Data Studio Tool
V100R003C30

User Manual

Issue 01

Date 2018-05-16



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Contents

1 Data Studio User Manual....1

2 About This Manual....2

2.1 Intended Audience....2
2.2 Change History....2
2.3 Document Conventions....4
2.4 Third Party Licenses....5
2.5 Reference Documents....5

3 About Data Studio....7

3.1 Overview....7
3.2 Supported Functions....8
3.3 Constraints and Limitations....10
3.4 Structure of Release Package....12
3.5 System Requirements....14

4 Installing Data Studio....16

4.1 Installing and Configuring Data Studio....16
4.2 Configuring Server for Debugging PL/SQL Functions....24

5 Getting Started....26

5.1 Starting Data Studio....26
5.2 Data Studio User Interface....27
5.3 Data Studio Menus....28
5.3.1 File....28
5.3.2 Edit....29
5.3.3 Run....33
5.3.4 Debug....34
5.3.5 Settings....35
5.3.6 Help....35
5.4 Data Studio Toolbars....36
5.5 Data Studio Right-Click Menus....37

6 Using Data Studio....42

6.1 Connection Profiles....42
6.1.1 Adding a Connection....42

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6.1.2 Editing a Connection 49
6.1.3 Renaming a Connection 50
6.1.4 Disconnecting a Connection 50
6.1.5 Removing a Connection 51
6.1.6 Refreshing a Database Connection 51
6.2 Databases 52
6.2.1 Creating a Database 52
6.2.2 Connecting to Database 53
6.2.3 Renaming a Database 53
6.2.4 Viewing a Database Properties 53
6.2.5 Dropping a Database 54
6.2.6 Disconnecting Database 54
6.3 Schemas 54
6.3.1 Creating a Schema 54
6.3.2 Renaming a Schema 55
6.3.3 Exporting DDL 55
6.3.4 Exporting DDL and Data 56
6.3.5 Dropping a Schema 57
6.4 Functions/Procedures 57
6.4.1 Creating Function/Procedure 57
6.4.2 Editing a Function/Procedure 58
6.4.3 Working with Functions/Procedures 59
6.4.3.1 Debugging a PL/SQL Function 59
6.4.3.1.1 Using Breakpoints 60
6.4.3.1.2 Controlling Execution 64
6.4.3.1.3 Checking Debug Information 67
6.4.3.2 Selecting a DB Object in the PL/SQL Viewer 69
6.4.3.3 Exporting a Function/Procedure DDL 70
6.4.3.4 Viewing Object Properties in the PL/SQL Viewer 71
6.4.3.5 Dropping a Function/Procedure 72
6.4.3.6 Executing a Function/Procedure 72
6.5 Tables 73
6.5.1 Creating Regular Table 74
6.5.1.1 Working with Columns 82
6.5.1.2 Working with Constraints 84
6.5.1.3 Working with Indexes 85
6.5.2 Creating Foreign Table 86
6.5.3 Creating Partition Table 86
6.5.3.1 Working with Partitions 92
6.5.4 Managing Table 92
6.5.4.1 Renaming a Table 94
6.5.4.2 Truncating a Table 94

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6.5.4.3 Reindexing a Table 94
6.5.4.4 Analyzing a Table 95
6.5.4.5 Vacuuming a Table 95
6.5.4.6 Setting the Table Description 95
6.5.4.7 Setting the Tablespace 95
6.5.4.8 Setting the Schema 96
6.5.4.9 Dropping a Table 96
6.5.4.10 Viewing Table Properties 96
6.5.5 Managing Table Data 97
6.5.5.1 Exporting Table DDL 97
6.5.5.2 Exporting Table DDL and Data 98
6.5.5.3 Exporting Table Data 99
6.5.5.4 Showing DDL 100
6.5.5.5 Importing Table Data 101
6.5.5.6 Viewing Table Data 102
6.5.5.7 Editing Table Data 104
6.6 Sequences 108
6.6.1 Creating Sequence 108
6.6.2 Working with Sequences 109
6.7 Views 110
6.7.1 Creating a View 110
6.7.2 Working with Views 110
6.8 Tablespaces 113
6.8.1 Creating a Tablespace 113
6.8.2 Working with Tablespaces 115
6.9 SQL Terminal 116
6.9.1 Opening SQL Terminals 117
6.9.2 Managing SQL Query Execution History 118
6.9.3 Saving and Opening SQL Scripts 120
6.9.4 Viewing Object Properties in the SQL Terminal 121
6.9.5 Canceling Execution of SQL Queries 121
6.9.6 Formatting of SQL Queries 122
6.9.7 Selecting a DB Object in the SQL Terminal 124
6.9.8 Viewing the Query Execution Plan and Cost 125
6.9.9 Viewing the Query Execution Plan and Cost Graphically 126
6.9.10 Working with the SQL Terminals 129
6.9.11 Exporting Query Results 135
7 Personalizing Data Studio 137
7.1 General 137
7.2 Editor 141
7.3 Environment 141
7.4 Export/Import 142

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7.5 Result Management 143
7.6 Security 145
8 References 148
8.1 Performance Specification 148
8.2 PL Debug Server Interfaces 149
8.3 PL Debug Server Datatypes 157
9 Troubleshooting 158
10 Security Management 163
10.1 Login History 163
10.2 Secure Export 164
10.3 Securing the Application In-Memory Data 164
10.4 SQL History 164
10.5 SSL Certificates 165
11 FAQs 166
12 Glossary 171

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1 Data Studio User Manual

Data Studio is an Integrated Development Environment (IDE) that helps OLAP and OLTP database developers to build the application conveniently. It supports essential features of the database.

This tool allows working with database objects with minimal programming knowledge. Data Studio provides you with various features, such as creating and managing database objects (database, schema, functions, procedures, tables, sequences, indexes, views, and tablespaces), executing SQL statements or SQL scripts, editing and executing PL/SQL statements, viewing graphically the query execution plan and cost, exporting table data, and debugging operations. It also provides SQL assistance for various queries/procedures/functions executed in SQL Terminal/PL/SQL Viewer.

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2 About This Manual

This section provides information about this manual and includes the following topics:

2.1 Intended Audience

2.2 Change History

2.3 Document Conventions

2.4 Third Party Licenses

2.5 Reference Documents

2.1 Intended Audience

This manual is intended for:

- Database Developers
- Database Administrators

The database developer must have a high-level technical understanding of the database.

The database administrator must be able to manage installation, handle operations, and solve problems.

2.2 Change History

The following table provides the change history for the Data Studio User Manual:

Date	Version	Change Description
2018-05-16	V100R003C30SPC001	Updated: ● **6.1.1 Adding a Connection** ● **9 - Troubleshooting**

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Date	Version	Change Description
2018-03-01	V100R003C30	Added: ● **6.9.9 Viewing the Query Execution Plan and Cost Graphically** ● **SQL Assistant** Updated: ● **3.3 Constraints and Limitations** ● **3.5 System Requirements** ● **6.1.1 Adding a Connection** ● **6.1.2 Editing a Connection** ● **6.2.1 Creating a Database** ● **6.2.2 Connecting to Database** ● **6.2.3 Renaming a Database** ● **6.4.1 Creating Function/Procedure** ● **6.5.1 Creating Regular Table** ● **6.5.3 Creating Partition Table** ● **6.5.5.7 Editing Table Data** ● **6.9.10 Working with the SQL Terminals** ● **SQL Assistant** ● **Edit Table Data** ● **9 Troubleshooting** ● **11 FAQs**
2017-11-17	V100R003C20	Added: ● **Search Objects** ● **6.5.2 Creating Foreign Table** ● **6.5.3 Creating Partition Table** ● **6.6 Sequences** ● **Error Locator** Updated: ● **3.3 Constraints and Limitations** ● **3.5 System Requirements** ● **6.1.1 Adding a Connection** ● **6.4 Functions/Procedures** ● **6.5.5.3 Exporting Table Data** ● **6.5.5.5 Importing Table Data** ● **6.5.5.6 Viewing Table Data** ● **Rename SQL Terminal** ● **9 Troubleshooting** ● **11 FAQs**

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Date	Version	Change Description
2017-07-30	V100R003C10	Initial Release

2.3 Document Conventions

This section describes the content, symbols, GUI, and text conventions used in this manual.

Content Conventions

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Symbol Conventions

The symbol conventions that may be found in this document are defined as follows:

Convention	Description
NOTE	Provides additional information to emphasize or supplement important points of the main text.
NOTICE:	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

GUI Conventions

The GUI conventions that may be found in this document are defined as follows:

Convention	Description
Boldface	Buttons, menus, parameters, tabs, window, and dialog titles are in **boldface**. For example, click **OK**.
>	Multi-level menus are in **boldface** and separated by the ">" signs. For example, choose **File > Create > Folder**.

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Code Conventions

The code conventions that may be found in this document are defined as follows:

Convention	Description
[ ]	Brackets enclose one or more optional items.
< >	Brackets indicate user input (value that can be changed by the user).
{ }	Braces enclose two or more items, one of which is required.
|	A vertical bar represents a choice of two or more options within brackets or braces. Enter one of the options.
. . .	Vertical ellipsis points indicate that one or more lines of code that are not directly related to the example are omitted.

2.4 Third Party Licenses

This section contains the third party licenses applicable to the tool. Refer to *V100R003C30 Open Source Software Notice Written Offer.pdf* for license information and details.

Table 2-1 List of third party software

Third Party Software
Apache Commons Collections 4.1
Apache Jakarta Commons Math 3.2
Commons CSV 1.4
druid 1.1.6
eclipse-jee-mars-R-win32 4.5.2
Eclipse Nebula NatTable 1.5.0
jQuery JavaScript Library 1.12.4

2.5 Reference Documents

The section contains the details about the documents that can be referred for using Data Studio.

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Table 2-2 Reference Documents

Document Name	Description
V100R003C30 Open Source Software Notice Written Offer.pdf	Written offer listing the open source software used and their license information
OLAP Product Documentation	Database Reference

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3 About Data Studio

This section contains the following topics:

3.1 Overview

3.2 Supported Functions

3.3 Constraints and Limitations

3.4 Structure of Release Package

3.5 System Requirements

3.1 Overview

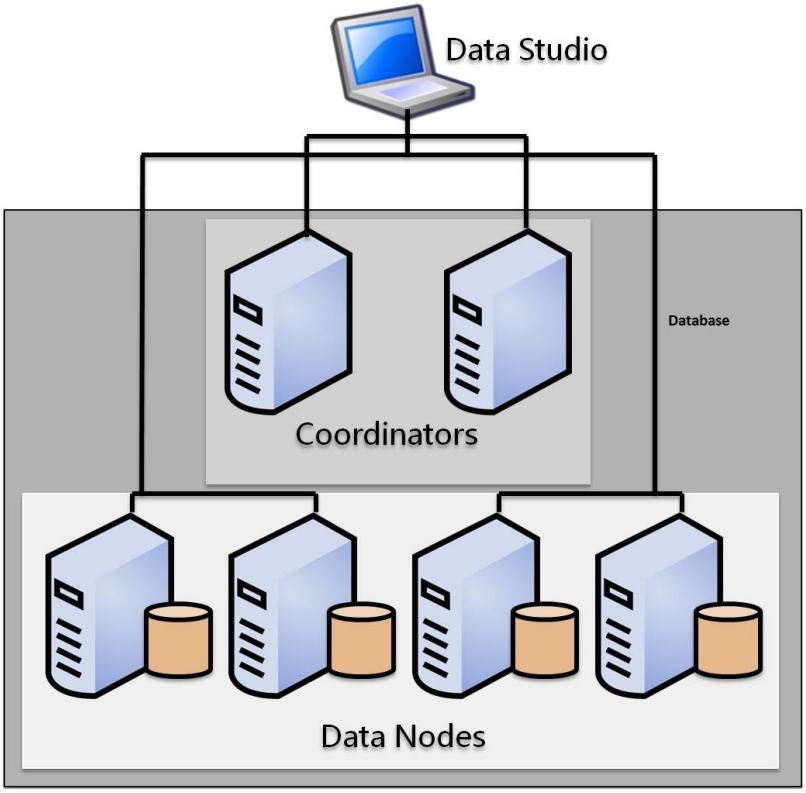
Data Studio provides a graphical interface which supports essential features of the database. This simplifies database development and application building tasks.

Data Studio allows the database developer to manage and create database objects (database, schema, functions, procedures, tables, sequences, columns, indexes, constraints, views, and tablespaces), executing SQL statements or SQL scripts, editing and executing PL/SQL statements, and importing and exporting table data.

Data Studio also allows the database developer to debug and fix defects in the PL/SQL code using debugging operations such as step into, step out, step over, continue, and terminate.

The following figure provides the operational context of database and Data Studio.

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3.2 Supported Functions

Below table describes the functions/operations of Data Studio that are supported and unsupported by OLAP and OLTP:

Functions/ Operations	OLAP				OLTP	
Version	V1R2C60	V1R2C60	V1R2C71	V1R2C80	V1R5C20	V1R6C00
Object Browser						
Connection Profiles	✓	✓	✓	✓	✓	✓
Databases	✓	✓	✓	✓	✓	✗
Schemas	✓	✓	✓	✓	✓	✗
Functions/ Procedures	✓	✓	✓	✓	✓	✗
Regular Tables	✓	✓	✓	✓	✓	✗

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Functions/ Operations	OLAP				OLTP	
Partition Tables	✓	✓	✓	✓	✓	✗
Foreign Tables	✓	✓	✓	✓	✓	✗
Indexes	✓	✓	✓	✓	✓	✗
Constraints	✓	✓	✓	✓	✓	✗
Table Data Management	✓	✓	✓	✓	✓	✗
Sequences	✗	✓	✓	✓	✗	✗
Views	✓	✓	✓	✓	✓	✗
Tablespaces	✓	✓	✓	✓	✓	✓
Search Objects	✓	✓	✓	✓	✓	✓
SQL Terminal						
Auto Commit	✓	✓	✓	✓	✓	✗
Auto-suggest	✓	✓	✓	✓	✓	✓
Error Locator	✓	✓	✓	✓	✓	✓
Execute queries	✓	✓	✓	✓	✓	✓
SQL Assistant	✗	✓	✗	✓	✗	✗
SQL Formatting	✓	✓	✓	✓	✓	✓
SQL History	✓	✓	✓	✓	✓	✓
Visual Explain Plan	✗	✗	✗	✓	✗	✗
PL/SQL Viewer						
Debug Objects	✓	✓	✓	✓	✓	✗
Breakpoint Operations	✓	✓	✓	✓	✓	✗

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Functions/ Operations	OLAP				OLTP	
Callstack Operations	✓	✓	✓	✓	✓	✗
Variables Operations	✓	✓	✓	✓	✓	✗
Results						
Export Results Data	✓	✓	✓	✓	✓	✓
Search Results	✓	✓	✓	✓	✓	✓
Toggle Show SQL	✓	✓	✓	✓	✓	✓
✓ - Supported ✗ - Not Supported						

Object Browser

You can view database objects in **Object Browser** in the tree format. For example, you can view the schema names as child nodes within the selected database and the corresponding table names within the selected schema.

The supported database objects (displayed in the tree format) are:

- Schemas
- Functions/Procedures
- Tables
- Sequences
- Views
- Columns, Constraints, and Indexes
- Tablespaces

3.3 Constraints and Limitations

The following are known limitations in Data Studio:

Character Encoding

When viewing SQL, DDL, object names or data containing Chinese characters, Data Studio encoding needs to be set to **GBK**. For more information on changing encoding settings, refer to **Environment > Session Setting**.

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Connection Management

Comma is considered as delimiter in **Include/Exclude** fields in **Advanced** tab of add and edit connection window. Hence schema name having comma is not supported in **Include/Exclude** fields.

Database Tables

- In the Create Table wizard > Index tab and in the Create Index wizard, the selected columns between list view, on remove, will not maintain order.
- When the Export/Import operation has completed, and if the Data Studio window is not the active window of the operating system, the popup dialog will not be shown until the Data Studio window becomes active.
- The following limitations are applicable for **Edit Table Data** operations:
  - Data Studio allows editing of only fetched records.
  - Entering expression values in **Edit Table Data** tab is not supported.
  - Edit table filter feature will not highlight search words within HTML tags such as <, &, >.
  - A cell containing single '&' in it will not be displayed in tooltip. A cell containing two consecutive '&' will display as single '&' in the tooltip.
  - Row focus is not retained on a newly added row. User must click on the desired cell to start editing.
- Keywords are not supported in Partition Value field like MAXVALUE. Any value which contains special characters, letters or negative numbers will be quoted. If this behavior is not expected, then copy the SQL query from SQL Preview tab. This query can be modified and executed on the SQL Terminal as required to create the partition.

Function/Procedure

Function/Procedure created in SQL Terminal or **Create Function/Procedure** wizard must end with / to indicate the end of function/procedure. Statements entered after a function/procedure without / at the end will be treated as a single query and may display errors during execution.

General

- A maximum of 100 tabs can be opened including **SQL Terminal**, **PL/SQL Viewer, Properties**, **View Table Data**, and **Edit Table Data** tabs. Tabs are based on available resources of the host machine.
- A maximum of 63 characters (text only) is allowed for database object names (database, schema, function, procedure, table, sequence, constraint, index, view, and tablespace). There is no limit to the number of characters that can be used in expressions and descriptions in Data Studio.
- Export DDL operation fails when a table, view, schema or function name contains two or more consecutive spaces in the object name.
- A maximum of 300 result tabs can be opened on a logged instance of Data Studio.
- If there are large objects loaded in Object Browser and Search Object window, then expanding of objects in Object Browser may be slow and Data Studio may become unresponsive.

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- Resizing the width of a cell containing text in a single line exceeding available display area may cause DS to become unresponsive.

Result Set

Execution of a new query from a SQL terminal where the fetch of a prior query's result is not completed will result in error while fetching pending results of the prior query. This is because Data studio started a read transaction on the prior query, which is closed and restarted before the execution of the next.

Security

- Data Studio validates SSL connection parameters only for the first connection profile. If a second connection is opened, then the connection uses the same SSL connection parameters when the Enable SSL field is checked.
- Client SSL certificate and Client SSL Key are validated only while performing the below DDL operations. When incorrect files are selected the below operations fails. Refer to **9 Troubleshooting** section.
  - Schema
    - Export DDL
    - Export DDL and Data
  - Table
    - Export DDL
    - Export DDL and Data
    - Show DDL
  - View
    - Export DDL

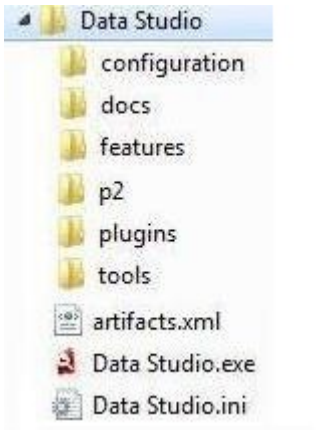
SQL Terminal

- Opening an SQL file containing a large number of queries may result in an 'Insufficient Memory' error. For more information, refer to **9 Troubleshooting**.
- For the SQL highlight feature, while editing a multi-line comment, the comment text's color may not follow the expected color rules. However, the color of the comment text is updated after editing (when the source tab is closed and opened again).
- Data Studio does not disable the auto-suggest and hyperlink features in commented text in the **SQL Terminal** and **PL/SQL Viewer**.
- SQL History saves only the first 1000 characters of the SQL queries.
- Hyperlink feature is not supported if schema or table name have either space or dot (.) in them.
- Auto-suggest is not supported if the object name contains single or double quotes in them.
- Auto-suggest is not supported for object alias.

3.4 Structure of Release Package

The release package structure of Data Studio is as follows:

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Folders/Files	Description
configuration	Contains information about the application launcher and the required **Eclipse** plug-in path.
docs	● Contains *Data Studio User Manual.pdf* which provides you with details on using Data Studio. ● Contains copyright notices, licenses, and the written offer for the open source libraries used in Data Studio.
features	Contains Eclipse (rich client protocol-GUI) and Data Studio features.
p2	Contains files required for provisioning and managing **Eclipse** and **Equinox**-based applications.
plugins	Contains the required **Eclipse** and Data Studio plugins.
tools	Contains Data Studio dependent tools.
UserData/ ● *Logs/* ● *Preferences/* ● *Profile/* – *History/* ● *Security/*	Contains separate folders for each OS user who uses Data Studio. **Logs** - Contains Data Studio.log which stores log information of all the operations performed in Data Studio. **Preferences** - Contains the *Preferences.prefs* file which stores the custom preferences. **Profile** - Contains the connection.properties, SQL History and Profiles.txt files required to manage connection profiles in Data Studio. **Security** - Contains files required to manage security in Data Studio. **NOTE** ● The UserData folder is created only after the first user opens an instance of Data Studio. ● *Logs* folder, language, memory settings and log level are common for all users. ● The *Logs* folder, *Data Studio.log* file, Preferences folder, Preferences.prefs file, Profile folder, connection.properties file, Profiles.txt file, and security folder are created after launching Data Studio. ● If *Logs* folder path is provided in Data Studio.ini file, then logs are created in the specified path.

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Folders/Files	Description
artifacts.xml	Contains the product build information.
Data Studio.exe	Allows you to connect to the database and perform various operations (like managing database objects, editing or executing PL/SQL programs and so on).
Data Studio.ini	Contains run-time configuration information of Data Studio.

3.5 System Requirements

This section provides the minimum system requirements for using Data Studio.

Hardware Requirements

The following table lists the minimum hardware requirements for Data Studio.

Table 3-1 List of hardware requirements for Data Studio

Hardware Requirement	Configuration
CPU	x86 32-bit; 64-bit
Available RAM	A minimum of 1 GB of free memory
Available Hard disk	A minimum of 1 GB of free space
Network Requirements	Gigabit Ethernet

Software Requirements

Operating System Requirements

The following table lists the details of OS requirements for Data Studio.

Table 3-2 List of OS environments for Data Studio

Operating System	Version	V100R003C10	V100R003C20	V100R003C30
Microsoft Windows	Windows Server 2008 (32 bit)	✓	✓	✓
	Windows Server 2008 (64 bit)	✗	✓	✓
	7 (32 bit)	✓	✓	✓
	7 (64 bit)	✓	✓	✓

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Operating System	Version	V100R003C10	V100R003C20	V100R003C30
	8 (32 bit)	✓	✓	✓
	8 (64 bit)	✗	✓	✓
	10 (32 bit)	✗	✓	✓
	10 (64 bit)	✓	✓	✓

NOTE

Data Studio has been tested on the listed OS environments.

Other Software Requirements

The following table lists the details of software requirements for Data Studio.

Table 3-3 List of software requirements for Data Studio

Software	Specification
Java	Recommended Java version is 1.8.0_141 or above with appropriate bit number

Table 3-4 List of Database Version Supported by Data Studio

Version	Supported
FusionInsight LibrA V100R002C60	✓
FusionInsight LibrA V100R002C70	✓
FusionInsight LibrA V100R002C71	✓
FusionInsight LibrA V100R002C80	✓

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4 Installing Data Studio

This section describes the installation and configuration steps to be followed to use Data Studio. It also explains the steps to configure server for debugging PL/SQL Functions.

This section contains the following topics:

4.1 Installing and Configuring Data Studio

4.2 Configuring Server for Debugging PL/SQL Functions

4.1 Installing and Configuring Data Studio

This section contains the following topics:

Installing Data Studio

Configuring Data Studio

Providing Location to Create Log File

Controlling Exception and Error Logs

Description of the Log Message

Different Types of Log Level

Installing Data Studio

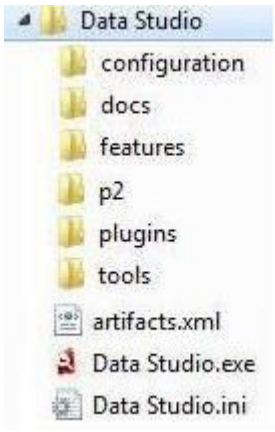
Data Studio can be run after extraction of package.

Follow the steps below to install Data Studio:

Step 1 Unzip the required package (32-bit or 64-bit) to the required location.

You will see the following files and folders:

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Step 2 Locate and double-click *Data Studio.exe* to launch Data Studio.

NOTE

UserData folder is created after the first user launches Data Studio. Refer to **5.1 Starting Data Studio** in case of any error while launching Data Studio.

----End

To create a new database connection, refer to **6.1.1 Adding a Connection**.

Configuring Data Studio

Steps to configure Data Studio using *Data Studio.ini* file:

NOTE

Restart Data Studio to view parameter changes. Invalid parameters added in the configuration file are ignored by Data Studio. All the below mentioned parameters are not mandatory.

List of configuration parameters used in Data Studio:

Table 4-1 Configuration Parameters

Parameter	Description	Value Range	Default Value
-startup	Defines the jar files required to load Data Studio. This information varies based on the version used.	N/A	*plugins/ org.eclipse.equinox.launcher_1.3.100.v20150511-1540.jar*

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Parameter	Description	Value Range	Default Value
--launcher.library	Defines the libraries required to load Data Studio. This information varies based on the version used.	N/A	*plugins/org.eclipse.equinox.launcher.win32.win32.x86_1.1.300.v20150602-1417* or *plugins/org.eclipse.equinox.launcher.win32.win32.x86_64_1.1.300.v20150602-1417* based on the package used
-clearPersistedState	Removes any cached state of the user interface and reloads Data Studio	N/A	N/A **NOTE** It is recommended to add this parameter.
-consoleLineCount	Defines the maximum number of lines to be displayed in the **Messages** window.	1 - 5000	1000
-logfolder	Used to create log folder. The user can specify the path to save logs. If the default value "." is used, then the folder is created in *Data Studio\UserData\<user name>\logs*. Refer to **Providing Location to Create Log File** section for more information.	N/A	.
-loginTimeout	Defines the connection open wait time in seconds. Based on the duration value entered Data Studio will try to connect beyond which it throws time out error/connection failed error	N/A	180
-data	Defines the instance data location for the session.	N/A	@none

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Parameter	Description	Value Range	Default Value
-detailLogging	Defines the criteria with reference to logging error messages. Set to **True** to log all error messages. Set to **False** to log only error messages explicitly mentioned by Data Studio. Refer to **Controlling Exception and Error Logs** for more information. This parameter is not added by default and it can be set manually if logging is required.	True/False	False
-logginglevel	Creates the log files based on the value specified. If the value provided is arbitrary or empty, log files will be created as per WARN value. Refer to **Different Types of Log Level** for more information. This parameter is not added by default and it can be set manually if logging is required.	FATAL, ERROR, WARN, INFO, DEBUG TRACE, ALL, OFF	WARN
-focusOnFirstResult	Defines auto focus behavior for **Result** window. Set to **false** to automatically set focus to the last opened **Result** window. Set to **true** to disable the automatic set focus.	True/False	False
NOTE ● All the above parameters must be added before -vmargs. ● -startup and --launcher.library must be added as first and second parameter respectively.			

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Parameter	Description	Value Range	Default Value
-vmargs	Specifies the start of virtual machine arguments. **NOTE** -vmargs must be the last parameter in the configuration file.	N/A	N/A
-vm <file name (javaw.exe) with relative path to Java executable>	Defines the relative path to Java executable	N/A	N/A
-Dosgi.requiredJavaVersion	Defines the minimum java version required to run Data Studio. This value must not be modified.	N/A	1.8 **Note:** Recommended Java version is 1.8.0_141
-Xms	Defines the initial heap space that Data Studio consumes. This value must be in multiples of 1024 and greater than 40 MB and less than or equal to -Xmx size. Append the letter k or K to indicate kilobytes, m or M to indicate megabytes, g or G to indicate gigabytes. Few examples: ● -Xms40m ● -Xms120m Refer to Java documentation for more information.	N/A	-Xms40m

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Parameter	Description	Value Range	Default Value
-Xmx	Defines the maximum heap space that Data Studio consumes. This value can be modified based on the available RAM space. Append the letter k or K to indicate kilobytes, m or M to indicate megabytes, g or G to indicate gigabytes. Few examples: ● -Xmx1200m ● -Xmx1000m Refer to Java documentation for more information.	N/A	-Xmx1200m
-testability	This parameter is used to enable testability features. For the current version the only feature controlled by this parameter is enabling of copy content of last triggered auto-complete operation using Ctrl +Space shortcut key. This parameter will not be available by default and needs to be added manually for testing.	True/False	True
-Duser.language	Defines the language settings for Data Studio. This parameter is added after the language setting is changed.	zh/en	N/A
-Duser.country	Defines the country settings for Data Studio. This parameter is added after the language setting is changed.	CN/IN	N/A

Providing Location to Create Log File

Step 1 Open the *Data Studio.ini* file.

Step 2 Provide the path for the *-logfolder* parameter.

For example:

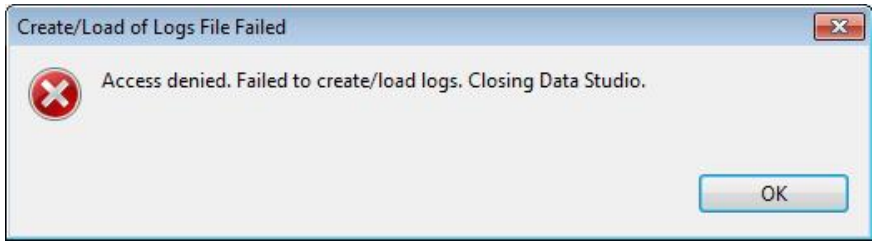
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-logfolder=c:\test1

In this case, the *Data Studio.log* file is created in the *c:\test1\<user name>\logs* path.

NOTE

If any of the user does not have access to the path mentioned in the Data Studio.ini file, then Data Studio closes with the below pop-up message.



----End

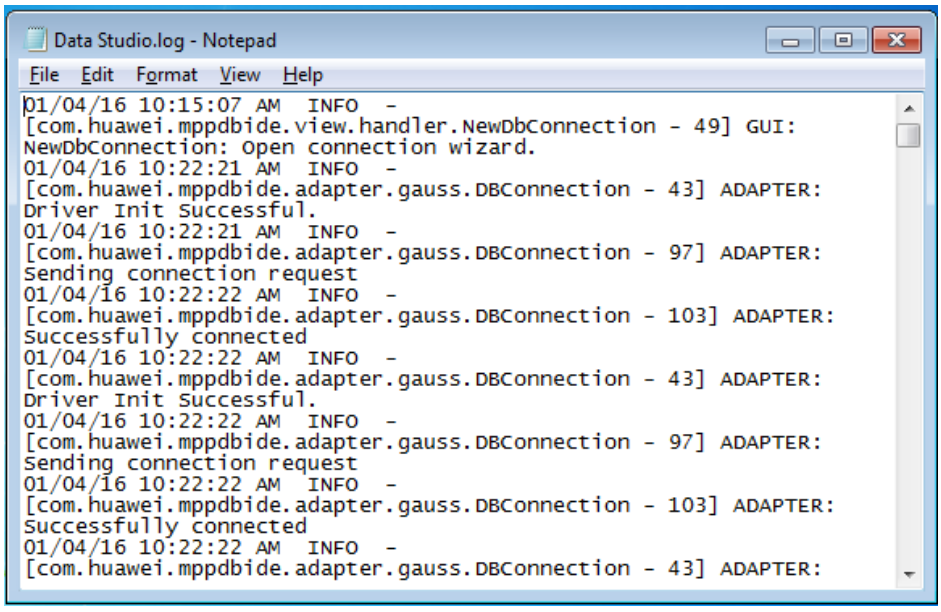
The *Data Studio.log* file will be created in the *Data Studio\UserData\<user name>\logs* path if

- The path is not provided in the *Data Studio.ini* file.
  For example: *-logfolder=*.
- The path provided does not exist.

NOTE

Refer to server manual for detailed information.

You can use any text editor to open and view the *Data Studio.log* file.



Controlling Exception and Error Logs

The stack trace details of exception, error or throw-able are controlled based on the program argument parameter. This parameter is configured in the *Data Studio.ini* file.

-detailLogging=false

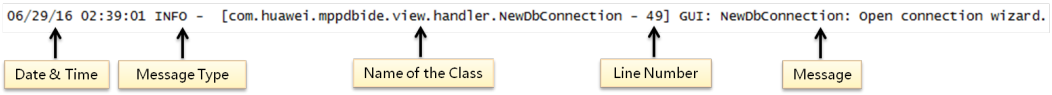
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If the flag value is 'true', then the stack trace details of exception, error or throw-able will be saved in the log file.

If the flag value is 'false', then no stack trace details will be saved in the log file.

Description of the Log Message

The description of the log message is as follows:



When the *Data Studio.log* file reaches the maximum file size of 10000 KB, it will create a new file and save as *Data Studio.log.1* automatically and the logs in *Data Studio.log* are moved to *Data Studio.log.1*. When *Data Studio.log* file reaches the maximum file size again, it will create a new file and save as *Data Studio.log.2*. The logs in *Data Studio.log* are moved to *Data Studio.log.1 and logs in Data Studio.log1 are moved to Data Studio.log.2*. Latest logs are always written in *Data Studio.log* file. This process continues till *Data Studio.log.5* reaches the maximum file size and the cycle restarts.

NOTE

To enable performance logging in the server log file, the configuration parameter *log_min_messag*es must be enabled and value must be set as *debug1* in the configuration file *data/postgresql.conf*, that is, *log_min_messages = debug1*.

Different Types of Log Level

The different types of log levels that are displayed in the *Data Studio.log* file are as follows:

- **TRACE**: The TRACE level provides detailed information than the DEBUG level and is at the top of the hierarchy.
- **DEBUG**: The DEBUG level indicates the granular information events that are most useful for debugging an application.
- **INFO**: The INFO level indicates the information messages that highlight the progress of the application.
- **WARN**: The WARN level indicates potentially harmful situations.
- **ERROR**: The ERROR level indicates error events.
- **FATAL**: The FATAL level indicates event(s) which cause the application to abort.
- **ALL**: The ALL level turns on all the log levels.
- **OFF**: The OFF level turns off all the log levels. This is opposite to ALL level.

  NOTE

  - If the user enters an invalid value to log level, then log level will be set to WARN.
  - If the user does not provide any log level, then log level will be set to WARN.

  The logger outputs all messages equal to or greater than its log level.

  The order of the standard log4j levels are as follows:

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Table 4-2 Logging Level

-	FATAL	ERROR	WARN	INFO	DEBUG	TRACE
OFF	✗	✗	✗	✗	✗	✗
FATAL	✓	✗	✗	✗	✗	✗
ERROR	✓	✓	✗	✗	✗	✗
WARN	✓	✓	✓	✗	✗	✗
INFO	✓	✓	✓	✓	✗	✗
DEBUG	✓	✓	✓	✓	✓	✗
TRACE	✓	✓	✓	✓	✓	✓
ALL	✓	✓	✓	✓	✓	✓
✓ - Log file created ✗ - Log file not created						

4.2 Configuring Server for Debugging PL/SQL Functions

Follow the steps below to configure server for debugging PL/SQL functions:

Step 1 Edit the *postgresql.conf* file in the coordinator of the database cluster.

Modify the *shared_preload_libraries* configuration option as follows:

```
shared_preload_libraries = '$libdir/plugin_debugger'
```

Restart the database for the new settings to take effect.

NOTE

- *postgresql.conf* files will be present in the configured path of all coordinator, primary, and standby data nodes.

  For example: If the coordinator path is configured as */home/data/coordinator,* then the *postgresql.conf* file will be present inside the */home/data/coordinator* directory.
- Modification of *shared_preload_libraries* configuration option is not required from FusionInsight LibrA V100R002C71 database version.

Step 2 Configure pg_hba.conf to allow connection to user's local windows machine:

1. Configure a client authentication mode and enable the client to connect to the host as user **jack**. Do not use user omm as the remote connection.

   Assume you are to allow the client whose IP address is 10.18.0.30 to access the current host.

   ```
   gs_guc set -Z coordinator -N all -I all -h "host all jack 10.18.0.30/32
   sha256"
   ```


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NOTE

Before using the jack user, connect to the database locally and run the following statement in the database to create jack:

```
postgres=#  CREATE USER jack PASSWORD 'Gaussdba@Mpp';
```

- **-Z coordinator** indicates that the instance type is coordinator.
- **-N all** indicates all hosts in the cluster.
- **-I all** indicates all instances of the host.
- **-h** indicates statements that need to be added in the **pg_hba.conf** file.
- **all** indicates that a client can connect to any database.
- **jack** indicates the user that accesses the database.
- *10.18.0.30/32* indicates that only the client whose IP address is 10.18.0.30 can connect to the host. Modify its value based on actual network configuration.

  For example:

  - 10.18.0.30/32 is to add permissions to a specific host.
  - 10.18.1.0/24 10.18.0.0/16 10.0.0.0/8 is to add permissions to a network segment.
- **sha256** indicates that the password of user **jack** is encrypted using the sha256 algorithm.

NOTICE

If running the command displays an error "Command not found", then login to the server where the CN resides as user omm and run the source ${BIGDATA_HOME}/mppdb/.mppdbgs_profile command to start environment variables.

Step 3 Restart the cluster.

----End

An example of configuring the database for debug is as follows:

```
#configure
vi <coordinator_install_path>/postgresql.conf

shared_preload_libraries = '$libdir/plugin_debugger'

vi ./bin/pgdata/pg_hba.conf

# IPv4 local connections:
host all all 10.18.18.18/32 sha256


#Stop cluster
cm_ctl stop

#Start cluster
cm_ctl start
```


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5 Getting Started

This section contains the following topics:

5.1 Starting Data Studio

5.2 Data Studio User Interface

5.3 Data Studio Menus

5.4 Data Studio Toolbars

5.5 Data Studio Right-Click Menus

5.1 Starting Data Studio

This section describes the steps to be followed to start Data Studio.

Prerequisites

The *StartDataStudio.bat* batch file checks the version of Operating System (OS), Java and Data Studio as a prerequisite to run Data Studio.

Step 1 In the **Release package** navigate to Tools folder, locate and double-click *StartDataStudio.bat* to execute and check Java version compatibility.

The batch file checks the version compatibility and will launch Data Studio or display appropriate message based on OS, Java and Data Studio version installed.

If the Java version installed is below 1.8, then appropriate **error message** displays.

The scenarios checked by the batch file to confirm the required versions of the OS and Java for DS.

DS Installation (32/64bit)	OS (bit)	Java (bit)	Outcome
32	32	32	Launches Data Studio
32	64	32	Launches Data Studio

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DS Installation (32/64bit)	OS (bit)	Java (bit)	Outcome
32	64	64	**Error message** displays
64	32	32	**Error message** displays
64	64	32	**Error message** displays
64	64	64	Launches Data Studio

----End

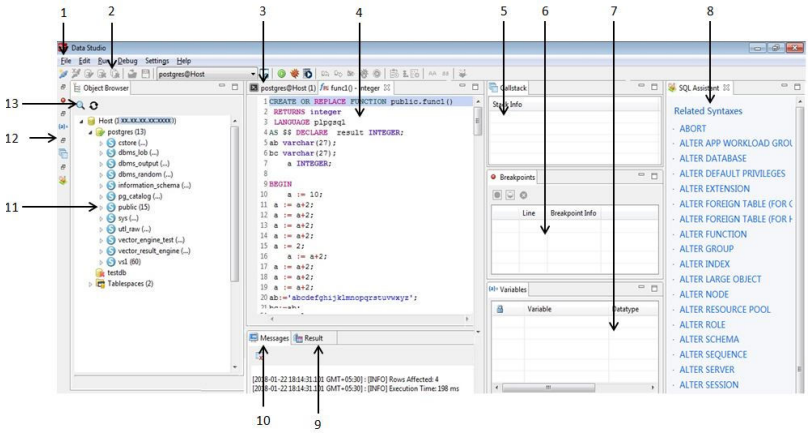
5.2 Data Studio User Interface

This section describes the user interface of Data Studio.

The Data Studio user interface contains the following:

1. **Main Menu** provides basic operations.
2. **Toolbar** contains buttons for easy access to frequently used operations.
3. **SQL Terminal** tab is used to execute SQL statements and functions/procedures.
4. **PL/SQL Viewer** tab displays the content of functions/procedures.
5. **Callstack** pane shows the execution stack.
6. **Breakpoints** pane shows any breakpoints that have been set.
7. **Variables** pane shows variables and their values.
8. **SQL Assistant** tab displays suggestion or reference for the information entered in the SQL Terminal and PL/SQL Viewer.
9. **Result** tab displays the result(s) of an executed function/procedure, or an SQL statement.
10. **Messages** tab displays the output of a process, such as standard input, standard output, and standard error(s).
11. **Object Browser** contains a hierarchical tree display of database connection(s) and related database objects.
12. **Minimized Window Panel** is used to open Callstack, Breakpoints and Variables pane. This panel is displayed only when Callstack, Breakpoints or Variables pane or all three are minimized.
13. **Search Toolbar** is used to search objects from the Object browser.

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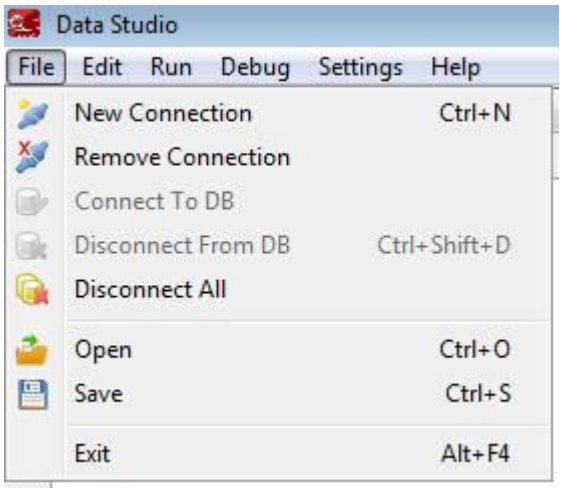


5.3 Data Studio Menus

This section describes the main menus of Data Studio.

5.3.1 File

The **File** menu contains database connection options. Click **File** from main menu or press **Alt** +**F** to open the **File** menu.



Function	Button	Shortcut Key	Description
New Connection		Ctrl+N	Creates and adds a new database connection to the **Object Browser** and **SQL Terminal**.
Remove Connection		-	Deletes the selected database connection from the **Object Browser**.
Connect To DB		-	Connects to the database.

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Function	Button	Shortcut Key	Description
Disconnect From DB		Ctrl+Shift+D	Disconnects from the selected database.
Disconnect All		-	Disconnects all the databases of a specified connection.
Open		Ctrl+O	Loads SQL queries into the **SQL Terminal**.
Save		Ctrl+S	Saves the SQL scripts of the **SQL Terminal** in an SQL file.
Exit	-	Alt+F4	Exits from Data Studio and closes the connection **NOTE** Any unsaved changes will be lost.

Closing Data Studio

Follow the steps below to close Data Studio:

Step 1 Click the  button.

Alternatively choose **File > Exit**.

Exit Application dialog box is displayed prompting you to take the required action.

Step 2 Click the appropriate buttons based on your requirement.

- **Force Exit** button - To exit the application without saving the SQL History information.

  NOTE

  Clicking on Force Exit button might not save the SQL History, if not saved yet.

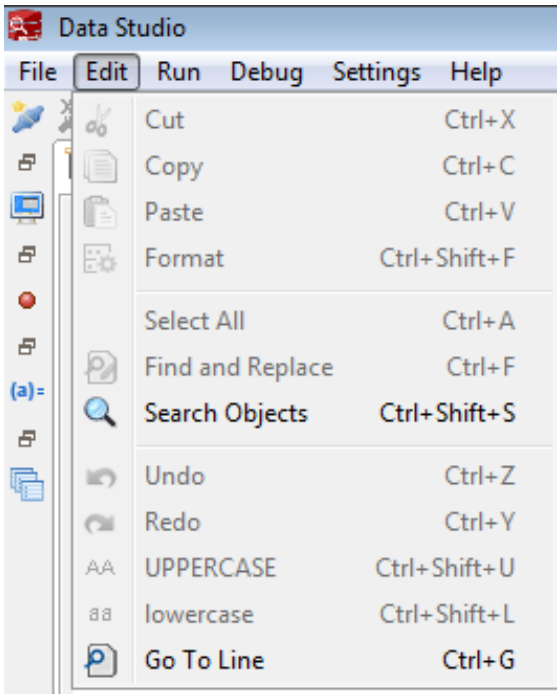
- **Graceful Exit** button - To exit the application after saving the SQL History information to disk in case the save is not complete at this point of time.
- **Cancel** button - To cancel exiting from the application.

----End

5.3.2 Edit

The **Edit** menu contains clipboard, **Format**, **Find and Replace**, and **Search Objects** operations to use in the **PL/SQL Viewer** and **SQL Terminal** tab. Press **Alt**+**E** to open the **Edit** menu.

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Function	Button	Shortcut Key	Description
Cut		Ctrl+X	Cuts the selected text
Copy		Ctrl+C	Copies the selected text or qualified object name
Paste		Ctrl+V	Pastes the selected text or qualified object name
Format		Ctrl+Shift+F	Formats all SQL statements and functions/procedures.
Select All	-	Ctrl+A	Selects all the text in SQL Terminal
Find and Replace		Ctrl+F	Finds and replaces text in SQL Terminal
Search Objects		Ctrl+Shift+S	Searches for objects within a connected database.
Undo		Ctrl+Z	Undoes the previous operation
Redo		Ctrl+Y	Redoes the previous operation
UPPERCASE		Ctrl+Shift+U	Changes the case of the selected text to uppercase
lowercase		Ctrl+Shift+L	Changes the case of the selected text to lowercase

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Function	Button	Shortcut Key	Description
Go To Line		Ctrl+G	Skips to a specific line in the Terminal or PL/SQL Viewer

Copy

Copy can also be used to copy objects from Object Browser.

The format of copied object name is:

Object Type	Copied Format
Functions/Procedures	schema.object name(parameter name parameter type,...)
Databases	object name
Schemas	object name
Tablespaces	object name
Columns	object name
Constraints	object name
Partition names	object name
All other object types	schema.object name

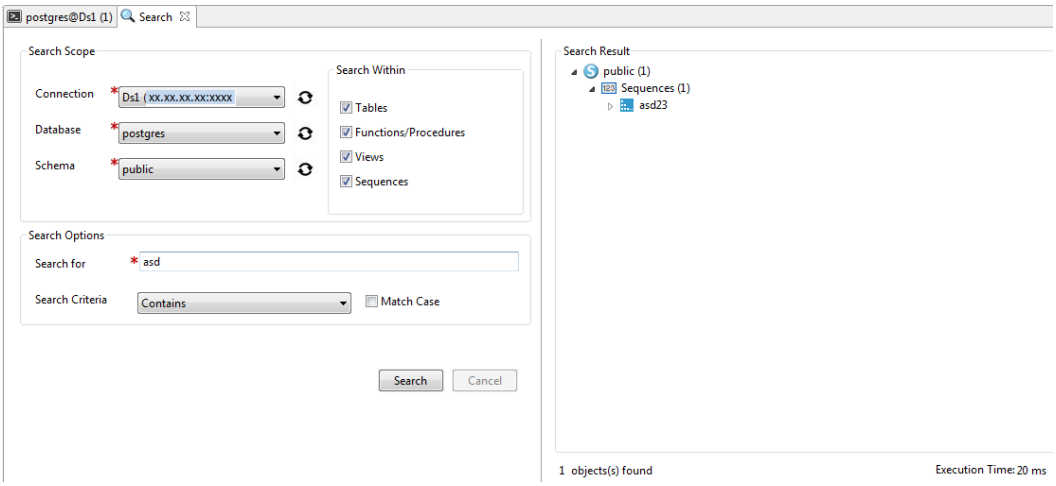
Search Objects

Search Objects option allows you to search for object(s) from the Object Browser based on the search criteria entered. The search operation can be executed either from **Edit > Search Objects** menu or by clicking the  from the Object Browser tool bar. The result of search displays tree structure similar to Object Browser. Right-click operations except for **Refresh** can be performed on the search result objects. Modified objects as a result of drop, set schema, rename, and so on can be viewed only from the main Object Browser after refresh. Right-click options on group names (tables, schema, views and so on) are not allowed on search result objects.

NOTE

Newly added objects can be viewed in the **Search** window by clicking the refresh option at the end of the object type.

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Search Criteria

Search Value Includes	Search Behavior
Contains	A search text which contains the searched characters will be displayed.
Starts With	A search text which starts with the searched character will be displayed.
Exact Word	A search text which matches exactly with searched characters will be displayed.
_	A search text with _ (underscore) in it considers the underscore as a wildcard of single character. This does not apply to regular expression, starts with and exact word search. **Example:** ● _ed, this displays all objects that starts with any single character followed by "ed". ● D_t_e, this displays all objects that has character "d", followed by any single character, followed by character "t", followed by any single character, and followed by character "e".
%	A search text with % (percentage) in it considers the percentage as a wildcard of multiple characters. This does not apply to regular expression, starts with and exact word search. **Example:** ● %ed, this displays all objects that has "ed" pattern in it. ● D%t%e, this displays all objects that has character "d", followed by any number of characters, followed by character "t", followed by any number of characters, and followed by character "e".

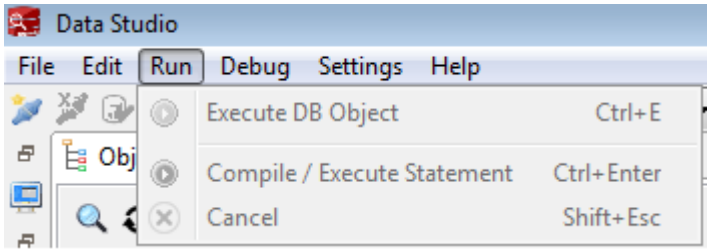
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Search Value Includes	Search Behavior
Regular Expression	A search text with regular expression searches for similar pattern in Object Browser that fulfills the search condition. Select Regular Expression from **Search Criteria** drop-down to perform this search. For more information refer to POSIX Regular Expressions rules. **Example:** ● ^a, this displays all objects that start with the letter a. ● ^[^A-Za-z]+$, this displays all objects that do not have alphabets in them. ● ^[^0-9]+$, this displays all objects that do not have numbers in them. ● ^[a-t][^r-z]+$, this displays all objects whose name starts between a and t and excludes those that have characters between r and z in them. ● ^e.*a$, this displays all objects that starts with the letter e and ends with letter a. ● ^[a-z]+$ and select **Match Case**, this displays all objects that contains only alphabets in lower case. ● ^[A-Z]+$ and select **Match Case**, this displays all objects that contains only alphabets in upper case. ● ^[A-Za-z]+$ and select **Match Case**, this displays all objects that contains only alphabets in lower case and upper case. ● ^[A-Za-z0-9]+$ and select **Match Case**, this displays all objects that contains only alphabets in lower case, upper case and numbers. ● ^".*"$, this displays all objects that are within in quotes.

Match case runs the search to match with the search text case.

5.3.3 Run

The **Run** menu contains options to execute a database object in the **PL/SQL Viewer** tab and to execute SQL statements in the **SQL Terminal** tab. Press **Alt**+**R** to open the **Run** menu.

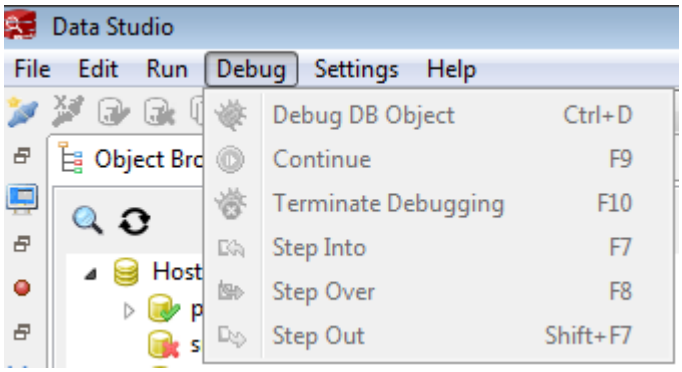


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Function	Button	Shortcut Key	Description
Execute DB Object		Ctrl+E	Starts execution (in normal mode) of the specified function/procedure. Displays the result in **Result** tab. Displays the information on actions performed in **Messages** tab.
Compile/Execute Statement		Ctrl+Enter	Compiles the function/procedure. Starts execution of SQL statements in the **SQL Terminal** tab.
Cancel		Shift+Esc	Cancels the executing query. Displays the result in **Result** tab. Displays the information on actions performed in **Messages** tab.

5.3.4 Debug

The **Debug** menu contains debug operations to use in the **PL/SQL Viewer** and **SQL Terminal** tab. Press **Alt**+**D** to open the **Debug** menu.

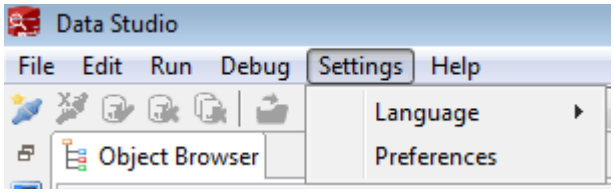


Function	Button	Shortcut Key	Description
Debug DB Object		Ctrl+D	Starts the debugging process.
Continue		F9	Continues with debugging.
Terminate Debugging		F10	Terminates debugging.
Step Into		F7	Steps through the code statement.
Step Over		F8	Steps over the function.
Step Out		Shift+F7	Steps out of the function.

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5.3.5 Settings

The **Settings** menu contains the option to change the language. Press **Alt**+**G** to open the **Settings** menu.



Function	Shortcut Key	Description
Language	-	Set the language for Data Studio user interface.
Preferences	-	Set the user preferences in Data Studio.

Setting the Language

Follow the steps below to change the language from English to Chinese:

Step 1 Choose **Settings** > **Language** > (zh_CN)中文（简体）(C).

Restart Data Studio dialog box is displayed.

NOTE

Save all data before changing the language.

Step 2 Click **Yes**.

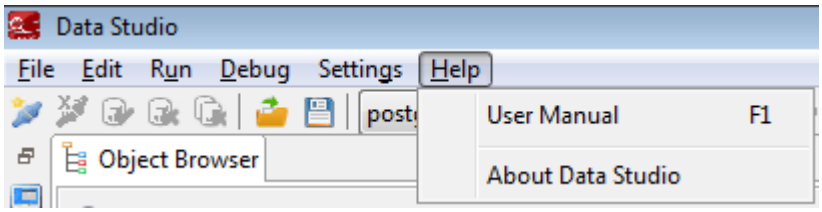
If you click **No**, the language settings will be applied the next time you restart Data Studio.

The language will be set after you restart Data Studio.

----End

5.3.6 Help

The **Help** menu contains the user manual and version information of Data Studio. Press **Alt** +**H** to open the **Help** menu.



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Function	Shortcut Key	Description
User Manual	F1	Opens the Data Studio User Manual.
About Data Studio	-	Displays the current version and copyright information of Data Studio.

NOTE

The *Version* displayed below is indicative and may not reflect the current version of Data Studio.



NOTE

Refer **https://java.com/en/download/help/path.xml** to set Java Home path.

5.4 Data Studio Toolbars

The following image shows the toolbar:



The toolbar contains the following actions:

- **New Connection**
- **Remove Connection**
- **Connect To DB**
- **Disconnect From DB**
- **Disconnect All**
- **Open SQL Script**
- **Save SQL Script**
- Connection Profile Drop-down List

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- **Open New SQL Terminal**
- **Execute DB Object**
- **Debug DB Object**
- **Compile a Function/Procedure**
- **Step Into**
- **Step Out**
- **Step Over**
- **Terminate Debugging**
- **Continue Debugging**
- **Execution Plan and Cost**
- **Execution Plan and Cost - Graphical**
- **Format**
- **Upper Case**
- **Lower Case**
- **SQL Assistant**

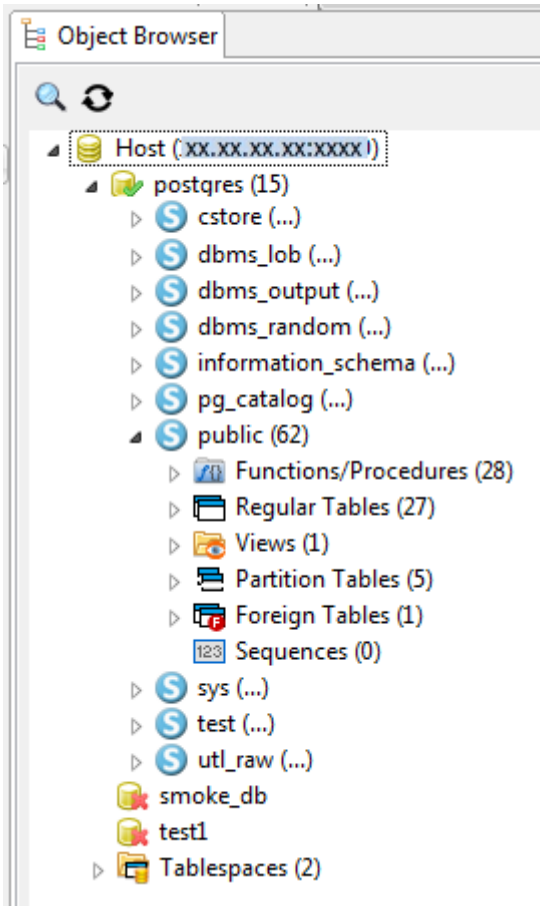
5.5 Data Studio Right-Click Menus

This section describes the right-click menus of Data Studio.

Object Browser Pane

The following image shows the **Object Browser** pane:

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Right-clicking the connection profile allows you to select **Refresh**, **Create Database**, **Disconnect All**, and **Remove Connection** options from the connection.

Menu Item	Shortcut Key	Description
Create Database	-	Creates a new database in this connection.
Rename Connection	-	Renames a connection name
Edit Connection	-	Modifies connection profile details
Remove Connection	-	Removes the existing database connection.
Disconnect All	-	Disconnects all the databases of this connection.
Refresh	F5	Refreshes the connection.

Right-clicking the active database allows you to select **Refresh**, **Disconnect From DB**, **Create Schema**, **Open Terminal, Rename Database**, **Drop Database**, and **Properties** options.

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Menu Item	Shortcut Key	Description
Connect to DB	-	Connects the database
Disconnect from DB	Ctrl+Shift+D	Disconnects the database
Create Schema	-	Creates a new schema in this connection.
Open Terminal	-	Open a Terminal in this connection
Rename Database	-	Renames the database name
Drop Database	-	Drops the database
Properties	-	Displays the properties of the database
Refresh	F5	Refreshes the database

Right-clicking the schema allows you to select **Refresh**, **Rename Schema**, **Drop Schema**, **Export DDL**, and **Export DDL and Data** options.

Menu Item	Shortcut Key	Description
Export DDL	-	Exports DDL of the schema
Export DDL and Data	-	Exports DDL and data of the schema
Rename Schema	-	Renames a schema
Drop Schema	-	Drops a schema
Refresh	F5	Refreshes the schema

Right-clicking **Functions/Procedures** allows you to select **Refresh** and **Create Function/ Procedure** options.

Menu Item	Shortcut Key	Description
Create Function/ Procedure	-	Creates Function/Procedure
Refresh	F5	Refreshes the Function/Procedure

Right-clicking **Tables** allows you to select **Refresh** and **Create table** options.

Menu Item	Shortcut Key	Description
Create Table	-	Creates table
Refresh	F5	Refreshes the table

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Right-clicking **Views** allows you to select **Refresh** and **Create View** options.

Menu Item	Shortcut Key	Description
Create View	-	Creates View
Refresh	F5	Refreshes the View

Right-clicking the **PL/SQL Viewer** allows you to **Cut**, **Copy**, **Paste**, **Select All**, **Compile, Execute,** and **Debug** in the **PL/SQL Viewer** tab.

Right Click Options	Shortcut Key	Description
Cut, Copy, Paste	Ctrl+X, Ctrl+C, Ctrl+V	Clipboard operations
Select All	Ctrl+A	Selects the content in PL/SQL Viewer
Compile	-	Compiles the function/procedure
Execute	-	Executes the function/procedure
Debug	-	Debugs the function/procedure

Right-clicking the **SQL Terminal** allows you to **Paste**, **Select All**, **Open**, **Save, Execute Statement**, **Find and Replace**, and **Execution Plan** in the **SQL Terminal** tab.

Right Click Options	Shortcut Key	Description
Cut, Copy, Paste	Ctrl+X, Ctrl+C, Ctrl+V	Clipboard operations
Select All	-	Selects all text
Execute Statement	-	Executes query
Open	-	Opens file
Save	-	Saves the query
Find and Replace	-	Finds and replaces text in SQL Terminal
Execution Plan	-	Executes the query
Cancel	-	Cancels execution

Right-clicking in the **Messages** tab allows you to **Copy**, **Select All**, and **Clear** the contents of the **Messages** tab.

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Right Click Options	Shortcut Key	Description
Copy	Ctrl+C	Copies the text
Select All	Ctrl+A	Selects all text
Clear	-	Clears the text

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6 Using Data Studio

This section provides details on how to use features of Data Studio. Data Studio requires a valid database connection to perform operations on the database.

Refer to **3.2 Supported Functions** to see the list of functions and database(s) supported by Data Studio.

This section contains the following topics:

6.1 Connection Profiles

6.2 Databases

6.3 Schemas

6.4 Functions/Procedures

6.5 Tables

6.6 Sequences

6.7 Views

6.8 Tablespaces

6.9 SQL Terminal

6.1 Connection Profiles

When Data Studio is started, the **New Database Connection** dialog box will open by default. To perform any DB operations, Data Studio must be connected to at least one database.

Enter the connection parameters to create a new database connection between Data Studio and the database in the server.

NOTE

You need to fill all the mandatory parameters, that are marked with asterisk (*) to complete the operation successfully.

6.1.1 Adding a Connection

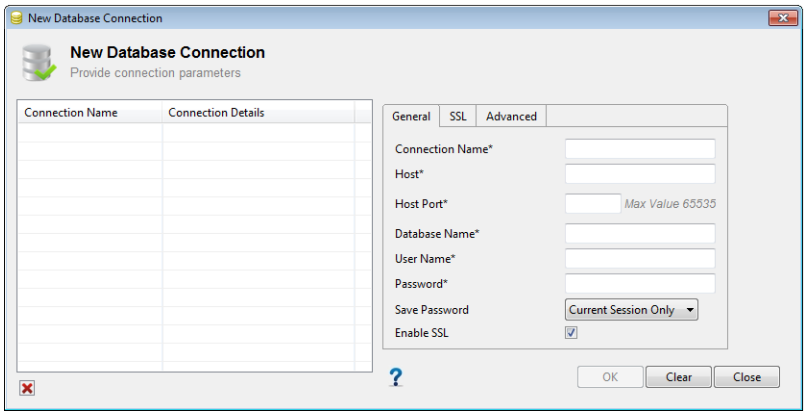
Follow the steps below to establish a new database connection:

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Step 1 Choose **File > New Connection** from the main menu, or

Click on the toolbar, or press **Ctrl+N** to connect to the database.

The **New Database Connection** dialog box is displayed.



NOTE

While establishing a connection, if the preference file is corrupted or the preferences values are invalid, then an error message displays informing you that preference values are invalid and default values are set for preferences. To complete establishing a new database connection operation, click **OK**.

Step 2 The table on the left lists the details of the existing connection profile(s) used to connect to the database.

- Double clicking a connection name populates the connection parameters such as **Connection Name**, **Host**, and **Host Port**.

  NOTE

  If password is corrupted for any of the existing connection profile or the key is corrupted, then the password field needs to be filled in for all created connections.

- Clicking displays different pop-up messages based on the connection status of database.
  - If the database connection is active, then **Remove Connection Confirmation** pop-up displays. Click **Yes** to disconnect all databases.
  - If the database connection is not active, then **Remove Connection Confirmation** pop-up displays.
- Clicking without a connection name displays a pop up stating to select at least one connection profile.

Step 3 Provide the following credentials to enter a new set of parameters to connect to the database:

NOTE

- You can click **Clear** to clear all fields in the **New Database Connection** dialog box.
- Use shortcut key (Ctrl+V) to paste data in Connection window. Data Studio does not support right-click options for all dialog boxes.

Field Name	Description	Example
Connection Name	Provide a connection name.	My_Connection_DB

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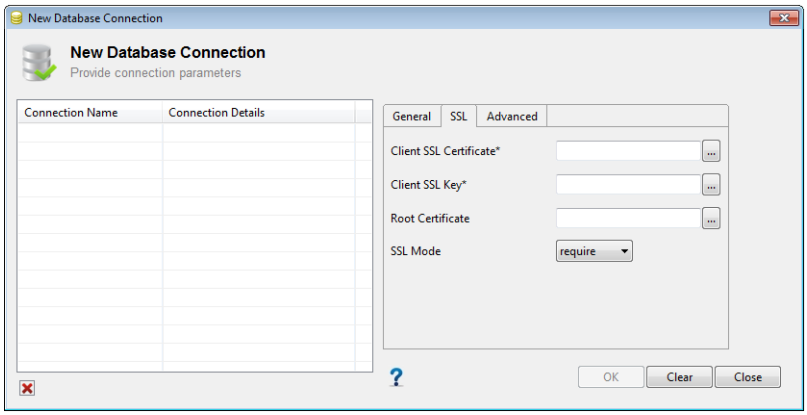
Field Name	Description	Example
Host	Provide the IP address (IPv4) or server domain name. **NOTE** ● **Host** field accepts only 63 characters. ● If domain name length is greater than 25 characters, then the complete domain name will not be displayed. ● Server domain name must start with a alphabet.	db.dws.myhuaweicloud.com 10.10.10.10
Host Port	Provide the port address.	25001
Database Name	Provide the database name.	postgres
User Name	Provide the user name to connect to the selected database.	-
Password	Provide the password to connect to the database. The password text is masked.	-

- Select an option from the **Save Password** drop-down list. The options available are:
  - **Permanently**: Saves the password even after exiting Data Studio. While establishing the connection for the first time this option will not be available. Refer to the **Save Password Permanently** section for information to hide/view this drop-down option.
  - **Current Session Only**: Saves the password only for the current session.
  - **Do Not Save**: Does not save the password. If this option is selected, Data Studio will prompt for the password for certain operations like:
    - **6.2.1 Creating a Database**
    - **6.2.3 Renaming a Database**
    - **6.4.3.1 Debugging a PL/SQL Function**
    - **6.9.10 Working with the SQL Terminals**
- **Enable SSL** check box is selected by default.

Step 4 Follow the steps below to enable SSL:

1. Select the **Enable SSL** option.
2. Click the **SSL** tab.

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3. Provide the following information. The following files are required for secured connection. Refer to **10.5 SSL Certificates** section.

   - To select the **Client SSL Certificate**, click  and select the Client SSL Certificate.
   - To select the **Client SSL Key**, click  and select the Client SSL key.
   - To select the **Root Certificate**, click  and select the Root Certificate.
   - Select the SSL Mode from **SSL Mode** drop-down. Refer to table below for description of different SSL modes.

     NOTE

     If the **SSL Mode** is selected as verify-ca or verify-full, then it is mandatory to select the Root Certificate.

SSL Mode	Description
require	Connects only using SSL connection. If a root certificate is added, then the source of the root certificate may be verified.
verify-ca	Connects only using SSL connection. If a server certificate is added, then verifies if the source of the server certificate is from a trusted authority (CA).
verify-full	Connects only using SSL connection and also verifies the source of the server certificate is from a trusted authority (CA) and also checks if the server host name matches with the name in the certificate.

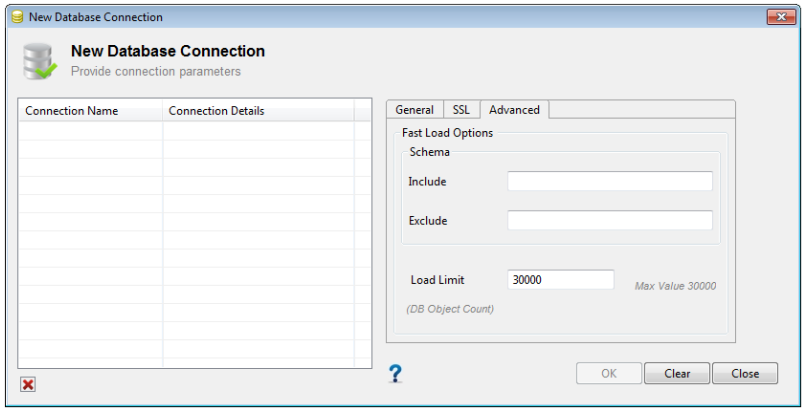
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NOTE

- Selecting **Client SSL Certificate** and **Client SSL Key** ensures secured connection for export of DDL and data using Data Studio.
- Selecting invalid file for Client SSL Certificate and/or Client SSL Key will result in export failure. Refer to **9 Troubleshooting**.
- If you deselect **Enable SSL** check box and proceed, then **Connection Security Alert** dialog box displays. Refer to **Security Disclaimer** for information to display this security alert or not.
  - **Continue** - Clicking Continue proceeds with unsecured connection.
  - **Cancel** - Clicking Cancel proceeds to enable SSL.
  - **Do not show again** - Checking this field hides the **Connection Security Alert** dialog box for subsequent connections for current logged instance of Data Studio.
- Refer to server manual for detailed information.

Step 5 Follow the steps below to set the **Fast Load Options**:

1. Click the **Advanced** tab.



2. Enter the schema names using comma separator to load on priority while establishing a connection in the **Include** field.
3. Enter the schema names using comma separator to avoid loading on priority while establishing a connection in the **Exclude** field.
4. Enter the load limit in **Load Limit** field. The maximum value allowed is 30000. This is the database object count.

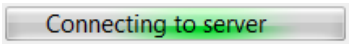
   NOTE

   - If the number of a object type (tables, view..) of the schema mentioned in the **Include** field is greater than the value entered in the **Load Limit** field, then the only the parent objects for a schema will be loaded. This implies that child objects like columns, constraints, indexes, functions with more than three parameters, and so on will not be loaded.
   - Schema names provided in the Include and Exclude lists are validated.

Step 6 Click **OK** to establish the connection successfully.

The status bar displays the status of the completed operation.

While Data Studio is connecting to the database, the following status bar shows the status:



Once the connection is established, all schema objects will be displayed in the **Object Browser** pane.

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NOTE

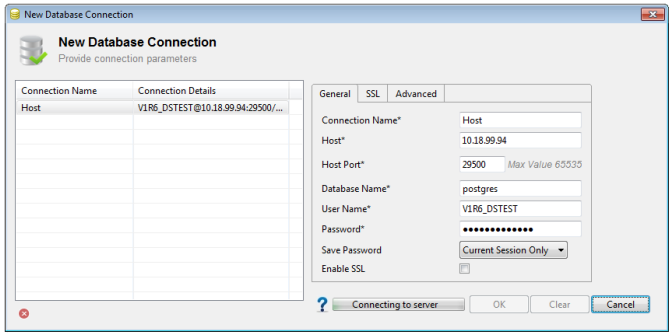
- Data Studio allows you to login even if the password has expired with a message informing that some operations may not work as expected. Refer to **Password Expiry** for information to change this behavior.
- Refer to **Cancel Connection** section to cancel the connection.
- Postgres specific schemas are not displayed in the Object Browser.

----End

Cancel Connection

Follow the steps below to cancel the connection operation:

Step 1 Click **Cancel**.



The **Cancel Connection** dialog box is displayed.

Step 2 Click **Yes**.

A message confirmation dialog box is displayed.

Step 3 Click **OK**.

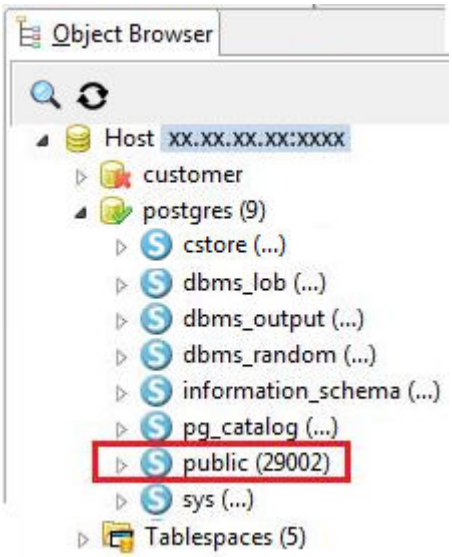
----End

Lazy Loading

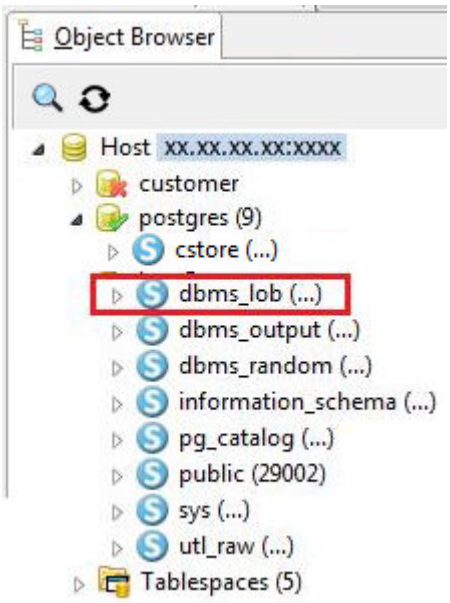
Lazy loading feature delays the loading of objects until required.

When you connect to a database only child objects of schema saved under **search_path** will be loaded as shown below:

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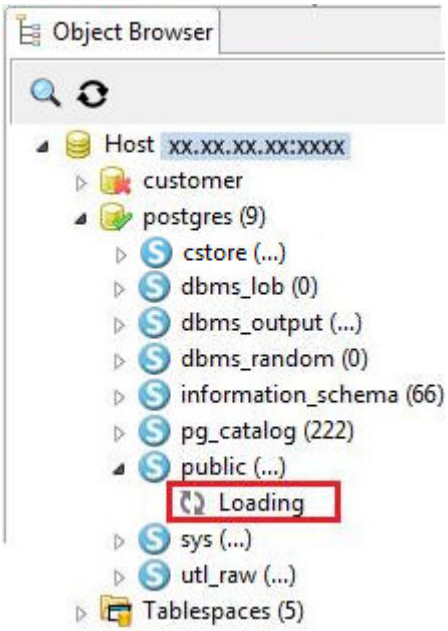


Unloaded schemas are represented as "schema (...)".



To load child objects expand the schema. During expansion of schema, the objects under the schema will show as loading:

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NOTE

If you try to load an unloaded object while loading is in progress for another object, a pop-up message displays informing you that another loading is in progress. The icon next to the unloaded object disappears. Refresh at the object or database level to display this icon again for loading.

If **search_path** is modified after establishing connection, then the changes will be reflected only after reconnecting the database. Auto completion is available for all objects.

A maximum of 50,000 objects will be loaded in the **Object Browser** pane within 1 minute.

Database connection timeout is set as 3 minutes (or 180 seconds) by default, beyond which connection time out error displays.

You can set the *loginTimeout* value in *Data Studio.ini* file. The file is present in the *Data Studio\Data Studio.ini* path.

6.1.2 Editing a Connection

Follow the steps below to edit the database connection properties:

Step 1 In the **Object Browser** pane, right-click the connection name and select **Edit Connection**.

Editing an active connection will require closing the connection and then reopening the connection with the new properties. A warning message about connections being reset is shown.

The **Edit Connection** dialog box is displayed.

Step 2 Click **OK** to proceed or **Cancel** to exit the operation.

NOTE

The **Connection Name** field cannot be modified.

Step 3 Edit the connection parameters. Connection parameters are explained in **6.1.1 Adding a Connection**.

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Step 4 Click **OK** to save the updated connection information.

NOTE

- You can click **Clear** to clear all fields in the **Edit Database Connection** dialog box.
- If you click **OK** without modifying any of the connection parameters, no changes saved dialog message displays. Until a connection parameter is changed the dialog message is displayed.
- Data Studio allows you to login even if the password has expired with a message informing that some operations may not work as expected. Refer to **Password Expiry** for information to change this behavior.
- Refer to **Cancel Connection** section to cancel the connection.

If SSL is not enabled, then a **Connection Security Alert** dialog box is displayed.

Step 5 Click **Continue** to proceed with unsecured connection or click **Cancel** to return to the **Edit Connection** dialog to enable SSL.

NOTE

Do not show again option is used to hide the **Connection Security Alert** dialog box for subsequent connections.

The **Remove Server Confirmation** is displayed to confirm closing databases for the edited connection.

Step 6 Click **Yes** to proceed to updating the connection information and reconnecting the connection with the updated parameters.

The status bar displays the status of the completed operation.

----End

6.1.3 Renaming a Connection

Follow the steps below to rename a database connection:

Step 1 In the **Object Browser** pane, right-click the connection name and select **Rename Connection**.

A **Rename Connection** dialog box is displayed prompting you to provide the new name for the connection.

Step 2 Enter the new connection name. Select the **OK** to rename the connection.

The status bar displays the status of the completed operation.

NOTE

The new connection name must be unique else the rename operation will fail.

----End

6.1.4 Disconnecting a Connection

You can disconnect all the databases from a connection.

Follow the steps below to disconnect a connection from the database:

Step 1 In the **Object Browser** pane, right-click the connection name and select **Disconnect All**. This will disconnect all the databases under that connection.

Data Studio displays a confirmation dialog box to disconnect all databases for the connection.

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Step 2 Click **Yes** to disconnect.

The status bar displays the status of the completed operation.

Data Studio populates all the connection parameters (except password) that were provided during the last successful connection with the database. To reconnect, you need to enter only the password in the connection wizard.

----End

6.1.5 Removing a Connection

Follow the steps below to remove an existing database connection:

Step 1 Right-click the connection name and select **Remove Connection**.

Data Studio displays a confirmation dialog box to remove the connection.

Step 2 Click **Yes** to remove the server connection.

The status bar displays the status of the completed operation.

This action will remove the connection from the **Object Browser**. Any unsaved data will be lost.

----End

6.1.6 Refreshing a Database Connection

Follow the steps below to refresh the database connection:

Step 1 In the **Object Browser** pane, right-click the connection name and select **Refresh** or press **F5**.

The status bar displays the status of the completed operation.

----End

The time taken to refresh the database depends on the number of objects present in the database. For a large database, it is recommended to perform this operation only if required.

- If you right-click the connection name and select **Refresh**, the connection profile is refreshed. During refresh, the connection will be updated with the latest copy from the server.
- If you right-click the Schema and select **Refresh**, all functions/procedures and tables under the schema are refreshed. During refresh, all functions/procedures and tables are updated with the latest copy from the server.

  If any stored function/procedure is deleted from the database before the refresh operation, then it will be removed from the **Object Browser** only after you perform the refresh operation.
- If you right-click a specific function/procedure and select **Refresh**, the specific function/procedure is refreshed. During refresh, the specific function/procedure is updated with the latest copy from the server.
- If you refresh at database level or connection profile level, then all the child objects of schema in **search_path** along with the schema already expanded by the user will be loaded.

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- If you re-connect to the Database, then only schema objects saved under **search_path** will be loaded. Previously expanded objects will not be loaded.
- Database and multiple objects under a database cannot be refreshed simultaneously.

6.2 Databases

This section contains the following:

- **Creating a Database**
- **Connecting to Database**
- **Renaming a Database**
- **Viewing a Database Properties**
- **Dropping a Database**
- **Disconnecting from Database**

6.2.1 Creating a Database

A relational database is a database that has a set of tables which is manipulated in accordance with the relational model of data. It contains a set of data objects used to store, manage, and access data. Examples of such data objects are tables, views, indexes, functions and so on.

Follow the steps below to create a database:

Step 1 In the **Object Browser** pane, right-click the connection name and select **Create Database**. A **Create Database** dialog box is displayed prompting you to provide the necessary information to create the database.

Step 2 Enter the database name. Refer to server manual for database naming rules.

Step 3 Select the required type of encoding character set from the **Database Encoding** drop-down list.

The database supports **UTF-8**, **GBK**, **SQL_ASCII**, and **LATIN1** types of encoding character sets. Creating the database with other encoding character sets may result in erroneous operations.

Step 4 Select the **Connect to the DB** check box and click **OK**.

The status bar displays the status of the completed operation.

You can view the created database in the **Object Browser**. The system related schema present in the server is automatically added to the new database.

NOTE

Data Studio allows you to login even if the password has expired with a message informing that some operations may not work as expected when no other database is connected in that connection profile. Refer to **Password Expiry** for information to change this behavior.

----End

Cancel Connection

Follow the steps below to cancel the connection operation:

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Step 1 Double-click the status bar to open the **Progress View** tab.

Step 2 In the **Progress View** tab, click .

Step 3 In the **Cancel Operation** dialog box, click **Yes**.

The status bar displays the status of the cancelled operation.

----End

6.2.2 Connecting to Database

You can connect to the database.

Follow the steps below to connect a database:

Step 1 In the **Object Browser** pane, right-click the database name and select **Connect to DB**.

The database is connected.

The status bar displays the status of the completed operation.

NOTE

- Data Studio allows you to login even if the password has expired with a message informing that some operations may not work as expected when no other database is connected in that connection profile. Refer to **Password Expiry** for information to change this behavior.
- Refer to **Cancel Connection** section to cancel the connection to database.

----End

6.2.3 Renaming a Database

Follow the steps below to rename a database:

Step 1 In the **Object Browser** pane, right-click the database and select **Rename Database**. A **Rename Database** dialog box is displayed prompting you to provide the necessary information to rename the database.

Step 2 Enter the new database name. Select the **Connect to the DB?** check box and click **OK**.

Data Studio displays a confirmation dialog box to rename the database.

Step 3 Click **OK** to rename the database.

The status bar displays the status of the completed operation.

You can view the renamed database in the **Object Browser**.

NOTE

Refer to **Cancel Connection** section to cancel the connection to database.

----End

6.2.4 Viewing a Database Properties

Follow the steps below to view the properties of a database:

Step 1 Right-click the database and select **Properties**.

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The status bar displays the status of the completed operation.

Data Studio displays the properties of the selected database.

NOTE

If the property of a database is modified for the database that is already opened, then refresh and open the properties of the database again to view the updated information on the same opened window.

----End

6.2.5 Dropping a Database

Follow the steps below to drop a database:

Step 1 In the **Object Browser** pane, right-click the database and select **Drop Database**. Data Studio displays a confirmation dialog box to drop the database.

Step 2 Click **OK** to drop the database.

A popup message and status bar displays the status of the completed operation.

----End

6.2.6 Disconnecting Database

You can disconnect the database.

Follow the steps below to disconnect a database:

Step 1 In the **Object Browser** pane, right-click the database name and select **Disconnect from DB**.

Data Studio displays a confirmation dialog box to disconnect database.

Step 2 Click **Yes** to disconnect.

The database is disconnected.

The status bar displays the status of the completed operation.

----End

6.3 Schemas

This section describes working with database schemas.

6.3.1 Creating a Schema

In relational database technology, schemas provide a logical classification of objects in the database. Some of the objects that a schema may contain include functions/procedures, tables, sequences, views, and indexes.

Follow the steps below to define a schema:

Step 1 In the **Object Browser** pane, right-click the database name and select **Create Schema**.

Step 2 Enter the schema name and click **OK**. You can create the schema only if the database connection is active.

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You can view the new schema in the **Object Browser** pane.

The status bar displays the status of the completed operation.

----End

You can perform the following actions on a schema:

- Refresh a Schema - To refresh a schema, right-click the **Schema Name** and select **Refresh Schema**. All the objects under that schema will be refreshed.
- Rename Schema (Refer to **6.3.2 Renaming a Schema** for more details)
- Drop Schema (Refer to **6.3.5 Dropping a Schema** for more details)
- Export DDL (Refer to **6.3.3 Exporting DDL** for more details)
- Export DDL and Data (Refer to **6.3.4 Exporting DDL and Data** for more details)

6.3.2 Renaming a Schema

Follow the steps below to rename a schema:

Step 1 In the **Object Browser** pane, right-click the required schema and select **Rename Schema**.

Step 2 Enter the schema name and click **OK**.

You can view the renamed schema in the **Object Browser**.

The status bar displays the status of the completed operation.

----End

6.3.3 Exporting DDL

Exporting the schema DDL exports the DDLs of functions/procedures, tables, sequences and views of the schema.

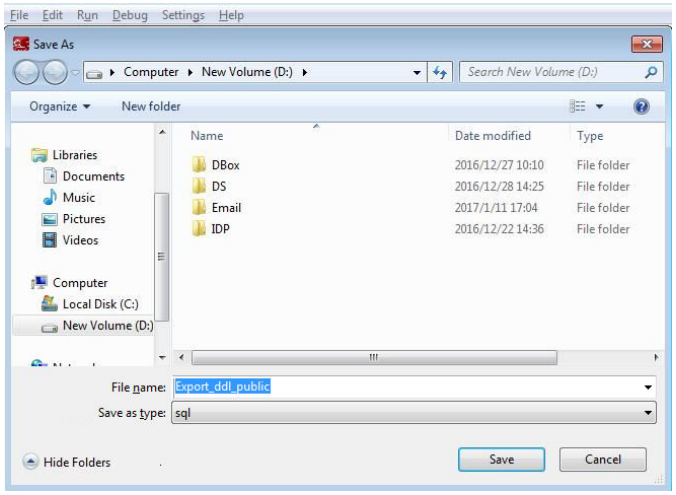
Follow the steps below to export the schema DDL:

Step 1 In the **Object Browser** pane, right-click the required schema and select **Export DDL**.

Data Studio displays the **Data Studio Security Disclaimer** dialog box. You can turn of this security disclaimer message. Refer to **Security Disclaimer** section for more information.

Step 2 Click **OK**.

Data Studio displays the **Save As** dialog box.



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Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the progress of the operation.

NOTE

- To cancel the export operation, double-click the status to open the **Progress View** tab and click . For more information refer to **Canceling the export table data operation**.
- The exported file name will not be the same as schema name, if the schema name contains characters which are not supported by Windows.
- Microsoft Visual C runtime file (***msvcrt100.dll***) is required to complete this operation. Refer **Troubleshooting** for more information.

The **Export** message and status bar displays the status of the completed operation.

Database Encoding	Data Studio File Encoding	Supports Exporting DDL
GBK	GBK	Yes
UTF-8	UTF-8	Yes
All other combination of encoding types are not supported for **Exporting DDL** operation.		

----End

6.3.4 Exporting DDL and Data

Exporting the schema DDL and data exports the following:

- DDLs of functions/procedures of the schema.
- DDLs and data of tables of the schema.
- DDLs of views of the schema.
- DDLs of sequences of the schema.

Follow steps below to export the schema DDL and data:

Step 1 In the **Object Browser** pane, right-click the required schema and select **Export DDL and Data**.

Data Studio displays the **Data Studio Security Disclaimer** dialog box. You can turn of this security disclaimer message. Refer to **Security Disclaimer** section for more information.

Step 2 Click **OK**.

Data Studio displays the **Save As** dialog box.

Step 3 In the **Save As** dialog box, select the location to save the DDL and data and click **Save**. The status bar displays the progress of the operation.

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NOTE

- To cancel the export operation, double-click the status to open the **Progress View** tab and click . For more information refer to **Canceling the export table data operation**.
- The exported file name will not be the same as schema name, if the schema name contains characters which are not supported by Windows.
- Microsoft Visual C runtime file (***msvcrt100.dll***) is required to complete this operation. Refer **Troubleshooting** for more information.

The **Export** message and status bar displays the status of the completed operation.

Database Encoding	Data Studio File Encoding	Supports Exporting DDL and Data
GBK	GBK	Yes
UTF-8	UTF-8	Yes
All other combination of encoding types are not supported for **Exporting DDL and Data** operation.		

----End

6.3.5 Dropping a Schema

Follow the steps below to drop a schema:

Step 1 In the **Object Browser** pane, right-click the required schema and select **Drop Schema**. Data Studio displays a confirmation dialog to drop the schema.

Step 2 Click **OK** to drop the schema. This action will remove the schema from the **Object Browser**.

A popup message and status bar displays the status of the completed operation.

----End

6.4 Functions/Procedures

This section describes working with functions and procedures.

6.4.1 Creating Function/Procedure

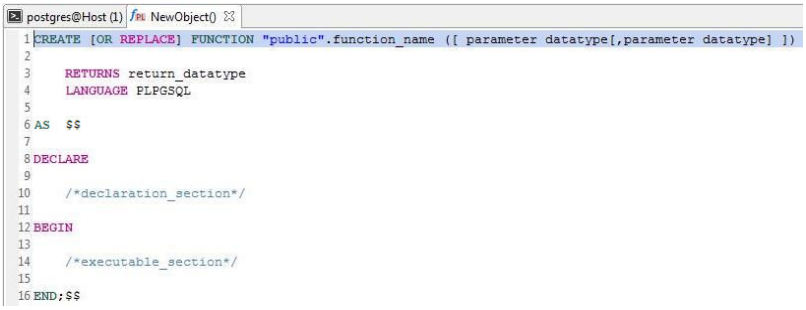
Follow the steps below to create a function/procedure and SQL function:

Step 1 In the **Object Browser** pane, right-click **Functions/Procedures** under the particular schema where you want to create the function/procedure and select either **Create PL/SQL Function** or **Create SQL Function** or **Create PL/SQL Procedure** based on your requirement.

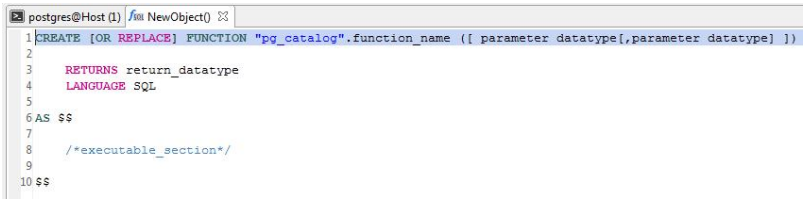
Data Studio opens a new tab with the selected template.

PL/SQL Function Template:

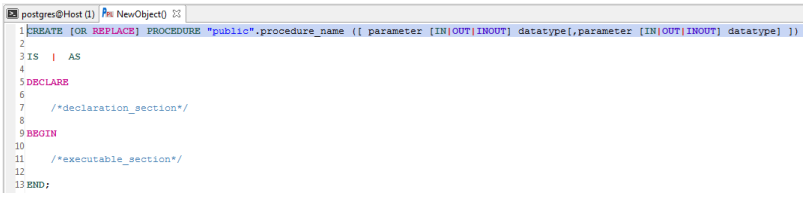
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SQL Function Template:



Create PL/SQL Procedure:



Step 2 Add the function/procedure by right-clicking in the tab and selecting **Compile**, or choosing **Run > Compile/Execute Statement** from the main menu, or pressing **Ctrl+Enter** to compile the function/procedure. You must compile the function/procedure to add it under the **Object Browser**.

Data Studio displays the **Created function/procedure Successfully** dialog box which displays the location of the new function/procedure.

Step 3 Click **OK** to close the *NewObject()* tab and add the debug object in the **Object Browser**. The * symbol next to the function/procedure name indicates that the function/procedure is not compiled or added in the **Object Browser**.

You must refresh (using **F5**) the **Object Browser** to view the newly added debug object.

NOTE

A popup message displays the status of the completed operation. The status bar will not display the status of this operation.

----End

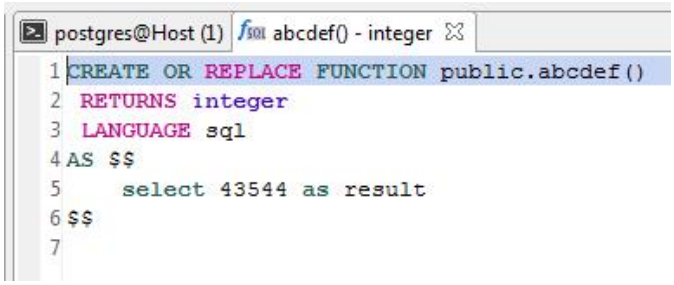
6.4.2 Editing a Function/Procedure

Follow the steps below to open and edit the function/procedure or SQL function:

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Step 1 In the **Object Browser** pane, double-click the required function/procedure or SQL function or right-click the required function/procedure or SQL function and select **View Source**. You must refresh the **Object Browser** to view the latest DDL.

The **PL/SQL Viewer** displays the function/procedure or SQL function based on your selection.



Only one function/procedure or SQL function with the same schema, name, and input parameter(s) can be opened in Data Studio.

Step 2 After editing or updating, compile and execute the PL/SQL program or SQL function. For more details, refer to **6.4.3.6 Executing a Function/Procedure**.

If you execute the function/procedure or SQL function before compiling, a **Source Code Change** dialog box is displayed.

Step 3 Click **Yes** to compile and execute the function/procedure.

The **Messages** tab displays the status of the completed operation.

Step 4 After compiling the function/procedure or SQL function, refresh the **Object Browser** (using **F5**) to view the updated code.

----End

6.4.3 Working with Functions/Procedures

This section provides you with details on working with functions/procedures and SQL functions in Data Studio.

NOTE

Data Studio supports plpgsql and SQL languages for the operations listed below:

- **6.4.1 Creating Function/Procedure**
- **6.4.2 Editing a Function/Procedure**
- **6.4.3.3 Exporting a Function/Procedure DDL**
- **6.4.3.5 Dropping a Function/Procedure**

6.4.3.1 Debugging a PL/SQL Function

This section contains the following topics:

6.4.3.1.1 Using Breakpoints

6.4.3.1.2 Controlling Execution

6.4.3.1.3 Checking Debug Information

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NOTE

SQL language function does not support debugging operations.

6.4.3.1.1 Using Breakpoints

This section contains the following topics:

- **Using the Breakpoints Pane**
- **Setting or Adding Breakpoints on a Line**
- **Enabling or Disabling a Breakpoint on a Line**
- **Removing a Breakpoint on a Line**
- **Source Code Change**
- **How to debug a PL/SQL program using breakpoints?**

A breakpoint is used to suspend the execution of a PL/SQL program at the line where the breakpoint is set. You can use breakpoints to control the execution and debug the function.

- An enabled breakpoint suspends the execution of the PL/SQL program whenever a breakpoint is encountered. When the execution hits the line of breakpoint, the execution will stop and you will be able to carry out other debug operations. Data Studio supports the following breakpoint operations:
  - Setting or Adding breakpoint on a line
  - Enabling or Disabling a breakpoint on a line
  - Removing a breakpoint on a line
- A disabled breakpoint will not suspend execution of PL/SQL program.

When you run a PL/SQL program, the execution pauses at every line where you set a breakpoint. When the program execution is paused, Data Studio retrieves information about the current program state, such as the values of the program variables.

Follow the steps below to debug a PL/SQL program:

Step 1 Set a breakpoint at the line where PL/SQL program execution should pause.

Step 2 Start the debugging session.

When a line with a breakpoint is reached, monitor the state of the application in the debugger pane, and continue the execution.

Step 3 Close the debugging session.

----End

Data Studio provides debugging options in the toolbar that helps you step through the debuggable objects.

Using the Breakpoints Pane

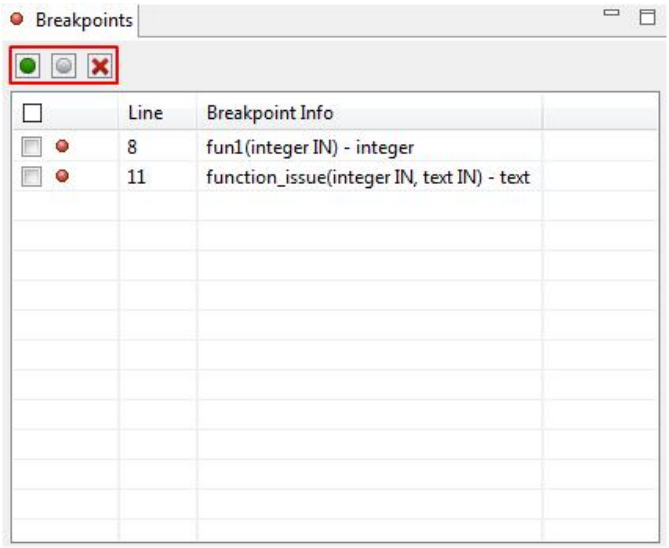
You can use the **Breakpoints** pane to view and manage the currently set breakpoints. From the minimized window panel, click the breakpoints option to open the breakpoints pane.

The **Breakpoints** pane lists each breakpoint with the line number and the debug object name.

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You can enable or disable all the breakpoints by clicking☐ in the **Breakpoints** pane. You can enable, disable or delete a specific breakpoint(s) by selecting the breakpoint check box and clicking , or in the **Breakpoints** pane.

Double-click the required breakpoint in the **Breakpoint Info** column to locate the breakpoint in the **PL/SQL Viewer** pane.



NOTE

- Disabling a breakpoint prevents the execution from pausing at the breakpoint, but leaves the definition in place (to enable the breakpoint later).
- Deleting a breakpoint removes it permanently.
- The content of the **Breakpoints** pane can be copied to the clipboard using **Alt**+**Y**.

Setting or Adding Breakpoints on a Line

Follow the steps below to set or add breakpoints on a line:

Step 1 Open the PL/SQL function where you want to add the breakpoint.

Step 2 In the **PL/SQL Viewer**, double-click the breakpoint ruler on the left side of the line number column. The added breakpoint is indicated by an enable breakpoint sign [] in the **PL/SQL Viewer**.

NOTE

If the execution of the function does not break or stop during debugging, the breakpoint that is already set will not be validated.

----End

Enabling or Disabling a Breakpoint on a Line

Once a breakpoint is set, you can temporarily disable it by selecting the corresponding check box in the left-side of the **Breakpoints** pane and clicking at the top of the **Breakpoints** pane. Disabled breakpoints will be grayed out [ ] in the **PL/SQL Viewer** and **Breakpoints** pane.

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To enable a disabled breakpoint, select the corresponding breakpoint (using check box) and click .

Removing a Breakpoint on a Line

If you no longer require the breakpoint, you can remove it using the same actions used to create it.

In the **PL/SQL Viewer** tab, open the function in which you want to remove the breakpoint. Double-click the enable breakpoint sign [] in the **PL/SQL Viewer** to disable the breakpoint. The breakpoint is removed from the workspace.

You can also enable or disable breakpoints using the **Breakpoints** pane as explained above.

Source Code Change

During debugging, if the source code is changed after it is fetched from the server and debug is continued, Data Studio displays an error.

It is recommended to refresh the object and perform the debug operation again.

NOTE

If the source code is changed after it is fetched from the server, and if you perform the execution or debug operation with no breakpoint set, then the result of the source code at the server will be displayed by Data Studio. It is always recommended to refresh before performing debug or execute operation.

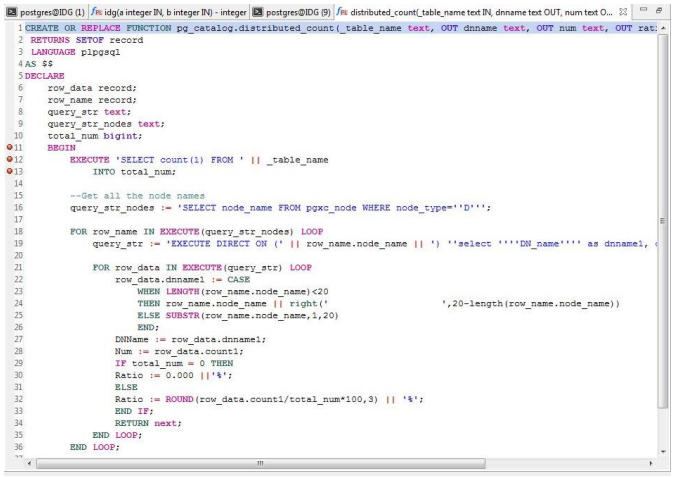
How to debug a PL/SQL program using breakpoints?

Follow the steps below to debug a PL/SQL program using breakpoints:

Step 1 Open the PL/SQL program and add a breakpoint at the line where you want to perform debug operation.

For example:

Line 11, 12, 13.



```
1  CREATE OR REPLACE FUNCTION pg_catalog.distributed_count(_table_name text, OUT dnname text, OUT num text, OUT rat
2  RETURNS SETOF record
3  LANGUAGE plpgsql
4  AS $$
5  DECLARE
6      row_data record;
7      row_name record;
8      query_str text;
9      query_str_nodes text;
10     total_num bigint;
11     BEGIN
12         EXECUTE 'SELECT count(1) FROM ' || _table_name
13             INTO total_num;
14
15         --Get all the node names
16         query_str_nodes := 'SELECT node_name FROM pgxc_node WHERE node_type=''D''';
17
18         FOR row_name IN EXECUTE(query_str_nodes) LOOP
19             query_str := 'EXECUTE DIRECT ON (' || row_name.node_name || ') ''select ''''DN_name'''' as dnname1,
20
21             FOR row_data IN EXECUTE(query_str) LOOP
22                 row_data.dnname1 := CASE
23                     WHEN LENGTH(row_name.node_name)<20
24                     THEN row_name.node_name || right('                    ',20-length(row_name.node_name))
25                     ELSE SUBSTR(row_name.node_name,1,20)
26                     END;
27                 DNName := row_data.dnname1;
28                 Num := row_data.count1;
29                 IF total_num = 0 THEN
30                 Ratio := 0.000 ||'%';
31                 ELSE
32                 Ratio := ROUND(row_data.count1/total_num*100,3) || '%';
33                 END IF;
34                 RETURN next;
35             END LOOP;
36         END LOOP;
```

Step 2 To start debugging, click  or press **Ctrl**+**D**, or right-click the PL/SQL program in the **Object Browser** and select **Debug**. The **Debug Function/Procedure** dialog box appears prompting for your input.

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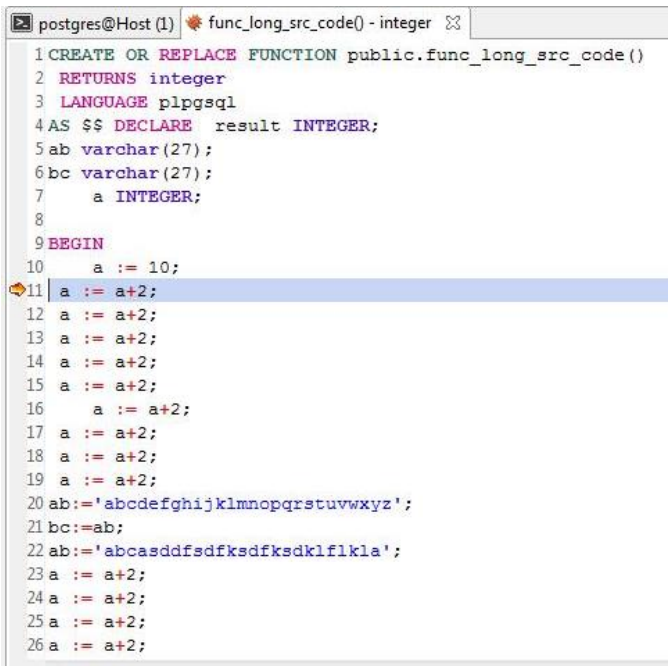
NOTE

If there is no input parameter, then **Debug Function/Procedure** dialog box will not appear.

Step 3 Provide your input and click **OK**. For varchar and date datatype, provide the input value in single quotes and for numeric datatype, provide the input value with or without single quotes.

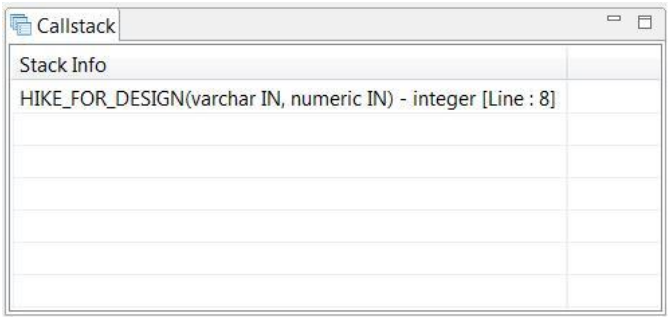
To set NULL as the parameter value, enter *NULL* or *null*.

On clicking the **Debug** button, you will see an arrow pointing to the line where breakpoint is set. The arrow indicates the line number at which execution will resume from.



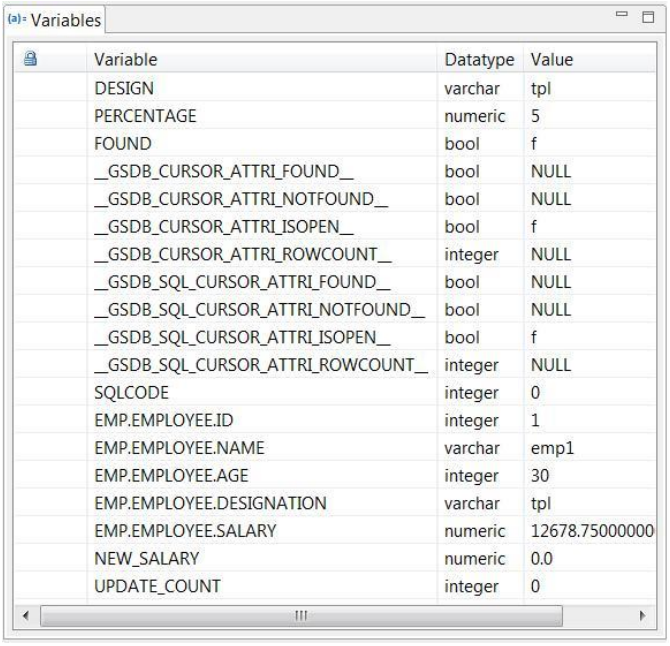
You can terminate debugging by clicking from the toolbar, or pressing **F10**, or select **Terminate Debugging** from the **Debug** menu. After stopping the debug operation, the execution of the function will not break for any breakpoint and the execution will proceed normally.

The **Callstack** and **Variables** panes are populated.



The **Variables** pane shows the current value of variables.

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Variable	Datatype	Value
DESIGN	varchar	tpl
PERCENTAGE	numeric	5
FOUND	bool	f
__GSDB_CURSOR_ATTRI_FOUND__	bool	NULL
__GSDB_CURSOR_ATTRI_NOTFOUND__	bool	NULL
__GSDB_CURSOR_ATTRI_ISOPEN__	bool	f
__GSDB_CURSOR_ATTRI_ROWCOUNT__	integer	NULL
__GSDB_SQL_CURSOR_ATTRI_FOUND__	bool	NULL
__GSDB_SQL_CURSOR_ATTRI_NOTFOUND__	bool	NULL
__GSDB_SQL_CURSOR_ATTRI_ISOPEN__	bool	f
__GSDB_SQL_CURSOR_ATTRI_ROWCOUNT__	integer	NULL
SQLCODE	integer	0
EMP.EMPLOYEE.ID	integer	1
EMP.EMPLOYEE.NAME	varchar	emp1
EMP.EMPLOYEE.AGE	integer	30
EMP.EMPLOYEE.DESIGNATION	varchar	tpl
EMP.EMPLOYEE.SALARY	numeric	12678.75000000
NEW_SALARY	numeric	0.0
UPDATE_COUNT	integer	0

You can step through the code using Step Into, Step Out or Step Over. For more details, refer to **6.4.3.1.2 Controlling Execution** .

Step 4 Click **Continue** to continue the execution till the next breakpoint (if any). The result of the executed PL/SQL program is displayed in the **Result** tab and the **Callstack** and **Variables** panes are cleared. You can copy the content of the **Result** tab, by clicking .

To remove the breakpoint, do the following:

- Double-click again on the breakpoint to remove it from the **PL/SQL Viewer**.
- Select the breakpoint in the breakpoint check box and click in the **Breakpoints** pane.

----End

6.4.3.1.2 Controlling Execution

This section contains the following topics:

- **Starting the Debug Process**
- **Stepping through a PL/SQL Function**
- **Continuing the Debug Execution**
- **Viewing Callstack**

Starting the Debug Process

Select the function that you want to debug in the **Object Browser** pane. Start debugging by clicking button on the toolbar (or any other method as mentioned in the earlier sections). If no breakpoint is set, or the set breakpoint is invalid, debug operation will not halt at any statement and simply execute the object and display the results (if any).

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Stepping through a PL/SQL Function

You can step through the debugging execution using the debug step commands from the toolbar. Step controls are used to step through the execution of the program line by line. If a breakpoint is encountered while performing a step operation, the execution will suspend at the breakpoint and the step operation is ended.

Stepping is the process of running one statement at a time. After stepping through a statement, you can see its effect in the other debugger tabs.

NOTE

A maximum of 100 **PL/SQL Viewer** tabs can be displayed at a time. If a new tab beyond 100 is opened, the tab of the calling function is closed. For example, if 100 tabs are already opened and if one of the debug object calls a new debug object (other than already opened 100 tabs), then Data Studio will close the calling function, and open the new debug object.

Step Into

To step through code one statement at a time, select **Step Into** from the **Debug** menu, or press button, or press **F7**.

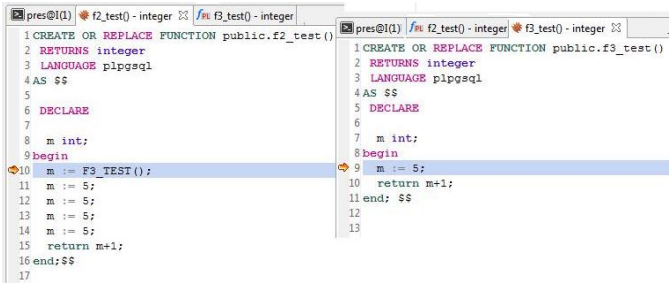
When stepping into a function, Data Studio executes the current statement and then enters the break mode. The debug position will be indicated by an arrow on the left ruler pane. If the executed statement calls another function, Data Studio will step into that function. Once you have stepped through all the statements in that function, Data Studio will jump back to the next statement of the function it was called from.

To go into the next statement, press the **Step Into** (**F7**) button again. If you press the **Continue** button, PL/SQL code execution will continue as normal.

For example:

In the following example, when you step into *Line 10*, you will move to line *'m := F3_TEST();'*, that is, *Line 9* in *f3_test()*. You can step through all the statements in *f3_test()* by stepping into each line by pressing the **Step Into** (**F7**) button repeatedly. Once you have stepped through all the statements in that function, Data Studio jumps to *Line 10* in *f2_test()*.

The currently debugging object is marked with symbol in the tab title with the function name.



Step Over

Step over is the same as step into, except that when it reaches a call for another function, it will not step into the function. The function will run, and you will be brought to the next statement in the current function. **F8** is the shortcut key for step over. However, if there is a

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breakpoint set inside the called function, step over will enter the function, and hit the set breakpoint.

In the below example, when you click **Step Over** in *Line 10*, Data Studio runs the *f3_test()* function.

```
 9 begin
10   m := F3_TEST();
11   m := 5;
12   m := 5;
13   m := 5;
14   m := 5;
15   return m+1;
16 end;$$
```

The cursor will be moved to the next statement in *f2_test()*, that is, *Line 11* in *f2_test()*.

```
 9 begin
10   m := F3_TEST();
11   m := 5;
12   m := 5;
13   m := 5;
14   m := 5;
15   return m+1;
16 end;$$
```

You can step over a function when you are familiar with the way the function works and are sure that its execution will not affect the issue that you are investigating.

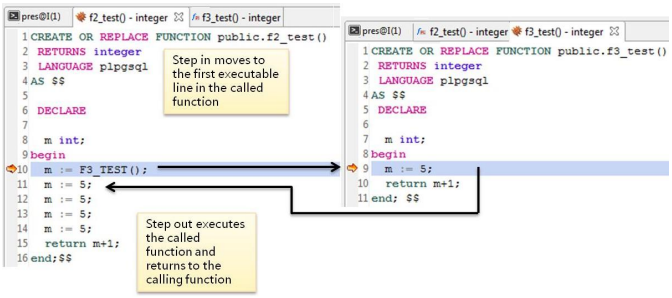
NOTE

Stepping over a line of code that does not contain a function call executes the line just like stepping into the line.

Step Out

Stepping out of a sub-program continues execution of the function and then suspends execution after the function returns to its calling function. You can step out of a long function when you have determined that the rest of the function is not significant to debug. However, if a breakpoint is set in the remaining part of the function, then that breakpoint will be hit before returning to the calling function.

Both stepping over and stepping out of a function will execute a function. The shortcut key for the step out operation is **Shift**+**F7**.



In the preceding example,

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- Choose **Debug > Step Into** to step into *f3_test()*.
- Choose **Debug > Step Out** to step out of *f3_test()*

Continuing the Debug Execution

When the debugging process stops at a specific location, you can select **Continue** (**F9**) from the **Debug Menu** or click button from the toolbar to continue the PL/SQL function execution.

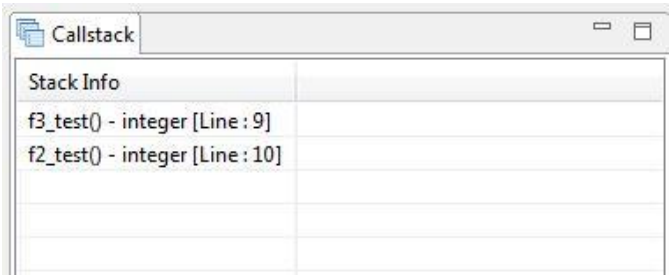
Viewing Callstack

The **Callstack** pane displays the chain of functions as they are called. The Callstack pane can be opened from the minimized window panel. The most recent functions are listed on the top, and the least recent on the bottom. At the end of each function name is the current line number in that function.

You can navigate among multiple functions through the **Callstack** pane by double-clicking the function name in the **Callstack** pane.

For example, when *f2_test()* calls *f3_test()* at *Line 10*, the debug pointer will point to the first valid executable line (which is *Line 9*, in the above example) in the called function.

In this case, the **Callstack** pane will be as shown below:



NOTE

The content of the **Callstack** pane can be copied to the clipboard using **Alt**+**J**.

6.4.3.1.3 Checking Debug Information

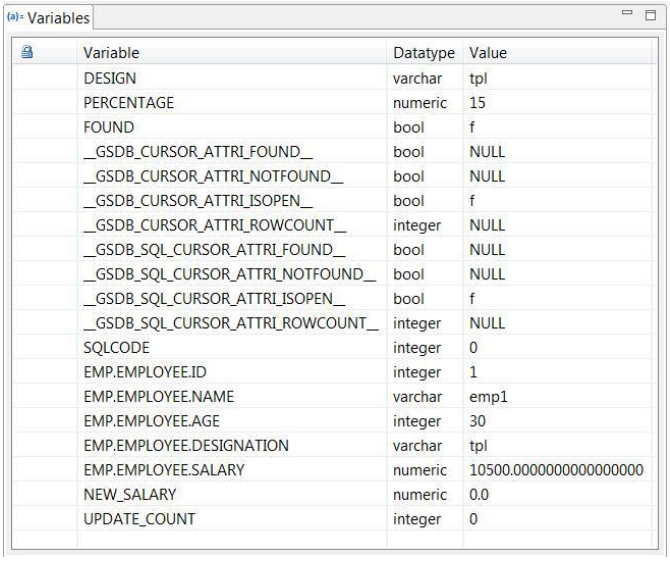
When you use Data Studio, you can examine debugging information through several debug tabs. This section describes the operations that can be performed to check the debug information:

- **Operating on Variables**
- **Viewing Results**

Operating on Variables

The **Variables** pane is used to monitor information or evaluate values. The Variables pane can be opened from the minimized window panel. Using this pane, you can evaluate or modify variables or arguments in a PL/SQL function. As you step through the code, the values of some local variables may change.

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Variable	Datatype	Value
DESIGN	varchar	tpl
PERCENTAGE	numeric	15
FOUND	bool	f
__GSDB_CURSOR_ATTRI_FOUND__	bool	NULL
__GSDB_CURSOR_ATTRI_NOTFOUND__	bool	NULL
__GSDB_CURSOR_ATTRI_ISOPEN__	bool	f
__GSDB_CURSOR_ATTRI_ROWCOUNT__	integer	NULL
__GSDB_SQL_CURSOR_ATTRI_FOUND__	bool	NULL
__GSDB_SQL_CURSOR_ATTRI_NOTFOUND__	bool	NULL
__GSDB_SQL_CURSOR_ATTRI_ISOPEN__	bool	f
__GSDB_SQL_CURSOR_ATTRI_ROWCOUNT__	integer	NULL
SQLCODE	integer	0
EMP.EMPLOYEE.ID	integer	1
EMP.EMPLOYEE.NAME	varchar	emp1
EMP.EMPLOYEE.AGE	integer	30
EMP.EMPLOYEE.DESIGNATION	varchar	tpl
EMP.EMPLOYEE.SALARY	numeric	10500.0000000000000000
NEW_SALARY	numeric	0.0
UPDATE_COUNT	integer	0

NOTE

The content of the **Variables** pane can be copied to the clipboard using **Alt**+**K**.

You can double-click the corresponding row of the variable and manually change variable values during run-time.

Click the **Variable**, **Datatype**, or **Value** column in the **Variables** pane to sort the values.

For example, to change the value of the percentage variable from 5 to 15, double-click the corresponding row in the **Variable** pane. The **Set Variable Value** dialog box will open, which prompts you to input the variable value. Provide the variable value and click **OK**.

To set NULL as the variable value, enter *NULL* or *null* in the **Value** text box.

If the variable is read-only, it will be indicated by beside the corresponding variable.

A variable declared as a constant will not be shown as read-only in the **Variables** pane; however while updating it, an error will be seen.

NOTE

- In the **Variables** pane, the parameter value will be displayed as *NULL*, if the input to the parameter value is either 'NULL' or NULL. The same is applicable for string datatypes.
- When the value is set to a variable using Data Studio, then the value of the variable is same as the value returned by the statement "select expression" executed from **gsql**.

Setting/Displaying Variables	Description
Setting NULL Values	Set NULL or null in the **Variables** pane.
Setting String Values	To set the string values, enclose string values within single quotes: ● To set variable as text(NULL), set 'NULL' in **Variables** pane ● To set abc, enter 'abc' ● To set string as 'abc' enter '"abc"'

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Setting/Displaying Variables	Description
Setting Boolean Values	Enclose the boolean values *t* or *f* within single quotes. To set *t* to a boolean variable, enter *'t'* in the **Variables** pane.
Displaying Variable Value	If the variable value is NULL text, it will be displayed as *NULL*. If the variable value is NULL, it will be displayed as *NULL*. If the variable value is a string, for example, abc, it will be displayed as abc.

Viewing Results

The **Result** tab displays the output for the PL/SQL debugging session, with the corresponding function/procedure name at the top of the tab. The **Result** tab will appear automatically, only if there is a result for the executed PL/SQL program.

You can copy the content of the **Result** tab, by clicking . Refer to **6.9.10 Working with the SQL Terminals** for more information.

NOTE

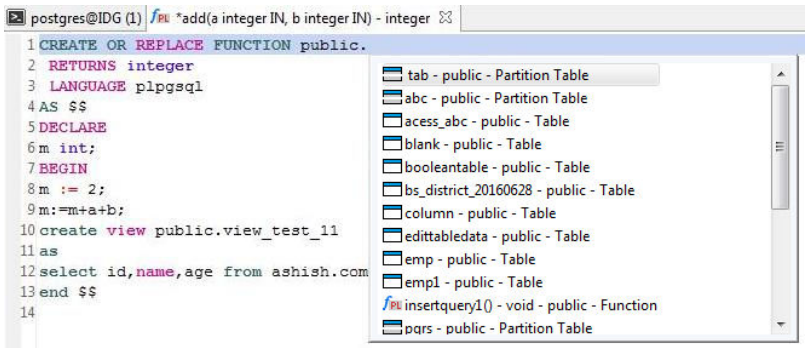
- The tool tip in the **Result** tab displays maximum of 10 lines, where each line contains maximum of 80 characters.
- If the result of the executed query is NULL, it will be displayed as <*NULL*>.
- Tab characters (ASCII 009) in table data will not be displayed in the **Results/View Table Data/ Properties** window. Tab characters will be included correctly when copying/exporting the data. Tool tip will also display the tab characters correctly.

6.4.3.2 Selecting a DB Object in the PL/SQL Viewer

Data Studio suggests a list of possible schema names, table names, column names, views, sequences, and functions in the **PL/SQL Viewer**.

Follow the steps below to select a DB object:

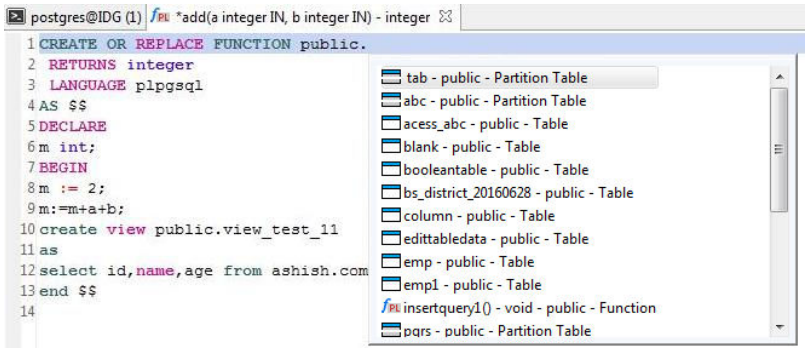
Step 1 Press **Ctrl+Space** and enter the required parent DB object name. The DB objects list is refined as you continue typing the DB object name. The DB objects list displays all DB objects of the database connected to the **SQL Terminal**.



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Step 2 To select the parent DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the parent DB object.

Step 3 Enter **.** (period) to list all child DB objects.



Step 4 To select the child DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the child DB object.

On selection, the child DB object will be appended to the parent DB object (with a period '.').

NOTE

- Auto-suggest also works on schema names, table names and column names in the same way as shown above for all schema objects.
- Auto-suggest may show "Loading" in Terminal for following scenarios:
  - The object is not loaded due to the value mentioned in the **Load Limit** field. Refer to **6.1.1 Adding a Connection** for more information.
  - The object is not loaded since it is added in the **Exclude** list option.
  - There is a delay in fetching the object from the server.
- If there are objects with the same name in different case, then auto-suggest will display child objects of both parent objects.

  Example:

  If there are two schemas with the name public and PUBLIC, then all child objects for both these schemas will be displayed.

----End

6.4.3.3 Exporting a Function/Procedure DDL

Follow the steps below to export the Function/Procedure or SQL Function DDL:

Step 1 In the **Object Browser** pane, right-click the required function/procedure or SQL function and select **Export DDL**.

Data Studio displays the **Data Studio Security Disclaimer** dialog box.

Step 2 Click **OK**.

Data Studio displays the **Save As** dialog box.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the progress of the operation.

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NOTE

- To cancel the export operation, double-click the status to open the **Progress View** tab and click .
- The exported file name will not be the same as function/procedure name, if the function/procedure name contains characters which are not supported by Windows.

The **Export** message and status bar displays the status of the completed operation.

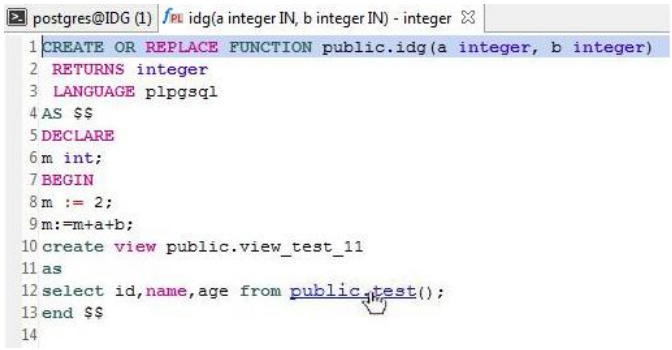
----End

6.4.3.4 Viewing Object Properties in the PL/SQL Viewer

Data Studio allows you to view table properties, procedures/functions and SQL functions.

Follow the steps below to view table properties:

Step 1 Press **Ctrl** and point to the table name.



Step 2 Click the highlighted table name. Data Studio displays the properties of the selected table.

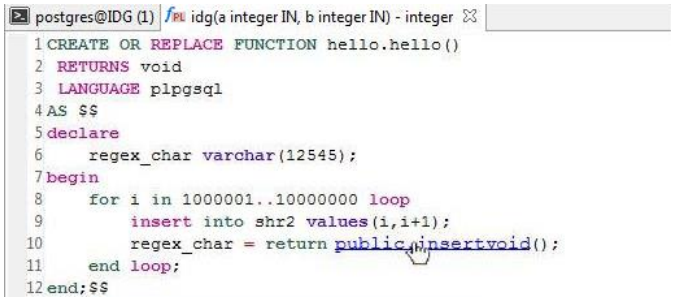
NOTE

The table properties are read-only.

----End

Follow the steps below to view functions/procedures or SQL functions:

Step 1 Press **Ctrl** and point to the procedure/function name or SQL function name.



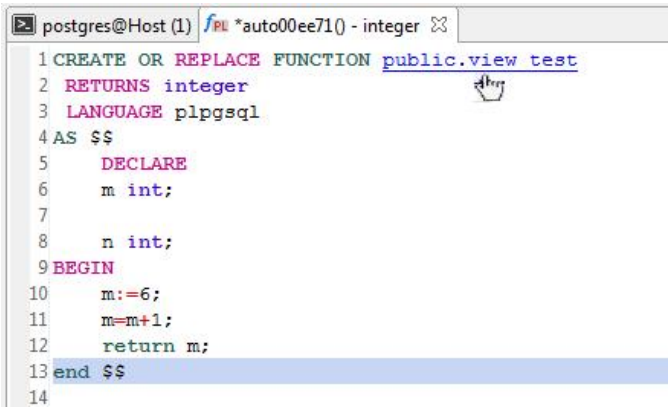
Step 2 Click the highlighted function/procedure name or SQL function name. Data Studio displays the function/procedure or SQL function in a new **PL/SQL Viewer** tab based on your selection.

----End

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Follow the steps below to View Object DDL:

Step 1 Press **Ctrl** and point to the View Object DDL name.



Step 2 Click the highlighted View Object DDL name. Data Studio displays the View Object DDL in a new tab based on your selection.

----End

6.4.3.5 Dropping a Function/Procedure

Follow the steps below to drop a function/procedure or SQL function object:

Step 1 In the **Object Browser** pane, right-click the required function/procedure object and select **Drop Object**.

Step 2 In the confirmation dialog box, click **Yes** to complete the operation successfully.

The status bar displays the status of the completed operation.

----End

6.4.3.6 Executing a Function/Procedure

After you connect to the database, all the stored functions/procedures and tables will be automatically populated in the **Object Browser** pane. You can use Data Studio to execute PL/SQL programs or SQL functions.

NOTE

- Blank lines occurring above or below in a function/procedure will be trimmed by Data Studio before being sent to the server. Blank lines will also be trimmed when displaying the source received from the server.
- To execute a function/procedure, enter the same values in Data Studio and the **gsql** client. If you do not enter any value in Data Studio, then *NULL* is considered as the input.

  For example:

  - To execute the function/procedure with string, enter the value as *data*

  - To execute the function/procedure with date, enter the value as *to_date('2012-10-10', 'YYYY-MM-DD');*
- A function/procedure with OUT and INOUT parameter types cannot be executed directly.
- Data Studio will not execute any function/procedure with unknown data type parameters.

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You can right-click the function/procedure in the **Object Browser** to perform the following operations:

- Refresh the program to get the latest program from the server
- Execute the function/procedure or SQL function
- Debug the PL/SQL function
- Drop the debug object

How to execute a PL/SQL program or SQL function?

Follow the steps below to execute a PL/SQL program or SQL function:

Step 1 Double-click and open the PL/SQL program or SQL function. Each debug object will open in a new tab. You can open a maximum of 100 tabs in Data Studio.

Step 2 Click  in the toolbar, or choose **Run > Execute DB Object** from the main menu, or right-click the program name in the **Object Browser** and select **Execute**.

Alternatively, you can right-click in the **PL/SQL Viewer** tab and select **Execute**.

Step 3 The **Execute Function/Procedure** dialog box is displayed prompting for your input.

NOTE

If there is no input parameter, then the **Execute Function/Procedure** dialog box will not appear. Instead, the PL/SQL program will execute and the result (if any) will be displayed in the **Result** tab.

Step 4 Provide your input for the function/procedure in the **Execute PL/pgSQL** dialog box and click **OK**.

To set NULL as the parameter value, enter *NULL* or *null*.

- If you do not provide a value that starts with a single quote, then a single quote (') will be added by Data Studio before and after the value and typecasting is done.
- If you provide a value that starts with a single quote, an additional single quote will not be added by Data Studio, but data type typecasting is done.

  For example:

  For supported data types, the execution queries are as follows:

  ```
  select func('1'::INTEGER);
  select func('1'::FLOAT);
  select func('xyz'::VARCHAR);
  ```

- If quotes are already provided, you need to take care of escaping the quotes.

  For example:

  If the input value is *ab'c*, then you need to enter *ab''c*.

The PL/SQL program is executed in the **SQL Terminal** tab and the result is displayed in the **Result** tab. You can copy the contents of the **Result** tab by clicking . Refer to **6.9.10 Working with the SQL Terminals** for more information.

----End

6.5 Tables

This section describes how to work with tables effectively.

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NOTE

You need to fill all the mandatory parameters that are marked with asterisk (*) to complete the operation successfully.

6.5.1 Creating Regular Table

This section describes the steps to create a Regular table.

Tables are logical structures maintained by the database manager. Tables are made up of columns and rows. You can define tables as part of your data definitions in the data perspective. Before you can define a table, you must first have a database and a schema defined. This section shows you how to create new table using Data Studio.

Follow the steps below to define a table in your database:

Step 1 In the **Object Browser** pane, right-click **Regular Tables**, and select **Create Regular Table**.

Step 2 Provide basic table information such as table name, tablespace, table type and so on. For more details, refer to **Providing General Information**. To create a tablespace, refer to **Working with Tablespaces**.

Step 3 Define column related information such as column name, data type schema, data type, and column constraints. For more details, refer to **Defining Columns**.

Step 4 Select the data distribution information for the table. For more details, refer to **Selecting Data Distribution**.

Step 5 Define the column constraints for different constraint types such as primary key, unique, and check. For more details, refer to **Defining Table Constraints**.

Step 6 Define the index information for the table such as index name, access method, tablespace and so on. For more details, refer to **Defining Indexes**.

In **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided. For more details, refer to **SQL Preview**.

----End

Providing General Information

When you create a table within a schema, the current schema is used as the table's schema. There are several steps involved in creating a table.

Provide the following information to create a regular table:

Step 1 Enter the table name in the **Table Name** field. It specifies the name of the table to be created.

NOTE

Select **Case** check box to retain the capitalization of the text entered in **Table Name** field. For example, if the table name entered is "Employee", then the table name is created as "Employee".

The schema name under which the table is created is displayed in the **Schema** drop-down.

Step 2 Select table orientation from **Table Orientation** drop-down.

Step 3 Select the tablespace from **Tablespace** drop-down. It specifies the name of the tablespace in which the new table is to be created. If not provided, the default tablespace of the table's schema will be used.

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Step 4 Select the table type from **Table Type** drop-down. It specifies the type of the table.

- **Normal**: If specified, the table is created as a normal table.
- **Unlogged**: If specified, the table is created as an unlogged table. Data written to unlogged tables is not written to the write-ahead log, which makes it considerably faster than ordinary tables. However, it is not crash-safe. An unlogged table is automatically truncated after a crash or unclean shutdown. The contents of an unlogged table are also not replicated to standby servers. Any indexes created on an unlogged table are also automatically unlogged.

Step 5 Select the required **Options**.

- **IF NOT EXISTS** check box to create the table only if table with same name does not exist.
- **WITH OIDS** check box for the new table to have OIDs (object identifiers) assigned. If you need a new table with OIDs, choose this option.
- Select the **Fill Factor**. The fill factor for a table is a percentage between 10 and 100. 100 (complete packing) is the default value.

  When a smaller fill factor is specified, INSERT operations pack table pages only to the indicated percentage; the remaining space on each page is reserved for updating rows on that page. This gives UPDATE operation a chance to place the updated copy of a row on the same page as the original, which is more efficient than placing it on a different page. For a table whose entries are never updated, complete packing is the best choice, but in heavily updated tables, smaller fill factors are appropriate. This parameter cannot be set for TOAST tables.

Step 6 Enter the description of the table in **Description of Table** box. It specifies a short note on the table.

Step 7 After providing the general information about the table, click **Next** to define the columns information for the table.

----End

Table below lists the supported fields for each Regular type tables:

Table 6-1 Supported Fields

Field Name	Row Table	Column Table	ORC Table
Tablespace	Normal	Normal	HDFS
Table Type	✓	✓	✗
If Not Exists	✓	✓	✓
With OIDS	✓	✗	✗
Fill Factor	✓	✗	✗

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Defining Columns

A column defines a unit of information within a table's row. Each row is an entry in the table. Each column is a category of information that applies to all rows. When you add a table to a database, you can define the columns that compose it. Columns determine the type of data that the table can hold.

After providing the general information about the table, click the **Columns** tab to define the list of table columns. Each column contains name, data type, and other optional properties.

You can perform the following operations on an existing column only for a Regular table:

- **Deleting a Column**
- **Editing a Column**
- **Moving a Column**

Follow the steps below to define column(s) for the table:

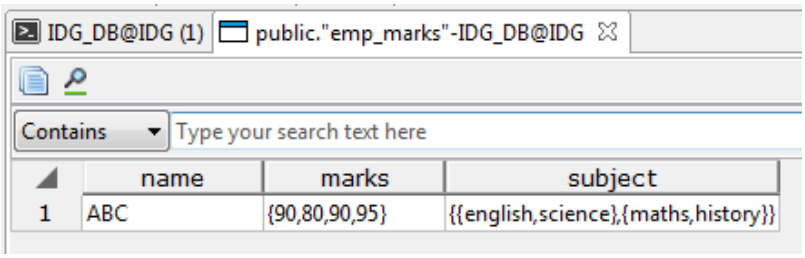
Step 1 Enter the column name in **Column Name** field. It specifies the name of a column to be created in the new table. This must be a unique name in the table.

NOTE

Select **Case** check box to retain the capitalization of the text entered in **Column Name** field. For example, if the column name entered is "Name", then the column name is created as "Name".

Step 2 Select the **Array Dimensions**. It specifies the array dimensions for the column.

Example: If array dimension for a column is defined as integer [], then it will add the column data as single dimension array.



The **marks** column in the above table was created as single dimension and **subject** column as two dimensions.

Step 3 Select the data type of the column from **Data Type** drop-down. For example, **bigint** for integer values.

For complex data types,

- Select the required schema from the **Data type Schema** drop-down list.
- Select the corresponding data type from the **Data Type** drop-down list. This list displays the tables and views for the selected schema.

  NOTE

  User defined data type will not be available for selection.

Step 4 Enter the precision/size value of the datatype entered in the **Precision/Size** field. This option is available only if a data type can be defined with precision/size.

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Step 5 Select the scale of the data type entered in the **Scale** field.

Step 6 Choose the following C**olumn Constraints** if required:

- **NOT NULL** - Specifies that this column is not allowed to contain null values.
- **UNIQUE** - Specifies that a column may contain only unique values.
- **DEFAULT** - Specifies the value that will be used for this column in case no value is defined.
- **CHECK** - Specifies an expression producing a boolean result which new or updated rows must satisfy for an INSERT or UPDATE operation to succeed.

Step 7 After you enter all information for new column, click **Add**. You can also delete a column from a list or change the order of columns. After defining all columns, click **Next**.

----End

Table below lists the supported fields for each Regular type tables:

Table 6-2 Supported Fields

Field Name	Row Table	Column Table	ORC Table
Array Dimensions	✓	✗	✗
Data type Schema	✓	✗	✗
Not Null	✓	✓	✓
Default	✓	✓	✓
Unique	✓	✗	✗
Check	✓	✗	✗

Deleting a Column

Follow the steps below to delete a column:

Step 1 Select the required column.

Step 2 Click **Delete**.

----End

Editing a Column

Follow the steps below to edit a column:

Step 1 Select the required column.

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Step 2 Click **Edit**.

Step 3 Edit the column details as required and click **Update** to save changes.

NOTE

You must complete the edit operation and save the changes to continue with other operations.

----End

Moving a Column

You can move a column to change the location of the column as required in the table. To move a column, select the required column and click **Up** or **Down**.

Selecting Data Distribution

Data distribution specifies how the table is distributed or replicated among data nodes.

Select one of the following options for the distribution type:

Distribution Type	Description
DEFAULT DISTRIBUTION	Specifies that the default distribution type will be assigned for this table.
REPLICATION	Each row of the table will be replicated in all the data nodes of the database cluster.
HASH	Each row of the table will be placed based on the hash value of the specified column.

After selecting data distribution, click **Next**.

Table below lists the supported options for each Regular type tables:

Table 6-3 Supported Options

Option Name	Row Table	Column Table	ORC Table
Default	✓	✓	✗
Hash	✓	✓	✓
Replication	✓	✓	✗

Defining Table Constraints

Creating constraints is optional. A table can have one (and only one) primary key. Creating the primary key is a good practice.

You can select the following types of constraints from the **Constraint Type** drop-down list:

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- **Primary Key**
- **Unique**
- **Check**

Primary Key

The primary key is the unique identity of a row and consists of one or more columns.

Only one primary key can be specified for a table, either as a column constraint or as a table constraint. The primary key constraint must name a set of columns that is different from other sets of columns named by any unique constraint defined for the same table.

Select the constraint type as **PRIMARY KEY** in the combo box and enter the constraint name. Select the column from **Available Columns** list and click **Add**. If you need a multi-column primary key, repeat this step for another column.

Optionally, you can select **On Tablespace** in which the index associated with a **PRIMARY KEY** constraint will be created. If this parameter is not provided, the index will be created in the same tablespace as the table.

Fillfactor for a table is a percentage between 10 and 100. The default value is 100 (complete packing). When a smaller fill factor is specified, INSERT operations will pack table pages only up to the indicated percentage; the remaining space on each page is reserved for updating rows on that page. This gives UPDATE operation a chance to place the updated copy of a row on the same page as the original, which is more efficient than placing it on a different page.

For a table whose entries are never updated, complete packing is the best choice, but in heavily updated tables, smaller fill factors are appropriate. This parameter cannot be set for TOAST tables.

DEFERABLE: Select this check box to defer this option.

INITIALLY DEFERRED: Select this check box to check the constraint at the set default time.

Click **Add** in the **Constraints** group box.

You can remove a primary key from the list using the **Delete** button.

Mandatory parameters are marked with asterisk (*) in the corresponding field.

Unique

Select the constraint type as **UNIQUE** in the combo box and enter the constraint name in the text box.

Select column in **Available Columns** list and click **Add**. If you need multi-column unique, repeat this step for another column. After adding the first column, the unique name is automatically filled from the table name. You can also change this name.

Optionally, you can select **Tablespace** in which the index associated with a unique constraint needs to be created. If this parameter is not provided, the index will be created in the same tablespace as the table.

Fillfactor for a table is a percentage between 10 and 100. 100 (complete packing) is the default. When a smaller fill factor is specified, INSERT operations pack table pages only to the indicated percentage; the remaining space on each page is reserved for updating rows on

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that page. This gives UPDATE operation a chance to place the updated copy of a row on the same page as the original, which is more efficient than placing it on a different page. For a table whose entries are never updated, complete packing is the best choice, but in heavily updated tables smaller fill factors are appropriate. This parameter cannot be set for TOAST tables.

DEFERABLE: Select this check box to defer this option.

INITIALLY DEFERRED: Select this check box to check the constraint at the set default time.

You can a remove unique from the list using **Delete** button.

Mandatory parameters are marked with asterisk (*) in the corresponding filed.

Check

Select the constraint type as **CHECK** in the combo box and enter the constraint name in the text box.

When the INSERT or UPDATE operation is performed, and if the check expression fails, then table data is not altered.

If you double-click on column in **Available Columns** list, it is inserted to **Check Expression** edit line to current cursor position.

Then, click **Add** in **Constraints** group box. You can also remove a check from the list using **Delete** button. Mandatory parameters are marked with asterisk (*) in the corresponding field.

After defining all constraints, click **Next**.

Table below lists the supported options for each Regular type tables:

Table 6-4 Supported Options

Option Name	Row Table	Column Table	ORC Table
Check	✓	✗	✗
Unique	✓	✗	✗
Primary Key	✓	✗	✗

Defining Indexes

Creating indexes is optional. Indexes are primarily used to enhance database performance. This operation constructs an index on the specified column(s) of the specified table. Select the **Unique Index** check box to enable this option.

Choose the name of the index method from the **Access Method** list. The default method is B-tree. Select the **Tablespace** in which the index must be created. If not specified, the index is created in the default tablespace.

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The **Fillfactor** for an index is a percentage that determines how full the index method will try to pack index pages. For B-trees, leaf pages are filled to this percentage during initial index build, and also when extending the index at the right (adding new largest key values). If pages subsequently become completely full, they will be split, leading to gradual degradation in the index's efficiency. B-trees use a default fill factor of 90, but any integer value from 10 to 100 can be selected. If the table is static, then a fill factor of 100 is best to minimize the index's physical size. For heavily updated tables, a smaller fill factor is better to minimize the need for page splits. Other index methods use fill factor in different but roughly analogous ways; the default fill factor varies between methods.

You can either enter a user-defined expression for the index or you can create the index using the **Available Columns** list. Select the column in the **Available Columns** list and click **Add**. If you need a multi-column index, repeat this step for other columns.

After entering the required information for the new index, click **Add**.

You can also delete an index from the list using the **Delete** button. After defining all indexes, click **Next**.

Table below lists the supported fields/options for each Regular type tables:

Table 6-5 Supported Fields/Options

Field/Option Name	Row Table	Column Table	ORC Table
Unique Index	✓	✗	✗
btree	✓	✓	✗
gin	✓	✓	✗
gist	✓	✓	✗
hash	✓	✓	✗
psort	✓	✓	✗
spgist	✓	✓	✗
Tablespace	Normal	Normal	✗
Fill Factor	✓	✗	✗
User Defined Expression	✓	✗	✗
Partial Index	✓	✗	✗

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SQL Preview

Data Studio generates a DDL statement based on the inputs provided in **Create New table** wizard.

You can only view, select, and copy the query. You cannot edit the query.

- To select all queries, press **Ctrl+A** or right-click and select **Select All**.
- To copy the selected query, press **Ctrl+C** or right-click and select **Copy**.

Click **Finish** to create the table. On clicking the **Finish** button, the generated query will be sent to the server. Any errors are displayed in the dialog box and status bar.

6.5.1.1 Working with Columns

After creating a table, you can add new columns in that table. You can also perform the following operations on the existing column only for a Regular table:

- **Creating New Column**
- **Rename Column**
- **Toggle Not Null**
- **Drop Column**
- **Set Column Default**
- **Change Data Type**

Creating New Column

Follow the steps below to add a new column to the existing table:

Step 1 Right-click **Columns** and select **Create column**.

The **Add New Column** dialog box is displayed prompting you to add information about the new column.

Step 2 Enter the details and click **Add**. You can view the added column in the corresponding table.

Data Studio displays the status of the operation in the status bar.

----End

Rename Column

Follow the steps below to rename a column:

Step 1 Right-click the required column and select **Rename Column**.

A **Rename Column** dialog box is displayed prompting you to provide the new name.

Step 2 Enter the name and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

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Toggle Not Null

Follow the steps below to set or reset the Not Null option:

Step 1 Right-click the required column and select **Toggle Not Null**.

A **Toggle Not Null Property** dialog box is displayed prompting you to set or reset the Not Null option.

Step 2 In the confirmation dialog box, click **OK** to complete the operation successfully. Data Studio displays the status of the operation in the status bar.

----End

Drop Column

Follow the steps below to drop the column:

Step 1 Right-click the required column and select **Drop Column**. This operation deletes the column from the table.

A **Drop Column** dialog box is displayed.

Step 2 Click **OK** to complete the operation successfully. Data Studio displays the status of the operation in the status bar.

----End

Set Column Default

Follow the steps below to set the default value for the column:

Step 1 Right-click the required column and select **Set Column Default Value**.

Data Studio displays a dialog box with the current default value (if it is set) and prompting you to provide the default value.

Step 2 Enter the value and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

Change Data Type

Follow the steps below to change the data type of the column:

Step 1 Right-click the required column and select **Change Data Type**.

Change Data Type dialog box is displayed.

NOTE

The existing data type will show as Unknown while modifying complex data types.

Step 2 Select the **Data type Schema** and **Data Type**. If the **Precision/Size** spin box is enabled, enter the required details and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

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6.5.1.2 Working with Constraints

You can perform the following operations after a table is created only for a Regular table:

- **Creating a Constraint**
- **Renaming a Constraint**
- **Dropping a Constraint**

Creating a Constraint

Follow the steps below to add a new constraint to the existing table:

Step 1 Right-click the required constraint of the table and select **Create constraint**.

An **Add New Constraint** dialog box is displayed prompting you to add information about the new constraint.

Step 2 Enter the **Constraint Name**, **Check Expression**, and click **Add**. You can view the added constraint in the corresponding table.

Data Studio displays the status of the operation in the status bar.

NOTE

The status bar will show the name of the constraint if it has been provided in the **Constraint Name** field, else the constraint name will not be displayed as it is created by database server.

----End

Renaming a Constraint

Follow the steps below To rename a constraint:

Step 1 Right-click the required constraint and select **Rename Constraint**.

A **Rename Constraint** dialog box is displayed prompting you to provide the new name.

Step 2 Enter the constraint name and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

Dropping a Constraint

Follow the steps below to drop the constraint:

Step 1 Right-click the required constraint and select **Drop Constraint**.

A **Drop Constraint** dialog box is displayed.

Step 2 Click **OK** to complete the operation successfully. Data Studio displays the status of the operation in the status bar.

----End

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6.5.1.3 Working with Indexes

An index can be created in a table to find data quickly and efficiently.

After creating a table, you can add a new index to that table. You can also perform the following operations on an existing index only for a Regular table:

- **Creating a New Index**
- **Renaming an Index**
- **Changing the Tablespace**
- **Changing the Fill Factor**
- **Dropping an Index**

Creating a New Index

Follow the steps below to add a new index to the existing table:

Step 1 Right-click **Indexes** and select **Create index**.

A **Create Index** dialog box is displayed prompting you to add information about the index.

Step 2 Enter the details and click **Create**. You can also view the SQL statement by clicking the **Preview Query** button. Items in **Available Columns** are not sorted. Items moved back from **Index Columns** to **Available Columns** are unsorted, and is not related to the column order in the table. You can set the order of the **Index Columns** using the arrow buttons. Data Studio displays the status of the operation in the status bar.

----End

Renaming an Index

Follow the steps below to rename an index:

Step 1 Right-click the required index and select **Rename Index**.

A **Rename Index** dialog box is displayed prompting you to provide the new name.

Step 2 Enter the name and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

Changing the Tablespace

Follow the steps below to change the tablespace:

Step 1 Right-click the required index and select **Change Tablespace**.

A **Change Tablespace** dialog box is displayed prompting you to select the tablespace details.

Step 2 Select the tablespace and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

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Changing the Fill Factor

Follow the steps below to change the fill factor:

Step 1 Right-click the required index and select **Change Fill Factor**.

A **Change Fill Factor** dialog box is displayed prompting you to select the fill factor details.

Step 2 Select the fill factor and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

Dropping an Index

Follow the steps below to drop an index:

Step 1 Right-click the required index and select **Drop Index**. Data Studio prompts you to confirm this operation.

The **Drop Index** dialog box is displayed.

Step 2 Click **OK** to complete the operation successfully. Data Studio displays the status of the operation in the status bar. This operation deletes the index from the table.

NOTE

When the last index of a table is dropped and if the table properties are checked, then **Has Index** may reflect the value "TRUE", though the table has no index. This value is updated to "FALSE" when a vacuum operation on the table is performed.

----End

6.5.2 Creating Foreign Table

Foreign tables created using query execution in SQL Terminal or any other tool can be viewed in the Object browser after refresh.

Step 1 To view the newly created foreign table, right-click and select **Refresh** either at database, schema and foreign table group level.

NOTE

- GDS Foreign table is denoted with  icon before the table name.
- HDFS Foreign table is denoted with  icon before the table name.

----End

6.5.3 Creating Partition Table

Partitioning refers to splitting what is logically one large table into smaller physical pieces based on specific schemes. The table based on the logic is called a partition table, and a physical piece is called a partition. Data is stored on these smaller physical pieces, namely, partitions, instead of the larger logical partition table.

Follow the steps below to define a table in your database:

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Step 1 In the **Object Browser** pane, right-click **Partition Tables**, and select **Create Partition Table**.

Step 2 Provide basic table information such as table name, tablespace, table type and so on. For more details, refer to **Providing General Information**.

Step 3 Define column related information such as column name, data type schema, data type, and column constraints. For more details, refer to **Defining Columns**.

Step 4 Select the data distribution information for the table. For more details, refer to **Selecting Data Distribution**.

Step 5 Define the column constraints for different constraint types such as primary key, unique, and check. For more details, refer to **Defining Table Constraints**.

Step 6 Define the index information for the table such as index name, access method, tablespace and so on. For more details, refer to **Defining Indexes**.

Step 7 Define the partition information for the table such as partition name, partition column, partition value and so on. For more details, refer to **Defining Partitions**.

In **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided. For more details, refer to **SQL Preview**.

----End

Providing General Information

Provide the following information to create a table:

For information on completing the below fields refer to **Providing General Information**.

- Table Name
- Schema
- Tablespace
- Options
- Description of Table

For completing all other fields refer below:

Step 1 Select table orientation from **Table Orientation** drop-down.

NOTE

If table orientation is selected as ORC, then a HDFS Partition table is created.

Step 2 Enter the ORC version number in the **ORC Version** field. This is applicable only for HDFS Partition table.

Step 3 After providing the general information about the table, click **Next** to define the columns information for the table.

Table below lists the supported fields for each Partition type tables:

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Table 6-6 Supported Fields

Field Name	Row Partition	Column Partition	ORC Partition
Tablespace	Normal	Normal	HDFS
Table Type	✗	✗	✗
If Not Exists	✓	✓	✓
With OIDS	✗	✗	✗
Fill Factor	✓	✗	✗

----End

Defining Columns

Refer to **Defining Columns** to define column(s) for the table.

Table below lists the supported fields for each Partition type tables:

Table 6-7 Supported Fields

Field Name	Row Partition	Column Partition	ORC Partition
Array Dimensions	✓	✗	✗
Data type Schema	✓	✗	✗
Not Null	✓	✓	✓
Default	✓	✓	✓
Unique	✓	✗	✗
Check	✓	✗	✗

Selecting Data Distribution

Refer to **Selecting Data Distribution** for selecting the distribution type.

Table below lists the supported options for each Partition type tables:

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Table 6-8 Supported Options

Option Name	Row Partition	Column Partition	ORC Partition
Default	✓	✓	✗
Hash	✓	✓	✓
Replication	✓	✓	✗

Defining Table Constraints

Refer to **Defining Table Constraints** to define table constraint(s).

Table below lists the supported options for each Partition type tables:

Table 6-9 Supported Options

Option Name	Row Partition	Column Partition	ORC Partition
Check	✓	✗	✗
Unique	✓	✗	✗
Primary Key	✓	✗	✗

Defining Indexes

Refer to **Defining Indexes** to define table indexes.

Table below lists the supported fields/options for each Partition type tables:

Table 6-10 Supported Fields/Options

Field/Option Name	Row Partition	Column Partition	ORC Partition
Unique Index	✓	✗	✗
btree	✓	✓	✗
gin	✓	✓	✗
gist	✓	✓	✗

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Field/Option Name	Row Partition	Column Partition	ORC Partition
hash	✓	✓	✗
psort	✓	✓	✗
spgist	✓	✓	✗
Tablespace	Normal	Normal	✗
Fill Factor	✓	✗	✗
User Defined Expression	✓	✗	✗
Partial Index	✓	✗	✗

Defining Partitions

After defining the indexes, click the **Partitions** tab to define the partitions.

You can perform the following operations on an existing partition for Row or Column Partition table. Below operations are not applicable for ORC Partition table:

- **Deleting a Partition**
- **Editing a Partition**
- **Change Order of Partition**

Follow the steps below to define partition(s) for the table:

Step 1 If **Row** or **Column** is selected as **Table Orientation** in the **General** tab, then **By Range** is displayed in the **Partition Type** section. If **ORC** is selected as **Table Orientation** in the **General** tab, then **By Value** is displayed in the **Partition Type** section.

Step 2 Select the column based on which partition needs be defined from the **Available Column** section and click .

The column moves to the **Partition Column** section.

NOTE

- If **Table Orientation** is selected as **Row** or **Column**, then only one column can be selected for partition.
- If **Table Orientation** is selected as **ORC**, then maximum of four columns can be selected for partition.
- A maximum of 4 columns can be selected to define partition.

Step 3 Enter a name for the partition in **Partition Name** field.

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Step 4 Click  next to the **Partition Value** field.

1. Enter the value by which you want to partition the table in **Value** column.
2. Click **OK**.

Step 5 Select the tablespace name from the **Tablespace** drop-down.

NOTE

Partition Name, **Partition Value**, **Tablespace** and **Partitions** section are disabled for ORC Partition tables.

Step 6 After you enter all information for partition, click **Add**.

Step 7 After defining all partitions, click **Next**.

----End

Table below lists the supported fields/options for each Partition type tables:

Table 6-11 Supported Fields/Options

Field/Option Name	Row Partition	Column Partition	ORC Partition
Partition Type	By Range	By Range	By Values
Partition Name	✓	✓	✗
Partition Value	✓	✓	✗
Tablespace	Normal	Normal	✗

Deleting a Partition

Follow the steps below to delete a partition:

Step 1 Select the required partition.

Step 2 Click **Delete**.

----End

Editing a Partition

Follow the steps below to edit a partition:

Step 1 Select the required partition.

Step 2 Click **Edit**.

Step 3 Edit the partition details as required and click **Update** to save changes.

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NOTE

You must complete the edit operation and save the changes to continue with other operations

----End

Change Order of Partition

You can change the order of partition as required in the table. To change the order, select the required partition and click **Up** or **Down**.

SQL Preview

Refer to **SQL Preview**

6.5.3.1 Working with Partitions

After creating a table, you can add/modify partitions. You can also perform the following operations on an existing partition:

Rename a Partition

Drop a Partition

Rename a Partition

Follow the steps below to rename a partition:

Step 1 Right-click the required partition and select **Rename Partition**.

Rename Partition Table dialog box is displayed prompting you to provide the new name for the partition.

Step 2 Enter new name and click **OK**.

Data Studio displays the status of the operation in the status bar.

----End

Drop a Partition

Follow the steps below to drop a partition:

Step 1 Right-click the required index and select **Drop Partition**.

Drop Partition Table dialog box is displayed.

Step 2 Click **OK**.

The partition is dropped from the table. Data Studio displays the status of the operation in the status bar.

----End

6.5.4 Managing Table

This section describes how to manage tables effectively.

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NOTE

- You need to fill all the mandatory parameters, that are marked with asterisk (*) to complete the operation successfully.
- Refresh is the only operation supported for foreign table.

After creating the table, you can perform operations on the existing table. Right-click the table and select the required operation.

Context Menu

Additional options for table operations are available in the table context menu.

The context menu options available for table operations are:

Table 6-12 Table Context Menu Options

Option	Description
View Table Data	Opens the table data information. Refer to **6.5.5.6 Viewing Table Data**
Edit Table Data	Opens the edit table data window. Refer to **6.5.5.7 Editing Table Data**
Reindex Table	Performs reindexing a table operation. Refer to **6.5.4.3 Reindexing a Table**
Analyze Table	Analyzes a table. Refer to **6.5.4.4 Analyzing a Table**
Truncate Table	Truncates table data. Refer to **6.5.4.2 Truncating a Table**
Vacuum Table	Vacuums table data. Refer to **6.5.4.5 Vacuuming a Table**
Set table Description	Sets the table description for the table. Refer to **6.5.4.6 Setting the Table Description**
Set Tablespace	Sets the tablespace for the table. Refer to **6.5.4.7 Setting the Tablespace**
Set Schema	Sets the schema for the table. Refer to **6.5.4.8 Setting the Schema**
Export Table Data	Exports the table data. Refer to **6.5.5.3 Exporting Table Data**
Import Table Data	Imports the table data. Refer to **6.5.5.5 Importing Table Data**
Show DDL	Shows the DDL of the table. Refer to **6.5.5.4 Showing DDL**
Export DDL	Exports the DDL of the table. Refer to **6.5.5.1 Exporting Table DDL**
Export DDL and Data	Exports the DDL and data of the table. Refer to **6.5.5.2 Exporting Table DDL and Data**
Rename Table	Renames the table. Refer to **6.5.4.1 Renaming a Table**

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Option	Description
Drop Table	Drops (deletes) the table. Refer to **6.5.4.9 Dropping a Table**
Properties	Displays the properties of the table. Refer to **6.5.4.10 Viewing Table Properties**

6.5.4.1 Renaming a Table

Follow the steps below to rename the table:

Step 1 Right-click the table and select **Rename Table**.

A **Rename Table** dialog box is displayed prompting you to provide the new name.

Step 2 Enter the table name and click **OK**. You can view the updated table name in the **Object Browser**.

Data Studio displays the status of the operation in the status bar.

NOTE

This operation is not supported for Partition ORC tables.

----End

6.5.4.2 Truncating a Table

Follow the steps below to truncate the table:

Step 1 Right-click the table and select **Truncate Table**. This operation deletes the data from an existing table.

Data Studio prompts you to confirm this operation.

Step 2 In the confirmation dialog box, click **OK** to complete the operation successfully.

A popup message and status bar displays the status of the completed operation.

----End

6.5.4.3 Reindexing a Table

Reindex operation rebuilds an index using the data stored in the index's table by replacing the old copy of the index. You need to reindex tables in the following scenarios:

- An index is corrupted and no longer contains valid data. Although in theory this must never happen, in practice, indexes can become corrupted due to software bugs or hardware failures. Reindex provides a recovery method.
- An index has become "bloated", that is, it contains many empty or nearly-empty pages. This can occur with B-tree indexes in PostgreSQL under certain uncommon access patterns. Reindex provides a way to reduce the space consumption of the index by writing a new version of the index without the dead pages.
- You have altered a storage parameter (such as fill factor) for an index, and wish to ensure that the change has taken full effect.

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Follow the steps below to reindex a table:

Step 1 Right-click the table and select **Reindex Table**.

A popup message and status bar displays the status of the completed operation.

NOTE

This operation is not supported for Partition ORC tables.

----End

6.5.4.4 Analyzing a Table

The analyze table operation gathers statistics about tables and indices of that table and stores the collected information in internal tables of the database where the query optimizer can access the information and use it to help make better query planning choices.

Follow the steps below to analyze a table:

Step 1 Right-click the table and select **Analyze Table**.

The **Analyze Table** message and status bar displays the status of the completed operation.

----End

6.5.4.5 Vacuuming a Table

Vacuum table operation reclaims space and makes it available for re-use.

Follow the steps below to vacuum the table:

Step 1 Right-click the table and select **Vacuum Table**.

The **Vacuum Table** message and status bar displays the status of the completed operation.

----End

6.5.4.6 Setting the Table Description

Follow the steps below to set the description of the table:

Step 1 Right-click the table and select **Set Table Description**.

Data Studio displays an **Update Table Description** dialog box and prompts you to provide the table description.

Step 2 Enter the description and click **OK**.

The status bar displays the status of the completed operation.

Step 3 To view the table description, right-click the table and select **Properties**.

----End

6.5.4.7 Setting the Tablespace

Follow the steps below to set the tablespace:

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Step 1 Right-click the table and select **Set Tablespace**.

Data Studio displays a **Set Tablespace** dialog box and prompts you to select the new tablespace.

Step 2 Select the tablespace from the drop-down list and click **OK**. The selected table will be moved to the new tablespace. To create a new tablespace, refer to **6.8.2 Working with Tablespaces**.

The status bar displays the status of the completed operation.

NOTE

- This operation will not be successful if you do not have the required access.
- This operation is not available for Partition table.

----End

6.5.4.8 Setting the Schema

Follow the steps below to set the schema:

Step 1 Right-click the table and select **Set Schema**.

Data Studio displays a **Set Schema** dialog box and prompts you to select the new schema for the selected table.

Step 2 Select the schema name from the drop-down list and click **OK**. The selected table will be moved to the new schema.

The status bar displays the status of the completed operation.

NOTE

- This operation is not supported for Partition ORC tables.
- If the required schema contains a table with the same name as the current table, then Data Studio does not allow setting the schema for the table.

----End

6.5.4.9 Dropping a Table

This operation removes the complete table structure (including the table definition and index information) from the database and you have to re-create this table once again to store data.

Follow the steps below to drop the table:

Step 1 Right-click the table and select **Drop Table**.

Data Studio prompts you to confirm this operation.

Step 2 In the confirmation dialog box, click **OK** to complete the operation successfully.

The status bar displays the status of the completed operation.

----End

6.5.4.10 Viewing Table Properties

Follow the steps below to view the properties of the table:

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Step 1 Right-click the table and select **Properties**.

Data Studio displays the properties (General, Columns, Constraints, and Index) of the selected table in different tabs.

NOTICE

When viewing table data, Data Studio automatically adjusts the column widths for an optimal table view. Users can resize the columns as needed. If the text contents of a cell exceeds the total available display area, then resizing the cell column may cause DS to become unresponsive.

NOTE

- Individual property window is displayed for each table.
- If the property of a table is modified for the table that is already opened, then refresh and open the properties of the table again to view the updated information on the same opened window.
- If the content of the column have spaces between the words, then word wrap is applied to fit the column within the display area. Word wrap is not applied if the content does not have any spaces between the words.
- The size of the column is determined by the maximum content length column.

----End

6.5.5 Managing Table Data

This section describes how to manage table data.

6.5.5.1 Exporting Table DDL

Follow the steps below to export the table DDL:

Step 1 In the **Object Browser** pane, right-click the required table and select **Export DDL**.

Data Studio displays the **Data Studio Security Disclaimer** dialog box.

Step 2 Click **OK**.

Data Studio displays the **Save As** dialog box.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the progress of the operation.

NOTE

- To cancel the export operation, double-click the status to open the **Progress View** tab and click .
- The exported file name will not be the same as table name, if the table name contains characters which are not supported by Windows.
- Microsoft Visual C runtime file (***msvcrt100.dll***) is required to complete this operation. Refer **Troubleshooting** for more information.

The **Export** message and status bar displays the status of the completed operation.

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Database Encoding	Data Studio File Encoding	Supports Exporting Table DDL
GBK	GBK	Yes
UTF-8	UTF-8	Yes
All other combination of encoding types are not supported for **Exporting Table DDL** operation.		

----End

6.5.5.2 Exporting Table DDL and Data

Exporting the table DDL and data exports the following:

- DDL of the table.
- Columns and rows of the table.

Follow the steps below to export the table DDL:

Step 1 In the **Object Browser** pane, right-click the required table and select **Export DDL and Data**.

Data Studio displays the **Data Studio Security Disclaimer** dialog box.

Step 2 Click **OK**.

Data Studio displays the **Save As** dialog box.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the progress of the operation.

NOTE

- To cancel the export operation, double-click the status to open the **Progress View** tab and click .
- The exported file name will not be the same as table name, if the table name contains characters which are not supported by Windows.
- Microsoft Visual C runtime file (***msvcrt100.dll***) is required to complete this operation. Refer **Troubleshooting** for more information.

The **Export** message and status bar displays the status of the completed operation.

Database Encoding	Data Studio File Encoding	Supports Exporting Table DDL and Data
GBK	GBK	Yes
UTF-8	UTF-8	Yes
All other combination of encoding types are not supported for **Exporting Table DDL and Data** operation.		

----End

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6.5.5.3 Exporting Table Data

Follow the steps below to export table data:

Step 1 Right-click the required table and select **Export Table Data**.

Data Studio displays the **Export Table Data** dialog box with the following options:

- **Format -** Table data can be exported either as CSV, Text or binary format. By default CSV is selected.
- **Include Header -** This option is available for CSV and Text files. If selected, it will include the column headers. By default, this option is selected when exporting to CSV or Text file, although it is not a mandatory field. This field will be disabled for binary format.
- **Quotes -** Use this option to define the quote character. You should enter only single byte character for this field. Quote character should not be same as delimiter. For CSV and Text format, by default this field is enabled, although it is not a mandatory field. This field will be disabled for binary format.
  - If table data value has delimiter in their values, then it will use the character mentioned in this field.
  - If the Quote character is present in value, then that character will be escaped with same quoted character.
  - If result value has multiline values, then it will be quoted with quoted character.
- **Escape -** Use this option to define the escape value. You should enter only single byte character for this field. Escape value should not be same as quote character. For CSV and Text format, by default this field is enabled, although it is not a mandatory field. This field will be disabled for binary format.
- **Replace NULL with -** Use this option to replace null value in the table with string. New line or carriage return characters are non-acceptable values for this field. Maximum of 100 characters can only be entered in this field. This field value must be different from delimiter and quote values. For CSV and Text format, by default this field is enabled, although it is not a mandatory field. This field will be disabled for binary format.
- **Encoding -** The **Encoding** field will be pre-populated with the encoding selection made in **Preferences > Session Setting** tab. This is not a mandatory field.
- **Delimiter -** Use this option to define delimiter. You can select the available delimiter or mention customized delimiter in the **Other** field in the Delimiter section. For CSV and Text format "," will be the default delimiter. Maximum of 10 bytes can only be entered in the **Other** field. For CSV and Text format, by default this field is enabled, although it is not a mandatory field. This field will be disabled for binary format. It is mandatory to enter a value when **Other** field is selected.
- **All Columns -** Use this option to quick select all columns. By default this is checked. To manually select columns, uncheck this and select columns from the **Available Columns** list.
  - **Available Columns -** You can use this column to select specific columns to export.
  - **Selected Columns -** This field displays the selected columns that will be exported. The columns can be re-ordered. By default all columns display in this field.
- **File Name** - Use this option to specify the name to save the exported file. By default, the table name is displayed in this field.

  NOTE

  File name follows Windows file naming convention.

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- **Output Path** - Use this option to select the location to save the exported file. The **Output Path** field is auto-populated with the selected path.
- **Security Disclaimer -** The security disclaimer is mentioned in this section, and you should read and agree, to continue with the export operation.
  - **I Agree** - By default this field is selected. You cannot proceed further if this field is not checked.
  - **Do not show again** - You can select this field to hide the Security Disclaimer for subsequent export table data operation for current logged instance of Data Studio.

Step 2 Complete the required fields and click **OK**.

Data Studio displays the **Save As** dialog box.

Step 3 Click **Save** to save the exported data in the selected format. The status bar displays the progress of the operation.

The **Data Exported Successfully** dialog box and status bar displays the status of the completed operation.

NOTE

- If the disk is full while exporting the table, then Data Studio displays an I/O error. Perform the following operations to resolve this error:
  1. Click **OK** to close the connection profile.
  2. Clean the disk.
  3. Re-establish the connection and export the table data.
- The exported file name will not be the same as table name, if the table name contains characters which are not supported by Windows.

----End

Canceling the export table data operation

Follow the steps below to cancel the export table data operation:

Step 1 Double-click the status bar to open the **Progress View** tab.

Step 2 In the **Progress View** tab, click .

Step 3 In the **Cancel Operation** dialog box, click **Yes**.

The **Messages** tab and status bar displays the status of the cancelled operation.

----End

6.5.5.4 Showing DDL

Follow the steps below to show DDL query of the table:

Step 1 Right-click the required table and select **Show DDL**.

Data Studio displays the DDL of the selected table.

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NOTE

- A new terminal is opened each time the **Show DDL** operation is executed.
- Microsoft Visual C runtime file (***msvcrt100.dll***) is required to complete this operation. Refer **Troubleshooting** for more information.

Database Encoding	Data Studio File Encoding	Supports Show DDL
GBK	GBK	Yes
UTF-8	UTF-8	Yes
All other combination of encoding types are not supported for **Show DDL** operation.		

----End

6.5.5.5 Importing Table Data

Prerequisites to import table data are:

- If the source import file does not match with the destination import table definition, then you must modify the properties of the destination table in the **Import Table Data** dialog box. Additional columns will be inserted with default value.
- You should know the export properties of the file that you are importing like delimiter, quote, escape character and so on. Export properties saved during export operation cannot be changed while importing the file.

Follow the steps below to import table data:

Step 1 Right-click the required table and select **Import Table Data**.

Data Studio displays the **Import Table Data** dialog box with the following options:

- **Import Data File -** This field displays the file path of the imported file. Use the **Browse** button to select different file.
- **Format -** Table data can be imported as CSV, Text or binary format. By default CSV is selected.
- **Include Header -** Use this option if the import file has column header. For CSV and Text format, by default this field is selected, although it is not a mandatory field. This field will be disabled for binary format.
- **Quotes -** You should enter only single byte character for this field. Quote character should not be same as delimiter and null parameter. For CSV and Text format, by default this field is selected, although it is not a mandatory field. This field will be disabled for binary format.
- **Escape -** You should enter only single byte character for this field. If escape value is same as quote value, then escape value will be replaced with '\0'. For CSV and Text format, by default this field is selected with value as double quotation mark, although it is not a mandatory field. This field will be disabled for binary format.
- **Replace with Null -** You can use this field to replace null value in the table with string. The same null string used while exporting should be used while importing data and this need to be explicitly mentioned. For CSV and Text format, by default this field is selected, although it is not a mandatory field. This field will be disabled for binary format.

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- **Encoding -** The **Encoding** field will be pre-populated with the encoding selection made in **Preferences > Session Setting** tab. This is not a mandatory field.
- **Delimiter -** You can select the available delimiter or mention customized delimiter in the **Other** field in the Delimiter section. For CSV and Text format "," will be the default delimiter. This field value should not be same as Quote and Replace Null with field values. For CSV and Text format, by default this field is selected, although it is not a mandatory field. This field will be disabled for binary format. It is mandatory to enter a value when **Other** field is selected.
- **All Columns -** Use this option to quick select all columns. By default this field is selected. To manually select columns, uncheck this and unselect columns from the **Selected Columns** list.
  - **Available Columns -** You can use this column to select specific columns to import.
  - **Selected Columns -** This field displays the selected columns that will be imported. By default all columns display in this field.

Step 2 Click the **Browse** button from the **Import Data File** field.

Data Studio displays the **Open** dialog box.

Step 3 In the **Open** dialog box, select the file to import and click **Open**.

Step 4 Complete the required fields and click **OK**.

The status bar displays the progress of the operation. The imported data is appended to the existing table data.

The **Data Imported Successfully** dialog box and status bar displays the status of the completed operation.

----End

Canceling the import table data operation

Follow the steps below to cancel the import table data operation:

Step 1 Double-click the status bar to open the **Progress View** tab.

Step 2 In the **Progress View** tab, click .

Step 3 In the **Cancel Operation** dialog box, click **Yes**.

The **Messages** tab and status bar displays the status of the canceled operation.

----End

6.5.5.6 Viewing Table Data

Follow the steps below to view table data:

Step 1 Right-click the table and select **View Table Data**.

Data Studio displays the **View Table Data** tab where you can view the table data information.

Toolbar menu in the **View Table Data** window:

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Toolbar Name	Toolbar Icon	Description
Copy to Clipboard		This icon is used to copy selected content from **View Table Data** window to clipboard. Shortcut key - **Ctrl +C**.
Advanced Copy to Clipboard		This icon is used to copy content from result window to clipboard. Results can be copied to include the row number and/or column header. Refer to **View Query Results** to set this preference. Shortcut key - **Ctrl+Shift +C**.
Show/Hide Search bar		This icon is used to display/hide the search text field. This is a toggle button.

Icons in Search field:

Icon Name	Icon	Description
Search		This icon is used to search the table data displayed based on the criteria defined. Search text are case insensitive.
Clear Search Text		This icon is used to clear the search text entered in the search field.

- **Query Submit Time** - Provides the query submitted time.
- Number of rows fetched with execution time displays. The default number of rows is displayed. If there are additional rows to be fetched, then it will be denoted with the word "more". You can scroll to the bottom of the table to fetch and display all rows.

NOTICE

When viewing table data, Data Studio automatically adjusts the column widths for an optimal table view. Users can resize the columns as needed. If the text contents of a cell exceeds the total available display area, then resizing the cell column may cause DS to become unresponsive.

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NOTE

- Individual table data window is displayed for each table.
- If the data of the table that is already opened is modified, then refresh and open the table data again to view the updated information on the same opened window.
- While the data is loading a message displays at the bottom stating "fetching".
- If the content of the column have spaces between the words, then word wrap is applied to fit the column within the display area. Word wrap is not applied if the content does not have any spaces between the words.
- The size of the column is determined by the maximum content length column.
- You can save preference to define:
  - Number of records to be fetched.
  - Column width
  - Copy option from result set.

    Refer to **Query Results** for more information.

----End

6.5.5.7 Editing Table Data

Data Studio allows you to edit table data in the **Edit Table Data** tab.

Follow the steps below to edit table data:

Step 1 Right-click the table and select **Edit Table Data**.

The **Edit Table data** tab is displayed.

Refer to **6.5.5.6 Viewing Table Data** section for description on copy and search toolbar options.

----End

Data Studio validates only the following data types entered into cells:

Biginit, bit, boolean, char, date, decimal, double, float, integer, numeric, real, smallint, time, time with time zone, time stamp, time stamp with time zone, tinyint, and varchar.

Editing of array type data type is not supported.

Any related errors during this operation reported by database will be displayed in Data Studio. Time with time zone and timestamp with time zone columns are non-editable columns.

You can perform the following operations in the **Edit Table Data** tab:

- **Insert**
- **Delete**
- **Update**
- **Copy**
- **Paste**

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Insert

Follow the steps below to insert a row:

Step 1 Click  to insert a row.

Step 2 Double-click the cell to modify and enter the required details in the row.

Step 3 Click  to save changes.

The **Edit Table Data** tab status bar shows the **Query Submit Time**, **Number of rows fetched**, **Execution time** and **Status** of the operation.

NOTICE

If unique key is not defined for a table and there are identical rows, then an update operation made on one of the rows will affect all identical rows. Refresh the **Edit Table Data** tab to view the updated rows.

NOTE

- Use the  to roll back the changes that are not saved.
- Changes to cells in a row that are not saved is highlighted in green. Once saved the color resets to default color.
- Failed unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the **Edit Table Data** tab.
- Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. Refer to **Edit Table Data** to set the behavior of save operation.
- You can save preference to define:
  - Number of records to be fetched
  - Column width
  - Copy option from result set

    Refer to **Query Results** for more information.

----End

Data Studio allows you to edit the distribution key column only for a new row.

Delete

Follow the steps below to delete a row:

Step 1 Click the row header to be deleted.

Step 2 Click  to delete a row.

Step 3 Click  to save changes.

A dialog box displays to define unique key.

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Step 4 Click the required option:

- **Use All Columns**

  Click **Use All Columns** to define all columns as unique key.

- **Custom Unique Key**

  a. Click **Custom Unique Key** to define selected columns as unique key.

  b. **Define Unique Key** dialogue box displays.

  c. Select the required columns and click **OK**.

- **Cancel**

  Click **Cancel** to modify the information in **Edit Table Data** tab.

  The **Edit Table Data** tab status bar shows the **Query Submit Time**, **Number of rows fetched**, **Execution time** and **Status** of the operation.

  Select **Remember the selection for this window** option to hide the unique definition window from displaying while continuing with the edit table data operation. Click  from **Edit Table Data** toolbar to clear previously selected unique key definition and display unique definition window again.

  NOTE

  - Use the  to roll back the changes that are not saved.
  - Deleted rows that are not saved is highlighted in red. Once saved the color resets to default color.
  - Failed unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the **Edit Table Data** tab.
  - Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. Refer to **Edit Table Data** to set the behavior of save operation.
  - Refresh table data to view deleted duplicate rows.

----End

Update

Follow the steps below to update cell data:

Step 1 Double-click the cell to update the contents of the cell.

Step 2 Click  to save changes.

A dialog box displays to define unique key.

Step 3 Click the required option:

- **Use All Columns**

  Click **Use All Columns** to define all columns as unique key.

- **Custom Unique Key**

  a. Click **Custom Unique Key** to define selected columns as unique key.

  b. **Define Unique Key** dialogue box displays.

  c. Select the required columns and click **OK**.

- **Cancel**

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Click **Cancel** to modify the information in **Edit Table Data** tab.

The status bar shows the **Execution Time** and **Status** of the operation.

Select **Remember the selection for this window** option to hide the unique definition window from displaying while continuing with the edit table data operation. Click  from **Edit Table Data** toolbar to clear previously selected unique key definition and display unique definition window again.

NOTE

- Use the  to roll back the changes that are not saved.
- Changes to cells in a row that are not saved is highlighted in green. Once the record is saved the color resets to default color.
- Failed unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the **Edit Table Data** tab.
- Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. Refer to **Edit Table Data** to set the behavior of save operation.
- Refresh table data to view changes made to duplicate rows.

----End

During edit operation, Data Studio does not allow you to edit the distribution key column as it is used by the DB to locate data in the database cluster.

Copy

You can copy data from the **Edit Table Data** tab.

Follow the steps below to copy data:

Step 1 Select the cell(s) and click .

NOTE

Data can be copied to include the row number and/or column header. Refer to **Query Results** to set this preference.

----End

Paste

You can copy data from a CSV file and paste it into cells in the **Edit Table Data** tab to insert and update records. If you paste onto existing cell data, the data is overwritten with the new data from the CSV file.

Follow the steps below to paste data into a cell:

Step 1 Copy data from CSV file.

Step 2 Select the cell(s) and click .

Step 3 Click  to save changes.

A dialog box displays to define unique key.

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Step 4 Click the required option:

- **Use All Columns**

  Click **Use All Columns** to define all columns as unique key.

- **Custom Unique Key**

  a. Click **Custom Unique Key** to define selected columns as unique key.

  b. **Define Unique Key** dialogue box displays.

  c. Select the required columns and click **OK**.

- **Cancel**

  Click **Cancel** to modify the information in **Edit Table Data** tab.

  The status bar shows the **Execution Time** and **Status** of the operation.

  Select **Remember the selection for this window** option to hide the unique definition window from displaying while continuing with the edit table data operation. Click  from **Edit Table Data** toolbar to clear previously selected unique key definition and display unique definition window again

  NOTE

  - The number of copied cells from CSV must match the number of cells selected in the Edit Table Data tab to paste the data.
  - Use the  to roll back the changes that are not saved.
  - Changes to cells in a row that are not saved is highlighted in green. Once saved the color resets to default color.
  - Failed unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the **Edit Table Data** tab.
  - Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. Refer to **Edit Table Data** to set the behavior of save operation.

----End

During paste operation, Data Studio does not allow you to edit the distribution key column as it is used by the DB to locate data in the database cluster.

NOTE

Empty cells are shown as [NULL]. Empty cell in **Edit Table Data** tab can be searched using the **Null Values** search drop-down.

6.6 Sequences

This section describes working with sequences.

6.6.1 Creating Sequence

Follow the steps below to create a sequence:

Step 1 In the **Object Browser** pane, right-click **Sequences** under the particular schema where you want to create the sequence and select **Create Sequence**.

Data Studio displays the **Create New Sequence** dialog box.

Step 2 Provide information to create a sequence:

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1. Enter a name in **Sequence Name** field.

   NOTE

   Select **Case** check box to retain the capitalization of the text entered in **Sequence Name** field. For example, if the sequence name entered is "Employee", then the sequence name is created as "Employee".

2. Enter minimum value in **Minimum Value** field.
3. Enter the increase step value in **Increment By** field.
4. Enter maximum value in **Maximum Value** field.

   NOTE

   Minimum and Maximum value should be between -9223372036854115808 and -9223372036854775807.

5. Enter start value of the sequence in **Start Value** field.
6. Enter cache information in **Cache** field. The cache value denotes the number of sequences stored in the memory for quick access.
7. Select **Cycle** field to recycle sequences after the number of sequences reaches either the maximum or minimum value.

   NOTE

   The schema name auto-populates in the **Schema** field.

8. Select table from **Table** drop-down.
9. Select column from **Column** drop-down.

Step 3 Click **Finish**.

The status bar displays the status of the completed operation.

NOTE

In **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided.

----End

6.6.2 Working with Sequences

You can perform the following operations on an existing sequence:

- **Dropping a Sequence**
- **Dropping a Sequence Cascade**

Dropping a Sequence

Follow the steps below to drop a sequence:

Step 1 Right-click the required sequence and select **Drop Sequence**.

The **Drop Sequence** dialog box is displayed.

Step 2 Click **Yes** to drop the sequence.

The status bar displays the status of the completed operation.

----End

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Dropping a Sequence Cascade

Follow the steps below to drop the sequence cascade:

Step 1 Right-click the required sequence and select **Drop Sequence Cascade**.

The **Drop Sequence Cascade** dialog box is displayed.

Step 2 Click **Yes** to drop the sequence cascade.

The status bar displays the status of the completed operation.

----End

6.7 Views

This section contains the following topics:

- **Creating a View**
- **Working with Views**

6.7.1 Creating a View

Follow the steps below to create a new view:

Step 1 Right-click **Views** and select **Create View**.

The **SQL Terminal** tab displays the DDL template for the view.

Step 2 Edit the DDL as required. For example,

```
CREATE OR REPLACE VIEW public.my_view
AS
SELECT eid,ename FROM mytest;
```

Step 3 Click  to execute the DDL.

Step 4 Press **F5** to refresh the **Object Browser**.

You can view the new view in the **Object Browser**.

NOTE

The status bar will not display message on completion of this operation.

----End

6.7.2 Working with Views

Views can be created to restrict access to specific rows or columns of a table. A view can be created from one or more tables and is determined by the query used to create the view.

You can perform the following operations on an existing view:

- **Exporting the View DDL**
- **Dropping a View**
- **Dropping a View Cascade**

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- **Renaming a View**
- **Setting the Schema for a View**
- **Viewing the Show DDL**
- **Setting the Default Value for the View Column**
- **Viewing the Properties of a View**

Exporting the View DDL

Follow the steps below to export the DDL:

Step 1 Right-click the required view and select **Export DDL**.

Data Studio displays the **Data Studio Security Disclaimer** dialog box.

Step 2 Click **OK**.

Data Studio displays the **Save As** dialog box.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the progress of the operation.

NOTE

- To cancel the export operation, double-click the status to open the **Progress View** tab and click .
- The exported file name will not be the same as view name, if the view name contains characters which are not supported by Windows.

The **Export** message and status bar displays the status of the completed operation.

----End

Dropping a View

Follow the steps below to drop the view:

Step 1 Right-click the required view and select **Drop View**.

The **Drop View** dialog box is displayed.

Step 2 Click **Yes** to drop the view.

The status bar displays the status of the completed operation.

----End

Dropping a View Cascade

Follow the steps below to drop the view and its dependent database objects:

Step 1 Right-click the required view and select **Drop View Cascade**.

The **Drop View** dialog box is displayed.

Step 2 Click **Yes** to drop the view and its dependent database objects.

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The status bar displays the status of the completed operation.

----End

Renaming a View

Follow the steps below to rename the view:

Step 1 Right-click the required view and select **Rename View**.

The **Rename View** dialog box is displayed.

Step 2 Enter the required name for the view and click **OK**. You can view the renamed view in the **Object Browser**.

The status bar displays the status of the completed operation.

----End

Setting the Schema for a View

Follow the steps below to set the schema for the view:

Step 1 Right-click the required view and select **Set Schema**.

The **Set Schema** dialog box is displayed.

Step 2 Select the required schema from the drop-down list and click **OK**.

The status bar displays the status of the completed operation.

If the required schema contains a view with the same name as the current view, then Data Studio does not allow setting the schema for the view.

----End

Viewing the Show DDL

Follow the steps below to view the DDL of the view:

Step 1 Right-click the required view and select **Show DDL**.

The DDL is displayed in a new **SQL Terminal** tab. You must refresh the **Object Browser** to view the latest DDL.

----End

Setting the Default Value for the View Column

Follow the steps below to set the default value for a column in the view:

Step 1 Right-click the required column name under the view and select **Set View Column Default Value**.

Data Studio displays a dialog box with the current default value (if it is set) and prompting you to provide the default value.

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Step 2 Enter the value and click **OK**.

Data Studio displays the status of the operation in the status bar.

----End

Viewing the Properties of a View

Follow the steps below to view the properties of the View:

Step 1 Right-click the required View and select **Properties**.

Data Studio displays the properties (General and Columns) of the selected View in different tabs.

NOTE

If the property of a View is modified that is already opened, then refresh and open the properties of the View again to view the updated information on the same opened window.

----End

6.8 Tablespaces

This section contains the following topics:

- **Creating a Tablespace**
- **Working with Tablespaces**

6.8.1 Creating a Tablespace

You can create tablespaces to optimize performance of database objects.

After creating a tablespace, it will be available in the **Create New table** wizard. For more information, refer to **6.5.1 Creating Regular Table**.

Follow the steps below to create a new tablespace:

Step 1 Right-click **Tablespaces** and select **Create Tablespace**. The **Create Tablespace** dialog box is displayed.

Step 2 Enter the following information to create the tablespace:

NOTE

You need to fill all the mandatory parameters that are marked with asterisk (*) to complete the operation successfully.

- **Name**: Enter the name of the tablespace. For example, New_Tablespace.
- **Location**: Enter the path to store the tablespace on the database. For example, *\home \user1*

  One path is limited to only one tablespace. Access permissions to the path must be set by the user.
- **Unlimited Size:** Select this check box to set unlimited maximum size of the tablespace.

  NOTE

  Once the **Unlimited Size** field is checked, the **Max Size** field becomes non-editable.

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- **Max Size**: Enter the maximum size of the tablespace. The supported range is 1 KB - 9,007,199,254,740,991 KB. The only acceptable value in this field is positive whole number.
- Select an option from the **Max Size** drop-down list. The options available are:
  - **KB**: Specifies the **Max Size** in kilobytes.
  - **MB**: Specifies the **Max Size** in megabytes.
  - **GB**: Specifies the **Max Size** in gigabytes.
  - **TB**: Specifies the **Max Size** in terabytes.
  - **PB**: Specifies the **Max Size** in petabytes.
- **File System**: Select the type of file system.
  - Select **General** to create the tabular type of tablespace.
  - Select **HDFS** to create the Hadoop Distributed File System (HDFS) type of tablespace.
- **Address**: Enter the NameNode IP address (IPv4) of the HDFS cluster and port number of the active and standby nodes.

  For example, xx.xx.xx.xx:xxxx
- **HDFS Configuration File Path**: Enter the path of the HDFS cluster configuration file. This is a mandatory field for HDFS file system.
- **HDFS Data Store Path**: Enter the HDFS data storage path. This is a mandatory field for HDFS file system.
- **Sequential Page Cost**: Sets the optimizer's estimated cost of a disk page fetch that is part of a series of sequential fetches. Enter the sequential read page overhead. The supported range is 0 - 1.79769e+308 (double byte). The default value is 1 which is also the recommended value. The acceptable values are either positive whole number or positive decimals with one decimal point.
- **Random Page Cost**: Sets the optimizer's estimated cost of a non-sequentially-fetched disk page. Enter the random read page overhead. The supported range is 0 - 1.79769e +308 (double byte). The default value is 4 which is also the recommended value. The acceptable values are either positive whole number or positive decimals with one decimal point.

NOTICE

Although the server allows to set the value of **Random Page Cost** to less than that of **Sequential Page Cost**, it is not physically sensitive to do so. However, setting them equal makes sense if the database is entirely cached in RAM, because in that case there is no penalty for fetching pages out of sequence. Also, in a heavily-cached database you must lower both values relative to the CPU parameters, since the cost of fetching a page already in RAM is much smaller than it would normally be.

NOTE

If the server does not support HDFS file system, then Address, HDFS Configuration File Path, and HDFS Data Store Path, fields becomes non-editable.

Step 3 Click **OK**. You can view the new tablespace in the **Object Browser**.

The status bar displays the status of the completed operation.

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NOTE

When OK is clicked, the Run in Background option is enabled. This option helps in continuing with other operations on the database while the tablespace is being created in the background. Once the tablespace is created a pop-up message displays with success or failure notification. Alternatively clicking  or pressing Esc runs the tablespace creation operation in background.

----End

6.8.2 Working with Tablespaces

You can perform the following operations on an existing tablespace:

- **Renaming a Tablespace**
- **Setting Tablespace Options**
- **Setting Maximum Tablespace Size**
- **Dropping a Tablespace**
- **Viewing the Tablespace DDL**

Renaming a Tablespace

Follow the steps below to rename a tablespace:

Step 1 Right-click the required tablespace and select **Rename Tablespace**.

The **Rename Tablespace** dialog box is displayed.

Step 2 Enter the new name for the tablespace and click **OK**.

The status bar displays the status of the completed operation.

NOTE

System tablespaces are displayed in the **Object Browser** by default.

You can view the renamed tablespace in the **Object Browser**.

----End

Setting Tablespace Options

Follow the steps below to set tablespace options:

Step 1 Right-click the required tablespace and select **Set Tablespace Option**.

The **Set Tablespace Option** dialog box is displayed.

Step 2 Enter the **Random Page Cost** and **Sequential Page Cost** and click **OK**.

The status bar displays the status of the completed operation.

----End

Setting Maximum Tablespace Size

Follow the steps below to set the maximum size of the tablespace:

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Step 1 Right-click the required tablespace and select **Set Tablespace MaxSize**.

The **Set Tablespace Maxsize** dialog box is displayed.

Step 2 To set an unlimited value for the maximum size of the tablespace, select the **Unlimited Size** check box.

To set a custom value for the maximum size of the tablespace, enter the maximum size of the tablespace in the **Max Size** text box. The supported range is 1 KB - 9,007,199,254,740,991 KB. Select an option from the **Max Size** drop-down list. The options available are:

- **KB**: Specifies the **Max Size** in kilobytes.
- **MB**: Specifies the **Max Size** in megabytes.
- **GB**: Specifies the **Max Size** in gigabytes.
- **TB**: Specifies the **Max Size** in terabytes.
- **PB**: Specifies the **Max Size** in petabytes.

Step 3 Click **OK**.

The status bar displays the status of the completed operation.

----End

Dropping a Tablespace

Follow the steps below to drop the tablespace:

NOTE

Data Studio does not allow dropping of system tablespace(s).

Step 1 Right-click the required tablespace and select **Drop Tablespace**.

The **Drop Tablespace** dialog box is displayed.

Step 2 Click **OK** to drop the tablespace.

The status bar displays the status of the completed operation.

----End

Viewing the Tablespace DDL

Follow the steps below to view the DDL of the tablespace:

Step 1 Right-click the required tablespace and select **Show DDL**.

The tablespace DDL is displayed in a new **SQL Terminal** tab with the terminal name format as 'tablespacename@servername'. You must refresh the **Object Browser** to view the latest DDL.

----End

6.9 SQL Terminal

This section contains the following topics:

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- **Opening Multiple SQL Terminals**
- **Managing SQL Query Execution History**
- **Saving and Opening SQL Scripts**
- **Viewing Object Properties in the SQL Terminal**
- **Canceling Execution of SQL Queries**
- **Formatting of SQL Queries**
- **Selecting a DB Object in the SQL Terminal**
- **Viewing the Query Execution Plan and Cost**
- **Working with the SQL Terminal**
- **Exporting Query Results**

6.9.1 Opening SQL Terminals

You can open multiple **SQL Terminal** tabs in Data Studio. You can use this feature to work with SQL queries when the current **SQL Terminal** is executing a query.

Follow the steps below to open a new SQL Terminal:

You can also open multiple SQL terminals on different connection profiles.

Step 1 In the **Object Browser** pane, right-click the required database and select **Open Terminal** or click  on the toolbar.

The new **SQL Terminal** tab is displayed.

----End

NOTE

- Data Studio supports a maximum of 100 SQL terminals and tabs in total. Each **SQL Terminal** will have multiple **Result** and one **Messages** tab based on the number of times a query is executed. If the connection with the database is lost, then the corresponding **SQL Terminals** are not disabled.
- Restoring individual SQL Terminal or tabs is not possible. The restore operation restores the complete set of minimized SQL Terminals and tabs.

Data Studio displays errors and warnings which do not have accompanying results in the status bar. Results of successful executions are displayed in the **Result** tab.

Follow the steps below to open a new SQL Terminal on a different connection profile:

Step 1 On the toolbar, select the required connection from the connection profile drop-down list.

Step 2 In the **Object Browser** pane, right-click the required database in the connection profile and select **Open Terminal** or click  on the toolbar. The new **SQL Terminal** tab is displayed.

The new **SQL Terminal** tab is named as *<database_name>@<connection_profile>(<tab_number>)*. For example, **postgres@IDG_1(2)**. The tab number is updated for each new **SQL Terminal** tab of the connection profile.

----End

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6.9.2 Managing SQL Query Execution History

Data Studio allows viewing and managing frequently used SQL queries. The history of executed SQL queries is maintained only for the **SQL Terminal**.

Follow the steps below to view the SQL History:

Click  in the **SQL Terminal** tab. **SQL History** dialog box displays.

NOTE

SQL history scripts are not encrypted.

The **SQL History** dialog box lists a maximum of 50 queries for each connection profile. Data Studio overwrites queries into the SQL history after the list is full. The executed query is automatically stored in the list.

The **SQL History** dialog box has the following columns:

- **Pin Status** - This displays the pinned status of the queries. Pinned queries will always show on the top and it will not be deleted from the history even when the list is full.
- **SQL Statement** - This displays the SQL query. The number of characters for an SQL query displayed in the **SQL Statement** column is limited to 1000.
- **Number of Records** - This displays the amount of records fetched by the SQL query.
- **Start Time** - This displays the time the query execution was started.
- **Execution Time** - This displays the time taken to execute the query.
- **Database Name** - This displays the name of the database.
- **Execution Status** - . This displays the execution status of the query as **Success** or **Failure**.

Deleting the connection profile deletes the history. If the **SQL History** dialog box is closed, the query is not removed from the list.

You can perform the following operations in the **SQL History** dialog box:

- **Loading an SQL query into the SQL terminal**
- **Loading multiple SQL queries into the SQL terminal**
- **Deleting an SQL query**
- **Deleting all SQL queries**
- **Pinning an SQL query**
- **Unpinning an SQL query**

Loading an SQL query into the SQL terminal

Follow the steps below to load the SQL query into the SQL terminal:

Step 1 Select the required query and click .

The query is appended to the cursor position in the **SQL Terminal**.

----End

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Loading multiple SQL queries into the SQL terminal

The **Load in SQL Terminal and close History** button loads selected queries into the **SQL Terminal** and closes the **SQL History** dialog box.

Follow the steps below to load selected SQL queries into the SQL terminal:

Step 1 Select the required queries.

Step 2 Click .

The queries are appended to the cursor position in the **SQL Terminal**.

----End

Deleting an SQL query

Follow the steps below to delete a SQL query from the SQL History list:

Step 1 Select the required query and click .

A confirmation pop up window displays.

Step 2 Click **OK**.

----End

Deleting all SQL queries

Follow the steps below to delete all SQL queries from the SQL History list:

Step 1 Click .

A confirmation pop up window displays.

Step 2 Click **OK**.

----End

Pinning an SQL query

You can pin queries that you do not want Data Studio to delete automatically from the **SQL History**. You can pin a maximum of 50 queries. Pinned queries are displayed at the top of the list.

NOTE

The pinned queries appear on top once the **SQL History** window is closed and re-opened.

Follow the steps below to pin a SQL query:

Step 1 Select the required SQL query and click .

The **Pin Status** column displays the pinned status of the query.

----End

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Unpinning an SQL query

Follow the steps below to unpin a SQL query:

Step 1 Select the required SQL query and click .

The **Pin Status** column displays the unpinned status of the query.

----End

6.9.3 Saving and Opening SQL Scripts

Data Studio allows you to save and open SQL scripts in the **SQL Terminal**.

Saving an SQL Script

Follow the steps below to save an SQL script:

Step 1 Choose **File > Save** from the main menu.

Alternatively, click **Save** on the toolbar or right-click the **SQL Terminal** and select **Save**.

Data Studio displays the **Data Studio Security Disclaimer** dialog box.

Step 2 Click **OK**.

Step 3 In the **Save As** dialog box, select the location to save the script and click **Save**.

NOTE

The script is saved as an SQL file. Data Studio sets the read/write permission for the saved SQL file. To ensure security, you must set the read/write permissions for folders.

Data Studio displays the status of the operation in the status bar.

----End

Opening an SQL Script

The encoding type of the SQL file must match the encoding type specified in **preferences**.

Follow the steps below to open an SQL script:

Step 1 Choose **File > Open** from the main menu.

Alternatively, click **Open** on the toolbar or right-click the **SQL Terminal** and select **Open**.

Step 2 In the **Open** dialog box, select the SQL file to import and click **Open**.

Data Studio displays the **Open SQL** dialog box.

Step 3 Click **Append** to add the SQL scripts to the **SQL Terminal**.

Or Click **Overwrite** to overwrite the contents of the **SQL Terminal**.

----End

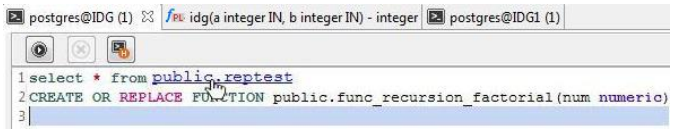
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6.9.4 Viewing Object Properties in the SQL Terminal

Data Studio allows you to view table properties and functions/procedures.

Follow the steps below to view table properties:

Step 1 Press **Ctrl** and point to the table name.



Step 2 Click the highlighted table name. Data Studio displays the properties of the selected table.

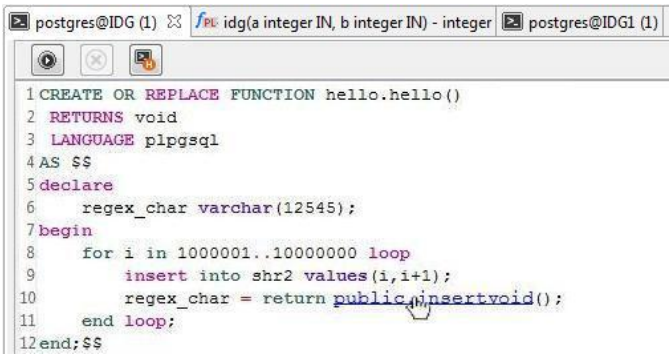
NOTE

The table properties are read-only.

----End

Follow the steps below to view functions/procedures:

Step 1 Press **Ctrl** and point to the function/procedure name.



Step 2 Click the highlighted function/procedure name. Data Studio displays the function/procedure in a new **PL/SQL Viewer** tab.

----End

Follow the steps below to view the properties of a View:

Step 1 Press **Ctrl** and point to the view name.

Step 2 Click the highlighted view name. Data Studio displays the properties of the selected view.

----End

6.9.5 Canceling Execution of SQL Queries

Data Studio allows you to cancel execution of an SQL query executing in the **SQL Terminal**.

Follow the steps below to cancel execution of an SQL query:

Step 1 Execute the SQL query in the **SQL Terminal**.

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Step 2 Click  in the **SQL Terminal** or press **Shift**+**Esc**.

Alternatively, you can choose **Run > Cancel** from the main menu or right-click in the **SQL Terminal** and select **Cancel**, or from **Progress View** tab select **Cancel**.

----End

When you cancel the query, the execution stops at the currently executing SQL statement.

Database changes made by the canceled query are rolled back and the queries following the canceled query are not executed.

A query is not canceled and the **Result** tab shows the result when:

1. The server has finished execution of the query and is preparing the result.
2. The result of the executed query is being transferred from the server to the Data Studio client.

A query cannot be canceled while viewing the query **Execution Plan**. For more details, refer to **6.9.8 Viewing the Query Execution Plan and Cost**.

The **Messages** tab shows the query cancelation message.

NOTE

The **Cancel** button is enabled only during query execution.

6.9.6 Formatting of SQL Queries

Data Studio supports formatting and highlighting of SQL queries and PL/SQL statements.

Conditions to SQL formatting:

1. CASE statements are not supported.
2. Only the CREATE, BEGIN, and END keywords are supported.
3. Word-wrap is not supported for keywords.
4. SQL formatting is valid when the first word of the statement in a line is a keyword. Otherwise, it will be aligned with the previous line.
5. Right-alignment is supported only for the INSERT, DELETE, and UPDATE keywords and reserved keywords.
6. Indentation is not supported for the CREATE, BEGIN, and END keywords. You must use a separate line for each keyword.

NOTE

Data Studio's SQL code formatting standards comply with rules 2, 4, and 10 of the Oracle Database Coding Standard (V1.0/IPD-CMM V3.0/INTERNAL).

SQL Formatting

Follow the steps below to format SQL queries and PL/SQL statements:

Step 1 Select the SQL statement to be formatted.

Step 2 Click  on the toolbar to format the query.

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Alternatively, use the key combination **Ctrl+Shift+F** or choose **Edit > Format** from the main menu.

NOTE

Database functions/procedures and queries will not be formatted together. These operations need to be performed independently.

The query is formatted.

----End

Follow the steps below to change case for SQL queries and PL/SQL statements:

Text case can be changed in the SQL Terminal using one of the following methods:

Method 1:

Step 1 Select the text, choose **Edit > Upper Case/Lower Case**.

The text changes to the case selected.

----End

Method 2:

Step 1 Select the text, choose AA or aa from toolbar.

The text changes to the case selected.

----End

Method 3:

Step 1 Select the text, press **Ctrl+Shift+U** to change to upper case or **Ctrl+Shift+L** to change to lower case.

The text changes to the case selected.

----End

SQL Highlight

Keywords are highlighted automatically as you enter them (according to the default color scheme) as shown below:



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The following figure shows the default color scheme for the specified type of syntax:

Syntax Category	Color Value	HEX Value	Shade
DEFAULT	RGB(0,0,0)	000000	
UNRESERVED_KEYWORD	RGB(198,0,134)	C60086	
TYPE	RGB(64,0,200)	4000C8	
PREDICATES	RGB(224,5,11)	E0050B	
RESERVED	RGB(35,90,80)	235A50	
CONSTANTS	RGB(35,90,80)	235A50	
SINGLE_LINE_COMMENT	RGB(64,128,128)	408080	
STRING	RGB(0,0,255)	0000FF	

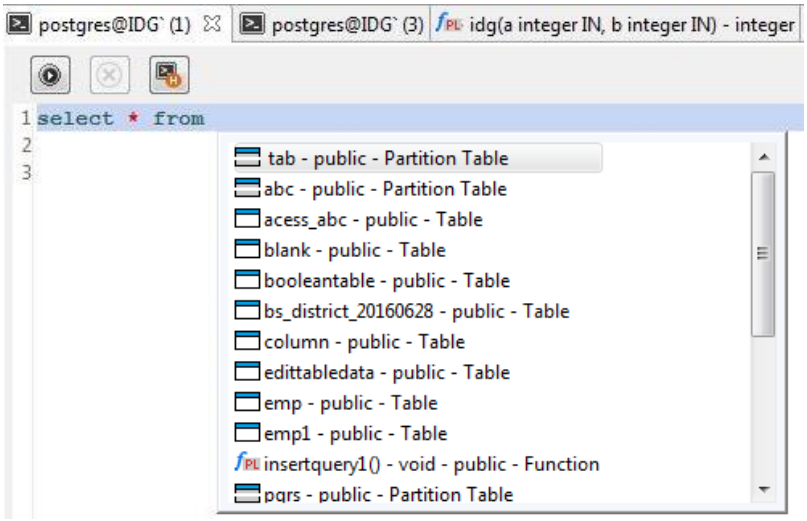
Refer to **Syntax Coloring** to customize the SQL highlight color scheme for the specific type of syntax.

6.9.7 Selecting a DB Object in the SQL Terminal

Data Studio suggests a list of possible schema names, table names and column names, and views in the **SQL Terminal**.

Follow the steps below to select a DB object:

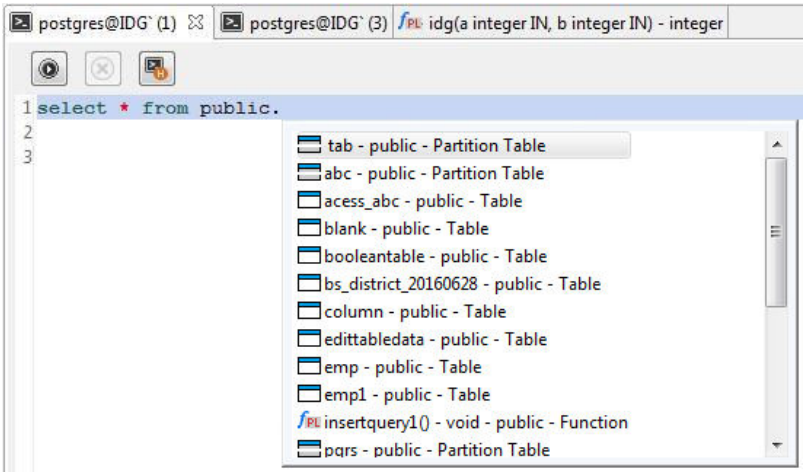
Step 1 Press **Ctrl**+**Space** and enter the required parent DB object name. The DB objects list is refined as you continue typing the DB object name. The DB objects list displays all DB objects of the database connected to the **SQL Terminal**.



Step 2 To select the parent DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the parent DB object.

Step 3 Enter **.** (period) to list all child DB objects.

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Step 4 To select the child DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the child DB object.

On selection, the child DB object will be appended to the parent DB object (with a period '.').

NOTE

- Auto-suggest also works on schema names, table names, column names, and views in the same way as shown above for all schema objects.
- Auto-suggest may show "Loading" in Terminal for following scenarios:
  - The object is not loaded due to the value mentioned in the **Load Limit** field. Refer to **6.1.1 Adding a Connection** for more information.
  - The object is not loaded since it is added in the **Exclude** list option. Refer to **6.1.1 Adding a Connection** for more information.
  - There is a delay in fetching the object from the server.
- If there are objects with the same name in different case, then auto-suggest will display child objects of both parent objects.

  Example:

  If there are two schemas with the name public and PUBLIC, then all child objects for both these schemas will be displayed.

----End

6.9.8 Viewing the Query Execution Plan and Cost

The execution plan shows how the table(s) referenced by the SQL statement will be scanned (plain sequential scan and index scan).

The SQL statement execution cost is the estimate at how long it will take to run the statement (measured in cost units that are arbitrary, but conventionally mean disk page fetches).

Follow the steps below to view the plan and cost for a required SQL query:

Step 1 Enter the query or use an existing query in the **SQL Terminal** and click on the toolbar.

Step 2 The **Execution Plan** dialog box is displayed. Select one or more parameters that you want to view, that is, **Analyze, Verbose, Costs, Buffers, Timing,** and **Format**.

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Parameter	Description
Analyze	Includes actual run times and other statistics.
Verbose	Includes additional information regarding the plan.
Costs	Includes information on the estimated startup and total cost of each plan node, as well as the estimated number of rows and the estimated width of each row.
Buffers	Includes information on buffer usage. This parameter requires **Analyze** to be enabled.
Timing	Includes the actual startup time and time spent in the node. This parameter requires **Analyze** to be enabled.
Format	Specifies the output format, which can be **TEXT, XML, JSON** or **YAML.**

Step 3 Select the required options and click **OK**.

NOTE

Format is mandatory and is selected by default.

The result is displayed in the **Messages** tab.

----End

6.9.9 Viewing the Query Execution Plan and Cost Graphically

Visual Explain plan displays a graphical representation of the sql query using information from the extended JSON format. This helps to refine query to enhance query and server performance. It helps to analyze the query path taken by the database and identifies heaviest, costliest and slowest node.

The graphical execution plan shows how the table(s) referenced by the SQL statement will be scanned (plain sequential scan and index scan).

The SQL statement execution cost is the estimate at how long it will take to run the statement (measured in cost units that are arbitrary, but conventionally mean disk page fetches).

Costliest - Highest **Self Cost** plan node.

Heaviest - Maximum number of rows output by a plan node is considered heaviest node.

Slowest - Highest execution time by a plan node.

NOTE

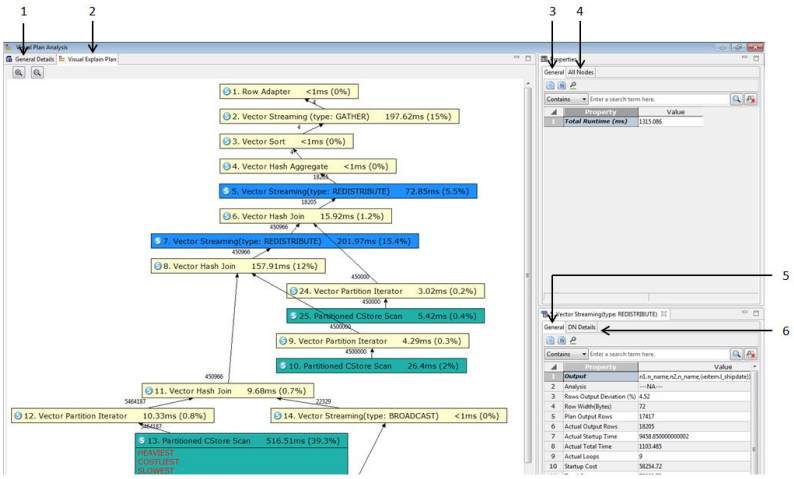
This feature is available only in FusionInsight LibrA V100R002C80 version.

Follow the steps below to view the graphical representation of plan and cost for a required SQL query:

Step 1 Enter the query or use an existing query in the **SQL Terminal** and click  on the toolbar.

Visual Plan Analysis window is displayed.

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- 1 - **General Detail tab** - This tab displays the query.
- 2 - **Visual Explain Plan** tab - This tab displays a graphical representation of all nodes like execution time, costliest, heaviest, and slowest node. Click each node to view the node details.
- 3 - **Properties - General** tab - Provides the execution time of the query in ms.
- 4 - **Properties - All Nodes** tab - Provides all node information.

Column Name	Description
Node Name	Name of the node
Analysis	Node analysis information is provided.
RowsOutput	Number of rows output by the plan node
RowsOutput Deviation (%)	Deviation % between estimated rows output and actual rows output by the plan node
Execution Time (ms)	Execution time taken by the plan node
Contribution (%)	Percentage of the execution time taken by plan node against the overall query execution time.
Self Cost	**Total Cost** of the plan node - Total Cost of all child nodes
Total Cost	Total cost of the plan node

- 5 - **Plan Node - General** tab - Provides the node information for each node.

Row Name	Description
Output	Provides the column information returned by the plan node
Analysis	Provides analysis of the plan node like costliest, slowest, and heaviest.

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Row Name	Description
RowsOutput Deviation (%)	Deviation % between estimated rows output and actual rows output by the plan node
Row Width (bytes)	The estimated average width of rows output by the plan node in bytes
Plan Output Rows	Number of rows output by the plan node
Actual Output Rows	Number of estimated rows output by the plan node
Actual Startup Time	The actual execution time taken by the plan node to output the first record
Actual Total Time	Actual execution time taken by the plan node
Startup Cost	The execution time taken by the plan node to output the first record
Total Cost	Execution time taken by the plan node
Is Column Store	This field represents the orientation of the table (column or row store)
Node Type	Represents the type of node
Parent Relationship	Represents the relationship with the parent node

Based on the plan node type additional information may display. Few examples:

Plan Node	Additional Information
Partitioned CStore Scan	Table Name, Table Alias, Schema Name
Vector Sort	Sort keys
Vector Hash Aggregate	Group By Key
Vector Has Join	Join Type, Hash Condition
Vector Streaming	Distribution key, Spawn On

- 6 - **Plan Node - DN Details** tab - Provides detailed data node information for each node. DN Details are available only if data is being collected from data node.

  Refer to **6.5.5.6 Viewing Table Data** section for description on copy and search toolbar options.

----End

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6.9.10 Working with the SQL Terminals

In the **SQL Terminal**, you can

- **Auto Commit**
- **Execute SQL Queries**
- **Locate Error**
- **Search in PL/SQL Viewer or SQL Terminal**
- **Go to Line in PL/SQL Viewer or SQL Terminal**
- **Execute Multiple Functions/Procedures or Queries**
- **Rename SQL Terminal**
- **SQL Assistant**

Auto Commit

Data Studio provides an option to commit/rollback transactions automatically or manually. Auto commit is **On** by default. In disconnected state the **Auto Commit** icon is disabled.

Follow the steps below to turn off auto commit:

Step 1 Click  on the SQL Terminal toolbar.

Auto commit/rollback is disabled for the Terminal.

NOTE

Once the auto commit is turned off you must manually commit/rollback the transaction.

- Commit - Execute the Commit command to commit a transaction.
- Rollback - Execute the Rollback command to rollback a transaction.

----End

Execute SQL Queries

Follow the steps below to execute function/procedure(s) or SQL queries

Enter a function/procedure(s) or SQL query(s) in the **SQL Terminal** tab and click  in the **SQL Terminal** tab, or press **Ctrl+Enter**, or choose **Run > Compile/Execute Statement** from the main menu.

Alternatively, you can right-click in the **SQL Terminal** tab and select **Execute Statement**.

NOTE

You can check the status bar to view the status of a query being executed.

The **Result** tab displays the results after executing the function/procedure(s) or SQL queries along with the query statement executed. The query statement can be copied.

The column width definition can be set using **Settings > Preferences** option. Refer to **Query Results** to set this parameter.

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In case of errors refer to **Error Locator** to understand how to locate errors.

Toolbar menu in the **Result** window:

Toolbar Name	Toolbar Icon	Description
Copy to Clipboard		This icon is used to copy selected content from result window to clipboard. Shortcut key - **Ctrl+C**.
Advanced Copy to Clipboard		This icon is used to copy content from result window to clipboard. Results can be copied to include the row number and/or column header. Refer to **View Query Results** to set this preference. Shortcut key - **Ctrl+Shift +C**.
Export all data		This icon is used to export all data either in CSV, Text or Binary format. Refer to **6.5.5.3 Exporting Table Data**. **NOTE** ● Columns mentioned in the query is auto-populated in the **Selected Columns** section with **Available Column** section empty. ● To export the query results, the query is re-executed using a new connection. The exported results may differ from the data in the results tab.
Export Current Page to CSV		This icon is used to export current page data to CSV.
Show/Hide Query bar		This icon is used to display/hide the query executed for that particular result set. This is a toggle button.
Show/Hide Search bar		This icon is used to display/hide the search text field. This is a toggle button.

Icons in Search field:

Icon Name	Icon	Description
Search		This icon is used to search the result set based on the criteria defined. Search text are case insensitive.
Clear Search Text		This icon is used to clear the search text entered in the search field.

Right-click options in the **Result** window:

Option	Description
Close	Closes only the active result window.

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Option	Description
Close Others	Closes all other result windows except for the active result window.
Close All	Closes all result windows including the active result window.

Status information displayed in the **Result** window:

- **Query Submit Time** - Provides the query submitted time.
- Number of rows fetched with execution time displays. The default number of rows is displayed. If there are additional rows to be fetched, then it will be denoted with the word "more". You can scroll to the bottom of the table to fetch and display all rows.

NOTICE

When viewing table data, Data Studio automatically adjusts the column widths for an optimal table view. Users can resize the columns as needed. If the text contents of a cell exceeds the total available display area, then resizing the cell column may cause DS to become unresponsive.

NOTE

- Each time a query is run in **SQL Terminal** tab, a new result window opens. To view the results in the new window, you must select the newly opened window.
- Set the **focusOnFirstResult** configuration parameter to **false** to automatically set focus to the newly opened **Result** window. Refer to **4.1 Installing and Configuring Data Studio** for details.
- Each row, column and selected cells can be copied from the result set.
- Export all data operation will be successful even after the connection is removed.
- If the content of the column have spaces between the words, then word wrap is applied to fit the column within the display area. Word wrap is not applied if the content does not have any spaces between the words.
- The size of the column is determined by the maximum content length column.
- You can save preference to define:
  - Number of records to be fetched.
  - Column width
  - Copy option from result set.

  Refer to **Query Results** for more information.

Error Locator

During execution of query/function/procedure in case of an error the error locator message displays.

Yes - Click **Yes** to continue with the execution.

No - Click **No** to stop the execution.

Select **Do not show additional errors for this execution** option to hide the error message popup from displaying while continuing with the current execution.

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Line number and position of error displays in **Messages** tab. The corresponding line number is marked with  icon along with red underline at the position of the error in the Terminal/PL/SQL Viewer. Hovering over  displays the error message. Refer to **11 FAQs** section to understand in certain scenarios why the line number and error detail does not match.

NOTE

If the query/function/procedure is modified while execution is in progress, then error locator may not display the correct line and position number.

Search in PL/SQL Viewer or SQL Terminal

Follow the steps below to search in PL/SQL Viewer or SQL Terminal:

F3 key is used to search next word and **Shift+F3** key is used to search previous word. These shortcut keys will be enabled only after **Ctrl+F** is used to search a text. These keys will be active with the current search word until a new word is searched. The value searched using **Ctrl+F** and **F3/Shift+F3** will be applicable only for the current instance.

Step 1 Choose **Edit > Find and Replace** from the main menu.

Alternatively press **Ctrl+F**.

Find and Replace dialog box is displayed.

Step 2 Enter the text to be searched in **Find what** field, and click the **Find Next** button.

The searched text is highlighted.

F3 and **Shift+F3** key will now be enabled for forward and backward search.

NOTE

Select **Wrap around** option to continue the search after reaching the last line in the SQL queries or PL/SQL statements.

----End

Go to Line in PL/SQL Viewer or SQL Terminal

Go to line option is used to skip to a specific line in the terminal.

Follow the steps below to go to a line in PL/SQL Viewer or SQL Terminal:

Step 1 Choose **Edit > Go To Line** from the main menu or

Alternatively press **Ctrl+G**.

Go to Line dialog box is displayed.

Step 2 Enter the desired number in the **Enter the line number** field, and then click the **OK** button.

The cursor moves to the beginning of the line entered in the **Go to Line** dialog box.

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NOTE

Below are invalid inputs to this field.

- Non-numeric value
- Special characters
- Line number entered does not exist in the editor.
- More than 10 digits is entered.

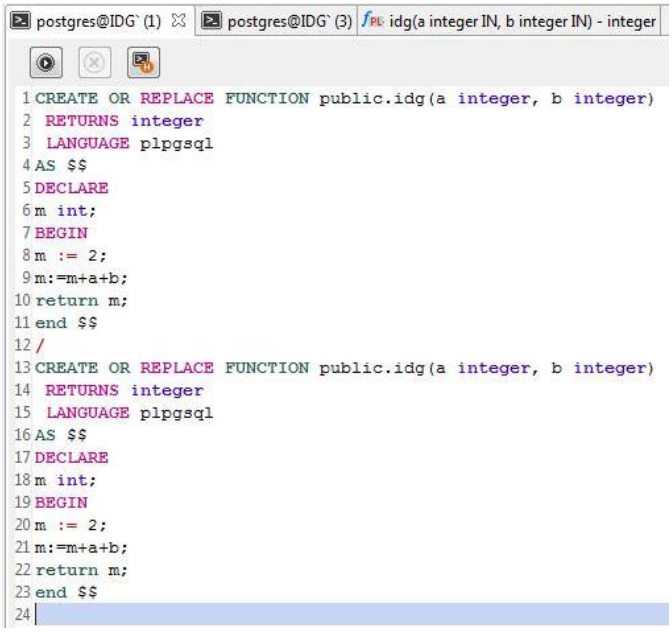
----End

Execute Multiple Functions/Procedures or Queries

Follow the steps below to execute multiple functions/procedures:

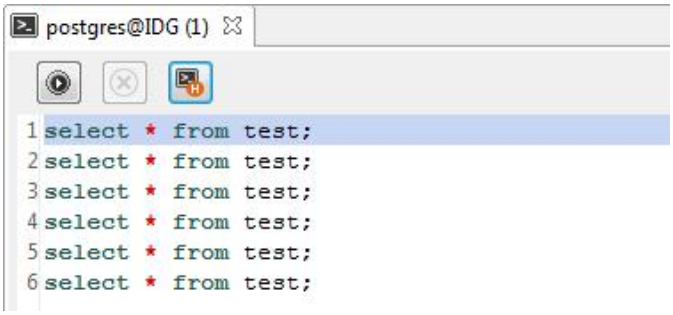
Insert '/' in a new line after the function/procedure in the **SQL Terminal**.

Add the new function/procedure in the next line.



Follow the steps below to execute multiple SQL queries:

Step 1 Enter multiple SQL queries in the **SQL Terminal** tab as follows:



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Step 2 Click in the **SQL Terminal** tab, or press **Ctrl+Enter**, or choose **Run > Compile/Execute Statement** from the main menu.

----End

Follow the steps below to execute an SQL query after a function/procedure:

Insert '/' in a new line after the function/procedure in the **SQL Terminal**.

Follow the steps below to execute PL/SQL statements and SQL queries on different connections:

In the toolbar, select the required connection from the connection profiles drop-down list and click in the **SQL Terminal** tab.

Rename SQL Terminal

Follow the steps below to rename SQL Terminal:

Step 1 In the **SQL Terminal** tab right-click and select **Rename Terminal**.

A **Rename Terminal** dialog box is displayed prompting you to provide the new name for the Terminal.

Step 2 Enter the new name and select **OK** to rename the Terminal.

NOTE

- Terminal name follows Windows file naming convention.
- **Rename Terminal** accepts a maximum of 150 characters.
- Restore option is not available to revert to the default name. You must manually rename the Terminal to default name.
- Tool tip of the renamed Terminal will display the old name.

----End

SQL Assistant

The **SQL Assistant** tool provides suggestion or reference for the information entered in the SQL Terminal and PL/SQL Viewer. Follow the steps below to open SQL Assistant:

When Data Studio is launched **SQL Assistant** panel displays with related syntax topics. As you type a query in the SQL Terminal topics related to the query displays. It also provides precautions, examples, syntax, function, and parameter description. Select the text and use the right-click option to copy selected information or copy and paste to SQL Terminal.

NOTE

- You can enable/disable the **SQL Assistant** tool permanently. Refer to **7.3-SQL Assistant** to enable/disable this option.
- SQL Assistant icon () from the toolbar can be used to open the SQL Assistant window.
- This feature is available only in FusionInsight LibrA V100R002C60 and FusionInsight LibrA V100R002C80 versions.

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6.9.11 Exporting Query Results

You can export the results of an SQL query into a CSV, Text or Binary file.

This section contains the following topics:

- **Exporting all data**
- **Exporting current page data**

Exporting all data

The following functions are disabled while the export operation is in progress:

- Executing SQL queries in the **SQL Terminal**
- Executing PL/SQL statements
- Debugging PL/SQL statements

Follow the steps below to export all results:

Step 1 Select the **Result** tab.

Step 2 Click .

Export ResultSet Data window displays.

Refer to **6.5.5.3 Exporting Table Data** to complete the export operation.

NOTE

You can check the status bar to view the status of the result being exported.

Data Studio displays the **Data Exported Successfully** dialog box.

Step 3 Click **OK**. Data Studio displays the status of the operation in the **Messages** tab.

NOTE

If the disk is full while exporting the results, then Data Studio displays an error in the **Messages** tab. Clean the disk, re-establish the connection and export the result data.

----End

The **Messages** tab shows the **Execution Time, Total result records fetched,** and the path where the file is saved.

Exporting current page data

It is recommended to export all results instead of exporting the current page.

Follow the steps below to export the current page:

Step 1 Select the **Result** tab.

Step 2 Click  to export the current page.

Data Studio displays the **Data Studio Security Disclaimer** dialog box.

Step 3 Click **OK**.

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Step 4 Select the location to save the current page.

NOTE

- You can check the status bar to view the status of the page being exported.

Step 5 Click **Save.** Data Studio displays the **Data Exported Successfully** dialog box.

Step 6 Click **OK**. Data Studio displays the status of the operation in the **Messages** tab.

NOTE

If the disk is full while exporting the results, then Data Studio displays an error in the **Messages** tab. Clean the disk, re-establish the connection and export the result data.

----End

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7 Personalizing Data Studio

This section provides details on how to personalize Data Studio using preferences settings. This section contains the following topics:

7.1 General

7.2 Editor

7.3 Environment

7.4 Export/Import

7.5 Result Management

7.6 Security

7.1 General

This section provides details on how to personalize shortcut keys.

Setting the Shortcut Keys

You can customize the Data Studio shortcut keys as required.

Follow the steps below to set or modify the shortcut keys:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box displays.

Step 2 Choose **General > Shortcut Mapper**. The **Shortcut Mapper** pane displays.

Step 3 Select the required shortcut key and click **Modify**.

Step 4 Enter the required shortcut key in the **Binding** text box.

For example, to change the shortcut key for **Step Into** from **F7** to **F6**, enter **F6** in the **Binding** text box.

Step 5 Click **OK**. The **Restart Data Studio** dialog box displays.

NOTE

Multiple shortcut keys can be modified before restarting Data Studio.

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Step 6 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, then the **Restart Confirmation** dialog box displays.

Step 7 Click **OK** to close running jobs and restart or click **Cancel** to abort restart operation.

----End

Follow the steps below to remove the shortcut keys:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box displays.

Step 2 Choose **General > Shortcut Mapper**. The **Shortcut Mapper** pane displays.

Step 3 Select the required shortcut key and click **Unbind Key**.

Step 4 Click **Ok**. The **Restart Data Studio** window displays.

NOTE

Multiple shortcut keys can be removed before restarting Data Studio

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, then the **Process is running** dialog box displays.

Step 6 Click **OK** to wait for operations to complete or click **Force Restart** to discard operations.

----End

Follow the steps below to restore the default shortcut keys:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box displays.

Step 2 Choose **General > Shortcut Mapper**. The **Shortcut Mapper** pane displays.

Step 3 Click **Restore Defaults**. For more information on default shortcut keys, refer to **5.5 Data Studio Right-Click Menus**.

Step 4 Click **Ok**. The **Restart Data Studio** window displays.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box displays.

Step 6 Click **OK** to wait for operations to complete or click **Force Restart** to discard operations.

----End

Shortcut Keys

Data Studio supports keyboard short cut keys similar to other windows based application. The following table lists some of the shortcut keys for effective usage of the functionalities provided by Data Studio. To customize the shortcut keys, refer to **Setting the Shortcut Keys**.

Function	Shortcut Key
Auto-suggest a List of DB Objects	Ctrl+Space

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Function	Shortcut Key
Backward Search	Shift+F3
Cancel the Executing Query	Shift+Esc
Change Text Case to Lower	Ctrl+Shift+L
Change Text Case to Upper	Ctrl+Shift+U
Close an Active PL/SQL Viewer, View Table Data, Edit Data, and Properties Tab	Shift+F4
Collapse selected Open Objects	Alt+Q
Compile/Execute SQL Terminal Statements	Ctrl+Enter
Continue with the plsql debug operation	F9
Copy Qualified Object Name from Object Browser, selected content from Terminal, Result, View Table Data or Edit Table Data tab	Ctrl+C
Copy content from Result, View Table Data or Edit Table Data tab including/excluding column header and row number	Ctrl+Shift+C
Copy Breakpoints Pane Content	Alt+Y
Copy Callstack Pane Content	Alt+J
Copy DB Objects from the Auto-suggest List	Alt+U
Copy Execution Time and Status from the Edit Table Data Tab	Ctrl+Shift+K
Copy the Query displayed in the Edit Data Tab	Ctrl+Alt+C
Copy Variables Pane Content	Alt+K
Cut	Ctrl+X
Debug DB Object	Ctrl+D
Debug Menu	Alt+D
Disconnect from DB	Ctrl+Shift+D
Edit Menu	Alt+E
Execute DB Object	Ctrl+E
Execution Plan and Cost	Ctrl+Shift+X
Expand/Collapse all the objects	Ctrl+M
File Menu	Alt+F
Find and Replace	Ctrl+F

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Function	Shortcut Key
Format (SQL, PL/SQL)	Ctrl+Shift+F
Forward Search	F3
Go to Line	Ctrl+G
Help Menu	Alt+H
Help (Show User Manual)	F1
Highlight Object Browser	Alt+X
Locate first element of Object browser	Alt+Page Up or Alt+Home
Locate last element of Object browser	Alt+Page Down or Alt+End
New Database Connection	Ctrl+N
Open Callstack, Breakpoints, and Variables pane	Alt+V
Open SQL Script	Ctrl+O
Paste	Ctrl+V
Redo	Ctrl+Y
Refresh Server Object	F5
Run Menu	Alt+R
Save SQL Script	Ctrl+S
Search Objects	Ctrl+Shift+S
Select All	Ctrl+A
Settings Menu	Alt+G
Step Into	F7
Step Out	Shift+F7
Step Over	F8
Switch between SQL terminals	Ctrl+Page Up or Ctrl+Page Down
Switch to first SQL terminal	Alt+S
Terminate Debugging	F10
Update a cell or column in Edit Table Data window. Click the cell or column header to enable this option.	F2
Visual Explain Plan - Graphical	Ctrl+Alt+X

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7.2 Editor

This section provides details on how to personalize syntax coloring.

Syntax Coloring

Follow the steps below to customize the SQL highlight color:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Syntax Coloring**. The **Syntax Coloring** pane displays.

Step 3 Click the color button to customize the color for the type of syntax.

For example, click  to customize the color for **Strings**. The color picker dialog box is displayed.

Use the color picker to set the required color for a specific syntax category. You can choose basic colors or define custom colors in the color picker.

NOTE

Click **Restore Defaults** from **Syntax Coloring** pane to reset to default color scheme.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, then Data Studio displays the **Process is running** dialog box**.**

Step 6 Click **Force Restart** to discard operations and restart Data Studio. Click **OK** to continue performing operations.

NOTE

The *Preferences.prefs* file contains the custom color settings. If the file is corrupted, Data Studio will display the default values.

The custom color(s) will be set after you restart Data Studio.

----End

7.3 Environment

Session Setting

Follow the steps below to set Data Studio and file encoding :

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**. The **Session Setting** pane displays.

Step 3 Select the required Data Studio encoding from **Data Studio Encoding** drop-down.

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Step 4 Select the file encoding from **File Encoding** field.

NOTE

Data Studio supports only UTF-8 and GBK file encoding types.

Step 5 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 6 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, then Data Studio displays the **Process is running** dialog box.

Step 7 Click **Force Restart** to discard operations and restart Data Studio. Click **OK** to continue performing operations.

NOTE

Click **Restore Defaults** from **Session Setting** pane to reset to default values. The default value for Data Studio Encoding and File Encoding is **UTF-8**.

----End

SQL Assistant

Follow the steps below to enable/disable SQL Assistant tool:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**. The **Session Setting** pane displays.

Step 3 Select **Enable/Disable** from SQL Assistant section.

Step 4 Click **OK**.

NOTE

Click **Restore Defaults** from **Session Setting** pane to reset to default value. The default value for SQL Assistant is **Enable**.

----End

7.4 Export/Import

This section provides details on how to personalize export DDL operation.

Export DDL

You can set preference to include tablespace in DDL while exporting DDL using the **Export DDL** setting.

Set include tablespace in DDL:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Export/Import > Export DDL**. The **Export DDL** pane displays.

Step 3 Select **Include Tablespace in DDL** to include the tablespace while exporting DDL.

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Step 4 Click **OK**.

NOTE

Click **Restore Defaults** from **Export DDL** pane to reset to default values. The default value is **Include Tablespace in DDL**.

----End

7.5 Result Management

This section provides details on how to personalize the column width, number of records to be fetched in the query results, and result copy of column header or row number using the **Query Results** setting.

Query Results

Set column width of query results:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Query Results**. The **Query Results** pane displays.

Step 3 Select the required option.

Column Width customization options:

Option	Outcome
Content Length	Selecting this option enables you to set the column width based on the content length of the column.
Custom Length	Selecting this option enables you to set the column width based on the value entered in this field. **NOTE** This column accepts value between 100 and 500.

Step 4 Click **OK**.

NOTE

Click **Restore Defaults** from **Query Results** pane to reset to default values. The default value is **Content Length**.

----End

Set the number of records to be fetched in the query results:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Query Results**. The **Query Results** pane displays.

Step 3 Select the required option.

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Option	Outcome
Fetch All records	Selecting this option enables you to fetch all the records in the query results.
Fetch custom number of records	Selecting this option enables you to set the number of records that needs to be fetched in the query results. **NOTE** This column accepts value between 100 and 5000.

Step 4 Click **OK**.

NOTE

Click **Restore Defaults** from **Query Results** pane to reset to default values. The default value is **Fetch custom number of records (1000)**.

----End

Set preference to copy column name and row number from query results:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Query Results**. The **Query Results** pane displays.

Step 3 Select the required option.

Option	Outcome
Include column header	Selecting this option enables you to copy column headers from the query results.
Include row number	Selecting this option enables you to copy row numbers from the query results.

Step 4 Click **OK**.

NOTE

Click **Restore Defaults** from **Query Results** pane to reset to default values. The default value is **Include column header**.

----End

Edit Table Data

Set save behavior of edit table data operation:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Edit Table Data**. The **Edit Table Data** pane displays.

Step 3 Select the required option:

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Option	Outcome
Save Valid Data	Selecting this option enables you to save all valid entries. Invalid entries are not saved.
Do not Save with Error	Selecting this option will not save any entries if there are invalid entries. Valid entries are also not saved.

Step 4 Click **OK**.

NOTE

Click **Restore Defaults** from **Edit Table Data** pane to reset to default values. The default value is **Save Valid Data**.

----End

7.6 Security

This section provides details on how to personalize password and security disclaimer display.

Save Password Permanently

You can enable/disable to display the permanent option to save password in the connection window.

Follow the steps below to modify display of permanent save password option:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Security > Password**. The **Password** pane displays.

Step 3 Select the required option. Refer table below to understand the customization options available:

Option	Outcome
Yes	Selecting this option enables you to view the "Permanently" save password option from the **Save Password** drop-down in the connection window.
No	Selecting this option removes the "Permanently" save password option from the **Save Password** drop-down in the connection window. Selecting this option removes the saved passwords.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, then Data Studio displays the **Process is running** dialog box.

Step 6 Click **Force Restart** to discard operations and restart Data Studio. Click **OK** to continue performing operations.

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NOTE

Click **Restore Defaults** from **Password** pane to reset to default values. The default value is **No**.

----End

Password Expiry

This section provides details on how to continue/discontinue working with Data Studio once password expires using the Password setting.

Follow the steps below to modify the behavior of Data Studio once password expires:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Security > Password**. The **Password** pane displays.

Step 3 Select the required option. Refer table below to understand the customization options available:

Option	Outcome
Yes	Selecting this option allows you to login to Data Studio after the password has expired. **NOTE** A message displays informing you that the password has expired and some operations may not work as expected in the following scenarios: ● Establishing a new connection. ● Editing a connection. ● Connecting to a database while creating the database when no other database is connected in that connection profile. ● Connecting to a database when no other database is connected in that connection profile.
No	Selecting this option will not allow you to login to Data Studio once the password has expired. A message displays informing you that the password has expired.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, then Data Studio displays the **Process is running** dialog box.

Step 6 Click **Force Restart** to discard operations and restart Data Studio. Click **OK** to continue performing operations.

NOTE

The default value is **Yes**.

----End

Security Disclaimer

You can enable/disable to display the security disclaimer for any unsecured connection/file operations.

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Follow the steps below to modify the display of security disclaimer:

Step 1 Choose **Settings** > **Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Security > Security Disclaimer**. The **Security Disclaimer** pane displays.

Step 3 Select the required option. Refer table below to understand the customization options available:

Option	Outcome
Enable	Selecting this option displays the security disclaimer each time you try to establish an unsecure connection or perform a file operation.
Disable	Selecting this option will not display the security disclaimer while establishing an unsecure connection or performing a file operation. You need to agree to the security implications that may arise due to unsecure connection.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, then Data Studio displays the **Process is running** dialog box.

Step 6 Click **Force Restart** to discard operations and restart Data Studio. Click **OK** to continue performing operations.

NOTE

Click **Restore Defaults** from **Security Disclaimer** pane to reset to default values. The default value is **Enable**.

----End

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8 References

This section contains the following topics:

8.1 Performance Specification

8.2 PL Debug Server Interfaces

8.3 PL Debug Server Datatypes

8.1 Performance Specification

Data Studio's performance to load and operate on the object browser directly depends on the number of objects to be loaded. These include tables, views, columns and so on.

The memory consumption also depends on the number of objects loaded.

To improve the performance of loading objects and of memory usage efficiency, it is recommended to split the objects across multiple namespaces and avoid having skewed namespaces with a very large number of objects. By default, Data Studio loads the namespaces in the *search_path* set for the user logged in. Other namespaces and the contained objects are loaded only when needed.

To improve performance of **Find/Find and Replace** operation, it is recommended to split lines that have more than 10000 characters in a single line into multiple smaller lines.

The following observations and outcomes of the performance tests done will help understand the performance aspects of Data Studio more clearly:

Recommended maximum memory that can be configured (Current release version)		1.4 GB
Performance with 150K tables and 150K views with 3 columns each at maximum memory configuration:		
>	Time taken to refresh the namespace in the object browser	15s
>	Time taken for initial loading and expanding of all table/views in the object browser	90s-120s

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>	Time taken for subsequent loading and expanding of all table/ views in the object browser	<10s
>	Total Memory occupied	700 MB

NOTE

This representative performance data is included for reference only. Actual performance may vary depending on the usage scenarios.

8.2 PL Debug Server Interfaces

The PL/pgSQL Debugger open source library used in Data Studio is taken from the following location:

http://pgfoundry.org/projects/edb-debugger/

The source code from the above site was downloaded on 16th August 2012.

Following are the interfaces used from open source that are modified according to PL debug server requirements:

PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_continue	Modified	Debug server sessionID (INT)	Datum to breakpoint datatype	This function sends a "continue" command to the debugger target and then waits for target to reach a breakpoint. This function returns a tuple of type 'breakpoint' that contains the function OID and line number where the target is currently stopped.
pldbg_create_listener	Modified	No input arguments	Datum to INT	Performs initialization on the debug server and returns session ID of the debug server.
pldbg_deposit_value	Modified	Debug server sessionID (INT), variable name (TEXT), line number (INT), value (TEXT)	Datum to boolean	Sets the value of the specified variable. True in case of success, and false in case of error.
pldbg_drop_breakpoint	Modified	sessionID (INT), function OID (OID), lineNumber (INT), breakpointID (Text)	Datum to boolean	Deletes the specified breakpoint. True in case of success, and false in case of error.

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_get_stack	Modified	sessionID (INT)	Datum to a SETOF frame tuples	This function returns a SETOF frame tuples. Each tuple in the result set contains ● Information about one stack frame. ● The function OID and line number within that function. ● A string that you can use to display the name and value of each argument for a particular invocation.
pldbg_get_proxy_info	Modified	No input arguments	Datum to proxyinfo type	This function retrieves a small collection of parameters from the server. All parameters are related to the version of the server and the version of this proxy API.

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_get_variables	Modified	session (INT)	Datum to a SETOF var tuples	This function returns a SETOF var tuples. Each tuple in the result set contains ● Information about one local variable (or parameter) in the stack frame that has the focus. ● The name of the variable, the line number at which the variable was declared. ● A flag that tells you whether the name is unique within the scope of the function (if the name is not unique, a debugger client may use the line number to distinguish between variables with the same name) ● A flag that tells you whether the variable is a CONST ● A flag that tells you whether the variable is NOT NULL, the data type of the variable (the OID of the corresponding pg_type) and the value of the variable. To view variables defined in a different stack frame, call pldbg_select_frame() to change the debugger's focus to that frame.

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_select_frame	Modified	session (INT), frame (INT)	Datum to breakpoint datatype	This function changes the debugger focus to the indicated frame (in the call stack). Whenever the target stops (at a breakpoint or as the result of a step/into or step/over), the debugger changes focus to most deeply nested function in the call stack (because that's the function that's executing).
pldbg_step_into	Modified	session (INT)	Datum to a SETOF breakpoint tuples	This function sends a "step/into" command to the debugger target and then waits for target to reach the next executable statement. This function returns a tuple of type 'breakpoint' that contains the function OID and line number where the target is currently stopped.
pldbg_step_over	Modified	session (INT)	Datum to a SETOF breakpoint tuples	This function sends a "step/over" command to the debugger target and then waits for target to reach the next executable statement within the current function. If the target encounters a breakpoint (presumably in a child invocation) before reaching the next executable line, it will stop at the breakpoint. This function returns a tuple of type 'breakpoint' that contains the function OID and line number where the target is currently stopped.

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_attach_session	Added	session (INT), targetSessionID (INT)	Datum to boolean	This function attaches the given target server with the debug server. Returns true if successful, and false if any error.
pldbg_initialize_debug	Added	No input arguments	Datum to boolean	This function initializes debug on the target server and returns target server ID.
pldbg_sync_target	Modified	session (INT)	Datum to a SETOF breakpoint tuples	This function syncs debug and target servers. After this API, if Target hits any breakpoint it will send the debug position to debug server and waits for further commands from debug server.
pldbg_detach_session	Added	session (INT)	Datum to boolean	This function detaches the target server from the debug server. After this API is executed, target server can no longer be debugged. The same target server or a different target server can be attached to the same debug server again. Returns true if successful, false if any error.
pldbg_debug_on	Added	No input arguments	Datum to boolean	This function switches on the debugging option on the target server. Without calling this function it is not possible to debug the target server. Returns true if successful, false if any error.

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_debug_off	Added	No input arguments	Datum to boolean	This function switches off the debugging option on the target server. After calling this API on the target server, debugging is not possible. Returns true if successful, false if any error.
pldbg_is_debug_on	Added	No input arguments	Datum to boolean	This function checks if debug is on the target server side. Returns true if successful, false if any error.
pldbg_enable_breakpoint	Added	session (INT), func oid (OID), linenumber (INT), breakpointID (TEXT)	Datum to boolean	This function enables a breakpoint which already exists. Returns true if successful, false if any error.
pldbg_disable_breakpoint	Added	session (INT), func oid (OID), linenumber (INT), breakpointID (TEXT)	Datum to boolean	This function disables a breakpoint which already exists. Returns true if successful, false if any error.
pldbg_set_breakpoint	Modified	session (INT), func oid (OID), linenumber (INT), breakpointID (TEXT)	Datum to boolean	This function sets the specified breakpoint on a given line number. The breakpoint set is enabled by default.

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_step_out	Added	session (INT)	This function returns a DATUM to a SETOF breakpoint tuples	This function sends a "stepout" command to the debugger target and then waits for target to reach the executable statement in the caller function. If the target encounters a breakpoint before reaching the caller function, it will stop at the breakpoint. If breakpoints are modified due to line validation, then this function will return the SETOF all the breakpoints which are modified. If breakpoints are not modified, then debug position will be returned.
pldbg_get_varinfo	Added	sessionID (INT), varName (TEXT), lineNumber (INT)	This function returns a DATUM to a VAR datatype	This function returns the value of the given variable (identified by name and optional line number) in VAR datatype.
pldbg_validate_version	Added	clientVersion (TEXT)	This function returns a DATUM to a boolean	This function checks if the client version passed is compatible with the server. Returns true if client and server are compatible, else returns false.
pldbg_server_in_sync	Added	sessionID (INT)	This function returns a DATUM to a boolean	This function is executed on the target server. It takes the debugger server ID as input and checks if the debug server has started waiting for connections from the target server. This function returns true if debugger is waiting for target else returns false

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_get_funcver	Added	func oid (OID)	This function returns a DATUM to funcVer datatype	This function returns the xmin and cmin for the function specified.
pldbg_resume_debug	Added	session (INT)	This function returns a DATUM to a SETOF breakpoint tuples	This function is used to resume debugging after the server has sent the set of breakpoints which are modified. This function will return SETOF breakpoints in case of breakpoint modification, else it will return debug position.
pldbg_oid_debug	No longer used	-	-	-
plpgsql_oid_debug	No longer used	-	-	-
pldbg_abort_target	No longer used	-	-	-
pldbg_attach_to_port	No longer used	-	-	-
pldbg_get_breakpoints	No longer used	-	-	-
pldbg_get_source	No longer used	-	-	-
pldbg_set_global_breakpoint	No longer used	-	-	-
pldbg_wait_for_breakpoint	No longer used	-	-	-
pldbg_wait_for_target	No longer used	-	-	-

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PL Debug Server API	Change Type	Input Parameters	Return Type	Description
pldbg_get_target_info	No longer used	-	-	-

8.3 PL Debug Server Datatypes

The following datatypes are used from the PL/pgSQL Debugger open source library. These are modified according to the PL debug server requirements.

Datatype	Change Type	Description
breakpoint	No change	This datatype is used to send the deposition, when a breakpoint is hit or during single stepping. It is also used to send breakpoint information in case of modification.
frame	No change	This datatype is used to send the frame details in the stack.
var	Modified	This datatype is used to send variable details.
proxyInfo	No change	This datatype is used to send version information of the server and debugger API.
funcVer	Added	This datatype is used to send xcmin and cmin of the function source.
targetinfo	No longer used	-

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9 Troubleshooting

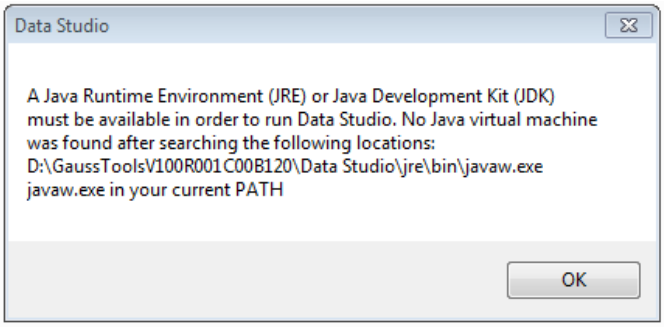
1. **Data Studio does not open. What do I do?**

   Solution: Check whether JRE is missing. Verify the configured Java path in the environment. Refer to **3.5 System Requirements** for supported Java JDK version.

2. **Data Studio does not open and displays a 'Java Runtime' error when I double-click the *Data Studio.exe* file. What do I do?**

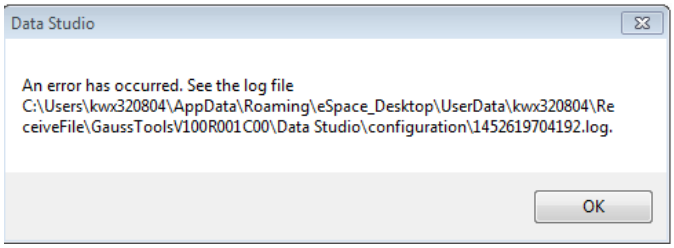
   Solution:

   - For no JRE:

     Check whether the Java Runtime Environment (JRE) or Java Development Kit (JDK) version 1.8.0_141 or above with appropriate bit number is installed on the system and Java Home path is set. If there are more than one version of Java installed, then set the -vm parameter in the configuration file. Refer to the **4.1 Installing and Configuring Data Studio** section to set this parameter. This is a prerequisite for running Data Studio.

   - For older versions of JRE:

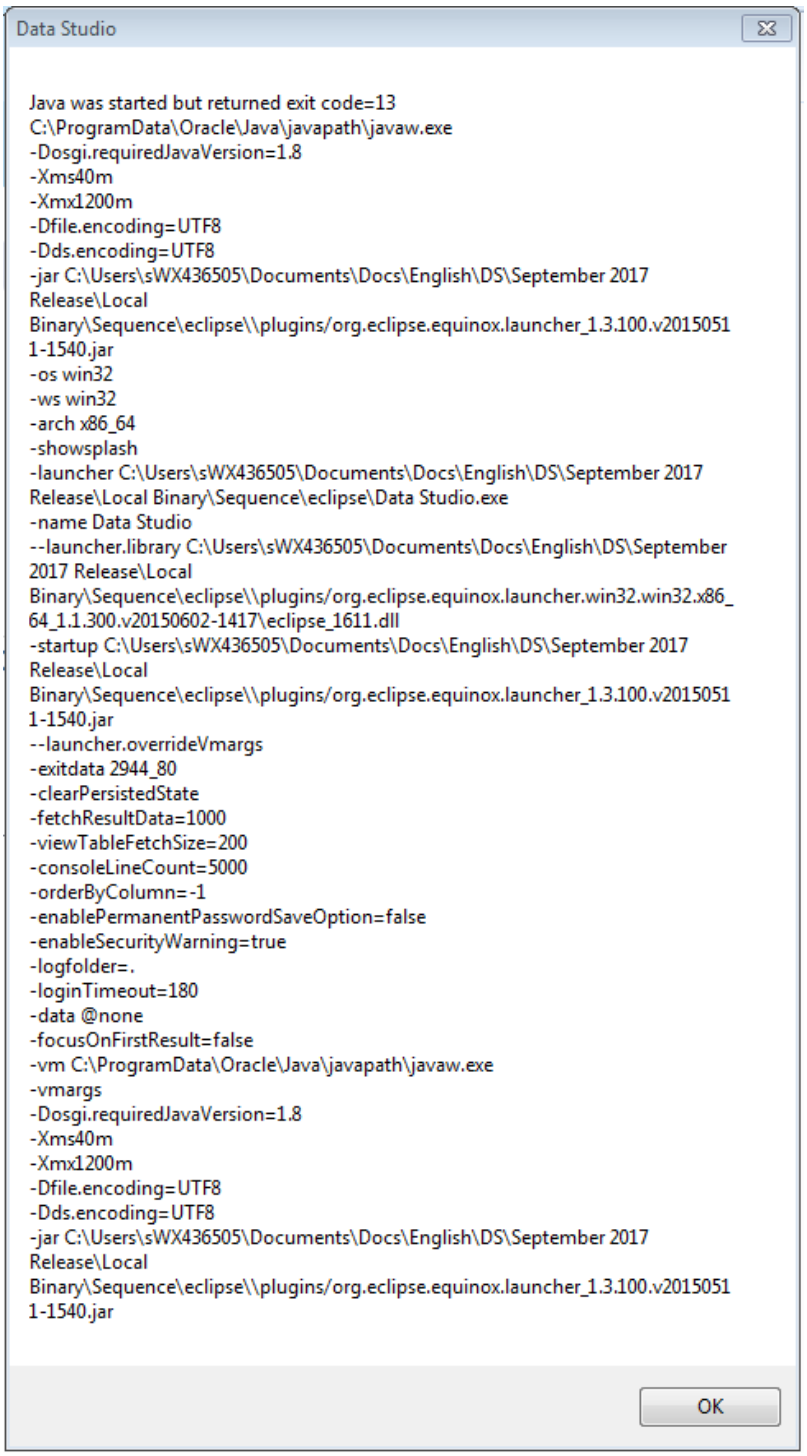
     

     Check the version of Java Runtime Environment (JRE) or Java Development Kit (JDK) that is installed on the system. An older version installed on the system

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causes this error. Update the JRE to version 1.8.0_141 or above with appropriate bit number.

- Java Incompatibility:



Check the version of Java Runtime Environment (JRE) or Java Development Kit (JDK) that is installed on the system. Incompatible Java bit version installed on the system causes this error. Update the JRE version to 1.8.0_141 or above with appropriate bit number.

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It is recommended to run the batch file to check compatibility and launch Data Studio. Refer to **5.1 Starting Data Studio** for more information.

3. **While running the *StartDataStudio.bat* file the following message displays. What do I do?**

   Solution:

Message	Solution
You are attempting to run 32-bit Data Studio on: ● 64 bit OS ● Microsoft Windows 7 Professional ● Java 1.8 64-bit JDK (Incompatible) Install Java 1.8 32-bit	Install Java 1.8 32-bit
Data Studio is supported with minimum Java Version of 1.8 Install Java version 1.8 in order to use Data Studio	Install Java version 1.8 with appropriate bit number
You are attempting to run 64-bit Data Studio on: ● 64 bit OS ● Microsoft Windows 7 Professional ● Java 1.8 32-bit JDK (Incompatible) Install Java 1.8 64-bit	Install Java 1.8 64-bit
You are attempting to run 64-bit Data Studio on: ● 32 bit OS ● Microsoft Windows 7 Professional ● Java 1.8 32-bit JDK (Incompatible) Install 32-bit Data Studio	Install 32-bit Data Studio

4. **Why does Data Studio not connect to the server even with all valid inputs?**

   Solution: Check whether the server is running in the specified IP and port. Check for availability of the specified user by connecting through **gsql**.

5. **What do I do for connection issues while using Data Studio?**

   Solution: A connection issue that may occur while using Data Studio is explained with an example:

   Establish a database connection.

   Run the query.

   When a connection exception occurs in any one of the database (**PostgreSQL**), the connection is closed. When the database connection is closed, all the function and procedure tabs, if open, will be closed too.

   An error will be seen and the **Object Browser** will show the status of the database.

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NOTE

Only the current database will be disconnected. Other databases will remain connected and re-connection is possible.

Re-connect to the database to proceed with execution.

6. **While fetching a function/procedure containing Chinese comments through a Java application, the Chinese characters are not visible. What do I do?**

   Solution: Set **Preferences > Session Setting > Data Studio Encoding** and **File Encoding** to *GBK*, so that Chinese characters are displayed properly.

7. **Connecting to large database, loading large number of queries into SQL Terminal, may result into 'Out of Memory' error or 'Java Heap Space' error. What is the solution?**

   Solution: 'Out of Memory' error or 'Java Heap Space' error occurs when Data Studio has used up the maximum allocated Java memory. By default, the configuration file Data Studio.ini (located in the Data Studio install path) contains the entry "-Xmx1200m", where 1200m denotes 1200MB as the maximum Java memory that can be used by Data Studio. The memory usage is based on the size of data fetched by Data Studio.

   To resolve this issue, increase the Java memory size to the desired value. For example, update "-Xmx1200m" to "-Xmx2000m" and restart Data Studio. If the updated memory size is used up as well, the same issue might reoccur.

   NOTE

   - As an example for 32-bit Data Studio and 8GB RAM the value of the Xmx parameter must not cross 2044MB and for 64-bit Data Studio and 8GB RAM the value of the Xmx parameter must not cross 6000MB. The limit may vary based on user's current memory usage.

     For example:

     -Xms1024m

     -Xmx1800m
   - The maximum file size that Data Studio can support in the SQL Terminal is based on the value of the Xmx parameter in the Data Studio.ini file and available memory.

8. **While executing an SQL query which returns a large amount of data, Data Studio displays an 'Insufficient Memory' error. What do I do?**

   Solution: Data Studio will disconnect the connection profile. Re-establish the connection and continue execution.

9. **While exporting DDL or data why do I get export failed message?**

   Solution: This could happen due to any of the following reasons:

   - Invalid file for Client SSL Certificate and/or Client SSL Key have been selected. Select the correct file and try again. Refer to **6.1.1 Adding a Connection** on establishing connection.
   - Identity of the object in the database could have been changed. Check if the identity of the object has been changed and try again.
   - You may have insufficient privileges. Contact the database administrator to obtain appropriate privileges.

10. **While performing Show DDL operation why do I get show DDL failed message?**

    Solution: This could happen due to any of the following reasons:

    - Invalid file for Client SSL Certificate and/or Client SSL Key have been selected. Select the correct file and try again. Refer to **6.1.1 Adding a Connection** on establishing connection.

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- Identity of the object in the database could have been changed. Check if the identity of the object has been changed and try again.
- You may have insufficient privileges. Contact the database administrator to obtain appropriate privileges.

11. **While performing Show DDL or Export DDL operation, why do I get this error message?**

    "Failed to start the program, because MSVCRT100.dll is missing. Try reinstalling the program to solve the problem?"

    Solution: This is because the operation requires gs_dump.exe to execute, and it requires the Microsoft VC runtime library *msvcrt100.dll*.

    To solve this, copy the ***msvcrt100.dll*** file from the **\Windows\System32** folder to **\Windows\SysWOW64** folder.

12. **Why does the saved connection profile details not show when I try to establish a connection?**

    Solution: This could happen if the *Profile* folder under *User Data* folder is not available or modified manually. Make sure the *Profile* folder is present with correct naming convention.

13. **When I close and reopen Data Studio the SQL query history information is lost. Why does this happen?**

    Solution: This could happen if the *Profile* folder is missing under *User Data* folder or the folder has been modified. Make sure the *Profile* folder is present with correct naming convention.

14. **When I try to modify any preference error saving preference message displays. Why do I get this error message?**

    Solution: This can happen if the *Preferences* folder is not present or renamed. Restart Data Studio to resolve this issue.

15. **What do I do when Data Studio becomes idle and *Data Studio.log* file states "No more handles"?**

    Solution: Restart Data Studio.

16. **What happens if an error occurs after I have edited a table and I am unable to make further changes?**

    Solution: All previously edited data will be lost. Close the **Edit Table Data** window and perform the changes again.

17. **Why do I keep getting the message "The number of pasted cell and the selected cell does not match" even though I have made the correct number of cell selection?**

    A: This can happen if the settings in **Preferences > Query Results** is set to include column header. The selected cells includes the column header cells as well. Modify the settings to disable include column header option and try again.

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10 Security Management

NOTICE

Users must ensure that the operating system is updated with the latest patches to prevent vulnerabilities and other security issues.

This section provides the security management information for Data Studio and it contains the following topics:

10.1 Login History

10.2 Secure Export

10.3 Securing the Application In-Memory Data

10.4 SQL History

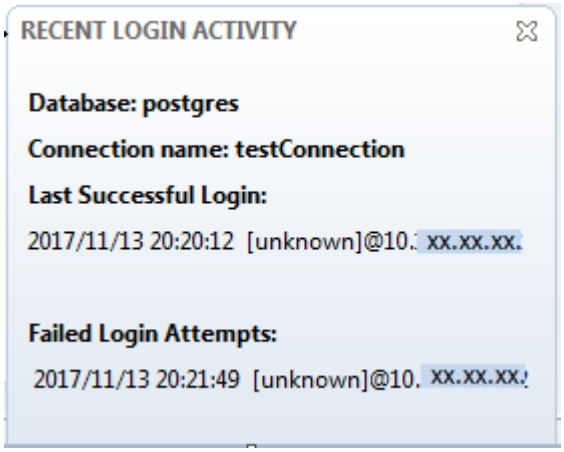
10.5 SSL Certificates

10.1 Login History

The following information is critical to manage security for Data Studio:

- When you log into the database, Data Studio displays a pop-up with details of the last successful login and failure attempts between the last two successful logins for you on the logged database.

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NOTE

If the pop-up displays the message "Last login details not available", then it implies that the connected database does not support the last login display feature.

- Your password will expire within 7 days from the date of notification. If the password expires, contact the database administrator to reset the password.
- The password must be changed every 90 days.

10.2 Secure Export

The following information is critical to manage security for Data Studio:

You can ensure secure export of DDL and data using Data Studio by enabling the SSL connection. Refer to **6.1.1 Adding a Connection** for steps to enable SSL connection.

10.3 Securing the Application In-Memory Data

The following information is critical to manage security for Data Studio:

- While running Data Studio in trusted environment, user must ensure to prevent malicious software to scan or access the memory which is used to store application data including sensitive information.

10.4 SQL History

The following information is critical to manage security for Data Studio:

- SQL History scripts are not encrypted.
- The **SQL History** list does not display sensitive queries that contain the following keywords:
  - Alter Role
  - Alter User
  - Create Role

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- Create User
- Identified by
- Password

Few query syntax examples are listed below:

- ALTER USER name [[WITH] option [...]]
- CREATE USER name [[WITH] option [...]]
- CREATE ROLE name [[WITH] option [...]]
- ALTER ROLE name [[WITH] option [...]]

10.5 SSL Certificates

NOTICE

The information on using SSL certificates is included only for reference purposes. For details on the certificates and for security guidelines for managing the certificates and related files, refer the database server documentation.

Data Studio can connect to the database using the Secure Sockets Layer [SSL] option. The following files are required to **add a connection**.

#	Certificate/Key	Description
1	Client SSL Certificate	Provided by System/Database Administrator
2	Client SSL Key	Provided by System/Database Administrator
3	Root Certificate	Provided by System/Database Administrator

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11 FAQs

1. **What are the reasons for a connection failure and what aspects must be checked in case of a connection failure?**

   A: Some of the reasons for a connection failure are as follows:

   - Verify the **Connection Properties**, to check whether the input to the connection properties is correct.
   - Check whether the server and client versions are compatible.
   - Check whether *database\pg_hba.conf* file is configured properly. Refer to the server manual for more details.
   - Check whether *Data Studio.ini* file is configured properly.

2. **When I try to establish a second connection with a different server using the same SSL certificates, why is the connection successful?**

   A: If the same SSL certificates are used by different server, then the second connection will be successful because the certificates are cached.

   When you try to establish a second connection with a different server using different SSL certificates, the connection will fail because of a certificate mismatch.

3. **Where is successfully logged connection information stored?**

   A: The information regarding the successfully logged connection information is stored in the following path:

   DataStudio\workspace\.metadata\.plugins\org.eclipse.core.runtime\.settings\com.huawei.mppdbide.view.prefs.

4. **When I right-click on the function/procedure and perform 'Refresh' in the Object Browser, the function/procedure is not visible. What can be the reason?**

   A: This may happen when you drop a function/procedure and recreate it. In this case, refresh the parent folder to view the function/procedure in the **Object Browser**.

5. **What action must be taken if a critical error occurs in a database session and is unable to proceed?**

   A: Critical error can occur in some of the following cases. Check whether:

   - The connection is left idle for long time and has timed out.
   - The server is running or not.
   - There is enough memory available on the server and no "out of memory" is reported on the server.

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6. **What is a constraint?**

   A: Constraints are used to restrict the insertion of unwanted data in columns. You can create constraints on single or multiple columns of any table. It maintains the data integrity of the table.

   There are three types of constraints supported:

   - Primary Key constraint
   - Unique Key constraint
   - Check constraint

7. **What is an index?**

   A: An index is a copy of select columns of data from a table that can be searched very efficiently. It also includes a low level disk block address or a direct link to the complete row of data it was copied from.

8. **What is the default encoding for Data Studio's files?**

   A: Exported, imported, and system files are encoded with the system's default encoding as configured in *Settings* > *Preferences*. The default encoding is UTF-8.

9. **When I try to open another instance of Data Studio multiple instances of Data Studio is not supported message displays. Why do I get this error message?**

   A: Opening multiple instances of Data Studio by the same user is not supported.

10. **When I try to perform DDL operation on an object, the task keeps running indefinitely and I am unable to cancel the task. What could be the reason?**

    A: This can happen if there is another active DML/DDL operation being performed on the same object. Close all active DML/DDL operations on the object and try again. If the problem still persists, it could be that another user might be performing a DML/DDL operation on that object. Try after sometime.

11. **Why is the exported query result different from the data available in the Results tab?**

    A: For export result set data, the query is re-executed using a new connection. Hence the exported result may differ from the data shown in the **Results** tab.

12. **Why does last login information show "Last login details not available"?**

    A: Last login details not available is shown, when you are connected to the older version of the database server or you have logged into the database for the first time after the database has been created.

13. **Why is the error marked incorrectly in the SQL Terminal?**

    A: This happens when server returns the incorrect line number. Review the error message in **Messages** tab and navigate to the corresponding line number to fix the error.

14. **Do Show DDL and Export DDL display dropped column information?**

    A: Yes, **Show DDL** and **Export DDL** operation will display the dropped column information.

15. **Why does Data Studio not launch after I have modified the -Xmx parameter?**

    A: This happens if the value defined for -Xmx parameter may be invalid. Refer to **4.1 Installing and Configuring Data Studio**.

16. **How can I access a Terminal quicker if I have opened multiple number of Terminals or tab?**

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A: After the number of opened Terminals or tabs reaches a certain limit based on screen resolution an icon () displays with a drop-down option at the end of the Terminal list. Click the  icon and select the required Terminal from the drop-down list. If the  is not available, then use the tooltip to identify the Terminal or tab. Terminal name can be searched by typing the search value above the list of SQL Terminal names.

Example:

- *s, this displays all Terminal name that starts with s.
- test, this displays all Terminal name that starts with test.
- *2, this displays all Terminal name that contains 2 in them.

17. **Why is that after I change the language DS restarts but the language does not change?**

    A: Sometimes the language may not reflect the selected change post restart. Manually restart DS to open the tool in selected language.

18. **Why does the last login details information not display?**

    A: At times the server returns an error while trying to fetch last login details. In such scenarios the last login pop-up message does not display.

19. **When viewing/exporting DDL, why does the Chinese text not show properly?**

    A: This happens if the SQL, DDL, object names or data contains Chinese text and the Data Studio file encoding is not set to GBK. To solve this, go to Settings > Preferences > Environment > **File Encoding Preferences** and set the encoding to GBK.

    The supported combinations of Database and Data Studio encoding for export operation are shown in **Table1 Supported combinations of file encoding**.

    To open/view the exported files in Windows Explorer: Files exported with UTF-8 encoding can be opened/viewed by double-clicking it or by right-clicking on the file and selecting **Open.** Files exported with GBK encoding must be opened in MS-Excel® using the import external data feature (**Data** > **Get External Data** > **From Text**).

Table 11-1 Supported combinations of file encoding used in the Database and Data Studio

Database Encoding	Data Studio File Encoding	Support for Chinese Text in Table Names	Support for English Text in Table Names
GBK	GBK	Yes	Yes
GBK	UTF-8	No - Incorrect details	No - Incorrect details
UTF-8	GBK	No - Export Fails	No - Incorrect details
UTF-8	UTF-8	Yes	Yes
SQL_ASCII	GBK	Yes	Yes
SQL_ASCII	UTF-8	No - Incorrect details	No - Incorrect details

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20. **Why do I get the error message "Conversion between GBK and LATIN1 is not supported"?**

    A: This message occurs if the Data Studio and Database encoding selected are incompatible. To solve this, select the compatible encoding. Compatible encoding is shown in **Table 11-2**

    Table 11-2 Table2 Compatible Encoding Formats

Data Studio Encoding	Database Encoding	Compatible
UTF-8	GBK	Yes
	LATIN	Yes
	SQL_ASCII	Yes
GBK	UTF-8	Yes
	LATIN	No
	SQL_ASCII	Yes
LATIN	UTF-8	Yes
	GBK	Yes
	SQL_ASCII	Yes
SQL_ASCII	UTF-8	Yes
	LATIN	Yes
	GBK	Yes

21. **Why is the PL/SQL procedure I compiled and executed is saved as PL/SQL function?**

    A: The database does not differentiate between PL/SQL function and procedure. According to the database all procedures are functions. Hence PL/SQL procedure is saved as PL/SQL function.

22. **Why is that I am not able to edit the distribution key?**

    A: The database allows you to edit the distribution key only for the first insert operation.

23. **While editing table data if I do not enter a value for default value column, will the value be added by the database server?**

    A: Yes, the database server will add the value but the value will not be visible after save in the Edit Table Data tab. Use the refresh option from the Edit Table Data tab or re-open the table again to view the added default value(s).

24. **While modifying/deleting table data why do I get a pop-up stating that more than one matching row found?**

    A: This happens because there are additional rows detected for modification/deletion based on Custom Unique Key or All Columns selection. If Custom Unique Key is selected, then it will delete/modify the rows that have exact match of the data in the column selected for deletion/modification. If All Columns is selected, then it will delete/

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modify the rows that match data in all columns. Hence this duplicate records matching the Custom Unique Key or All Columns will be deleted/modified if Yes is selected. If No is selected, the row that is not saved will be marked for correction.

25. **When I right-click on a text box I see additional context menu options. Why does this happen?**

    A: The additional context menu options like Right to left Reading order, Show Unicode control characters and so on are provided by Windows 7 in case the keyboard you are using supports right to left and left to right input.

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12 Glossary

The following table contains abbreviations, terminologies and their descriptions:

Term	Definition
Breakpoint	A location in a program at which execution is halted so that a programmer can examine the program's status, the contents of Variable, and so on.
Client	A computer or program that connects to or requests the services of another computer or program.
Column constraints	Column constraints are restrictions on the data that can be inserted into a given column.
Compile	Performs a PL/SQL compilation of the function.
Consistency	Transactions always operate on a consistent view of the data. Data is consistent as long as it conforms to a set of invariants, that is, no two rows in the customer table can have the same customer ID and all orders have an associated customer row. When one transaction gets inconsistent, other transactions cannot see these inconsistencies, and it be eliminated when the transaction ends.
CSV	A comma-separated value (CSV) (also sometimes called character-separated value, because the separator character does not have to be a comma) file stores tabular data (numbers and text) in plain-text form. Plain text means that the file is a sequence of characters, with no data that has to be interpreted instead, as binary numbers. A CSV file consists of a number of records, separated by line breaks of some kind; each record consists of fields, separated by some other character or string, most commonly a literal comma or tab. Usually, all records have an identical sequence of fields.
Database (DB)	Database is a collection of related information, typically organized to make common retrievals easy and efficient. Properties of a database: ● Database name ● Endian file formats (BIG_ENDIAN or LITTLE_ENDIAN) ● Relations ● A database without relation cannot exist

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Term	Definition
Database Administrator (DBA)	A database administrator (short form DBA) is a person responsible for the installation, configuration, upgrade, administration, monitoring and maintenance of databases in an organization. The role includes the development and design of database strategies, monitoring and improving database performance and capacity, and planning for future expansion requirements. They may also plan, co-ordinate and implement security measures to safeguard the database.
DBMS	**Database Management System**: A database management system (DBMS) is a software package with computer programs that controls the creation, maintenance, and use of a database. It allows organizations to conveniently develop databases for various applications.
DDL	A data definition language or data description language is syntax that is similar to a computer programming language for defining data structures, especially database schemas.
Debugging	Debugging is a methodical process of finding and reducing the number of bugs, or defects, in a computer program or a piece of electronic hardware, thus making it behave as expected.
Debug Object	Debug Object is an abstraction of any database debug-able objects like functions/ procedures.
Default	The pre-defined configuration of a system or an application. In most programs, the defaults can be changed to reflect personal preferences.
DML	**Data Manipulation Language**: A data manipulation language (DML) is a family of syntax elements similar to a computer programming language used for inserting, deleting and updating data in a database. Performing read-only queries of data is sometimes also considered a component of DML.
Drop-down menu	A menu that opens vertically on-screen to display context-related options. Also called pop-up menu or pull-down menu.
Execute	To perform an instruction.
Expression	An SQL statement that returns a value.
Field	A field is a segment of database record for query and display. It is a part of a record used for a particular category of data. Properties of a field: ● Field name ● Field type ● Field size ● Wildcard Value: Default value (this is provided only for Field types, namely, UINT8, UINT16, UINT32, STRING, VSTRING, and IP_ADDRESS).

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Term	Definition
GUI	**Graphical User Interface**: A working environment in which a computer user is presented with a screen on which there are pictures or Icons representing programs, actions or files, and either uses a mouse cursor (or similar pointing device) to select the appropriate icon or uses a keyboard with directional buttons or keys to move around the screen and select the appropriate icon. There are often drop-down menus available when the mouse is placed over certain parts of the screen. A GUI typically makes use of Object-Oriented or event-driven programming; instead of following a pre-determined sequence of actions, the application waits for an event such as a mouse-click over a particular icon, to determine what action is required and execute the appropriate piece of code; the application then goes back into the "wait" state until another event occurs, such as a mouse click over a different icon.
Hadoop Distributed File System (HDFS)	Hadoop distributed file systems allow data access with a high throughput and are applicable to large-scale data set applications.
HTML	An application of the Standard Generalized Markup Language that uses tags to mark elements, such as text and graphics, in a document to indicate how Web browsers must display these elements to the user and must respond to user actions.
In-memory database	An in-memory database (IMDB; also main memory database system or MMDB) is a database management system that primarily relies on main memory for computer data storage. It is contrasted with database management systems which employ a disk storage mechanism. Main memory databases are faster than disk-optimized databases since the internal optimization algorithms are simpler and execute fewer CPU instructions. Accessing data in memory reduces the I/O reading activity when querying the data which provides faster and more predictable performance than disk. In applications where response time is critical, such as telecommunications network equipment and mobile ads networks, main memory databases are often used.
Key	A key is a field, or combination of fields, that uniquely identifies a record in a table.
Key Store	A key store is a file that contains your public and private keys.
Menu Bar	The horizontal strip across the top of an application's window. Each word on the strip has a context sensitive drop-down menu containing features and actions that are available for the application in use.
Null Value	A field that does not contain a data item is said to have a null value. In a numeric field, a null value is not the same as a value of zero; in a character field, a null value is not the same as a blank -- both the numeric zero and blank character are definite values. A null value indicates that the field's value is undefined -- its value is not known.
Object Browser	The object browser gives you access to all information that is relevant to PL/SQL development: ● Create, view, edit, rename and drop objects. ● View properties of the database and table. ● Query and edit the data of tables and views.

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Term	Definition
OLAP	**Online Analytical Processing:** A technology that uses multidimensional structures to provide rapid access to data for analysis. Source data for OLAP is commonly stored in data warehouses in a relational database.
ORDBMS	**Object-relational Database Management System:** An object-relational database (ORD), or object-relational database management system (ORDBMS), is a database management system (DBMS) similar to a relational database, but with an object-oriented database model: objects, classes and inheritance are directly supported in database schemas and in the query language. In addition, just as with pure relational systems, it supports extension of the data model with custom data-types and methods.
PL/pgSQL	**Procedural Language/PostgreSQL:** A procedural programming language which is supported by PostgreSQL ORDBMS.
PL/SQL	PL/SQL stands for Procedural Language extension of SQL. PL/SQL is a combination of SQL along with the procedural features of programming languages. It was developed by Oracle Corporation in the early 90's to enhance the capabilities of SQL.
PL/SQL Functions	A function is a named PL/SQL block which is similar to a procedure. The major difference between a procedure and a function is, a function must always return a value, but a procedure may or may not return a value.
Port	A network portal through which two computing processes can communicate.
Postgres/PostgreSQL	PostgreSQL, often simply "Postgres", is an object-relational database management system (ORDBMS) with an emphasis on extensibility and standards-compliance. As a OLAP database, its primary function is to store data, securely and supporting best practices, and retrieve it later, as requested by other software applications, be it those on the same computer or those running on another computer across a network (including the Internet). It is free and open source software, released under the terms of the PostgreSQL License, a permissive free software license.
Primary Key	A primary key uniquely specifies a tuple within a table. In order for an attribute to be a primary key it must not repeat. While natural attributes (attributes used to describe the data being entered) are sometimes good primary keys, surrogate keys are often used instead.
Procedures	Procedures, also known as routines, subroutines, methods, or functions (not to be confused with mathematical functions, but similar to those used in functional programming), simply contain a series of computational steps to be carried out.
Procedural Language	Procedural programming can sometimes be used as a synonym for imperative programming (specifying the steps the program must take to reach the desired state), but can also refer (as in this article) to a programming paradigm, derived from structured programming, based upon the concept of the procedure call. Procedures, also known as routines, subroutines, methods, or functions (not to be confused with mathematical functions, but similar to those used in functional programming), simply contain a series of computational steps to be carried out. Any given procedure might be called at any point during a program's execution by other procedures or by itself.

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Term	Definition
Query	A complete select statement that specifies 1) the columns and tables from which data is to be retrieved, 2) optionally, conditions that the data must satisfy, 3) optionally, computations that are to be performed on the retrieved column values, and 4) optionally, a desired ordering of the result set.
Relational Database	A relational database is a database that has a collection of tables of data items, all of which is formally described and organized according to the relational model. Data in a single table represents a relation, from which the name of the database type comes. In typical solutions, tables may have additionally defined relationships with each other.
Relational Model	A database in which inter-table relationships are organized based on common data columns which define a one-to-many relationship between a row of the primary key table and one or more rows of the matching foreign key table. Besides describing how the database tables are related, the relational model also defines how the related data can be accessed and manipulated. SQL is the most commonly used relational model database language.
Row	One set of related values for all of the columns declared in a given table. Also known as a record occurrence.
Schema	A schema is a collection of logical structures of data or schema objects.
SSL	**Secure Sockets Layer:** A security protocol that works at a socket level. This layer exists between the TCP layer and the application layer to encrypt/decode data and authenticate concerned entities.
Step Into	Step Into executes a single program statement at a time. If the execution point is located on a call to a subprogram, Step Into steps into that subprogram and places the execution point on its first statement. If the execution point is located on the last statement of a subprogram, Step Into returns from the subprogram, placing the execution point on the line of code that follows the call to the subprogram from which you are returning.
Step Out	Step Out leaves the current subprogram and goes to the next statement.
Step Over	Step Over bypasses the next subprogram (unless the subprogram has a breakpoint) and goes to the next statement after the subprogram. If the execution point is located on a subprogram call, it runs that subprogram without stopping (instead of stepping into it), then positions the execution point on the statement that follows the call. If the execution point is located on the last statement of a subprogram, Step Over returns from the subprogram, placing the execution point on the line of code that follows the call to the subprogram from which you are returning.
Stored Procedure	A stored procedure or in simple a proc is a named PL/SQL block which performs one or more specific task. This is similar to a procedure in other programming languages. A procedure has a header and a body. The header consists of the name of the procedure and the parameters or variable passed to the procedure. The body consists or declaration section, execution section and exception section similar to a general PL/SQL Block. A procedure is similar to an anonymous PL/SQL block but it is named for repeated usage.

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Term	Definition
SQL	SQL referred to as Structured Query Language, is a special-purpose programming language designed for managing data in relational database management systems (RDBMS).
Table	A collection of closely related columns. A table consists of rows each of which shares the same columns but vary in the column values.
Tablespace	A tablespace is used to optimize the performance of the database.
Trust Store	A trust store is a key database file that contains the public keys for your partners' self-signed and CA certificates. The public key is stored as a signer certificate. For commercial CA, the CA root certificate is added. Because the trust store file does not contain your private key, the trust store file can be more publicly accessible than the key store file.
URI	**Uniform Resource Identifier**: A URI is the unique name used to access the resource. It is not necessarily a specific file location (For example, it may be a call to an application or a database), which is why it is preferred over the similar acronym URL (Uniform Resource Locator).
URL	**Uniform Resource Locator:** It is the global address of documents and other resources in the world wide web.
View	Views restrict access to specific rows or columns of a table. A view can be created from one or more tables and is determined by the query used to create the view.

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