** view for contains buttons and a listing of the tables on the accelerator.

Table 22. Buttons in the **Tables** section

Button	Description
Add	Starts the Add Tables wizard.
Remove	Removes the selected tables from the accelerator.
Load	Opens the Load Tables window, in which you can select accelerator-shadow tables for loading and set the lock scope for the load process.
Acceleration	Opens a pull-down menu, from which you can enable or disable the selected accelerator-shadow tables so that these are included or excluded from query acceleration.
Replication	Only visible if incremental updates are configured. This is not the case in Figure 7 on page 81 . Clicking the button opens a pull-down menu from which you can enable or disable incremental updates for selected accelerator-shadow tables.
List Tasks	Opens the List Tasks window, which displays the running tasks on the currently viewed accelerator, such as table load processes. To cancel a running task, select it in the list and click Cancel Selected Task .

Table 23. Icons and columns in the table of tables




Item	Description
	Icon representing the schema of a table
	Icon representing an accelerator-only table
	Icon representing an accelerator-shadow table
Name	Column containing the table names

Table 23. Icons and columns in the table of tables (continued)

Item	Description
Size	<p>Column containing the table sizes.</p> <p>The table sizes displayed in the Size column are the sizes reported by the database engine of the accelerator (Db2 Warehouse). They are taken from the catalog of the database. The size is calculated as follows:</p> $\text{<number of pages allocated to the table> * <page size>}$ <p>If rows have been deleted from the table (for example by replication or by a partial reload), a certain space on the pages might remain empty. So if you run many data maintenance jobs on a table, such as replication, without ever reloading the table fully, the table might still grow over time, even if the overall number of rows does not change.</p>
Acceleration	Column that shows whether acceleration is enabled for a table
Last Load	Column that shows the timestamp of the last successful load for each table or the current table state. Because accelerator-only tables are not loaded by IBM Db2 Analytics Accelerator functions, the column always shows the table state (for example <i>AOT ready</i>) for this type of table.
Storage Saver Partition	<p>Column that provides information about the archived partitions of a table. The column is visible only if tables with archived partitions exist.</p> <p>At the schema level, the column shows how many partitions out of the total number of partitions were archived. At the table level, it shows the compressed data size of the archived partitions and the number of rows in these partitions. If archiving is in progress for a partition, the columns shows <i>In Progress</i>.</p>
Replication Since	<p>Column that shows the last incremental-update capture-point (a timestamp) for incrementally updated accelerator-shadow tables or <i>Disabled</i> for the tables that are not updated in that way.</p> <p>The column shows <i>Suspended</i> when a table load has started and incremental updates are therefore on halt, and <i>Refreshing</i> when table changes are being applied, be this through the ongoing load process or the draining of incremental updates from the spill queue.</p>
Distribution Key	Column that shows <i>Random</i> if random distribution is used or the names of distribution-key-columns if a distribution key is used.
Skew	Column that shows the skew value for each table on the accelerator. The skew value is a metric for the distribution imbalance of table rows across the worker nodes. The value is the difference between the smallest and the largest portion of data for a table in megabytes (MB).

Query Monitoring

The **Query Monitoring** section shows an extensive number of additional buttons, information columns, and other controls. For a description, see [“Selecting and ordering query monitoring columns” on page 170](#).

Stored procedure call

To display or refresh the list of schemas and tables, IBM Db2 Analytics Accelerator Studio invokes the **SYSPROC.ACCEL_GET_TABLES_INFO** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the

IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference. A link to this document is provided under **Related reference** at the end of this section.

Related concepts

Tables states

A table can go through various states while it is being processed by IBM Db2 Analytics Accelerator for z/OS. The meaning of these states is explained here. In addition, it is shown which operation you can run on a table in a particular state. Finally, a diagram shows the possible shifts from one state to another (state transitions).

How to select tables for query acceleration

Selecting the proper tables for a query to be accelerated is basically simple: You need to define the tables that are referenced by the query. Slightly more thought needs to be spent on the choice of proper distribution keys and organizing keys.

Related tasks

Defining tables on an accelerator

Using the **Add Tables to Accelerator** or the **Select Tables to Add**wizard, you can define accelerator-shadow tables on an accelerator.

Loading tables

Successful queries against accelerator-shadow tables are possible only if the tables contain data. Therefore, you must load the tables after their definition (empty structure) has been copied to the accelerator.

Enabling tables for query acceleration

You can permit or prevent the sending of queries to an accelerator by enabling or disabling the corresponding accelerator-shadow tables.

Specifying or changing a distribution key or organizing keys

Distribution and organizing keys have a considerable impact on the query response time.

Including or excluding tables from incremental updates

Incremental updates can be enabled or disabled on the table level. So you can individually select the tables that take part in the process. When a subsystem has been configured for incremental updates, the toolbar of the accelerator view shows an extra button, which works like a drop-down menu.

Selecting and ordering query monitoring columns

You can customize the view that displays the query history of an accelerator. That is, you can select the columns to be displayed. In IBM Db2 Analytics Accelerator Studio, you can also change the order of their appearance.


Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Interface elements of IBM Data Server Manager

Here is a brief description of the interface elements in IBM Data Server Manager that allow you to administer accelerators.

Note: When you start IBM Data Server Manager for the first time, you see the **Welcome** page (see [Figure 8 on page 89](#)). You can start crucial functions directly from the **Welcome** page. However, if you'd rather

like to see the main entry point for administering accelerators, click  in the upper left of the browser window and select **ADMINISTER > Accelerators**

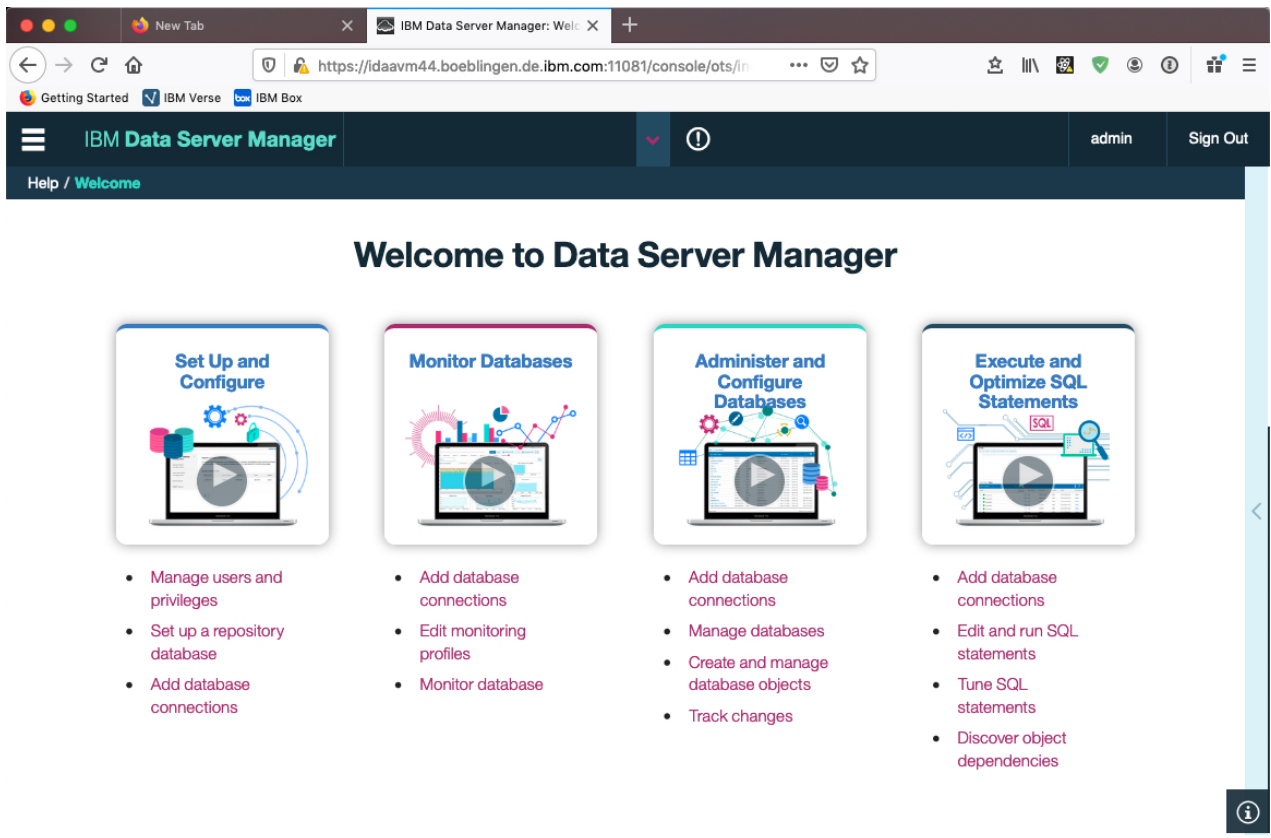



Figure 8. Welcome page of IBM Data Server Manager

Main menu

In IBM Data Server Manager, you access the main menu by clicking  in the upper left of the browser window.

From the top-level entry point, the following menu choices are relevant to the administration of accelerators:

ADMINISTER > Accelerators

To add, maintain, or remove accelerators.

RUN SQL

To run queries or create, save, and maintain reusable query scripts. From the **Run SQL** window, you also have access to a list of past queries and to a window that displays query results. You can run accelerated queries from this window.

SETTINGS > Manage Connections

To configure or select profiles for connections to Db2 subsystems or data sharing groups.

HELP > Open Help / Close Help

To show or hide context-sensitive help information in a side window on the right.

HELP > Welcome

To display the **Welcome** page, which provides an easy access point to essential functions.

Accelerator view in IBM Data Server Manager

See a brief description of the status information and the function buttons on the **Accelerator** view of IBM Data Server Manager.

The screenshot shows the IBM Data Server Manager interface. At the top, there's a navigation bar with 'IBM Data Server Manager' and 'ABCXYZ4'. Below this is a 'Main menu' button. A 'Connection to Db2 subsystem' is indicated. A toolbar contains buttons: 'Stop', 'Add', 'Remove', 'Manage', 'Monitor', and 'Refresh'. A table lists accelerators with columns: 'ACCELERATOR NAME', 'ACCELERAT...', 'ACCELERATION STA...', 'USED SPACE', and 'ACTIVE QUERIES'. The table has rows for MAQ100, SIM075, SIM083, SIM127, SIM148 (selected), SIM197, SIM86, and SIMP148. A 'Details of selected accelerator' callout points to the SIM148 row. Below the table, the 'Acceleration Status' is 'Online'. The 'Diagnostics' section shows 'Used Space' as 'Not Available' and 'Credentials Valid Since' as '1/15/20 4:23 PM'. There are 'Update' and 'Encryption Details' buttons.

ACCELERATOR NAME	ACCELERAT...	ACCELERATION STA...	USED SPACE	ACTIVE QUERIES
MAQ100	STOPPED	Online	Available	0 (0 queued)
SIM075	STARTED	Online	Available	0 (0 queued)
SIM083	-1 wo...	STOPPED	Unknown	Not Available
SIM127	-1 wo...	STOPPED	Unknown	Not Available
SIM148	1 wor...	STARTED	Online	Not Available
SIM197	1 wor...	STARTED	Online	Not Available
SIM86	-1 wo...	STOPPED	Unknown	Not Available
SIMP148	-1 wo...	STARTED	Unknown	Not Available

Acceleration Status : Online

Diagnostics

Used Space : Not Available

Credentials Valid Since : 1/15/20 4:23 PM

Update Encryption Details

Figure 9. Accelerator view in IBM Data Server Manager

Acceleration Status and Diagnostics

The **Acceleration Status** is displayed on top of the **Accelerator** view, followed by the **Diagnostics** section, which contains status information and controls for related functions.

Table 24. **Acceleration Status** and information in the **Diagnostics** section

Label	Description
Acceleration Status	<p>Whether the accelerator is currently enabled in Db2 for z/OS. To change the current status, click Start or Stop.</p> <p>If the accelerator is attached to a Db2 data sharing group, the behavior is different. The status <i>Started</i> is displayed if acceleration has been started for at least one member of the data sharing group. Other statuses are shown only if the status is the same for all members of the data sharing group. If the status of individual members is different, a warning icon is displayed.</p> <p>If you move the mouse pointer over the displayed status or the warning icon, a pop-up window shows the acceleration status for all members of the data sharing group.</p> <p>An additional functional link labeled Change is displayed for data sharing groups. Clicking it opens a window in which you can change the acceleration status of each member in the data sharing group.</p>
Used Space	<p>The amount of disk space that is taken up by the tables, in proportion to the available space on the accelerator.</p> <p>This is the space allocated in the file system of the accelerator for the table spaces of the connected Db2 subsystem. Currently, these table spaces can only grow. So if you have removed tables from the accelerator that have used space before, then this size is a high watermark that may include free space in the table spaces for this subsystem. This free space can be reused when you add additional tables from this Db2 subsystem to the accelerator or when existing tables grow. However, the free space cannot be used by other Db2 subsystems paired with the same accelerator because these Db2 subsystems have their own table spaces. The free space can be given back to the operating system when you remove the pairing between the current Db2 subsystem and the accelerator. This action will remove the table spaces for this subsystem.</p>
Credentials Valid Since	Shows the date on which the last authentication of the accelerator took place. To renew the authentication, click Update .
Trace	<p>Shows the trace profiles for the accelerator and the stored procedures that are currently in use. To change a profile, click Configure. To change the settings for the saving of trace information to a file, click Save. To delete the trace information that has been collected, click Clear.</p> <p>Note: The Clear option is not available for cloud accelerators.</p>
Encryption Details	If you click Encryption Details , the Encryption Details window opens, which shows information about the use of encryption for the selected accelerator. This includes the status of hard-disk encryption, the status of encryption of data in motion, a list of encrypted IPsec tunnels (IP connections), and a list of the certificates that are used.

If an accelerator is selected, and you scroll down in the **Accelerator** view, you can see numerous details of the accelerator.

Acceleration Status : Online

Diagnostics

Used Space : Not Available

Credentials Valid Since : 12/14/20 4:19 PM

Update

Encryption Details

Query execution statistics

: ARCHIVE/OFF

Configure

Save

Buttons to start other functions

Active Queries : Not Available

Query History : -1 successful -1 failed

Monitoring

Queue : Avg. wait time: **N/A**

CPU cost : Query Execution: **N/A** Data maintenance: **N/A** Replication: **N/A**

Replication

Replication Status : Not Enabled

Replication Latency : N/A

z/OS

Stored Procedure Version : 7.1.9.20201118-0017

Server

Transfer Updates

Remove

Apply other software version

Apply Software Installation Progress

Accelerator Server Version : 7.5.5.202012100735

Access Server : 11.4.0.2.11016

Db2 Level : 11.5.5.0 [Build s2011011400]

Serial Number : 1234567

Replication Engine : 11.4.0.2 [Build Release master_5537]

Accelerator Container : ibmdashdb/local:v11.5.5.0-20201102-1156-local

Appliance Software : 1.2.3.4 [Build 123456789]

Configure Additional Ports

Version information

Queries

Table 25. Information in the **Queries** section

Label	Description
Active Queries	The number of accelerated queries that are currently being processed. In parentheses, you see the number of queued queries.
Query History	Metrics related to completed queries since the start of the currently viewed accelerator, divided into the following categories: Successful Number of queries that ran successfully Failed Number of queries that failed

Monitoring

The **Monitoring** section provides the following information:

Table 26. Information in the **Monitoring** section

Label	Description
Queue	<p>Metrics related to queuing since the start of the currently viewed accelerator:</p> <p>Max. length The highest number of queries in the queue, up to this time.</p> <p>Important: The Max. length and Max. wait time values cover all system transactions during a given period of time. This includes internal system queries, as well as INSERT, UPDATE, and DELETE operations. Therefore, these fields might display positive values even if there have been no active user queries recently. A discrepancy becomes noticeable when you compare the values with the ones reported in the query history, which provides the same information for individual queries.</p> <p>Avg. wait time Average time that queries had to stay in the queue. The basis for the calculation is all queries that were processed during the last minute.</p> <p>Max. wait time Longest time that a query stayed in the queue, that is, before it was processed.</p>
CPU Cost	<p>CPU time that was used since the start of the currently viewed accelerator, with regard to the connected Db2 subsystem. The total CPU time is divided into the following categories:</p> <p>Query execution CPU time needed for query processing</p> <p>Data maintenance CPU time needed for load and High Performance Storage Saver operations</p> <p>Replication CPU time needed for incremental updates</p>

Replication

The **Replication** section contains information about incremental update processing:

Table 27. Information in the **Replication** section

Label	Description
Replication Status	<p>Information is displayed only if incremental updates are configured. A status of Started indicates that the incremental update process is running for tables included in the process. Stopped indicates that the incremental update process has been suspended. To change the current status, click Start or Stop.</p>

Table 27. Information in the Replication section (continued)

Label	Description
Replication Latency	<p>Only visible if incremental updates are configured. This is not the case in Figure 9 on page 90. The value indicates how much the incremental update function is lagging behind. Possible values:</p> <p>Stopped Incremental updates have been stopped for the entire accelerator.</p> <p>Low It will take less than three minutes to propagate recent changes to the corresponding accelerator-shadow tables.</p> <p>Medium Recent changes to the original Db2 tables will be propagated to the corresponding accelerator-shadow tables within three and six minutes.</p> <p>High It will take six minutes or longer to apply recent changes to Db2 tables to the corresponding accelerator-shadow tables.</p> <p>See Note on replication latency.</p> <p>Clicking Show Events opens the event viewer, which keeps a record of all transactions that are related to incremental updates.</p>
Replication Latency (continued)	<p>Source Agent Number of data changes to relevant Db2 for z/OS tables (tables for which accelerator-shadow tables have been defined and that are included in the incremental update process.</p> <p>Inserts Number of row inserts in the relevant Db2 for z/OS tables.</p> <p>Updates Number of updates to rows in the relevant Db2 for z/OS tables.</p> <p>Deletes Number of row deletions from the relevant Db2 for z/OS tables.</p> <p>Latency Repetition of the Replication Latency value.</p> <p>Clicking Show Events opens the event viewer, which keeps a record of all transactions that are related to incremental updates.</p>

Note on replication latency: The *replication latency* is disclosed through different channels, at different points in time. Sometimes, it is calculated by different systems. Values are reported:

- In the **Accelerator** view as described in the previous table
- When you run the Db2 command -DIS ACCEL(<name>) DETAIL
- In trace files:

```
<Event id="61098" timestamp="2018-11-28 18:07:51" level="W" addressee="0" >
  The current replication latency of XXXXXs on DB2 location ADB2K04 (subscription
  DWE9PLVY)
  has exceeded the threshold of 3600s.
</Event>
```

- In the status monitoring counter Q8STCRL
- As a result of running the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure in connection with the <getAcceleratorInfo> parameter.

These systems or reporting channels are not synced, so deviating values are inevitable. Deviations can be considerable, depending on the channel that is tapped and on the time when this is done. Stick to one reporting channel if you need to compare latency values.

z/OS

The following information is displayed in the **z/OS** section:

Table 28. Information in the z/OS section	
Label	Description
Stored Procedure Version	The currently installed version of the IBM Db2 Analytics Accelerator stored procedures

Server

The **Server** section contains information about software components that are installed on the IBM Integrated Analytics System.

Table 29. Information in the Server section	
Label	Description
Accelerator Server Version	<p>The version of the IBM Db2 Analytics Accelerator for z/OS software that is currently in use. To transfer an update package from the z/OS UNIX file system (zFS) on z/OS to the accelerator, click Transfer Updates. To remove an obsolete version no longer used, click Remove. To use a different version of the IBM Db2 Analytics Accelerator for z/OS software, click Apply other software version.</p> <p>Note: The Transfer updates, Remove, and Apply other software version options are not available for cloud accelerators.</p>
Access Server	Only visible if incremental updates are configured. This is the version of the CDC Access Server, the central component in the incremental update process which manages the list of subscriptions (incremental update requests) and controls the agents involved in the process.
Replication Engine	Information is displayed only if incremental updates are configured. This is the version of the CDC Apply Agent, which propagates data changes to the IBM Integrated Analytics System, according to the instructions received from the CDC Access Server.

Related concepts

[Tables states](#)

A table can go through various states while it is being processed by IBM Db2 Analytics Accelerator for z/OS. The meaning of these states is explained here. In addition, it is shown which operation you can run on a table in a particular state. Finally, a diagram shows the possible shifts from one state to another (state transitions).

[How to select tables for query acceleration](#)

Selecting the proper tables for a query to be accelerated is basically simple: You need to define the tables that are referenced by the query. Slightly more thought needs to be spent on the choice of proper distribution keys and organizing keys.

Related tasks

[Defining tables on an accelerator](#)

Using the **Add Tables to Accelerator** or the **Select Tables to Add**wizard, you can define accelerator-shadow tables on an accelerator.

[Loading tables](#)

Successful queries against accelerator-shadow tables are possible only if the tables contain data. Therefore, you must load the tables after their definition (empty structure) has been copied to the accelerator.

Enabling tables for query acceleration

You can permit or prevent the sending of queries to an accelerator by enabling or disabling the corresponding accelerator-shadow tables.

Specifying or changing a distribution key or organizing keys

Distribution and organizing keys have a considerable impact on the query response time.

Including or excluding tables from incremental updates

Incremental updates can be enabled or disabled on the table level. So you can individually select the tables that take part in the process. When a subsystem has been configured for incremental updates, the toolbar of the accelerator view shows an extra button, which works like a drop-down menu.

Selecting and ordering query monitoring columns

You can customize the view that displays the query history of an accelerator. That is, you can select the columns to be displayed. In IBM Db2 Analytics Accelerator Studio, you can also change the order of their appearance.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

List of tables

Here is a brief description of the elements and interactive controls in the view that lists the tables on an accelerator

List of tables

To display the list of tables on an accelerator, select the accelerator (row) in the **Accelerator** view and click the **Manage** button. The list of tables has a toolbar of its own, with buttons described in [Table 30](#) on page 97. See the following figure:

The screenshot shows the IBM Data Server Manager interface. At the top, there's a navigation bar with 'IBM Data Server Manager', 'ABCXYZ4', and user 'admin'. Below this, a breadcrumb trail shows 'Administer / Accelerators'. The main content area is titled 'Accelerator: ABC100' and has tabs for 'Tables' and 'Queries'. A yellow box highlights the 'List of tables' title. Below the tabs, there's a toolbar with buttons: 'Add', 'Remove', 'Load', 'Alter Keys', 'List Tasks', 'Acceleration', 'Storage Saver', and 'Federation'. A table lists the tables for the TPCCH schema:

	SCHEMA NAME	TABLE NAME	SIZE	ACCELERATION	ERRORS	LAST LOAD TIME	LAST LOAD
<input checked="" type="checkbox"/>	TPCH	-	N/A	-	None	-	-
<input type="checkbox"/>	TPCH	NATION	3 MB	Disabled	None	12/16/19 12:57 PM	Loaded
<input checked="" type="checkbox"/>	TPCH	PARTSUPP	1.93 GB	Disabled	None	12/16/19 12:57 PM	Loaded
<input type="checkbox"/>	TPCH	PART	377 MB	Disabled	None	12/16/19 12:57 PM	Loaded
<input type="checkbox"/>	TPCH	ORDERS	2.37 GB	Disabled	None	12/16/19 12:57 PM	Loaded
<input type="checkbox"/>	TPCH	CUSTOMER	401 MB	Disabled	None	12/16/19 12:57 PM	Loaded
<input type="checkbox"/>	TPCH	SUPPLIER	30 MB	Disabled	None	12/16/19 12:39 PM	Loaded
<input type="checkbox"/>	TPCH	LINEITEM	0 MB	Disabled	None		Initial Load Pending

Figure 10. The list of tables in IBM Data Server Manager

Table 30. Buttons on the toolbar of the list of tables

Button	Description
Add	Starts the Add Tables wizard.
Remove	Removes the selected tables from the accelerator.
Load	Opens the Load Tables window, in which you can select accelerator-shadow tables for loading and set the lock scope for the load process.
Alter Keys	Opens a window in which you can select or change the distribution and organizing keys that are used by the accelerator.
List Tasks	Opens the List Tasks window, which displays the running tasks on the currently viewed accelerator, such as table load processes. To cancel a running task, select it in the list and click Cancel Selected Task .
Acceleration	Opens a pull-down menu, from which you can enable or disable the selected accelerator-shadow tables so that these are included or excluded from query acceleration.
Storage Saver	<p>Allows you to archive partitions on an accelerator or restore these to their original locations. The button opens a menu with the following choices:</p> <p>Move Partitions to Accelerator Opens the Move Storage Saver Partitions to Accelerator window, which allows you to select Db2 for z/OS tables or partitions to archive the data therein on the accelerator currently viewed.</p> <p>Restore Partitions to Db2 Opens Restore Storage Saver Partitions to Db2 window, in which you can select accelerator-archive tables and partitions that have been archived on the currently selected accelerator in order to restore these.</p>
Federation	<p>Allows you to control federated access. The button opens a menu with the following choices:</p> <p>Grant Grants a referencing Db2 subsystem access to tables that belong to another Db2 subsystem (called owning or remote Db2 subsystem)</p> <p>Create Reference Creates reference tables on the accelerator shared between the referencing Db2 subsystem and the owning Db2 subsystem. The reference tables contain metadata for access to the original data by the referencing Db2 subsystem.</p> <p>Revoke Revokes previously granted table access.</p> <p>Remove Removes reference tables.</p>
Replication	Only visible if incremental updates are configured. This is not the case in Figure 10 on page 96 . Clicking the button opens a pull-down menu from which you can enable or disable incremental updates for selected accelerator-shadow tables.

The list of tables contains the following columns:

Table 31. Columns in the list of tables

Column	Description
SCHEMA NAME	Column containing schema names
TABLE NAME	Column containing the table names
SIZE	Column containing the table sizes. If rows have been deleted from the table (for example by replication or by a partial reload), a certain space on the pages might remain empty. So if you run many data maintenance jobs on a table, such as replication, without ever reloading the table fully, the table might still grow over time, even if the overall number of rows does not change.
ACCELERATION	Column that shows whether acceleration is enabled for a table
ERRORS	Column that shows the number of errors in each table
LAST LOAD TIME	Column that shows the timestamp of the last successful load for each table or the current table state. Because accelerator-only tables are not loaded by IBM Db2 Analytics Accelerator functions, the column always shows the table state (for example <i>AOT ready</i>) for this type of table.
LAST LOAD	Column that shows the table states, such as, <i>loaded</i> , <i>load pending</i> , and so on.
STORAGE SAVER PARTITIONS	Column that provides information about the archived partitions of a table. The column is visible only if tables with archived partitions exist. At the schema level, the column shows how many partitions out of the total number of partitions were archived. At the table level, it shows the compressed data size of the archived partitions and the number of rows in these partitions. If archiving is in progress for a partition, the columns shows <i>In Progress</i> .
REPLICATION SINCE	Only visible if incremental updates are configured. Column that shows the last incremental-update capture-point (a timestamp) for incrementally updated accelerator-shadow tables or <i>Disabled</i> for the tables that are not updated in that way. If continuous incremental updates are enabled, the column shows <i>Suspended</i> when a table load has started and incremental updates are therefore on halt, and <i>Refreshing</i> when table changes are being applied, be this through the ongoing load process or the draining of incremental updates from the spill queue.
DISTRIBUTION KEY	Column that shows <i>Random</i> if random distribution is used or the names of distribution-key-columns if a distribution key is used.
SKEW	Column that shows the skew value for each table on the accelerator. The skew value is a metric for the distribution imbalance of table rows across the snippet-processing units (SPUs) or worker nodes. The value is the difference between the smallest and the largest data slice for a table in megabytes (MB).
ORGANIZING KEYS	Column that shows the names of the organizing keys (column names) that were selected for a table.

Table 31. Columns in the list of tables (continued)	
Column	Description
ORGANIZED	<p>Column that shows the percentage of the table data that is organized based on the specified organizing keys for that table. For organized tables, this value is typically 100%, and 0% for tables that are not organized at all. Values in between indicate that an organizing key has been specified, and that the organization process is ongoing.</p> <p>For small tables, the value is not displayed (it only makes sense to use organizing keys when the table has at least 5 extents per data slice).</p> <p>If you archive tables with the High Performance Storage Saver, the value decreases and ends up at 0% when you have archived the entire table. The reason is that the former accelerator-shadow table is emptied during the process. Hence the degree of organization can no longer be displayed for the archived partitions. The degree of organization of an accelerator-archive table (a table in the read-only table space) is not displayed, but remains the same as before archiving.</p>
REMOTE	Column that indicates whether federated access has been granted to tables.

Stored procedure call

To display or refresh the list of tables, IBM Data Server Manager invokes the SYSPROC.ACCEL_GET_TABLES_INFO stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

List of queries

Here is a brief description of the elements and interactive controls in the view that lists the queries on an accelerator.

To display the list of active or past queries on an accelerator:

1. Select the accelerator (row) in the **Accelerator** view.
2. Click the **Manage** button.
3. Click the **Queries** tab.

The toolbar on top of the list of queries has few buttons, which are described in [Table 32 on page 100](#). See the following figure:

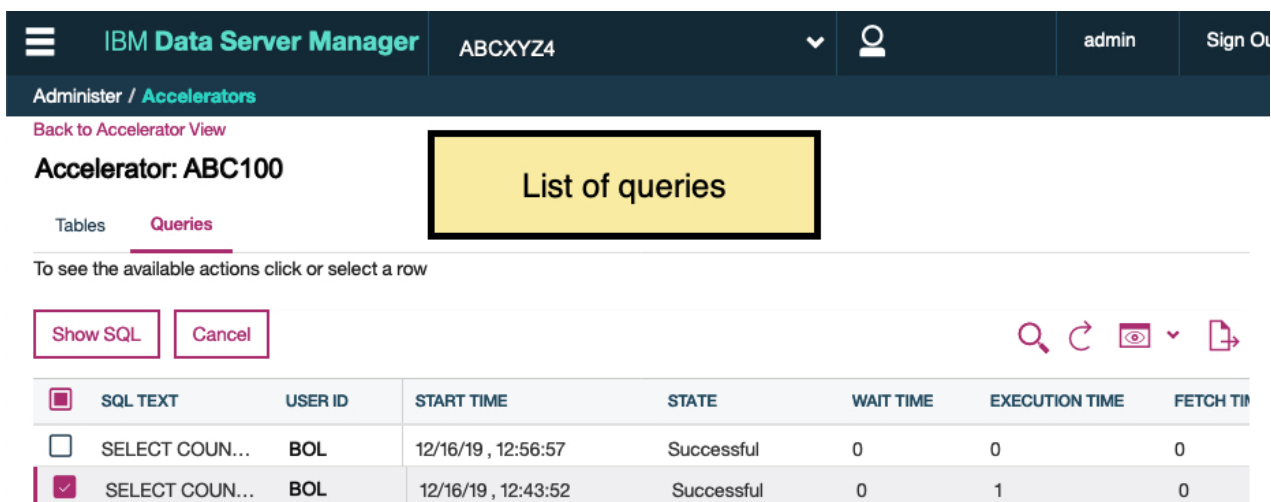


Figure 11. The list of queries in IBM Data Server Manager

Table 32. Buttons on the toolbar of the list of queries	
Button	Description
Show SQL	Shows the SQL code of a query after selecting it in the list.
Cancel	Cancels a running query after selecting it in the list.

Columns

The list of queries contains the following columns:

Table 33. Columns in the list of queries	
Column	Description
SQL TEXT	Column that shows the beginning of a query's SQL code.
USER ID	Column that shows the IDs of the users who submitted the queries.
START TIME	Times when queries were received by IBM Db2 Analytics Accelerator for z/OS. For more information on the time values, see the following description .
STATE	<p>Processing states that queries are in. The following states are possible:</p> <p>UNKNOWN The state cannot be determined.</p> <p>QUEUED A query has been passed to the accelerator for processing.</p> <p>RUNNING The query is being processed by the accelerator.</p> <p>FETCHING The accelerator has finished processing the query, but Db2 for z/OS has not yet finished collecting the results.</p> <p>FAILED The query did not run to completion because one or more errors occurred.</p> <p>SUCCESSFUL Query execution has been completed successfully.</p> <p>CANCELED The query did not run to completion because it was canceled by a user.</p>

Table 33. Columns in the list of queries (continued)	
Column	Description
WAIT TIME	Periods of time that queries had to “spend” in the queue before they were processed by the IBM Integrated Analytics System. For more information on the time values, see the following description .
EXECUTION TIME	The time a query spent in the queue before it was sent to the accelerator plus the time needed to process the query on the IBM Integrated Analytics System. For more information on the time values, see the following description .
FETCH TIME	The time interval starting with the first retrieval of a result row by Db2 and ending with the last. In most cases, Netezza® query execution has already finished when the result retrieval process is still ongoing. For more information on the time values, see the following description .
ELAPSED TIME	The total time that was needed to process a query (from the state QUEUED to the state FAILED, SUCCESSFUL, or CANCELED). For more information on the time values, see the following description .
RESULT SIZE	The data size of the rows that were returned in query results (in MB or GB) from the accelerator to Db2 for z/OS.
ROWS RETURNED	The number of rows that were returned by the accelerator as query results.

Interface elements of IBM Unified Experience for z/OS

Here is a brief description of the interface elements in IBM Unified Experience for z/OS that allow you to administer accelerators.

When you start IBM Unified Experience for z/OS, you see the **Explore objects** page (see [Figure 12 on page 102](#)). To administer accelerators, you can use the **Object type** filter on this page to first select the right type of objects. Accelerator-related objects are:

Subsystem (Db2)

This filter selects all connected Db2 subsystems. The subsystems are displayed in a table and each entry in the first column, which contains the subsystem names, is a hyperlink. If you click one of these hyperlink, you get to a new page, which lists the details of that subsystem. If accelerators are attached to a selected subsystem, these accelerators appear in another table on the subsystem details page, and clicking one the accelerator names (again hyperlinks) open the details page of that accelerator.

Accelerator (Db2)

This filter, when applied, displays a list of all the accelerators attached to all the subsystems administered by your installation of IBM Unified Experience for z/OS. It is the faster option if you already know the name of the accelerator you want to work on. The table that lists the accelerator names has a column that shows you the name of the Db2 subsystem a particular accelerator is attached to.

Note: To filter on Db2 subsystems or accelerators, the Db2 subsystems must be registered, and the accelerators must have been paired with the Db2 subsystems. For more information on these tasks, see:

1. [“Creating a database connection profile” on page 117](#)
2. [“Adding accelerators” on page 130](#)

Having selected one of these choices from the **Object type** drop-down list, click **Apply** to apply the chosen filter. You can select both filters, but this will give you just a two-column list with the names of all the subsystems and accelerators, without any further information.

To remove a selected filter, click the **x** icon that you find on the right of each tag under **Applied filters**.

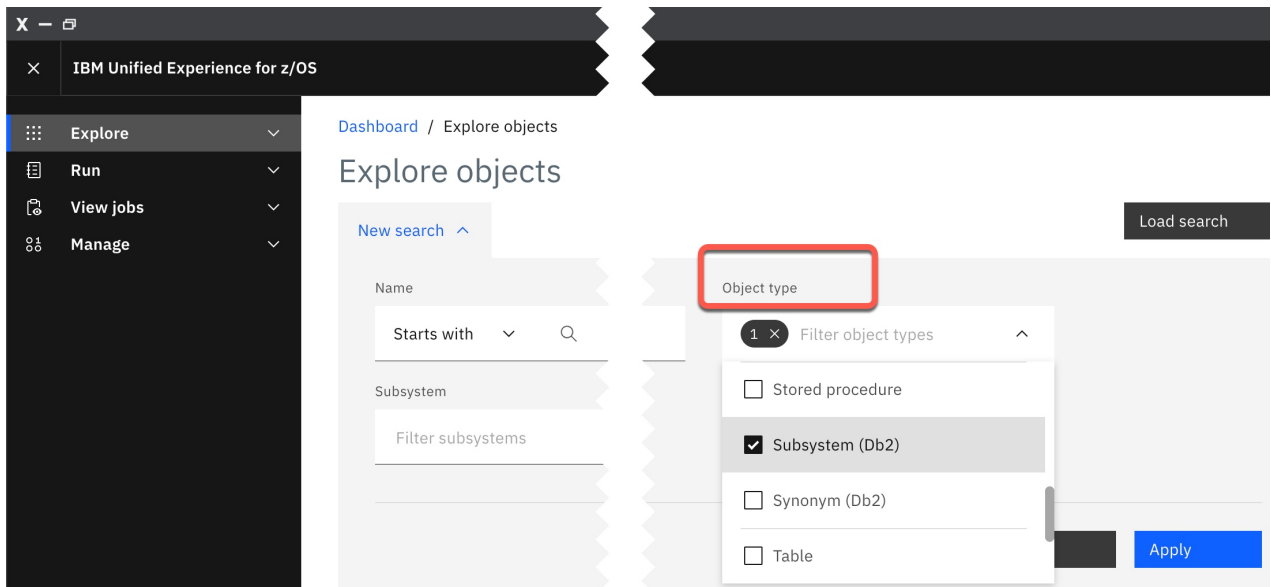


Figure 12. Starting IBM Unified Experience for z/OS - the Explore objects page

Accelerator details in IBM Unified Experience for z/OS

Have a look at the main elements of an accelerator details page. You also find a description of each element.

Having clicked one of the hyperlinks on the **Explore** objects page after applying the **Accelerator (Db2)** filter, you see the details of the selected accelerator, as in the following example:

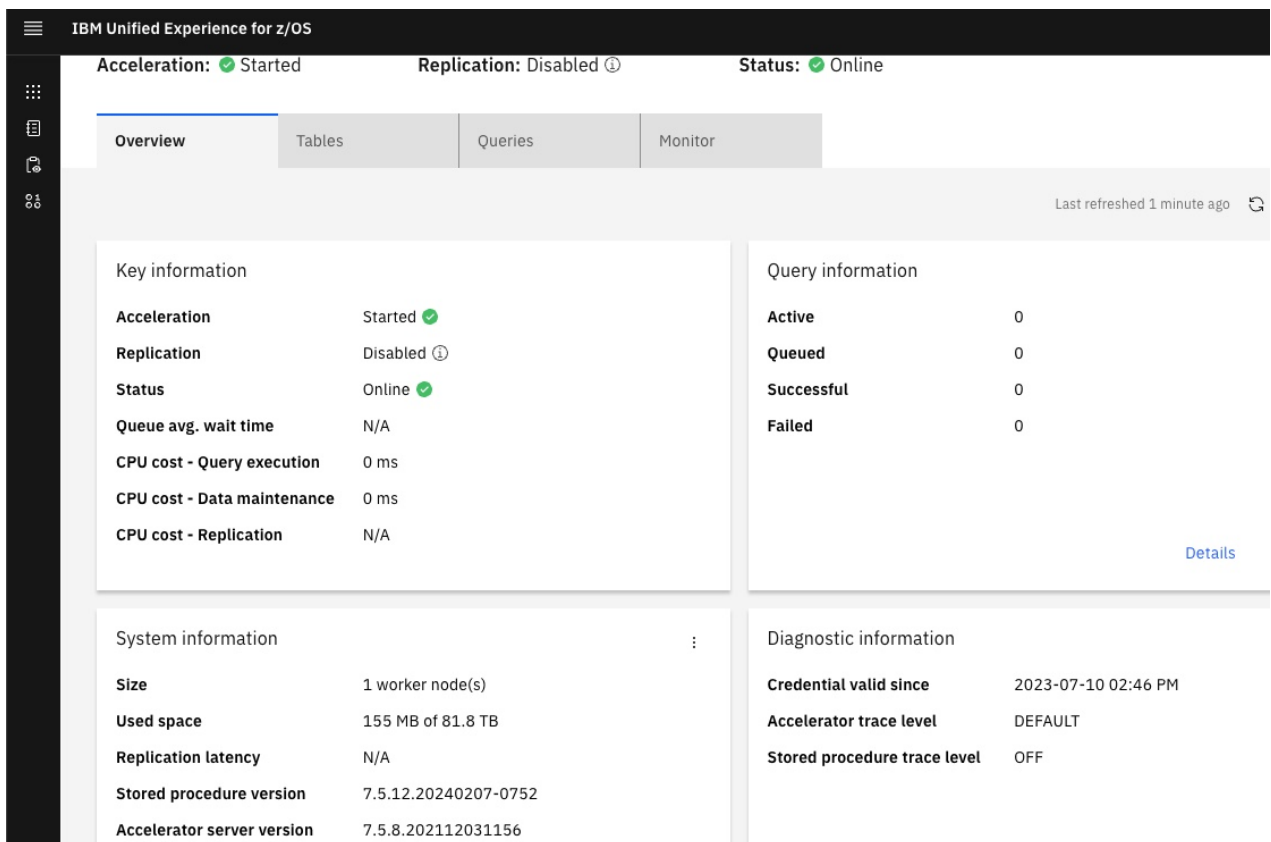


Figure 13. **Accelerator** details page in IBM Unified Experience for z/OS

Header

The header on top of the tabbed notebook gives you the following statuses:

Acceleration

Indicates whether acceleration has been enabled in Db2 for z/OS. To change the current status, click **Start** or **Stop**.

If the accelerator is attached to a Db2 data sharing group, the behavior is different. The status *Started* is displayed if acceleration has been started for at least one member of the data sharing group. Other statuses are shown only if the status is the same for all members of the data sharing group. If the status of individual members is different, a warning icon is displayed.

If you move the mouse pointer over the displayed status or the warning icon, a pop-up window shows the acceleration status for all members of the data sharing group.

An additional functional link labeled **Change** is displayed for data sharing groups. Clicking it opens a window in which you can change the acceleration status of each member in the data sharing group.

Replication

Information is displayed only if incremental updates are configured. A status of **Started** indicates that the incremental update process is running for tables included in the process. **Stopped** indicates that the incremental update process has been suspended. To change the current status, click **Start** or **Stop**.

Status

Indicates whether the accelerator is ready to process queries or other requests. To to that, the accelerator's status must be *online*. If the status is *offline*, the accelerator cannot be reached over the network for some reason.

The header is visible from all pages of the tabbed notebook. It also contains a button labeled **Accelerator actions**. Clicking the button opens a drop-down list with choices that allow you to start other accelerator functions, jump to other IBM Unified Experience for z/OS windows, or remove the selected accelerator.

Overview

The **Overview** tab is the tab that you see after opening an accelerator details page. The **Overview** tab is divided into four sections, **Key information**, **Query information**, **System information**, and **Diagnostic information**.

The first tile on the **Overview** tab is labeled **Key information**. At the beginning, it repeats the information on the header, that is, **Acceleration**, **Replication**, and **Status**.

Table 34. <i>Key information, continued</i>	
Label	Description
Queue avg. wait time	Average time that queries had to stay in the queue. The basis for the calculation is all queries that were processed during the last minute.
CPU cost - Query execution	CPU time needed for query processing, in milliseconds.
CPU cost - Data maintenance	CPU time needed for load and High Performance Storage Saver operations, in milliseconds.
CPU cost - Replication	CPU time needed for incremental updates, in milliseconds.
Trace	<p>Shows the trace profiles for the accelerator and the stored procedures that are currently in use. To change a profile, click Configure. To change the settings for the saving of trace information to a file, click Save. To delete the trace information that has been collected, click Clear.</p> <p>Note: The Clear option is not available for cloud accelerators.</p>

Table 34. **Key information**, continued (continued)

Label	Description
Encryption Details	If you click Encryption Details , the Encryption Details window opens, which shows information about the use of encryption for the selected accelerator. This includes the status of hard-disk encryption, the status of encryption of data in motion, a list of encrypted IPsec tunnels (IP connections), and a list of the certificates that are used.

The **Query information** tile gives you the following information:

Table 35. **Query information**

Label	Description
Active	The number of accelerated queries that are currently being processed.
Queued	The number of queries that have been lined up for processing.
Successful	Number of queries that ran successfully.
Failed	Number of queries that failed.
Details	If you click this hyperlink on the lower right of the tile, the Query tab is displayed, where you can find more detailed information about the queries.

The **System information** tile gives you the following information:

Table 36. **System information**

Label	Description
Size	The number of processing nodes the accelerator uses.
Used space	<p>The amount of disk space that is taken up by the tables, in proportion to the available space on the accelerator.</p> <p>This is the space allocated in the file system of the accelerator for the table spaces of the connected Db2 subsystem. Currently, these table spaces can only grow. So if you have removed tables from the accelerator that have used space before, then this size is a high watermark that may include free space in the table spaces for this subsystem. This free space can be reused when you add additional tables from this Db2 subsystem to the accelerator or when existing tables grow. However, the free space cannot be used by other Db2 subsystems paired with the same accelerator because these Db2 subsystems have their own table spaces. The free space can be given back to the operating system when you remove the pairing between the current Db2 subsystem and the accelerator. This action will remove the table spaces for this subsystem.</p>

Table 36. **System information** (continued)

Label	Description
Replication latency	<p>Only visible if incremental updates are configured. This is not the case in Figure 13 on page 102. The value indicates how much the incremental update function is lagging behind. Possible values:</p> <p>Stopped Incremental updates have been stopped for the entire accelerator.</p> <p>Low It will take less than three minutes to propagate recent changes to the corresponding accelerator-shadow tables.</p> <p>Medium Recent changes to the original Db2 tables will be propagated to the corresponding accelerator-shadow tables within three and six minutes.</p> <p>High It will take six minutes or longer to apply recent changes to Db2 tables to the corresponding accelerator-shadow tables.</p> <p>See Note on replication latency.</p>
Stored Procedure Version	The currently installed version of the IBM Db2 Analytics Accelerator stored procedures
Accelerator Server Version	<p>The version of the IBM Db2 Analytics Accelerator for z/OS software that is currently in use. To manage the software of the accelerator, click the tile menu (three dots on the upper right of the tile), and select Manage software. Doing so opens another tabbed notebook, in which you can take the following actions:</p> <p>Transfer updates To transfer an update package from the z/OS UNIX file system (zFS) on z/OS to the accelerator. Here, can choose between two options:</p> <p>Transfer files from system Z To transfer a software update package directly from the attached IBM Z data server.</p> <p>Transfer files from client To upload a software update package from a client workstation to the IBM Z data server and then transfer it from there to the accelerator.</p> <p>Apply software version To apply a software update package that has already been transferred to the accelerator.</p> <p>Remove software version To remove older, no longer needed software update packages from the accelerator in order to clean up the packages view.</p> <p>Software installation progress Gives you access to the software installation logs, which you can also copy and download.</p>

Note on replication latency: The *replication latency* is disclosed through different channels, at different points in time. Sometimes, it is calculated by different systems. Values are reported:

- In the **Accelerator** view as described in the previous table
- When you run the Db2 command -DIS ACCEL(<name>) DETAIL

- In trace files:

```
<Event id="61098" timestamp="2018-11-28 18:07:51" level="W" addressee="0" >
  The current replication latency of XXXXXs on DB2 location ADB2K04 (subscription
  DWE9PLVY)
  has exceeded the threshold of 3600s.
</Event>
```

- In the status monitoring counter Q8STCRL
- As a result of running the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure in connection with the <getAcceleratorInfo> parameter.

These systems or reporting channels are not synced, so deviating values are inevitable. Deviations can be considerable, depending on the channel that is tapped and on the time when this is done. Stick to one reporting channel if you need to compare latency values.

The **Diagnostic information** tile provides the following information:

Table 37. <i>Diagnostic information</i>	
Label	Description
Credential valid since	Shows the date on which the last authentication of the accelerator took place.
Accelerator trace level	The currently used accelerator trace level. For information about the various trace levels, see the documentation of the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure, in particular the section on the <getTrace> command element in the <i>IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference</i> .
Stored procedure trace level	The currently used stored procedure trace level. For information on stored procedure tracing, see the description of the message parameter, especially the section <i>Controlling the trace behavior</i> in the <i>IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference</i> .

List of tables

Here is a brief description of the elements and interactive controls in the view that lists the tables on an accelerator.

List of tables

To display the list of tables on an accelerator:

1. Select and apply the **Accelerator (Db2)** filter on the **Explore objects** page of IBM Unified Experience for z/OS.
2. Click the name of the accelerator (hyperlink) in the output list. This opens the accelerator details page.
3. Click the **Tables** tab.

Table 38. <i>Buttons on the Tables tab</i>	
Button	Description
Add	Opens a new window, in which you can select schemas and tables to be added to the accelerator.
Remove	Removes the selected tables from the accelerator.
Load	Opens the Load Tables window, in which you can select accelerator-shadow tables for loading and set the lock scope for the load process.
Alter Keys	Opens a window in which you can select or change the distribution and organizing keys that are used by the accelerator.

<i>Table 38. Buttons on the Tables tab (continued)</i>	
Button	Description
List Tasks	Opens the List Tasks window, which displays the running tasks on the currently viewed accelerator, such as table load processes. To cancel a running task, select it in the list and click Cancel Selected Task .
Acceleration	Opens a pull-down menu, from which you can enable or disable the selected accelerator-shadow tables so that these are included or excluded from query acceleration.
Storage Saver	<p>Allows you to archive partitions on an accelerator or restore these to their original locations. The button opens a menu with the following choices:</p> <p>Move Partitions to Accelerator Opens the Move Storage Saver Partitions to Accelerator window, which allows you to select Db2 for z/OS tables or partitions to archive the data therein on the accelerator currently viewed.</p> <p>Restore Partitions to Db2 Opens Restore Storage Saver Partitions to Db2 window, in which you can select accelerator-archive tables and partitions that have been archived on the currently selected accelerator in order to restore these.</p>
Federation	<p>Allows you to control federated access. The button opens a menu with the following choices:</p> <p>Grant Grants a referencing Db2 subsystem access to tables that belong to another Db2 subsystem (called owning or remote Db2 subsystem)</p> <p>Create Reference Creates reference tables on the accelerator shared between the referencing Db2 subsystem and the owning Db2 subsystem. The reference tables contain metadata for access to the original data by the referencing Db2 subsystem.</p> <p>Revoke Revokes previously granted table access.</p> <p>Remove Removes reference tables.</p>
Replication	Only visible if incremental updates are configured. Clicking the button opens a pull-down menu from which you can enable or disable incremental updates for selected accelerator-shadow tables.

The list of tables contains the following columns:

<i>Table 39. Columns in the list of tables</i>	
Column	Description
SCHEMA NAME	Column containing schema names
TABLE NAME	Column containing the table names
SIZE	<p>Column containing the table sizes.</p> <p>If rows have been deleted from the table (for example by replication or by a partial reload), a certain space on the pages might remain empty. So if you run many data maintenance jobs on a table, such as replication, without ever reloading the table fully, the table might still grow over time, even if the overall number of rows does not change.</p>

Table 39. Columns in the list of tables (continued)

Column	Description
ACCELERATION	Column that shows whether acceleration is enabled for a table
ERRORS	Column that shows the number of errors in each table
LAST LOAD TIME	Column that shows the timestamp of the last successful load for each table or the current table state. Because accelerator-only tables are not loaded by IBM Db2 Analytics Accelerator functions, the column always shows the table state (for example <i>AOT ready</i>) for this type of table.
LAST LOAD	Column that shows the table states, such as, <i>loaded</i> , <i>load pending</i> , and so on.
STORAGE SAVER PARTITIONS	<p>Column that provides information about the archived partitions of a table. The column is visible only if tables with archived partitions exist.</p> <p>At the schema level, the column shows how many partitions out of the total number of partitions were archived. At the table level, it shows the compressed data size of the archived partitions and the number of rows in these partitions. If archiving is in progress for a partition, the columns shows <i>In Progress</i>.</p>
REPLICATION SINCE	<p>Only visible if incremental updates are configured. Column that shows the last incremental-update capture-point (a timestamp) for incrementally updated accelerator-shadow tables or <i>Disabled</i> for the tables that are not updated in that way.</p> <p>If continuous incremental updates are enabled, the column shows <i>Suspended</i> when a table load has started and incremental updates are therefore on halt, and <i>Refreshing</i> when table changes are being applied, be this through the ongoing load process or the draining of incremental updates from the spill queue.</p>
DISTRIBUTION KEY	Column that shows <i>Random</i> if random distribution is used or the names of distribution-key-columns if a distribution key is used.
SKEW	Column that shows the skew value for each table on the accelerator. The skew value is a metric for the distribution imbalance of table rows across the snippet-processing units (SPUs) or worker nodes. The value is the difference between the smallest and the largest data slice for a table in megabytes (MB).
ORGANIZING KEYS	Column that shows the names of the organizing keys (column names) that were selected for a table.
ORGANIZED	<p>Column that shows the percentage of the table data that is organized based on the specified organizing keys for that table. For organized tables, this value is typically 100%, and 0% for tables that are not organized at all. Values in between indicate that an organizing key has been specified, and that the organization process is ongoing.</p> <p>For small tables, the value is not displayed (it only makes sense to use organizing keys when the table has at least 5 extents per data slice).</p> <p>If you archive tables with the High Performance Storage Saver, the value decreases and ends up at 0% when you have archived the entire table. The reason is that the former accelerator-shadow table is emptied during the process. Hence the degree of organization can no longer be displayed for the archived partitions. The degree of organization of an accelerator-archive table (a table in the read-only table space) is not displayed, but remains the same as before archiving.</p>

Table 39. Columns in the list of tables (continued)	
Column	Description
REMOTE	Column that indicates whether federated access has been granted to tables.

Stored procedure call

To display or refresh the list of tables, IBM Unified Experience for z/OS invokes the SYSPROC.ACCEL_GET_TABLES_INFO stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see SYSPROC.ACCEL_GET_TABLES_INFO in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*.

List of queries

Here is a brief description of the elements and interactive controls on the **Queries** tab. The **Queries** tab allows you to search for and filter active and past queries, and display the SQL statements used by these queries.

To open the **Queries** tab:

1. Select and apply the **Accelerator (Db2)** filter on the **Explore objects** page of IBM Unified Experience for z/OS.
2. Click the name of the accelerator (hyperlink) in the output list. This opens the accelerator details page.
3. Click the **Queries** tab.

The **Queries** tab has a number of controls, which are described in [Table 40 on page 109](#). See the following figure:

Figure 14. The **Queries** tab in IBM Unified Experience for z/OS

Table 40. Buttons and other controls on the Queries tab	
Button	Description
Scope	The queries that you want to search on. Possible sections are: All All queries on the accelerator Active Currently running queries on the accelerator Completed Completed queries on the accelerator
Start timestamp	The beginning of the time frame used for filtering. This filter criterion looks at the timestamps that were recorded when the queries started. If you enter 0 here, all queries up to the specified End timestamp will be captured.
End timestamp	The end of the time frame used for filtering. This filter criterion looks at the timestamps that were recorded when the queries ended. If you enter 0 here (default), currently running queries will also be selected.
Minimum elapsed time	This filter criterion looks at the duration of query processing on the accelerator, that is, the total time from start to finish. Only queries with a duration equal to or higher than the entered value will be captured.
Minimum execution time	This filter criterion looks at the time needed to execute the queries on the accelerator. Only queries with an execution time equal to or higher than the entered value will be captured.

Table 40. Buttons and other controls on the **Queries** tab (continued)

Button	Description
Select column	<p>This drop-down list allows you to select a criterion by which to sort the queries that were found.</p> <p>Elapsed time To sort by elapsed time, from the shortest to the longest time encountered, or the other way around.</p> <p>Submit timestamp To sort by the time when queries were submitted. The sort order is from the earliest time to the last time a query was submitted, and can be reversed.</p> <p>Execution time To sort by execution time, from the shortest to the longest execution time encountered, or the other way around.</p> <p>Queued time To sort by the time that queries had to "spend" in the queue before they could be processed. The sort order is from the shortest to the longest time, and can be reversed.</p> <p>Result rows To sort by the number of result rows that were returned by the queries. The sort order is from the highest number of rows to the lowest, and can be reversed.</p> <p>Result bytes To sort by the amount of memory or disk space claimed by the results. The sort order is from the highest byte number to the lowest, and can be reversed.</p>
User ID	This filter criterion selects queries based on the ID of the user who submitted the queries. Only queries submitted by the specified user will be captured.
Clear all	To clear all filters you have set.
Save as	To open the Save search window and save your filter criteria under a name for later use.
Capture	To apply the filters you have set and start the search. The results are displayed at the bottom of the window.

Columns

The search results are displayed in a table with the following columns:

Table 41. Columns in the search results table (list of queries found)

Column	Description
SQL TEXT	Column that shows the beginning of a query's SQL code.
USER ID	Column that shows the IDs of the users who submitted the queries.
START TIME	Times when queries were received by IBM Db2 Analytics Accelerator for z/OS. For more information on the time values, see the following description .

Table 41. Columns in the search results table (list of queries found) (continued)

Column	Description
STATE	<p>Processing states that queries are in. The following states are possible:</p> <p>UNKNOWN The state cannot be determined.</p> <p>QUEUED A query has been passed to the accelerator for processing.</p> <p>RUNNING The query is being processed by the accelerator.</p> <p>FETCHING The accelerator has finished processing the query, but Db2 for z/OS has not yet finished collecting the results.</p> <p>FAILED The query did not run to completion because one or more errors occurred.</p> <p>SUCCESSFUL Query execution has been completed successfully.</p> <p>CANCELED The query did not run to completion because it was canceled by a user.</p>
WAIT TIME	Periods of time that queries had to “spend” in the queue before they were processed by the IBM Integrated Analytics System. For more information on the time values, see the following description .
EXECUTION TIME	The time a query spent in the queue before it was sent to the accelerator plus the time needed to process the query on the IBM Integrated Analytics System. For more information on the time values, see the following description .
FETCH TIME	The time interval starting with the first retrieval of a result row by Db2 and ending with the last. In most cases, Netezza query execution has already finished when the result retrieval process is still ongoing. For more information on the time values, see the following description .
ELAPSED TIME	The total time that was needed to process a query (from the state QUEUED to the state FAILED, SUCCESSFUL, or CANCELED). For more information on the time values, see the following description .
RESULT SIZE	The data size of the rows that were returned in query results (in MB or GB) from the accelerator to Db2 for z/OS.
ROWS RETURNED	The number of rows that were returned by the accelerator as query results.

Monitoring

The **Monitoring** tab gives you access to performance and other data for the selected accelerator. Some of this data represented in interactive graphs.

To open the **Monitor** tab:

1. Select and apply the **Accelerator (Db2)** filter on the **Explore objects** page of IBM Unified Experience for z/OS.
2. Click the name of the accelerator (hyperlink) in the output list. This opens the accelerator details page.
3. Click the **Monitor** tab.

The **Monitor** tab is divided into several other tabs, and each of these sub-tabs focuses on a specific area of the available data.

System utilization

The system utilization tab is concerned with the CPU, memory, buffer pool, and network utilization of the worker nodes and the coordinator (head) node of the accelerator. The data is plotted on an interactive graph.

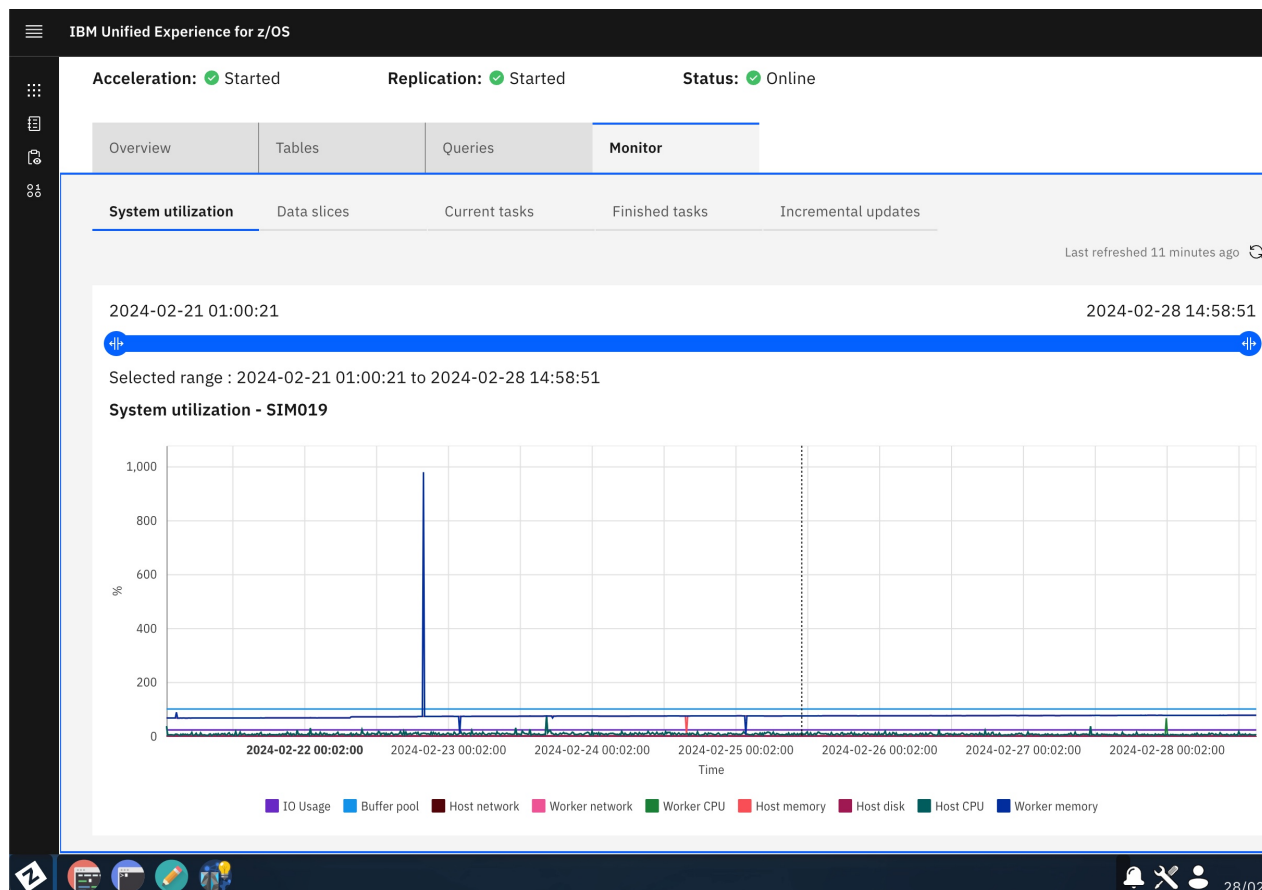


Figure 15. The system utilization graph on the **Monitor** tab

The blue bar on top of the graph is a slider with two endpoints that you can use to adjust the time frame that is covered by the graph.

By default, the graph shows all available metrics. Clicking one of the colored icons in the legend shows just the associated metric on the graph, and makes all other metrics disappear. Clicking additional icons will add the selected metrics to the graph. Clicking the same icon will make the associated metric disappear. Deselecting all metrics in this way makes the graph return to its default state. That is, all metrics are shown.

If you hover the mouse over one of the timestamps on the x-axis, a pop-up window is displayed that shows the numeric value of each selected metric at the selected point in time.

The metrics you can find in this graph are described in [Table 42 on page 112](#).

Table 42. Metrics	
Metric	Description
IO Usage	The percentage of the network bandwidth that is used for input and output operations.
Buffer pool	The utilization of the buffer pool in percent

<i>Table 42. Metrics (continued)</i>	
Metric	Description
Host network	The utilization of the host network in percent, that is, the network traffic to and from the coordinator or head node in relation to the network's capacity.
Worker network	The utilization of the worker network in percent, that is, the network traffic between the worker nodes in relation to the network's capacity.
Worker CPU	The combined utilization of the worker CPUs in percent.
Host memory	The utilization of the coordinator or head node memory in percent.
Host disk	The used disk space of the coordinator or head node in percent of the overall disk space.
Host CPU	The utilization of the coordinator or head node CPU in percent.
Worker memory	The utilization of the memory of all worker nodes in percent.

Data slices

The graph on the **Data slices** tab shows you how the data slices are distributed across the disks or disk partitions allocated to the accelerator's worker nodes, and how much disk space these distributed portions are using in percent of the available disk space. A data slice is the data that one of the connected Db2 subsystems or data sharing members (data source) submits for processing to the accelerator. This data is distributed among the worker nodes. Thus each worker node processes a portion of each data slice submitted by the connected data sources.

On the graph, you can identify the points of origin. By clicking the icons in the legend, you can show or hide individual data slices that contribute to the workload.

If you hover the mouse pointer over the colored segments of the bars on the graph, a pop menu shows you the percentage of disk utilization for that portion or data slice. The window also gives you the position of that slice on the x-axis and its point of origin. Each position on the x-axis represents the disk or disk partition assigned to a worker node of the accelerator.

Current tasks

The **Current tasks** tab lists the currently running tasks in a table. The table consists of the following columns:

<i>Table 43. Columns in the table that lists currently running tasks on the accelerator</i>	
Column name	Description
Task ID	A unique number that identifies a task
Status	The current status of a running task
Type	The name of the job or process that is running a task
User	The ID of a user who started a task

Table 43. Columns in the table that lists currently running tasks on the accelerator (continued)

Column name	Description
Age	The time that a task has been processed for, up to the present point in time. Each duration is shown in a time format that represents hours, minutes, and seconds separated by a colon.
Priority	The priority the accelerator has assigned to a task. For more information, see <i>Mapping of z/OS importance levels to priorities of the accelerator database engine</i> in the <i>IBM Db2 Analytics Accelerator for z/OS: Installation Guide</i> .

A second table underneath displays various monitoring values related to the connected Db2 subsystems or data sharing members. For a description of the values in this table, see [Database system monitor elements](#).

Finished tasks

The **Finished tasks** tab lists accelerator tasks that have been finished in a table. The information is the basically the same as for the current tasks. The only difference is the focus on no-longer-running tasks, be it that these have been completed or aborted.

Incremental updates

The **Incremental updates** tab provides information about the replication process, such as the replication latency and throughput. The tab is only populated if incremental updates have been configured for the accelerator.

Interface elements of IBM Db2 Analytics Accelerator Administration Services

IBM Db2 Analytics Accelerator Administration Services is a web interface that allows you to complete administration tasks by using REST APIs. For each administration task, you find a suitable REST call. These REST calls use a JSON format. To illustrate the structure of the commands and the parameters, an example is provided for each REST call.

Getting started

To get started, you first enter the URL of the IBM Db2 Analytics Accelerator Administration Services UI in your browser. The UI opens, and a block is displayed for each available API call. Each block is introduced by a colored rectangle, which shows the type of the REST call, followed by the name of the API endpoint.

The next step is to add a connection. To this end, scroll down to **Db2zConntection** and click



to expand that section. An example is displayed, which shows you the structure of the API call and the parameters you can specify.

To enter your API call, click the **Try it out** button on the right. For a simple connection with user ID and password, you must provide the following parameters:

"userName":

Your Db2 for z/OS user ID.

"hostName":

The host name or IP address of the data server on which your Db2 subsystem is located.

"portNumber":

The port number that the data server uses to listen to requests.

"locationName":

The location name of the Db2 subsystem you want to connect to. This is the name of that subsystem in the SYSIBM.LOCATIONS table.

"connectionName"

A name that identifies your connection. You can choose this name freely, but it must not be longer than 8 characters.

"password"

The password of your Db2 for z/OS user ID.

Note: This is the simplest, but not the only way to log in. For other, SSL-based login types, see step “10” on page 120 in [“Creating a database connection profile”](#) on page 117.

Proceed as follows:

1. Type in the parameter values as required.
2. Click **Execute**.
3. If your request is successful, you find an authentication token in the request body ("token" : value in the "result" : object). Copy the entire token to the clipboard. See the following example:

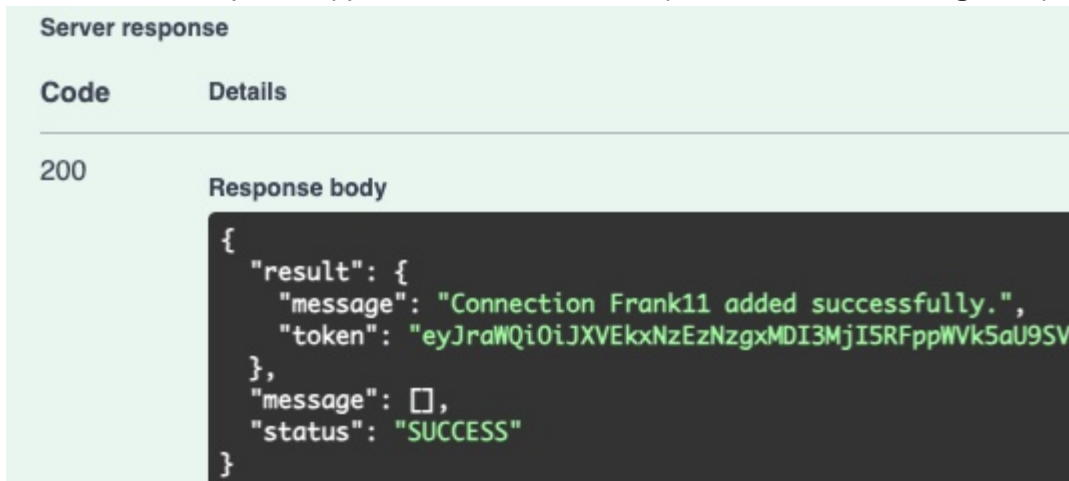


Figure 16. Token returned in response to a successful connection request

4. Navigate to the REST call you want to execute next and click the padlock icon (🔒) on the right. The following window opens:

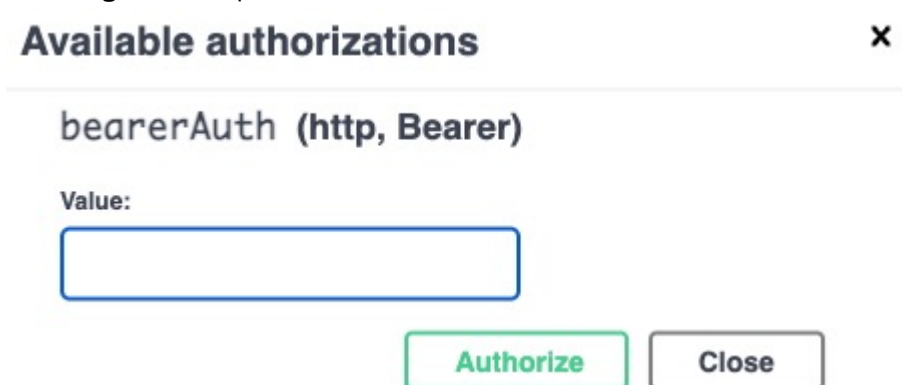



Figure 17. Authentication window

5. Paste the token in the **Value** field and click **Authorize**.

You are now authenticated for the entire session. That is, you can submit REST calls without having to authenticate again as long as the browser session exists. To indicate this, the padlock icons on the UI are now closed ().

Submitting REST calls

The calls are grouped into categories. Each category contains calls that belong together, such as the **Accelerated Table** category. Each call is represented by a colored block on the web UI. A colored rectangle at the beginning shows the type of a call, which is then followed by the name of its API endpoint. To expand a block, click the type rectangle or the API endpoint. The basic structure is the same for all calls. See the example in [Figure 18 on page 116](#).

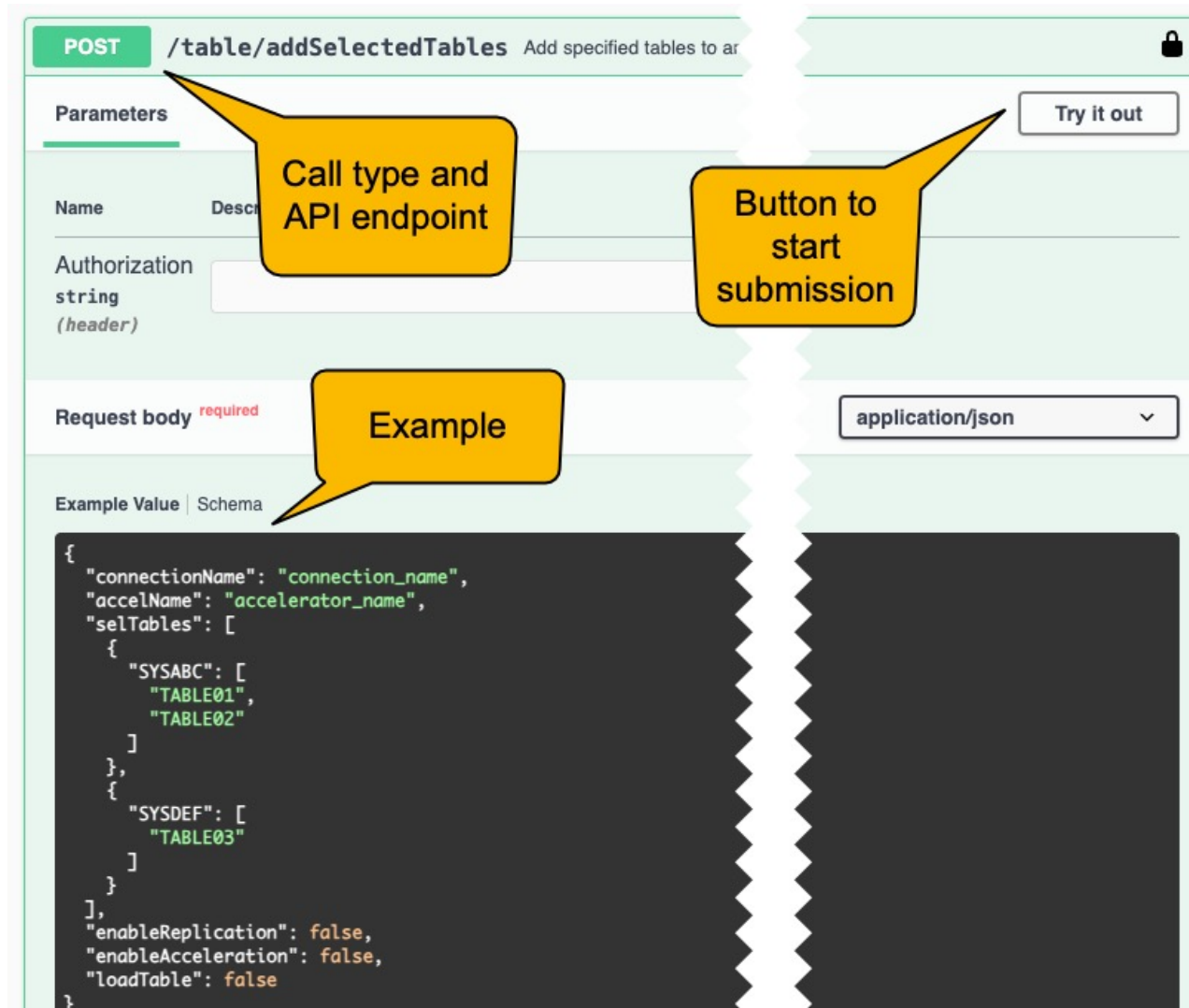


Figure 18. REST call to add tables

To proceed:

1. Click the **Try it out** button.
2. Enter the parameter values as required in the request body.
3. Click **Execute**.
4. Check the response. A successful response shows code 200 or 201.

Chapter 6. Administration tasks

See an overview of the tasks that you can complete from your administration client.

Prerequisites

Before you go about a task, check whether you meet the requirements for running your administration client:

- Network connections must exist between the database server and the machine on which the administration client is installed. In addition, network connections must exist between the database server and the accelerators.
- At least one accelerator (hardware) must be installed and connected to your database server.
- The appropriate Program Temporary Fixes (PTFs) must be installed so that IBM Db2 Analytics Accelerator for z/OS can connect to your database management system.
- IBM Db2 Analytics Accelerator for z/OS stored procedures must exist on the database server.
- IBM Db2 Analytics Accelerator for z/OS jobs have been run to configure and integrate the accelerator hardware and software into your database environment.

Creating a database connection profile



Create a database connection profile to gain access to a Db2 subsystem on a database server. A Db2 subsystem houses one or more databases, in which the source data for query acceleration (schemas and tables) is kept.

About this task

No matter which administration client you use, the connection information is stored in profiles for reuse. Having created a profile, you can reconnect to a database by selecting the profile in your administration client. To learn more, see [“Connecting to a database server” on page 124](#).

Procedure

1. Open the wizard or window to add a database connection:

IBM Db2 Analytics Accelerator Studio	On the header of the Administration Explorer on the left, click the downward-pointing arrow next to New and select New Connection to a Database .
IBM Data Server Manager	a. Click  in the upper left. b. Select SETTINGS > Manage Connections . c. Select Add > Add a database .
IBM Unified Experience for z/OS	a. On the sidebar to the left, click  Manage to expand the submenu, then select Subsystems . b. On the Subsystems page that is displayed in the main window, click Register subsystem .
IBM Db2 Analytics Accelerator Administration Services	Scroll down in your browser and expand the entry for the /source/add API call.

2. Give the database connection profile a name:

IBM Db2 Analytics Accelerator Studio	Decide how to name the database connection profile: <ul style="list-style-type: none"> To use the name of the database server that you want to connect to, leave Use default naming convention selected. To choose a different name, clear Use default naming convention, and type the name in the Connection Name field.
IBM Data Server Manager	Type the name in the Database connection name field.
IBM Unified Experience for z/OS	Type the name in the Subsystem name field.
IBM Db2 Analytics Accelerator Administration Services	Type a name, that is, a value next to the colon of the "connectionName": parameter. You can type a name of your choice. Make sure to enclose your name in double quotes. The result is supposed to look like this: <pre>"connectionName": "your name"</pre>

3. Select the database management system:

IBM Db2 Analytics Accelerator Studio	From the Select a database manager list, select Db2 for z/OS . Make sure that in the JDBC driver drop-down list, IBM Data Server Driver for JDBC and SQLJ (JDBC 4.0) Default is selected.
IBM Data Server Manager	From the Data server type drop-down list, select Db2 for z/OS .
IBM Unified Experience for z/OS	From the Subsystem type drop-down list, select Db2 .
IBM Db2 Analytics Accelerator Administration Services	N/A

4. Specify the **Location** name of the Db2 subsystem. This is the name of the Db2 subsystem in the Db2 system table SYSIBM.LOCATIONS.

IBM Db2 Analytics Accelerator Studio	Type the name in the Location field.
IBM Data Server Manager	Type the name in the Location field.
IBM Unified Experience for z/OS	Type the name in the Location field.
IBM Db2 Analytics Accelerator Administration Services	Type a valid Db2 subsystem name to serve as the value of the "locationName": parameter. Make sure to enclose the value in double quotes.

Tip: To determine the **Location**, **Host** name, and **Port number**, a Db2 for z/OS systems programmer or database administrator can issue a -DIS DDF command.

5. Specify the host name or IP address of the computer on which the database server is located:

IBM Db2 Analytics Accelerator Studio	Type the host name or IP address in the Host field.
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IBM Data Server Manager	Type the host name or IP address in the Host name field.
IBM Unified Experience for z/OS	Type the host name or IP address in the Hostname field.
IBM Db2 Analytics Accelerator Administration Services	Type the IP address or DNS host name of the data server on which the Db2 subsystem is located as the value of the "hostName" : parameter. Make sure to enclose the IP address or host name in double quotes.

6. Specify the port number for connections to the database server:

IBM Db2 Analytics Accelerator Studio	In the Port number field, you see that port number 446 is selected by default. Leave this setting unless the database server uses another port.
IBM Data Server Manager	In the Port number field, type the number of the port that was configured during the installation of IBM Data Server Manager. By default, this is 11511 for secure (https://) connections.
IBM Unified Experience for z/OS	In the Port field, you see that port number 8010 is selected by default. Leave this setting unless the database server uses another port.
IBM Db2 Analytics Accelerator Administration Services	Type the number of the port that the data server uses to listen to requests as the value of the "portNumber" : parameter. Make sure to enclose the port number in double quotes.

7. Select specific options of your administration client:

IBM Db2 Analytics Accelerator Studio	<p>Select Retrieve objects created by this user only if you want to restrict database access to the databases, schemas, tables, and other objects that were created by the logon user.</p> <p>If you do not select this option (default), IBM Db2 Analytics Accelerator Studio will show and make selectable all databases, schemas, and tables that the logon user has access to, including those to which this user might have only read access.</p>
IBM Data Server Manager	<p>Select:</p> <ul style="list-style-type: none"> a. Enable operation to allow a user (ID) to administer, tune, and query the connected Db2 subsystem. b. Enable data collection to allow a user (ID) to collect data from the connected Db2 subsystem. <p>Both options are required for successful operation of IBM Db2 Analytics Accelerator. You specify the corresponding user IDs on the next tab.</p>

IBM Unified Experience for z/OS	Select Suppress Db2 grants to prevent that the tables in the subsystem are opened up for federated access.
IBM Db2 Analytics Accelerator Administration Services	N/A

8. If you use IBM Data Server Manager, click the **Credential** tab.

9. Specify the user ID of the logon user or operation user:

IBM Db2 Analytics Accelerator Studio	In the User name field, type the user ID that you want to use to log on to the database server.
IBM Data Server Manager	In the group box labeled Operation credentials , you find a User ID field. Type the ID of the logon user in this field.
IBM Unified Experience for z/OS	In the DBA User ID field, type the user ID that you want to use to log on to the database server.
IBM Db2 Analytics Accelerator Administration Services	Type the database logon user ID as the value of the "username" : parameter. Make sure to enclose this name in double quotes.

Note that you can only use your administration client successfully if the logon user has sufficient rights to run the stored procedures that are called by the administration client functions. The section *Appendix C. Required access rights in the IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference* lists the privileges that are required to run a particular stored procedure. If you are uncertain, use an ID with SYSADMIN authority.


Important: Most accelerator functions are executed by stored procedures. To be able to run these stored procedures from an administration client user interface, the user ID that you specify here needs sufficient authorizations in Db2 for z/OS. See the list of required top-level authorizations with respect to the type of user:

- *Db2 for z/OS power-user authorizations for administration clients in the IBM Db2 Analytics Accelerator for z/OS: Installation Guide*
- *Minimum Db2 for z/OS authorizations for administration clients in the IBM Db2 Analytics Accelerator for z/OS: Installation Guide*

In addition, the selected user ID needs specific access rights for each of the stored procedures this ID is supposed to run. See which authorizations are required:

Appendix B: Required access rights in the IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference

10. Specify the password belonging to the logon user ID or operation user ID:

IBM Db2 Analytics Accelerator Studio	<ul style="list-style-type: none"> • In the Password field, type the password of the logon user. • Leave the Save password check box deselected. <div>  Attention: You can select Save password to avoid having to enter the password each time that you want to work with the database server. This, however, is not recommended because only a lightweight encryption is applied </div>
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	<p>when the password is stored on your local hard disk.</p> <ul style="list-style-type: none"> • Leave the Default schema field blank.
IBM Data Server Manager	<p>a. Under Operation credentials, in the Password field, type the password of the logon user.</p> <p>b. To save the logon password so that you do not need to provide it each time you connect to the same Db2 subsystem, select Save credentials to repository.</p>
IBM Unified Experience for z/OS	In the Password field, type the password of the logon user.
IBM Db2 Analytics Accelerator Administration Services	<p>Type the password of the logon user ID as the value of the "password" : parameter. Make sure to enclose password in double quotes.</p> <p>Note: For this logon type to succeed, the "credentialType" parameter must be set to "password", which is the default value. So do not change it if you want to log on by password. If an SSL logon mechanism has been set up, you must instead set "sslConnection": "true", and then try other login type and password combinations, such as "sslKeyStoreLocation": and "sslKeyStorePassword". See the following example, which uses the "sslTrustStoreLocation": and "sslTrustStorePassword": keywords for a key ring authentication:</p> <pre> { "sslConnection": "true", "sslTrustStoreLocation": "safkeyring:// <user>/<keyring>", "sslTrustStorePassword": "password", "additionalProperties": { "sslTrustStoreType": "JCERACFKS" } } </pre>

11. Specify a secondary user ID (optional for IBM Db2 Analytics Accelerator Studio and IBM Unified Experience for z/OS), or the data collection user ID for IBM Data Server Manager.

In many organizations, it is a common practice to have personal user IDs with restricted authority and special-purpose user IDs (groups in most cases) with extensive privileges in a certain field. IBM Db2 Analytics Accelerator Studio supports this practice in that you can specify a secondary user ID, which might have the privileges that your logon user ID lacks, such as the privilege to run stored procedures. If the secondary ID is a group user ID, the logon user must of course be a member of that group.

IBM Db2 Analytics Accelerator Studio	To specify a secondary user ID, follow these steps:
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	<p>a. On the Connection Parameters page, click the Optional tab.</p> <p>b. In the Property field, type the following statement:</p> <pre>currentSQLID</pre> <p>c. In the Value field, type the secondary user ID.</p> <p>d. Click Add.</p> <p>e. Click the General tab to return to that page and complete the logon.</p>
IBM Data Server Manager	Under Data collecting credentials , in the User ID field, type the ID of the data collection user (this user is related to the Enable data collection option in step “7” on page 119).
IBM Unified Experience for z/OS	Select Subsystem-specific Sqlid and specify the secondary user ID in the DBA SQL user ID field.
IBM Db2 Analytics Accelerator Administration Services	N/A

12. Test the connection or connections:

IBM Db2 Analytics Accelerator Studio	Click Test Connection to check if you can log on to the database server.
IBM Data Server Manager	<p>a. In the Operation credentials group box, click the Test Connection button to check if your operation user can log on to the Db subsystem.</p> <p>b. In the Data collecting credentials group box, click the Test Connection button to check if your data collection user can log on to the Db subsystem.</p>
IBM Unified Experience for z/OS	Click Test Connection to check if you can log on to the database server.
IBM Db2 Analytics Accelerator Administration Services	<p>a. Submit the database connection data you entered. Code 210 is returned if the connection was successful.</p> <p>b. Additionally, you can run the /testConnection API call to check if the connection is working properly.</p>

13. Save your database connection profile:

IBM Db2 Analytics Accelerator Studio	Click Finish .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Next to move on to the Configuration page. This page contains numerous fields that are populated with default values. Normally, these values do not have to be changed. However, if you do see a need to change a value, first click


	<p>the  icon to read the description. If you need more information, look up the field description in the Db2 for z/OS documentation.</p> <p>When finished, click Save.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>Your connection data is kept as long as the session exists in your browser. Depending on your browser settings, it might be cached, so that you can see it the next time you open the Swagger UI.</p>

Results

After creating the profile, your administration client automatically connects to the Db2 subsystem.

What to do next

If it takes too long to load all objects of the Db2 subsystem into the current view of your administration client (more than one minute), you can set a filter to limit the number of schemas to be loaded:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> 1. In the Administration Explorer, right-click the icon representing the Db2 subsystem (database symbol). 2. Select Properties from the menu. 3. In the Properties for ... window, select Default Schema Filter. 4. Clear the Disable filter check box. This activates the filter controls. 5. From the Name drop-down list, select a suitable filter mask. In the adjacent text field, type the filter string. For example, to exclude all schemas whose names starts with the characters BLU: <ol style="list-style-type: none"> a. From the Name drop-down list, select Does not start with the characters. b. In the text field, type BLU. 6. Click Apply.
IBM Data Server Manager	<ol style="list-style-type: none"> 1. Select  > ADMINISTER > Schemas. <ul style="list-style-type: none"> • You can use the Filter by Name field to quickly filter the list of schemas using ordinary characters and wildcard characters (% for strings and _ for individual characters). For example, entering A% will display just the schemas whose names start with the letter A. • Another way is to use the filter editor: <ol style="list-style-type: none"> a. Click the funnel icon in the upper right. b. In the Filter window, you can define many types of filter rules. For example, to

	<p>exclude all schemas whose names start with the characters BLU:</p> <ul style="list-style-type: none"> i) Leave the first drop-down list unchanged. ii) From the second drop-down list, select does not contain. iii) In the text entry field, type BLU. iv) Click Apply. The Filter window closes, and the list of schemas is refreshed. Notice that the funnel icon is completely filled with color when a filter has been applied.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> 1. Redisplay the Subsystems page. If necessary, go to the side bar on the left, and select Manage > Subsystems. 2. On the upper left of this page, you find a search field with a placeholder text that reads Search registered subsystems. Enter a character or a string of characters in this field to just display the subsystems whose names start with that character or string. <p>Restriction: Wildcard characters like * or % are not supported by this field.</p>
IBM Db2 Analytics Accelerator Administration Services	N/A


Connecting to a database server

The steps to connect to a Db2 subsystem differ with respect to the administration client that you use.

Before you begin


If it takes too long to load all objects of the Db2 subsystem into the current view of your administration client (more than one minute), you can set a filter to limit the number of schemas to be loaded:

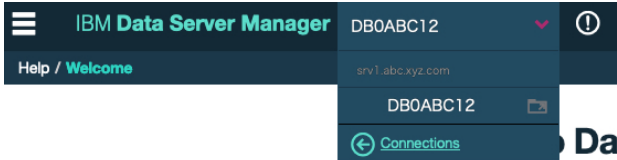

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> 1. In the Administration Explorer, right-click the icon representing the Db2 subsystem (database symbol). 2. Select Properties from the menu. 3. In the Properties for ... window, select Default Schema Filter. 4. Clear the Disable filter check box. This activates the filter controls. 5. From the Name drop-down list, select a suitable filter mask. In the adjacent text field, type the filter string. For example, to exclude all schemas whose names starts with the characters BLU:
--------------------------------------	---

	<p>a. From the Name drop-down list, select Does not start with the characters.</p> <p>b. In the text field, type BLU.</p> <p>6. Click Apply.</p>
IBM Data Server Manager	<p>1. Select  > ADMINISTER > Schemas.</p> <ul style="list-style-type: none"> You can use the Filter by Name field to quickly filter the list of schemas using ordinary characters and wildcard characters (% for strings and _ for individual characters). For example, entering A% will display just the schemas whose names start with the letter A. Another way is to use the filter editor: <ul style="list-style-type: none"> a. Click the funnel icon in the upper right. b. In the Filter window, you can define many types of filter rules. For example, to exclude all schemas whose names start with the characters BLU: <ul style="list-style-type: none"> i) Leave the first drop-down list unchanged. ii) From the second drop-down list, select does not contain. iii) In the text entry field, type BLU. iv) Click Apply. The Filter window closes, and the list of schemas is refreshed. Notice that the funnel icon is completely filled with color when a filter has been applied.
IBM Unified Experience for z/OS	<p>1. Redisplay the Subsystems page. If necessary, go to the side bar on the left, and select Manage > Subsystems.</p> <p>2. On the upper left of this page, you find a search field with a placeholder text that reads Search registered subsystems. Enter a character or a string of characters in this field to just display the subsystems whose names start with that character or string.</p> <p>Restriction: Wildcard characters like * or % are not supported by this field.</p>
IBM Db2 Analytics Accelerator Administration Services	N/A

Procedure

Depending on your administration client, use one of the following approaches:

IBM Db2 Analytics Accelerator Studio	In the Administration Explorer , double-click the icon representing the Db2 subsystem. For example:  STLEC1
--------------------------------------	--

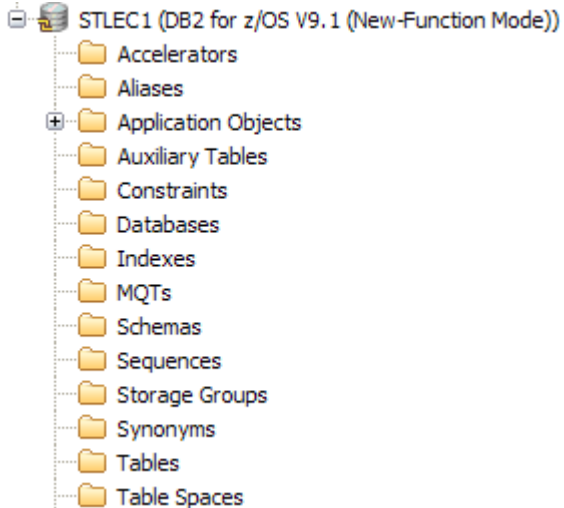

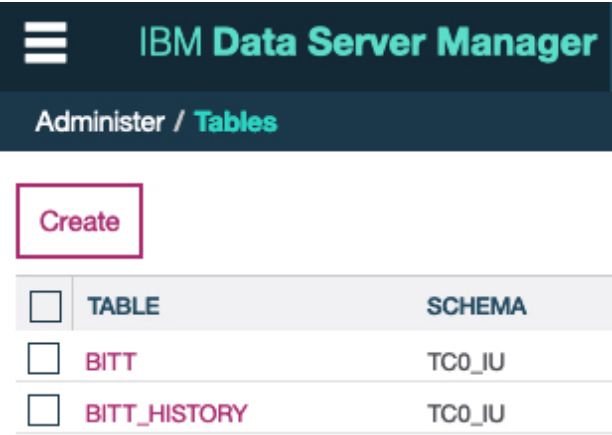
IBM Data Server Manager	<p>IBM Data Server Manager tries to reconnect to the previously connected Db2 subsystem by default. If the reconnection fails, or you want to connect to a different subsystem, you can select the appropriate connection name from the drop-down list on the top banner. For example:</p>  <p>Alternatively:</p> <ol style="list-style-type: none"> Click  and select SETTINGS > Manage Connections. Select the box in front of a listed connection.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> On the Explore objects page, go to the Object type drop-down list and select Subsystems (Db2). Click Apply. Click one of the subsystem names (hyperlinks) in the Name column of the table at the bottom. Wait until the subsystem details are displayed.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Scroll down in your browser and expand the entry for the /source/edit API call. Type in the information that is required to reconnect. For more information, see “Creating a database connection profile” on page 117. Click Submit.

























Results

You see the following results if the connection was successful:

IBM Db2 Analytics Accelerator Studio	The icon representing the subsystem changes and the database object types, such as table spaces or tables, are displayed in a folder hierarchy in the Administration Explorer .
IBM Data Server Manager	The views on the main menu, under the ADMINISTER submenu, are populated.
IBM Unified Experience for z/OS	The table at the bottom lists the registered Db2 subsystems. Clicking one of the subsystem names displays the details of that subsystem.
IBM Db2 Analytics Accelerator Administration Services	Return code 200 is displayed.

Examples

IBM Db2 Analytics Accelerator Studio	<p>After a successful connection, you can see the following folder hierarchy in the Administration Explorer:</p> 									
IBM Data Server Manager	<p>Tables in the connected Db2 subsystem are displayed after selecting  > ADMINISTER > Tables:</p>  <table><tr><th></th><th>TABLE</th><th>SCHEMA</th></tr><tr><td><input type="checkbox"/></td><td>BITT</td><td>TC0_IU</td></tr><tr><td><input type="checkbox"/></td><td>BITT_HISTORY</td><td>TC0_IU</td></tr></table>		TABLE	SCHEMA	<input type="checkbox"/>	BITT	TC0_IU	<input type="checkbox"/>	BITT_HISTORY	TC0_IU
	TABLE	SCHEMA								
<input type="checkbox"/>	BITT	TC0_IU								
<input type="checkbox"/>	BITT_HISTORY	TC0_IU								
IBM Unified Experience for z/OS	<p>Registered Db2 subsystems are displayed in the table at the bottom after applying the Subsystems (Db2) object type filter on the Explore objects</p>									


	<div>page:</div> <div>4 objects found</div> <div>Objects meeting the search criteria are listed below. Use the column selector button to select columns.</div> <table><thead><tr><th>Name</th><th>Object type</th><th>Location</th><th>Version</th></tr></thead><tbody><tr><td> DC1A </td><td>Db2 subsystem</td><td>DWZDC1A</td><td>12</td></tr><tr><td> DC1B </td><td>Db2 subsystem</td><td>DWZDC1B</td><td>12</td></tr><tr><td> DD1A </td><td>Db2 subsystem</td><td>DWZDD1A</td><td>13</td></tr><tr><td> DD2A </td><td>Db2 subsystem</td><td>DWZDD1A</td><td>13</td></tr></tbody></table>	Name	Object type	Location	Version	 DC1A 	Db2 subsystem	DWZDC1A	12	 DC1B 	Db2 subsystem	DWZDC1B	12	 DD1A 	Db2 subsystem	DWZDD1A	13	 DD2A 	Db2 subsystem	DWZDD1A	13
Name	Object type	Location	Version																		
 DC1A 	Db2 subsystem	DWZDC1A	12																		
 DC1B 	Db2 subsystem	DWZDC1B	12																		
 DD1A 	Db2 subsystem	DWZDD1A	13																		
 DD2A 	Db2 subsystem	DWZDD1A	13																		
IBM Db2 Analytics Accelerator Administration Services	You can submit other API requests after return code 200 has been displayed.																				

Exploring a database server

When a connection to a database server has been established successfully, you can navigate to various folders or pages of your administration client to obtain information about the objects in the database. You can, for example, find out which schemas and tables the connection gives you access to.

Procedure

Follow these steps:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> If necessary, open the Administration Explorer and expand the node representing the database server connection. Expand the single node underneath, which represents the database server. Navigate downwards in the folder hierarchy to see the objects on the database server.
IBM Data Server Manager	<ol style="list-style-type: none"> Click  in the upper left. Expand the ADMINISTER submenu. Select the appropriate choice for the type of objects you'd like to view, for example Tables, Views, Schemas, or Accelerators.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> On the Explore objects page, go to the Object type drop-down list and select Subsystems (Db2). Click Apply. Registered Db2 subsystems are displayed in a table. Click one of the subsystem names (hyperlinks) in the Name column of the table at the bottom. Wait until the subsystem details are displayed. View the key information about the Db2 subsystem.

	<p>f. A sub-window at the bottom lists the connected accelerators. Click one of the accelerator names (hyperlinks) to get to the accelerator window.</p> <p>g. In the Accelerator details window, click the Tables tab to view the tables on that accelerator, or the Queries tab to filter and view all the queries that have been processed or are being processed by the accelerator.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>To obtain more information about the Db2 subsystems and connected accelerators, submit other API requests, such as:</p> <ul style="list-style-type: none"> • /source/all • /source • /accelerator/getAllAccelerators • /accelerator/getAccelerator • /table/getAllTables • /query/captureAllQueries

Results

IBM Db2 Analytics Accelerator Studio	<p>Selecting a folder shows the corresponding objects in the Object List Editor.</p> <p>When IBM Db2 Analytics Accelerator for z/OS has been set up correctly, the Administration Explorer shows a folder called Accelerators. You can open this folder to display the list of configured accelerators. Double-clicking an accelerator name opens a view that shows the details of this accelerator.</p>
IBM Data Server Manager	<p>Selecting a choice from the ADMINISTER submenu displays a page that lists the objects of your choice. Various control buttons allow you to interact with these objects.</p> <p>To display a list of the connected accelerators, select ADMINISTER > Accelerators from the main menu. To view the details of an accelerator, select its entry in the list. The details are displayed at the bottom of the page.</p>
IBM Unified Experience for z/OS	<p>Applying the Subsystem (Db2) filter gives you access to the registered Db2 subsystems. It allows you to drill down further by selecting an individual subsystem, view the relevant details, and the connected accelerators. From there, you can add accelerators, or pick one of the already listed accelerators to view tables on the accelerator and queries that have been processed or are being processed.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>After a successful connection, you can submit other API requests to obtain information about</p>

Adding accelerators

Adding an accelerator to your configuration is a two-step process. First, you must obtain a pairing code from the IBM Db2 Analytics Accelerator Console. Second, you must enter this pairing code along with the IP address and the name of the accelerator in the **Add Accelerator** wizard of your administration client.

Obtaining the pairing code for authentication

Communication between an accelerator and a Db2 subsystem requires both components to share credentials. These credentials are generated after you submit a temporarily valid pairing code. This step is required each time you add a new accelerator. The following steps describe how to obtain the pairing code.

About this task

Note: You can renew the authentication for an existing accelerator without having to use a new pairing code. To do so, click the **Update** link in the **Accelerator** view.

The steps *Obtaining the pairing code for accelerator authentication* and *Adding Accelerators* (next topic) belong together, but are seldom carried out by the same person. Since the pairing code obtained from the IBM Db2 Analytics Accelerator Console is only valid for a limited time (30 minutes by default), the persons operating the console and the administration client must coordinate their steps.

To obtain the pairing code, the **SYSPROC.ACCEL_UPDATE_CREDENTIALS** stored procedure is run on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Ask the network administrator or the person who did the TCP/IP setup for the IP address of the accelerator. Make a note of this information. You need to enter it as you complete the steps that follow.

For IBM Db2 Analytics Accelerator on an IBM Integrated Analytics System, this is the virtual IP or wall IP address.

For Db2 Analytics Accelerator on Z, this is the IP address of the network that you labeled DB2 in the **Appliance Installer**.

2. Log on to the IBM Db2 Analytics Accelerator Console by using **telnet** or **ssh**. The preferred method is **ssh**.

For more information:

- [Appendix B, “Using telnet to log on to the IBM Db2 Analytics Accelerator Console,” on page 293](#)
- [Appendix C, “Using ssh to log on to the IBM Db2 Analytics Accelerator Console,” on page 295](#)

3. Press the Pause key, then Enter to display the following screen:


```

*****
*           Welcome to the IBM Db2 Analytics Accelerator Configuration Console
*****

You have the following options:
(0) - (Menu) Manage Configuration Console
Users
(1) - (Menu) Run Accelerator Functions
(2) - (Menu) Manage Incremental Updates
(3) - (Menu) Manage Encryption of Data in Motion
(4) - (Menu) Manage Call Home

-----
(x) - Exit the Configuration Console

```

4. Type 1 and press Enter to display the submenu:

```

main -> accel
-----
You have the following options:

(0) - Go back one level
(1) - Obtain pairing code, IP address, and port
(2) - List paired Db2 subsystems
(3) - Clear query history
(4) - Restart accelerator process
(5) - Reboot all appliance nodes
(6) - Dump extensive diagnostic information
(7) - Stop backend database
(8) - Start backend database
(9) - Transparently convert Db2 for z/OS REAL columns into DOUBLE columns when loading a table
(10) - Set the DB2 subsystem for time synchronization
(11) - Rotate key used to generate service password
(12) - Accelerator Workload Management
(13) - FODC Dump File Management

```

5. Type 1 and press Enter:

6. When the message Specify for how long you want the pairing code to be valid. is displayed, enter an appropriate integer to specify the validity period in minutes.

The time that you choose must be sufficient for you or a coworker to go to the workstation that runs the administration client, start the **Add New Accelerator** wizard, and enter the information that is returned by the console. Values from 5 to 1440 are allowed. If you just press Enter, you accept the default of 30 minutes.

```

Press <return> to accept the default of 30 minutes.
Cancel the process by entering 0.

```

```

Accelerator pairing information:
Pairing code   : 6048
IP address    : 203.0.113.8
Port          : 1400
Port (AT-TLS) : 11400
Valid for     : 30 minutes

```

```

Press <return> to continue

```

Important: A pairing code is valid for a single try only. Furthermore, the code is bound to the IP address that is displayed on the console.

7. Make a note of the following information on the **console**:

- Pairing code
- IP address
- Port (for unencrypted network communication). Use this port if you are not sure.
- Port (AT-TLS) (for encrypted network communication).

The use of encryption requires extra configuration steps on the accelerator and on the participating z/OS LPARs.

8. Press Enter to return to the main menu of the **console**.
9. Type x and press Enter to exit the **console** and close the telnet session.

Related tasks

[Completing the authentication using the Add Accelerator wizard](#)

To complete the authentication, you specify the IP address, the port number, and the pairing code in the **Add Accelerator** wizard.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Completing the authentication using the Add Accelerator wizard

To complete the authentication, you specify the IP address, the port number, and the pairing code in the **Add Accelerator** wizard.

Before you begin

Make sure that the following conditions apply:

- You need privileges to run Db2 administration commands and stored procedures on z/OS. If you created a power user as suggested in the *Installation Guide*, the power user will have the required privileges.
- You have a valid pairing code. The pairing code, which is of temporary validity, can be obtained by using the **IBM Db2 Analytics Accelerator Console**.



Attention: Do not give ordinary users SELECT authorization on the SYSIBM.USERNAMES table because this allows the users to see the authentication information in the SYSIBM.USERNAMES.NEWAUTHID column.

About this task

You can renew the authentication for an existing accelerator without having to use a new pairing code. To do so, click the **Update** link in the **Accelerator** view.



Attention: Making a new backup of your Db2 catalog tables is strongly recommended after each authentication update because restoration processes in your Db2 subsystem can make an accelerator unusable. This happens if you must restore your Db2 catalog and the backup of the catalog was made before the last update of the accelerator credentials. In this case, the latest authentication information will not be in the catalog tables of the backup, and so the accelerator can no longer be used.


For the completion of this task, the following stored procedures are run on your data server:

- SYSPROC.ACCEL_TEST_CONNECTION
- SYSPROC.ACCEL_ADD_ACCELERATOR

For information about the privileges that are required to run these procedures and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related information** at the end of this section.

Procedure

1. Go to the folder or page that lists the accelerators:

IBM Db2 Analytics Accelerator Studio	Select the Accelerators folder in the Administration Explorer .
IBM Data Server Manager	<ol style="list-style-type: none"> a. Click . b. Select > ADMINISTER > Accelerators.

IBM Unified Experience for z/OS	<ol style="list-style-type: none"> On the Explore objects page, go to the Object type drop-down list and select Subsystem (Db2). Click Apply. Registered Db2 subsystems are displayed in a table. Click the name of the subsystem (hyperlink) that you want to add an accelerator to in the Name column of the table at the bottom. Wait until the subsystem details are displayed.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Reconnect to the Db2 subsystem that you want to add an accelerator to by submitting a /source/edit API request. Return code 200 is displayed if the connection was successful.

2. Start the **Add Accelerator** wizard:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> On the menu bar of the Object List Editor, click the downward-pointing arrow next to the green plus sign. From the drop-down menu, select Add Accelerator.
IBM Data Server Manager	Click Add .
IBM Unified Experience for z/OS	In the Paired accelerators window at the bottom, click Add new + .
IBM Db2 Analytics Accelerator Administration Services	After successfully reconnecting to the data server, submit the /accelerator/add API request.

3. In the **Name** field, type a name for the accelerator.

This name is automatically copied to the **Location** field.

The location name is the unique name of the accelerator in the SYSIBM.LOCATIONS table. Mostly, this is the same name as the accelerator name.



Attention:

- If you want to connect more than one Db2 subsystem to the same accelerator, you must use a different location name for each pairing. For each IP address and port combination, the assignment to an accelerator must be logically unique. If you disregard this rule and use the same location name, you will lose the connection to the previously paired Db2 subsystem, and the data on the accelerator will be deleted. This mechanism was implemented on purpose because it ensures that a newly added accelerator is always “clean”.
- Reuse an accelerator name only if you are absolutely sure that the accelerator was stopped before it was removed.

Background: When an accelerator is paired with Db2 for z/OS, Db2 starts a heartbeat thread to monitor vital accelerator functions. This heartbeat thread is bound to the IP address of the accelerator. It continues to run if you remove the accelerator without stopping it before. The continuing thread is canceled only when you shut down Db2.

Your new accelerator will take over the still running heartbeat thread of the removed accelerator if all of the following conditions are true:

- You did not stop the accelerator before the removal.
- You did not shut down and restart Db2 for z/OS after the removal.

c. You used the name of the removed accelerator for the new accelerator.

If thereafter problems with the new accelerator occur, and you need to check the heartbeat information, you might fail to notice that this information does not pertain to the accelerator you are scrutinizing.

4. Provide the pairing code:

IBM Db2 Analytics Accelerator Studio	In the Pairing code field, type the pairing code.
IBM Data Server Manager	In the Pairing code field, type the pairing code.
IBM Unified Experience for z/OS	In the Pairing code field, type the pairing code.
IBM Db2 Analytics Accelerator Administration Services	Specify the pairing code as the value of the "pairingCode" : parameter.

5. Provide the IP address:

IBM Db2 Analytics Accelerator Studio	In the IP address field, type the IP address of the accelerator.
IBM Data Server Manager	In the IP address field, type the IP address of the accelerator.
IBM Unified Experience for z/OS	In the IP address field, type the IP address of the accelerator.
IBM Db2 Analytics Accelerator Administration Services	Specify the IP address as the value of the "ipAddress" : parameter.

6. Specify the correct port:

IBM Db2 Analytics Accelerator Studio	In the Port field, type 1400. This is the fixed port for network communication between the z/OS data server and the accelerator.
IBM Data Server Manager	The Port field is already filled with port number 1400. Leave this as is, unless you know for sure that a different port has been configured.
IBM Unified Experience for z/OS	The Port field is already filled with port number 1400. Leave this as is, unless you know for sure that a different port has been configured.
IBM Db2 Analytics Accelerator Administration Services	Specify the port number as the value of the "port" : parameter.

7. Run a connection test:

IBM Db2 Analytics Accelerator Studio	Click Test Connection to check whether the accelerator with the given address can be connected to. If the test ran successfully, click OK .
IBM Data Server Manager	Click Test Connection to check whether the accelerator with the given address can be connected to. If the test ran successfully, click OK .
IBM Unified Experience for z/OS	Not required. After clicking Submit to add the accelerator, a connection test is run automatically. When you return to the accelerator

	details page, the active connections are listed in the sub-window on the right, under Active connections .
IBM Db2 Analytics Accelerator Administration Services	Submit a /testConnection API request.

Related tasks

[Obtaining the pairing code for authentication](#)

Communication between an accelerator and a Db2 subsystem requires both components to share credentials. These credentials are generated after you submit a temporarily valid pairing code. This step is required each time you add a new accelerator. The following steps describe how to obtain the pairing code.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

DRDA connection does not work

You can ping the accelerators, but you cannot establish a distributed relational database access (DRDA) connection between your database management system and the accelerator.


Selecting an accelerator

For most of the tasks that follow in this section, one of the preparatory steps is to select the accelerator that you want to work on. This step is the same for all these tasks.

Before you begin

- You need a connection to a database that has an accelerator attached to it.
- You (your user ID) must be connected to the database and have the rights to control the accelerator.
- The status of the accelerator must be *Online*.

Procedure

- To select an accelerator from IBM Db2 Analytics Accelerator Studio:
 1. In the **Administration Explorer**, select the **Accelerators** folder.
 2. In the **Object List Editor**, double-click an accelerator name to open the corresponding **Accelerator** view.
- To select an accelerator from IBM Data Server Manager:
 1. Click  in the upper left.
 2. Select **ADMINISTER > Accelerators**.
 3. In the list of accelerators, select the name of the accelerator (row).
- To select an accelerator from IBM Unified Experience for z/OS:
 1. On the **Explore objects** page, go to the **Object type** drop-down list and select **Accelerator (Db2)**.
 2. Click **Apply**. Registered Db2 subsystems are displayed in a table.
 3. Click one of the accelerator names (hyperlinks) in the **Name** column of the table at the bottom.
 4. Wait until the accelerator details are displayed.
- In IBM Db2 Analytics Accelerator Administration Services, it is unnecessary to select an accelerator in a separate step. Instead, you provide the accelerator name in the request body of your API request.

Displaying accelerator networking details

To display the networking details of connected accelerators, such as the host names, IP addresses, and ports used, you can issue an SQL query.

About this task



The information can be extracted from certain Db2 catalog tables and system tables:

- SYSACCEL.SYSACCELERATORS
- SYSIBM.IPNAMES
- SYSIBM.LOCATIONS

Restriction: This function is not available from the IBM Db2 Analytics Accelerator Administration Services interface.

Procedure

1. Start the SQL editor that is embedded in your administration client:


IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none">a. On the toolbar of the Administration Explorer, click the downward-pointing arrow next to the New button.b. Select New SQL Script from the menu.
IBM Data Server Manager	<ol style="list-style-type: none">a. Click  in the upper left.b. Select RUN SQL. <p>Note: This option is available only if an active database connection has been selected from the drop-down list on the top banner.</p>
IBM Unified Experience for z/OS	<ol style="list-style-type: none">a. Expand (click) the  Run on the sidebar.b. Select SQL.c. From the Connections drop-down list in the upper right of the window, select a Db2 subsystem or data sharing group.

2. Copy and paste the following query in the text editing area:

```
SELECT A.ACCELERATORNAME, A.LOCATION, I.IPADDR, L.PORT
FROM SYSACCEL.SYSACCELERATORS AS A, SYSIBM.IPNAMES AS I, SYSIBM.LOCATIONS AS L
WHERE A.LOCATION = L.LOCATION AND I.LINKNAME = L.LINKNAME;
```

IBM Db2 Analytics Accelerator Studio	In IBM Db2 Analytics Accelerator Studio, the text editing area is in the script window on the right.
IBM Data Server Manager	In IBM Data Server Manager, the text editing area is in the upper half of the page, right in front of you.
IBM Unified Experience for z/OS	The text editing area comes into view after you select a Db2 subsystem from the Connections drop-down list.

3. Run the query:

IBM Db2 Analytics Accelerator Studio	a. Click  If no connection profile is selected in the Administration Explorer , the Select Connection Profile window comes up. If so, select the proper database connection profile (database server) in the Connections list. b. Click Finish .
IBM Data Server Manager	Select Run > Run all from the toolbar.
IBM Unified Experience for z/OS	Click Run .

4. View the results:

IBM Db2 Analytics Accelerator Studio	Click the Result1 tab in the lower right corner.
IBM Data Server Manager	The results are shown in the Result set pane on the lower right.
IBM Unified Experience for z/OS	The results are shown at the bottom of the page.

The results are displayed in a table.

Example

ACCELERATORNAME	LOCATION	IPADDR	PORT
BC6	BC6	203.0.113.7	1277
TF12	TF12	203.0.113.8	1400
TF3	TF3	203.0.113.9	1400

Defining tables on an accelerator

Using the **Add Tables to Accelerator** or the **Select Tables to Add** wizard, you can define accelerator-shadow tables on an accelerator.

Before you begin

- Make sure that at least one accelerator has been configured.
- Make sure that a database connection is associated with this accelerator.
- Make sure that your resource database contains tables.
- The incremental update function requires that tables have a unique key. Therefore, you might need to add unique keys to some of your source tables. If the chosen key column is neither a primary key, nor a primary index, you must explicitly specify it as an informational unique constraint. This cannot be done in IBM Db2 Analytics Accelerator Studio. You must run the SYSPROC.ACCEL_ADD_TABLES stored procedure for this purpose.

About this task

- Table columns of the type CHAR and VARCHAR can be encoded in UNICODE, EBCDIC, or ASCII.

You can add tables with differently encoded columns (EBCDIC, ASCII, and Unicode) to a single accelerator. However, a single query can only reference columns in tables that all have the same encoding.

- IBM Db2 Analytics Accelerator for z/OS does not support EDITPROC encryption. SQL encryption and decryption functions, such as DECRYPT_CHAR(), require binary table columns, which cannot be used on an accelerator. Furthermore, data that is stored in Db2 with the EDITPROC encryption tool will not be

encrypted on the hard disk of the accelerator. However, the data on an accelerator is encoded with a special algorithm for efficient compression and therefore cannot be easily extracted from the media.


This task is carried out by the SYSPROC.ACCEL_ADD_TABLES stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
3. Start adding tables:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> a. In the Object List Editor, double-click the accelerator name. b. In the Accelerator view, click Add on the toolbar, which is located above the list of tables.
IBM Data Server Manager	<ol style="list-style-type: none"> a. Select a row in the list of accelerators. b. Click the Manage button on the toolbar. c. Click the Add button on the toolbar.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> a. In the accelerator details window, click the Tables tab. b. Click the Add + button.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> a. Start a /table/addSelectedTables API request. Specify the connection name, accelerator name, schema names and table names in the request body. b. Click Execute.

4. If the list of tables is long, narrow the choice by using a filter. A filter is available in all supported administration clients, except IBM Db2 Analytics Accelerator Administration Services.

IBM Db2 Analytics Accelerator Studio	<p>In the Add Tables to Accelerator window, you see a list of all available schemas and tables under Available tables.</p> <p>Type the names of schemas or tables in the Name like filter field, either fully or partially, to display just schemas and tables bearing or starting with that name. The names of tables that have already been selected are grayed out.</p>
IBM Data Server Manager	<p>In the Select Tables to Add window, you see a list of all available schemas and tables.</p> <p>Click  to display the search field. Type the names of schemas or tables in the search field, either fully or partially, to display just schemas</p>




	and tables containing your search string. The names of tables that have already been selected are grayed out.
IBM Unified Experience for z/OS	<p>In the Add tables window, you can see the following filter fields:</p> <ul style="list-style-type: none"> • Schema filter • Table filter <p>In these fields, you can enter a search string to search for schemas, tables, or both.</p> <p>In front of each of these filter fields, you find a drop-down list with the values Starts and Contains. Starts is the default value. When it is selected, the filter function searches for schema names or table names that start with the specified character or character string.</p> <p>If you select Contains instead, the filter function searches for schemas or tables that contain the specified string.</p> <p>Click Search to apply the filter and start searching.</p>
IBM Db2 Analytics Accelerator Administration Services	N/A


5. Select the tables.

The list of selectable items is organized hierarchically. At first, you might only see the available schemas. If you click the twistie in front of a schema name, the tables belonging to the schema come into view.




You cannot select accelerator-only tables because these tables already exist on an accelerator. Entries for these tables are listed, but are grayed out. Apart from the different icon, you find the information *already added* in parentheses to identify the table as an accelerator-only table. Remember that accelerator-only tables are created by a `CREATE TABLE . . . IN ACCELERATOR` SQL statement.

The **Unsupported Columns** column lists the unsupported columns in each Db2 table (if any). If possible, do not select tables with unsupported columns because such columns are not loaded on the accelerator. Queries referencing such columns cannot be accelerated. In most cases, a column is not supported because its data type cannot be handled by IBM Db2 Analytics Accelerator for z/OS.

IBM Db2 Analytics Accelerator Studio	<ul style="list-style-type: none"> • To define a single table on the selected accelerator, select its name under Available tables, in the Name column, and click  to move the column to the Tables to be added list. To select multiple tables, hold down the CTRL key and click the names of the tables that you want to add. To move all visible tables to the Tables to be added list, click . • To correct your choice and remove a table from the Tables to be added list, select it in the Name column of that list and click  to move the table back to the Available tables list.
--------------------------------------	---


	<p>To remove all tables from the Tables to be added list, click .</p> <p>Note: Detecting unsupported columns takes a long time if IBM Db2 Analytics Accelerator Studio has to connect to a database with numerous tables. To save this time, you can suppress the display of unsupported columns. To do so, go to Window > Preferences > IBM Db2 Analytics Accelerator > Accelerator View and clear the Check for unsupported columns check box.</p>
IBM Data Server Manager	<ul style="list-style-type: none"> • To add all schemas (including all tables), select the check box in front of the column label SCHEMA NAME. • To add all tables belonging to a schema, select the check box in front of a schema name. • To add individual tables, click the twistie in front of a schema name to expand the list of tables belonging to that schema. Then select the check box in front of one or more table names.
IBM Unified Experience for z/OS	<ul style="list-style-type: none"> • To add all schemas (including all tables), select the check box in front of the column label Schema name. • To add all tables belonging to a schema, select the check box in front of a schema name. • To add individual tables, click the twistie in front of a schema name to expand the list of tables belonging to that schema. Then select the check box in front of one or more table names. • To clear your filter settings and start over, click Clear.
IBM Db2 Analytics Accelerator Administration Services	N/A

If a Db2 source table was created after IBM Db2 Analytics Accelerator Studio connected to a Db2 subsystem on the data server, you might be unable to locate this table in the list. In such a case, click the refresh button:

IBM Db2 Analytics Accelerator Studio	
IBM Data Server Manager	
IBM Unified Experience for z/OS	<p>a. Click Cancel to return to the accelerator details page.</p> <p>b. Click the icon depicting two circular arrows in the upper right of the window. </p>

	c. Click Add + again to return to the Add tables window.
IBM Db2 Analytics Accelerator Administration Services	N/A

In IBM Db2 Analytics Accelerator Studio, the problem can also occur if you have defined a filter in the **Administration Explorer** or in the **Properties** section of a database connection profile. If so, proceed as follows:

- a. Close the **Add Tables** window.
 - b. Remove the filter.
 - c. Reopen the **Add Tables** window.
 - d. Click .
6. Confirm by closing the **Add Tables** or **Select Tables to Add** wizard.

IBM Db2 Analytics Accelerator Studio	Click Finish .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Add .
IBM Db2 Analytics Accelerator Administration Services	N/A

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Determining the status of an accelerator

See how to check the status of an accelerator.

Before you begin

- A database connection profile must exist for the database that is associated with the accelerator.
- You (your user ID) must be connected to the database.

About this task

This task is carried out by the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
3. View the status:

IBM Db2 Analytics Accelerator Studio	The status is displayed on top of the page that is displayed.
--------------------------------------	---

IBM Data Server Manager	The Acceleration Status of the selected accelerator is displayed in the lower half of the window.
IBM Unified Experience for z/OS	The status is shown in the Key information box on the Overview tab.
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /accelerator/getAcceleratorStatus request.</p> <p>b. In the request body, specify the connection name, the accelerator name, and your authorization token.</p> <p>c. Click Execute.</p> <p>If your request could be executed successfully (return code 200), you find the status information in the response body.</p>

Related tasks

Enabling an accelerator

Queries can only be routed to an accelerator if the accelerator has been enabled in Db2 for z/OS.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Enabling an accelerator

Queries can only be routed to an accelerator if the accelerator has been enabled in Db2 for z/OS.


Before you begin

- You need a connection to a database that has an accelerator attached to it.
- You (your user ID) must be connected to the database and have the rights to control the accelerator.
- The **Acceleration** status of the accelerator must be *Stopped*.

Procedure

Use one of the following methods to enable an accelerator:

- On the command-line in Db2 for z/OS, enter **-start ACCEL <name>** where <name> is the name of the accelerator.
- In your administration client:
 - a) Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see [“Connecting to a database server”](#) on page 124.
 - b) Select the accelerator. For more information, see [“Selecting an accelerator”](#) on page 135.
 - c) Start the accelerator:

IBM Db2 Analytics Accelerator Studio	Click  on the toolbar.
IBM Data Server Manager	Click the Start button on the toolbar.
IBM Unified Experience for z/OS	In the upper right corner, locate the Accelerator actions button and select Accelerator actions > Start acceleration .

IBM Db2 Analytics Accelerator Administration Services	<p>a. Start an /accelerator/startStopAccelerator request.</p> <p>b. In the request body:</p> <ul style="list-style-type: none"> i) Specify the connection name ("connectionName":). ii) Specify the accelerator name ("accelName":). iii) Set "startAccel": to the value true. <p>c. Click Execute.</p>
---	---

This invokes the Db2 command **-START ACCEL** on your data server.

Results

When an accelerator has been enabled, its acceleration status changes to *Started*.

Related tasks

Disabling an accelerator

You can disable an accelerator to prevent the routing of queries to this accelerator.

Disabling an accelerator

You can disable an accelerator to prevent the routing of queries to this accelerator.

Before you begin


- You need a connection to a database that has an accelerator attached to it.
- You (your user ID) must be connected to the database and have the rights to control the accelerator.
- The status of the accelerator must be *Online*.




About this task

Disabling an accelerator is recommended, for example, before you update software on the data server or on the accelerator. You can also disable an accelerator temporarily to compare response time. During the disablement, all queries are processed by Db2. You might also want to disable an accelerator for maintenance tasks. However, it is not necessary to disable an entire accelerator for maintaining accelerator-shadow tables; each table can be disabled individually.

Procedure

- On the command-line in Db2 for z/OS, enter **-stop ACCEL <name>** where <name> is the name of the accelerator.
- In your administration client:
 - a) Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see [“Connecting to a database server”](#) on page 124.
 - b) Select the accelerator. For more information, see [“Selecting an accelerator”](#) on page 135.
 - c) Stop the accelerator:

IBM Db2 Analytics Accelerator Studio	<p>– Click  to disable the selected accelerator without canceling running queries. The accelerator status first changes to <i>Stopping</i>,</p>
--------------------------------------	--

	<p>then to <i>Stopped</i>. During the <i>Stopping</i> phase, running queries are completed.</p> <p>– Click the  button on the right of the  button and select Force from the menu to disable the selected accelerator and cancel all running queries. The status of the accelerator changes to <i>Stopped</i> immediately.</p> <p>Note: Clicking the stop button does not make an accelerator unusable or remove it from the configuration. It just deactivates it. To restart an accelerator, click the  button on the toolbar.</p>
IBM Data Server Manager	<p>Click the Stop button on the toolbar. The accelerator status first changes to <i>Stopping</i>, then to <i>Stopped</i>. During the <i>Stopping</i> phase, running queries are completed.</p> <p>Note: Clicking the stop button does not make an accelerator unusable or remove it from the configuration. It just deactivates it. To restart an accelerator, click the Start button on the toolbar.</p>
IBM Unified Experience for z/OS	<p>In the upper right corner, locate the Accelerator actions button and select Accelerator actions > Stop acceleration.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>Start an /accelerator/startStopAccelerator request.</p> <p>In the request body:</p> <ol style="list-style-type: none"> Specify the connection name ("connectionName":). Specify the accelerator name ("accelName":). Set "startAccel": to the value false. <p>Click Execute.</p>

Results

When an accelerator has been disabled, its acceleration status changes to *Stopped*.

Enabling or disabling an accelerator for members of a data sharing group

If an accelerator is attached to a Db2 data sharing group, you can enable or disable acceleration individually for each member of the group.

Procedure

1. In the **Administration Explorer**, select the **Accelerators** folder.

2. In the **Object List Editor**, double-click an accelerator to open the **Accelerator** view.
3. In the header of the Accelerator view, next to the **Acceleration** status, click the **Change** link.
4. The **Start / Stop Acceleration** window lists all members of the data sharing group and shows their acceleration status. To enable or disable the accelerator for members of the data sharing group, select the appropriate check boxes in front of the member names.
If the group contains many members, you can speed up the process by using the **Select All** and **Deselect All** buttons.
5. Click one of the following buttons on top of the list:
 - Start**
To enable the accelerator for the selected members
 - Stop**
To disable the accelerator for the selected members
 - Stop Force**
To disable the accelerator immediately, that is, without waiting for the completion of not yet finished queries.
6. Click **Close** when finished or **Cancel** to close the window without making changes.

Loading tables

Successful queries against accelerator-shadow tables are possible only if the tables contain data. Therefore, you must load the tables after their definition (empty structure) has been copied to the accelerator.

Before you begin

- A database connection profile must exist for the database that is associated with the accelerator.
- You (your user ID) must be connected to the database. Your user ID requires privileges to:
 - Control the accelerator
 - Read the data to be loaded into the accelerator
- The accelerator-shadow tables that you want to load or update must exist on the accelerator.

About this task

- Loading accelerator-shadow tables can take a long time (for example minutes or hours) depending on the amount of data in the original Db2 tables.
- An external product can be used to speed up and facilitate the load process: the Db2 Analytics Accelerator Loader, which can also load external, non-Db2 for z/OS data into accelerator-shadow tables and comes with extra load options.
- The disk throughput can be volatile, depending on the disk configuration, the placement of data sets, the number of parallel I/O operations, and so on. To a large extent, the throughput depends on the following factors:
 - Partitioning of tables in your Db2 subsystem. In Db2 for z/OS, this determines the degree of parallelism that can be used internally by the Db2 Unload Utilities.
 - Number of DATE, TIME, and TIMESTAMP columns in your original table. The conversion of the values in such columns is CPU-intensive.
 - Compression of data in Db2 for z/OS.
 - Number of available processors.
 - Workload Manager (WLM) configuration.
 - Workload on the IBM Z server.
 - Workload on the accelerators.

- During a load, IBM Db2 Analytics Accelerator automatically selects a suitable distribution key.

Restrictions:

- IBM Db2 Analytics Accelerator for z/OS does not support EDITPROC encryption. SQL encryption and decryption functions, such as `DECRYPT_CHAR()`, require binary table columns, which cannot be used on an accelerator. Furthermore, data that is stored in Db2 with the EDITPROC encryption tool will not be encrypted on the hard disk of the accelerator. However, the data on an accelerator is encoded with a special algorithm for efficient compression and therefore cannot be easily extracted from the media.
- During a load process, you cannot close IBM Db2 Analytics Accelerator Studio or the database connection before the loading has finished.
- Incremental updates are not restarted automatically if you enable these for just one table and complete the enablement steps in this order:
 1. Define the accelerator-shadow table.
 2. Enable incremental updates for this table.
 3. Load the accelerator-shadow table.
 4. Start incremental updates (**Replication** > **Start**).
 5. Reload the accelerator-shadow table.

Normally, when this is done for more than one table, incremental updates continue or are restarted for all tables that are not being loaded or where loading has been finished, which finally results in an automatic restart for all tables. In this special case (just one table), however, you must restart incremental updates manually after the reload.

- If you change the partitioning type of the table space of an accelerator-shadow table in Db2 for z/OS (for example, from *segmented* to *partitioned by growth*), you can no longer load the accelerator-shadow table. The operation will fail. Therefore, you must remove the table from the accelerator and redefine it after changing the partitioning type.
- After a load, a replication-enabled accelerator-shadow table goes into *Suspended* state if someone has stopped replication during the load.

Suspended means that the table is skipped when incremental updates are applied. To make this table part of the incremental update process again, you must reload it.

You can also integrate the loading and updating of accelerator-shadow tables into your scheduled ETL processes by invoking the `SYSPROC.ACCEL_LOAD_TABLES` stored procedure directly from a job that is run by your preferred scheduler (for example, Tivoli® workload scheduler).

Table loading is carried out by the **`SYSPROC.ACCEL_LOAD_TABLES`** stored procedure on your data server. In addition, the **`SYSPROC.ACCEL_SET_TABLES_ACCELERATION`** stored procedure is invoked to enable acceleration for the loaded table.

For information about the privileges that are required to run these procedures and further details, see *Appendix C. Required access rights* in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related information** at the end of this section.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
3. In IBM Unified Experience for z/OS, click the **Tables** tab. In IBM Db2 Analytics Accelerator Studio or IBM Data Server Manager, scroll down. You see a list of the tables on the accelerator. Select the accelerator-shadow tables that you want to load.

To see the tables, you might have to expand the schema nodes first, by clicking the plus sign or twistie in front of a schema name. Selecting an entire schema will select all accelerator-shadow tables belonging to that schema for loading.

4. Prepare the load:

IBM Db2 Analytics Accelerator Studio	Click the Load button on the toolbar.
IBM Data Server Manager	Click the Load button on the toolbar.
IBM Unified Experience for z/OS	Select Take action > Load on the toolbar above the list of tables.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none">a. Start a /table/partition/load API request.b. In the request body:<ol style="list-style-type: none">i) Specify the connection name ("connectionName":).ii) Specify the accelerator name ("accelName":).

In the graphical user interfaces (IBM Db2 Analytics Accelerator Studio, IBM Data Server Manager, and IBM Unified Experience for z/OS), a secondary window opens. In this window, you can select further options.

Note: Comparable parameters for these options are not available in IBM Db2 Analytics Accelerator Administration Services.

In the graphical user interfaces, the list in this **Load Tables** window contains a column labeled **Load Recommended**. The information in this column is supposed to help you with the selection. A comparable parameter is not available in IBM Db2 Analytics Accelerator Administration Services. Because table loads are long-running processes, only load or reload an accelerator-shadow table or partition when necessary.

Important:

- You can only select table partitions if the tables are partitioned by range or partitioned by growth, and if they were already loaded in the past. In all other cases, you can only load entire tables.
- The information in the **Load Recommended** column might be inaccurate if Db2 realtime statistics are not up-to-date (RUNSTATS) or if incremental updates have been applied to the accelerator-shadow table since the last load.

The **Load Recommended** column contains one of the following statuses for each table or partition:

No - data unchanged

Table or partition data has not changed in Db2 for z/OS. Therefore, you need not load or reload the accelerator-shadow table or partition.

Yes - changed data

A load or reload of the accelerator-shadow table or partition is recommended because data changes have been applied to the original Db2 for z/OS tables.

Unknown - no statistics

A load or reload of the accelerator-shadow table or partition is recommended because the current status of the table or partition cannot be determined. It must therefore be assumed that the table is out of sync. The reason might be that access to Db2 statistics is not available or that the last successful invocation of RUNSTATS was some time ago.

Unknown - replication enabled

Data changes have been detected since the last load of the accelerator-shadow table, but the table is currently enabled for incremental updates. The data changes are propagated asynchronously by the incremental update function, but it can not be determined whether the table is already in sync. A reload is usually not required under this condition.

Yes - enforced

A partition with a value of **Yes - enforced** in the **Load Recommended** column will always be loaded if the entire accelerator-shadow table is selected for loading. A possible reason is that the partition is in *InitialLoadPending* state because it has never been loaded before.

If the list of tables and partitions is long, you can apply a filter to hide certain items from the display. To do so, select a different value from the **Show recommended** drop-down list (in IBM Data Server Manager, this drop-down list has no label). The following choices are available:

All (default)

Displays all accelerator-shadow tables and partitions.

All recommended

Displays only the accelerator-shadow tables and partitions for which a load or reload is recommended.

No - data unchanged

Displays only the accelerator-shadow tables and partitions that need not be loaded or reloaded.

Yes - changed data

Displays only the accelerator-shadow tables and partitions for which a load or reload is recommended because data in the original tables has changed.

Unknown - no statistics

Displays only the accelerator-shadow tables and partitions for which a load or reload is recommended because the status cannot be determined.

Yes - enforced

Displays only the accelerator-shadow tables and partitions for which a load or reload will be enforced.

5. Select the appropriate tables or partitions.

IBM Db2 Analytics Accelerator Studio	<p>Select the appropriate check boxes in front of the table or partition names, or use the buttons on the right:</p> <p>Select All Selects all tables and partitions that are shown in the Load Tables window.</p> <p>Deselect All Deselects all tables and partitions.</p> <p>Select Recommended Selects all accelerator-shadow tables and partitions for which a load or reload is recommended in the Load Recommended column.</p> <p>Expand All Expands all table nodes so that the partitions come into view.</p> <p>Collapse All Collapses all table nodes so that the table partitions are hidden from view.</p> <p>Next Unknown Jumps to and selects the next accelerator-shadow table or partition with a status of Unknown - no statistics in the Load Recommended column. This might prove useful if the list is crowded.</p>
IBM Data Server Manager	Select the appropriate check boxes in front of the table or partition names.

	To quickly select just the tables and partitions for which a load is recommended, click the Select Recommended button.
IBM Unified Experience for z/OS	<p>Select the appropriate check boxes in front of the schema or partition names.</p> <p>To quickly select just the tables and partitions for which a load is recommended, select Select the recommended items from the table below.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>Specify the tables in an array that serves as the value of the "selTables" parameter. This array, in which you specify the schemas, tables, and table partitions, must be structured as follows:</p> <pre> "selTables": [{ "schemaName": "SYSABC", "tables": [{ "name": "TABLE01", "partitions": [{ "name": "-" }] }, { "name": "TABLE02", "partitions": [{ "name": "-" }] }] }, { "schemaName": "SYSDEF", "tables": [{ "name": "TABLE03", "partitions": [{ "name": "-" }] }] }] </pre>

6. Specify the locking behavior:

In the graphical user interfaces, select **Lock Db2 tables while loading** if you want to protect (lock) the original tables or table partitions in the database against changes during the load operation:

All Tables

Protects the Db2 source tables of to-be-loaded accelerator-shadow tables against changes during the load operation.

Data availability

Newly loaded data becomes available for queries when the load job has been finished for the entire table set.

Error behavior

If an error occurs while loading one of the tables in the set, the load job for that table is aborted, and the job proceeds with the next table in the set. Message AQT20121E is issued in case of a load error.

Current Table

Protects just the Db2 source table of the accelerator-shadow tables that is currently being loaded.

Data availability

Newly loaded data in a table becomes available for queries when the load job for that table has been finished and when the entire operations has moved on to the next table in the set.

Error behavior

If an error occurs while loading one of the tables in the set, the load job for that table is aborted, and the job proceeds with the next table in the set. Messages:

- Message AQT20121E is returned if the load of all tables in the set failed.
- Message AQT10420W is issued for each single table after a failure to load that table

Current Partitions

Protects the original Db2 table-space partition of the accelerator-shadow table partition to be loaded against changes during the load. With this setting, a non-partitioned table is always locked completely.

Note: Locks at partition level are not supported for Db2 for Linux®, UNIX, and Windows.

Data availability

Newly loaded data in a table partition becomes available for queries when the load job for that partition has been finished and when the entire operations has moved on to the next partition or table.

Error behavior

If an error occurs while loading a table partition, the load job for that partition is aborted, and the job proceeds with the next partition to be loaded. An error has no effect on other partitions or tables to be loaded; the job continues. Messages:

- Message AQT20121E is returned if the load of all tables or all partitions of a partitioned table in the set failed.
- Message AQT10421W is issued for each partition after a failure to load that partition.

Special cases

To avoid partially loaded tables, lock mode TABLE is applied during an initial load, even if you specified lock mode PARTITIONS. For details, see the description of lock mode TABLE.

If the reload of a partition that is enabled for incremental updates fails, incremental updates are disabled for the entire table even if the reload of the other table partitions succeeded.

NONE

No locking at all. However, only committed data is loaded into the accelerator-shadow tables because the Db2 data is unloaded with isolation level CS and SKIP LOCKED DATA.

Data availability

Data availability is the same as for lock mode PARTITIONS.

Error behavior

The error behavior is the same as for lock mode PARTITIONS.

Note: In IBM Db2 Analytics Accelerator Administration Services, you can apply a lock option if you set the "lockEnabled": parameter to true, and then specify the locking behavior as the value of the "lockType": parameter. Example:

```
{
  "connectionName": "My_DB2",
  "accelName": "ACCEL01",
  "lockEnabled": true,
  "accelerationEnabled": false,
  "lockType": "All Tables",
  "selTables": [
    .
    .
    . ]
}
```

7. In the graphical user interfaces, the option **After load enable acceleration for disabled tables** ensures that you can run accelerated queries against all accelerator-shadow tables immediately after the completion of the load operation. It is selected by default. In IBM Db2 Analytics Accelerator Administration Services, this option is enabled by setting the value of "accelerationEnabled" : to true. It is recommended that you always use this option. Turn it off only if there is a good reason to do so.

The following scenario is thinkable: the table is big and one or more columns could not be loaded because their data type is not supported. These columns, however, would have held the crucial data. In this case, it makes perfect sense to switch the option off to prevent a waste of processing resources.

8. Start the load process:

IBM Db2 Analytics Accelerator Studio	Click OK .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Load .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Note: If the load fails, first check whether DSNUTIL was started in Db2 for z/OS.

Related concepts

Updating accelerator tables continually

The incremental update function of IBM Db2 Analytics Accelerator for z/OS allows you to update accelerator-shadow tables continually. Changes to the data in original Db2 for z/OS tables are thus propagated to the corresponding target tables with a high frequency and just a brief delay. This way, query results from an accelerator are always extracted from recent, close-to-real-time data.

Distribution keys

A distribution key determines how tables rows are distributed among the available working nodes. IBM Db2 Analytics Accelerator for z/OS selects a suitable distribution key automatically when tables are loaded. The distribution varies between the two extremes: an even distribution (called random distribution) without the use of a key and a maximally skewed distribution that uses a distribution key.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

[IDLE THREAD TIMEOUT field \(IDTHTOIN subsystem parameter\)](#)

Enabling tables for query acceleration

You can permit or prevent the sending of queries to an accelerator by enabling or disabling the corresponding accelerator-shadow tables.

Before you begin

- You need a connection to a database that has an accelerator attached to it.
- You (your user ID) must be connected to the database and have the rights to control the accelerator.
- The tables must have been defined on the accelerator.

About this task

After its creation, an accelerator-shadow table is in *load pending* state. Query acceleration is disabled for tables in this state. The *load pending* state is also reached when an error has led to an operation failure. Also, when data has been loaded into a table, the table is not automatically enabled. Therefore, you must enable the table so that it becomes *active* and will thus be used in accelerated queries. You can disable or re-enable a loaded accelerator-shadow table by switching query acceleration for this table on or off. To enable a table, the table must be in *loaded* or *update in progress* state.

If partitions of a table have been archived by the High Performance Storage Saver, these partitions no longer belong to the regular accelerator-shadow table. Enabling this table for accelerated queries will thus not enable the archived partitions. To include archived partitions in accelerated queries, you must therefore use the GET_ACCEL_ARCHIVE special register in your queries or set this option as a ZPARM.

Tip: If you want to disable all tables, it is better to stop the entire accelerator. For more information, see the link under **Related tasks** at the end.

The task of enabling tables for query acceleration is carried out by the **SYSPROC.ACCEL_SET_TABLES_ACCELERATION** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

When an accelerator-shadow table has been enabled, the corresponding entry in the ENABLED column of the SYSACCEL.SYSACCELERATEDTABLES is set to ON. Although an accelerator-shadow table can exist on more than one accelerator, it can be enabled on only one accelerator. If a table is in a state that does not permit enabling, the operation ends abnormally and the enablement is canceled.

Important:

- Query acceleration can be always disabled regardless of the state an accelerator-shadow table is in. This is useful if you need to recover from an error situation in which an accelerator is down or unreachable.
- You might have to reload or even remove tables from an accelerator after the execution of an ALTER TABLE or ALTER TABLESPACE statement in Db2 for z/OS. For more information, see *What to do after changing a table or table space in Db2 for z/OS* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see “Selecting an accelerator” on page 135.
3. Select the tables you want to enable. In IBM Db2 Analytics Accelerator Studio, you might have to scroll down to the list of tables.
4. Enable acceleration for the selected tables:

IBM Db2 Analytics Accelerator Studio	Select Acceleration > Enable from the toolbar.
IBM Data Server Manager	Select Acceleration > Enable Acceleration from the toolbar.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> a. On the accelerator details page, click the Tables tab. b. Scroll down to the list of tables. c. Select the tables to enable: <ol style="list-style-type: none"> i) To enable acceleration for all schemas (that is, all tables in all schemas), select the check box in front of the column label Schema name. ii) To enable acceleration for all tables belonging to a schema, select the check box in front of a schema name.

	<p>iii) To enable acceleration for individual tables, click the twistie in front of a schema name to expand the list of tables belonging to that schema. Then select the check box in front of one or more table names.</p> <p>d. On the toolbar above the list of tables, select Take action > Enable acceleration.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /table/enableDisableAcceleration request.</p> <p>b. In the request body:</p> <ul style="list-style-type: none"> i) Specify the connection name ("connectionName":). ii) Specify the accelerator name ("accelName":). iii) Specify the tables in an array that serves as the value of the "selTables" parameter. The first-level elements in this array must be JSON objects (key-value pairs), in which the key is the schema name, followed by the value, which is an array that contains the names of the tables belonging to that schema. Separate these table names by a comma. Also separate the JSON objects by a comma. Example: <pre> "selTables": [{ "SYSABC": ["TABLE01", "TABLE02"] }, { "SYSDEF": ["TABLE01"] }], </pre> <p>c. Set the "enableAcceleration": parameter to the value true.</p> <p>d. Click Execute.</p>

Results

Queries against these tables are accelerated if the associated accelerator has been started.

Related tasks

[Disabling query acceleration for tables](#)

You can disable accelerated queries against selected tables without entirely disabling the associated accelerator.

[Loading tables](#)

Successful queries against accelerator-shadow tables are possible only if the tables contain data. Therefore, you must load the tables after their definition (empty structure) has been copied to the accelerator.

[Disabling an accelerator](#)

You can disable an accelerator to prevent the routing of queries to this accelerator.

Related reference

What to do after changing a table or table space in Db2 for z/OS

In a number of cases, an ALTER TABLE or ALTER TABLESPACE statement in Db2 for z/OS does not involve maintenance work on your accelerator-shadow tables. There are cases, however, in which it does. See which steps you might have to take.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Disabling query acceleration for tables

You can disable accelerated queries against selected tables without entirely disabling the associated accelerator.

Before you begin

- You need a connection to a database that has an accelerator attached to it.
- You (your user ID) must be connected to the database and have the rights to control the accelerator.
- The tables that you want to disable must have been added to the accelerator.

About this task

The task of disabling tables is carried out by the SYSPROC.ACCEL_SET_TABLES_ACCELERATION stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Select the accelerator. For more information, see [“Selecting an accelerator”](#) on page 135.
2. Select the tables you want to disable. In IBM Db2 Analytics Accelerator Studio, you might have to scroll down to the list of tables.
3. Disable acceleration for the selected tables:

IBM Db2 Analytics Accelerator Studio	Select Acceleration > Disable from the toolbar.
IBM Data Server Manager	Select Acceleration > Disable Acceleration from the toolbar.
IBM Unified Experience for z/OS	<ol style="list-style-type: none">a. On the accelerator details page, click the Tables tab.b. Scroll down to the list of tables.c. Select the tables to enable:<ol style="list-style-type: none">i) To enable acceleration for all schemas (that is, all tables in all schemas), select the check box in front of the column label Schema name.ii) To enable acceleration for all tables belonging to a schema, select the check box in front of a schema name.iii) To enable acceleration for individual tables, click the twistie in front of a schema name

	<p>to expand the list of tables belonging to that schema. Then select the check box in front of one or more table names.</p> <p>d. On the toolbar above the list of tables, select Take action > Disable acceleration.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /table/enableDisableAcceleration request.</p> <p>b. In the request body:</p> <ul style="list-style-type: none"> i) Specify the connection name ("connectionName":). ii) Specify the accelerator name ("accelName":). iii) Specify the tables in an array that serves as the value of the "selTables" parameter. The first-level elements in this array must be JSON objects (key-value pairs), in which the key is the schema name, followed by the value, which is an array that contains the names of the tables belonging to that schema. Separate these table names by a comma. Also separate the JSON objects by a comma. Example: <pre> "selTables": [{ "SYSABC": ["TABLE01", "TABLE02"] }, { "SYSDEF": ["TABLE01"] }], </pre> <p>iv) Set the "enableAcceleration" parameter to the value false.</p> <p>c. Click Execute.</p>

Results

This disables query acceleration for the selected tables only. Other tables that are associated with the same accelerator are not affected.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Specifying or changing a distribution key or organizing keys

Distribution and organizing keys have a considerable impact on the query response time.

About this task

Distribution keys and organizing keys can influence the query response time positively as well as negatively. Therefore, make sure that you only select such keys when necessary, and that you select a proper key.

Important: This product allows the setting of distribution keys for accelerator-only tables. The description of this type of key in this topic applies to accelerator-only tables in the same way. However, due to the different nature of accelerator-only tables, a distribution key must be set as part of the CREATE TABLE ... IN ACCELERATOR statement.

Organizing keys, on the other hand, are still not supported for accelerator-only tables.

Distribution key: The default behavior is: If the tables involved have an enforced unique constraint in Db2 for z/OS (unique index), the index that consists of the fewest table columns is taken as the distribution key during the initial load of the table data. If none of the tables has such an index, the data (table rows) is distributed evenly among the processing nodes (random distribution).

In general, unique key columns, such as primary keys or columns with a unique index, are a good choice for a distribution key because all values are distinct, which leads to an even distribution of the data across the database partitions. Unique key columns are also often used as join columns for table joins in queries. Joining tables on distribution key columns results in a collocated join of the tables in the database partition that the data resides in. This optimizes the query performance.

The default distribution key can be set or changed to a single column or a set of columns of your choice after you have added or loaded a table on the accelerator. Note that setting the distribution key after you have added the table (but not loaded it yet) is much faster than changing it after you have loaded the table because no data must be redistributed. Consider the following points as you select columns for a distribution key:

- The table data should be distributed evenly across all database partitions.

Columns that allow NULL as a value are not a good choice if many NULL values can be expected. The reason is that all rows with a NULL in the specified column will end up in the same database partition.

- The key should effect a collocation of rows that are commonly fetched together from different tables.

Use as few columns as possible in the distribution key to achieve this. For example, you might be able to use only the column that most frequently acts as a join column in your queries.

You can discard the default distribution key and change to a random distribution only after you have loaded the relevant table on the accelerator. This is what the **Random distribution without a distribution key** check box signifies.

If **Random distribution without a distribution key** is selected, all table rows are distributed sequentially to the database partitions (random distribution), so that each partition receives an equal share of the data. Expect an advantage of a change from a distribution key to random distribution only under the following conditions:

- The data is not distributed evenly.
- The use of the key did not result in collocated joins for most queries.

Unless both of these conditions apply, it is better to use a single column or a set of columns as the distribution key. If random distribution is used because a table does not contain a unique constraint in Db2 for z/OS, keep this setting for small tables only. For large tables, select a distribution key according to the guidelines above.

Organizing keys: An organizing key further enhances the performance in that it sorts table rows into blocks with equal values in the selected columns. The query engine can thus process incoming rows more quickly, as less time is required to scan the rows. Since the rows are distributed for processing in blocks, entire blocks can be skipped if the value in a particular column does not match a selection criterion specified in the query. It is not necessary to scan the entire accelerator-shadow table on disk.

Important:


- An organizing key has no effect if the table is too small. The **Organized** column in the **Accelerator** view reflects this by not showing a value for the degree of organization (percentage).
- Do not change the keys of more than one table at a time if tables with sizes of more than 1 GB are involved.

- An organizing key can only be changed after a table has been loaded because the key change effects a resorting of the table. And after the next reload, the organizing key and the sorting are lost, so that the key must be set again.

This task of altering or changing distribution keys or organizing keys is carried out by the **SYSPROC.ACCEL_ALTER_TABLES** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
3. Open the window to change the keys:




IBM Db2 Analytics Accelerator Studio	<p>Click the Alter Keys button on the toolbar.</p> <p>You see the Alter Distribution or Organizing Keys window.</p> <p>The list on the left has a Recommendation column, which suggests certain columns to be used in a distribution key or as organizing keys. Suggestions are made on the basis of a previous run of Db2 RUNSTATS. So if no recommendations can be seen, use RUNSTATS and then return to the Alter Distribution or Organizing Keys window.</p> <p>RUNSTATS also calculates the column cardinality (Cardinality in the selection list). This is the number of distinct values in a column. The higher this number, the better a column is suited as a distribution key.</p>
IBM Data Server Manager	<p>Click the Alter Keys button on the toolbar.</p> <p>You see the Alter Distribution and Organizing Keys window.</p> <p>The list of table columns contains a RECOMMENDED column, which suggests certain columns to be used in a distribution key or as organizing keys. Suggestions are made on the basis of a previous run of Db2 RUNSTATS. So if no recommendations can be seen, use RUNSTATS and then return to the Alter Distribution and Organizing Keys window.</p>
IBM Unified Experience for z/OS	<p>a. In the list of tables, select a table that you want to set a key on.</p> <p>b. Click the  icon for that table, which is located in the very right column of the tables list.</p>

	c. From the menu that opens, select Alter keys .
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /table/alterKeys request.</p> <p>b. In the request body:</p> <ul style="list-style-type: none"> i) Specify the connection name ("connectionName":). ii) Specify the accelerator name ("accelName":).

Important: The RUNSTATS utility cannot collect statistics for accelerator-only tables because the data of this type of table does not reside in Db2. Hence key recommendations that rely on Db2 statistics cannot be given. You only find key recommendations for accelerator-only tables if these can be derived from the column data type.

4. To specify a distribution key:



IBM Db2 Analytics Accelerator Studio	<p>a. If random distribution is currently selected for the table, clear the Random distribution without a distribution key check box. This enables the controls for the definition of a distribution key.</p> <p>b. In the Alter Distribution or Organizing Keys window, you see a list of the columns in the selected table. To specify a column as the distribution key or as part of it, select the column in the list and click the right-arrow button.</p> <p>The Name like filter field makes it easier to find particular columns if the list is long. Type a column name in this field, either fully or partially, to display just the columns bearing or starting with that name. The names of columns that are currently selected as keys are grayed out.</p> <p>Selected columns appear in the upper list box on the right. You can remove a selected column by first selecting it in this box, and then clicking the left-arrow button.</p> <p>Using the buttons with the upward-pointing and downward-pointing arrows, you can change the order of the columns in the key. The order of the columns in the list has an influence on the hash value that is calculated to determine the target processing node. To place the rows of joined tables on the same processing node, the distribution keys of all tables must yield the same hash value. It is therefore important to specify the distribution key columns for all tables in the same order.</p> <p>c. Repeat this step to add further columns to the key. A maximum of four columns is allowed.</p>
--------------------------------------	--


IBM Data Server Manager	<p>a. To select a column for a distribution key, select the corresponding check box in the DISTRIBUTION KEY column.</p> <p>You can use a filter to find particular columns:</p> <p>Click  to display the search field. Type the names of columns you are looking for in the search field, either fully or partially. This will display just the column names that contain your search string.</p> <p>Selected columns appear in a small list or table on the lower left. You can remove a selected column from this list by clearing the check box in the DISTRIBUTION KEY column.</p> <p>Selecting an entry in the small list on the lower left and using the Move Up and Move Down buttons, you can change the order of the columns in the key. The order of the columns in the list has an influence on the hash value that is calculated to determine the target processing node. To place the rows of joined tables on the same processing node, the distribution keys of all tables must yield the same hash value. It is therefore important to specify the distribution key columns for all tables in the same order.</p> <p>b. Repeat the previous step to add further columns to the key. A maximum of four columns is allowed.</p>
IBM Unified Experience for z/OS	<p>In the Alter keys window, you see a list of the table columns.</p> <p>a. Select a column to include in the distribution key.</p> <p>b. Click the  icon for that column.</p> <p>c. Select Add to distribution keys.</p> <p>The column name is added to the Distribution keys box on the right.</p> <p>d. Repeat steps “4.a” on page 159 through “4.c” on page 159 to add additional columns.</p> <p>Note: It is not possible to select more than one column, and then add these in a single step.</p> <p>You can change the column order of the key by dragging and dropping individual column names in the Distribution keys box.</p> <p>To remove a column from the key, click the  icon next to it.</p>

IBM Db2 Analytics Accelerator Administration Services	In the request body, specify distribution key columns as values of the "distKeysArray" : array. Separate the values by a comma.
---	---

Remember: It is a best practice to use as few columns as possible in a distribution key.

5. To specify organizing keys:

IBM Db2 Analytics Accelerator Studio	<p>a. Select a column to be used as an organizing key in the list on the left and click the right-arrow button next to the list box at the bottom.</p> <p>The Name like filter field makes it easier to find particular columns if the list is long. Type a column name in this field, either fully or partially, to display just the columns bearing or starting with that name. The names of columns that are currently selected as keys are grayed out.</p> <p>Selected columns appear in the lower list box on the right. You can remove a selected column by first selecting it in this box, and then clicking the left-arrow button.</p> <p>b. Repeat the previous step to add further keys. A maximum of four keys is allowed.</p>
IBM Data Server Manager	<p>a. To select a column as an organizing key, select the corresponding check box in the ORGANIZATION KEY column.</p> <p>You can use a filter to find particular columns:</p> <p>Click  to display the search field. Type the names of columns you are looking for in the search field, either fully or partially. This will display just the column names that contain your search string.</p> <p>You can remove an organizing key by clearing the check box in the ORGANIZATION KEY column.</p> <p>b. Repeat the previous step to add further keys. A maximum of four keys is allowed.</p>
IBM Unified Experience for z/OS	<p>In the Alter keys window, you see a list of the table columns.</p> <p>a. Select a column to add it as an organizing key.</p> <p>b. Click the  icon for that column.</p> <p>c. Select Add to organizing keys.</p> <p>The column name is added to the Organizing keys box on the lower right.</p> <p>d. Repeat steps “5.a” on page 160 through “5.c” on page 160 to add additional columns.</p>

	<p>Note: It is not possible to select more than one column, and then add these in a single step.</p> <p>You can change the column order of the key by dragging and dropping individual column names in the Organization keys box.</p> <p>To remove an organizing key, click the  icon next to the column name.</p>
IBM Db2 Analytics Accelerator Administration Services	In the request body, as the values of the "schemaName" : and "tableName" : parameters, specify the name of the schema and the name of the table that you want to apply the keys to.

6. Finish the key definition:

IBM Db2 Analytics Accelerator Studio	Click OK .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Submit .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Related concepts

[Defining the data to load into an accelerator](#)

Defining the data to load into an accelerator basically means selecting the proper tables. However, you also need to complete a number of related sub-tasks. This section lists all required tasks in the correct order.

Related tasks

[Setting a distribution key for accelerator-only tables](#)

A distribution key for accelerator-only tables is set as part of the CREATE TABLE ... IN ACCELERATOR statement that creates the accelerator-only table.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Setting a distribution key for accelerator-only tables

A distribution key for accelerator-only tables is set as part of the CREATE TABLE ... IN ACCELERATOR statement that creates the accelerator-only table.

Before you begin

For an introduction to accelerator-only tables, see [“Accelerator-only tables and in-database transformation” on page 19](#).

For a description of distribution keys, see:

- [“Distribution keys” on page 10](#)
- The *About this task* section in [“Specifying or changing a distribution key or organizing keys” on page 155](#)

About this task

Due to the special nature of accelerator-only tables, you cannot set distribution keys for this type of table by using the **Alter Keys** function in your administration client or by running the SYSPROC.ACCEL_ALTER_TABLES stored procedure.

Note that the following procedure cannot be used to set organizing keys. Organizing keys are not supported for accelerator-only tables at this time.

Procedure

1. Open the SQL editor of your choice to create the accelerator-only table

The distribution key is added to the CREATE TABLE statement in a comment string. Because SPUFI as well as DSNTEP2 or DSNTEP4 convert SQL comments to uppercase, do not use these editors if the distribution key columns are in lowercase. As an alternative, you can use the SQL editor in IBM Db2 Analytics Accelerator Studio or IBM Data Server Manager.

2. Type the CREATE TABLE statement as shown in the following example:

```
CREATE TABLE TEST.TESTAOT( C1 INTEGER, C2 INTEGER, C3 INTEGER)
IN ACCELERATOR XYZ100 -- <ACCOPTS> <distributionKey> (C1, C2) </distributionKey> </ACCOPTS>
;
```

where:

--

Introduces a simple SQL comment

<ACCOPTS> ... </ACCOPTS>

Is an XML element that encloses additional options for the accelerator.

<distributionKey> ... </distributionKey>

Is an element inside the <ACCOPTS> . . . </ACCOPTS> element, which indicates that a distribution key follows.

(C1, C2)

Are the table columns that make up the distribution key. Notice the parentheses.

Important:

- Your distribution key specification can span multiple lines. If so, make sure that each line starts with a simple SQL comment (--).
 - The simple comments must come after the IN ACCELERATOR clause and the <ACCOPTS> clause must be specified correctly. Otherwise, no distribution key is sent to the accelerator. You might fail to notice this because you receive a "successful" SQL code after the creation of the accelerator-only table. You should therefore verify that the key was sent by running the SYSPROC.ACCEL_GET_TABLES_INFO stored procedure after you submit your SQL statement.
 - SPUFI, DSNTEP2, and DSNTEP4 strip off comment by default. Therefore, to ensure that your SQL comments are passed to Db2 for z/OS, specify the SQLFORMAT option with SQLCMNT or SQLPL as the value.
3. Submit the SQL statement.
If the statement contains a syntax error, you receive an error message with SQL code -904.

What to do next

Running the SYSPROC.ACCEL_GET_TABLES_INFO stored procedure on your accelerator-only table, you can check whether the distribution key was set correctly.

Related concepts

Distribution keys

A distribution key determines how tables rows are distributed among the available working nodes. IBM Db2 Analytics Accelerator for z/OS selects a suitable distribution key automatically when tables are loaded. The distribution varies between the two extremes: an even distribution (called random distribution) without the use of a key and a maximally skewed distribution that uses a distribution key.

Related tasks

[Specifying or changing a distribution key or organizing keys](#)

Distribution and organizing keys have a considerable impact on the query response time.

Related information

[CURRENT SPUFI DEFAULTS panel](#)

[DSNTEP2 and DSNTEP4](#)

Running an SQL script from your administration client

To modify connected databases or create objects in these databases, you can run SQL scripts directly from your administration client. This is useful because you need not change the system or console to execute SQL statements.

Before you begin

Make sure that the user running the administration client has sufficient privileges on the selected databases to execute the SQL code.



About this task

If you run an accelerated query from the SQL Script Editor of IBM Data Studio, the SQL Script Editor invokes the JDBC method `Statement.setNumRows()`, which causes the JDBC driver to convert the query into a read-only query (FOR READ ONLY). This happens even if the FOR READ ONLY clause is not part of the query statement. If the clause is not part of the statement, the query might end with an error message and reason code 4 (The query is not read-only). The error occurs with actual queries in a production environment and EXPLAIN-only queries alike. With EXPLAIN-only queries, the error does not matter. Actual queries, however, will not return results when the error occurs. Therefore, add the FOR READ ONLY clause explicitly to the SQL statement text if you submit actual queries from the SQL Script Editor.

Tip: Queries that return large result sets might benefit from asynchronous result set fetching. For more information, see [“Asynchronous result fetching”](#) on page 23.

Procedure

1. From your administration client, connect to the Db2 subsystem or data sharing group the query is supposed to run against.
For more information, see [“Connecting to a database server”](#) on page 124.
2. Open the SQL editor:


IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none">a. On the toolbar of the Administration Explorer, click the downward-pointing arrow next to the New button.b. Select New SQL Script from the menu.
IBM Data Server Manager	<ol style="list-style-type: none">a. Click  in the upper left.b. Select RUN SQL. <p>Note: This option is available only if an active database connection has been selected from the drop-down list on the top banner.</p>
IBM Unified Experience for z/OS	<ol style="list-style-type: none">a. Expand (click) the  Run on the sidebar.

	<p>b. Select SQL.</p> <p>c. From the Connections drop-down list in the upper right of the window, select a Db2 subsystem or data sharing group.</p>
--	---

3. Type or paste your SQL statement in the text area:

IBM Db2 Analytics Accelerator Studio	<p>Type or paste the SQL statement in the blank space of the Script<x>.sql workspace that opens on the upper right.</p> <p>Note: <x> stands for a counting number (integer). This means that your first SQL script is named Script1.sql, the second Script2.sql, and so on.</p>
IBM Data Server Manager	Type or paste the SQL statement in the text area that opens in the upper half of the window.
IBM Unified Experience for z/OS	Type or paste the SQL statement in the text area that opens on the New statements tab in front of the SQL window.


4. Run your SQL script:

IBM Db2 Analytics Accelerator Studio	<p>a. Click </p> <p>If no connection profile is selected in the Administration Explorer, the Select Connection Profile window comes up. If so, select the proper database connection profile (database server) in the Connections list.</p> <p>b. Click Finish.</p>
IBM Data Server Manager	Select Run > Run all from the toolbar.
IBM Unified Experience for z/OS	Click Run .

What to do next

You might want to save your SQL script for reuse:

IBM Db2 Analytics Accelerator Studio	SQL scripts can be saved in your local workspace if you created an appropriate project before, for example a <i>Data Development</i> project. For information on how to create and work with Data Development projects, refer to <i>Creating a data development project</i> in the online help of IBM Data Studio.
IBM Data Server Manager	<p>You can save your SQL script using one of the options on the Script menu on the toolbar:</p> <p>Save Saves your script to the computer where IBM Data Server Manager is installed. You can view all scripts saved on this computer if you click</p>

	<p>the Saved scripts tab in the lower half of the Run SQL window.</p> <p>Save to client Saves the script to your local workstation, that is, the computer that you are currently using to work with IBM Data Server Manager.</p>
IBM Unified Experience for z/OS	<p>You can save your SQL script to a comma-separated value (csv) file by using the export function:</p> <ol style="list-style-type: none"> 1. Click the  icon on the very right, on top of the results table. 2. In the Export in CSV format window, expand the Select CSV separators drop-down list. 3. Select a suitable value separator. 4. Click Export to save the csv file.

EXPLAIN information

After creating the necessary EXPLAIN tables, you can analyze queries by invoking the Db2 EXPLAIN function. The analysis shows whether a query can be accelerated, indicates the reason for a failure, and gives a response time estimate. The outcome of the analysis can also be visualized in an access plan graph.

Preparations

To be able to use the EXPLAIN function in order to check whether a query can be accelerated, you need the following EXPLAIN tables:

- PLAN_TABLE
- DSN_QUERYINFO_TABLE

For basic EXPLAIN information, you need just the PLAN_TABLE. To create EXPLAIN tables (including DSN_QUERYINFO_TABLE) for a specific user, customize and run the DSNTESC member of the SDSNSAMP library. Modify and run the DSNTIJOS sample job to create EXPLAIN tables that are qualified by SYSIBM and Db2OSC, as these tables are used by Db2 optimization tools like IBM Query Tuner.

Description

The EXPLAIN tables provide the following information:

PLAN_TABLE

For each accelerated query, the query blocks are pruned and a single row is inserted in the PLAN_TABLE with an ACESSTYPE of 'A'. The query is thus represented by a single row with the value 1 in the QBLOCKNO column. For queries that are not accelerated, the PLAN_TABLE can contain multiple rows representing the tables accessed by each query block, with an ACESSTYPE other than 'A'. If there are multiple rows belonging to the same query, these are numbered consecutively in the QBLOCKNO column.

DSN_QUERYINFO_TABLE

Additional EXPLAIN information can be found in the DSN_QUERYINFO_TABLE. See [Table 44 on page 166](#).

Table 44. Important columns in DSN_QUERYINFO_TABLE	
Column	Description
QINAME1	When the ACCESTYPE of a query in the PLAN_TABLE is A, and the REASON_CODE in DSN_QUERYINFO_TABLE is 0, this row contains the name of the accelerator that will process the query.
QINAME2	When the ACCESTYPE of a query in the PLAN_TABLE is A, and the REASON_CODE in DSN_QUERYINFO_TABLE is 0, this row contains the location name of the accelerator that will process the query. The location name is the unique name of the accelerator in the SYSIBM.LOCATIONS table. Mostly, this is the same name as the accelerator name.
TYPE	The type of the output for this row. A type of A means that Db2 for z/OS routes the query to an accelerator.
REASON_CODE	The reason code for a query. When the value of TYPE is A and the reason code is 0, the query can be accelerated. If the REASON_CODE column contains a value other than 0, something prevents the acceleration of the query. To look up the other reason codes, refer to Table 45 on page 166.
QI_DATA	When the value of TYPE is A and the reason code is 0, this row contains the SQL code of the converted query that was routed to the accelerator. If a query has a reason code other than 0, this column contains a description of the reason code.

Reason codes

Table 45 on page 166 lists and describes the various reason codes. A reason code greater than 0 indicates that a query cannot be accelerated.

Table 45. Possible reason codes in DSN_QUERYINFO_TABLE		
REASON_CODE	Description	Suggested solution
0	The query qualifies for routing to an accelerator.	N/A
1	An active accelerator or tables enabled for query acceleration could not be found when the statement was executed. If an accelerator is available, make sure that it is started, and that enabled tables exist on that accelerator.	Start the accelerator.
2	The query could not be routed to an accelerator because the CURRENT QUERY ACCELERATION special register is set to the value NONE.	Set the CURRENT QUERY ACCELERATION special register to one of the following values: <ul style="list-style-type: none"> • ALL • ELIGIBLE • ENABLE • ENABLE WITH FAILBACK
3	The query is a short-running Db2 query or query acceleration is not advantageous.	If you must accelerate the query for some reason, set the CURRENT QUERY ACCELERATION special register to one of the following values: <ul style="list-style-type: none"> • ALL • ELIGIBLE

Table 45. Possible reason codes in DSN_QUERYINFO_TABLE (continued)

REASON_CODE	Description	Suggested solution
4	The query is not read-only.	Ensure that the query meets the criteria for a read-only query.
6	The query uses a scrollable cursor or a remotely defined rowset-positioned cursor.	Remove the SCROLL clause or WITH ROWSET POSITIONING clause from the cursor declaration.
7	The query uses multiple encoding schemes.	Ensure that all objects to which the query refers have the same encoding scheme.
8	The FROM clause of the query specifies a data-change-table-reference.	Rewrite the FROM clause of the query so that it does not include a data-change-table-reference clause.
10	The query contains a recursive reference to a common table expression.	Ensure that the FROM clause of the query does not reference a common table expression.
11	The query contains an unsupported expression. The QI_DATA column contains this expression.	Remove the unsupported expression from the query.
12	The query references a table with one of the following characteristics: <ul style="list-style-type: none"> • The table is not defined on the accelerator. • The table is defined on a different accelerator. • The table is not enabled for query acceleration. 	Ensure that all tables that are referenced by the query are defined on the same accelerator, and that all tables are enabled for query acceleration.
13	The accelerator server that contains the tables that are referenced in the query is not started.	Start the accelerator that contains the tables that are referenced in the query.
14	A column that is referenced in the query has been altered after loading the column data into the corresponding accelerator-shadow table.	Reload the accelerator-shadow table.
15	The query uses functionality that is available only in newer Db2 for z/OS versions, but not in the versions supported by IBM Db2 Analytics Accelerator.	Ensure that the query does not use any functionality that is available only in not yet supported Db2 versions.
16	The query is not in a package.	Bind the application that contains the query into a package.
17	The query is an INSERT from SELECT statement. Subsystem parameter QUERY_ACCEL_OPTIONS does not specify option 2 to enable the acceleration of INSERT from SELECT statements.	Enable the acceleration of INSERT from SELECT statements by updating subsystem parameter QUERY_ACCEL_OPTIONS to include option 2.

Table 45. Possible reason codes in DSN_QUERYINFO_TABLE (continued)

REASON_CODE	Description	Suggested solution
18	The query uses new Db2 11 for z/OS functionality.	Try to rewrite the query so that it does not use the new (unsupported) Db2 11 for z/OS functionality.
19	The accelerator is not at the correct level (that is, you are using an older version) and therefore does not support all the functions in the SQL statement. The QI_DATA column in DSN_QUERYINFO_TABLE contains the function text or expression text that has caused the failure. Update the accelerator software to enable query acceleration for the SQL statement that contains the function text or expression text.	Update the accelerator software to a service level that supports all functions in the query.
20	The query is a rowset cursor that is declared WITH RETURN, executes remotely, or executes under an SQL PL routine.	If the query executes remotely, turn off multi-row-fetch (use MULTI_FETCH=1). In the other cases, set the CURRENT QUERY ACCELERATION special register or QUERY_ACCELERATION ZPARM to the value 1 to turn off query acceleration.
22	<p>The statement references an accelerator-only table, but cannot be routed to an accelerator. For example:</p> <ul style="list-style-type: none"> A MERGE statement references an accelerator-only table. An UPDATE or DELETE statement references an accelerator-only table, but the target table of the UPDATE or DELETE is a normal DB2 table, for example: <pre>UPDATE db2_table SET ... (SELECT ... FROM accelerator_only_table)</pre> <ul style="list-style-type: none"> An INSERT, UPDATE, or DELETE refers to a row expression with a sub-select, for example: <pre>UPDATE accelerator_only_table SET (C1,C2) = (SELECT C3,C4 FROM table_2)</pre>	<ul style="list-style-type: none"> Remove the reference to the accelerator-only table If possible, rewrite the statement so that it references a regular DB2 table instead of an accelerator-only table.
23	The SELECT INTO statement is bound for acceleration but is run as a remote SELECT INTO statement, which is not supported for acceleration.	Check if you can import (copy) the table to select from into the local Db2 subsystem (the one that is paired with the accelerator), or if you can pair the remote Db2 subsystem with the accelerator.

Table 45. Possible reason codes in DSN_QUERYINFO_TABLE (continued)

REASON_CODE	Description	Suggested solution
24	The DDL or DML statement cannot be offloaded because the connection to the accelerator server does not allow updates. This can occur when a two-phase commit requester (for example, a Db2 for z/OS requester) connects to a Db2 for z/OS server to offload a DDL or DML statement."	Issue the DDL or DML statement directly from the Db2 for z/OS server, or from a requester which does not require a two-phase commit, for example, the IBM Data Server Driver for JDBC.
25	The statement contains a reference to a column with an unsupported data type.	See if you can remove the column reference from the query. If not, consider changing the data type to a supported type. If none of this is possible, run the query in IBM Db2 Analytics Accelerator (not accelerated).
33	The query could not be routed to an accelerator because different product versions are used, and each version would have returned a different reason code.	Request EXPLAIN output and check the REASON_CODE column in the DSN_QUERYINFO_TABLE table. For situations that result in reason code 33, two rows are returned: one that explains why the query cannot be offloaded to IBM Db2 Analytics Accelerator versions earlier than V7, and another that explains why the query cannot be offloaded to IBM Db2 Analytics Accelerator or later. In the latter case, the error description might be prefixed by (Vx) to indicate the specific accelerator version. The (Vx) prefix is displayed only when reason code 33 is returned by the original query.
34	Your query was returned to Db2 for z/OS for FAILBACK processing. However, the query contains a pass-through-only expression, which can only be handled by an accelerator. Therefore, FAILBACK processing fails.	Set the CURRENT QUERY ACCELERATION special register to ENABLE , ELIGIBLE, or ALL to run queries that contain pass-through-only expressions.
35	The query uses new Db2 12 for z/OS functionality.	Try to rewrite the query so that it does not use the new (unsupported) Db2 12 for z/OS functionality.
36	The USE ONLY NEW ACCELERATOR_TYPE ZPARAM is set to YES, but no active accelerator (V7 or above) was found or the table is not enabled for query offloading in the accelerator (V7 or above) when the statement was executed.	Start the accelerator (version 7 or above) or enable the table for query acceleration.
37	The USE ONLY NEW ACCELERATOR_TYPE ZPARAM is set to YES, but the accelerator (V7 or above) containing the tables of the query is not started.	Start the accelerator (version 7 or above) that contains the tables that are referenced by the query.

Table 45. Possible reason codes in DSN_QUERYINFO_TABLE (continued)

REASON_CODE	Description	Suggested solution
38	The USE ONLY NEW ACCELERATOR_TYPE ZPARM is set to YES, but the accelerator (V7 or above) is not at the right level.	Update the accelerator (to version 7 or above) to enable the acceleration of the SQL statement that contains the function text or expression text. Make sure your QUERY_ACCEL_OPTIONS values are properly specified.
39	The query uses new Db2 13 for z/OS functionality.	Try to rewrite the query so that it does not use the new (unsupported) Db2 13 for z/OS functionality.

For example, reason code 7 resolves to The query uses multiple encoding schemes..If you receive this reason code, check the encoding schemes that are used by the tables. If different schemes are used, you might have to curtail the query so that it only refers to columns that use the same coded character set identifier (CCSID) or code page.

Sample EXPLAIN query

```
-- clean up explain tables
DELETE FROM PLAN_TABLE WHERE QUERYNO = 3825;
DELETE FROM DSN_QUERYINFO_TABLE WHERE QUERYNO = 3825;

-- enable accelerator for this session
SET CURRENT QUERY ACCELERATION=ENABLE;

-- explain query
EXPLAIN ALL SET QUERYNO = 3825 FOR
SELECT SUM(L_QUANTITY), SUM(O_TOTALPRICE), O_CUSTKEY
FROM TPCH.LINEITEM L JOIN TPCH.ORDERS O ON L.L_ORDERKEY = O.O_ORDERKEY
WHERE O.O_ORDERDATE > '01.01.1994' GROUP BY O.O_CUSTKEY;

-- check if query is eligible for acceleration
SELECT QBLOCKNO, ACCESTYPE FROM PLAN_TABLE AS P WHERE QUERYNO = 3825;

SELECT QINAME1 AS ACCELERATOR, REASON_CODE, QI_DATA FROM DSN_QUERYINFO_TABLE
WHERE QUERYNO = 3825;
```

The DELETE statements at the beginning remove old information from the EXPLAIN tables.

The SET CURRENT QUERY ACCELERATION=ENABLE special register is required. Leaving it out would mean to run an inhouse Db2 query that is not sent to any accelerator.

Then comes the actual test query. It starts with the mandatory EXPLAIN statement. A number is assigned to the query so that the EXPLAIN information pertaining to that query can be easily extracted from the EXPLAIN tables by means of a SELECT statement.

The first SELECT statement extracts the QBLOCKNO and the ACCESTYPE column values of the query from the PLAN_TABLE. The second SELECT statement extracts the QINAME1, REASON_CODE, and QI_DATA values of the query from DSN_QUERYINFO_TABLE.

Selecting and ordering query monitoring columns

You can customize the view that displays the query history of an accelerator. That is, you can select the columns to be displayed. In IBM Db2 Analytics Accelerator Studio, you can also change the order of their appearance.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.

2. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
3. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
4. Go to the view or page that lists the query history:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> a. Scroll down until you see the heading Query Monitoring. b. Click the twistie next to the heading to reveal the contents of the section.
IBM Data Server Manager	<ol style="list-style-type: none"> a. Click the Manage button on the toolbar. b. Click the Queries tab.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> a. Click the Queries tab. b. Set a filter that defines which queries will be displayed. You can select from the following filter criteria: <ul style="list-style-type: none"> Scope To capture all or just a subset of the available queries. Selectable scopes: All Currently running and completed (past) queries. Active Currently running queries Completed Queries that ended Start timestamp To define the start point of a time interval that covers all the queries that ran during the time defined by the interval. Specify this time in the format YYYY-MM-DD hh:mm:ss. End timestamp To define the end point of a time interval that covers all the queries that ran during the time defined by the interval. Specify this time in the format YYYY-MM-DD hh:mm:ss. Minimum elapsed time To capture queries on the basis of the overall time that was needed to complete a query. Specify a number of seconds (integer value). Minimum execution time To capture queries on the basis of the time that was needed to execute a query. Specify a number of seconds (integer value). For the difference between the elapsed time and the execution time, see Figure 19 on page 186.




	<p>User name To capture just the queries that were submitted by a certain user. Specify the ID of that user.</p> <p>c. You might want to determine by which of the selected filter criteria the resulting query list is ordered. If so, go to Ordering criteria and from the Select column drop-down list, select one of the filter criteria to serve as the ordering column for the results.</p> <p>d. Click Capture.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /query/captureAllQueries request.</p> <p>b. In the request body, you can specify all the filter criteria that exist for IBM Unified Experience for z/OS (see row before) by using the following parameters:</p> <p>"minElapsedTime": See "Minimum elapsed time" on page 171.</p> <p>"minExecutionTime": See "Minimum execution time" on page 171.</p> <p>"userName": See "User name" on page 172.</p> <p>"fromTimestamp": See "Start timestamp" on page 171.</p> <p>"toTimestamp": See "End timestamp" on page 171.</p> <p>"orderBy": See step "4.c" on page 172.</p> <p>"maxRows": See step "2.a" on page 180.</p> <p>c. Click Execute.</p>

You see the recent query history immediately (SQL statements and other information about recent queries).

You can select various information columns, some of which are displayed by default. For a list of the available columns, click the appropriate **Related reference** link at the end of this topic.



Important: The reference for all times that are displayed is the accelerator system time. The accelerator system time is determined by the first Db2 subsystem that was added to the configuration. A warning is issued if the accelerator works with data from a Db2 subsystem that was not the first to be added. It is very important to keep this in mind if the Db2 subsystems (data servers) are situated in different time zones.

5. Access the column display function:



IBM Db2 Analytics Accelerator Studio	Click  .
IBM Data Server Manager	Click  on the toolbar.
IBM Unified Experience for z/OS	Click  .

IBM Db2 Analytics Accelerator Administration Services	N/A
---	-----

6. To add columns:



IBM Db2 Analytics Accelerator Studio	<p>In the Adjust Query Monitoring Table window, you see the following lists:</p> <p>Available columns The names of available columns that are currently not selected for display</p> <p>Shown columns The names of the columns that are currently displayed. The order from top to bottom indicates their appearance in the Accelerator view from left to write.</p> <ul style="list-style-type: none"> • To add a single column for display in the Accelerator view, select it in the Available columns list and click  to move the column to the Shown columns list. • To move all available columns to the Shown columns list, click . • Click OK when finished.
IBM Data Server Manager	<ol style="list-style-type: none"> Select the appropriate check boxes in front of the column names in the drop-down list. Click OK.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> Select the appropriate check boxes in front of the column names. To find a column if the list is long, you can use the Search field on top. Click Apply.
IBM Db2 Analytics Accelerator Administration Services	N/A

7. To remove columns from the display:

IBM Db2 Analytics Accelerator Studio	<ul style="list-style-type: none"> • To hide a single column from the display in the Accelerator view, select it in the Shown columns list and click  to move the column to the Available columns list. • To remove all columns from the display, click . • Click OK when finished.
IBM Data Server Manager	<ol style="list-style-type: none"> Clear the appropriate check boxes in front of the column names in the drop-down list. Click OK.

IBM Unified Experience for z/OS	<ol style="list-style-type: none"> Select the appropriate check boxes in front of the column names. To find a column if the list is long, you can use the Search field on top. Click Remove.
IBM Db2 Analytics Accelerator Administration Services	N/A

8. In IBM Db2 Analytics Accelerator Studio, you can also change the order in which the columns appear:

- To change the order of appearance in the **Accelerator** view, select a column in the **Shown columns** list and click  or  to move the column up or down.

The order of the columns from top to bottom represents the order in which these columns appear from left to right in the **Accelerator** view.

- To restore the default settings for the **Query Monitoring** section in the **Accelerator** view, click **Restore Defaults**.
- Click **OK** when finished.

Results


IBM Db2 Analytics Accelerator Studio	Your settings are applied to the table in the Query Monitoring section, that is, columns are added, removed or their order of appearance is changed.
IBM Data Server Manager	Your settings are applied to the query history, that is, columns are added or removed from the display.
IBM Unified Experience for z/OS	Your settings are applied to the query history, that is, columns are added or removed from the display.
IBM Db2 Analytics Accelerator Administration Services	N/A

What to do next

- To show further details about a selected query or to rerun the query, you can use the following functions:

Show SQL

To view the SQL of the query.


IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> Select the query. Click Show SQL.
IBM Data Server Manager	N/A
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> Click the  icon displayed on the very right of the entry for the query in the query history table. From the menu that opens, select View SQL query.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Start a /query/getSQLText request.

	<ol style="list-style-type: none"> 2. In the request body, specify the connection name, the accelerator name, the plan ID of the query and your authorization token. 3. Click Execute.
--	---

Show Plan

To view the access plan graph of the query

Note: For accelerator-only tables, the **Show SQL** and **Show Plan** functions show information about data manipulation (DML) jobs, such as INSERT, UPDATE, or DELETE, but not data definition (DDL) jobs, such as CREATE or DROP.

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> 1. Select the query. 2. Click Show Plan.
IBM Data Server Manager	N/A
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> 1. Click the  icon displayed on the very right of the entry for the query in the query history table. 2. From the menu that opens, select Visual Explain.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> 1. Start a /query/getVisualExplain request. 2. In the request body, specify the connection name, the accelerator name, the plan ID of the query, the tmsHost, the tmsPort, and your authorization token. 3. Click Execute.

Show Explain Details

Opens a window with a textual representation of a query's access plan and other information about the query execution. As an example, see the following extract:

```
...
FROM
  KLMDWEDB14."CUSTOMER-UID_01140003-V0" AS Q1
WHERE
  (Q1."DWA_Partition_ID (hidden)" <= 100001)
```

Access Plan:

```
-----
Total Cost:          105.849
Query Degree:        8
```

```

      Rows
      RETURN
      (   1)
      Cost
      I/O
      |
      333.333
      LTQ
      (   2)
      105.849
      15
      |
      333.333
      CTQ
      (   3)
      105.778
```

```



      15
      |
    333.333
    TBSCAN
    (    4)
    105.766
      15
      |
     1000
CO-TABLE: KLMDWEDB14
CUSTOMER-UID_01140003-V0
      Q1

```

Operator Symbols :

Symbol	Description
ATQ	: Asynchrony

...



IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> 1. Select the query. 2. Click Show Explain Details.
IBM Data Server Manager	N/A
IBM Unified Experience for z/OS	 <ol style="list-style-type: none"> 1. Click the  menu icon displayed on the very right of the entry for the query in the query history table. 2. From the menu that opens, select View explain details.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> 1. Start a /query/showExplainDetails request. 2. In the request body, specify the connection name, the accelerator name, the plan ID of the query, and your authorization token. 3. Click Execute.

Capture query environment data

Collects Db2 for z/OS support documents to be saved in a trace file.

This function is equivalent to running the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure with the <getAdditionalSupport> command and DB2SUPPORT as the value of the tcommand attribute. The generated trace file (a compressed archive) is placed in the file path specified as the value of the absoluteAdditionalSupportZipFilePath attribute. See SYSPROC_ACCEL_CONTROL_ACCELERATOR in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*.

To access this function:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> 1. Select the query. 2. Click Capture query environment data.
IBM Data Server Manager	N/A
IBM Unified Experience for z/OS	 <ol style="list-style-type: none"> 1. Click the  icon displayed on the very right of the entry for the query in the query history table.

	2. From the menu that opens, select Capture Query Environment .
IBM Db2 Analytics Accelerator Administration Services	1. Start a /query/captureQueryEnvironment request. 2. In the request body, specify the connection name, the accelerator name, and the plan ID of the query. 3. Click Execute .

To save the collected information to a trace file, complete these steps after you run the **Capture query environment data** function (this function):

1. Click **Save Trace**.
2. Select the option **Manually collected diagnostic information** in the **Save Trace** window.
3. Click **OK** to save your settings.

Capture query environment data and performance data


Collects Db2 for z/OS support documents and CDE performance data to be saved in a trace file. If you select this option, you will be asked for a timeout value. This is because the selected query must be rerun to obtain the performance data. A query might run for a long time. The timeout option allows you to end the query prematurely and capture the performance data that was gathered up to this point.

If you set a timeout and the timeout is reached while the data collection is still running, the operation is aborted and you receive an AQT10050E error that includes the following diagnostic information:

```
AQT10050E - An internal error occurred on the 'XYZ001' accelerator:
ODBC operation executeQuery failed with SQLSTATE 22003 because
the timeout was reached, and the query execution was stopped.
Nevertheless, trace information could be collected successfully.
<ODBCDiagnostics>
  <SQLSTATE>22003</SQLSTATE>
  <SQLCODE>-904</SQLCODE>
  <Tokens num="0">
</Tokens>
  <Message></Message>
</ODBCDiagnostics>
```

This function is equivalent to running the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure with the <getAdditionalSupport> command and CDE_PERFORMANCE_TRACE as the value of the tcommand attribute. The generated trace file (a compressed archive) is placed in the file path specified as the value of the absoluteAdditionalSupportZipFilePath attribute. See SYSPROC_ACCEL_CONTROL_ACCELERATOR in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*.

To access this function:

IBM Db2 Analytics Accelerator Studio	1. Select the query. 2. Click Capture query environment and performance data .
IBM Data Server Manager	N/A
IBM Unified Experience for z/OS	1. Click the  icon displayed on the very right of the entry for the query in the query history table.

	<ol style="list-style-type: none"> From the menu that opens, select Capture Query Environment. In the Capture Query Environment window, select Collect performance data. Specify a timeout in minutes in the field underneath. Click Save.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Start a /query/captureQueryEnvironment request. In the request body, specify the connection name, the accelerator name, and the plan ID of the query. Set the "performanceDataCollection": parameter to true. Set the "performanceDataCollectionTimeout": parameter to an integer value, for example 30 (30 minutes). Click Execute.

To save the collected information to a trace file, complete these steps after you run the **Capture query environment data and performance data** function (this function):

- Click **Save Trace**.
- Select the option **Manually collected diagnostic information** in the **Save Trace** window.
- Click **OK** to save your settings.

Collect system performance data

Collects system performance data to be saved in a trace file. This includes information about the utilization of the accelerator and the backend database engine, as well as information about SQL statements, accelerator tasks, and so on.

This function is equivalent to running the SYSPROC.ACCEL_CONTROL_ACCELERATOR stored procedure with the <getAdditionalSupport> command and SYSTEM_PERFORMANCE_DATA as the value of the tcommand attribute. The generated trace file (a compressed archive) is placed in the file path specified as the value of the absoluteAdditionalSupportZipFilePath attribute. See SYSPROC.ACCEL_CONTROL_ACCELERATOR in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*.

To access this function:

IBM Db2 Analytics Accelerator Studio	1. In the Query Monitoring section, click Collect System Performance Data .
IBM Data Server Manager	N/A
IBM Unified Experience for z/OS	On the accelerator details page, select Accelerator actions > Collect performance snapshot .
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Start a /monitor/captureSystemPerformanceData request. In the request body, specify the connection name and the accelerator name.

	<p>3. You can set the "topQueries" : parameter to an integer value, for example 10. This limits the performance data collection to the 10 most recent queries.</p> <p>4. Click Execute.</p>
--	--

To save the collected information to a trace file, complete these steps after you run the **Collect System Performance Data** function (this function):

1. Click **Save Trace**.
2. Select the option **Manually collected diagnostic information** in the **Save Trace** window.
3. Click **OK** to save your settings.

Re-Run

In IBM Db2 Analytics Accelerator Studio, you can click this button to rerun the currently selected query. This button is not available on the other supported administration client.

Cancel

In IBM Db2 Analytics Accelerator Studio and IBM Data Server Manager, you can click this button to cancel a running (active) query or an INSERT, UPDATE, or DELETE operation on an accelerator-only table. This button is not available in IBM Unified Experience for z/OS and IBM Db2 Analytics Accelerator Administration Services.

- To limit the number of queries that are displayed in the **Query Monitoring** table, you have the following options:
 1. Show all recent queries, just the queries that are currently being processed, or just the completed queries:

IBM Db2 Analytics Accelerator Studio	<p>Select the appropriate value from the View drop-down list:</p> <p>All Queries To show all recent queries</p> <p>Active Queries To show just the queries that are currently being processed</p> <p>Query History To show just the completed queries</p>
IBM Data Server Manager	<p>Select the appropriate value from the View drop-down list:</p> <p>All Queries To show all recent queries</p> <p>Active Queries To show just the queries that are currently being processed</p> <p>Query History To show just the completed queries</p>
IBM Unified Experience for z/OS	<p>a. In the Filtering Criteria on the Queries tab, select the appropriate value from the Scope drop-down list:</p> <p>All To show all recent queries</p>

	<p>Active To show just the queries that are currently being processed</p> <p>Completed To show just the completed queries</p> <p>b. Click Capture.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /query/captureAllQueries request.</p> <p>b. In the request body, specify the connection name, the accelerator name, and other filter criteria as needed.</p> <p>c. Set the "scope" : parameter to the appropriate value:</p> <p>"all" To show all recent queries</p> <p>"active" To show just the queries that are currently being processed</p> <p>"completed" To show just the completed queries</p> <p>d. Click Execute.</p>

2. Limit the number of displayed queries on the basis of their values in one of the columns:

IBM Db2 Analytics Accelerator Studio	<p>In the Query Monitoring table:</p> <p>a. Change the default (All) in the first drop-down list to the right of the Show label to one of the restricting values (Highest 5, Highest 10 and so on).</p> <p>b. From the other drop-down list further to the right, select the column in the Query Monitoring table that the setting in the previous step refers to.</p> <p>c. Click Run.</p>
IBM Data Server Manager	N/A
IBM Unified Experience for z/OS	<p>In the Filtering Criteria on the Queries tab:</p> <p>a. Change the Maximum number of statements to capture. The default is 100.</p> <p>b. Click Capture.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>In the body of your /query/captureAllQueries request:</p> <p>a. Change the value of the "maxRows" : parameter to the number of queries you want to display.</p> <p>b. Click Execute.</p>

This limits the number of displayed queries to those with the highest value in the selected column. If you select a column containing time values, this means that the display will be restricted to the slowest queries. The designers of the product have opted for this order because the slowest

queries usually have the highest potential for query optimizing, and are most probably the ones that a database administrator wants to touch again after they have been run.

Related tasks

Saving trace information

The **Save Trace** function saves the collected trace information. In the **Save Trace** window, which opens before the action is completed, you can specify or change the settings for the save operation.

Related reference

Selectable columns in the query history

The table in this section briefly describes all columns that can be selected for display in the query history of an accelerator.

Related information

Query history is not displayed - error message returned

The query history is not displayed in the **Accelerator** view and a corresponding error message is returned.

Selectable columns in the query history

The table in this section briefly describes all columns that can be selected for display in the query history of an accelerator.

Table 46. Selectable columns			
Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Accounting String	Accounting information that can be provided by an application programming interface (API) on the client side, such as the <code>setDb2ClientAccountingInformation</code> API of a connecting JDBC client. For more information, see Providing extended client information to the data source with IBM Data Server Driver for JDBC and SQLJ-only methods	X	
Client User ID	The ID of a connecting client user. This ID can be provided by an application programming interface (API) on the client side, such as the <code>setDb2ClientUser</code> API of a connecting JDBC client. For more information, see Providing extended client information to the data source with IBM Data Server Driver for JDBC and SQLJ-only methods	X	
Client Workstation Name	The name or ID of a connecting client workstation. This ID can be provided by an application programming interface (API) on the client side, such as the <code>setDb2ClientWorkstation</code> API of a connecting JDBC client. For more information, see Providing extended client information to the data source with IBM Data Server Driver for JDBC and SQLJ-only methods	X	

Table 46. Selectable columns (continued)

Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Collection ID	The ID or name that identifies a group of static SQL packages. If a collection ID is displayed, this means that the static SQL package containing the query belongs to that group.	X	
Connection Name	<p>The connection name. Possible values are:</p> <p>For batch: BATCH</p> <p>For TSO: TSO</p> <p>For QMF: Db2CALL</p> <p>For Db2 utilities: UTILITY</p> <p>For Db2 private protocol: The Db2 subsystem ID</p> <p>For IMS: The IMS ID</p> <p>For CICS®: The CICS ID</p> <p>For DRDA connections from non-Db2 requesters: SERVER</p> <p>For more information, see IFCID 147 - Thread Correlation Data.</p>	X	

Table 46. Selectable columns (continued)

Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Connection Type	<p>The type of the Db2 connection. Valid values are:</p> <p>APPLCTN Application directed access</p> <p>BATCH Batch job</p> <p>CICS CICS attach</p> <p>Db2CAF Db2 call attach</p> <p>DLIBATCH DL/I batch</p> <p>IMS IMS thread</p> <p>IMS BMP IMS attach BMP</p> <p>IMS TBMP IMS transaction BMP</p> <p>IMS CTL IMS control region</p> <p>IMS MPP IMS attach MPP</p> <p>SYSTEM System directed access</p> <p>TSO/E TSO/E foreground and background</p> <p>UNKNOWN Unrecognizable connection type</p> <p>UTILITY Db2 utility</p> <p>For more information, see Thread SQL Counts Attributes.</p>	X	

Table 46. Selectable columns (continued)

Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Correlation ID	<p>The correlation ID value. Possible values are:</p> <p>For BATCH: Job name.</p> <p>For TSO: Logon ID.</p> <p>For IMS/VS: PST#.PSBNAME</p> <p>For CICS: CONNECTION_TYPE.THREAD_TYPE.THREAD_#.TRAN-ID</p> <p>For RRSAF: CORRELATION-ID value from SIGNON function.</p> <p>For threads using the Db2 private protocol or DRDA from a Db2 requester: This field contains the correlation-ID name of the thread at the requesting location.</p> <p>For threads using DRDA from a non-Db2 requester: This field contains the first 12 characters in the DDM external name (EXTNAM) parameter of the DDM EXCSAT command received as part of the SQL connect.</p> <p>For more information, see IFCID 147 - Thread Correlation Data</p>	X	
CPU Time	<p>The overall CPU time that was needed by an accelerator to process a query or data manipulation (DML) statement. This value reflects parallel processing such that the CPU value might exceed the accumulated elapsed time. This is an indicator for the amount of used resources.</p> <p>For completed statements, this is the CPU time from the initial request to the last row being returned to Db2. In case of DML statements, this is measured until the final result (SQLCA) is sent to Db2.</p> <p>For in-process statements, this is the time from the initial request to the current point in time. The counter includes the CPU time that was used by the product and also the CPU time spent on the accelerator (on the coordinator node and all worker nodes). Because parallel processing is the standard, the CPU time cannot be related to the elapsed time. If query processing has already finished on the accelerator, the CPU time spent inside this system is included. If the SQL statement is still running on the accelerator, only the CPU time that was used by IBM Db2 Analytics Accelerator is available.</p>	X	

<i>Table 46. Selectable columns (continued)</i>			
Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Data Sharing Group Name	The name of the Db2 data sharing group (if the accelerator is connected to such a group rather than a Db2 subsystem)	X	
Data Sharing Member Name	If the accelerator is connected to a Db2 data sharing group, the name of the group member that sent the query.	X	
Db2 Subsystem ID	The Db2 subsystem ID.	X	

Table 46. Selectable columns (continued)

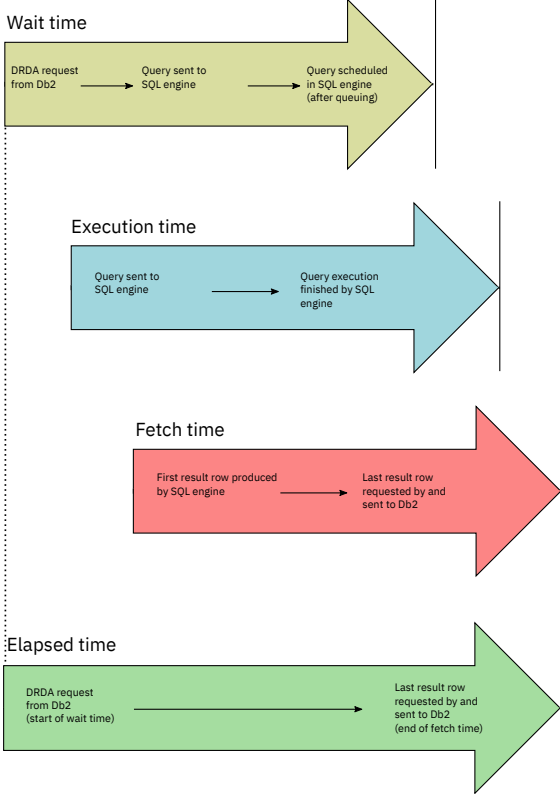
Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Elapsed Time	<p>The total time that was needed to process a query (from the state QUEUED to FAILED, SUCCESSFUL, or CANCELED).</p> <p>The following diagram shows the beginning, duration, and the end of each time in the Query Monitoring section on a time scale. This way, you can better relate the values to each other. It starts with the Start Time (point in time, where the diagram starts and when the accelerator receives the query). The following interval, the Wait Time overlaps with the Execution Time because the Execution Time includes the period that a query stays in the accelerator's execution queue. The Execution Time overlaps with the following interval, the Fetch Time, because Db2 starts fetching results when the first result rows have been returned by the accelerator, that is, at a time when the entire query has not necessarily finished processing. Finally, the diagram shows the Elapsed Time, which includes all intervals mentioned before because it lasts from the beginning of the Start Time to the time when the query controller stops processing the query.</p>  <p><i>Figure 19. Wait time, execution time, fetch time, and elapsed time in comparison</i></p>	X	X

Table 46. Selectable columns (continued)

Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Error Description	The error description or error token that is returned with the SQL Code . The description might be truncated.	X	
Execution Time	The time that a query spent in the queue before it was sent to the accelerator plus the time needed to process the query on the IBM Integrated Analytics System.	X	X
Fetch Time	The time interval starting with the first retrieval of a result row by Db2 and ending with the last. In most cases, query execution has already finished when the result retrieval process is still ongoing.	X	X
Location Name	Location name of the Db2 subsystem sending the query.	X	
LU Name	Network LU (logical unit) name of the requester sending the query. This is used in the end-to-end monitoring of accelerated queries in multi-tier architectures where Db2 for z/OS handles requests passed on by an application server on behalf of a client application. This allows you to identify queries that were issued by a certain LU Name.	X	
Network ID	Network ID of the requester sending the query. This is used in the end-to-end monitoring of accelerated queries in multi-tier architectures where Db2 for z/OS handles requests passed on by an application server on behalf of a client application. This allows you to identify queries that were issued by a certain Network ID.	X	

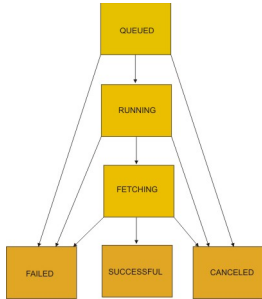
Table 46. Selectable columns (continued)

Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Original Authorization ID	<p>The original authorization ID. Possible values are:</p> <p>For TSO: The logon ID.</p> <p>For batch: The user ID on the job statement.</p> <p>For IMS (message-driven regions): The sign-on ID, LTERM, ASXBUSR, or PSB name.</p> <p>For IMS (control regions): The user ID on the job statement, or the RACF® started procedure entry if RACF is used.</p> <p>For CICS: The user ID, TERM ID, TRAN ID, or as specified in the resource control table.</p> <p>For MVS operator commands and Db2 system internal agents: SYSOPR</p> <p>For a distributed application server (AS):</p> <ul style="list-style-type: none"> • If the application requester (AR) is a Db2 system, then this is the same value that was assigned at the AR. • If the application requester is not a Db2 system, then this is the user ID used to make the initial connection with the application server. <p>For more information, see IFCID 147 - Thread Correlation Data</p>	X	
Package Name	<p>The name that identifies a static SQL package or application package. If such a name is displayed, this means that the query was submitted by an application program in the form of a bound package for static SQL processing.</p>	X	

Table 46. Selectable columns (continued)

Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
Plan Name	<p>The plan name. It is blank for a Db2 command thread; otherwise:</p> <p>DSNESP RR For SPUFI with repeatable read</p> <p>DSNESP CS For SPUFI with cursor stability</p> <p>DSNUT IL For Db2 utilities</p> <p>DSNTE P2 For DSNTEP2</p> <p>DSNB IN D For binding</p> <p>The application plan name For IMS or CICS</p> <p>A blank plan name For IMS and CICS commands</p> <p>DSQPL AN For QMF</p> <p>The first 8 bytes of the application name For DRDA connections to the common servers</p> <p>For more information, see IFCID 147 - Thread Correlation Data.</p>	X	
Priority	<p>The Workload Manager (WLM) importance level that the query or job holds in Db2.</p> <p>For more information, see <i>Mapping of z/OS importance levels to priorities of the accelerator database engine in the IBM Db2 Analytics Accelerator for z/OS: Installation Guide</i>.</p>	X	
Product ID	ID of the product (application requester) that routed the query, such as a JDBC driver.	X	
Result Size	The data size of the rows that were returned in query results (in MB or GB) from the accelerator to Db2 for z/OS.	X	X
Rows Returned	The number of rows that were returned by the accelerator as query results.	X	X
SQL Code	The SQL code that is returned to the user after the query or job execution.	X	
SQL Text	The SQL statements of recently submitted queries.	X	
Start Time	Times when queries were received by IBM Db2 Analytics Accelerator.	X	

Table 46. Selectable columns (continued)

Column name	Description	Available in IBM Db2 Analytics Accelerator Studio	Available in IBM Data Server Manager
State	<p>Processing states that queries are in. The following states are possible:</p> <p>UNKNOWN The state cannot be determined.</p> <p>QUEUED A query has been passed to the accelerator for processing.</p> <p>RUNNING The query is being processed by the accelerator.</p> <p>FETCHING The accelerator has finished processing the query, but Db2 for z/OS has not yet finished collecting the results.</p> <p>FAILED The query did not run to completion because one or more errors occurred.</p> <p>SUCCESSFUL Query execution has been completed successfully.</p> <p>CANCELED The query did not run to completion because it was canceled by a user.</p> <p>With the exception of the UNKNOWN state, each query passes through all the states, unless an error leads to an abnormal ending or a user cancels the query. This is shown in the following diagram:</p>  <pre> graph TD QUEUED[QUEUED] --> RUNNING[RUNNING] RUNNING --> FETCHING[FETCHING] FETCHING --> FAILED[FAILED] FETCHING --> SUCCESSFUL[SUCCESSFUL] FETCHING --> CANCELED[CANCELED] </pre>	X	X
User ID	The names of users who submitted past queries.	X	
Wait Time	The times that queries had to “spend” in the queue before they were processed by the IBM Integrated Analytics System.	X	X

Canceling tasks

See how to cancel tasks that are in progress on an accelerator, such as load operations.

About this task

You cancel a task by using the **List Tasks** function. Mind that you cannot use this function to cancel queries. To cancel a running query or an INSERT, UPDATE, or DELETE operation on an accelerator-only table, see *Canceling queries*.

Important: When a load job fails, and you run the command to check the status of the Db2 UNLOAD utility in Db2 for z/OS, you might find numerous UNLOAD threads in the STOPPED state. The stopped threads are ended automatically when you start another load job.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
3. In IBM Data Server Manager, click the **Manage** button on the toolbar.
4. Display the tasks:

IBM Db2 Analytics Accelerator Studio	Click List Tasks on the toolbar.
IBM Data Server Manager	Click List Tasks on the toolbar.
IBM Unified Experience for z/OS	a. Select Accelerator actions > List tasks .
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none">a. Start a /table/listTasks request.b. In the request body, specify the connection name, the accelerator name, and your authorization token.c. Click Execute.d. Make a note of the task IDs that identify the tasks you want to cancel. You find these in the response body.

The table in the **List Tasks** window shows all tasks that are currently running on the accelerator. In IBM Db2 Analytics Accelerator Administration Services, the tasks are returned in the response body.

The table or response body that lists the tasks contains the following information, which gives you further details about a task:

Task ID

A unique number that identifies a task.

Name

The type of the task, for example **Load Tables**.

Execution Time

The time that passed since the start of the task.

Progress

The degree of completeness since the start of the task.

If individual tables were selected for processing, the number denotes the number of records (table rows) that were processed so far.

If an entire schema was selected for processing, the number represents the percentage of completion. The maximum value is 1, denoting 100 percent. Therefore, a value of 0.25 means 25 percent complete.

Progress Message

Additional information about running tasks.

User

The IDs of the users who started the tasks.

- To cancel a task, select it in the table and click **Cancel Selected Task** or **Cancel**

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> Select the task in the table of the List Tasks window. Click Cancel Selected Task.
IBM Data Server Manager	<ol style="list-style-type: none"> Select the task in the table of the List Tasks window. Click Cancel Selected Task.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> Select the task in the table of the List tasks window. Click Cancel.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Start a /table/cancelTask request. In the request body, specify the connection name, the accelerator name. Look up the task ID you got as part of the response to the /table/listTasks request you submitted earlier. Specify this ID as the value of the "taskId" : parameter. Click Execute.

- In IBM Db2 Analytics Accelerator Studio, IBM Data Server Manager, or IBM Unified Experience for z/OS, click **Close** to close the **List Tasks** window.

Removing tables from an accelerator

Follow the steps in this topic to remove accelerator-shadow tables from an accelerator.

About this task

If a part or all of a table (all partitions) have been archived by the High Performance Storage Saver, then this table (an accelerator-archive table) cannot be removed without first restoring the archived data. After restoring the data, the table remains on the accelerator, but becomes an ordinary accelerator-shadow table, which means that it can be removed.

If you remove a table from Db2 for z/OS, you also have to remove the corresponding accelerator-shadow table from all of your accelerators. That is, you have remove each copy of the accelerator-shadow table in a separate, manual step, either by following the procedure below or by running the **SYSPROC.ACCEL_REMOVE_TABLES** stored procedure. The only exception are tables that are replicated by the IBM Integrated Synchronization function. In this case, the accelerator-shadow tables are removed automatically when you remove the original Db2 tables.

The table removal task is carried out by the **SYSPROC.ACCEL_REMOVE_TABLES** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator”](#) on page 135.
3. Select the tables that you want to remove.

IBM Db2 Analytics Accelerator Studio	Select the appropriate check boxes in front of the schema or table names. Selecting a schema name leads to the removal of all tables in that schema.
IBM Data Server Manager	Select the appropriate check boxes in front of the schema or table names. Selecting a schema name leads to the removal of all tables in that schema.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> a. Click the Tables tab. b. Select the appropriate check boxes in front of the schema or table names. Selecting a schema name leads to the removal of all tables in that schema.
IBM Db2 Analytics Accelerator Administration Services	N/A

4. Remove the tables:

IBM Db2 Analytics Accelerator Studio	Click Remove on the toolbar.
IBM Data Server Manager	Click Remove on the toolbar.
IBM Unified Experience for z/OS	<p>From the Take action drop-down button on top of the list of tables, select Remove.</p> <p>If some of the specified tables you want to remove have been archived by the High Performance Storage Saver, select Remove archive. This setting will also remove archived tables.</p>
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> a. Start a /table/removeTablesFromAccelerator request. b. In the request body, specify the connection name and the accelerator name. c. Specify the tables to remove in an array that serves as the value of the "selTables" parameter. The first-level elements in this array must be JSON objects (key-value pairs), in which the key is the schema name, followed by the value, which is an array that contains the names of the tables belonging to that schema. Separate these table names by a

	<p>comma. Also separate the JSON objects by a comma. Example:</p> <pre> "selTables": [{ "SYSABC": ["TABLE01", "TABLE02"] }, { "SYSDEF": ["TABLE01"] }], </pre> <p>d. Set the "forceArchiveRemove" parameter to the value <code>true</code> if some of the tables to be removed have been archived by the High Performance Storage Saver. This setting will also remove archived tables.</p> <p>e. Click Execute.</p>
--	---



Attention: If federated access is enabled for a table that you want to remove, you are presented with an additional warning in a confirmation dialog when your administration client queries the SYSACCEL.SYSACCELERATEDTABLESAUTH table. The text in that dialog reads

Federated access has been granted to one or more of the tables you selected.
Do you really want to remove these tables from the accelerator?

However, if SYSACCEL.SYSACCELERATEDTABLESAUTH cannot be queried for some reason, this dialog does not come up, and the selected tables are removed as if there were no tables with federated access.

- Confirm the removal by clicking **Yes** in the **Remove Table** window.

IBM Db2 Analytics Accelerator Studio	Click Yes in the Remove Table window.
IBM Data Server Manager	Click Yes in the Remove Table window.
IBM Unified Experience for z/OS	Click Remove in the Remove table window.
IBM Db2 Analytics Accelerator Administration Services	N/A

Related tasks

[Including or excluding tables from incremental updates](#)

Incremental updates can be enabled or disabled on the table level. So you can individually select the tables that take part in the process. When a subsystem has been configured for incremental updates, the toolbar of the accelerator view shows an extra button, which works like a drop-down menu.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Exporting a table specification

You can save a list of the accelerator-shadow tables on an accelerator to an XML file and in a later step import that list for use with another accelerator. This way, tables can be added more quickly than by adding schemas and tables individually.

About this task

A typical use case is an administrator who saves a valid table specification that was created in a test environment in order to use this specification in a production environment. To make the definition work

in a different environment, you can edit the XML file with a text editor, and, for example, use the find-and-replace function to replace the names of schemas and tables.

Restriction: This option is available in IBM Db2 Analytics Accelerator Studio only. It does not exist for the other administration clients.

Procedure

1. Click **File > Export**.
2. In the **Export** window, expand the **IBM Db2 Analytics Accelerator** folder to see its contents.
3. Select **Table Specifications**.
4. Click **Next**.
5. In the **Export Table Specification** window, select an appropriate database connection profile.
The profile gives you access to the accelerators that a Db2 subsystem is connected to. Tables are exported from these accelerators. You thus have to select the proper profile, that is, one that gives you, by way of the connected Db2 subsystem, access to the accelerators that contain the right tables. If the proper profile does not exist yet, you can click **New** to create it.
6. Click **Next**.
7. From the **From accelerator** drop-down list, select the accelerator containing the tables to be exported.
8. In the table below, you can see the schemas and tables on the selected accelerator. From this table, you can select the tables or entire schemas whose specification you want to save to an XML file.
Type the names of schemas or tables in the **Name like** filter field, either fully or partially, to display just schemas and tables bearing or starting with that name. The names of tables that have already been selected are grayed out.
9. Click **Browse**.
10. In the **Export to File** window, navigate to the folder in which you want to save your table specification XML file.
11. Type a file name in the **File name** field.
By default, the file is given an extension of `idaa.xml`. Files of this type are encoded in UTF-8.
12. Click **Save**.
You return to the **Export Table Specification** window. The path and the file name of your table specification XML file are displayed in the **To XML file** field.
13. Click **Finish**.

Importing a table specification

You can import a list of accelerator-shadow tables for query acceleration that was previously saved to an XML file.

About this task

A typical use case is an administrator who saves a valid table specification that was created in a test environment in order to use in a production environment. To make the definition work in a different environment, you can edit the XML file with a text editor, and, for example, use the find-and-replace function to replace the names of schemas and tables.

Restriction: This option is available in IBM Db2 Analytics Accelerator Studio only. It does not exist for the other administration clients.

Procedure

1. Click **File > Import**.
2. In the **Import** window, expand the **IBM Db2 Analytics Accelerator** folder to see its contents.
3. Select **Table Specifications**.

4. Click **Next**.
5. In the **Import Table Specification** window, select an appropriate database connection profile.
The profile gives you access to the accelerators that a Db2 subsystem is connected to. Tables are exported from these accelerators. You thus have to select the proper profile, that is, one that gives you, by way of the connected Db2 subsystem, access to the accelerators that contain the right tables. If the proper profile does not exist yet, you can click **New** to create it.
6. Click **Next**.
7. From the **To accelerator** drop-down list, select the accelerator on which you want to define the tables.
8. Click **Browse** to navigate to the folder that contains the XML file with the list of accelerator-shadow tables.
9. In the **Import from File** window, navigate to the proper XML file, select it, and click **Open**.

Important: XML files in UTF-8 format are recommended. Such files start with the following header:

```
<?xml version="1.0" encoding="UTF-8"?>
```

You return to the **Import Table Specification** window. The path and the file name of the selected XML file is displayed in the **From XML** file field.

10. In the table below, you can see the schemas and tables that are listed in the selected XML file. From this list, select entire schemas or individual tables that you want to define on the accelerator.
Type the names of schemas or tables in the **Name like** filter field, either fully or partially, to display just schemas and tables bearing or starting with that name. The names of tables that have already been selected are grayed out.
11. Click **Finish**.

Removing accelerators

Follow the steps in this topic to remove accelerators from the system configuration. Bear in mind that this action will also remove the tables from an accelerator.

Before you begin

Important: Make sure that you stop an accelerator before you remove it. Otherwise the heartbeat thread, which provides monitoring information, continues to run. This heartbeat thread might be taken over by a new accelerator if you reuse the name of the removed accelerator. In this case, the heartbeat thread will provide false information because it does not pertain to the new accelerator. For more information, see the [attention note in Completing the authentication using the Add Accelerator wizard](#).

About this task


The table removal task is carried out by the following stored procedures on your data server:

- **SYSPROC.ACCEL_REMOVE_TABLES**
- **SYSPROC.ACCEL_REMOVE_ACCELERATOR**

For information about the privileges that are required to run these procedures and further details, see *Appendix C. Required access rights in the IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related information** at the end of this section.

Procedure

1. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
2. *IBM Db2 Analytics Accelerator Studio only:* Go to the **Object List Editor** on the right and select the accelerator that you want to remove.
3. Remove the accelerator.

IBM Db2 Analytics Accelerator Studio	<ul style="list-style-type: none"> a. Click  on the toolbar. b. Confirm the removal by clicking Yes in the Confirm Removing Accelerator window.
IBM Data Server Manager	<ul style="list-style-type: none"> a. Click Remove on the toolbar. b. Confirm the removal by clicking Yes in the Remove Accelerator window.
IBM Unified Experience for z/OS	<ul style="list-style-type: none"> a. From the Accelerator actions drop-down button, select Remove. b. In the Remove accelerator window, click Remove.
IBM Db2 Analytics Accelerator Administration Services	<ul style="list-style-type: none"> a. Start a <code>/accelerator/{accelName}</code> request. b. In the request body, specify the accelerator name and the connection name. c. Click Execute.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Tracing

IBM Db2 Analytics Accelerator offers a variety of predefined trace profiles in case you need diagnostic information. These profiles determine the trace detail level and the components or events that will generate trace information. After collecting the information, you can save it to a file. In addition, most administration clients allow you to send the trace information directly to IBM by using the built-in FTP function. This function is capable of adding the information to existing IBM support cases.

Configuring the trace behavior

IBM Db2 Analytics Accelerator provides trace profiles. These profiles consist of lists of components and events that result in the collection of trace information. In addition, they determine the verbosity level of the information, that is, how detailed the trace information will be. Profiles are available for accelerators as well as for stored procedures. In IBM Db2 Analytics Accelerator Studio, you can also use custom profiles that have been saved to an XML file.

About this task

When a traceable event was caused by a component that is covered by the selected profile, trace information about this event is collected and stored in a temporary file.

You can save the temporary trace information to a permanent file or even add the information to a support case. Where to save the collected information is configured in another dialog, the **Save Trace** window.

Recommendation: Tracing can have a considerable impact on the system performance. The more verbose the information, the bigger the (negative) impact. Therefore, use the default profiles unless you are instructed otherwise by IBM support.

If none of the available profiles covers your problem scenario, you can ask IBM support for an appropriate profile. If you open a support case, IBM support will give you detailed instructions on how to configure the trace behavior.

Two sets of profiles are available. The first set captures accelerator events; the second events that were caused by stored procedures. The scope of these profile sets is different. Accelerator trace profiles are saved on the selected accelerator. When active, they capture any event on this accelerator, no matter if

incidents were caused by an (external) application program or by a function of your administration client. In contrast, stored procedure trace profiles are a part of your administration client. This means that you can only capture events with the help of these profiles if a stored procedure is called by a function of your administration client. Stored procedures that are called from external applications can thus not be traced. Furthermore, the temporary file, which holds the collected trace information about stored procedures, is deleted when you close the administration client. Therefore, to retain access to this information, specify a permanent trace file in the **Save Trace** window.

Using the **Configure Trace** function invokes the **SYSPROC.ACCEL_CONTROL_ACCELERATOR** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
3. *IBM Db2 Analytics Accelerator Studio only*: In the **Object List Editor**, double-click the accelerator name.
4. Open the **Configure Trace** window:

IBM Db2 Analytics Accelerator Studio	In the header section at the top of the Accelerator view, click Configure .
IBM Data Server Manager	In the lower half of the Accelerator view, click Configure .
IBM Unified Experience for z/OS	From the Accelerator actions drop-down button on the upper right of the window, select Manage trace .
IBM Db2 Analytics Accelerator Administration Services	Start a /trace request.

5. To select a profile for accelerator tracing:

IBM Db2 Analytics Accelerator Studio	<p>Select one of the profiles from the Profile drop-down list under the heading Accelerator.</p> <p>By default, the currently active trace profile is selected. You can select one of the other standard profiles or a custom profile. A custom profile must be imported before you can select it from the Profile drop-down list.</p> <p>You find additional information about the standard profiles in the Description field. The text in this field gives you details about the events that are covered by the profile.</p> <p>To select a custom profile that has been saved to an XML file:</p> <ol style="list-style-type: none"> a. Click Import. b. Navigate to the XML file in your file system. c. Select the file and click OK.
--------------------------------------	---

	d. Select the custom profile from the Profile drop-down list.
IBM Data Server Manager	Select one of the standard profiles from the Accelerator drop-down list. By default, the currently active trace profile is selected.
IBM Unified Experience for z/OS	Depending on the type of event and the intended verbosity level: <ul style="list-style-type: none"> From the Accelerator drop-down list, select one of the available accelerator profiles. The DEFAULT profile is preselected. From the Stored procedure drop-down list, select one of the available stored procedure profiles. By default, OFF is preselected, which means no stored procedure tracing.
IBM Db2 Analytics Accelerator Administration Services	In the request body, specify: <ul style="list-style-type: none"> The connection name. The accelerator name. Depending on the type of event and the intended verbosity level: <ul style="list-style-type: none"> The accelerator trace profile name as the value of the "accelTraceConfigName" : parameter. If you do not specify a profile name, the DEFAULT profile is used. The stored procedure trace profile name as the value of the "spTraceConfigName" : parameter. If you do not specify a profile name, stored procedure tracing is turned off.

6. To discard your individual settings and return to the default profiles for both, accelerator tracing and stored-procedure tracing (**DEFAULT** and **Off**):

IBM Db2 Analytics Accelerator Studio	Click Restore Defaults .
IBM Data Server Manager	a. From the Accelerator drop-down list, select DEFAULT . b. From the Stored Procedure drop-down list, select Off .
IBM Unified Experience for z/OS	Click Reset .
IBM Db2 Analytics Accelerator Administration Services	Prepare a second /trace request or change the existing request. In the request body, specify empty values or no value at all for: <ul style="list-style-type: none"> "accelTraceConfigName" : "spTraceConfigName" :

7. Save your settings:

IBM Db2 Analytics Accelerator Studio	Click OK .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Configure trace .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Results

The selected profiles remain active until other profiles are selected or until they are reset to the default.

Related tasks

Saving trace information

The **Save Trace** function saves the collected trace information. In the **Save Trace** window, which opens before the action is completed, you can specify or change the settings for the save operation.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Saving trace information

The **Save Trace** function saves the collected trace information. In the **Save Trace** window, which opens before the action is completed, you can specify or change the settings for the save operation.

About this task

You can specify or change the location of the trace file on your local system. The **Save Trace** window also allows you to include or exclude certain information from the bulk of information that was collected as a result of using a particular profile. You can also choose to add the Eclipse error log to the trace file, since the information in the Eclipse error log is not generated by means of an IBM Db2 Analytics Accelerator trace profile. Moreover, you can send trace information to IBM using the file transfer protocol (FTP) to the effect that the trace information is added to an existing support case.

Using the **Save Trace** function invokes the **SYSPROC.ACCEL_CONTROL_ACCELERATOR** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator”](#) on page 135.
3. Open the **Save Trace** window:

IBM Db2 Analytics Accelerator Studio	In the header section at the top of the Accelerator view, click Save .
IBM Data Server Manager	In the lower half of the Accelerator view, click Save .
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> a. From the Accelerator actions drop-down button on the upper right of the window, select Manage trace. b. Click the Save trace tab.

IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> a. Start a /trace/receiveTrace request. b. In the request body, specify: <ul style="list-style-type: none"> • The connection name • The accelerator name • Other profile parameters as needed. These parameters determine which of the parts of the collected information to include in the zip file.
---	---

4. Select the information that you want to store in the trace file.

Accelerator

Log and trace information produced by components running inside Docker container (mainly IBM Db2 Analytics Accelerator and SQL engine). This includes, for example: accelerator logs, SQL engine logs, system logs of the Docker container.

Note: When you open the **Save Trace** window from the context menu of the Accelerators folder rather than from the header of the **Accelerator** view, the **Accelerator** check box is inactive. The reason is that selecting the entire Accelerators folder does not allow you to specify or select the particular accelerator in whose trace information you are interested. The **Save Trace** menu choice on the context menu of the Accelerators folder is a kind of “last rescue” option. Without it, there would be no way to submit trace information to IBM in case an error prevented the proper listing of the accelerators in the right pane (accelerators view). If such an error occurs, you have no access to the **Save Trace** function for individual accelerators.

Appliance

Trace information from the IBM Integrated Analytics System on which IBM Db2 Analytics Accelerator and the SQL engine run.

Note: Similar traces can be obtained for Db2 Analytics Accelerator on Z. To this end, however, you must log in to the **Admin UI** of the Secure Service Container LPAR and create a *dump*. See *Creating a trace file (dump)* in the *IBM Db2 Analytics Accelerator for z/OS: Installation Guide*.

The **Appliance** option described here is only for IBM Db2 Analytics Accelerator on an IBM Integrated Analytics System.

Stored procedure trace information

Trace information that is collected while running stored procedures of IBM Db2 Analytics Accelerator for z/OS, as the result of using a particular profile for stored-procedure tracing in the **Configure Trace** window. Using the check box, you can include or exclude this information from the trace file to be saved.

Eclipse error log

Error information that is collected by the Eclipse framework, on which the foundation for IBM Db2 Analytics Accelerator Studio, IBM Data Studio, is built. Hence this information does not pertain to errors in IBM Db2 Analytics Accelerator for z/OS, but to its software environment.

Manually collected diagnostic information

Query-related Db2 support documents and CDE performance data (CDE stands for *columnar data engine*).

5. Where to save the trace file:

IBM Db2 Analytics Accelerator Studio	<p>Under the heading Save to local file system, in the Folder field, type the location of the trace file (full directory path) on your local system.</p> <p>Alternatively, you can click Browse to select a folder.</p>
--------------------------------------	--

IBM Data Server Manager	The trace information will be exported in a zip file to the default download directory in the local file system of the network server on which IBM Data Server Manager is installed. You cannot change this.
IBM Unified Experience for z/OS	The trace information will be exported in a zip file to the default download directory in the local file system of the network server on which IBM Unified Experience for z/OS is installed. You cannot change this.
IBM Db2 Analytics Accelerator Administration Services	The trace information will be exported in a zip file to the default download directory in the local file system of the network server on which IBM Db2 Analytics Accelerator Administration Services is installed. You cannot change this.

6. To add the trace information to a support case:

IBM Db2 Analytics Accelerator Studio	<p>a. Select Add trace information to IBM problem management record (PMR) using FTP to add the selected information to an existing support case.</p> <p>b. In the fields next to PMR number, type the identification number of the support case.</p> <p>c. In the FTP password field, type the password for logging on to the IBM RETAIN server on which the support case was opened.</p> <p>Note: Most IBM FTP servers for support cases accept the registered email address as the password.</p> <p>The currently selected server is displayed in square brackets in the text above the Password field.</p> <p>To change the server or the proxy settings required to access the server, select Window > Preferences > IBM Db2 Analytics Accelerator for z/OS > Save Trace Dialog from the IBM Data Studio main menu.</p>
IBM Data Server Manager	<p>a. Select Associate the trace file with the following support case.</p> <p>b. In the Support case ID field, type the support case ID (number) of the support case.</p>
IBM Unified Experience for z/OS	<p>a. Select Associate/upload the trace file with the following support case.</p> <p>b. In the Support case ID field, type the support case ID (number) of the support case.</p> <p>c. In the Transfer ID field, enter your transfer ID. To create a transfer ID, go to this website: https://www.secure.ecurep.ibm.com/transfers/.</p>

	<p>You need your IBM ID to log in.</p> <p>d. In the Password field, enter the password that belongs to your transfer ID.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>In the request body, specify the following parameters:</p> <p>"ftpChoosen": Set this parameter to true.</p> <p>"caseID": The support case number.</p> <p>"userID" Your transfer ID.</p> <p>"password": The password belonging to the transfer ID.</p>

7. To reset your choices:

IBM Db2 Analytics Accelerator Studio	If you want to reset your choices in the Save Trace window to make corrections or start over, click Restore Defaults .
IBM Data Server Manager	<p>a. Click Cancel.</p> <p>b. Reopen the Save Trace window by clicking Save again from the Accelerator view.</p>
IBM Unified Experience for z/OS	Click the Reset button.
IBM Db2 Analytics Accelerator Administration Services	N/A

Note: This option just undoes all of your recent actions in the **Save Trace** window. It does not reset profiles and affects your current settings rather than future settings. Compare this with the description of the **Reset configuration profiles to default after collecting traces** check box (see next step).

8. To revoke all individual settings and in a future run save just the information that is selected by using the default trace profiles, you can select an additional option. This prevents that verbose trace information consumes too much space on your hard disks. If you want to retain your individual settings after saving them once, clear the check box or leave it deselected (default).

IBM Db2 Analytics Accelerator Studio	Select Reset configuration profiles to default after collecting traces .
IBM Data Server Manager	Select Reset configuration profiles to default after collecting traces .
IBM Unified Experience for z/OS	Select Reset configuration profiles to default after collecting traces .
IBM Db2 Analytics Accelerator Administration Services	In the request body, set the "resetConfig": parameter to true.

9. Save your settings:

IBM Db2 Analytics Accelerator Studio	Click OK .
IBM Data Server Manager	Click Save .
IBM Unified Experience for z/OS	Click Save trace .

Related tasks[Configuring the trace behavior](#)

IBM Db2 Analytics Accelerator provides trace profiles. These profiles consist of lists of components and events that result in the collection of trace information. In addition, they determine the verbosity level of the information, that is, how detailed the trace information will be. Profiles are available for accelerators as well as for stored procedures. In IBM Db2 Analytics Accelerator Studio, you can also use custom profiles that have been saved to an XML file.

Related information[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Setting a refresh interval or a skew threshold

In IBM Db2 Analytics Accelerator Studio, you can set the refresh interval for the **Accelerator** view or the warning threshold for table skew.

About this task

Restriction: The other administration clients do not offer these functions.

Procedure

1. Select **Preferences > IBM Db2 Analytics Accelerator > Accelerator View** from the main menu.
2. Set values:
 - To set or change the interval after which the information in the **Accelerator** view is automatically refreshed, select the appropriate value from the **Automatically refresh information in the Accelerator view** drop-down list. The default is **Every minute**, meaning that the information in the **Accelerator** view is refreshed each time after the passing of one minute.
 - To set or change a table skew value that will result in a warning message when it has been exceeded by a very big accelerator-shadow table in the range of 100 million rows, type a decimal number between 0 and 1 in the text field next to **Show a warning if the skew value of very big tables exceeds**. Example: 0.7. The default is 0.25.

Notes:

- What is considered to be *very big* varies with the size of your IBM Integrated Analytics System. On smaller systems, the tables that will cause a warning are smaller and vice versa. The threshold is somewhere in the range between 50 million and 100 million table rows.
- The actual skew value can be greater than 1, and thus you could enter a value greater than one, but for the tables that are affected by the skew threshold (very big accelerator-shadow tables), 1 is already a bad value.

To be able to issue a warning, IBM Db2 Analytics Accelerator Studio must compare the specified skew threshold with the actual skew values of the tables on your accelerators. The actual values are obtained by running the **SYSPROC.ACCEL_GET_TABLES_INFO** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

- To disable checking for unsupported columns, clear the **Check for unsupported columns** check box. By default, this feature is enabled because it tells you beforehand why a table cannot be added or why certain columns were skipped.

Important: For the deactivation to take effect, you must disconnect, then reconnect to the Db2 subsystem. To do so:

- a. Go to the **Administration Explorer**.
 - b. In the **All Databases** folder, navigate to the appropriate Db2 subsystem icon.
 - c. Right-click the icon.
 - d. Select **Disconnect** from the menu.
 - e. Double-click the icon to reconnect.
3. Click **Apply** to save the changes or **Restore Defaults** to undo the changes.
 4. Click **OK** to save your settings and exit the window or just exit the window.

Related information

IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference

Updating accelerator tables continually

The incremental update function of IBM Db2 Analytics Accelerator for z/OS allows you to update accelerator-shadow tables continually. Changes to the data in original Db2 for z/OS tables are thus propagated to the corresponding target tables with a high frequency and just a brief delay. This way, query results from an accelerator are always extracted from recent, close-to-real-time data.

The information about changes to be transferred comes from the Db2 for z/OS log.

In the past, data in accelerator-shadow tables could only be updated by use of the table load function. With this function, you can only update entire tables and entire table partitions, and the latter only if the tables are partitioned by range or partitioned by growth. The incremental update function, in contrast, updates individual table rows. Advantages and disadvantages are connected with either method. [Table 47 on page 205](#) compares the advantages and disadvantages.

<i>Table 47. Comparison of table update methods</i>		
Manual update of entire table using load function	Manual update of entire partitions using load function	Incremental update
For all types of tables	Only for range-partitioned tables and tables partitioned by growth	For all types of tables
Potentially long-running process, depending on the size of the tables	Potentially long-running process, depending on the size of partitions and the distribution of data changes across partitions (the more partitions are involved, the more time-consuming the update becomes)	Short-running process after initial load
Fast (up to one TB per hour)	Fast (up to one TB per hour)	Slower (in the range of GBs per hour)
Redundant load of table rows that have not changed, resulting in waste of processing resources (MIPS)	Redundant load of table rows that have not changed, resulting in waste of processing resources (MIPS)	No redundant load of table rows, no waste of processing resources.
Just a snapshot of the original data at some point in the past	Just a snapshot of the original data at some point in the past	Continual updates, recent data

Use cases

Incremental updates are the preferable method with regard to the following points of interest:

Realtime business intelligence

If real-time data is very important for your business intelligence operations, incremental updates are the preferable choice. Incremental updates do not guarantee that query data is the most recent available, but the latency is low, and this makes incremental updates a cost-efficient alternative.

Quick reporting on operational data

Incremental updates provide an uncomplicated, easy-to-use, and fast way to reporting on data in an operational data store (ODS) because the function is deeply integrated into your Db2 for z/OS and IBM Db2 Analytics Accelerator for z/OS setup. No up-front extraction and transformation of data is required to obtain results.

Cost-efficiency

Incremental updates are more cost-efficient than traditional update methods because there is no redundancy during updates and hence no waste of processing resources.

In addition, internal tests have shown that running incremental update processes affect the query response time only marginally.

High availability

Incremental updates can be configured in such a way that data changes in a Db2 for z/OS table are propagated to more than one accelerator-shadow table on multiple accelerators. If one accelerator fails, another one can take over to process incoming queries. This happens with just a short delay.

Making queries wait for incremental updates

To minimize the gap in data recency between the original Db2 for z/OS tables and incrementally updated accelerator-shadow tables (replication latency), you can delay the execution of queries until the latest incremental updates have been applied. This guarantees that an accelerated query against incrementally updated tables always "sees" the latest changes that have been committed in Db2 for z/OS.

This capability fulfills the criteria for Hybrid Transactional Analytical Processing (HTAP). It allows you to run transactional processes as well as analytical queries on a unified data store with a minimized time lag between transactional completion and analytical insight. Informed business decisions can be made much faster, on the basis of much more recent data.

To activate the delay, you must add a special register to your queries. You can also use a ZPARM or bind option to the same effect. The special register is:

```
SET CURRENT QUERY ACCELERATION WAITFORDATA = n.m.
```

where *n.m.* is a decimal number denoting seconds. The minimum is 0.0 (no delay). The maximum is 3600.0 (a delay of one hour).

Important: If you want to use a delay, specify at least 20 seconds. Lower values might work, but you must take the time into account that is needed to scan and read the Db2 for z/OS log and to report the findings. Experience has shown that realistic delays are around 20 seconds long.

Example

```
SET CURRENT QUERY ACCELERATION = ENABLE;  
SET CURRENT QUERY ACCELERATION WAITFORDATA = 120.0;  
SELECT * FROM XYZ WHERE [...]
```

The first special register in line 1 enables query acceleration. The second special register sets the delay to 120 seconds. What follows is the SQL code for the query. The execution of the query will be postponed for 120 seconds. During that time, the replication engine tries to apply all committed changes that have accumulated before the query started. If the replication engine cannot finish the job during that period, the query will not be accelerated. The further handling depends on the option set in the first special register and on the expiration behavior configured on the IBM Db2 Analytics Accelerator Console. The first special register is set to ENABLE. That means the query fails if one of the conditions for query acceleration is not met. Let's assume that the conditions can be met; so normally, the query would run on the accelerator. However, the default expiration behavior is to abort a query if the incremental updates cannot

be applied in time. Supposing the default behavior is set, the query would indeed fail if not all of the pending incremental updates could be applied in 120 seconds.

How to calculate the proper delay time

You certainly ask yourself how to determine the proper delay time (WAITFORDATA value) for your environment. There are two values by which an initial delay time or starting point can be calculated: the *replication latency* and the *replication velocity*. The replication latency is the time that the incremental update process is lagging behind. The replication velocity is a measure for the speed at which data changes could be applied in the past. You get these two values by running the following Db2 command:

```
-DIS ACCEL(<name>) DETAIL
```

where <name> is the name of the accelerator attached to the Db2 subsystem. If incremental updates have been configured for this pair of Db2 subsystem and accelerator, you find the two values in the command output. For example:

```
...
CURRENT REPLICATION LATENCY FOR THIS DB2 SYSTEM = 2000 MS
NUMBER OF SUCCESSFUL QUERY REQUESTS WITH DELAY PROTOCOL FOR ALL DB2 SYSTEMS = 0
NUMBER OF EXPIRED QUERY REQUESTS WITH DELAY PROTOCOL FOR ALL DB2 SYSTEMS = 1
REPLICATION VELOCITY = 0.04 DB2 LOG SECONDS APPLIED PER SECOND
...
```

In this example, The latency is 2000 milliseconds or 2 seconds, and the velocity is 0.04. You get the proper WAITFORDATA value by dividing latency by velocity. For the example, this gives you a WAITFORDATA value of 50 seconds to start with.

See the [note on replication latency](#).

Conditions for the success or failure of a query

Whether a query fails depends on the setting of the SET CURRENT QUERY ACCELERATION special register. It also depends on the type of the table. For accelerator-only tables, the WAITFORDATA option is always ignored because it can be assumed that the data in these tables is always the most recent data available (there is no other data in a Db2 for z/OS source table).

If the WAITFORDATA option has been set for queries that reference incrementally updated tables as well as tables not enabled for incremental updates (loaded tables), the query might fail if loaded tables are to be excluded.

For information on how to configure the treatment of loaded tables, see *Including or excluding loaded tables from WAITFORDATA queries* in the *IBM Db2 Analytics Accelerator for z/OS: Installation Guide*.

Table 48 on page 207 lists the possible combinations of settings and their effect with regard to query processing. It is assumed that an incoming query satisfies the conditions for query acceleration.

Table 48. Settings that influence WAITFORDATA query processing			
CURRENT QUERY ACCELERATION	WAITFORDATA	Loaded tables ²	Query processing
NONE	N/A	N/A	Db2 for z/OS

² This has an effect only if loaded tables are referenced by the query

Table 48. Settings that influence WAITFORDATA query processing (continued)

CURRENT QUERY ACCELERATION	WAITFORDATA	Loaded tables ²	Query processing
ENABLE / ELIGIBLE / ALL	0.0	Include	Accelerator
		Exclude	Query fails
	> 0.0	Include	Query fails if outstanding incremental updates cannot be applied within WAITFORDATA period.
		Exclude	Query fails
ENABLE WITH FAILBACK	0.0	Include	Accelerator
		Exclude	Db2 for z/OS
	> 0.0	Include	Db2 for z/OS
		Exclude	Db2 for z/OS

Error codes in connection with WAITFORDATA processing

If an error occurs in connection with WAITFORDATA processing, an error message with SQLCODE = -904 is returned in the format:

WAITFORDATA rsn=<reason code>:<reason code text>

where

<reason code>

An integer (positive, negative, or 0)

<reason code text>

The message text

Example

SQLCODE = -904, ERROR: UNSUCCESSFUL EXECUTION CAUSED BY AN UNAVAILABLE RESOURCE.
REASON 00E7000E, TYPE OF RESOURCE 00001080, AND RESOURCE NAME WAITFORDATA
rsn=1:Table(s) are in invalid state.

The message shows rsn=1 as the <reason code>, and Table(s) are in invalid state. as the <reason code text> .

Table of error codes

Table 49 on page 209 lists the possible reason codes and message texts. It also provides a description of the most common causes.

² This has an effect only if loaded tables are referenced by the query

Table 49. Reason codes and texts in WAITFORDATA error messages

RSN code	Message text	Common causes
1	Table(s) are in invalid state.	Not all tables to be processed are in the <i>replicationInProgress</i> state. This state, however, is a precondition for WAITFORDATA processing. Check the Last Load column in the Tables section of the Accelerator view in IBM Db2 Analytics Accelerator Studio.
2	Subscription state is invalid.	Incremental updates have not been started for the accelerator on which the tables are located. In IBM Db2 Analytics Accelerator Studio, check the Replication status in the header of the Accelerator view. The status must be <i>Started</i> . If necessary, click Start .
3	Set of tables is empty or invalid.	Some tables are empty or have not been enabled for incremental updates. Make sure that none of the tables in the set are empty. If you find empty tables, reload them, or exclude them from the set. Check the Replication Since column in the Tables section of the Accelerator view in IBM Db2 Analytics Accelerator Studio. The column must show a date for all the tables to be processed. If necessary, click Replication > Enable Replication .
4	An unknown internal error occurred.	A program thread checks whether pending incremental updates were applied within the specified WAITFORDATA delay. The thread might have been interrupted, but the exact reason cannot be determined. The WAITFORDATA query failed.
5	Timeout for WAITFORDATA reached.	Pending incremental updates could not be applied within the WAITFORDATA period.

Dependencies on other processing states, configurations, or product features

Other processing states or the use of certain configuration settings or other product features might affect query processing if WAITFORDATA is enabled (value > 0.0):

- If one of the tables referenced by the query is currently being reloaded, or in the spilling or draining state, the query will fail or be processed by Db2 for z/OS (ENABLE WITH FAILBACK). This is because the

end of these processes or table states cannot be predicted, and in most cases, they take much longer than the WAITFORDATA period.

- If partitions of a table have been archived with the High Performance Storage Saver, WAITFORDATA processing can still be used for the active partitions of the table. The archived partitions do not receive incremental updates, so a WAITFORDATA setting will not have an effect.
- If workload balancing is used in a high-availability setup, a WAITFORDATA setting > 0.0 might lead to successful or failing queries. The decisive factor is the replication latency of the accelerator that a query is sent to. If the latency is higher than the WAITFORDATA period, the query fails. The problem is that one does not know beforehand to which accelerator a query is sent. The accelerator is picked at random.
- If the product software on the accelerator is back-level, and does not support the WAITFORDATA protocol, a query does not necessarily fail. If CURRENT QUERY ACCELERATION is set to ENABLE, ELIGIBLE, or ENABLE WITH FAILBACK, the query might be processed by Db2 for z/OS. If, on the other hand, the special register is set to ALL, the query will fail. The same applies to the equivalent ZPARM or bind option settings.
- WAITFORDATA processing is not possible if *federated access* has been granted to any of the tables referenced by a query. This is because the reference tables (referencing accelerator-only tables), which contain metadata, cannot be updated by the same incremental update process, as they were created from a different, disconnected Db2 subsystem. The reference tables would inevitably be out-of-sync. Therefore, queries against such tables will fail.
- You cannot change the distribution key or the organizing keys of a table while incremental updates are enabled. To enable the **Alter Keys** function, you must first disable replication, and that means that a setting of WAITFORDATA > 0.0 will have no effect.
- A failure of the database engine on the accelerator has the effect that all queries with a WAITFORDATA setting will fail. However, these queries will be restarted and processed as usual after the database engine has recovered or after a replacement instance has been started.
- Treatment of date, time, and timestamp values: An accelerated query that retrieves dates might give you the same values as Db2 for z/OS, but a query that selects time values or timestamps will probably produce different results. The reason is that the WAITFORDATA period and the difference between the z/OS system clock and the accelerator's system clock (≤ 7 seconds) are added to these values while the incremental updates are being applied.

Related concepts

[Accelerator view in IBM Db2 Analytics Accelerator Studio](#)

To show the tables on an accelerator, view the query history, or access various other functions, double-click an accelerator name in the **Object List Editor**, which opens the related **Accelerator** view.

[Accelerator view in IBM Data Server Manager](#)

See a brief description of the status information and the function buttons on the **Accelerator** view of IBM Data Server Manager.

[Accelerator details in IBM Unified Experience for z/OS](#)

Have a look at the main elements of an accelerator details page. You also find a description of each element.

[Interface elements of IBM Db2 Analytics Accelerator Administration Services](#)

IBM Db2 Analytics Accelerator Administration Services is a web interface that allows you to complete administration tasks by using REST APIs. For each administration task, you find a suitable REST call. These REST calls use a JSON format. To illustrate the structure of the commands and the parameters, an example is provided for each REST call.

Related tasks

[Including or excluding tables from incremental updates](#)

Incremental updates can be enabled or disabled on the table level. So you can individually select the tables that take part in the process. When a subsystem has been configured for incremental updates, the toolbar of the accelerator view shows an extra button, which works like a drop-down menu.

Starting or stopping incremental updates

When a Db2 subsystem has been configured for incremental updates, you can start or stop incremental updates for attached accelerators from the corresponding accelerator views in your administration client. Using the functional links in the header starts or stops incremental updates for an entire accelerator.

About this task

When a subsystem has been configured for incremental updates, the header of the accelerator view shows an additional entry, which is labeled **Replication**. Next to this label, you find a status indicator and, in some of the supported administration clients, a functional link. Status indicator and link vary according to the current status of the accelerator. For example, if incremental updates have been stopped, the status indicator shows *Stopped* and a functional link labeled **Start**. This is reversed to *Started* and **Stop** when incremental updates have been started. The following statuses are possible:

Disabled

The incremental update function has not been configured for this accelerator and is therefore not available.

Error

The incremental update function has been configured, but an error occurred. In most cases, this means that a component cannot be reached. Therefore, it cannot be started or controlled. The event log might provide useful information about the root cause of the error.

Started

The incremental update function is running and updates are applied to accelerator-shadow tables that have been included in the process.

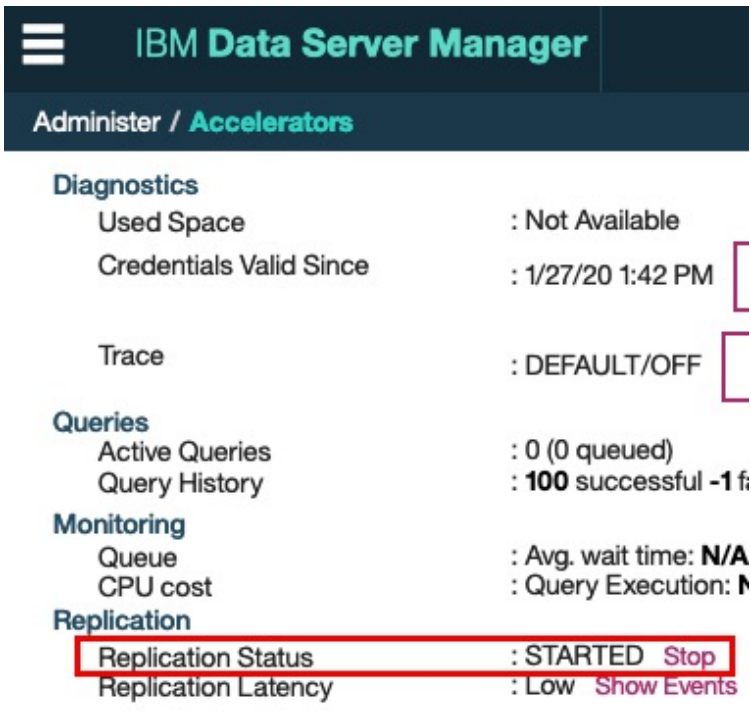
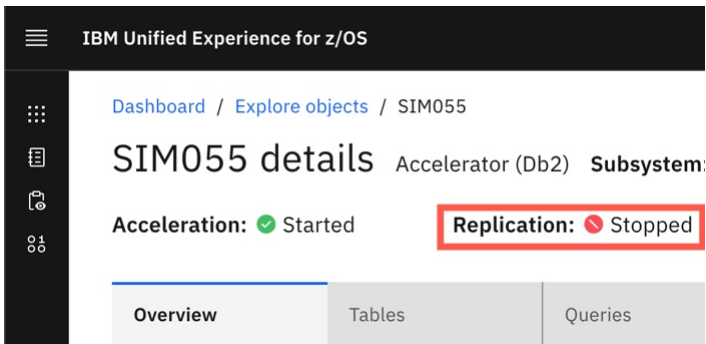
Stopped

The incremental update function is available and accelerator-shadow tables have been included in the process. However, the function is not running right now.

See [Table 50 on page 211](#).

Table 50. Replication status in the header of the Accelerator view											
IBM Db2 Analytics Accelerator Studio	<div> <div> <div>Accelerator: VMNPS04 @ DW</div> <div> <div>Acceleration: Unknown Start Stop</div> <div>Status: Unknown Save Clear</div> <div>Used space: N/A</div> <div>Replication: Stopped Start</div> </div> <div> <div>▶ Query Statistics</div> <div>▶ About</div> </div> <div> <div>▼ Tables (3 of 3 loaded / 3 of 3 enabled for replication)</div> <div> <div> <div></div> Add... <div></div> Alter Keys... <div></div> Rem... <div></div> Replication ▼ <div></div> </div> <div> <input type="checkbox"/> Name like: type filter text </div> <table> <thead> <tr> <th>Name</th><th>Replication Since</th></tr> </thead> <tbody> <tr> <td> IUTEST</td><td>3 of 3</td></tr> <tr> <td> CUSTOMERA</td><td>11/16/12 1:21 PM</td></tr> <tr> <td> CUSTOMERA2</td><td>11/16/12 1:21 PM</td></tr> <tr> <td> CUSTOMERA3</td><td>11/16/12 1:21 PM</td></tr> </tbody> </table> </div> </div> </div> </div>	Name	Replication Since	IUTEST	3 of 3	CUSTOMERA	11/16/12 1:21 PM	CUSTOMERA2	11/16/12 1:21 PM	CUSTOMERA3	11/16/12 1:21 PM
Name	Replication Since										
IUTEST	3 of 3										
CUSTOMERA	11/16/12 1:21 PM										
CUSTOMERA2	11/16/12 1:21 PM										
CUSTOMERA3	11/16/12 1:21 PM										

Table 50. Replication status in the header of the Accelerator view (continued)

IBM Data Server Manager	 <p>The screenshot shows the 'IBM Data Server Manager' interface. Under the 'Administer / Accelerators' section, there are several status indicators. The 'Replication Status' is highlighted with a red box and shows 'STARTED' with a 'Stop' link. Other indicators include 'Used Space' (Not Available), 'Credentials Valid Since' (1/27/20 1:42 PM), 'Trace' (DEFAULT/OFF), 'Active Queries' (0), 'Query History' (100 successful), 'Queue' (Avg. wait time: N/A), and 'CPU cost' (Query Execution: N/A).</p>
IBM Unified Experience for z/OS	 <p>The screenshot shows the 'SIM055 details' page in the 'IBM Unified Experience for z/OS' interface. The 'Replication' status is highlighted with a red box and shows 'Stopped' with a red stop icon. The 'Acceleration' status is 'Started' with a green checkmark. The page also shows 'Accelerator (Db2)' and 'Subsystem' information, and tabs for 'Overview', 'Tables', and 'Queries'.</p>
IBM Db2 Analytics Accelerator Administration Services	N/A

Important: Using the functional links starts or stops the incremental update process for all tables that have been enabled for incremental updates on the selected accelerator.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator. For more information, see [“Selecting an accelerator”](#) on page 135.
3. To start incremental updates:

IBM Db2 Analytics Accelerator Studio	Click Start in the header of the accelerator view. The status, which is labeled Replication , changes to <i>Started</i> .
IBM Data Server Manager	Click Start in the header of the accelerator view. The status, which is labeled Replication Status , changes to <i>Started</i> .

IBM Unified Experience for z/OS	From the Accelerator actions drop-down button on the upper right of the window, select Start replication . The status, which is labeled Replication , changes to <i>Started</i> .
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Start an /accelerator/startStopReplication request. In the request body, specify the connection name and the accelerator name. Set the "enable" : parameter to true.

4. To stop incremental updates:

Restriction: If you stop replication inadvertently while a regular reload of a replication-enabled accelerator-shadow table is taking place (started by the load function or the SYSPROC.ACCEL_LOAD_TABLES stored procedure), the table state changes to *Suspended* after the load. That is, the table is treated like a faulty table. To re-enable incremental updates for this table, restart incremental updates on the accelerator and reload the table again.

IBM Db2 Analytics Accelerator Studio	<p>Click Stop in the header of the accelerator view. This opens the Stop Replication window, in which you can select between the following options for stopping the incremental update process:</p> <p>Controlled Completes all work in progress before stopping the process.</p> <p>Immediate Stops the process without completing work in progress. Compared with the Controlled option, using this option causes a restart of the process to take longer.</p>
IBM Data Server Manager	<p>Click Stop in the header of the accelerator view. This opens the Stop Replication window, in which you can select between the following options for stopping the incremental update process:</p> <p>Controlled Completes all work in progress before stopping the process.</p> <p>Immediate Stops the process without completing work in progress. Compared with the Controlled option, using this option causes a restart of the process to take longer.</p>
IBM Unified Experience for z/OS	From the Accelerator actions drop-down button on the upper right of the window, select Stop replication . This opens the Stop replication window, in which you can select between the following options for stopping the incremental update process:

	<p>Controlled Completes all work in progress before stopping the process.</p> <p>Immediate Stops the process without completing work in progress. Compared with the Controlled option, using this option causes a restart of the process to take longer.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start an /accelerator/startStopReplication request.</p> <p>b. In the request body, specify the connection name and the accelerator name.</p> <p>c. Set the "enable" : parameter to false.</p> <p>d. Leave the "state" : parameter set to "CONTROLLED" or change the setting to "IMMEDIATE".</p> <p>The option "CONTROLLED" completes all work in progress before incremental updates are stopped.</p> <p>The option "IMMEDIATE" stops incremental updates immediately, without completing work in progress before.</p> <p>Note: A restart of the process takes longer if you use the "IMMEDIATE" option.</p>

5. Complete your action:

IBM Db2 Analytics Accelerator Studio	Click OK . You return to the accelerator view, which now reflects the chosen replication status (<i>Started</i> or <i>Stopped</i>).
IBM Data Server Manager	Click OK . You return to the accelerator view, which now reflects the chosen replication status (<i>Started</i> or <i>Stopped</i>).
IBM Unified Experience for z/OS	Click Yes . You return to the accelerator view, which now reflects the chosen replication status (<i>Started</i> or <i>Stopped</i>).
IBM Db2 Analytics Accelerator Administration Services	Click Execute . The response message indicates whether replication was started or stopped successfully.

Including or excluding tables from incremental updates

Incremental updates can be enabled or disabled on the table level. So you can individually select the tables that take part in the process. When a subsystem has been configured for incremental updates, the toolbar of the accelerator view shows an extra button, which works like a drop-down menu.

Before you begin

An accelerator-shadow table can only be included in the incremental update process if it contains data, that is, if it has been loaded.

When loading a table, make sure that the lock mode **TABLE_SET** is selected. This ensures that data changes will not go amiss during the time between unloading the table data from Db2 to the accelerator and the point where the incremental update process sets in.

You can select lock mode **ROW** for a better performance. This mode effects a faster propagation of changes for the following reason: Incremental updates are not halted when a table load starts and continued after the load, but are temporarily written to a spill queue. This queue is drained in the course of events.

However, this comes at the price of a slower load process because lock mode **ROW** prevents the loading of the temporary table, which eventually replaces the former accelerator-shadow table. That is, loads are executed as a series of row changes. Decide whether faster loads or faster incremental updates are more important to you.



Attention:

- Tables to be included must have a unique constraint (primary key or primary index). If such a key does not exist in the accelerator-shadow table or cannot be determined, you must redefine the table and specify such a key. You cannot do this from your administration client; you must run the corresponding stored procedure (SYSPROC.ACCEL_ADD_TABLES) with a special option. The columns that you choose for the key must contain unique values or form such values when they are combined. The values of the selected key columns will then be written to a hidden column in the accelerator-shadow table. This column, called *informational unique constraint*, then serves as the primary key or primary index. For more information, see the entry about the *table_specifications* parameter of the SYSPROC.ACCEL_ADD_TABLES stored procedure in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*.
- When lock mode ROW is set, Db2 data is unloaded at isolation level CS (cursor stability). Whether a row, a page, or an entire table is locked is determined by the LOCKSIZE defined for the table space of the source tables. To avoid deadlocks during the draining of the spill queue, set this table space to LOCKSIZE ROW if you want to use lock mode ROW for your incrementally updated tables.
- If you update Db2 for z/OS tables by running the LOAD utility rather than an INSERT, UPDATE, or DELETE operation, you must set the following parameters (for the LOAD utility):
 - SHRLEVEL CHANGE
 - LOG YES

Otherwise, the changes that were made by the LOAD utility are not detected by the incremental update function, and will thus not be reflected in your accelerator-shadow tables.

- The Db2 source tables of your accelerator-shadow tables have an attribute named DATA CAPTURE. The attribute can carry the value Y or N (default), for yes or no. When incremental updates are enabled for a table, the DATA CAPTURE attribute of the table is set to the value Y. Once set, this attribute value persists, even if the table is disabled at a later time. Bear this in mind, especially if you run applications that use the DATA CAPTURE attribute.

The DATA CAPTURE attribute is set by an ALTER TABLE statement, which is run as part of the SYSPROC.ACCEL_SET_TABLES_REPLICATION stored procedure. However, the attribute can only be set successfully if the ID of the user who runs the stored procedure has ALTER TABLE authorization. If this is not the case, a database administrator must set the attribute for all tables in Db2 for z/OS.

- You might have to reload or even remove tables from an accelerator after the execution of an ALTER TABLE or ALTER TABLESPACE statement in Db2 for z/OS. For more information, see *What to do after changing a table or table space in Db2 for z/OS* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
- IBM InfoSphere Change Data Capture for z/OS uses a metadata table called DMMD_SIGNALS. This table is a kind of an interface for the entire process. It does not make sense to select it for incremental updates. Ensure that you do not select it inadvertently as doing so will lead to unpredictable and unwanted side-effects.

- If a table is dropped from Db2 for z/OS, you normally have to remove all related accelerator-shadow tables manually from the attached accelerators to avoid catalog mismatches. There is one exception: If the tables are enabled for replication, and replication is carried out by the IBM Integrated Synchronization function, the accelerator-shadow tables are removed automatically.

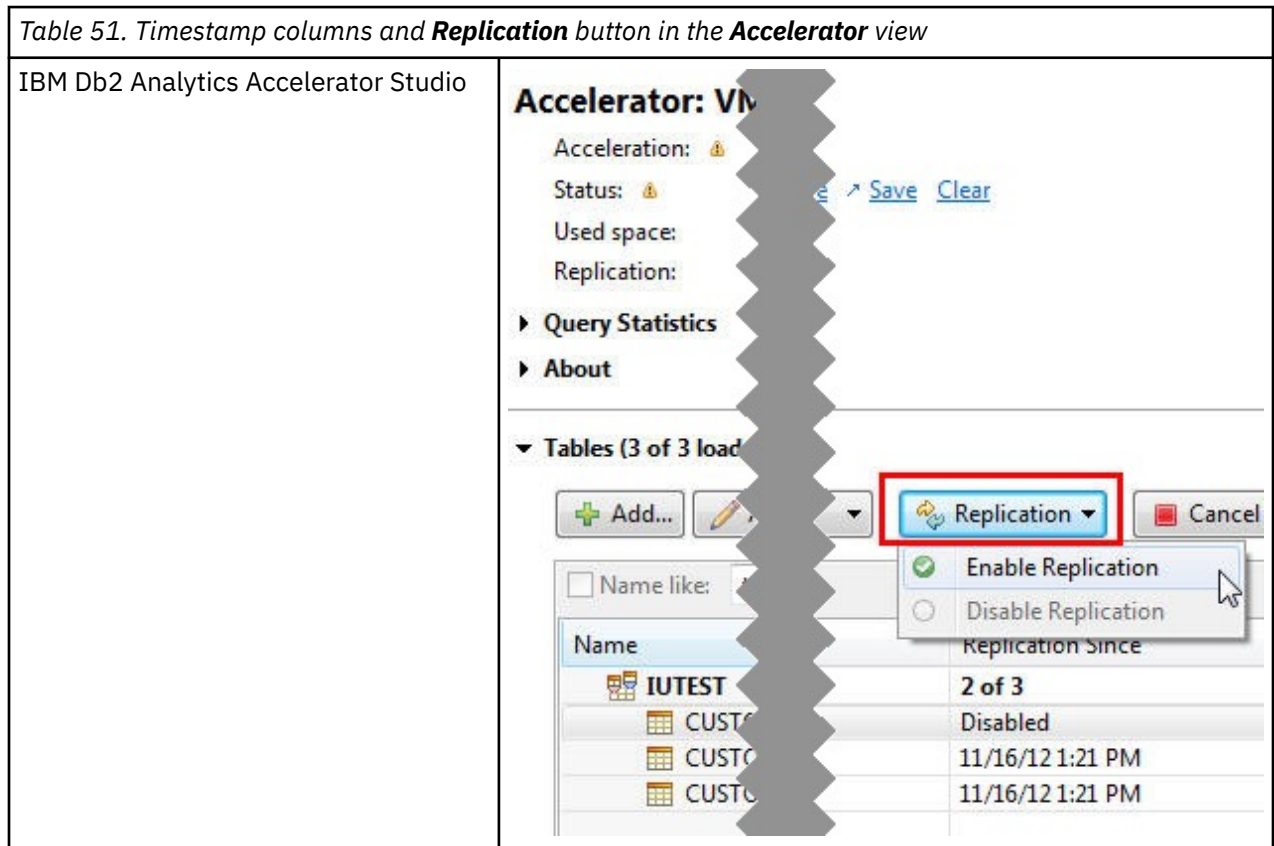
About this task

Two different situations must be considered before adding tables to an incremental update process:

- An accelerator-shadow table has not yet been loaded, that is, it is in *Initial load pending* state. If you enable such a table, and load it immediately thereafter, the tables in Db2 and on the accelerator are in sync. No data changes will be lost because the table contents are the same at the outset and the incremental update process captures all future changes and propagates these to the accelerator. Tables of this type show the same timestamp in the **Last Load** and **Replication Since** columns of the accelerator view. See the entry for the REP1 table in [Table 51](#) on [page 216](#).
- An accelerator-shadow table has already been loaded when it is added to the incremental update process. In this case, it is likely that the tables are out of sync because data changes might have been applied to the original Db2 table, and not been reflected in the corresponding accelerator-shadow table because the last manual update of the table was before these changes happened. If a safety mechanism was not in place, such tables would continue to be out of sync because the incremental update process can only capture and propagate changes that occur in the future. To avoid this, the status of such tables changes to *Initial load pending* when incremental updates are enabled. This state enforces a complete reload of the tables before they can be used, so that the synchronization gap is closed before the incremental update process sets in.

Important: If the load fails for some of the selected tables, incremental updates are automatically disabled for these tables.

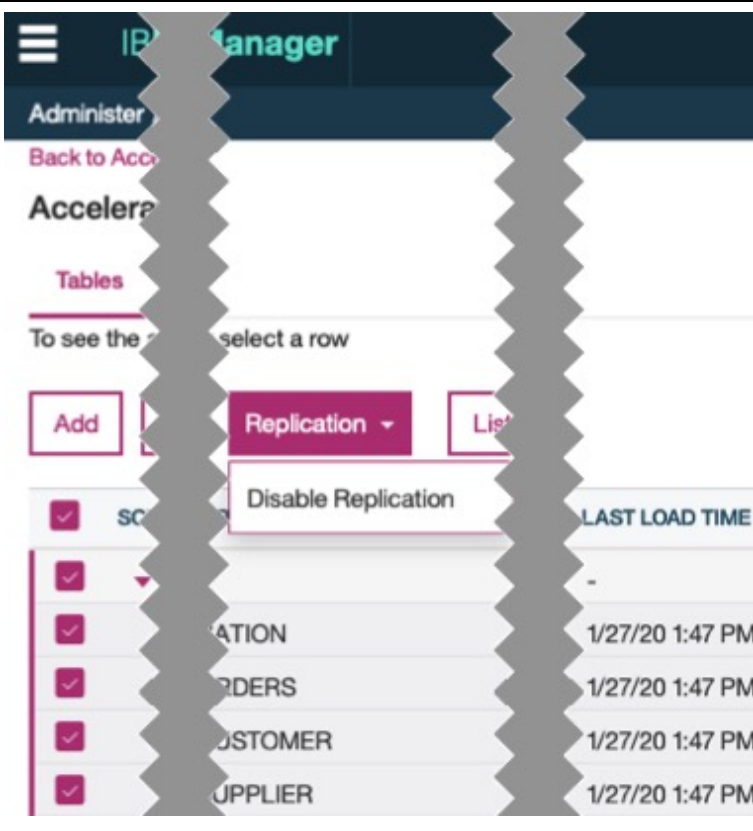
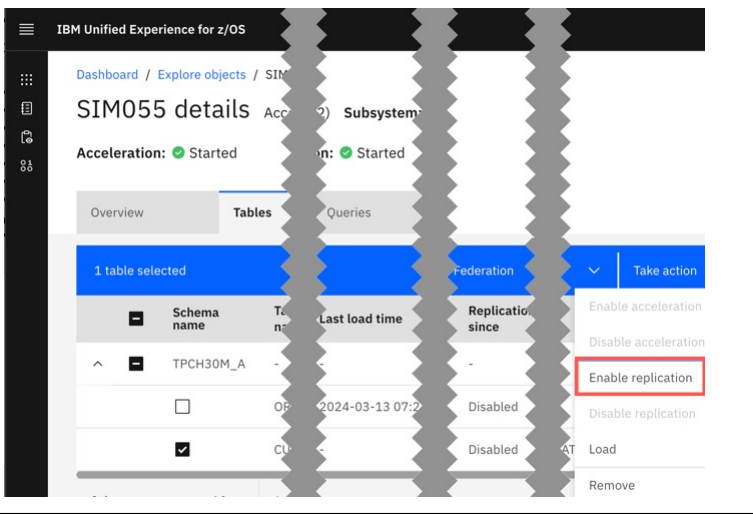
*Table 51. Timestamp columns and **Replication** button in the **Accelerator** view*



The screenshot shows the IBM Db2 Analytics Accelerator Studio interface. On the left, the text 'IBM Db2 Analytics Accelerator Studio' is visible. The main panel is titled 'Accelerator: VM'. Below the title, there are sections for 'Acceleration:', 'Status:', 'Used space:', and 'Replication:'. There are also links for 'Save' and 'Clear'. Below these are expandable sections for 'Query Statistics' and 'About'. The 'Tables (3 of 3 load)' section is expanded, showing a table list with columns 'Name', 'Last Load', and 'Replication Since'. The 'Replication' button is highlighted with a red box, and a dropdown menu is open, showing options 'Enable Replication' (selected) and 'Disable Replication'. The table list shows three tables: 'IUTEST' (2 of 3), 'CUSTO' (Disabled), and 'CUSTO' (11/16/12 1:21 PM).

Name	Last Load	Replication Since
IUTEST	2 of 3	Disabled
CUSTO	11/16/12 1:21 PM	11/16/12 1:21 PM
CUSTO	11/16/12 1:21 PM	11/16/12 1:21 PM

Table 51. Timestamp columns and **Replication** button in the **Accelerator** view (continued)

<p>IBM Data Server Manager</p>	 <p>The screenshot shows the IBM Data Server Manager interface. The 'Accelerator' view is active, displaying a table with columns for 'Schema name', 'Table name', and 'LAST LOAD TIME'. A 'Replication' dropdown menu is open, showing the option 'Disable Replication'.</p>
<p>IBM Unified Experience for z/OS</p>	 <p>The screenshot shows the IBM Unified Experience for z/OS interface. The 'SIM055 details' view is active, displaying a table with columns for 'Schema name', 'Table name', 'Last load time', and 'Replication since'. A 'Replication' dropdown menu is open, showing the option 'Enable replication'.</p>
<p>IBM Db2 Analytics Accelerator Administration Services</p>	<p>N/A</p>

The **Replication Since** column shows the following states in the order indicated as soon as a load process begins:

1. *Suspended*
2. *Refreshing*

The *Refreshing* state is shown until the last change has been drained from the spill queue. When you move the mouse pointer over the *Refreshing* label, the current processing phase is displayed in a tool-tip window. The refresh process consists of the following phases:

Pending

The table load process was started, but no data has yet been transferred. Therefore, only the data that has been transferred before the refresh is available for accelerated queries.

Spilling

The table load is in progress, and data is being transferred. Incremental updates that occur during this time are written to the spill queue. Therefore, only the recently transferred load data is available for accelerated queries.

Draining

The load has finished and the changes that have been collected in the spill queue are being applied. Only the data changes that have already been transferred to the table are available for accelerated queries.

Tip: If a table remains in the draining phase for several hours, you are probably in the very rare situation in which new changes arrive in the spill queue faster than they can be drained from it, so that the draining phase never ends (infinite drain). In this case, stop incremental updates completely for a while.

Restriction: It is not possible to enable tables if the table name or the schema name contains GB18030 characters (Simplified Chinese) of Unicode plane 2 (U+20000-U+2FFFF: Supplementary Ideographic Plane). Trying to do so results in an error.

Procedure

1. Select the accelerator to access the tables you want enable for incremental updates:

For more information, see [“Selecting an accelerator” on page 135](#).

2. Select the accelerator-shadow tables to be included or excluded.

In IBM Data Server Manager, the table selection results in the display of additional buttons on the toolbar.

Important:

- The incremental update process must be running when you enable the very first table. Make sure that this is the case. If not, click **Start** or **Start replication** in the header of the **Accelerator** view. In IBM Db2 Analytics Accelerator Administration Services, start a corresponding **/accelerator/startStopReplication** request.
- A running incremental update process is not required if you want to enable additional tables later on. However, the point becomes relevant again if you have disabled all tables. The process must be running when you enable or re-enable the first table.

3. Include or exclude tables from the process:

IBM Db2 Analytics Accelerator Studio	<ul style="list-style-type: none">• To enable incremental updates for the selected tables: Click Replication > Enable Replication. See Table 51 on page 216 for the location of the button.• To disable incremental updates for the selected tables: Click Replication > Disable Replication.
IBM Data Server Manager	<ul style="list-style-type: none">• To enable incremental updates for the selected tables: Click Replication > Enable Replication. See Table 51 on page 216 for the location of the button.

	<ul style="list-style-type: none"> To disable incremental updates for the selected tables: Click Replication > Disable Replication.
IBM Unified Experience for z/OS	<ul style="list-style-type: none"> To enable incremental updates for the selected tables: From the Take action drop-down button on top of the list of tables, select Enable replication. See Table 51 on page 216 for the location of the button. To disable incremental updates for the selected tables: From the Take action drop-down button on top of the list of tables, select Disable replication
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /table/enableDisableTablesReplication request.</p> <p>b. In the request body:</p> <ol style="list-style-type: none"> Specify the connection name ("connectionName":). Specify the accelerator name ("accelName":). Specify the tables in an array that serves as the value of the "selTables" parameter. The first-level elements in this array must be JSON objects (key-value pairs), in which the key is the schema name, followed by the value, which is an array that contains the names of the tables belonging to that schema. Separate these table names by a comma. Also separate the JSON objects by a comma. Example: <pre> "selTables": [{ "SYSABC": ["TABLE01", "TABLE02"] }, { "SYSDEF": ["TABLE01"] }], </pre> <p>c. Set the "enableReplication": parameters to one of the following values:</p> <p>true To enable incremental updates for the specified tables.</p> <p>false To disable incremental updates for the specified tables.</p> <p>d. Click Execute.</p>

Related reference

[What to do after changing a table or table space in Db2 for z/OS](#)

In a number of cases, an ALTER TABLE or ALTER TABLESPACE statement in Db2 for z/OS does not involve maintenance work on your accelerator-shadow tables. There are cases, however, in which it does. See which steps you might have to take.

Related information

[CREATE TABLESPACE](#)

Monitoring incremental updates

You can monitor the changes to accelerator tables that result from incremental updates.

IBM Db2 Analytics Accelerator Studio and IBM Data Server Manager

The header of the **Accelerator** view provides an additional line of information when incremental updates have been configured for the accelerator. This line of information is labeled **Replication latency**.

One of the following values is displayed next to this label:

When you move the mouse pointer over the latency value in IBM Db2 Analytics Accelerator Studio, a pop-up window shows the following information:

Target Agent

Operations completed by the incremental update function.

Inserts

Number of row inserts in accelerator-shadow tables that have been included in the incremental update process.

Deletes

Number of row deletions from accelerator-shadow tables that have been included in the incremental update process.

Remember:

- An UPDATE is a DELETE followed by an INSERT, so these two figures account for all incremental updates that have been applied.
- Since an UPDATE in DB2 is a DELETE followed by an INSERT on the accelerator side, the values can be different from those in Db2 for z/OS (see **Source Agent**). Furthermore, multiple operations on a single row within a short time might be reported as just one single operation.
- If a load operation is in progress and lock mode **Row** has been selected, the original DB2 tables are not locked during the load. Hence it is possible to INSERT new rows into the DB2 tables even though a load is taking place. If incremental updates are enabled for the same tables, the incremental update function stores these new rows in the spill queue until the load has finished, and applies these changes thereafter (draining the spill queue). In the course of a drain, a DELETE and an INSERT operation is carried out for each row in the affected accelerator-shadow tables. The DELETE deletes the row that was inserted by the previous load operation, and the INSERT adds this row again (applies the latest change) . This has the effect that the number **Deletes** increases in cases like this.

See [Table 52 on page 221](#).

Table 52. **Replication latency in the accelerator view**

IBM Db2 Analytics Accelerator Studio

Accelerator: 11

Acceleration: Credentials valid since: 11/13/12 6:56 PM [Update](#)

Status: Trace: DEFAULT / OFF [Configure](#) [Clear](#)

Used space: Active queries: N/A

Replication: Replication latency: Low [Show events](#)

► Query Statistics

► About

▼ Tables (3 of 3 in Acceleration)

[Add...](#) [Load...](#) [Acceleration](#) [Storage](#) [Replication](#)

☐ Name like

Name	Rows	Acceleration	Last Load	Replication Since
1. IUTES	- 3 of 3	3 of 3 tables	2 of 3	
2. C...	- Enabled	11/16/12 1:21 PM	Disabled	
3. C...	- Enabled	11/16/12 1:21 PM	11/16/12 1:21 PM	
4. C...	- Enabled	11/16/12 1:21 PM	11/16/12 1:21 PM	

IBM Data Server Manager

IBM Data Server Manager

Administer / Accelerators

Diagnostics

Used Space : Not Available

Credentials Valid Since : 1/27/20 1:42 PM

Trace : DEFAULT/OFF

Queries

Active Queries : 0 (0 queued)

Query History : 100 successful -1 failed

Monitoring

Queue : Avg. wait time: N/A

CPU cost : Query Execution: N/A

Replication

Replication Status : STARTED [Stop](#)

Replication Latency : Low [Show Events](#)

IBM Unified Experience for z/OS

In IBM Unified Experience for z/OS, the replication latency and other replication-specific information are plotted on a graph. You access this graph as follows:

1. Open the Accelerator view
2. Click the **Monitor** tab.
3. On the **Monitor** tab, click the **Incremental updates** sub-tab.

The graph shows data curves only if replication has been enabled for the accelerator, and if incremental updates have been applied or are being applied, that is, if tables have been enabled for replication.

IBM Db2 Analytics Accelerator Administration Services

In IBM Db2 Analytics Accelerator Administration Services, you can submit a **/monitor/incrementalUpdate** request:

1. Start the Swagger UI in a web browser.
2. Submit a **/source/add** or **/source/edit** request to access the accelerator that you want to obtain information about.
3. Submit the authorization token when prompted.
4. Go to the **Monitor** section and expand the **/monitor/incrementalUpdate** request block.
5. In the request body, specify the connection name and the accelerator name.
6. Click **Execute**.

The monitoring data is returned in the response body.

Metrics displayed by external tools

To monitor the performance of the incremental updated process, a few metrics that are displayed by external tools might be of interest to you. External tools are IBM OMEGAMON® for Db2 Performance Expert on z/OS and similar third-party applications:

Q8STLRCP

CPU TIME FOR LOG READER TASK

Q8STLRZE

ZIIP ELIGIBLE TIME FOR LOG READ TASK

Q8STLRZI

ZIIP TIME FOR LOG READER TASK

For a description of these metrics, see [IFCID 002 - Accelerator Data - Subsystem/Group Perspective V4 or later](#)

The following metrics might offer further insight:

QISTLRCP

TOTAL INSYNC CPU TIME

QISTLRZI

TOTAL INSYNC ZIIP TIME

QISTLRZE

TOTAL INSYNC ZIIP ELIGIBLE TIME

For a description of these metrics, see [IFCID 002 - Data Manager Data](#).

Using the event viewer for incremental updates

The event viewer shows system messages that are related to incremental update processes. It is equipped with various filtering options to facilitate the search for particular messages.

About this task

The event viewer shows a log entry for each system event that occurred in connection with incremental updates. The entries are listed in a table, which contains the following columns:

Type or**Severity**

The type of the event or message connected with the event. Possible types are **Error**, **Warning**, and **Information**.

Message

The message code and the starting text of the event message. The full message is displayed in the **Message** window on the lower right.

Event ID

The unique identifier of the event.

Originator

The component that issued a message.

Time

The time at which an event occurred.

Procedure

- To open the event viewer:
 - a) Connect to the Db2 subsystem that is associated with the replication-enabled accelerator.

This must be an accelerator that is included in the incremental update process. That is, incremental updates must be configured for the Db2 subsystem to which the accelerator is attached. For more information, see [“Connecting to a database server” on page 124](#).
 - b) Select the replication-enabled accelerator. For more information, see [“Selecting an accelerator” on page 135](#).
 - c) Open the event viewer:

IBM Db2 Analytics Accelerator Studio	Click the Show events link in the header of the Accelerator view .
IBM Data Server Manager	Next to the Replication Latency value in the Accelerator view , click Show Events .
IBM Unified Experience for z/OS	From the Accelerator actions drop-down list, select Replication events .
IBM Db2 Analytics Accelerator Administration Services	N/A

Note: The current replication status of the accelerator (*Started*, *Stopped*, or *Error*) is irrelevant.

- Selecting a message in the **Replication Events** window has the following effect:

IBM Db2 Analytics Accelerator Studio	The main column values are displayed in the Event Details section on the lower left, and the full message text is displayed in the Message window on the lower right.
IBM Data Server Manager	The full message text is displayed at the bottom of the window.
IBM Unified Experience for z/OS	
IBM Db2 Analytics Accelerator Administration Services	

- Using the **View** or **Severity** drop-down list, you can hide all messages of an event type that is different from the selected type. To apply this type of filter in IBM Db2 Analytics Accelerator Studio and IBM Data Server Manager, click the **Run** button after selecting an event type from the drop-down list. For example, if you select **Error** and **Run**, only error messages and messages with a severity higher than *error* are displayed.

The underlying mechanism is the same as for the classification of trace information. The lower the severity of the selected information type, the more verbose is the information that is displayed. While the **Error** type provides information about errors and even severer events only, the **Warning** type provides information about warnings, errors, and severer events. That is, each information type with a lower severity includes the information of the types with a higher severity.

- Using the **Show** drop-down list, you can select a time frame for the messages to be displayed. To apply this type of filter in IBM Db2 Analytics Accelerator Studio and IBM Data Server Manager, click the **Run** button after selecting a time frame from the drop-down list. For example, if you select **Last 24 hours** and **Run**, the event viewer shows all events that happened during the last 24 hours.

In IBM Db2 Analytics Accelerator Studio, you can even define a custom time frame:

- Select **Custom interval** from the **Show** drop-down list to open the **Define Custom Interval** window.
 - To use a predefined time frame (same as using the **Show** drop-down list in the **Replication Events** window), leave the **Show events within** radio button as is, and select a suitable time frame from the adjacent drop-down list.
 - To define a custom time frame, select **Show events** and:
 - In the line starting with **From**, select the start of your time frame by using the date picker and the time spin buttons on the right.
 - In the line starting with **To**, select the end of your time frame by using the date picker and the time spin buttons on the right.
- Click **OK** to return to the **Replication Events** window.

- **IBM Db2 Analytics Accelerator Studio only:** Typing a search term in the search field on the top of the table reduces the messages being displayed to those messages that contain the search term.
For example, if you know the error code belonging to a particular message, you can type in this error code to show just the messages for one particular type of error.
- To close the **Replication Events** viewer:

IBM Db2 Analytics Accelerator Studio	Click the cross-shaped icon on the window tab.
IBM Data Server Manager	Click Close .
IBM Unified Experience for z/OS	Click the Go back button.
IBM Db2 Analytics Accelerator Administration Services	N/A

Warnings related to incremental update processes

The following warnings might occur in connection with incremental updates.

InsufficientLockModeWarning

This warning is issued if you did not select the option **Lock Db2 tables while loading** for the initial load of an accelerator-shadow table taking part in the incremental update process, or if you selected the lock modes **NONE** or **PARTITION**.

If locks were disabled for the initial load of an accelerator-shadow table (**Lock Db2 tables while loading** not selected), the following message is displayed:

One of the tables has replication enabled. This table must be locked while loading to avoid an inconsistency of data between Db2 and the accelerator.

If the lock modes **NONE** or **PARTITION** were used, data consistency between tables in Db2 and accelerator-shadow tables cannot be guaranteed because table changes can be applied to the Db2 tables during the unload process. If possible, use the lock mode **TABLE_SET**.

NoUniqueConstraintsDefinedWarning

A table does not have a unique constraint, such as a unique key or unique index. This would result in a poor performance when UPDATE or DELETE changes are propagated to an accelerator-shadow table (because it takes longer to identify the changed table rows).

To avoid a performance degradation, the product inserts informational unique constraints into the accelerator-shadow table. That is, a hidden column with unique values is inserted to serve as the unique index.

OrganizingKeysAndUniqueConstraintsMismatchWarning

The unique constraints of a table in Db2 for z/OS differ from those of the corresponding accelerator-shadow table or exceed the number of matching organizing keys. This might lead to a slow propagation of data changes to the accelerator. In the case of different unique constraints, it just takes longer to identify the table rows to be updated or deleted. A mismatch between the unique constraints of the table and the organizing keys affects the change propagation negatively if there are more unique constraints than matching organizing keys. If extents cannot be located for certain table rows because there is no matching organizing key, table scans take longer.

Collecting CDC trace information

None of the options in the **Save Trace** window of IBM Db2 Analytics Accelerator Studio collects trace information about the CDC capture engine. This information, however, might be the key to a problem with the incremental update function.

About this task

If you are facing a problem with the incremental update function, provide as much information about the related software components as possible the support team. This includes information about the CDC

capture engine, which is the part of IBM InfoSphere Change Data Capture for z/OS that runs on z/OS. The support team might even ask you for this type of information. Here is a description on how to obtain it.

Procedure

1. The CDC capture engine is just one of the started tasks running on your z/OS system. If you do not know the name of the started task, ask a z/OS systems programmer which task that is.
2. In the SDSF program on z/OS, type XDC in front of the relevant address space output to copy its contents to a sequential data set.
3. Transfer this data set in ASCII mode to your Linux or Windows workstation and add the resulting txt file to your support case.
4. If a trace dump has been generated, include that information as well. Transfer this data in TERSED format to your workstation because this retains the mainframe-readable formatting of the data during the transfer to a non-mainframe system, and thus ensures that the data remains useful for IBM support. Use an extension of `trs` for the files.

The TERSED format also reduces the file size. See the documentation for the AMATERSE program if you need further assistance.

What to do after changing a table or table space in Db2 for z/OS

In a number of cases, an ALTER TABLE or ALTER TABLESPACE statement in Db2 for z/OS does not involve maintenance work on your accelerator-shadow tables. There are cases, however, in which it does. See which steps you might have to take.

NOT Programming Interface information

ALTER TABLE

- If a column was added, changed, or deleted by an ALTER TABLE operation on a Db2 table, queries against this table are not accelerated if they reference the new, changed, or deleted column (reason code 14). Therefore, you must complete the following steps after an ALTER TABLE operation:

1. Remove the corresponding accelerator-shadow table from all accelerators on which it is defined.

In most cases, a REORG operation is not required before the table can be redefined on the accelerator. However, a REORG is required in the following cases, although this seems to be just a recommended action, as the advisory *REORG-pending* (AREO) state suggests:

- The ALTER TABLE operation added a column.
- The ALTER TABLE operation changed column data types.
- The ALTER TABLE operation dropped columns in *Db2 11 for z/OS*.

2. Redefine the table on the accelerators from which you previously removed it.
3. Load the redefined table on all accelerators.
4. Enable query acceleration for the redefined table on all accelerators.

ALTER TABLESPACE

If a table space was changed in Db2 for z/OS (ALTER TABLESPACE), and the tables of that table space also exist on an accelerator, actions are required under the following conditions:

- If the maximum number of partitions has changed (MAXPARTITIONS), you only have to reload the new or changed partitions. It is not required to reload existing partitions that have not changed.
- If a table space was changed from *segmented* to *partitioned by growth*, you must remove the accelerator-shadow tables of that table space from all accelerators, then redefine and re-prepare these for accelerated queries. Follow steps [“1” on page 225](#) through [“4” on page 225](#) to do that.

LOAD from DD DUMMY input data set

If you have emptied a table space or a table-space partition by overwriting its content through a **LOAD REPLACE** operation with **DD DUMMY** as the SYSREC data set, and the table has been enabled for incremental updates using IBM Integrated Synchronization, you need not reload the table or partition on the accelerator. The content changes are mirrored automatically in the corresponding accelerator-shadow table.

REORG DISCARD

If you have emptied a partition of a *range-partitioned* table through a **REORG DISCARD** operation without affecting any other partition of this table, and if the table has been enabled for incremental updates using IBM Integrated Synchronization, you need not reload the partition on the accelerator. The content changes are mirrored automatically in the corresponding accelerator-shadow table.

End of NOT Programming Interface information

Freeing up storage in Db2 for z/OS

The High Performance Storage Saver archives data of table partitions in Db2 for z/OS to an accelerator. The resulting tables are called accelerator-archive tables. Moving data that is no longer actively used (historical data) to a less expensive storage device, you can free up costly storage space on your database server.

Details

The High Performance Storage Saver is a fully integrated function. Its use has the positive side-effect that it also makes the database system more responsive. This is because fewer objects need to be maintained in the catalog, smaller or fewer indexes need to be searched, reorganizations become quicker, report data and statistics can be gathered faster.

If a query could be accelerated while the original data resided in Db2, it can also be accelerated when the data has been archived to an accelerator.

Just like before, the query routing process is handled by the Db2 query optimizer and IBM Db2 Analytics Accelerator. If data has been archived to an accelerator, and an incoming query needs to access this data, and if furthermore the query qualifies for acceleration, then the query is automatically processed by IBM Db2 Analytics Accelerator.

You can determine whether archived data is to be included in queries. By default, this type of data is excluded, and IBM Db2 Analytics Accelerator for z/OS automatically skips archived records when it processes a query. This often leads to different results for queries that are run repeatedly because the query is run just against the remaining Db2 data. If this behavior is not wanted, you can set the **CURRENT GET_ACCEL_ARCHIVE** special register or the **GET_ACCEL_ARCHIVE** configuration parameter to YES.

You can reload accelerator tables without thinking about archived partitions. Partitions that have been archived are automatically excluded from the load process.

The High Performance Storage Saver is flexible. It is still possible to define one and the same query table on multiple accelerators. It is also possible to archive the data of one or more partitions to an accelerator, while the data of other partitions remains in Db2 for z/OS and on the same or other accelerators.

Before any data is moved to an accelerator and deleted from Db2, image copies are created, which allow you to restore the data if needed. The table spaces of the affected (archived) partitions are set to a persistent read-only state, which prevents future INSERT, UPDATE, and DELETE operations on these partitions. Furthermore, the High Performance Storage Saver ensures that the data in the image copies is consistent with the data that is going to be archived.

The table space of an archived partition continues to exist. It will be empty, but will still claim as much disk space as defined by the *minimum primary space allocation*. To meet your space-saving goal, check the minimum primary space allocation (PRIQTY) for the table spaces of the partitions that you want to

archive. Decrease the value if needed by submitting an appropriate `ALTER TABLESPACE ... PRIQTY` statement.

Restrictions

The following restrictions exist in connection with the High Performance Storage Saver:

- The High Performance Storage Saver works on range-partitioned tables only. If the partitioning is controlled by an index, the index must (already) exist.
- The smallest unit that you can archive is a partition. That is, all the table rows in specified partitions are copied to the accelerator and are finally removed from Db2.
- You can only archive partitions of tables that exist as accelerator-shadow tables and that are in *InitialLoadPending* or *Loaded* state. This implies that partitions cannot be archived if incremental updates have been enabled for the table.
- Table data cannot be archived if a column in the table serves as the parent in a foreign-key-relationship. The reason for this is that the original data is deleted at the end of the archiving process, which removes the values of the foreign key. This cannot be permitted because it violates a fundamental rule for data integrity in a relational database.
- Normally, you cannot rotate a Db2 partition or change partition boundaries if the data of this partition data has been archived to an accelerator. Commands to rotate a partition or change partition boundaries will be rejected by Db2 for z/OS. This restriction can be circumvented by first removing the Partition Read-Only (PRO) state with the help of the Db2 REPAIR utility. If you rotate a partition after removing the PRO state, you are still able to recover the archived partitions by using the image copies, except for those partitions that have been "rotated out". If you change the partition boundaries, on the other hand, the image copies become unusable and the data cannot be restored. You will also end up with orphaned data on the accelerator.



Attention: A rotation leads to the deletion of the data in those Db2 partitions that have been "rotated out". In addition, the corresponding image copies, which were created when the data was archived, will become unusable. The first archiving operation on the table that used to contain the "rotated -out" partitions will also delete the data of the "rotated-out" partitions from the accelerator, irrespective of the partitions that you specified for archiving.

- You can archive partitions that contain *Db2 archive tables*. However, you cannot archive *Db2 archive-enabled tables*. Do not confuse these tables with partitions and tables that were archived to an accelerator by the High Performance Storage Saver (accelerator-archive tables). If necessary, check the Db2 documentation for definitions of the terms *Db2 archive table* and *Db2 archive-enabled table*. Bear in mind also that when a Db2 archive table has been processed by the High Performance Storage Saver, you can no longer shift rows from the corresponding Db2 archive-enabled table to the Db2 archive table or vice versa. A message with SQLCODE=-904 is returned when you try to do that.
- No failback mechanism is in place in case an error occurs. Records that have already been archived are not rolled back. The Db2 catalog explicitly marks the partitions containing these records as "archived".
- Columns that cannot be loaded into accelerator tables because their data types are not supported can also not be archived. The following data types lead to a failure of the archiving operation:
 - BLOB
 - CLOB
 - DBCLOB
 - XML

The behavior is different for user-defined data types that are not supported. Trying to archive columns of such types will result in just a warning; the rest of the partition or table data will be archived.

Although the original data is deleted after archiving, the data in unsupported columns is not lost because it is saved to the image copies.

- If the GET_ACCEL_ARCHIVE special register (or ZPARM) has been set to the value YES, and a query addresses tables whose data has been archived to different accelerators, the query fails.

- For an archiving operation to succeed, a shared lock is required on the involved tables or partitions. Long-running transactions, such as database queries, might prevent the lock from being obtained. Make sure that long-running transactions are finished before you start archiving.

Archiving partition or table data with the High Performance Storage Saver

The functionality of the High Performance Storage Saver is fully integrated into your administration client. See how to archive the data of partitions or entire tables from the **Accelerator** view.

Before you begin

1. Make sure that you have read the introduction to the High Performance Storage Saver and the list of restrictions in the superordinate topic.
2. For the creation of the image copies, the AQTENV data set must be referenced by the Workload Manager (WLM) environment that has been set up for the IBM Db2 Analytics Accelerator for z/OS stored procedures, and a user with sufficient access rights must have set at least one of the following environment variables in this data set (a z/OS systems programmer or database administrator usually has the required access rights):

- AQT_ARCHIVE_COPY1
- AQT_ARCHIVE_COPY2
- AQT_ARCHIVE_RECOVERYCOPY1
- AQT_ARCHIVE_RECOVERYCOPY2

These variables determine how many local image copies and recovery image copies are created for each archived partition and how the data sets are named. If you set a variable, a corresponding data set is created when partition data is archived. At least one of the variables must be set. Default values do not exist. Each value is a template specification as used in the Db2 TEMPLATE utility, for example:

```
AQT_ARCHIVE_COPY1 = &USERID..&DB..&TS..P&PART..&UNIQ.
```

where

&USERID.

ID of the user who runs SYSPROC.ACCEL_ARCHIVE_TABLES

&DB.

Name of the database that a partition resides in

&TS.

Name of the table space that the partition resides in

&PART.

Identifier of the (physical) partition. The letter P in the example is a text or string constant used as a prefix. This is required because &PART. resolves to a numeric value like 00001, and this not valid for qualifiers in a data-set name.

&UNIQ.

Causes the creation of a unique identifier

The template specification in the example could, for instance, result in the following image copy name:

```
BCKE.V4L1.BCKERTSE.CKRange3.P00001.D72R4KHN
```

- All template variables that are documented for the Db2 COPY utility can be used, with the exception of &SEQ (&SQ), &LIST (&LI), and &DSNUM.
- The chosen variables must ensure the uniqueness of image-copy data-set names. It is therefore recommended that you use at least the &PART. and &UNIQ. template variables.
- Templates must resolve to valid z/OS data set names.
- The template data-set names that you use must have been mapped to suitable data classes in the DFSMS.

Important: The AQT_ARCHIVECOPY_HLQ environment variable that was used with earlier versions of the High Performance Storage Saver is deprecated. Remove it from the AQTENV data set.

3. The High Performance Storage Saver stored procedure SYSPROC.ACCEL_ARCHIVE_TABLES creates image copies whose size might exceed 65535 tracks on direct access storage devices (DASDs). Therefore, a z/OS systems programmer must define and use a data class in the storage management subsystem (SMS) that supports larger sequential data sets and must associate this data class with the range of template data-set names for image copies. Data set types that can be used to this end are shown in [Table 53 on page 229](#).

Table 53. Suitable data-set types for storage saver image copies and corresponding SMS data-class settings

Data-set type	Settings in SMS data class	Properties of data-set type
Extended-format data set	<ul style="list-style-type: none"> • Data Set Name Type = EXT • One of the following extension sub-parameter settings: <ul style="list-style-type: none"> – Ext subparameter = R (required) – Ext subparameter = P (preferred) • Volume Count > 1 	<ul style="list-style-type: none"> • Requires multiple volumes • Maximum volume size still 65535 tracks
Large-format data set	Data Set Name Type = LARGE	<ul style="list-style-type: none"> • Multiple volumes possible, but not required • Volume sizes of more than 65535 tracks possible
Extended-attribute data set	EATTR = OPT	<ul style="list-style-type: none"> • Data sets must be stored on an extended-address volume (EAV) with at least 65521 cylinders. • Multiple volumes possible, but not required. A single volume might be sufficient.

To associate a suitable data class with the range of template data-set names, the z/OS systems programmer must create or modify a corresponding automatic class selection routine (ACS routine). The following example shows an excerpt of such an ACS routine, in which it has been assumed that the value of AQT_ARCHIVE_COPY1 starts with IDAAHPSS, as in IDAAHPSS.&USERID.&DB.&TS.&P&PART.&UNIQ.:

```
FILTLIST LARGE INCLUDE(IDAAHPSS.**)  
...  
WHEN (&DSN = &LARGE) DO SET &DATACLAS = 'LARGE' ...
```

Tip: You can also define the ACS routine in such a way that the image copies created by the High Performance Storage Saver are stored on tape devices so that space can be saved on more expensive storage devices.

4. After setting the environment variables mentioned in step “2” on [page 228](#), the Workload Manager (WLM) environment for the SYSPROC.ACCEL_ARCHIVE_TABLES stored procedure must be refreshed. Make sure that this has been done.
5. If you intend to archive partitions from a Db2 data sharing group, make sure that the following conditions apply:

- a. The volumes or devices for the storage of image copies must be available for all members of the data sharing group.
 - b. The values of the environment variables mentioned in step “2” on page 228 must be identical on all members of the data sharing group.
6. Non-partitioning indexes might slow down the archiving process. If more than just a few small to mid-sized non-partitioning indexes are defined for a table, but the partitions to be archived are not many and rather large, then consider dropping the indexes before archiving. Re-create the indexes thereafter.
 7. If you also use the incremental update function, check the setting of the ONUTILITYACTION keyword in the IBM InfoSphere Change Data Capture for z/OS configuration. The setting ONUTILITYACTION=IDLE leads to a conflict because IDLE suspends the propagation of data changes for the entire table, and not just the partitions that have been archived by the High Performance Storage Saver. Hence the parts that have not been archived will not be synchronized anymore. To avoid this conflict, set the keyword to the value IGNORE.

About this task

The archiving task is carried out by the SYSPROC.ACCEL_ARCHIVE_TABLES stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, follow the appropriate **Related reference** link at the end of this topic.

Note: It might take a long time to archive many partitions. If you an administration client to invoke the ACCEL_ARCHIVE_TABLES stored procedure, the administration client must stay open until the task has been completed. Otherwise, the stored procedure aborts, in which case it might be difficult to recover from the errors that were caused by the abortion. To avoid this problem, invoke the stored procedure from a TSO batch job. You can also repeatedly archive a smaller set of partitions at a time. Before you invoke the function, make sure that you have enough disk space for the image copies.

Procedure

1. Connect to the Db2 subsystem that is associated with the accelerator you want to archive to.
For more information, see “[Connecting to a database server](#)” on page 124.
2. Select the accelerator. For more information, see “[Selecting an accelerator](#)” on page 135.
3. In IBM Data Server Manager, click the **Manage** button.

Note: You can only archive partition or table data to a regular accelerator. Therefore, you must open the **Accelerator view** of a regular accelerator.

4. If the tables are not yet defined as accelerator-shadow tables, click **Add** to start the **Add Tables** wizard and define these tables.
5. If necessary, refresh the **Accelerator** view.
6. To archive the data of a range-partitioned table or partitions of this table, expand the appropriate schema node and select the table name.

In IBM Db2 Analytics Accelerator Administration Services, you specify the schema and table names in the request body. See next step.

7. Prepare the archiving process:

IBM Db2 Analytics Accelerator Studio	On the toolbar of the Accelerator view, select Storage Saver > Move Partitions to Accelerator .
IBM Data Server Manager	On the toolbar of the Accelerator view, select Storage Saver > Move Partitions to Accelerator .
IBM Unified Experience for z/OS	On top of the list of tables, you find a toolbar with an Archiving drop-down button. Click this button and select Archive .

IBM Db2 Analytics Accelerator Administration Services	<p>a. Start an /archive/archiveSelectedTables request.</p> <p>b. In the request body:</p> <ul style="list-style-type: none"> i) Specify the connection name. ii) Specify the accelerator name. iii) Specify the tables to be archived in an array that serves as the value of the "selTablesAndPartitions":parameter. <p>r. Also specify the partitions as shown:</p> <pre> "selTablesAndPartitions": [{ "schemaName": "example_schema_name", "tableName": "example_table_name", "partitions": ["Partition 1", "Partition 2"] }] </pre>
---	---

8. In the **Move Storage Saver Partitions to Accelerator** window, you can select a partitioning key or individual partitions.

Note: If you use IBM Db2 Analytics Accelerator Administration Services, skip this step and move on to step “9” on page 232.

- To select the partition data to be archived with the help of a partitioning key, leave **Move all partitions up to and including the following limit key** selected and choose the proper key from the drop-down list.

The drop-down list is filled with the values of the LIMITKEY column in the SYSIBM.SYSTABLEPART catalog table. The values are sorted by the LOGICAL_PART column in SYSIBM.SYSTABLEPART and appear in descending order. Mostly, LIMITKEY is a column of the type DATE or DATE/TIME, which allows you to select partitions whose data covers a certain time frame. The key that you use might be different, and so might be the choices in the drop-down list.

- To manually select the partitions whose data you want to archive, click **Manually select partitions** and select the appropriate check boxes in front of the (logical) partition names. The names of partitions whose data has already been archived are grayed out. To select all partitions:

IBM Db2 Analytics Accelerator Studio	Click Select all .
IBM Data Server Manager	Select the check box in front of the Logical Partition column header.
IBM Unified Experience for z/OS	
IBM Db2 Analytics Accelerator Administration Services	N/A

To clear all selections:

IBM Db2 Analytics Accelerator Studio	Click Deselect all .
IBM Data Server Manager	Clear the check box in front of the Logical Partition column header.
IBM Unified Experience for z/OS	

IBM Db2 Analytics Accelerator Administration Services	N/A
---	-----

9. Start archiving:

IBM Db2 Analytics Accelerator Studio	Click OK .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

What to do next

Check with your database operators (the people running queries) whether the archived data needs to be accessed by their queries. Whether to include or exclude the archived data can be controlled by using the **GET_ACCEL_ARCHIVE** parameter (ZPARM) or the SET CURRENT GET_ACCEL_ARCHIVE special register. The parameter or special register can be set to the value YES or NO. If you set it to YES, the archived data will be available for queries.

The **GET_ACCEL_ARCHIVE** parameter is set on the DSN6SPRN panel of a Db2 subsystem. The systems programmer or database administrator needs to enable option 2.

The SET CURRENT GET_ACCEL_ARCHIVE special register can be prepended to the SQL script for a query.

Example: Suppose you have a table called ORDERS, which contains a history of purchase transactions. This table is partitioned by time and contains a partition for each quarter. You keep ten years of history, but only a small subset of the queries accesses older data. Most queries use a range predicate, which restricts the query to data of the current year. You decide to archive all data that was collected in the previous years. For the queries that access the current year's data only, you need not set the SET CURRENT GET_ACCEL_ARCHIVE special register because these queries need not “see” the archived data. They can run on the accelerator or in Db2 for z/OS, depending on the SET CURRENT QUERY ACCELERATION special register. For those queries that need to access older data, you specify SET CURRENT GET_ACCEL_ARCHIVE=YES. For the latter type of queries, you must also set the SET CURRENT QUERY ACCELERATION special register to a value other than NONE. The query cannot run in Db2 for z/OS because Db2 does no longer contain the data.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Impact of special register settings

It has been said that a query cannot be accelerated without setting the SET CURRENT QUERY ACCELERATION special register to a value other than NONE. It has also been said that the GET_ACCEL_ARCHIVE or the SET CURRENT GET_ACCEL_ARCHIVE special register determines whether data that was moved with the help of the High Performance Storage Saver is included in a query. The table in this topic explores all combinations of these settings for qualifying and non-qualifying queries and briefly describes the consequences.

If a query can neither be executed in Db2 for z/OS, nor on an accelerator, the following message is displayed, which starts with SQL code -4742:

```
-4742 The statement cannot be executed by Db2 or in the accelerator (REASON <code>)
```

where <code> stands for the numeric reason code. For a list of the reason codes, follow the link at the end of this topic.

Table 54. Impact of special register settings on the query execution, taking the query qualification into account

Setting of SET CURRENT QUERY ACCELERATION	Setting of GET_ACCEL_ARCHIVE or SET CURRENT GET_ACCEL_ARCHIVE	Query qualifies for acceleration?	Consequence
NONE	NO	No	The query is executed in Db2.
NONE	NO	Yes	The query is executed in Db2.
NONE	YES	No	The query fails and SQL code -4742 is returned.
NONE	YES	Yes	The query fails and SQL code -4742 is returned.
ENABLE	NO	No	The query is executed in Db2.
ENABLE	NO	Yes	The query is accelerated. Data of moved tables and partitions is excluded. If the query fails on the accelerator, SQL code -901 is returned to the calling application.
ENABLE	YES	No	The query fails and SQL code -4742 is returned.
ENABLE	YES	Yes	The query is accelerated. Data of moved tables and partitions is included, provided that this data resides on the accelerator that the query is directed at. If the query fails on the accelerator, SQL code -901 is returned to the calling application.
ENABLE WITH FAILBACK	NO	No	The query is executed in Db2.
ENABLE WITH FAILBACK	NO	Yes	The query is accelerated. Data of moved tables and partitions is excluded. If the query fails on the accelerator, an attempt is made to run the query in Db2.
ENABLE WITH FAILBACK	YES	No	The query fails and SQL code -4742 is returned.
ENABLE WITH FAILBACK	YES	Yes	The query is accelerated. Data of moved tables and partitions is included, provided that this data resides on the accelerator that the query is directed at. If the query fails, SQL code -4742 is returned.
ALL	NO	No	The query fails and SQL code -4742 is returned.
ALL	NO	Yes	The query is accelerated. Data of moved tables and partitions is excluded. If the query fails on the accelerator, SQL code -901 is returned to the calling application.
ALL	YES	No	The query fails and SQL code -4742 is returned.

Table 54. Impact of special register settings on the query execution, taking the query qualification into account (continued)

Setting of SET CURRENT QUERY ACCELERATION	Setting of GET_ACCEL_ARCHIVE or SET CURRENT GET_ACCEL_ARCHIVE	Query qualifies for acceleration?	Consequence
ALL	YES	Yes	The query is accelerated. Data of moved tables and partitions is included, provided that this data resides on the accelerator that the query is directed at. If the query fails on the accelerator, SQL code -901 is returned to the calling application.
ELIGIBLE	NO	No	The query is executed in Db2.
ELIGIBLE	NO	Yes	The query is accelerated. Data of moved tables and partitions is excluded. If the query fails on the accelerator, SQL code -901 is returned to the calling application.
ELIGIBLE	YES	No	The query fails and SQL code -4742 is returned.
ELIGIBLE	YES	Yes	The query is accelerated. Data of moved tables and partitions is included, provided that this data resides on the accelerator that the query is directed at. If the query fails on the accelerator, SQL code -901 is returned to the calling application.

Important: A query that would be executed in Db2 for z/OS according to the special register or parameter settings in [Table 54 on page 233](#) fails with SQL code -4742 if the query references data that can only be found on the accelerator because it has been moved.

Related concepts

EXPLAIN information

After creating the necessary EXPLAIN tables, you can analyze queries by invoking the Db2 EXPLAIN function. The analysis shows whether a query can be accelerated, indicates the reason for a failure, and gives a response time estimate. The outcome of the analysis can also be visualized in an access plan graph.

Restoring archived partitions

Restoring archived partition data might become necessary if you must add or update data in the original Db2 partition. It might also become necessary if an error in IBM Db2 Analytics Accelerator for z/OS has led to the loss of archived data. Restoring archived data is required also after changing the schema of a Db2 table (for example, adding a column).

About this task

In the context of archived partition data, the restore operation is typically just a single operation in a series of actions that must be taken. For example, adding a column to a Db2 table involves the following steps:

1. Restoring the archived partitions to Db2
2. Removing the corresponding accelerator-shadow table
3. Making changes to the schema, that is, submitting the ALTER TABLE ADD COLUMN statement

4. Redefining the accelerator-shadow table
5. Archiving the partition data once again

What you need to know about the restore function:

- The restore function uses the last Db2 image copy to recover the data. If that image copy is damaged, the function automatically uses the next image copy in backward chronological order.
- All indexes are rebuilt.
- A CHECK DATA operation is carried out if needed.
- An archived partition is not deleted from the accelerator, but kept as a regular partition for query acceleration.
- All image copies and entries in the Db2 catalog table SYSIBM.SYSCOPY are kept.
- The status information of tables in the ARCHIVE column of the SYSIBM.SYSACCELERATEDTABLES catalog table is restored if no further copies exist on any accelerator. That is, the values 'A' or 'C' are reset to ''.
- If a restore operation fails for some reason, you can resume it if you run the function again on the same table or partitions.
- Depending on the amount of data to be restored, the operation might need several hours to complete.



Attention: Do not sever the connection to the Db2 subsystem during that time.

- If you have archived the same partition more than once on different accelerators, you can run a restore operation for this partition from each of the accelerators. This is not prohibited. However, the Db2 data is not updated anymore after the first restore because the system treats it like an already restored partition. So if the data is different on the accelerators, carefully decide from which accelerator you want to restore first.
- Bear in mind that queries might run longer and might return more copious results after a restore because the formerly archived partitions are no longer excluded from the queries.

The task of restoring partition or table data to Db2 for z/OS is carried out by the SYSPROC.ACCEL_RESTORE_ARCHIVE_TABLES stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the corresponding article in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. You find a link at the end of this topic.

Procedure

1. Connect to the Db2 subsystem or data sharing group that the accelerator is attached to. For more information, see *Connecting to a database server* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.
2. Select the accelerator you want to restore from.
For more information, see [“Selecting an accelerator” on page 135](#).
3. Check whether the tables that the partitions belong to have been enabled for incremental updates. If so, disable incremental updates.
You might come across this situation if just a subset of all the partitions of a table was archived. If unarchived partitions remain on the accelerator, the relevant table can be enabled for incremental updates. However, a restore operation fails if this has been done.
4. If necessary, refresh the view.
5. Prepare the restoration process:

IBM Db2 Analytics Accelerator Studio	On the toolbar, select Storage Saver > Restore Partitions to Db2 .
IBM Data Server Manager	On the toolbar, select Storage Saver > Restore Partitions to Db2 .

IBM Unified Experience for z/OS	On top of the list of tables, you find a toolbar with an Archiving drop-down button. Click this button and select Restore .
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start an /archive/restoreSelectedTables request.</p> <p>b. In the request body:</p> <ul style="list-style-type: none"> i) Specify the connection name. ii) Specify the accelerator name. iii) Specify the tables to be archived in an array that serves as the value of the "selTablesAndPartitions":parameter. <p>r. Also specify the partitions as shown:</p> <pre> "selTablesAndPartitions": [{ "schemaName": "example_schema_name", "tableName": "example_table_name", "partitions": ["Partition 1", "Partition 2"] }] </pre>

6. In the **Restore Storage Saver Partitions to Db2** window, you can select tables and partitions to be restored.

Note: If you use IBM Db2 Analytics Accelerator Administration Services, skip this step and move on to step “7” on page 236.

Select the check box in front of a table name to restore the data of an entire table (all partitions). Select the appropriate check boxes in front of (logical) partition names to restore just the data of the selected partitions. To select all tables and partitions that can be restored:

IBM Db2 Analytics Accelerator Studio	Click Select all .
IBM Data Server Manager	Select the check box in front of the Logical Partition column header.
IBM Unified Experience for z/OS	
IBM Db2 Analytics Accelerator Administration Services	N/A

To clear all selections:

IBM Db2 Analytics Accelerator Studio	Click Deselect all .
IBM Data Server Manager	Clear the check box in front of the Logical Partition column header.
IBM Unified Experience for z/OS	
IBM Db2 Analytics Accelerator Administration Services	N/A

When you highlight a partition name, the **Image copies** section displays the names of the image copies (data set names) that will be used to restore the partition.

7. Start restoring:

IBM Db2 Analytics Accelerator Studio	Click OK .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

What to do next

The recovery of partitions invalidates the statistics in the SYSIBM.SYSTABLESPACESTATS catalog table. This leads to a situation in which table metrics, such as the partition size, are not reported anymore. To avoid this, run the following Db2 command to refresh the statistics in the catalog table:

```
RUNSTATS TABLESPACE <database-name>.<table-space name> SHRLEVEL REFERENCE
```

where *<database-name>* is the name of the database and *<table-space name>* is the name of the table space.

Note: This step might take several hours to complete. If you plan to archive the partition data again shortly, you can omit it.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

How to handle the RBA and LRSN conversion in Db2 11 for z/OS

In Db2 11 for z/OS, the relative byte address (RBA) and the log record sequence number (LRSN) were changed from a 6-byte format to a 10-byte format. This has implications if you have archived partition data with the High Performance Storage Saver. In Db2, the migration from the old format to the new requires a REORG operation. However, the empty partitions that remain after archiving cannot be reorganized because they were set to persistent read-only (PRO) state.

To maintain the compatibility of archived tables and partitions, follow the series of steps in the following table that best suits your needs:

<i>Table 55. Steps to maintain compatibility</i>	
<ol style="list-style-type: none"> 1. Remove the PRO state with the help of the Db2 REPAIR utility. 2. Run the REORG operation. 3. Reset the PRO state. <p>This is the recommended solution. It saves you a lot of time because you avoid to restore data. Note that you can restore the data at a later time into already converted tables and partitions even if the image copies were taken before the RBA and LRSN conversion. A further REORG operation will be needed after that.</p>	<ol style="list-style-type: none"> 1. Restore the data of the archived tables and partitions from the existing image copies. 2. Run the REORG operation. 3. Archive the data again with the High Performance Storage Saver. <p>If you do not want a coexistence of data in different RBA and LRSN formats, then this solution is to be preferred. Bear in mind that this will occupy system resources for a much longer time.</p>

Federated access

The term *federated access* or *federation* describes the ability to run accelerated queries against tables that do not belong to or originate from the Db2 subsystem that issues the query.

Normally, you can only accelerate queries if a Db2 subsystem is paired with an accelerator and if the tables to be queried exist in that Db2 subsystem. This can be regarded as a security feature; a second Db2 subsystem paired with the same accelerator cannot access tables in the first Db2 subsystem and vice versa.

However, there are situations in which one would like to lift this restriction: Db2 subsystems are often organized alongside geographical boundaries, temporal boundaries, or areas of business.

Geographical boundaries translate into a segmentation of the table data by region. For example, a company does business in the U.S. and in Asia; the tables in subsystem A contain the sales figures for the U.S.; the tables in subsystem B the sales figures for Asia.

If data is temporally segmented, the tables in each subsystem cover different time spans. For example, the tables in subsystem A contain the data related to recent business activities, reaching three months from the present time into the past. Db2 subsystem B, on the other hand, contains business data that is older than three months.

If data is segmented by areas of business, the organization of the database follows a company's key business areas or its product portfolio. Assume that an organization runs a chain of gas stations and also produces cosmetics (both business areas are based on oil). Subsystem A contains the data of the gas station business; subsystem B the data of the cosmetics business.

Frequently, the aim of analytical queries is to capture trends across regions, time lines, or business areas. In accordance with the previous examples, one would like to find out how the business in the U.S. develops against the business in Asia. How do recent sales figures compare with those of the past? What are the growth rates in the gas station business as opposed to those in the cosmetics sector?

Queries that answer these question require access to different data sources. If the data is segmented by the organization of the database, access must be extended to tables in other Db2 subsystems, and this is what the *federated access* feature is about.

An access extension to tables in a Db2 subsystem is achieved through the following steps:

1. A user with sufficient rights on the Db2 subsystem that owns the tables (remote Db2 subsystem) grants the right to access a set of tables to a Db2 subsystem that normally cannot access these tables (called the referencing Db2 subsystem).
2. A user with sufficient rights on the referencing subsystem runs a command to create reference tables. These reference tables contain metadata and pointers to accelerator-shadow tables on the accelerator. They are implemented as accelerator-only tables on the shared accelerator, with corresponding entries in the catalog of the referencing Db2 subsystem.
3. Queries from the referencing Db2 subsystem can now access these referencing accelerator-only tables.

See the following figure:

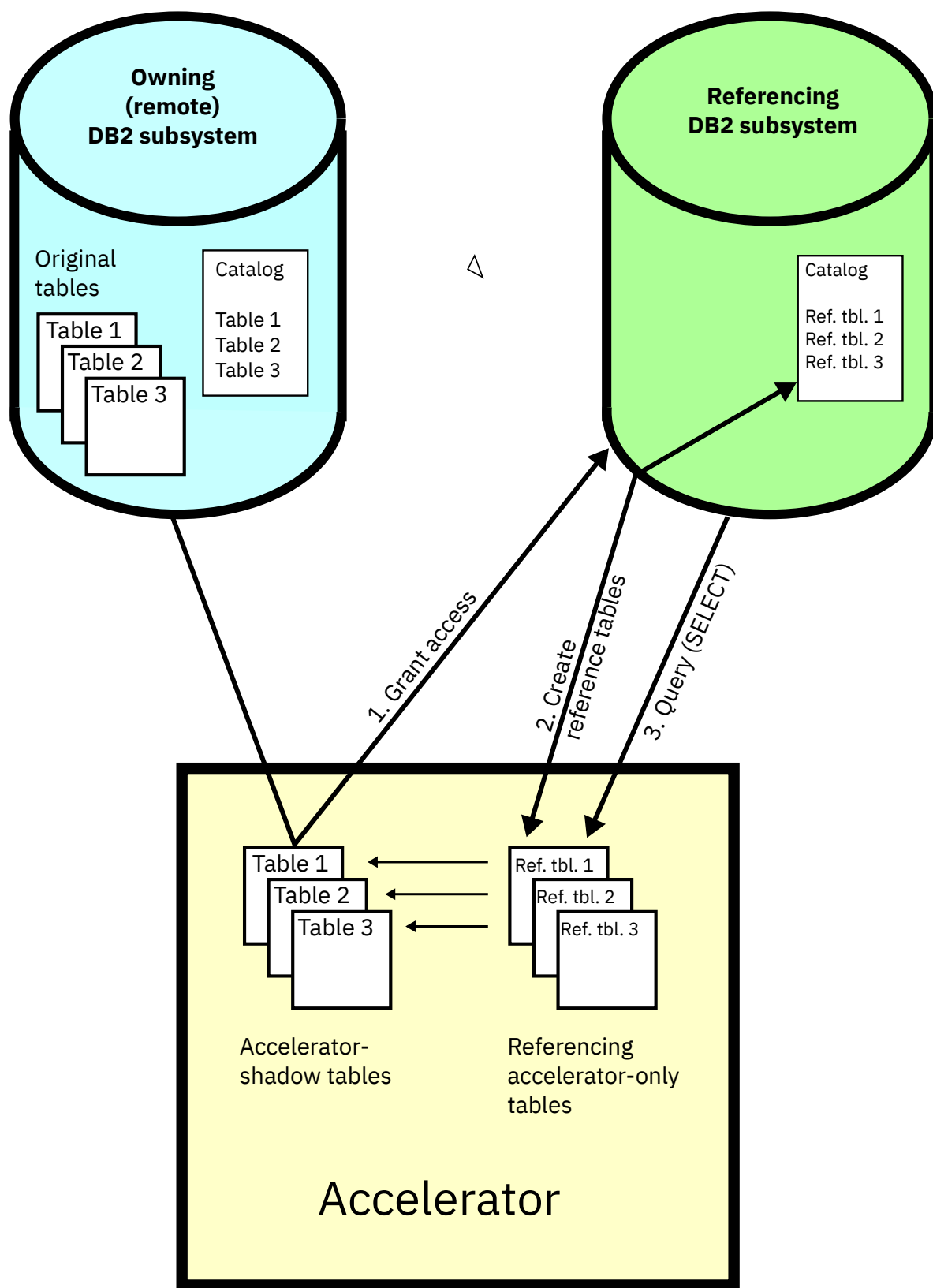


Figure 20. Federated access diagram

It is possible for the administrator of the owning Db2 subsystem to revoke the access privileges at any time.

It is also possible (for the administrator of the referencing Db2 subsystem) to remove the reference tables. This is mostly done when the data in these tables has become obsolete. To obtain results on more recent data, the administrator might want to delete the existing reference tables and create new ones.

Granting access to remote tables

As an administrator or user with sufficient access rights on a Db2 subsystem, you can grant the right to access tables in the subsystem to another (referencing Db2 subsystem). The granted permission includes the right to create reference tables from the referencing Db2 subsystem.

Before you begin

- The owning (remote) Db2 subsystem and the referencing Db2 subsystem must share (be paired with) a common accelerator.
- Database connections must exist for both Db2 subsystems.
- Your user ID needs the required authorizations to run the SYSPROC.ACCEL_GRANT_TABLES_REFERENCE stored procedure on the owning (remote) Db2 subsystem.

Procedure

1. Connect to the owning (remote) Db2 subsystem.

For more information, see [“Connecting to a database server” on page 124.](#)

2. Select the accelerator that is paired with the owning (remote) Db2 subsystem.

For more information, see [“Selecting an accelerator” on page 135.](#)


3. Display the list of tables on that accelerator:

Mind that although the referencing Db2 subsystem is paired with the same accelerator, it will use a different accelerator view, which will show a different list of tables. Make sure that you select the view which will display the tables in the owning Db2 subsystem.

IBM Db2 Analytics Accelerator Studio	Scroll down to the Tables section.
IBM Data Server Manager	Click Manage .
IBM Unified Experience for z/OS	Click the Tables tab.
IBM Db2 Analytics Accelerator Administration Services	Move on to the next step.

4. Grant access to the tables on that accelerator:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none">a. From the toolbar above the list of tables, select Federation > Grant Access.b. In the Db2 Tables window, select the tables that you want to give access to, that is, accelerator-shadow tables or ordinary, that is, not referencing accelerator-only tables in the owning (remote) Db2 subsystem.c. Click Next.
IBM Data Server Manager	<ol style="list-style-type: none">a. Select Federation > Grant.b. In the selection box labeled Db2 Tables, select the tables that you want to give access

	to, that is, accelerator-shadow tables or ordinary, that is, not referencing accelerator-only tables in the owning (remote) Db2 subsystem.
IBM Unified Experience for z/OS	<p>a. Select one of the tables that you want to grant access to.</p> <p>Note: It is not possible to select more than one table and grant access to these in a single step.</p> <p style="text-align: center;">⋮</p> <p>b. Click the  menu icon for that table on the very right.</p> <p>c. From the menu, select Grant access.</p> <p>d. If necessary, repeat the preceding steps for other tables.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /table/grantTablePrivileges request.</p> <p>b. In the request body, specify:</p> <ul style="list-style-type: none"> • A connection name as the value of the "owningConnectionName" : parameter. That is, you must be connected to the remote Db2 subsystem that owns the source tables. If you are not connected to that system yet, submit a /source/add or /source/edit request first. • The name of the shared accelerator as the value of the "owningAccelName" : parameter. This must be an accelerator that is paired with the owning (remote) Db2 subsystem, and contains copies of the source tables (accelerator-shadow tables). • The tables you want to grant access to. Specify the tables in an array that serves as the value of the "selTables" parameter. The first-level elements in this array must be JSON objects (key-value pairs), in which the first key is the schema name, and the second key is a string called "tables" :, which takes an array of lower-level JSON objects with a "name" : key as its value. Each of these lower-level object is supposed to contain a table name. The tables that you specify as the values of the "name" : key must belong to the previously specified schema (the value of the first key in the object). Separate these table names by a comma. Also separate the JSON objects by a comma. Example: <pre>"selTables": [{</pre>

	<pre> "schemaName": "schemaName1", "tables": [{ "name": "tableName1" }, { "name": "tableName2" }] }, { "schemaName": "schemaName2", "tables": [{ "name": "tableName3" }] }] } } </pre>
--	---

5. Select the Db2 subsystems that are supposed to have access to the selected tables (referencing Db2 subsystems).

IBM Db2 Analytics Accelerator Studio	In the window or selection box that is labeled Db2 Subsystems , you see a list of the Db2 subsystems that are connected to the same accelerator. Select one or more referencing Db2 subsystems, that is, subsystems that should have access to the selected tables.
IBM Data Server Manager	In the window or selection box that is labeled Db2 Subsystems , you see a list of the Db2 subsystems that are connected to the same accelerator. Select one or more referencing Db2 subsystems, that is, subsystems that should have access to the selected tables.
IBM Unified Experience for z/OS	From the table under the heading Select Db2 subsystems , select a referencing Db2 subsystem by clicking the selection box in front of the subsystem name in the Profile name column. Note: In IBM Unified Experience for z/OS, you can select only one referencing Db2 subsystem in the Grant access window.
IBM Db2 Analytics Accelerator Administration Services	N/A

6. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Finish .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Submit .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Results

The administrator of the referencing Db2 subsystem can now create reference tables for the tables that she or he has been given access to.

Creating reference tables

Running the **Create Reference Tables** function from your administration client, you create accelerator-only tables that contain metadata and pointers to accelerator-shadow tables on the shared accelerator, provided that access to these tables has been granted before.

Before you begin

- The owning (remote) Db2 subsystem and the referencing Db2 subsystem must share (be paired with) a common accelerator.
- Database connection profiles must exist for both Db2 subsystems.
- Your user ID needs the required authorizations to run the SYSPROC.ACCEL_CREATE_REFERENCE_TABLES stored procedure on the referencing Db2 subsystems.

About this task

The reference tables are used when a query from a referencing Db2 subsystem includes the names of tables on the remote Db2 subsystem. The query thus goes against the reference tables. The metadata and pointers in the reference tables ensure that the right data in the accelerator-shadow tables or the (regular) accelerator-only tables is queried. The accelerator-shadow tables or accelerator-only tables that actually contain the data are the result of **Add Tables** and **Load Tables** operations from the owning or remote Db2 subsystem.

Procedure

1. Connect to the referencing Db2 subsystem.
For more information, see [“Connecting to a database server” on page 124.](#)
2. Select the accelerator that is paired with the referencing Db2 subsystem.
For more information, see [“Selecting an accelerator” on page 135.](#)
3. Display the list of tables on that accelerator:

IBM Db2 Analytics Accelerator Studio	Scroll down to the Tables section.
IBM Data Server Manager	Click Manage .
IBM Unified Experience for z/OS	Click the Tables tab.
IBM Db2 Analytics Accelerator Administration Services	<p>You can retrieve a list of the eligible tables in the remote (owning) Db2 subsystem. This is helpful if you don't know which tables you need to specify in one of the steps that follow:</p> <ol style="list-style-type: none">a. Start a /table/getTablesForCreateReference request.b. In the request body, specify:<ul style="list-style-type: none">• A connection name as the value of the "owningConnectionName" : parameter. That is, you must be connected to the remote Db2 subsystem that owns the source tables. If you are not connected to that system yet, submit a /source/add or /source/edit request first.• The name of the shared accelerator as the value of the "owningAccelName" : parameter. This must be an accelerator that is paired with the owning (remote) Db2 subsystem, and contains copies of the source tables (accelerator-shadow tables).


	<ul style="list-style-type: none"> The name of the referencing Db2 subsystem as the value of the "referencingConnectionName" : parameter. That is, you must be connected to the referencing Db2 subsystem. If you are not connected to that system yet, submit a /source/add or /source/edit request first. <p>c. Click Execute.</p> <p>The list of tables is returned in the response body.</p>
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4. Start creating references:

IBM Db2 Analytics Accelerator Studio	<p>a. On the toolbar of the Tables section, select Federation > Create Reference Tables.</p> <p>b. In the Db2 Subsystems window, you see a list of Db2 subsystems that qualify as referencing Db2 subsystems, that is, subsystems that will query the remote tables. Select one or more of these subsystems.</p> <p>c. Click Next.</p>
IBM Data Server Manager	<p>a. Select Federation > Create Reference.</p> <p>b. In the selection box labeled Db2 Subsystems, you see a list of Db2 subsystems that qualify as referencing Db2 subsystems, that is, subsystems that will query the remote tables. Select one or more of these subsystems.</p>
IBM Unified Experience for z/OS	<p>a. On the toolbar above the list of tables, click Create references.</p> <p>b. In the Create references window, you find a selection box labeled Db2 Subsystems. In this box, you see a list of Db2 subsystems that qualify as referencing Db2 subsystems, that is, subsystems that will query the remote tables. Select one of these subsystems.</p> <p>Note: In IBM Unified Experience for z/OS, you can select only one referencing Db2 subsystem in the Create references window.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>a. Start a /table/createTableReferences request.</p> <p>b. In the request body, specify:</p> <ul style="list-style-type: none"> A connection name as the value of the "owningConnectionName" : parameter. That is, you must be connected to the remote Db2 subsystem that owns the source tables. If you are not connected to that system yet, submit a /source/add or /source/edit request first. The name of the shared accelerator as the value of the "owningAccelName" : parameter. This must be an accelerator that is paired with the owning (remote) Db2 subsystem, and contains copies of the source tables (accelerator-shadow tables).

	<ul style="list-style-type: none"> • A connection name as the value of the "referencingConnectionName": parameter. That is, you must be connected to the remote Db2 subsystem that owns the source tables. If you are not connected to that system yet, submit a /source/add or /source/edit request first. • The name of the shared accelerator as the value of the "referencingAccelName": parameter. This must be the same accelerator as the "owningAccelName": accelerator.
--	--

5. Select the tables that you want to create reference tables for:

IBM Db2 Analytics Accelerator Studio	<p>In the Db2 Tables window, you see a list of tables on the accelerator. Select the tables for which you want to create reference tables by selecting the appropriate check boxes. To select all tables that belong to a schema, select the check box in front of the schema name.</p> <p>Type the names of schemas or tables in the Name like filter field, either fully or partially, to display just schemas and tables bearing or starting with that name. The names of tables that have already been selected are grayed out.</p> <p>To the right of the Name like field, you also find controls (icons) to do the following:</p> <ol style="list-style-type: none"> Select or deselect all tables Expand or collapse all schemas
IBM Data Server Manager	<p>In the selection box labeled Db2 Tables, select the tables for which you want to create reference tables by selecting the appropriate check boxes. To select all tables in the selection box, select the check box in front of the NAME column header.</p> <p>You can use a filter to limit the number of tables in the selection box:</p> <ol style="list-style-type: none"> Click  to display the search field. Type the names of tables in the search field, either fully or partially, to display just tables containing your search string. The names of tables that have already been selected are grayed out.
IBM Unified Experience for z/OS	<p>In the selection box labeled Select Db2 tables, select the tables for which you want to create reference tables by selecting the appropriate check boxes. To select all tables in the selection box, select the check box in front of the Schema name column header.</p> <p>You can use a filter to limit the number of tables in the selection box:</p>

	<p>In the search field to the right of the  icon, type the names of tables, either fully or partially, to display just tables containing your search string. The names of tables that have already been selected are grayed out.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>In the request body, specify the tables that you want to access from the referencing Db2 subsystem. Specify the tables in an array that serves as the value of the "selForCreateReference": parameter. The first-level elements in this array must be JSON objects with the following key-value pairs:</p> <ul style="list-style-type: none"> • Schema name of a remote table (key "schemaName":) • Table name of a remote table that belongs to the specified schema (key "tableName":) • Schema name of the corresponding reference table (key "referenceSchema":). • Table name of the corresponding reference table (key "referenceTable":) • Name of the referencing Db2 subsystem (key "referenceDatabase":) <p>Specify values for all the keys in a single JSON object; specify an additional object for each remote table to be referenced. Separate the key-value pairs by a comma. Also separate the JSON objects by a comma. Example:</p> <pre> "selTablesForCreateReference": [{ "schemaName": "schema_name_1", "tableName": "table_name_1", "referenceSchema": "reference_schema_1", "referenceTable": "reference_table_1", "referenceDatabase": "reference_database_1" }, { "schemaName": "schema_name_2", "tableName": "table_name_2", "referenceSchema": "reference_schema_2", "referenceTable": "reference_table_2", "referenceDatabase": "reference_database_2" }] </pre>

6. Optional: Select the check box to complete the required grant step and create the reference tables in one go:

IBM Db2 Analytics Accelerator Studio	Select Grant access before creating reference tables
IBM Data Server Manager	Select Check here to enable a Grant stored procedure call before Create Reference.
IBM Unified Experience for z/OS	N/A

IBM Db2 Analytics Accelerator Administration Services	Set the "grantEnabled" : parameter to the value true.
---	---

Note: This option has an effect only if your user ID has the authorization to run the SYSPROC.ACCEL_GRANT_TABLES_REFERENCE stored procedure on the owning (remote) Db2 subsystem.

7. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Finish .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Submit .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Results

Reference tables for the selected tables are created on the shared accelerator and corresponding entries are written to the catalog of the referencing Db2 subsystem. The new tables can be queried from the referencing Db2 subsystem.

Revoking table access

Run the **Revoke Access** or **Revoke** function to withdraw the right to access remote tables from a referencing Db2 subsystem.

Before you begin

- The owning (remote) Db2 subsystem and the referencing Db2 subsystem must share (be paired with) a common accelerator.
- Database connection profiles must exist for both Db2 subsystems.
- Your user ID needs the required authorizations to run the SYSPROC.ACCEL_REVOKE_TABLES_REFERENCE stored procedures on the owning (remote) Db2 subsystem.

Procedure

1. Connect to the owning (remote) Db2 subsystem:
For more information, see [“Connecting to a database server”](#) on page 124.
2. Select the accelerator that is paired with the owning (remote) Db2 subsystem.
For more information, see [“Selecting an accelerator”](#) on page 135.

3. Display the list of tables on that accelerator:


Mind that although the referencing Db2 subsystem is paired with the same accelerator, it will use a different accelerator view, which will show a different list of tables. Make sure that you select the view which will display the tables in the owning Db2 subsystem.

IBM Db2 Analytics Accelerator Studio	Scroll down to the Tables section.
IBM Data Server Manager	Click Manage .
IBM Unified Experience for z/OS	Click the Tables tab.
IBM Db2 Analytics Accelerator Administration Services	You can retrieve a list of the remote tables to which access has been granted. This is helpful if you don't know the names of the tables that you must specify in one of the steps that follow:

	<p>a. Start a /table/getTablesForRevoke request.</p> <p>b. In the request body, specify:</p> <ul style="list-style-type: none"> • A connection name as the value of the "owningConnectionName" : parameter. That is, you must be connected to the remote Db2 subsystem that owns the source tables. If you are not connected to that system yet, submit a /source/add or /source/edit request first. • The name of the shared accelerator as the value of the "owningAccelName" : parameter. This must be an accelerator that is paired with the owning (remote) Db2 subsystem, and contains copies of the source tables (accelerator-shadow tables). • The name of the referencing Db2 subsystem as the value of the "referencingConnectionName" : parameter. That is, you must be connected to the referencing Db2 subsystem. If you are not connected to that system yet, submit a /source/add or /source/edit request first. <p>c. Click Execute.</p> <p>The list of tables is returned in the response body.</p>
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4. Revoke access to tables in the owning Db2 subsystem:

IBM Db2 Analytics Accelerator Studio	<p>a. From the toolbar above the list of tables, select Federation > Revoke Access.</p> <p>b. In the Db2 Subsystems window, you see a list of the Db2 subsystems that are paired with the same accelerator. Select one or more referencing Db2 subsystems that should no longer be allowed to access certain remote tables in the owning Db2 subsystem. You select these tables in step “Revoking table access” on page 247.</p> <p>c. Click Next.</p> <p>d. In the Db2 Tables window, select the tables that the previously selected Db2 subsystems should be denied access to. Select by clicking the appropriate check boxes. To select all tables that belong to a schema, select the check box in front of the schema name.</p> <p>Type the names of schemas or tables in the Name like filter field, either fully or partially, to display just schemas and tables bearing or starting with that name. The names of tables that have already been selected are grayed out.</p> <p>To the right of the Name like field, you also find controls (icons) to do the following:</p>
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	<ol style="list-style-type: none"> Select or deselect all tables Expand or collapse all schemas
IBM Data Server Manager	<ol style="list-style-type: none"> Select Federation > Revoke. Select the Db2 subsystems that are supposed to have access to the selected tables. In the selection box labeled Db2 Subsystems, select one or more referencing Db2 subsystems that should no longer access certain remote tables in the owning Db2 subsystem. You select these tables in the next step. In the selection box labeled Db2 Tables, select the tables that the previously selected Db2 subsystems should be denied access to. Select by clicking the appropriate check boxes. To select all tables that belong to a schema, select the check box in front of the schema name. <p>You can use a filter to limit the number of tables in the selection box:</p> <ol style="list-style-type: none"> Click  to display the search field. Type the names of tables in the search field, either fully or partially, to display just tables containing your search string. The names of tables that have already been selected are grayed out.
IBM Unified Experience for z/OS	<ol style="list-style-type: none"> On the toolbar above the list of tables, click Revoke access. In the Revoke access window, you find a selection box labeled Db2 Subsystems. In this box, you see the list of referencing Db2 subsystems. Select one of these subsystems. <p>Note: In IBM Unified Experience for z/OS, you can select only one referencing Db2 subsystem in the Revoke access window.</p>
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Start a /table/revokeTablePermissions request. In the request body, specify: <ul style="list-style-type: none"> A connection name as the value of the "owningSubsystemConnectionName" : parameter. That is, you must be connected to the remote Db2 subsystem that owns the source tables. If you are not connected to that system yet, submit a /source/add or /source/edit request first. The name of the shared accelerator as the value of

	<p>the "owningSubsystemAccelName" : parameter. This must be an accelerator that is paired with the owning (remote) Db2 subsystem, and contains copies of the source tables (accelerator-shadow tables).</p> <ul style="list-style-type: none"> • A connection name as the value of the "referencingSubsystemLocation" : parameter. That is, you must be connected to the referencing Db2 subsystem. If you are not connected to that system yet, submit a / source/add or /source/edit request first. • The tables that you no longer want to be accessed by the referencing Db2 subsystem. Specify the tables in an array that serves as the value of the "selGrantedTables" parameter. The first-level elements in this array must be JSON objects (key-value pairs), in which the first key is the schema name, and the second key is a string called "tables" : , which takes a lower-level array as its value. In this array, list the names of the tables that belong to the previously specified schema (the value of the first key in the object). Separate these table names by a comma. Also separate the JSON objects by a comma. Example: <pre> "selGrantedTables": [{ "schemaName": "schema_name1", "tables": ["table_name1", "table_name2"] }, { "schemaName": "schema_name2", "tables": ["table_name1"] }], </pre>
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5. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Finish .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Submit .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Results

Access rights to the selected tables are revoked. Even though the corresponding reference tables are not deleted, the referencing Db2 subsystem can no longer query the tables that the reference tables point to. Attempts will be answered with an authorization error.

Removing reference tables

Run the **Remove Reference Tables** or **Remove Reference** function to delete reference tables (referencing accelerator-only tables) from an accelerator.

Before you begin

- The owning (remote) Db2 subsystem and the referencing Db2 subsystem must share (be paired with) a common accelerator.
- Database connection profiles must exist for both Db2 subsystems.
- Your user ID needs the required authorizations to run the SYSPROC.ACCEL_REMOVE_REFERENCE_TABLES stored procedure on the referencing Db2 subsystem.

Procedure

1. Connect to the referencing Db2 subsystem:
For more information, see [“Connecting to a database server” on page 124](#).
2. Select the accelerator that is paired with the referencing Db2 subsystem:
For more information, see [“Selecting an accelerator” on page 135](#).
3. Display the list of tables on that accelerator:


IBM Db2 Analytics Accelerator Studio	Scroll down to the Tables section.
IBM Data Server Manager	Click Manage .
IBM Unified Experience for z/OS	Click the Tables tab.
IBM Db2 Analytics Accelerator Administration Services	Move on to the next step.


4. Start removing reference tables:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none">a. On the toolbar of the Tables section, select Federation > Remove Reference Tables.b. In the Db2 Subsystems window, you see a list of the Db2 subsystems that are paired with the same accelerator. Select one or more Db2 subsystems containing reference tables.c. Click Next.
IBM Data Server Manager	<ol style="list-style-type: none">a. Select Federation > Remove Reference.b. In the selection box labeled Db2 Subsystems, you see a list of the referencing Db2 subsystems. Select one or more of these subsystems.
IBM Unified Experience for z/OS	<ul style="list-style-type: none">• On the toolbar above the list of tables, click the Federation drop-down button and select Remove references.• In the Remove references window, you find a selection box labeled Db2 Subsystems. In this box, you see the list of referencing Db2 subsystems. Select one of these subsystems.

	<p>Note: In IBM Unified Experience for z/OS, you can select only one referencing Db2 subsystem in the Revoke access window.</p>
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> Start a /table/removeTableReferences request. In the request body, specify: <ul style="list-style-type: none"> A connection name as the value of the <code>connectionName</code> : parameter. That is, you must be connected to the referencing Db2 subsystem. If you are not connected to that system yet, submit a /source/add or /source/edit request first. The name of the shared accelerator as the value of the <code>accelName</code> : parameter. This must be the accelerator that is paired with the owning (remote) Db2 subsystem and the referencing Db2 subsystem.

5. Select the reference tables that you want to remove:

IBM Db2 Analytics Accelerator Studio	<p>In the Db2 Tables window, you see a list of the tables on the accelerator. Select the reference tables that you want to remove by clicking the appropriate check boxes. To select all tables that belong to a schema, select the check box in front of the schema name.</p> <p>Type the names of schemas or tables in the Name like filter field, either fully or partially, to display just schemas and tables bearing or starting with that name. The names of tables that have already been selected are grayed out.</p> <p>To the right of the Name like field, you also find controls (icons) to do the following:</p> <ol style="list-style-type: none"> Select or deselect all tables Expand or collapse all schemas
IBM Data Server Manager	<p>In the selection box labeled Db2 Tables, select the reference tables that you want to remove by clicking the appropriate check boxes. To select all tables in the selection box, select the check box in front of the NAME column header.</p> <p>You can use a filter to limit the number of tables in the selection box:</p> <ol style="list-style-type: none"> Click  to display the search field. Type the names of tables in the search field, either fully or partially, to display just tables containing your search string. The names of tables that have already been selected are grayed out.

IBM Unified Experience for z/OS	<p>In the selection box labeled Select Db2 tables, select the reference tables that you want to remove by selecting the appropriate check boxes. To select all tables in the selection box, select the check box in front of the Schema name column header.</p> <p>You can use a filter to limit the number of tables in the selection box:</p> <p>In the search field to the right of the  icon, type the names of tables, either fully or partially, to display just tables containing your search string. The names of tables that have already been selected are grayed out.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>In the request body, specify the reference tables to remove in an array that serves as the value of the "selTables" parameter. The first-level elements in this array must be JSON objects (key-value pairs), in which the first key is the schema name, and the second key is a string called "tables" :, which takes a lower-level array as its value. In this array, list the names of the tables that belong to the previously specified schema (the value of the first key in the object). Separate these table names by a comma. Also separate the JSON objects by a comma. Example:</p> <pre> "selTables": [{ "schemaName": "schema_name1", "tables": ["table_name1", "table_name2"] }, { "schemaName": "schema_name2", "tables": ["table_name1"] }], </pre>

6. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Finish .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Submit .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

7. Click **Finish**.

Results

The selected reference tables (referencing accelerator-only tables) are removed from the accelerator. Corresponding entries are removed from the catalog of the referencing Db2 subsystem.

Installing updates

Refer to the appropriate sections to update individual components or migrate from one version to another.

It is rarely necessary to update all components. However, if you must update more than one component, follow the suggested order.

Order in which to update components

1. Prerequisite PTFs for Db2 11 for z/OS, Db2 12 for z/OS, or Db2 13 for z/OS. See *Installing prerequisite PTFs for Db2 for z/OS* in the *Installation Guide*.
2. Administration client. See:
 - [“Updating IBM Db2 Analytics Accelerator Studio” on page 264](#)
 - [“Updating IBM Data Server Manager” on page 265](#)
 - [“Updating IBM Unified Experience for z/OS” on page 266](#)
 - [“Updating IBM Db2 Analytics Accelerator Administration Services” on page 266](#)
3. Depending on your accelerator solution, one of the following software components:
 - For IBM Db2 Analytics Accelerator on an IBM Integrated Analytics System: IBM Db2 Analytics Accelerator software.

When in doubt: It is better if the accelerator software is at a newer level than the stored procedures. See *Updating IBM Db2 Analytics Accelerator software* in the *Installation Guide*.
 - For Db2 Analytics Accelerator on Z: Db2 Analytics Accelerator on Z

See *Updating Db2 Analytics Accelerator on Z* in the *Installation Guide*.
4. Stored procedures. See *Updating the IBM Db2 Analytics Accelerator stored procedures* in the *Installation Guide*.

Updating IBM Db2 Analytics Accelerator on IIAS

IIAS software components are components that run on the accelerator hardware, that is, the IBM Integrated Analytics System (IIAS). This chapter does not apply to updates for Db2 Analytics Accelerator on Z. Components on the IBM Integrated Analytics System are IBM Db2 Analytics Accelerator, the SQL engine, and the operating system of the accelerator.

Installing update packages for the accelerator

IBM Db2 Analytics Accelerator for z/OS software includes specific libraries and other code to be installed on the IBM Integrated Analytics System.

Before you begin

Make sure that the following conditions apply:

- Make sure that IBM Db2 Analytics Accelerator for z/OS has been successfully connected to Db2 for z/OS.
- IBM UNIX System Services is installed on your z/OS data server.
- You have a user ID and a password to log on to your z/OS data server. The user ID has read access to the z/OS UNIX file system (z/FS).
- The user ID is authorized to run the SYSPROC.ACCEL_UPDATE_SOFTWARE2 stored procedure.

About this task

The entire installation or update procedure consists of the following steps:

1. Downloading the fix pack or update package.

2. Transferring the update packages to the accelerator.
3. Activating the newly installed software.

This topic covers step “1” on [page 254](#) only.

Procedure

Downloading the fix pack or update package. You have two options here:

- Download the fix pack or update package from IBM Fix Central to your workstation and then upload the package from your workstation using your administration client. Place the checksum file for installation verification in the same directory on your workstation.

There is a checksum file for every supported algorithm. Supported algorithms are SHA256, SHA1 and MD5. The corresponding files on IBM Fix Central are:

- sha1sums.txt
- md5sums.txt

Any of these files contains one line for each package. Every line consists of two values. The first value is the hash used for verification; the second value is the corresponding package name.

Important: During the process, a large global temporary table is created in Db2 for z/OS. This table requires up to 25 GB of disk space. Make sure that this amount of disk space is available.

- Download the fix pack or update package from IBM Fix Central and save it directly in the directory specified by the AQT_HOST_PACKAGE_DIRECTORY environment variable. To use this second option, you must:
 - a. Log on to your z/OS data server using a remote client, such as IBM Personal Communications (Windows) or IBM Host On-Demand (Mac).
 - b. Set the AQT_HOST_PACKAGE_DIRECTORY environment variable to a directory path in the z/FS. Then save the update package in this directory. Place the checksum file for installation verification in the same directory (for details, see the previous description of the first download option).

Important:

- In the z/FS, the checksum files must be available in UTF-8 format. However, if you transfer the files from an FTP client, this format is identified as a text format and the transfer mode will probably be set to *ascii*. You must change the transfer mode to *binary* because this guarantees that the file stays as it is. If *ascii* is used as the transfer mode, chances are that the files are converted to EBCDIC format. This leads to an error when the checksum files are used for verification.
- An update packages requires up to 25 GB of disk space. Make sure that enough space is available in the z/FS directory that AQT_HOST_PACKAGE_DIRECTORY points to.

Important: The directory that AQT_HOST_PACKAGE_DIRECTORY points to requires multiple gigabytes (GB) of disk space. For example, if you work with multiple accelerators in a rolling upgrade scenario, you must have multiple instances of the installation packages in the file system. So make sure that the directory can accommodate all the files.

Results

Your local workstation or the z/FS directory (as set by the AQT_HOST_PACKAGE_DIRECTORY environment variable) on your z/OS data server now contains the accelerator update package *version.tar.z*.

Transferring update packages for the accelerator

Transfer update packages for IBM Db2 Analytics Accelerator for z/OS on an IBM Integrated Analytics System by completing the steps in this section.

Before you begin

Make sure that the following conditions apply:

- You have downloaded suitable accelerator installation packages and their respective checksum files to a workstation that is connected to your z/OS data server, or such packages exist in a z/FS directory on that server. For the latter option, the AQT_HOST_PACKAGE_DIRECTORY environment variable must point to the z/FS directory, and the checksum files must have been transferred in *binary* mode.
- The value of the AQT_HOST_PACKAGE_DIRECTORY environment variable determines where your administration client "looks" for software updates. If it is not set correctly, the packages cannot be located and thus cannot be transferred or installed.
- The user ID has read and write access to the directory that the AQT_HOST_PACKAGE_DIRECTORY environment variable points to and to all its sub-directories. You specify this variable in the AQTENV data set. The AQTENV data set must be referenced by the Workload Manager (WLM) environment that was set up for the IBM Db2 Analytics Accelerator for z/OS stored procedures. To avoid a setup with obsolete or wrong entries, use the sample AQTENV data set that comes with IBM Db2 Analytics Accelerator for z/OS Version 7.5.

About this task

You can transfer update packages from the z/OS UNIX file system (z/FS) to the accelerator or from the workstation that you use to run your administration client. Whichever computer you choose, it must be able to connect to the z/OS data server. The first method requires that the packages have been placed in the proper z/FS directory. To add the packages to this location, you can, for example, download packages from IBM Fix Central directly to the z/FS of the mainframe. To this end, you need a client application on the mainframe that is capable of handling FTPS (FTP over TLS) traffic. The download site at IBM Fix Central offers an option called *Download using bulk FTPS*. The second method requires that the update packages have been downloaded to the client workstation before. To actually use a transferred package, you must activate it. How to do this is described in a later topic. See the hint at the end of this description.

Installing a software update invokes the SYSPROC.ACCEL_UPDATE_SOFTWARE2 stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

Procedure

1. Start your administration client.
2. Select the target accelerator, that is, the accelerator supposed to receive the update package.
For more information, see [“Selecting an accelerator” on page 135](#).
3. Prepare the package transfer:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> a. If necessary, expand the About section. b. In the About section, click the Transfer updates link.
IBM Data Server Manager	In the lower half of the Accelerator view, click Transfer Updates .
IBM Unified Experience for z/OS	<p>On the accelerator details page:</p> <ol style="list-style-type: none"> a. Make sure that the Overview tab is in front. b. In the System information box, click the : icon. c. Select Manage software from the menu.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> a. Start an /accelerator/transferFiles request. b. In the request body, specify:

	<ul style="list-style-type: none"> • The proper connection name as the value of the "connectionName" : parameter. If you want to transfer the package from an IBM Z computer, you must connect to that computer. If you want to transfer the package from your local computer, this can be any Db2 subsystem that connects to the receiving accelerator. If you are not connected to the proper system yet, submit a /source/add or /source/edit request first. • The name of the receiving accelerator as the value of the "accelName" : parameter.
--	--

4. Select the packages that you want to transfer:

IBM Db2 Analytics Accelerator Studio	<p>a. Select the appropriate check boxes in the first column of the package list in the Transfer Software Version window.</p> <p>b. Choose the appropriate method to transfer the selected packages:</p> <p>Transfer files from system Z To transfer one or more packages from the z/FS of your z/OS data server.</p> <p>Note: If the verification message says . . . package was deployed without integrity check . . . , the reason might be that the checksum files were not transferred in <i>binary</i> mode. See this Important note.</p> <p>Transfer file from client To transfer one or more downloaded packages from the connected client workstation.</p> <p>You can either drag and drop files in the box labeled Upload files, or click Drag and drop files here or click to upload.</p> <p>The latter option opens your local file manager, in which you can navigate to the update package file and select it.</p>
IBM Data Server Manager	<p>a. Select the appropriate row in the package list of the Transfer Updates window.</p> <p>Restriction: In IBM Data Server Manager you can only select and transfer one package at a time. To transfer additional packages, you must revisit the Transfer Software Version window and repeat this and the following step.</p> <p>b. Choose the appropriate method to transfer the selected packages:</p>

	<p>Transfer files from system Z</p> <p>To transfer one or more packages from the z/FS of your z/OS data server.</p> <p>Note: If the verification message says . . . package was deployed without integrity check . . ., the reason might be that the checksum files were not transferred in <i>binary</i> mode. See this Important note.</p> <p>Transfer file from client</p> <p>To transfer one or more downloaded packages from the connected client workstation.</p> <p>You can either drag and drop files in the box labeled Upload files, or click Drag and drop files here or click to upload.</p> <p>The latter option opens your local file manager, in which you can navigate to the update package file and select it.</p>
IBM Unified Management Server for z/OS	<p>a. Make sure that the Transfer software version tab is in front.</p> <p>b. Choose the appropriate method to transfer the selected packages:</p> <p>Transfer file from client</p> <p>To transfer one or more downloaded packages from the connected client workstation.</p> <p>Transfer file from IBM Z</p> <p>To transfer one or more packages from the z/FS of your z/OS data server.</p> <p>Note: If the verification message says . . . package was deployed without integrity check . . ., the reason might be that the checksum files were not transferred in <i>binary</i> mode. See this Important note.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>In the request body:</p> <ul style="list-style-type: none"> To transfer from the zFS of an IBM Z system, click the Add item button next to the "zFiles": parameter. In the entry field that opens above the button, type the package name. <p>You can select more than one package. To do so, click Add item again. Each time you click the button, an additional entry field opens, in which you can type another package name.</p> <ul style="list-style-type: none"> To transfer the package from your local computer, click the Add item button next to

	<p>the "localFiles": parameter. This action reveals a field with a Choose file button.</p> <p>Click Choose file, navigate to the update package in your local file system, and select the file.</p> <p>You can select more than one package. To do so, click Add item again. Each time you click the button, an additional Choose file button is displayed, which allows you to select another package file.</p> <p>Note: As soon as you click Add item next to "localFiles":, the selection box Send empty value is cleared. Mind that this box must be selected if you want to transfer a package from an IBM Z system rather than your local file system.</p>
--	---



Attention:

- Make sure that you select the proper packages, that is, packages belonging to the release level that you want to upgrade to. The list in the **Transfer Updates** window might be confusing, especially if it also contains older packages. To find the correct package numbers, see the closing information or the release notes for the latest program temporary fix (PTF). You find the closing information or the release notes for a PTF on the support home page, in the category *Plan and install documentation*.
- If the list contains too many packages so that selecting the proper ones becomes awkward, select unwanted package names and click **Remove**. This will just remove the packages from the list or view, but won't delete the package files from the z/FS or your client workstation.

5. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Install .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Transfer .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

What to do next

To save space in the SMP/E target directory of the z/FS, consider deleting sub-directories that contain already transferred packages. Be careful, however, if you have more than one accelerator. Do not delete packages if these are still needed for other accelerators.

If the AQT_HOST_PACKAGE_DIRECTORY environment variable does not point directly to the SMP/E target directories but to a copy, you might also want to delete the copy.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Activating an updated accelerator software version

To use a recently transferred software package, you must first activate that package by selecting the version that the package contains.

Before you begin

Before you can activate a new software version, you must complete these steps:

1. Cancel all running tasks. For more information, see [“Canceling tasks” on page 191](#).
2. If incremental updates are enabled, stop these. For more information, see step “4” on page 213 in [“Starting or stopping incremental updates” on page 211](#).

Wait a few minutes, so that pending incremental updates can be applied to the tables on the accelerator. Your wait time should roughly equal your replication latency period. For more information, see *How to calculate the proper delay time* in the *IBM Db2 Analytics Accelerator for z/OS: User's Guide*.

Note: If you have connections to Db2 data sharing groups (DSGs) and prefer to run the SYSPROC.ACCEL_SET_REPLICATION stored procedure from a client command line: It is not necessary to stop incremental updates for each individual member. A DSG is treated like a single connection and stopping incremental updates for the primary member will also stop these for the other members.

3. Stop the accelerator. For more information, see [“Disabling an accelerator” on page 143](#).

Remember: You must repeat these steps for each Db2 subsystem or data sharing group that is connected to an accelerator.

About this task

- Earlier product versions allow you to switch between older and newer versions of the IBM Db2 Analytics Accelerator software. This is not possible with IBM Db2 Analytics Accelerator for z/OS Version 7.x.x. Once you have activated a particular version, you cannot go back to an older one.
- The application of an update affects all Db2 subsystems that are connected to an accelerator.
- The activation of a different accelerator software version causes a restart of the accelerator.

Activating a software update invokes the SYSPROC.ACCEL_UPDATE_SOFTWARE2 stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.



Attention:

- The activation of a new version of IBM Db2 Analytics Accelerator for z/OS software components might delete the query history from the accelerator if the new version introduces changes to the query history function.
- The sequence in which you activate the different software components is important. The sequence depends on the source and on the target version. To find the proper sequence for your particular update, see [“Order in which to update components” on page 254](#).
- When the accelerator is restarted with a new accelerator software version, accelerated queries cannot be processed on that accelerator before it reaches the *online* state. The only way to avoid a delay is to use a second accelerator in a workload balancing setup. That is, a second accelerator which is connected to the same Db2 subsystem, and which contains the same set of tables. Note that the tables must be loaded and enabled.

Procedure

1. Select the accelerator that you want to update.
For more information, see [“Selecting an accelerator” on page 135](#).
2. *IBM Db2 Analytics Accelerator Studio only:*
In the **Accelerator** view, from the **Refresh** drop-down list in the upper right, select **Automatic off**.

Otherwise, you might see warnings during the activation of the new software saying that the accelerator cannot be contacted.

3. Prepare the update:

IBM Db2 Analytics Accelerator Studio	a. If necessary, expand the About section. b. In the About section, click Apply other software version .
IBM Data Server Manager	a. In the lower half of the window, scroll down to the Server section. b. Click Apply other software version .
IBM Unified Experience for z/OS	On the accelerator details page: a. Make sure that the Overview tab is in front. b. In the System information box, click the : icon. c. Select Manage software from the menu. d. In the Manage software window, click the Apply software version tab.
IBM Db2 Analytics Accelerator Administration Services	a. Start an <code>/accelerator/applySoftwareUpdate</code> request. b. In the request body, specify: <ul style="list-style-type: none"> • The proper connection name as the value of the "connectionName" : parameter. Choose a Db2 subsystem or data sharing group that connects to the accelerator you want to update. If you are not connected to the proper system yet, submit a <code>/source/add</code> or <code>/source/edit</code> request first. • The name of the accelerator to be updated as the value of the "accelName" : parameter.

4. In the **Apply Software Version** window, you can see all software packages currently available on the accelerator. To read information about a particular version before you activate it, select the appropriate entry in the list. The information is provided in the **Details of selected version** text box at the bottom.

5. Change the current version by selecting a different package.

IBM Db2 Analytics Accelerator Studio	Activate a version by selecting the appropriate check box in the File column.
IBM Data Server Manager	Select the appropriate entry (row) in the table.
IBM Unified Experience for z/OS	Select the appropriate entry (row) in the table.
IBM Db2 Analytics Accelerator Administration Services	In the request body, specify the file name of the update package as the value of the "fileName": parameter. Example: <pre>"fileName": "SoftwareUpdateFile.zip",</pre>

Important: In older versions of this article, a step described the option **Skip firmware and update only accelerator components (faster)**, which limits the scope of the update. The use of this option is discouraged for product version 7.5.10 and later versions because older firmware levels can lead to problems.

6. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Install .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Submit .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Results

In some cases, migration processes require some time to finish, especially after a restart of the database container. It is therefore quite normal that, after you confirm the update, the accelerator is not instantly ready to process queries. However, after confirming the update, you can check the progress of the activation:

IBM Db2 Analytics Accelerator Studio	The Installation Log viewer starts automatically. See Figure 21 on page 263 .
IBM Data Server Manager	The Installation Log viewer starts automatically. See Figure 21 on page 263 .
IBM Unified Experience for z/OS	Click the Software installation progress tab to view the Installation Log viewer. See Figure 21 on page 263 .
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none"> 1. Start an /accelerator/applySoftwareInstallationProgress request to obtain progress information. 2. In the request body, specify the connection name and the accelerator name. 3. Click Execute. <p>The progress information is displayed in the response body. The information is organized in a way similar to that in the Figure 21 on page 263.</p>

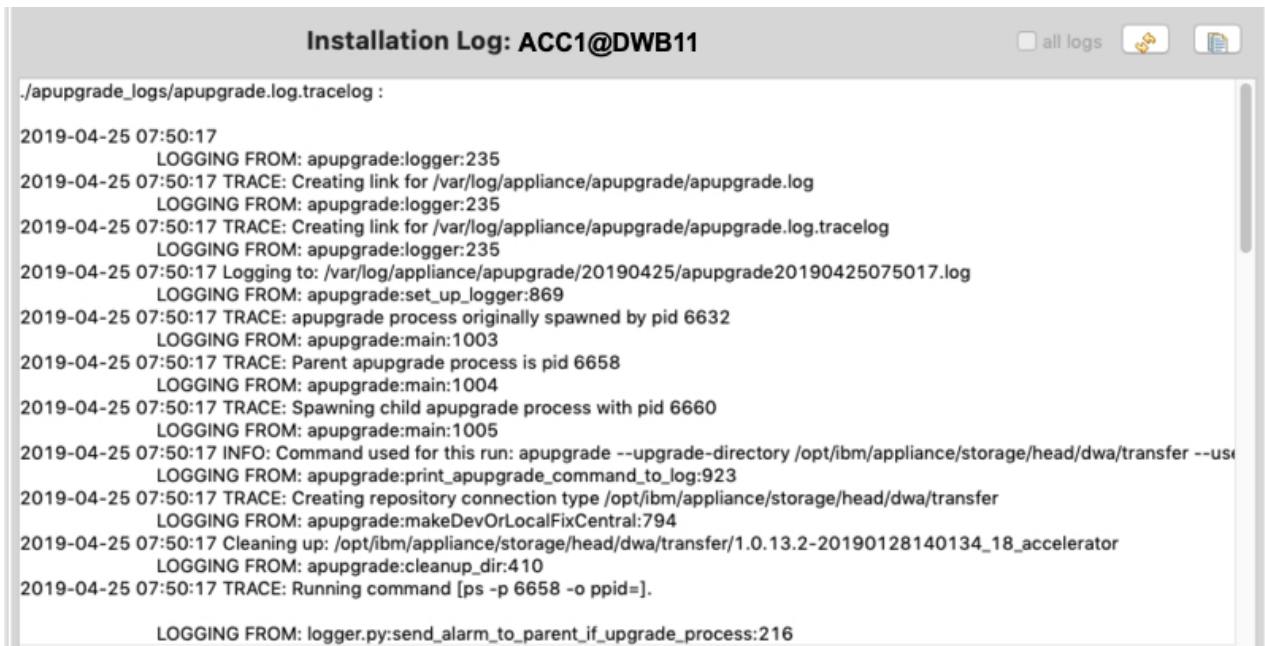


Figure 21. The Installation Log viewer

While the activation is in progress, the log viewer shows the status of all affected components in the upper part of the window. In the lower part, you see the last 20 lines of the `apupgrade_logs/apupgrade.log` file on the accelerator, which provides additional information.

Statuses are flagged as follows:

not_started

The activation has been scheduled, but not yet started.

started

The activation is currently in progress.

upgrade_skip_up_to_date

The activation of the update is unnecessary because the component is already up-to-date.

install_complete

The activation has been completed.

postinstall_complete

The activation has been completed and checks were applied successfully.

You can refresh the **Installation Log** viewer window to display the latest status changes. It also has an **all logs** check box. When selected, additional information is pulled in from other log files and displayed in the log viewer window.

If the selected updates can be activated successfully, the accelerator returns to the *online* state, so that queries can be processed.

You can also run the `SYSPROC.ACCEL_CONTROL_ACCELERATOR` stored procedure with the `<getActivationLog>` command to obtain the same information.

What to do next

To avoid a cluttered selection window, you can remove packages from the accelerator that you no longer need.

For instructions on how to complete this task, follow the appropriate link under **Related tasks**.

Related information

[IBM DB2 Analytics Accelerator for z/OS: Stored Procedures Reference](#)

Updating IBM Db2 Analytics Accelerator Studio

Follow the instructions here to download and install an upgrade of IBM Db2 Analytics Accelerator Studio.

About this task

To download a refresh pack for IBM Db2 Analytics Accelerator Studio, a workstation with an internet connection is required.

If IBM Installation Manager is installed on a workstation without an internet connection, the program cannot automatically locate the repositories for updates of already installed products or additional plugins. Therefore, an administrator has to download the update repository to a central location that users without an internet connection have access to.

Workstation users without an internet connections can then let their local IBM Installation Manager installations point to the repository in the central location or copy the entire installation package from the central location to their workstations and go on from there.

You can use the newer versions of IBM Db2 Analytics Accelerator Studio with older versions of accelerators and stored procedures. However, the user interface might not show new functions until you update the stored procedures to the next higher or newest version.

Procedure

- To download a refresh pack for yourself or for others from a computer with an internet connection:
 - a) Click the following link:
[Select fixes: IBM Db2 Analytics Accelerator Studio
\(All releases, All platforms\)](#)
 - b) Select the proper refresh pack and click the **Continue** button above the list.
 - c) Sign in with your IBM ID or click **Create IBM id** and follow the instructions to create an IBM ID first.
 - d) Select your preferred download method:
 - **Download using Download Director** (requires Java enabled browser)
 - **Download using bulk FTP**
 - **Download using your browser (HTTPS)**
 - e) Leave the check box **Include prerequisites and co-requisite fixes (you can select the ones you need later)** selected.
 - f) In the **View and accept terms** window, click **I agree** to agree to the terms and conditions.
 - g) Click **Download now** and follow the instructions.
- To update an IBM Db2 Analytics Accelerator Studio installation:
 - a) Start IBM Installation Manager.
 - b) Update IBM Db2 Analytics Accelerator Studio by using one of the following procedures:
 - The following approach works if you can still connect to a previously accessed IBM Installation Manager repository, and if that repository has been updated (contains the update you want):
 - a. Click **Update**.
 - b. Follow the instructions in the wizard. Deselect components that you do not want to update.
 - If the first method did not work, but you can access the downloaded refresh pack (see step [“7” on page 264](#)) on your company's network or on your local workstation:
 - a. From the main menu of IBM Installation Manager, select **File > Preferences > Repositories**.
 - b. Click **Add Repository**.
 - c. Click **Browse** and navigate to the directory that contains the refresh pack, either in the central location, or on your local workstation.

- d. Select the refresh pack (compressed archive) and click **Open**.
- e. Click **OK** twice to return the main window of IBM Installation Manager.
- f. Click **Install**.
- g. Follow the instructions in the installation wizard.

Updating IBM Data Server Manager

Follow the instructions here to download and install an upgrade of IBM Data Server Manager.

About this task

To download a refresh pack for IBM Data Server Manager, a workstation with an internet connection is required.

Procedure

- To download a refresh pack for yourself or for others from a computer with an internet connection:
 - a) Click the following link:

Select fixes: Information Management, Data Server Manager (All releases, All platforms)
 - b) Select the proper refresh pack.

Important: The page also lists refresh packs for IBM Db2 Data Management Console (datamgtconsole). This is not the same as IBM Data Server Manager. Make sure to select only packages that are labeled *Data-Server-Manager*.
 - c) Click **Continue**.
 - d) Sign in with your IBM ID or click **Create IBM id** and follow the instructions to create an IBM ID first.
 - e) Select your preferred download method:
 - **Download using Download Director** (requires Java-enabled browser)
 - **Download using bulk FTPS/SFTP**
 - **Download using your browser (HTTPS)**
 - f) Leave the check box **Include prerequisites and co-requisite fixes (you can select the ones you need later)** selected.
 - g) Click **Continue**.
 - h) On the **Download files using ...** page, scroll down to the section that shows the name of the refresh pack in bold type.
 - i) Click the blue file name link with the download icon in front to start the download.
- To update a IBM Data Server Manager installation:
 - a) If necessary, transfer the downloaded package to the machine on which you want to install the update.
 - b) Depending on your operating system, take one of the following actions:
 - For AIX® and Linux:
 - a. Extract the content of the downloaded archive to an empty directory of your choice.
 - b. Open a terminal window.
 - c. Change to the directory that contains the extracted package content.
 - d. Run **./setup.sh**.

If the web server of your previous installation is still running, the setup.sh program will tell you so and will also give you the process identification number (PID). You can then kill the process and restart the setup.sh program to continue.

- On Windows, start the update wizard by double-clicking the downloaded file. Follow the instructions in the wizard.

What to do next

To check if the upgrade works, open IBM Data Server Manager in a web browser and log on.

Updating IBM Unified Experience for z/OS

IBM Unified Experience for z/OS is a component of IBM Unified Management Server for z/OS. Therefore, for update instructions, see [Service updates and support information](#) on the IBM Unified Management Server for z/OS website.

Updating IBM Db2 Analytics Accelerator Administration Services

IBM Db2 Analytics Accelerator Administration Services is a component of IBM Unified Management Server for z/OS. Therefore, for update instructions, see [Service updates and support information](#) on the IBM Unified Management Server for z/OS website.

Removing obsolete software packages from an accelerator

To free up space on an accelerator and reduce the number of versions that are displayed in the selection window, you can remove packages that you no longer need.

About this task

The removal wizard can remove all packages that have been deployed with the help of the transfer wizard, that is:

- Accelerator software packages
- Database software packages

Procedure

1. Select the accelerator that you want to remove packages from.
For more information, see [“Selecting an accelerator”](#) on page 135.
2. Prepare the removal:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none"> a. If necessary, expand the About section. b. In the sub-section labeled Server, click Remove.
IBM Data Server Manager	<ol style="list-style-type: none"> a. In the lower half of the window, scroll down to the Server section. b. Click Remove.
IBM Unified Experience for z/OS	<p>On the accelerator details page:</p> <ol style="list-style-type: none"> a. Make sure that the Overview tab is in front. b. In the System information box, click the <div style="text-align: center;">⋮</div> icon. c. Select Manage software from the menu. d. In the Manage software window, click the Remove software version tab.

IBM Db2 Analytics Accelerator Administration Services	<p>a. Start an /accelerator/removeFilesFromAccelerator request.</p> <p>b. In the request body, specify:</p> <ul style="list-style-type: none"> • The proper connection name as the value of the "connectionName" : parameter. Choose a Db2 subsystem or data sharing group that connects to the accelerator you want remove packages from. If you are not connected to the proper system yet, submit a /source/add or /source/edit request first. • The name of the accelerator that you want to remove packages from as the value of the "accelName" : parameter.
---	---

3. Select the packages (files) to remove

IBM Db2 Analytics Accelerator Studio	<p>In the Remove Software Versions window, select the software packages that you want to remove. To do so, select the appropriate check boxes in the first column.</p> <p>As a decision aid, you might want to read the information under Details of selected version, which is displayed for each package.</p>
IBM Data Server Manager	<p>In the Remove Software Versions window, select the software packages that you want to remove. To do so, select the appropriate check boxes in the first column.</p> <p>As a decision aid, you might want to read the information under Details of selected version, which is displayed for each package.</p>
IBM Unified Experience for z/OS	<p>On the Remove software version tab, select the software packages that you want to remove. To do so, select the appropriate check boxes in the first column of the table under the heading List of files transferred to accelerator.</p> <p>As a decision aid, you might want to read the information under Details of selected version, which is displayed for each package.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>In the request body:</p> <p>a. Specify the files to remove in an array that serves as the value of the "files" : parameter. Separate the file names by a comma. Example:</p> <pre>"files": ["software_package_1.zip", "software_package_2.zip"],</pre> <p>b. Specify "software" as the value of the "type" : parameter.</p>

4. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Remove .
IBM Data Server Manager	Click Remove .
IBM Unified Experience for z/OS	Click Submit .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

What to do next

The removal process that is described in this topic can only remove packages from an accelerator. To free up space in the z/OS UNIX file system (zFS) of your data server, manually delete no longer needed IBM Db2 Analytics Accelerator for z/OS packages from the zFS. To do so, open a UNIX System Services shell and delete the files by using the **rm** command.

Opening a support case

You might run into a situation in which you have to contact IBM support because you cannot solve an issue by yourself. A reason might be that specific updates or patches are required to successfully complete maintenance or repair jobs on the accelerator. Such jobs are usually carried out by an IBM service engineer. Follow the steps here to open a support case and provide IBM support with the necessary information.

1. For help with component updates, it is useful to enable tracing. In your administration client, enable tracing for the accelerator or component that you want to update. A trace level of DEFAULT is sufficient.

For more information, see *Tracing* in the *IBM Db2 Analytics Accelerator Studio: User's Guide*.

2. Save the trace information to a file.
3. Open a support case at <https://www.ibm.com/mysupport/s>. Consider that IBM support needs some time to analyze your system, coordinate maintenance actions, and update components as required.
4. Attach the trace file to the support case.

Transferring maintenance updates

A task that is closely related to support cases is the transfer of maintenance updates for IBM Db2 Analytics Accelerator on an IBM Integrated Analytics System. When you have submitted the support case, IBM support will tell you the proper download location and the names of the packages that you have to download. After finishing the download, transfer the update packages as a preparation for the IBM service personnel, who will help you install the updates on your IBM Integrated Analytics System.

Before you begin

Update packages must exist in the download directory for packages of this type in the z/OS UNIX file system (zFS). The target system must be able to access this directory.

Important: The AQT_HOST_PACKAGE_DIRECTORY environment variable points to this download directory. It specifies an absolute path (starting from the root directory). The AQT_HOST_PACKAGE_DIRECTORY environment is set in the <HLQSP> .SAQTSAMP (AQTENV) data set, where <HLQSP> is the chosen high-level qualifier for stored-procedure libraries. The value of this environment variable determines where IBM Db2 Analytics Accelerator Studio looks for updates. If it is not set correctly, the packages cannot be located and thus cannot be transferred to the IBM Integrated Analytics System. To avoid a setup with obsolete or wrong entries, use the sample AQTENV data set that comes with the latest version of IBM Db2 Analytics Accelerator for z/OS.

About this task

In general, maintenance update packages are not installed automatically. They are just transferred to a directory on the IBM Integrated Analytics System, from where you must install them manually with the help of IBM support.

Transferring an update invokes the **SYSPROC.ACCEL_UPDATE_SOFTWARE2** stored procedure on your data server. For information about the privileges that are required to run this procedure and further details, see the appropriate section in the *IBM Db2 Analytics Accelerator for z/OS: Stored Procedures Reference*. A link to this document is provided under **Related reference** at the end of this section.

To start an update transfer process, follow the steps in this section.

Procedure

1. Start your administration client.
2. Select the target accelerator, that is, the accelerator supposed to receive the update package.
For more information, see [“Selecting an accelerator” on page 135](#).
3. Prepare the package transfer:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none">a. If necessary, expand the About section.b. In the About section, click the Transfer updates link.
IBM Data Server Manager	In the lower half of the Accelerator view, click Transfer Updates .
IBM Unified Experience for z/OS	<p>On the accelerator details page:</p> <ol style="list-style-type: none">a. Make sure that the Overview tab is in front.b. In the System information box, click the ⋮ icon.c. Select Manage software from the menu.
IBM Db2 Analytics Accelerator Administration Services	<ol style="list-style-type: none">a. Start an /accelerator/transferFiles request.b. In the request body, specify:<ul style="list-style-type: none">• The proper connection name as the value of the "connectionName" : parameter. If you want to transfer the package from an IBM Z computer, you must connect to that computer. If you want to transfer the package from your local computer, this can be any Db2 subsystem that connects to the receiving accelerator. If you are not connected to the proper system yet, submit a /source/add or /source/edit request first.• The name of the receiving accelerator as the value of the "accelName" : parameter.

4. Select the packages that you want to transfer:

IBM Db2 Analytics Accelerator Studio	<ol style="list-style-type: none">a. Select the appropriate check boxes in the first column of the package list in the Transfer Software Version window.
--------------------------------------	---

	<p>b. Choose the appropriate method to transfer the selected packages:</p> <p>Transfer files from system Z To transfer one or more packages from the z/FS of your z/OS data server.</p> <p>Note: If the verification message says . . . package was deployed without integrity check . . ., the reason might be that the checksum files were not transferred in <i>binary</i> mode. See this Important note.</p> <p>Transfer file from client To transfer one or more downloaded packages from the connected client workstation.</p> <p>You can either drag and drop files in the box labeled Upload files, or click Drag and drop files here or click to upload.</p> <p>The latter option opens your local file manager, in which you can navigate to the update package file and select it.</p>
IBM Data Server Manager	<p>a. Select the appropriate row in the package list of the Transfer Updates window.</p> <p>Restriction: In IBM Data Server Manager you can only select and transfer one package at a time. To transfer additional packages, you must revisit the Transfer Software Version window and repeat this and the following step.</p> <p>b. Choose the appropriate method to transfer the selected packages:</p> <p>Transfer files from system Z To transfer one or more packages from the z/FS of your z/OS data server.</p> <p>Note: If the verification message says . . . package was deployed without integrity check . . ., the reason might be that the checksum files were not transferred in <i>binary</i> mode. See this Important note.</p> <p>Transfer file from client To transfer one or more downloaded packages from the connected client workstation.</p> <p>You can either drag and drop files in the box labeled Upload files, or click Drag and drop files here or click to upload.</p> <p>The latter option opens your local file manager, in which you can navigate to the update package file and select it.</p>

IBM Unified Management Server for z/OS	<p>a. Make sure that the Transfer software version tab is in front.</p> <p>b. Choose the appropriate method to transfer the selected packages:</p> <p>Transfer file from client To transfer one or more downloaded packages from the connected client workstation.</p> <p>Transfer file from IBM Z To transfer one or more packages from the z/FS of your z/OS data server.</p> <p>Note: If the verification message says . . . package was deployed without integrity check . . ., the reason might be that the checksum files were not transferred in <i>binary</i> mode. See this Important note.</p>
IBM Db2 Analytics Accelerator Administration Services	<p>In the request body:</p> <ul style="list-style-type: none"> To transfer from the zFS of an IBM Z system, click the Add item button next to the "zFiles": parameter. In the entry field that opens above the button, type the package name. You can select more than one package. To do so, click Add item again. Each time you click the button, an additional entry field opens, in which you can type another package name. To transfer the package from your local computer, click the Add item button next to the "localFiles": parameter. This action reveals a field with a Choose file button. Click Choose file, navigate to the update package in your local file system, and select the file. You can select more than one package. To do so, click Add item again. Each time you click the button, an additional Choose file button is displayed, which allows you to select another package file. <p>Note: As soon as you click Add item next to "localFiles":, the selection box Send empty value is cleared. Mind that this box must be selected if you want to transfer a package from an IBM Z system rather than your local file system.</p>



Attention:

- Make sure that you select the proper packages, that is, packages belonging to the release level that you want to upgrade to. The list in the **Transfer Updates** window might be confusing, especially if it also contains older packages. To find the correct package numbers, see the closing information or the release notes for the latest program temporary fix (PTF).

You find the closing information or the release notes for a PTF on the support home page, in the category *Plan and install documentation*.

- If the list contains too many packages so that selecting the proper ones becomes awkward, select unwanted package names and click **Remove**. This will just remove the packages from the list or view, but won't delete the package files from the z/FS or your client workstation.

5. Confirm:

IBM Db2 Analytics Accelerator Studio	Click Install .
IBM Data Server Manager	Click OK .
IBM Unified Experience for z/OS	Click Transfer .
IBM Db2 Analytics Accelerator Administration Services	Click Execute .

Installing maintenance updates

While updates for IBM Db2 Analytics Accelerator and the database engine on an IBM Integrated Analytics System are installed automatically at the end of the transfer process or by using the **Apply** function, other updates have to be installed manually with the help of IBM support.

Before you begin

Make sure that the following conditions apply:

- You have opened a support case as described in [“Opening a support case”](#) on page 268.
- The IBM Integrated Analytics System must be fully operational. Hardware problems must not exist. Replace defective hard disks before installing the update.
- Remote access from z/OS OMVS to the accelerator via secure shell (ssh) must be enabled.
- IBM support will ask you to open or allow a screen-sharing session on your workstation. Make sure that this complies with the security guidelines of your organization or ask the responsible staff for a special permit.

About this task

An update installation requires you to stop the database container for approximately 30 minutes. The accelerator cannot be used during this time.

Procedure

1. Contact IBM support.

IBM support will ask you for remote screen-sharing access to the client machine.

2. With IBM assistance, open a login shell to the accelerator.

There are several ways to do that:

- If an ssh server and an ssh client are installed in the z/FS of your IBM Z, and if server and client have been activated, you can connect with a network client application, such as PuTTY, from your client workstation to the accelerator by opening the following connections:
 - a. From your workstation to the IBM Z server by ssh. Use your user ID and password to log in. See an example of an ssh login from a PuTTY window:

```
login as: willy
willy@boedca1's password:
```

Important: If your z/OS version is V2R2 or higher, make sure that the address space for the Cryptographic Service Facility (CSF) has been started. Otherwise, the ssh connection to z/OS will fail.

b. From the IBM Z to the accelerator by ssh. See the following example:

```
ssh -p 2222 root@10.104.9.3
```

where:

2222

is the listening port on the accelerator

10.104.9.3

is the IP address of the accelerator

- If an ssh server is installed and active on your IBM Z, and if port-forwarding is enabled for that server, you can connect to the accelerator by an ssh tunnel, which looks like a single connection from your client workstation to the accelerator. To enable port-forwarding, set `AllowTcpForwarding yes` in the `/etc/ssh/sshd_config` file of your zFS and restart the ssh server for the change to take effect.

Example: The commands for a tunnel connection would look similar to these:

a. `ssh -L 10022:10.0.0.1:2222 user@systemz`

where:

-L 10022

is the local port on the client workstation

10.0.0.1

is the IP address of the accelerator

2222

is the remote port or listening port on the accelerator

user@systemz

user is ID with which you log on to the UNIX System Services ssh server and systemz is the host name of that server.

b. `ssh -p 10022 root@localhost`

where:

-p 10022

is the local port on the client workstation

root@localhost

root is the user ID on the accelerator and localhost is the host name of the client workstation

Tip: IBM used to provide a tool package called IBM Ported Tools for z/OS. See:

https://www-03.ibm.com/systems/z/os/zos/features/unix/port_tools.html

The package does not exist anymore, but more specific packages with similar functionality are now offered by the Rocket software company (<https://www.rocketsoftware.com/zos-open-source>). These packages usually include an OpenSSH component, which contains an ssh client that you can use to connect from the UNIX System Services file system to the accelerator. Note that you only need the client component of OpenSSH for maintenance updates (called **ssh**).

The resulting login screen looks similar to this:

```
Using keyboard-interactive authentication.
Secure token for service password
(this token must be sent to IBM together with the serial# the first time you request
a service password):

MHU2cK9FLC2pIkYAEb0oyDxK1yU7UQ01VPyXVviVxwGRtAC3gBiXio5YLXzQTCQRfL/TRyuG8zFBC2CkSe3
GXPrfjM9KgB41gEFY0oxSEhjXY0S89fKGa7E/M+/VCdnsfHX2k2GpBq0XpyVPps6o0Q==

Enter Service Password (Date: '20170506' Serial#: '7130001' Rev: '4'):
```

3. As you enter the command to log on to the machine, the secure token, which contains the encrypted machine password, is displayed on the screen. In the previous example, this is the cryptic string that starts with MHu2cK. For the first service session, submit this token and the machine serial number to IBM support. IBM support will then generate a service password.

You have to submit the secure token only for the first service session. The token is stored in an IBM service database for subsequent requests. This database cannot be accessed from the internet. If a further service session is required, you just have to give IBM support the serial number of the machine.

4. IBM support will enter the service password for you. The password will be valid exclusively for your accelerator machine and for the current date only.
5. Navigate to the directory on the accelerator in which the transferred update files are stored.
6. To proceed, follow the instructions of IBM support.
7. Having installed the updates, delete the files that are not needed anymore.
8. Terminate the ssh session by entering `exit` at the command prompt.

Chapter 7. Status information about the system and the incremental update function

When the system has been properly configured, a heartbeat connection is established between the accelerator and the connected Db2 subsystems. Every 30 seconds, the heartbeat connection provides the Db2 subsystems with status information about the accelerator. You can view most of this information by using the `-DIS ACCEL Db2` commands. Detailed information about specific events cannot be viewed in this way, but is written to the z/OS system log (SYSLOG), in the form of DSNX881I messages. This includes messages that are related to the incremental update function.

To establish a heartbeat connection, an accelerator must have been paired successfully with a Db2 subsystem. In addition, the accelerator must have been started for that particular subsystem by the `-START ACCEL` command or by using the corresponding function of your administration client.

To receive incremental-update-related event messages in a SYSLOG, IBM Integrated Synchronization or IBM InfoSphere Change Data Capture for z/OS must have been installed and properly configured.

Support model

IBM Db2 Analytics Accelerator is a solution that consists of various hardware and software components. Each of these components might issue a DSNX881I message. If the message indicates a hardware or software problem, a problem related to Db2 for z/OS, or a problem with the attached accelerator hardware, always open a support case. Select the following information as you open the support case:

Table 56. Support case information	
Product:	Db2 Analytics Accelerator for z/OS
Service Type:	Defect/BreakFix or Usage
Product Version:	750
Software or Hardware related:	Software
Platform Type:	IIAS or zLinux

Your support case will be routed internally to the proper support request queue. Make sure that the request contains an IBM Db2 Analytics Accelerator trace file that was obtained by using the **Save Trace** function in your administration client. Such a trace file does not only contain software trace messages, but also a complete set of diagnostic hardware information.

The **Save Trace** window in IBM Db2 Analytics Accelerator Studio allows you to select an **Accelerator** and an **Appliance** option (apart from other options). It is important to notice the difference between the two:

Accelerator

Collects trace information from components running inside the Docker container

Appliance

Collects trace information from the physical system on which the Docker container is running

For details, follow the link to the description of the **Save Trace** function at the end of this topic.

Consider using automatic DSNX881I notifications. This function can inform administrators of critical events and create support cases automatically.

DSNX881I message structure

Each DSNX881I message is made up of the following parts, which occur in the order indicated:

```
DSNX881I -<SSID> <MESSAGE-ID> <SEVERITY>  
<ACCELERATOR_MESSAGE_COUNTER> (<ACCELERATOR-TIMESTAMP>)  
ACCELERATOR-NAME(ACCELERATOR-IP) <MESSAGE-TEXT>
```

The placeholders have the following meaning:

SSID

Is the Db2 subsystem ID (SSID)

MESSAGE - ID

A numeric ID for the specific error message. This ID can be used for system monitoring.

Messages with IDs from 1 to 19 and from 21 to 2999

Accelerator heartbeat (system state) messages.

Messages with ID 20

These are incremental-update-related messages generated by IBM Integrated Synchronization or IBM InfoSphere Change Data Capture for z/OS (CDC). They can be informational messages, warnings, or errors. Do not configure automatic notifications and support cases based on these messages, as the messages do not take the overall system state into account. In most cases, these messages are issued alongside messages in the range from ID3000 to ID3999. Refer to the latter type of messages because these contain proper instructions and do take the overall system state into account.

Message with IDs from 3000 to 3999

These are messages related to the incremental update function. In contrast to the ID20 messages, these messages are more specific or might ask for a concrete intervention (manual or automated) on your part. They can be used to trigger automatic notifications and support cases.

SERVERTY**I**

Information message

W

Warning message

E

Error message

ACCELERATOR_MESSAGE_COUNTER

An internal counter that increases with every additional error on the accelerator. If the text after the DSNX881I qualifier is longer than 255 characters, another DSNX881I message is issued. All messages belonging together will have the same <ACCELERATOR_MESSAGE_COUNTER> value. The <MESSAGE-TEXT> block of the each subsequent message contains a sequel to the information in the previous message.

ACCELERATOR-TIMESTAMP

The time when the error occurred on the accelerator. The internal clock of the accelerator is synchronized with the first Db2 subsystem that was connected to the accelerator.

ACCELERATOR-NAME

The name of the accelerator on which the error occurred.

ACCELERATOR-IP

The IP address of the accelerator on which the error occurred.

MESSAGE

A textual description of the error.

The length of a DSNX881I message does not exceed 255 characters. If more characters are needed, additional DSNX881I messages are written to the SYSLOG. If an LPAR contains multiple Db2 subsystems that are connected to the same physical accelerator, error messages are issued for every subsystem. That is, you see the same messages multiple times in the log, each time with a different subsystem ID (SSID).

If an accelerator is paired with a data sharing group (DSG), all members of the group can write messages to group's system logs (SYSLOGs), provided that the -START ACCEL command has been issued for all members. In this case, make sure that applications are in place that monitor the SYSLOGs. If all members of the DSG are located in the same logical partition (LPAR), there is only one SYSLOG to monitor (see [Figure 22 on page 277](#)). However, if the members are located in different LPARs, you need to monitor the SYSLOGs of all LPARs involved (see [Figure 23 on page 278](#)).

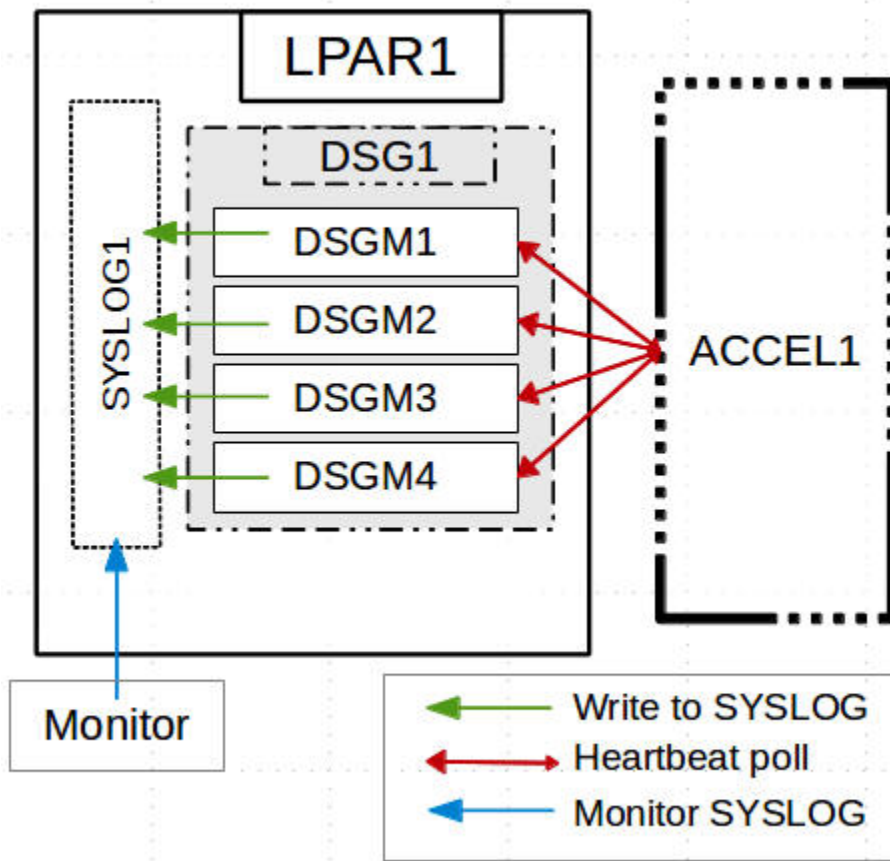


Figure 22. All members in the same LPAR

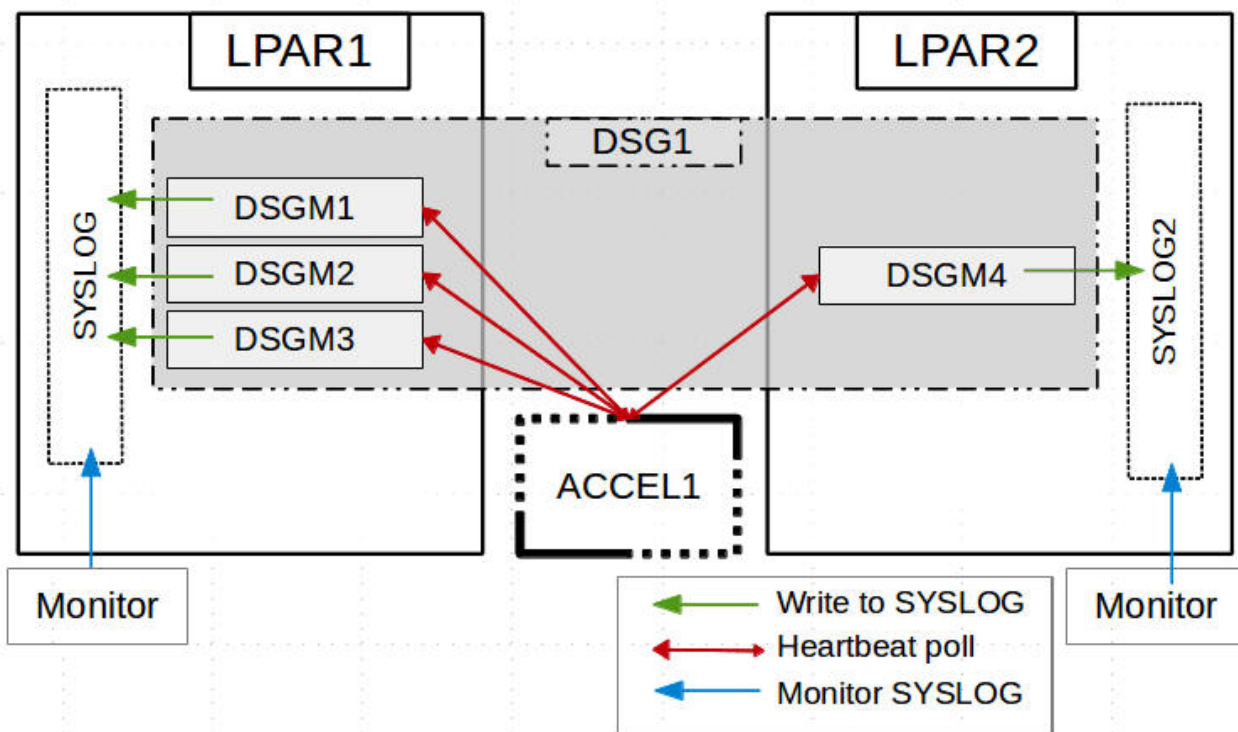


Figure 23. Members in two different LPARs

Note: It might look as if only one member writes messages to the SYSLOG, but this is actually a synchronization issue. If one member is always the first to issue a heartbeat request, then this member will receive all the messages and write these to the SYSLOGs. After that, the messages are deleted from the accelerator queue. The other members that send their heartbeat requests later will not receive these messages because the queue is empty. You might also see that only a few members write messages to the SYSLOG. This just means that the first member to send a heartbeat request is (always) found among this subset of members. The underlying mechanism is the same.

If an error occurs while an accelerator is in the *Stopped* state, that is, the `-STOP ACCEL` command has been issued before, an error message is stored on the accelerator. As soon as the accelerator becomes available again in Db2, the stored error messages are sent to the Db2 subsystem, provided that `-START ACCEL` has been issued for the subsystem, or, in case of a data sharing group, for at least one member of the group. It might happen that a DSNX881I message reports a past problem that has already been fixed.

For a list of message IDs, severity indicators, and message texts, see *Structure of DSNX881I Messages*. For a list of all replication-related messages that might be returned by the IBM Integrated Synchronization function, see *DSNX881I messages (ID 20) returned by IBM Integrated Synchronization* (links under **Related information**).

Related tasks

Saving trace information

The **Save Trace** function saves the collected trace information. In the **Save Trace** window, which opens before the action is completed, you can specify or change the settings for the save operation.

Related information

[Prerequisites and Maintenance](#)

[Structure of DSNX881I Messages](#)

[DSNX881I messages \(ID 20\) returned by IBM Integrated Synchronization](#)

Chapter 8. Troubleshooting

In the following sections, you find descriptions of known IBM Db2 Analytics Accelerator for z/OS problems. The author and the development team have tried to provide a solution wherever possible. However, a solution might be unavailable because the cause of a problem cannot be clearly identified. This is mostly the case if multiple causes can lead to the same symptom. It can also be that a solution has not yet been found. In such cases, contact IBM support.

Important: During a customer session with IBM support, system parameters might be changed. For the parameter changes to take effect, a restart of an accelerator is often required. In such situations, the accelerator will be unavailable for operational tasks until it has come back online.

Firewall blocks operations because crucial ports are closed

If product functions are not executed, check your firewall settings. IBM Db2 Analytics Accelerator requires certain ports to be open. See the table in this topic.

Symptoms

- You cannot accelerate queries.
- You cannot run functions from the IBM Db2 Analytics Accelerator Console.
- Incremental updates do not work or IBM InfoSphere Change Data Capture for z/OS cannot be configured.
- You cannot open a secure-shell (ssh) connection to an accelerator.
- Services are unavailable or switches (routers) cannot be reached because ICPM (Internet Control Message Protocol) traffic is blocked.

Causes

Required networking ports are closed.

Resolving the problem

Table 57. Required networking ports for IBM Db2 Analytics Accelerator		
Function or protocol	Required port	Direction
Query execution (DRDA protocol)	1400	Both ways
Communication between accelerator and stored procedures	1401	Both ways
IBM Db2 Analytics Accelerator Console	1600	Both ways
Secure DRDA (stunnel)	11400	Both ways
Secure communication between accelerator and stored procedures (stunnel)	11401	Both ways
Incremental update communication	11301-11350	Outbound (from z/OS to accelerator)

Table 57. Required networking ports for IBM Db2 Analytics Accelerator (continued)

Function or protocol	Required port	Direction
CDC configuration	5999	Inbound (generally from accelerator to z/OS; depends on the configuration of the CDC capture engine)
DB2 DDF port (for continuous incremental updates)	446 (default)	Inbound (from accelerator to z/OS)
Secure shell connection (ssh)	2222	Both ways
ICMP traffic	N/A	Both ways

IBM Db2 Analytics Accelerator Studio does not start

If IBM Db2 Analytics Accelerator Studio does not start, the reason might be that the name of the starting user contains a number sign (#).

Symptoms

IBM Db2 Analytics Accelerator Studio does not start.

Causes

At installation time, IBM Db2 Analytics Accelerator Studio creates a workspace directory in

@user.home\IBM\Db2 Analytics Accelerator Studio 2.1\workspace

where @user.home is the user's home directory, which is usually the same as the user name.

This means, if the user name contains a number sign (#), the workspace directory path contains a number sign, too. IBM Db2 Analytics Accelerator Studio cannot handle workspace directory paths that include number signs.

Resolving the problem

1. If the user name contains a number sign (#), open the file `datastudio.ini` in a text editor. This file is located in the installation directory of IBM Db2 Analytics Accelerator Studio.
2. Remove the following entries:

```
-data
@user.home\IBM\Db2 Analytics Accelerator Studio 2.1\workspace
```

3. Save and close the file.
4. The next time you start IBM Db2 Analytics Accelerator Studio, you are asked for the workspace directory path. This allows you to enter an alternative path that does not contain a number sign.

IBM Db2 Analytics Accelerator Studio on Linux does not start

IBM Db2 Analytics Accelerator Studio does not start from certain versions of Linux, particularly SUSE Linux Enterprise Server 10 with service pack 4.

Symptoms

An error message similar to the following is displayed:

```
/opt/tools/isaostudio/./jre/bin/javaw: symbol lookup error:
/usr/lib/xulrunner-1.9.2.17/libxul.so: undefined symbol:
gdk_screen_get_resolution
```

Causes

An updated version of a required library (XULRunner) is not compatible with IBM Db2 Analytics Accelerator Studio.

Resolving the problem

Use an earlier version of the XULRunner library. The problem also occurs in connection with IBM Rational® Performance Tester. You can apply the suggested solution analogously. See:

<https://www.ibm.com/support/docview.wss?uid=swg21393436>

Package not found when running a stored procedure from IBM Db2 Analytics Accelerator Studio

You receive a message saying that a package was not found when you try to run an IBM Db2 Analytics Accelerator for z/OS stored procedure from IBM Db2 Analytics Accelerator Studio.

Symptoms

You receive a message similar to this one:

```
SQL0805N  Package "<location>.NULLID.SYSSTAT.5359534C564C3031"
was not found.  SQLSTATE=51002
```

Causes

The package has not been bound due to an IBM Db2 Analytics Accelerator Studio installation error.

Resolving the problem

Bind the package manually. The following methods can be used:

- From the Db2 command-line client:

1. `cd <Db2-client-install-folder>\bnd`

where <Db2-client-install-folder> is the fully qualified path to the installation folder of the Db2 command-line client.

2. `db2 connect to <database-name>`

where <database-name> is the database to which the stored procedure belongs.

3. `db2 bind @db2cli.lst grant public`

- Using the Db2Binder utility from a Windows command-prompt:

1. Adjust the following command as needed. Then press the Enter key.

```
cd /d <idaa-studio-install-directory>
\plugins\com.ibm.datatools.db2_2.1.403.v20120228_2105\driver
```

where <idaa-studio-install-directory> is the drive and installation directory of IBM Db2 Analytics Accelerator Studio on your local workstation, for example C:\Program Files\IBM\ IBM Db2 Analytics Accelerator Studio 2.1. The full name of the com.ibm.datatools.db2_ directory changes with each new driver. So make sure that you choose the correct directory.

2. Enter:

```
..\..\..\jre\bin\java -cp db2jcc4.jar;
db2jcc4_license_cisuz.jar;
db2jcc4_license_cu.jar com.ibm.db2.jcc.Db2Binder
-url jdbc:db2://<server>:<port>/<location>
-user <user-id> -password <password>
```

where

<server>

Is the host name of the Db2 data server

<port>

Is the port on which the Db2 data server listens to JDBC requests

<location>

Is the unique name of the database server. An application uses the location name to access a Db2 database server. A database alias can be used to override the location name when accessing a remote server.

<user-id>

Is a user ID with the privilege of running the Db2 Binder utility

<password>

Is the password belonging to <user-id>

Long-running tasks are not completed

Tasks started from an administration client are not completed if they need more than two minutes of time, as, for example, the loading of an accelerator-shadow table.

Symptoms

The progress indicator never reaches the end or runs in an endless loop. You never receive a message that reports the successful completion or failure of the task.

Causes

A Db2 timeout setting (IDLE THREAD TIMEOUT parameter) prematurely ends the process (DDF thread) before the task is completed. The default value of this parameter is 2 minutes.

Resolving the problem

Increase the Db2 timeout value. For instructions, follow the link at the end of this topic.

Related information

[IDLE THREAD TIMEOUT field \(IDTHTOIN subsystem parameter\)](#)

SQL code -430 from IBM Db2 Analytics Accelerator for z/OS stored procedures

A stored procedure of IBM Db2 Analytics Accelerator for z/OS ends abnormally, and you receive an error message with SQL code -430.

Symptoms

IBM Db2 Analytics Accelerator for z/OS stored procedures end abnormally. Your administration client returns a message window like this one:



Figure 24. SQL code -430 message window

Causes

This might be a configuration problem.

Diagnosing the problem

1. Verify that the IBM Db2 Analytics Accelerator for z/OS stored procedures run in a separate Workload Manager (WLM) environment. Each application environment must be set up according to the instructions in *Setting up a WLM application environment for IBM Db2 Analytics Accelerator for z/OS stored procedures* in the *IBM Db2 Analytics Accelerator for z/OS: Installation Guide*. In particular, the ADMIN_INFO_SYSPARM and DSNUTILU stored procedures must run in different WLM environments and NUMTCB must be set to the correct value.
2. If the problem persists, collect the following diagnostic information for IBM support:
 - CEEDUMP in the WLM job
 - Stored procedure trace files in the z/FS directory /tmp. The names of these files follow this pattern:

```
aqt-trace-<YYYYMMDD-HHMM>-<procedure name>-*
```

Example:

```
aqt-trace-20171113-1028-ACCEL_TEST_CONNECTION-ghbHxQ
```

Transfer the trace files in binary mode.

Database access problems after updating IBM Db2 Analytics Accelerator Studio or IBM Optim Query Tuner

IBM Db2 Analytics Accelerator Studio or IBM Optim Query Tuner no longer run successfully after an upgrade to a new version. A message says that privileges to access the database are missing.

Symptoms

A text similar to the following is displayed as part of the error message:

STEFANA DOES NOT HAVE THE PRIVILEGE TO PERFORM OPERATION EXECUTE PACKAGE
ON OBJECT DB 20SC.DSN50ADM. SQLCODE=-551, SQLSTATE=42501, DRIVER=3.58.81

Causes

A bind step has not been executed or users lack an execution privilege.

Diagnosing the problem

A bind step must be executed before a new version of IBM Db2 Analytics Accelerator Studio or IBM Optim Query Tuner can be employed. However, after carrying out the bind step, only the user who ran the command has the privilege to access the database from IBM Db2 Analytics Accelerator Studio or IBM Optim Query Tuner. If other users want to use IBM Db2 Analytics Accelerator Studio or IBM Optim Query Tuner, you must grant them this privilege.

Resolving the problem

1. To create and bind the Db2 packages, follow the instructions on this website:
https://www.ibm.com/support/knowledgecenter/SS62YD_4.1.1/com.ibm.datatools.qrytune.configothers.doc/topics/enabledb2zfromclient_ds.html
2. To grant the EXECUTE privilege to other users, proceed as follows:
 - a. In the Data Source Explorer in the IBM Data Studio client, expand the connection to the subsystem. Right-click the icon for the subsystem and select **Analyze and Tune > Configure for Tuning > Advanced Configuration and Privilege Management**.
 - b. Click **Manage Package Privileges** to display and modify the authorization IDs that can execute the tuning packages.

DRDA connection does not work

You can ping the accelerators, but you cannot establish a distributed relational database access (DRDA) connection between your database management system and the accelerator.

Symptoms

Db2 commands or IBM Db2 Analytics Accelerator for z/OS stored procedures cannot establish a TCP/IP connection with the accelerator. Running the SYSPROC.ACCEL_TEST_CONNECTION stored procedure reveals this issue.

Resolving the problem

Make sure that the distributed data facility (DDF) of Db2 for z/OS uses the same TCP/IP stack as the ping program.

Different results for floating-point aggregates

Queries that involve floating-point aggregates produce different results when processed by IBM Db2 Analytics Accelerator for z/OS rather than Db2 for z/OS.

Symptoms

The very same query is processed twice, once by IBM Db2 Analytics Accelerator for z/OS and once by Db2 for z/OS. The results are different.

Causes

The result differences are differences in precision or error tolerances, which are caused by different methods of representation for floating-point numbers.

Resolving the problem

The problem cannot be solved. The differences must be accepted.

Related concepts

[Differences in floating-point error tolerances](#)

For queries that involve floating-point aggregates, you can expect IBM Db2 Analytics Accelerator for z/OS to produce results that are different from those delivered by inhouse Db2 for z/OS processing.

Stored procedure calls fail with message AQT10206E while temporary files are being created

Some or all running instances of the IBM Db2 Analytics Accelerator for z/OS stored procedures fail during the creation of temporary files.

Symptoms

Message AQT10206E is displayed for each failed stored procedure call:

```
AQT10206E - The OPEN NEW operation on the "/tmp/aqt-stored-procedure-trace-XXX"
file, data set, or pipe failed. Diagnostic information: mkstemp() failed with
rc = -1 and errno = 133
```

Causes

IBM UNIX System Services provides a z/OS UNIX file system (zFS) for z/OS. This file system, which contains the directory for the storage of temporary files (/tmp), is full. No more temporary files can be created for the execution of stored procedures.

Resolving the problem

Delete no longer needed files from the zFS. For example, you can safely delete stored-procedure trace-files. Note that you need superuser privileges in IBM UNIX System Services to do that. Follow these steps to delete the stored-procedure trace-files:

1. Log in to the IBM UNIX System Services shell of the logical partition (LPAR) from where you started the IBM Db2 Analytics Accelerator for z/OS stored procedure that returned the error. To log in, you can open a secure shell (ssh) window and use the **su** command to log in with superuser privileges. You can also use the IBM UNIX System Services shell to log in directly with an ID that has the required superuser privileges.
2. Change to the /tmp directory:

```
cd /tmp
```

3. Delete the stored-procedure trace files:

```
rm aqt-stored-procedure-trace*
```

Query history is not displayed - error message returned

The query history is not displayed in the **Accelerator** view and a corresponding error message is returned.

Symptoms

You do not see valid values in the columns of the **Query Monitoring** section of the **Accelerator** view and a message similar to the following is displayed:

```
[2013-05-25 05:14:09,790] [ERROR] [HistoryCol] Query History collection
impossible com.ibm.db2.jcc.am.SqlException: UNSUCCESSFUL EXECUTION CAUSED
BY AN UNAVAILABLE RESOURCE. REASON 00C900D1, TYPE OF RESOURCE 00000907,
AND RESOURCE NAME. SQLCODE=-904, SQLSTATE=57011, DRIVER=4.15.79
```

Causes

The value of the Db2 for z/OS parameter LOBVALA might be too low.

Resolving the problem

Increase the value of the LOBVALA parameter. The default value is 10240. Set it to 20480. Increase the value further if this does not solve the problem.

Db2 for z/OS returns SQLCODE -30040

A query cannot be executed and SQLCODE -30040 is returned by Db2 for z/OS.

Symptoms

Db2 for z/OS reports SQLCODE -30040, after IBM Db2 Analytics Accelerator has reported a DRDARessourceLimitError (DRDA code point 0x1233) and one of the following reason codes:

Reason 0x00001304 Type 0x00001409

The allowed maximum of concurrently running queries has been reached or exceeded. Your actual maximum depends on your hardware resources. The minimum is 100, the (theoretical) maximum is 240 queries running in parallel.

Reason 0x00000301 Type 0x00001409

The accelerator state forbids the execution of the query. For example, if the state is *Initializing* or *Maintenance*, queries cannot be processed.

Resolving the problem

1. Depending on the reason code, wait for earlier queries to finish or wait for the accelerator to change to a state that permits query execution.
2. Resubmit the failed query.

Result size exceeds Db2 for z/OS limit

Query results are returned incompletely or not at all. Error messages occur.

Symptoms

Common errors in this context are Db2 storage error 00E2000C and SQL error SQLCODE -352.

Causes

When query results are returned, Db2 for z/OS applies a size limit to the rowset that is returned. This limit is 10 MB. IBM Db2 Analytics Accelerator does not have such a limit and might produce result sets larger than that, especially if multi-row fetching is involved. When the accelerator returns the query results to Db2 for z/OS, the limit is exceeded and the errors do occur. For background information, see [Rowset fetches and inserts](#).

Resolving the problem

Set a corresponding limit for the maximum result size (query block size) in the query itself or in the application program that submits the query.

Appendix A. Impact of special register, ZPARM, or bind option settings on accelerator-only tables

SQL statements that reference accelerator-only tables can only be executed on an accelerator. However, certain combinations of special register and ZPARM settings might prohibit the execution of a statement on an accelerator. The same is true for the QUERYACCELERATION bind option for static SQL queries. The table in this section shows how these settings affect the statement execution.

Legend

The statement examples in [Table 58 on page 287](#) use abbreviations that indicate the type of a table:

AOT

Accelerator-only table

ACC

Regular accelerator table

Db2

Db2 table (not on accelerator)

Remember that the ZPARM setting QUERY_ACCEL_OPTIONS=2 enables INSERT . . . SELECT FROM . . . statements. With accelerator-only tables, the effect is often different from the effect it has in connection with regular accelerator tables. In many cases, the setting leads to an error. When applied successfully, it mostly leads to an acceleration of the INSERT portion of an INSERT . . . SELECT FROM . . . statement.

Table 58. Statement execution depending on the settings of CURRENT QUERY ACCELERATION, QUERY_ACCELERATION, or QUERYACCELERATION and QUERY_ACCEL_OPTIONS=2			
Statement	Special register SET CURRENT QUERY ACCELERATION= ZPARM QUERY_ACCELERATION= (ZPARM) Bind option QUERYACCELERATION=	QUERY_ACCEL_OPTIONS=2	Statement execution
SELECT * FROM T1_AOT	NONE (1)	No	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Accelerator
SELECT * FROM T1_AOT, T5_ACC	NONE (1)	No	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Accelerator

Table 58. Statement execution depending on the settings of CURRENT QUERY ACCELERATION, QUERY_ACCELERATION, or QUERYACCELERATION and QUERY_ACCEL_OPTIONS=2 (continued)

Statement	Special register SET CURRENT QUERY ACCELERATION= ZPARM QUERY_ACCELERATION= (ZPARM) Bind option QUERYACCELERATION=	QUERY_ACCEL_OPTIONS=2	Statement execution
SELECT * FROM T1_AOT, T3_Db2	NONE (1)	No	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Error, reason code 12
SELECT * FROM T5_ACC, T3_Db2	NONE (1)	No	Db2
	ALL (5)	No	Error, reason code 12
	ELIGIBLE (4)	No	Db2
	ENABLE (2)	No	Accelerator
INSERT INTO T1_AOT VALUES (...)	NONE (1)	No	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Accelerator
INSERT INTO T1_AOT SELECT FROM T2_AOT	NONE (1)	No	Error, reason code 2
		Yes	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	INSERT portion accelerated
		Yes	INSERT portion accelerated
INSERT INTO T1_AOT SELECT FROM T5_ACC	NONE (1)	No	Error, reason code 2
		Yes	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	INSERT portion accelerated
		Yes	INSERT portion accelerated

Table 58. Statement execution depending on the settings of CURRENT QUERY ACCELERATION, QUERY_ACCELERATION, or QUERYACCELERATION and QUERY_ACCEL_OPTIONS=2 (continued)

Statement	Special register SET CURRENT QUERY ACCELERATION= ZPARM QUERY_ACCELERATION= (ZPARM) Bind option QUERYACCELERATION=	QUERY_ACCEL_OPTIONS=2	Statement execution
INSERT INTO T1_AOT SELECT FROM T3_Db2	NONE (1)	No	Error, reason code 2
		Yes	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Error, reason code 12
		Yes	Error, reason code 12
INSERT INTO T1_AOT SELECT FROM T2_AOT, T3_Db2, T5_ACC	NONE	No	Error, reason code 2
		Yes	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Error, reason code 2
		Yes	Error, reason code 12
<ul style="list-style-type: none"> • INSERT INTO T5_ACC SELECT FROM T1_AOT • INSERT INTO T3_Db2 SELECT FROM T1_AOT 	NONE (1)	No	Error, reason code 2
		Yes	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	SELECT portion accelerated
		Yes	SELECT portion accelerated

Table 58. Statement execution depending on the settings of CURRENT QUERY ACCELERATION, QUERY_ACCELERATION, or QUERYACCELERATION and QUERY_ACCEL_OPTIONS=2 (continued)

Statement	Special register SET CURRENT QUERY ACCELERATION= ZPARM QUERY_ACCELERATION= (ZPARM) Bind option QUERYACCELERATION=	QUERY_ACCEL_OPTIONS=2	Statement execution
<ul style="list-style-type: none"> • INSERT INTO T5_ACC SELECT FROM T5_ACC • INSERT INTO T3_Db2 SELECT FROM T5_ACC 	NONE (1)	No	Db2
		Yes	Db2
	ALL (5)	No	Error, reason code 17
		Yes	SELECT portion accelerated
	ELIGIBLE (4)	No	Db2
		Yes	SELECT portion accelerated
	ENABLE (2)	No	Db2
		Yes	Entirely in Db2 or SELECT portion accelerated (based on estimated response-time reduction)
<ul style="list-style-type: none"> • INSERT INTO T5_ACC SELECT FROM T3_Db2 • INSERT INTO T3_Db2 SELECT FROM T3_Db2 	ALL (5)	No	Error, reason code 17
		Yes	Error, reason code 12
	NONE (1)	No	Db2
	ENABLE (2) ELIGIBLE (4)	Yes	Db2
<ul style="list-style-type: none"> • UPDATE T1_AOT (SELECT FROM T2_AOT) • UPDATE T1_AOT (SELECT FROM T5_ACC) • DELETE T1_AOT (SELECT FROM T2_AOT) • DELETE T1_AOT (SELECT FROM T5_ACC) 	NONE (1)	No	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Accelerator

Table 58. Statement execution depending on the settings of CURRENT QUERY ACCELERATION, QUERY_ACCELERATION, or QUERYACCELERATION and QUERY_ACCEL_OPTIONS=2 (continued)

Statement	Special register SET CURRENT QUERY ACCELERATION= ZPARM QUERY_ACCELERATION= (ZPARM) Bind option QUERYACCELERATION=	QUERY_ACCEL_OPTIONS=2	Statement execution
<ul style="list-style-type: none"> • UPDATE T1_AOT (SELECT FROM T3_Db2) • DELETE T1_AOT (SELECT FROM T3_Db2) 	NONE (1)	No	Error, reason code 2
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Error, reason code 12
<ul style="list-style-type: none"> • UPDATE T5_ACC (SELECT FROM T1_AOT) • UPDATE T3_Db2 (SELECT FROM T1_AOT) • DELETE T5_ACC (SELECT FROM T1_AOT) • DELETE T3_Db2 (SELECT FROM T1_AOT) 	NONE (1)	No	Error, reason code 22
	ENABLE (2) ELIGIBLE (4) ALL (5)	No	Error, reason code 22

Appendix B. Using telnet to log on to the IBM Db2 Analytics Accelerator Console

A telnet logon to the IBM Db2 Analytics Accelerator Console is still possible for compatibility reasons, but not recommended. Consider using the more secure ssh method instead.

Procedure

1. Start a client or emulator session (using, for example, IBM Personal Communications) to communicate with the z/OS system on which your Db2 subsystem is located.
2. Log on to TSO/ISPF.
3. Enter the following command:

```
tso telnet <hostname> 1600
```

where

<hostname>

Is the IP address of the accelerator that is connected to the Db2 for z/OS data server.

1600

Is the number of the port configured for accessing the IBM Db2 Analytics Accelerator Console using a telnet connection between the Db2 for z/OS data server and the accelerator.

For example:

```
tso telnet 203.0.113.8 1600
```

4. When prompted, enter acceladm as the user ID, followed by the console password.
The initial password is dwa-1234. You must change this password at the first logon.
The console also offers an option to create additional console users with different passwords.
5. Press the Pause key, then Enter to display the following screen:

```
*****
*           Welcome to the IBM Db2 Analytics Accelerator Configuration Console
*****
You have the following options:
(0) - (Menu) Manage Configuration Console
Users
(1) - (Menu) Run Accelerator Functions
(2) - (Menu) Manage Incremental Updates
(3) - (Menu) Manage Encryption of Data in Motion
(4) - (Menu) Manage Call Home
-----
(x) - Exit the Configuration Console
```

What to do next

Type x and press Enter to exit the **console** and close the telnet session.

Appendix C. Using ssh to log on to the IBM Db2 Analytics Accelerator Console

A secure shell (ssh) connection ensures that the information exchanged between your IBM Z system and the accelerator console is encrypted.

Before you begin

- An ssh client must be installed on the mainframe computer (IBM Z). Starting with z/OS V2R2, the OpenSSH package, which contains an ssh client, is part of the operating system.

If you still use z/OS V2R1, you can obtain an ssh client by installing the respective component from BM Ported Tools for z/OS. See:

https://www-03.ibm.com/systems/z/os/zos/features/unix/port_tools.html

Mind that IBM does not offer this package anymore. However, the functionality lives on in more specific packages provided by the Rocket software company (<https://www.rocketsoftware.com/zos-open-source>). These packages usually include the OpenSSH component that contains the ssh client, so that you can connect from the z/FS file system to the accelerator. Note that you only need the client component of OpenSSH for maintenance updates (called ssh).

- An ssh client must also be installed on the workstation used to access the IBM Db2 Analytics Accelerator for z/OS Console. You can use a tool like PuTTY, which comes free of charge.

Procedure

1. On your client workstation, open an ssh shell and connect to the mainframe computer by using the following command:

```
ssh <mainframe-ip>
```

where <mainframe-ip> is the IP address or host name of the IBM Z system that is connected to the accelerator.

2. Enter the logon user ID and password for the IBM Z system.
3. When connected, enter the following commands from the shell to connect to the IBM Db2 Analytics Accelerator Console:

```
ssh -p 2222 configuration-console@<accelerator-ip>
```

where

-p 2222

Specifies a non-default connection port.

<accelerator-ip>

Is the IP address of the accelerator.

For IBM Db2 Analytics Accelerator on an IBM Integrated Analytics System, this is the virtual IP or wall IP address.

For Db2 Analytics Accelerator on Z, this is the IP address of the network that you labeled DB2 in the **Appliance Installer**.

4. When prompted, enter acceladm as the user ID, followed by the console password.
The initial password is dwa-1234. You must change this password at the first logon.
The console also offers an option to create additional console users with different passwords.
5. Press the Pause key, then Enter to display the following screen:

```
*****
*           Welcome to the IBM Db2 Analytics Accelerator Configuration Console
*****

You have the following options:
(0) - (Menu) Manage Configuration Console
Users
(1) - (Menu) Run Accelerator Functions
(2) - (Menu) Manage Incremental Updates
(3) - (Menu) Manage Encryption of Data in Motion
(4) - (Menu) Manage Call Home

-----
(x) - Exit the Configuration Console
```

What to do next

Type x and press Enter to exit the **console** and close the **ssh** session.

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GDPR considerations

For PID(s): 5697-DA7, 5697-DA5, 5697-DAB

Notice: This document is intended to help you in your preparations for GDPR readiness. It provides information about features of IBM Db2 Analytics Accelerator for z/OS that you can configure, and aspects of the product's use, that you should consider to help your organization with GDPR readiness. This information is not an exhaustive list, due to the many ways that clients can choose and configure features, and the large variety of ways that the product can be used in itself and with third-party applications and systems.

Clients are responsible for ensuring their own compliance with various laws and regulations, including the European Union General Data Protection Regulation. Clients are solely responsible for obtaining advice of competent legal counsel as to the identification and interpretation of any relevant laws and regulations that may affect the clients' business and any actions the clients may need to take to comply with such laws and regulations.

The products, services, and other capabilities described herein are not suitable for all client situations and may have restricted availability. IBM does not provide legal, accounting, or auditing advice or represent or warrant that its services or products will ensure that clients are in compliance with any law or regulation.

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GDPR

General Data Protection Regulation (GDPR) has been adopted by the European Union (“EU”) and applies from May 25, 2018.

Why is GDPR important?

GDPR establishes a stronger data protection regulatory framework for processing of personal data of individuals. GDPR brings:

- New and enhanced rights for individuals
- Widened definition of personal data
- New obligations for processors
- Potential for significant financial penalties for non-compliance
- Compulsory data breach notification

Read more about GDPR

- EU GDPR Information Portal (<https://www.eugdpr.org/>)
- [ibm.com®/GDPR website \(https://ibm.com/GDPR\)](https://ibm.com/GDPR)

The EU General Data Protection Regulation (GDPR) regulates data privacy in the European Union (EU). For details, see: <https://www.eugdpr.org>

The regulations laid out in the GDPR apply if the data controller (an organization that collects data from EU residents), or the processor (an organization that processes data on behalf of a data controller, such as a cloud service provider), or the data subject (an individual) is based in the EU (source: Wikipedia. See: https://en.wikipedia.org/wiki/General_Data_Protection_Regulation). A violation of GDPR regulations might incur severe financial penalties (fines) and reputation damages. This documentation is intended for data controllers or processors who use Db2 for z/OS together with IBM Db2 Analytics Accelerator for z/OS with the aim of storing personal data of EU residents (individuals). As regards IBM Db2 Analytics Accelerator for z/OS, the IBM company is neither the data controller, nor the data processor. Nevertheless, the IBM company feels obliged to give such entities guidance on how to follow GDPR regulations.

Your responsibilities as a data controller or processor

If you act on behalf of a data controller or data processor, see the frequently asked questions (FAQ) on the official GDPR website to find out what your responsibilities are:

<https://www.eugdpr.org/gdpr-faqs.html>

Furthermore, refer to chapter 4 in the GDPR regulations:

<https://www.eugdpr.org/article-summaries.html>

Product Configuration for GDPR

The following sections provide considerations for configuring IBM Db2 Analytics Accelerator for z/OS to help your organization with GDPR readiness.

How to configure the offering so that it can be used in a GDPR environment

The following sections describe how personal data is stored and processed by IBM Db2 Analytics Accelerator for z/OS (called 'accelerator' in the text that follows).

If personal data is to be stored on an accelerator, the following configuration steps might help you meet your compliance objectives with regard to GDPR:

- Activate the encryption of data in motion (data that is transferred over a data network between Db2 for z/OS and the accelerator).
- Activate the encryption of data at rest (encryption of disks and other storage devices).
- Do not share passwords for the operation of the IBM Db2 Analytics Accelerator Console between multiple persons. Instead, create separate user IDs with different passwords for each console user.
- Give read access to personal data (the privilege to run queries) only to authorized Db2 for z/OS users. To this end, define appropriate Db2 authorizations (SELECT, and so on) in the Db2 for z/OS catalog.
- Restrict the right to unload data from and to create image copies in Db2 for z/OS. Give this right to authorized administrators only.
- Restrict access to the 'Save Trace' function in Db2 Analytics Accelerator for z/OS because the collected trace data might contain personal data. Access should be given to authorized administrators only.
- Restrict access to the table SYSIBM.USERNAMES in the catalog of the Db2 for z/OS communication database because this table contains authentication credentials. If these credentials are read or copied by unauthorized users, these users might obtain access to sensitive personal data.

Data Life Cycle

You can create copies of any Db2 for z/OS table on an accelerator (accelerator-shadow tables). As soon as you create a copy of a Db2 for z/OS table and load it with personal data, the GDPR regulations apply in the same way as they apply to personal data in the original Db2 for z/OS tables.

An accelerator also allows you to load and store external data outside of Db2 for z/OS, such as the data of VSAM files, in accelerator-shadow tables. Products like the Db2 Analytics Accelerator Loader can be used to this end. If the external data contains personal information, the GDPR regulations apply to the data that is transferred to the accelerator.

What types of data?

The administrative environment of an accelerator (client and configuration software) does not store personal data, except for the user IDs and authentication tokens of its administrators. However, the GDPR regulations apply to all personal data that you store in database tables on the accelerator.

Where in the process?

An accelerator is loaded with data in the course of individual load operations or by the incremental update function (automated load of table updates). Adding a table to an accelerator does not yet copy any data. It merely defines the table's structure (metadata) on the accelerator. However, if you load the table or enable it for incremental updates, the data of the source table - which might contain personal data - is copied to the accelerator.

For what purpose?

An accelerator, like Db2 for z/OS, is a general database management system for SQL queries. Such queries are run with the aim of retrieving stored information and gaining further insights (analytical queries that uncover the dependencies or connections between sets of values). An accelerator can return the results of SQL queries to authorized and authenticated users of the system. The results usually consist of subsets or aggregations of numerous data records. All these records might include personal data.

Personal data used for online contact with IBM

IBM Db2 Analytics Accelerator for z/OS clients can submit online comments/feedback/requests to contact IBM about accelerator subjects in a variety of ways, primarily:

- Public comments area on pages in the IBM Integration community on IBM developerWorks®
- Public comments area on pages of the IBM Db2 Analytics Accelerator for z/OS product documentation in the IBM Documentation
- Feedback forms in the IBM Integration community

Typically, only the client name and email address are used, to enable personal replies for the subject of the contact, and the use of personal data conforms to the *IBM Online Privacy Statement* (<https://www.ibm.com/privacy/cc/>).

Data Collection

IBM Db2 Analytics Accelerator for z/OS can be used to collect personal data. When assessing your use of IBM Db2 Analytics Accelerator for z/OS and the requirements of GDPR, you should consider the types of personal data which in your circumstances are stored on an accelerator.

The use of an accelerator does not impose new requirements for the collection of personal data. It does not introduce new users or new privileges, but makes use of existing users and their privileges as defined in Db2 for z/OS. The use of an accelerator does not introduce additional obligations for the safekeeping or administration of data if you already observe the GDPR regulations for the storage of data in Db2 for z/OS.

Make sure that the process of collecting data and storing it in Db2 for z/OS is GDPR-compliant. The use of an accelerator will then be equally compliant.

Data Storage

The use of IBM Db2 Analytics Accelerator for z/OS involves the storage of data in a persistent manner.

An accelerator is a general-purpose data processing and retrieval engine. It is not aware of the meaning of data or any meaning that can be inferred from it. It is thus the responsibility of the data controller or processor to classify the data as personal data - for example account data - and make sure that the collection, access and processing of this data is in accordance with the GDPR regulations.

Storage in backups:

An accelerator has no backup function. However, image copies are created in Db2 for z/OS when the accelerator's archiving function is used (high performance storage saver). If these image copies contain personal data, the GDPR rules apply. This means, for example, that if individuals request their data to be deleted, it must also be deleted from all the image copies that may exist.

Storage in archives:

The high performance storage saver deletes table data from Db2 for z/OS and stores it exclusively on an accelerator. If this data contains personal information, the GDPR regulations might require that you delete the personal information from a number of records. The current version of the accelerator software does not allow DELETE operations on archived partitions. So in case you must delete records, first restore the archived partition to Db2 for z/OS, then delete then delete the personal data from Db2 for z/OS. Finally, archive the partition again (which now does not include the personal data anymore).

Data Access

Access to data on an accelerator requires a Db2 for z/OS user ID and a password. The accelerator recognizes the privileges defined in Db2 for z/OS and does not allow a user to run functions that she or he is not entitled to use.

As long as the Db2 for z/OS authorizations, such as SELECT, INSERT, UPDATE, or DELETE privileges, are defined in accordance with the GDPR regulations, access to data on the accelerator will likewise be in accordance with these regulations.

So it is crucial that the definition of roles and access rights in Db2 for z/OS effectuates an adequate separation of duties and responsibilities.

One accelerator-specific function might provide access to personal data on the accelerator: This is the "Save Trace" function, which collects diagnostic information for troubleshooting. The resulting trace files might contain personal data because they sometimes include the code of SQL queries to which personal information has been passed in the form of query literals. Trace files can also include memory dumps that contain personal data.

It is therefore important that access privileges to data, such as SELECT privileges or superuser privileges like SYSADM and DBADM, are granted with great care. The permission to use the "Save Trace" function should be given to selected administrators only.

The privilege to create image copies in Db2 for z/OS must also be handled with care. It is required, for example, if a user wants to archive table partitions on an accelerator.

Data Processing

Privileges defined in the Db2 for z/OS catalog control data processing on an accelerator.

In addition to that, the encryption features (encryption of data in motion and encryption of data at rest) should be activated. This prevents an unauthorized person without proper privileges from gaining direct access to personal data by interfering with the network communication or by obtaining physical access to the storage devices (hard disks or solid state disks).

Encryption features and safeguarding precautions:

Encryption of data in motion:

This feature encrypts the network traffic between an IBM Z system and an accelerator.

Encryption of data at rest:

This feature encrypts the data on an accelerator's physical storage devices (hard disks and solid state disks). Depending on the model of the hardware, the feature might already be turned on by default.

Encryption key ownership:

Restrict access to the encryption keys because the keys enable a person to read or decrypt personal data on a network or storage device. Put the safekeeping and maintenance (rotation) of the encryption keys in the hands of a trusted administrator.

Data Deletion

When data is deleted from Db2 for z/OS, it might still exist in table copies on the accelerator. To delete the data on an accelerator, you have the following options:

The data in accelerator-shadow tables is deleted:

- If the data in the original Db2 for z/OS tables has been deleted, and if the affected accelerator-shadow tables have been reloaded (with the contents of the now empty Db2 tables).
- If the accelerator-shadow tables are removed from the accelerator.
- If the incremental update function is used and the function replicates empty table content to the accelerator because the original Db2 for z/OS table data has been deleted.

The data in an accelerator-only table (AOT) is deleted:

- If the AOT is removed from the accelerator.
- If an explicit DELETE statement is submitted on the Db2 for z/OS side, which references the AOT and contains a predicate that specifies the row to be deleted.

The data in partitions archived by the High Performance Storage Saver is deleted:

- If the table partitions are removed from the accelerator.
- If an archived partition is restored to Db2 for z/OS.
- If the data is deleted from Db2 for z/OS because this means that the archived partition is reloaded or that the partition is archived again after the deletion from Db2 for z/OS (empty table content will be reloaded or archived).

Data Monitoring

Db2 for z/OS provides powerful auditing and monitoring functions that allow you to track the processing of personal data. Because IBM Db2 Analytics Accelerator for z/OS is a logical component of Db2 for z/OS, and keeps only copies of Db2 for z/OS data, the monitoring functions for data processing in Db2 for z/OS are sufficient.

Responding to Data Subject Rights

To identify an individual's data that is stored on an accelerator, you can submit SQL queries from Db2 for z/OS. These queries ought to search for the name, the account number, or for other identifying information about the subject using SQL syntax. Since an accelerator works on copies of Db2 for z/OS data, the same queries can be run to retrieve the data either from Db2 for z/OS or from the accelerator. Specific advice or examples of such queries can not be provided here because the structure and the content of the database tables, as defined by the data controller or data processor, is not known.

Does the offering facilitate being able to meet data subject rights?

Right to Access

Can the client provide individuals access to their data?

Db2 for z/OS and accelerators can process SQL queries in which an individual's ID can be specified as a search criterion. This way, all data stored about that individual can be retrieved. In Db2 for z/OS,

a client's data access can be restricted, so that the client can only search and retrieve a subset of the available data records, that is, those records that belong to a specific group of individuals. To this end, a feature called label based access control (LBAC) can be employed. IBM Db2 Analytics Accelerator provides a similar functionality, which restricts access to a selected set of rows based on the CURRENT SQLID special register.

Can the client provide individuals information about what data the client has about the individual?

Yes. To identify an individual's data stored on an accelerator, the client can submit SQL queries from Db2 for z/OS. These queries ought to search for the name, the account number, or for other identifying information about the subject using SQL syntax.

Right to Modify

Can the client allow an individual to modify or correct their data?

Db2 for z/OS allows a client to update the data that is stored about an individual. Depending on the architecture of the application, it might even be possible to authorize the individuals, so that these can update their data by themselves. After an update in Db2 for z/OS, the modified data is copied to the accelerators attached to the database during the next reload operation, which can be started manually or automatically (by the incremental update function). During that process, incorrect data will be overwritten.

Can the client correct an individual's data for them?

Yes (see the previous question *Can the client allow an individual to modify or correct their data?*).

Right to Restrict Processing

Can the client stop processing an individual's data?

Yes. In Db2 for z/OS, a client can submit DELETE statements to remove data records of individuals. The removal will be reflected in the data that is stored on an attached accelerator when the next reload operation (manual or automatic) is taking place. During that process, records previously deleted from Db2 for z/OS will also be deleted from the accelerator. Furthermore, an individual's data can be excluded from SQL queries through the use of filters in query predicates. For example, a query that reads `SELECT CUSTOMER_DATA FROM CUSTOMER_TABLE where custid NOT IN (a, b, . . . c)` returns only data records that are not related to (do not belong to) the users in the specified group (a, b, . . . c).

Right to Object

Same as [“Right to Restrict Processing”](#) on page 306.

Right to Be Forgotten

Can the client delete an individual's data?

Yes.

Right to Data Portability

Can the customer provide an individual with the information that they have about the individual in a user-friendly/machine readable format?

Yes.

Glossary

This glossary includes terms and definitions for IBM Db2 Analytics Accelerator for z/OS.

The following cross-references are used in this glossary:

- *See* refers you from a term to a preferred synonym, or from an acronym or abbreviation to the defined full form.
- *See also* refers you to a related or contrasting term.

A

accelerator-archive table

A table on an accelerator that contains data archived by the High Performance Storage Saver. The data in an accelerator-archive table comes from a Db2 table. The original Db2 data is deleted during the archiving process, so that storage space is freed in Db2 for z/OS. The High Performance Storage Saver is typically used for historical Db2 data that is no longer actively queried and maintained. It is none the less possible to include the data in accelerator-archive tables in accelerated queries. To archive a Db2 table or partitions of this table with the High Performance Storage Saver, the table must exist as an accelerator-shadow table. However, the tables does not have to be loaded.

accelerator-shadow table

A table on an accelerator whose definition is derived from a Db2 for z/OS table and that can be used for accelerated queries after loading (copying data from the original Db2 table to the accelerator-shadow table).

access plan graph

A visual representation of a query that shows the database objects that are accessed by the query and the order in which this is done.

APF

See [authorized program facility](#).

authorized program facility (APF)

In a z/OS environment, a facility that permits the identification of programs that are authorized to use restricted functions.

C

cluster

- Number of configured accelerators.
- Table rows that are grouped together because they have the same value in a particular column.

collocated join

A join method where columns of an accelerator-shadow table must be on the same processing node. Leads to shorter query response times.

coordinator node

The primary node of the accelerator. It distributes the workload among the other nodes.

D

data slice

A portion of an accelerator-shadow table that is processed by a worker node.

DDF

See [distributed data facility \(DDF\)](#).

distributed data facility (DDF)

A set of Db2 for z/OS components by which Db2 for z/OS communicates with another relational database management system.

Dynamic Statement Cache

A pool in which Db2 saves prepared SQL statements that can be shared among different threads, plans, and packages. By sharing these statements, applications can avoid unnecessary preparation processes and thus improve performance.

F

fact table

A database table, commonly located at the center of a star schema surrounded by dimension tables, that contains measures of a business process, and foreign keys from the dimension tables.

failback

An automatic operation that returns the processing of a query to Db2 for z/OS if an error occurs while the query is processed by an accelerator.

friendly arithmetic

When an exception, such as a buffer overflow, a division by zero, or an out-of-range value occurs, Db2 returns the value NULL combined with a +802 warning, provided that the faulty expression is in the outermost SELECT statement and affects only one row.

I

inhouse processing

A query is processed by Db2 for z/OS and not routed to an accelerator.

L

lock

A means of preventing uncommitted changes made by one application process from being perceived by another application process and for preventing one application process from updating data that is being accessed by another process. A lock ensures the integrity of data by preventing concurrent users from accessing inconsistent data.

P

port-forwarding

A networking mechanism that allows Secure Shell access to a host in a private network from the outside.

Q

query conversion

Db2 for z/OS and the query engine of IBM Db2 Analytics Accelerator handle certain SQL expressions differently. In some cases, IBM Db2 Analytics Accelerator does not support an SQL expression that is supported by Db2 for z/OS. Therefore, changes to the mode of processing are sometimes inevitable when a query is routed to an accelerator.

R

row

See [table row](#).

rowset

A set of rows for which a cursor position is established.

S

Secure Shell (SSH)

A UNIX-based command interface and protocol for securely getting access to a remote computer.

S-FTP

See [SSH File Transfer Protocol](#).

skew

An imbalanced distribution of table rows among the processing nodes of the accelerator.

Sockets Secure (SOCKS)

A client/server architecture that transports TCP/IP traffic through a secure gateway. A SOCKS server performs many of the same services that a proxy server does.

SOCKS

See [Sockets Secure](#).

SSH File Transfer Protocol

A network protocol that provides the ability to transfer files securely over any reliable data stream.

SSH tunnel

A secure and encrypted path through a network.

SSH

See [Secure Shell](#).

systems programmer

A programmer who plans, maintains, and controls the use of an operating system with the aim of improving the overall productivity of an installation.

T

table row (row)

The horizontal component of a table, consisting of a sequence of values, one for each column of the table.

table space

A logical unit of storage in a database. In Db2 for z/OS, a table space is a page set and can contain one or more tables.

temporary table

A table that holds temporary data. Temporary tables are useful for holding or sorting intermediate results from queries that contain many rows. The two kinds of temporary tables, which are created by different SQL statements, are the created temporary table and the declared temporary table.

throughput

A measure of the amount of information transmitted over a network in a given period of time. Throughput is generally measured in bits per second (bps), kilobits per second (Kbps), or megabits per second (Mbps).

V

virtual IP address

An IP address that is shared among multiple domain names or multiple servers. Virtual IP addressing enables one IP address to be used either when insufficient IP addresses are available or as a means to balance traffic to multiple servers.

W

WLM application environment

A z/OS Workload Manager attribute that is associated with one or more procedures. The WLM application environment determines the address space in which a given procedure runs.

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