BTP 22
DBPS - 18.2

A Database Administration Tool

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  - Snowflake connection
  - Security and Constraints Editor
- Nayan Ramani - 201801009
  - Bug Fixing
  - Storage and Performance Population
- Yash Ghaghada - 201801042
  - Update Drivers
  - DBO Licensing
- Shruti Agrawal - 201801077
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  - Bug Fixing
- Zenil Kothari - 201801128
  - Sequence Editors
  - Bug Fixing
- Meet Shah - 201801434
  - Table Editor
  - Depencency Population
  - Permission Population

Product Overview

What is DBPS?

DBArtisan

Core Console which automates routine processes for DB Administration.

Rapid SQL

Powerful visual interface for SQL with tools to check, debug & auto-complete.

DB Optimizer

A Tool that provide novel option to optimize the SQL queries.

DB Change Manager

Allow you to track and report changes with comparision and auditing features.

Project Work

Add Snowflake Support

The DBPS 18.2 Version requires the support of another relational database called Snowflake, which makes DBPS DB-rich software.

Update Drivers & Trial Version

Update the driver support for DB2 LUW and Sybase IQ datasource and also update the DBOptimizer Trial Version.

Understand & Resolve Bugs

Six bugs need to be resolved, which requires an understanding of the codebase to make the DBPS a more reliable platform.

Snowflake Connect String

Why Driver URL?

In order to use databases we need to first set up connections to them. As we are using JDBC/ODBC the mode of connection is using a driverURL which we can send to the database driver to set up our connection to the database.

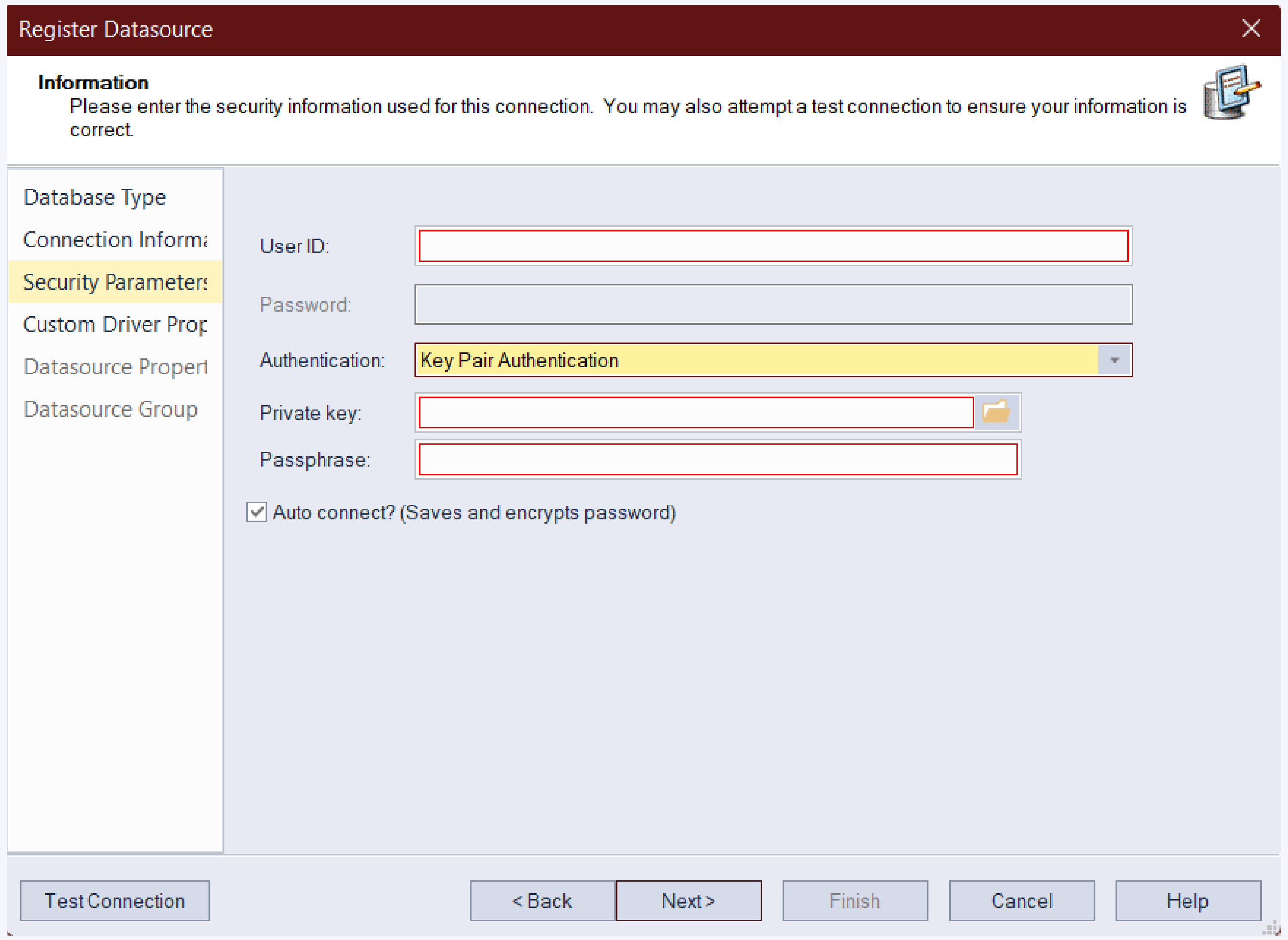
How Driver URL Looks Like?

jdbc:snowflake://<account_identifier>.snowflakecomputing.com/?<connection_params>

Description of URL parameters

- **account identifier**: host name
- **connection parameters** are Database, Warehouse and Authentication parameters. Types of Auth methods are listed below:
    - Username and Password: This requires connection parameters as username and password to be added.
    - SSO Authentication: This requires "authentication=externalbrowser" as a connection parameter.
    - Key pair Authentication: This requires a private key file and passphrase as the connection parameters

Authentication UI



Register Datasource

Information

Please enter the security information used for this connection. You may also attempt a test connection to ensure your information is correct.

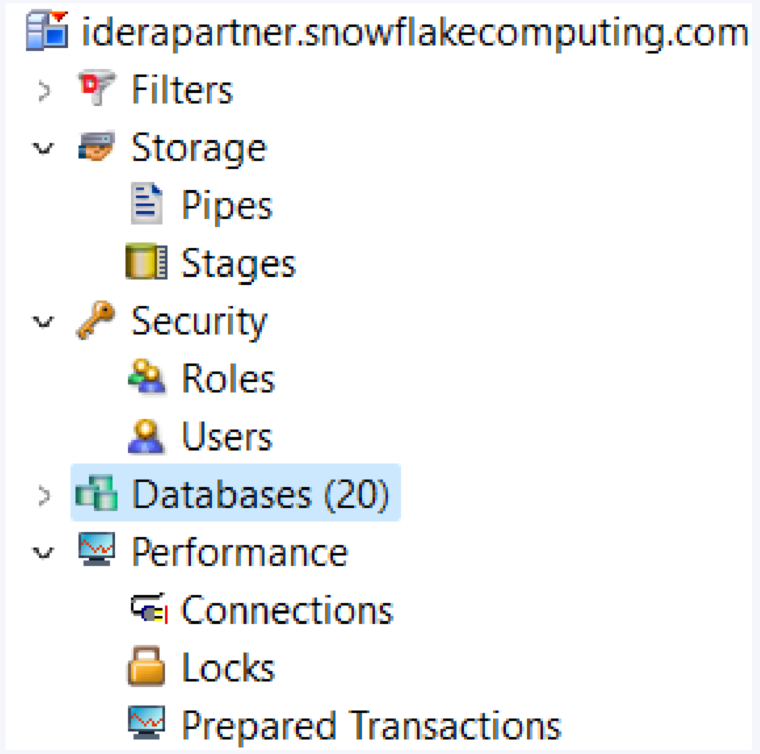
User ID:	
Password:	
Authentication:	Key Pair Authentication
Private key:	
Passphrase:	

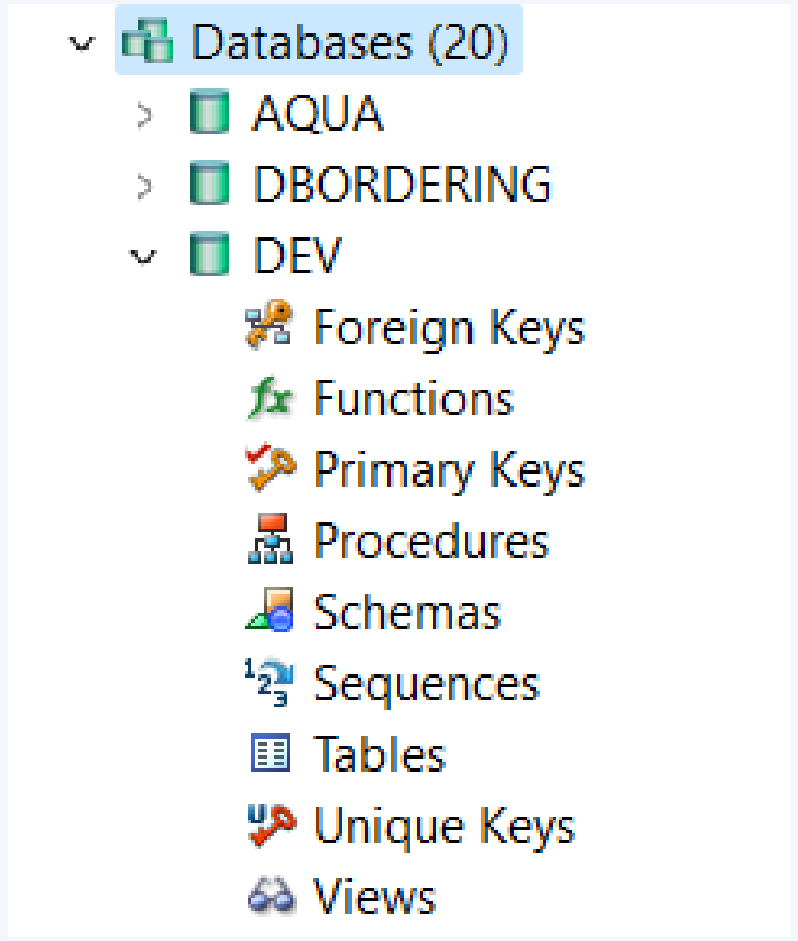
✓ Auto connect? (Saves and encrypts password)

Our Authentication UI will take these inputs. First page will take account identifier(server), database, warehouse and name of datasource we want it to have inside the app. Next page includes the authentication details as shown in the figure. Third page will let us select which driver we need to go with JDBC or ODBC.

Tree Nodes

- There is a TOT string added for each object which contains information regarding how it would show up in the tree but we have to set up an object in Snowflake which has list of all the object TOT which would show up when we open up a snowflake node and also what will show up under them.



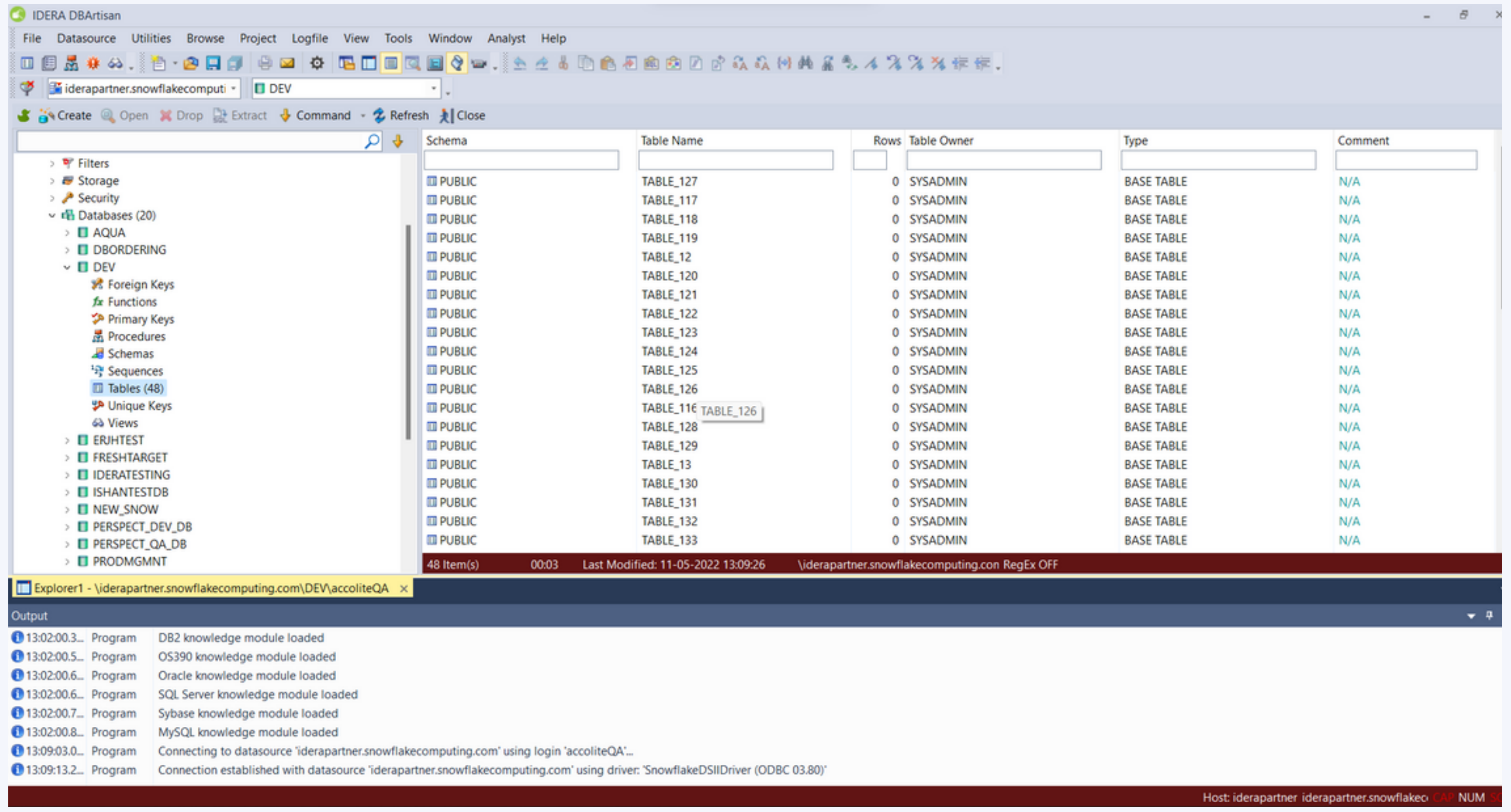


- There were no TOT Strings for Pipes, Stages and Connection so we added them and configured them.

- There are Storage, Security Node, Database Node and Performance Node.

Wizard Population

- When we click a particular tree node i.e. a particular object it needs to run a query that populates that particular object.
- For that we use an xml file which contains <Object> describing a particular object.



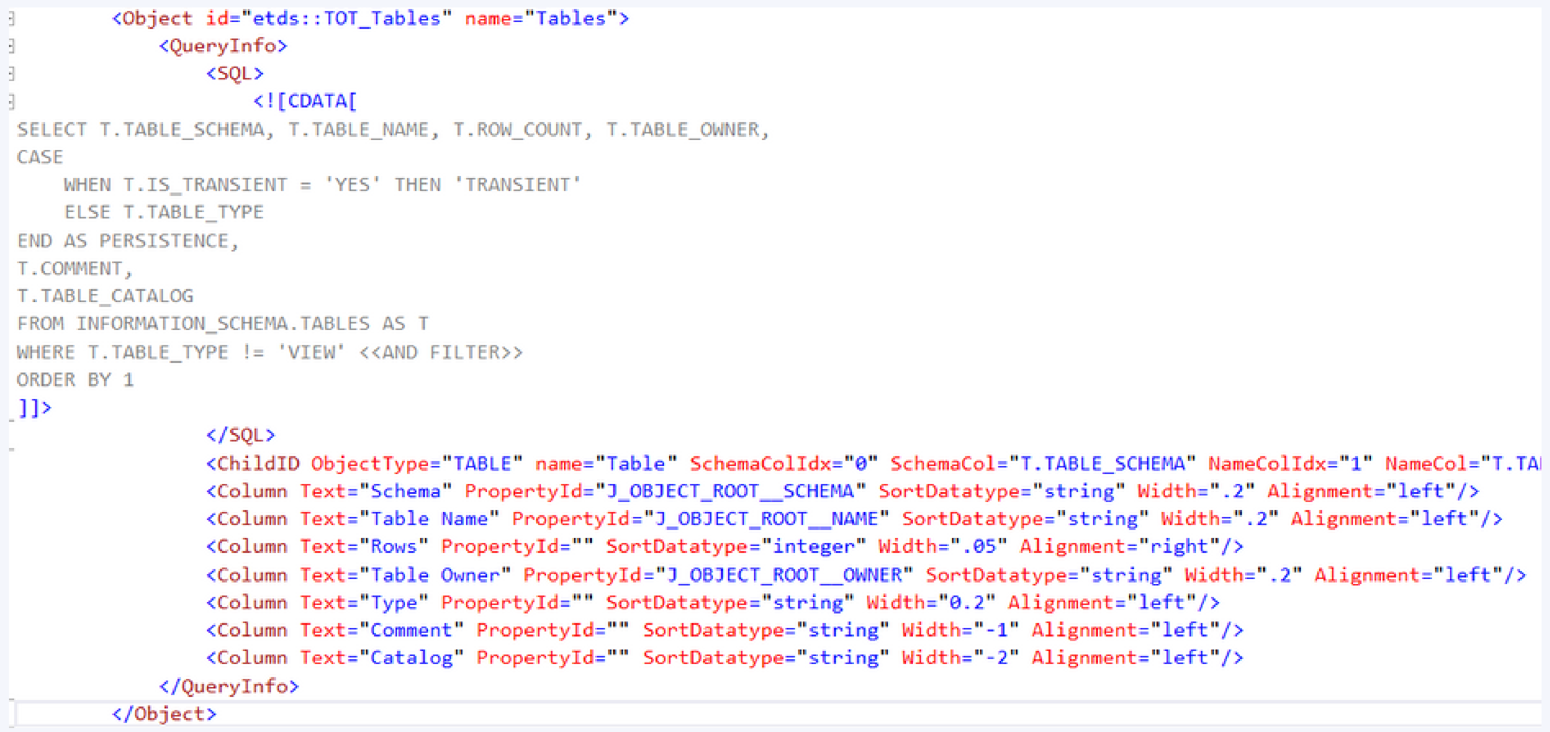
Schema	Table Name	Rows	Table Owner	Type	Comment
PUBLIC	TABLE_127	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_117	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_118	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_119	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_12	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_120	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_121	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_122	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_123	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_124	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_125	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_126	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_116 TABLE_126	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_128	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_129	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_13	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_130	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_131	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_132	0	SYSADMIN	BASE TABLE	N/A
PUBLIC	TABLE_133	0	SYSADMIN	BASE TABLE	N/A

```
48 Item(s)      00:03      Last Modified: 11-05-2022 13:09:26      \iderapartner.snowflakecomputing.con RegEx OFF
```

```
13:02:00.3...  Program  DB2 knowledge module loaded
13:02:00.5...  Program  OS390 knowledge module loaded
13:02:00.6...  Program  Oracle knowledge module loaded
13:02:00.6...  Program  SQL Server knowledge module loaded
13:02:00.7...  Program  Sybase knowledge module loaded
13:02:00.8...  Program  MySQL knowledge module loaded
13:09:03.0...  Program  Connecting to datasource 'iderapartner.snowflakecomputing.com' using login 'accoliteQA'...
13:09:13.2...  Program  Connection established with datasource 'iderapartner.snowflakecomputing.com' using driver: 'SnowflakeDSIIDriver (ODBC 03.80)'
```

```
Host: iderapartner iderapartner.snowflakec  CAP NUM
```

figure: Wizard Population DBArt



```
        <Object id="etds::TOT_Tables" name="Tables">
            <QueryInfo>
                <SQL>
                    <![CDATA[
SELECT T.TABLE_SCHEMA, T.TABLE_NAME, T.ROW_COUNT, T.TABLE_OWNER,
CASE
    WHEN T.IS_TRANSIENT = 'YES' THEN 'TRANSIENT'
    ELSE T.TABLE_TYPE
END AS PERSISTENCE,
T.COMMENT,
T.TABLE_CATALOG
FROM INFORMATION_SCHEMA.TABLES AS T
WHERE T.TABLE_TYPE != 'VIEW' <<AND FILTER>>
ORDER BY 1
]]>
                </SQL>
                <ChildID ObjectType="TABLE" name="Table" SchemaColIdx="0" SchemaCol="T.TABLE_SCHEMA" NameColIdx="1" NameCol="T.TA
                <Column Text="Schema" PropertyId="J_OBJECT_ROOT__SCHEMA" SortDatatype="string" Width=".2" Alignment="left"/>
                <Column Text="Table Name" PropertyId="J_OBJECT_ROOT__NAME" SortDatatype="string" Width=".2" Alignment="left"/>
                <Column Text="Rows" PropertyId="" SortDatatype="integer" Width=".05" Alignment="right"/>
                <Column Text="Table Owner" PropertyId="J_OBJECT_ROOT__OWNER" SortDatatype="string" Width=".2" Alignment="left"/>
                <Column Text="Type" PropertyId="" SortDatatype="string" Width="0.2" Alignment="left"/>
                <Column Text="Comment" PropertyId="" SortDatatype="string" Width="-1" Alignment="left"/>
                <Column Text="Catalog" PropertyId="" SortDatatype="string" Width="-2" Alignment="left"/>
            </QueryInfo>
        </Object>
```

figure: Wizard Population XML

- It will have <Query> as its child tag which will have an actual query to run followed by <ChildID>, <ParentID> and <Columns> tags to describe the query in detail to show up in UI.
- This XML file is loaded in C++ and will create a UI using that. The Result of this is shown in figure: Wizard Population DBArt.

Object Editors

The wizard gives us brief information about the entities present in the object of the tree node. For detailed information on a particular entity of that object, we can open an editor which has different tabs giving us information about that object entity, and also if we have permission we can edit that details

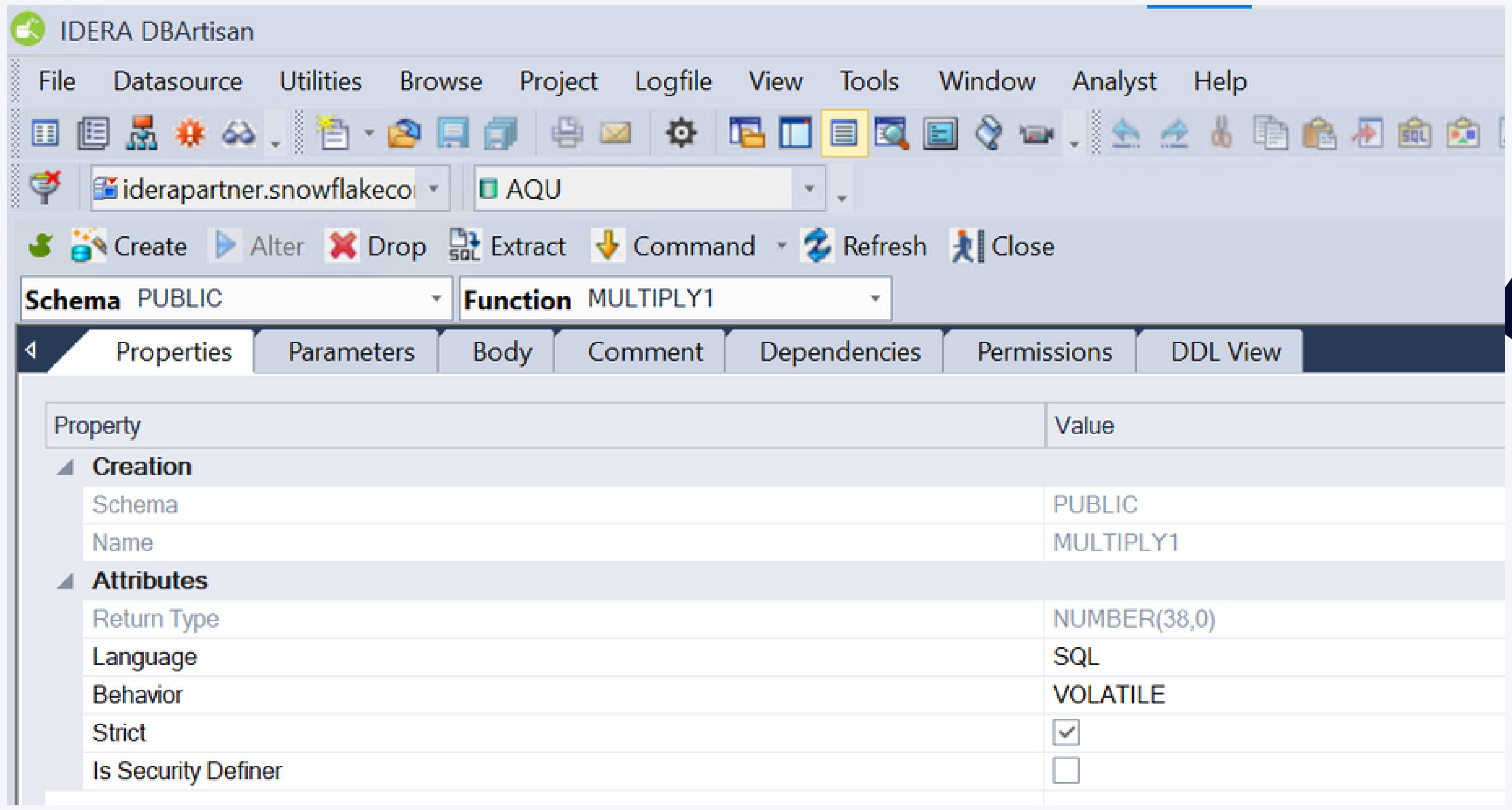
How does Editor Population Works?

When we open up Editor for a object entity it will go to the java object population to fetch the data where there will be a Snowflake < ObjectN ame >.java file which will call a query from properties files and add the required parameters to it and execute the query and send the data to the UI.

Tabs in Object Editor

- The properties tab shows and allows us to alter the features of any particular existing object which can be further divided into properties for creation, object type, and attributes.

- It is present for every Object Editor.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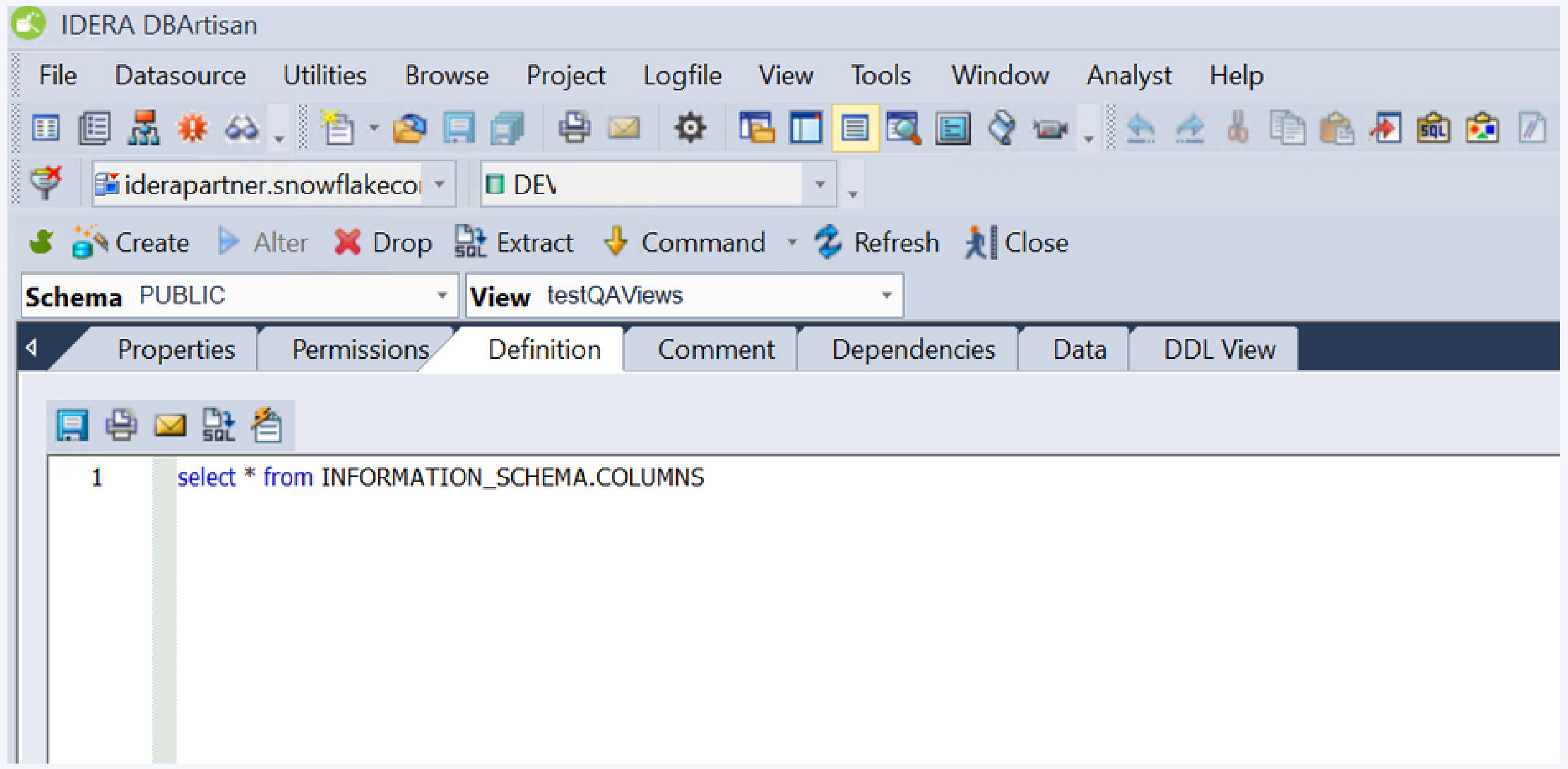
AQU
Create Alter Drop Extract Command Refresh Close
Schema PUBLIC
Function MULTIPLY1
Properties Parameters Body Comment Dependencies Permissions DDL View

Property	Value
Creation	
Schema	PUBLIC
Name	MULTIPLY1
Attributes	
Return Type	NUMBER(38,0)
Language	SQL
Behavior	VOLATILE
Strict	✓
Is Security Definer	☐

figure: Functions **Properties** Tab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Schema PUBLIC
View testQAViews
Properties Permissions Definition Comment Dependencies Data DDL View

```
select * from INFORMATION_SCHEMA.COLUMNS
```

figure: Views **Definition** Tab

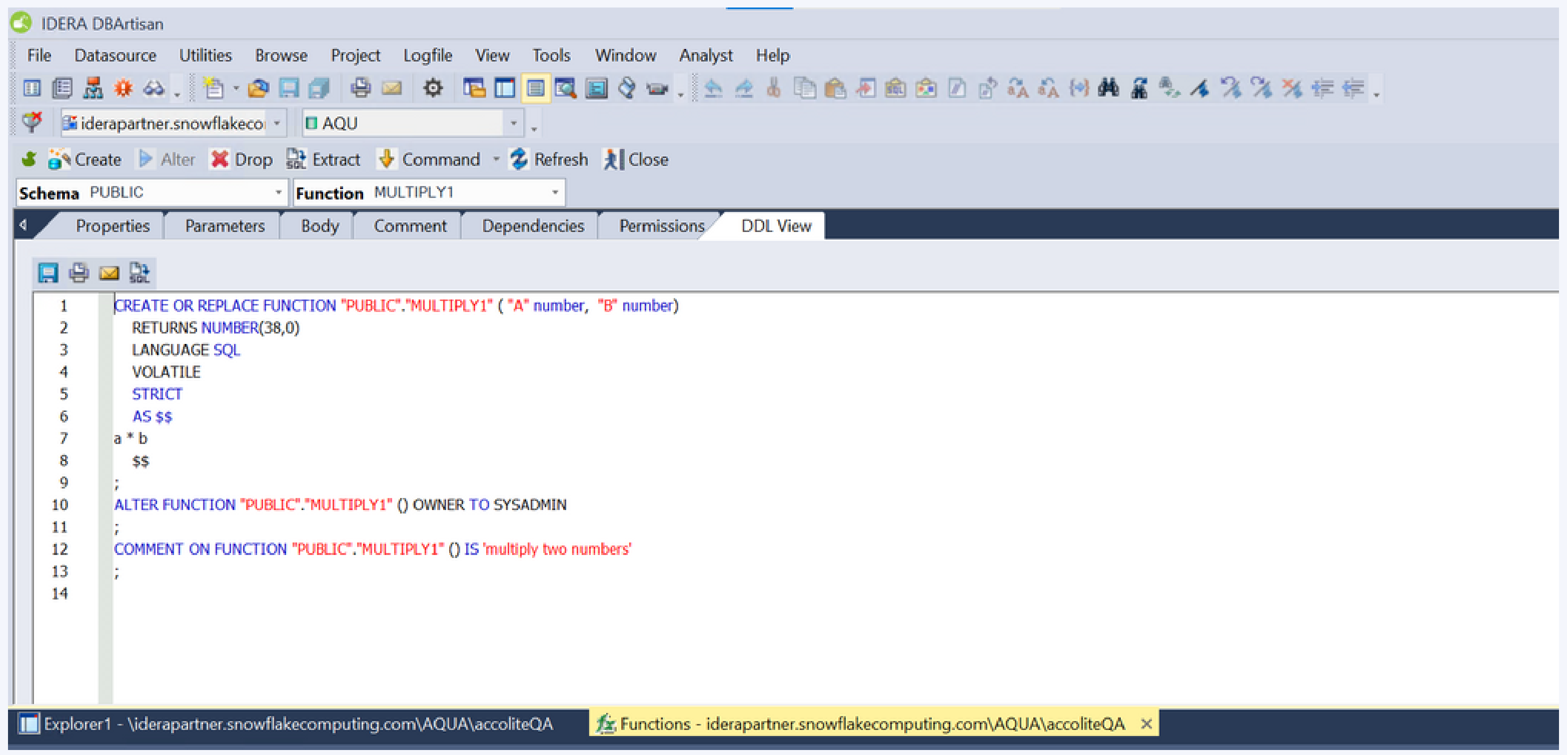
- The object definition tab parses and displays an editable window of SQL extracted from the DDL view, so the user can see the main body of the SQL query without the outer statements initializing a create/replace, object name, object schema, etc.

- It is present for Views Editor only.

Tabs in Object Editor

- The DDL view tab displays the editable window of the final SQL query that was executed in order to create/alter/drop/extract any object. Changes in any of the other tabs will be reflected in the final SQL query inside of the DDL view (and vice versa).

- It is present for every Object Editor.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Create Alter Drop Extract Command Refresh Close
Schema PUBLIC
Function MULTIPLY1
Properties Parameters Body Comment Dependencies Permissions DDL View

```
CREATE OR REPLACE FUNCTION "PUBLIC"."MULTIPLY1" ( "A" number,  "B" number)
    RETURNS NUMBER(38,0)
    LANGUAGE SQL
    VOLATILE
    STRICT
    AS $$
a * b
    $$
;
ALTER FUNCTION "PUBLIC"."MULTIPLY1" () OWNER TO SYSADMIN
;
COMMENT ON FUNCTION "PUBLIC"."MULTIPLY1" () IS 'multiply two numbers'
;
```

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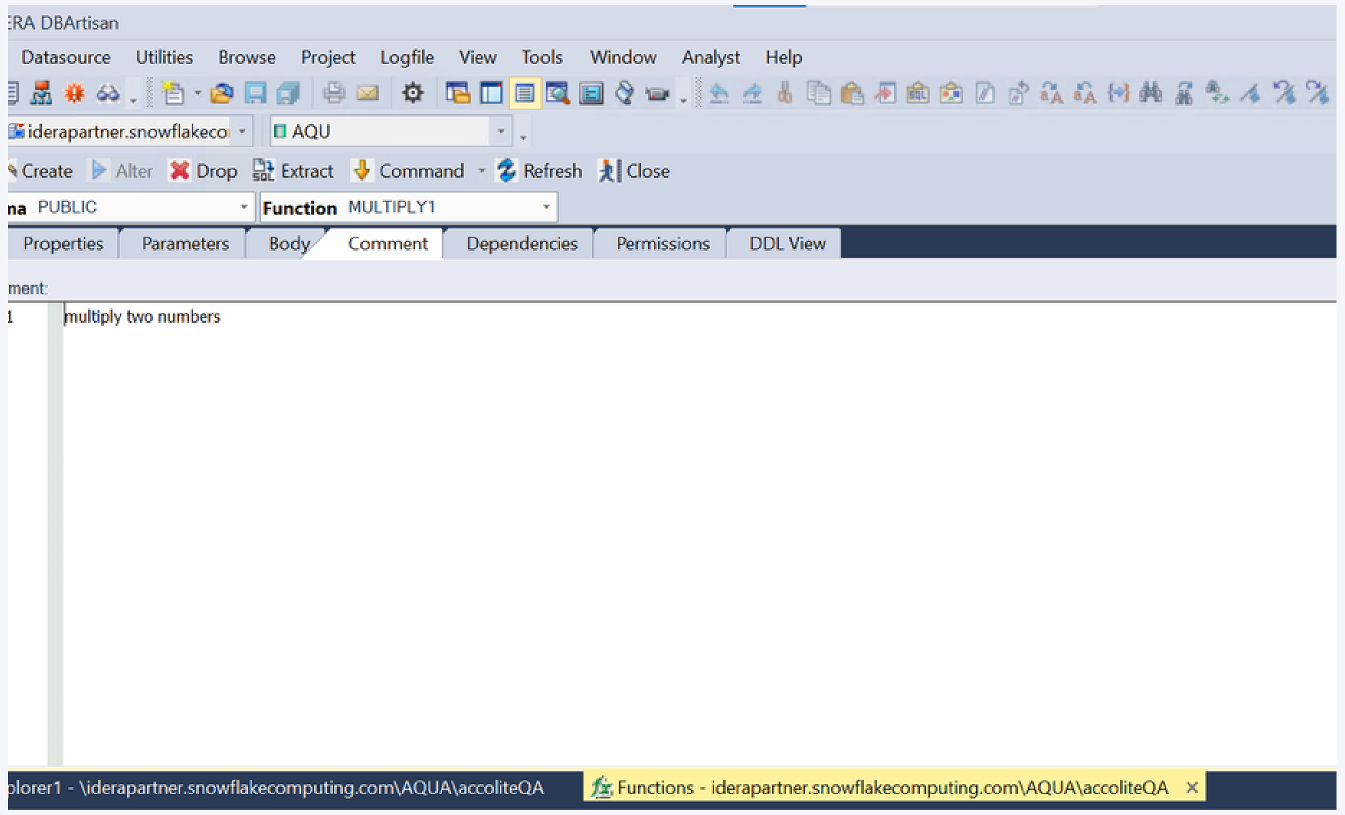
Functions - iderapartner.snowflakecomputing.com\AQUA\accoliteQA

figure: Functions **DDL View** tab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na PUBLIC
Function MULTIPLY1
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ment:

```
multiply two numbers
```

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figure: **Comment** Tab

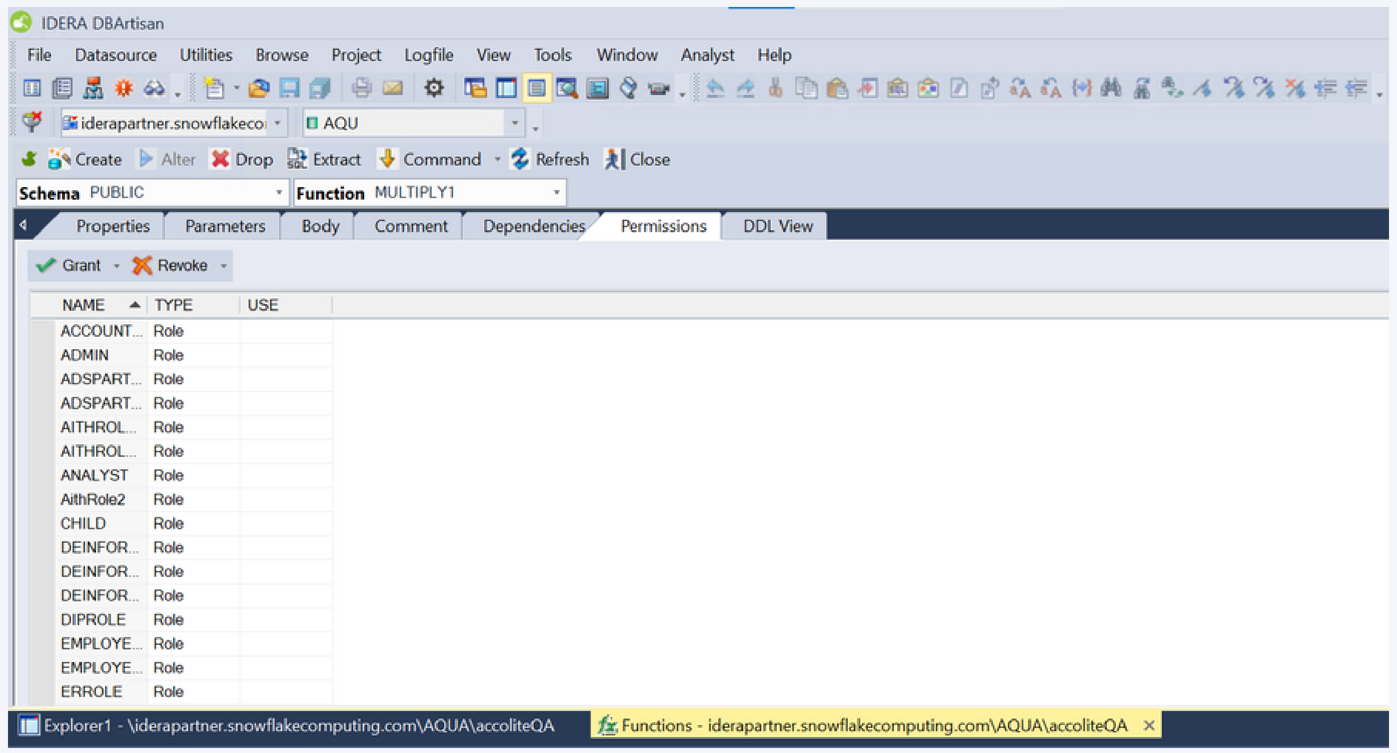
- Comments tab(if not left blank) can add/overwrite a comment for an existing object.

- Comment tab is present for every Object Editor.

Tabs in Object Editor

- It has a list of all the roles and permissions that can be granted for a particular object. We can also grant or revoke permissions for a role.

- Permissions tab is present in Roles, Functions, Procedure, Schemas, Sequences, Table and Views Editor.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File Datasource Utilities Browse Project Logfile View Tools Window Analyst Help
Create Alter Drop Extract Command Refresh Close
Properties Parameters Body Comment Dependencies Permissions DDL View
Grant Revoke

Schema PUBLIC
Function MULTIPLY1

NAME	TYPE	USE
ACCOUNT...	Role	
ADMIN	Role	
ADSPART...	Role	
ADSPART...	Role	
AITHROL...	Role	
AITHROL...	Role	
ANALYST	Role	
AithRole2	Role	
CHILD	Role	
DEINFOR...	Role	
DEINFOR...	Role	
DEINFOR...	Role	
DIPROLE	Role	
EMPLOYE...	Role	
EMPLOYE...	Role	
ERROLE	Role	

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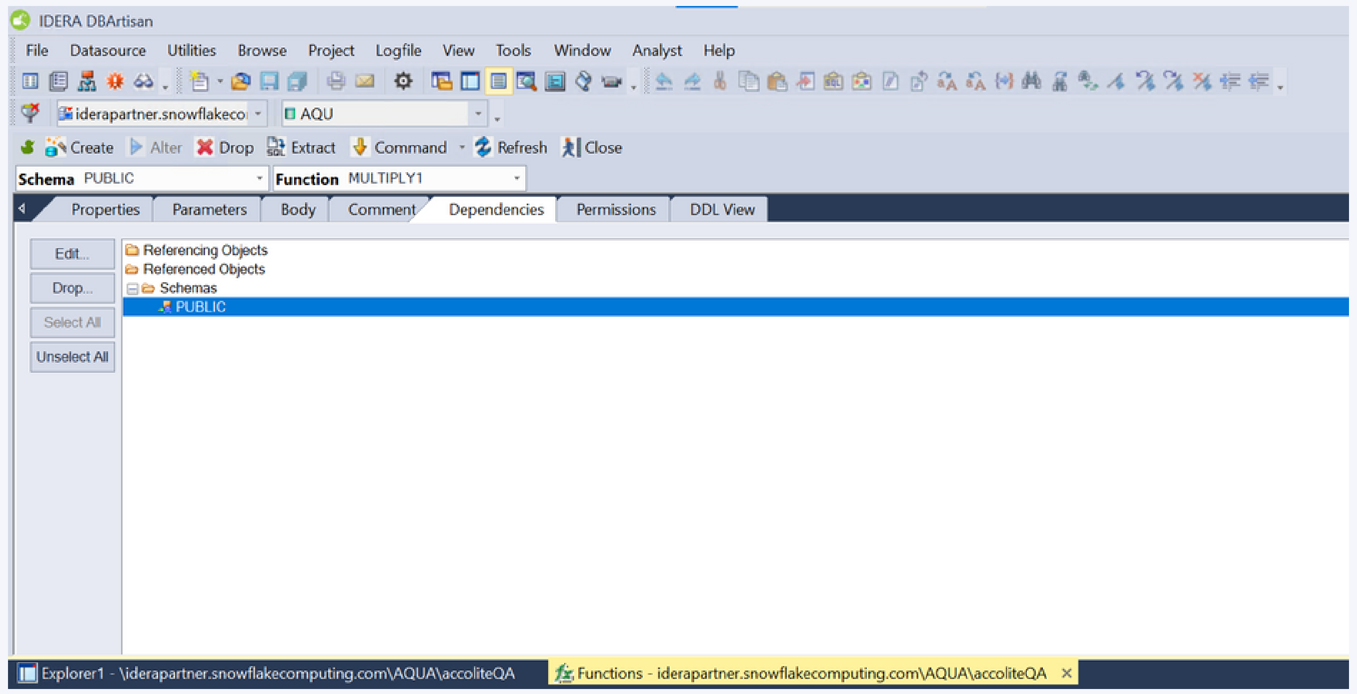
figure: Functions **Permissions** tab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Create Alter Drop Extract Command Refresh Close
Properties Parameters Body Comment Dependencies Permissions DDL View
Edit...
Drop...
Select All
Unselect All

Schema PUBLIC
Function MULTIPLY1

Referencing Objects
Referenced Objects
Schemas
PUBLIC

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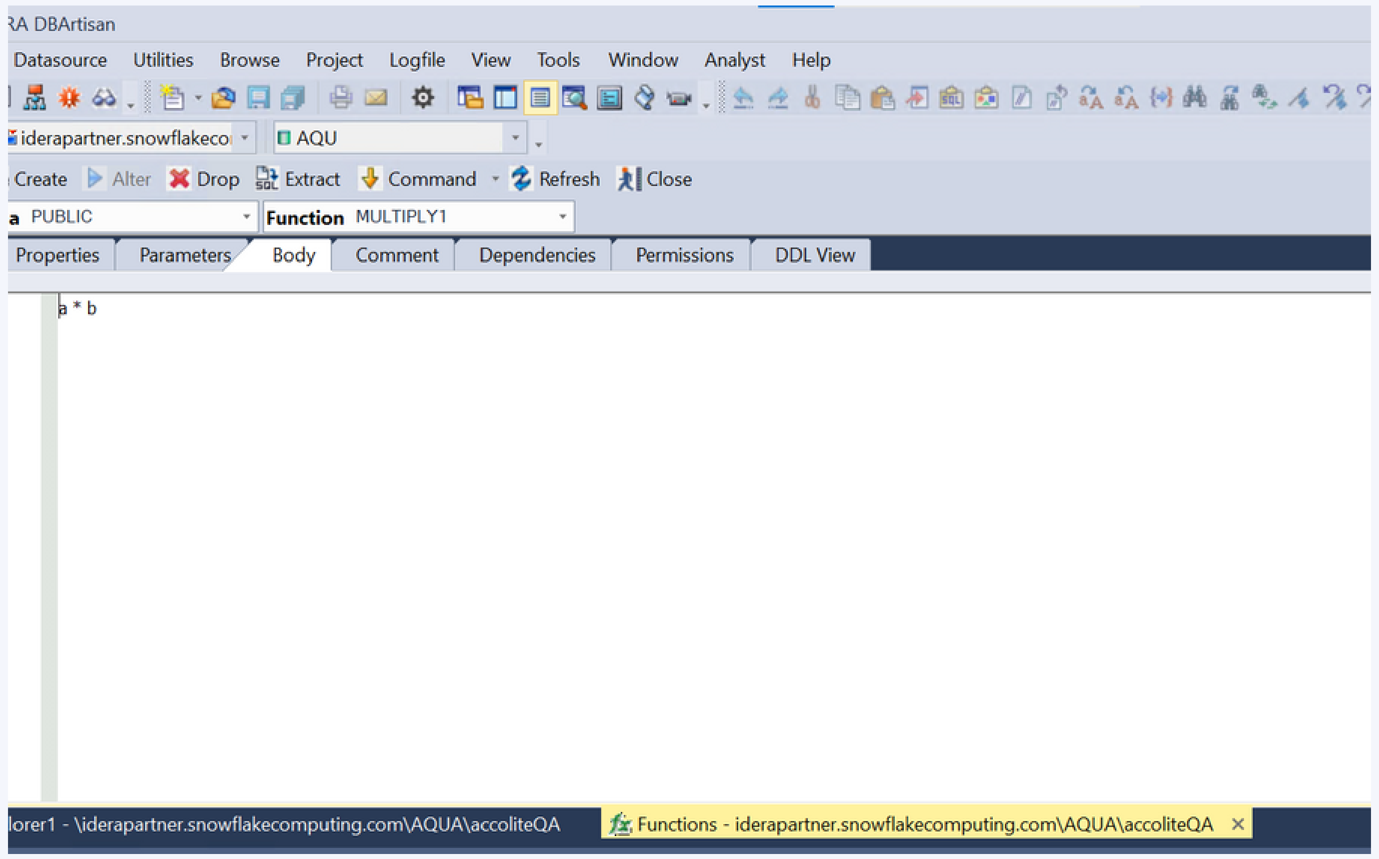
figure: **Dependencies** Tab

- It gives a list of dependencies for the object which contains of all the items that object is referring to, dependent on other items and the items which are referring to that object, depending on the current object.

- Dependencies tab is present in Foreign Keys, Primary Keys, Unique Keys, Functions, Procedure, Schemas and Views Editor.

Tabs in Object Editor

- Body tab is present for Functions and Procedure Editors.
- It contains the body of the particular function or procedure.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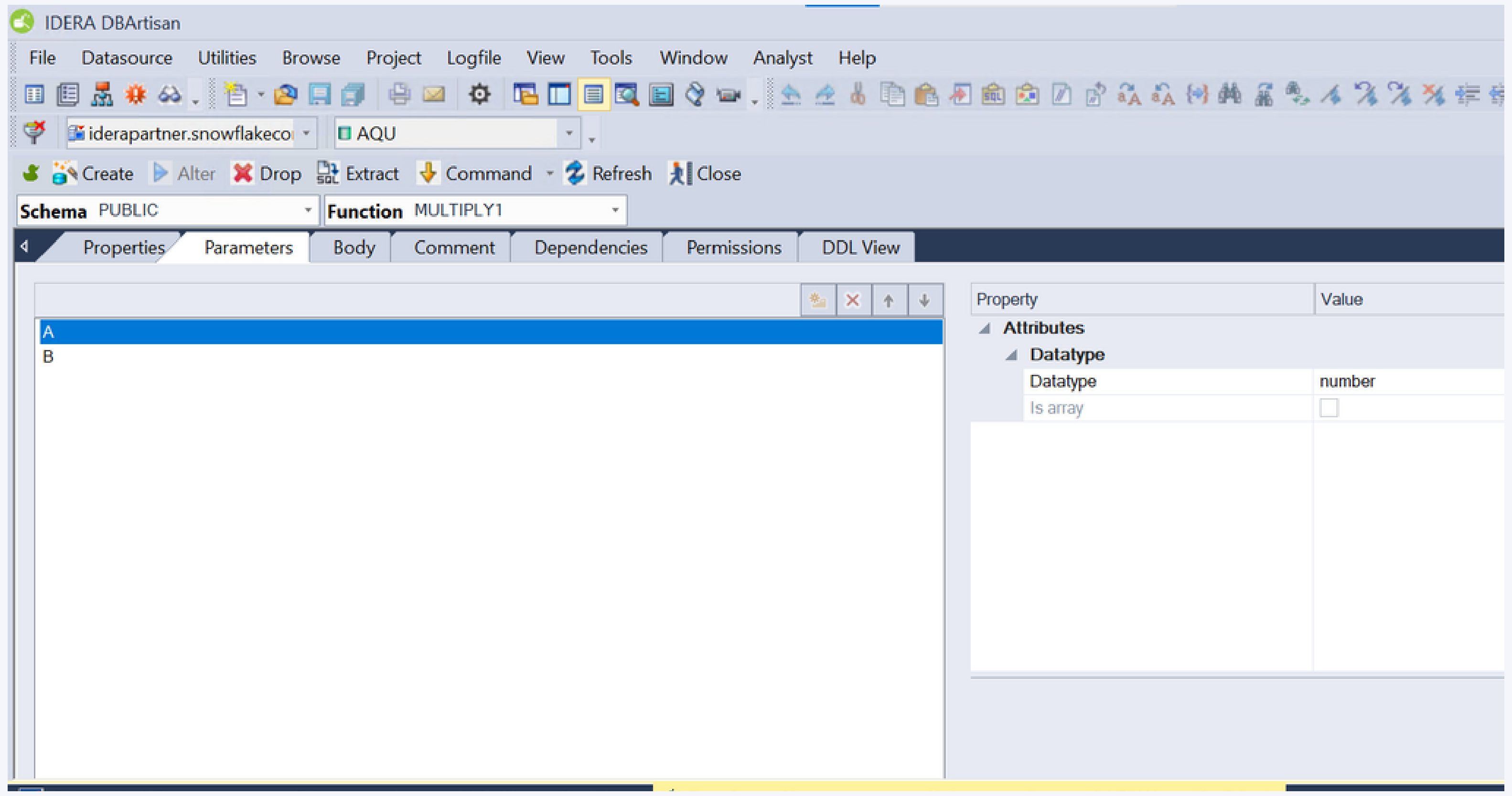
```
a * b
```

figure: **Body** tab

- Similar to Body, Parameters are also present for editors of Functions and Procedure only.
- It shows the parameters of a function/procedure and properties of the parameters.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Create Alter Drop Extract Command Refresh Close
Schema PUBLIC Function MULTIPLY1
Properties Parameters Body Comment Dependencies Permissions DDL View

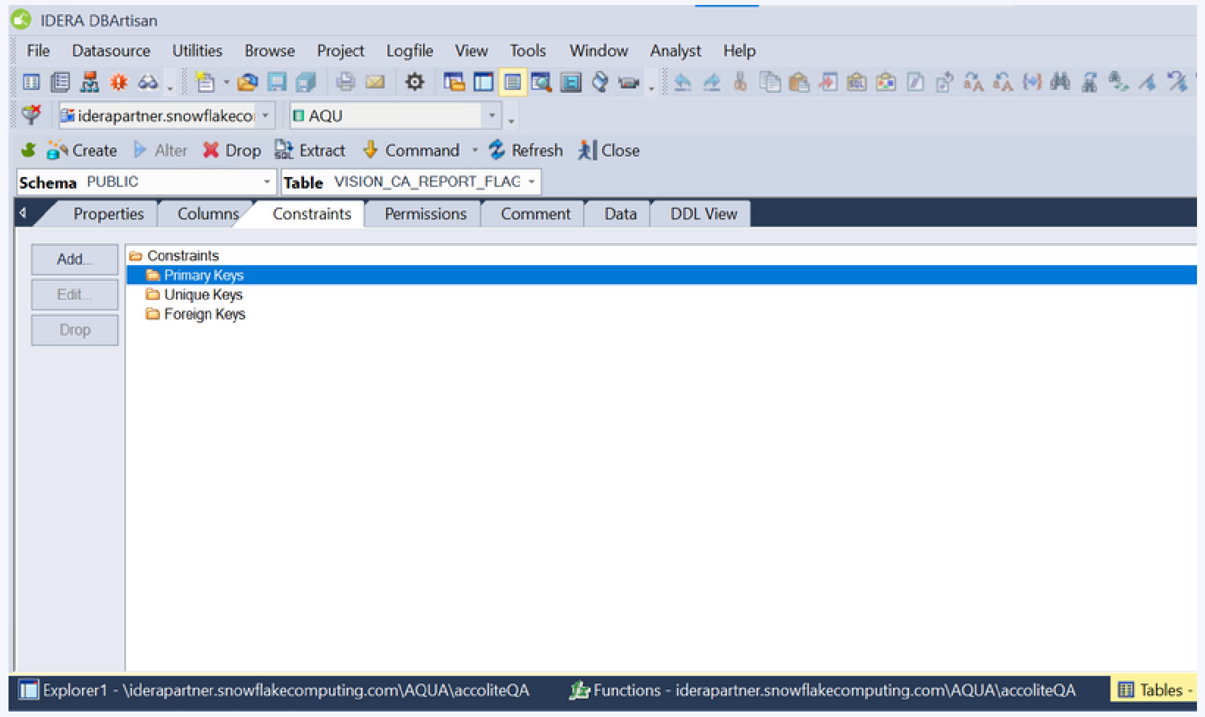
A
B

Property	Value
Attributes	
Datatype	
Datatype	number
Is array	☐

figure: **Parameters** Tab

Tabs in Object Editor

- Constraints Tab is present only for Table Editor.
- It lists down all the constraints which are applied to that particular table with having option to alter it.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Properties Columns Constraints Permissions Comment Data DDL View
Add... Edit... Drop
Constraints
Primary Keys
Unique Keys
Foreign Keys
Tables

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Schema PUBLIC · Table VISION_CA_REPORT_FLAC

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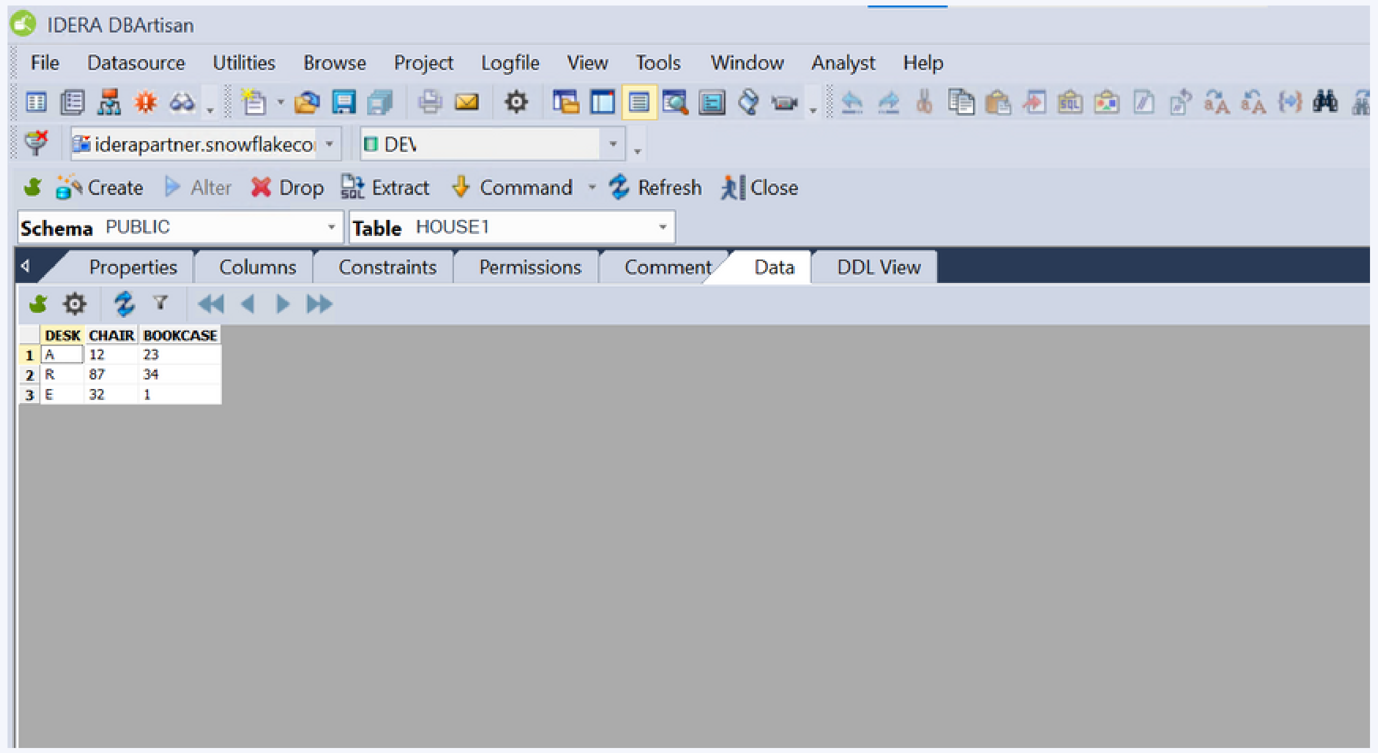
figure: **Constraints** tab

- It provides the data in that particular object.
- It is present for Tables and Views Editor.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Properties Columns Constraints Permissions Comment Data DDL View

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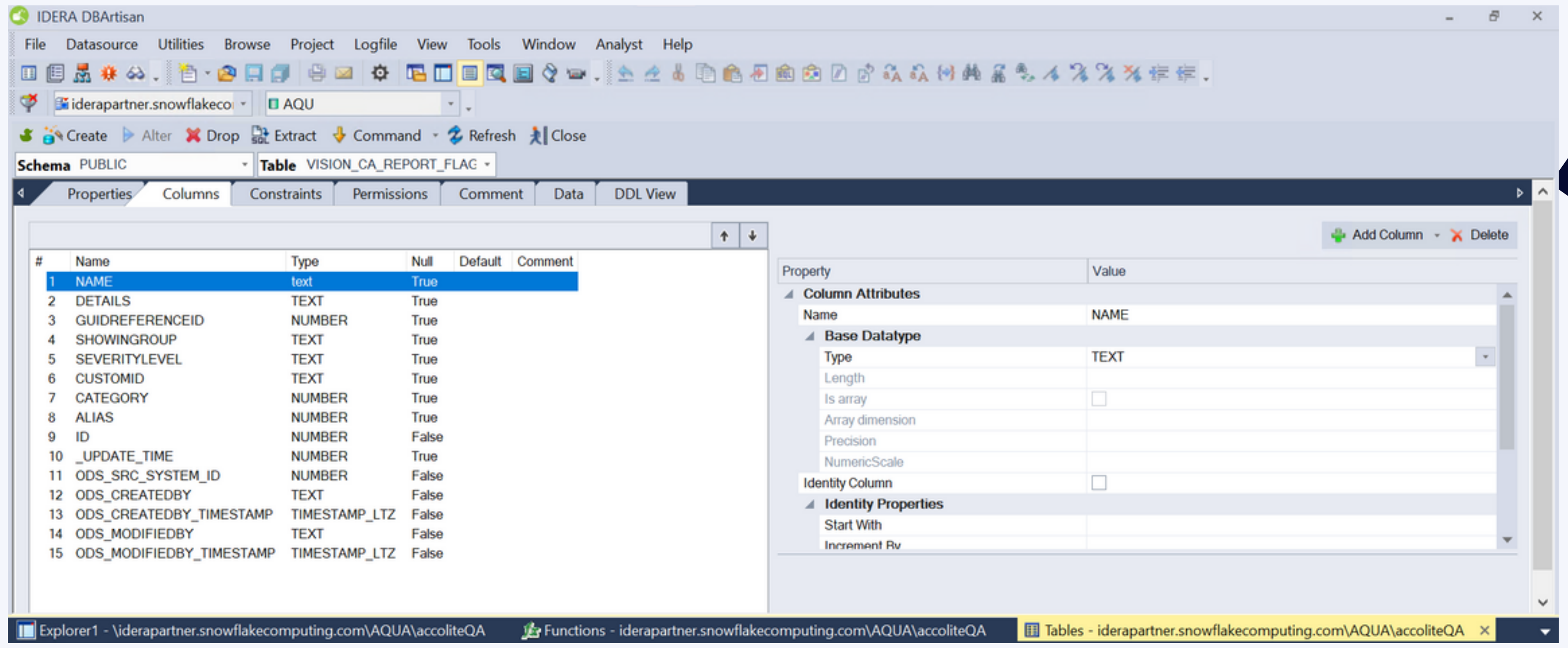
Schema PUBLIC · Table HOUSE1

	DESK	CHAIR	BOOKCASE
1	A	12	23
2	R	87	34
3	E	32	1

figure: **Data** Tab

Tabs in Object Editor

- There are three types of column tabs present depending on the object type.
- For Tables it provides the information about table columns
- For Foreign Key it provides the mapping between the columns of the referenced and referring table.
- For Primary/Unique Key, it provides the columns which are part of primary/unique key.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AQU
Create Alter Drop Extract Command Refresh Close
Properties Columns Constraints Permissions Comment Data DDL View
Add Column Delete

Schema PUBLIC Table VISION_CA_REPORT_FLAG

#	Name	Type	Null	Default	Comment
1	NAME	text	True		
2	DETAILS	TEXT	True		
3	GUIDREFERENCEID	NUMBER	True		
4	SHOWINGGROUP	TEXT	True		
5	SEVERITYLEVEL	TEXT	True		
6	CUSTOMID	TEXT	True		
7	CATEGORY	NUMBER	True		
8	ALIAS	NUMBER	True		
9	ID	NUMBER	False		
10	_UPDATE_TIME	NUMBER	True		
11	ODS_SRC_SYSTEM_ID	NUMBER	False		
12	ODS_CREATEDBY	TEXT	False		
13	ODS_CREATEDBY_TIMESTAMP	TIMESTAMP_LTZ	False		
14	ODS_MODIFIEDBY	TEXT	False		
15	ODS_MODIFIEDBY_TIMESTAMP	TIMESTAMP_LTZ	False		

Property	Value
Column Attributes	
Name	NAME
Base Datatype	
Type	TEXT
Length	
Is array	☐
Array dimension	
Precision	
NumericScale	
Identity Column	☐
Identity Properties	
Start With	
Increment By	

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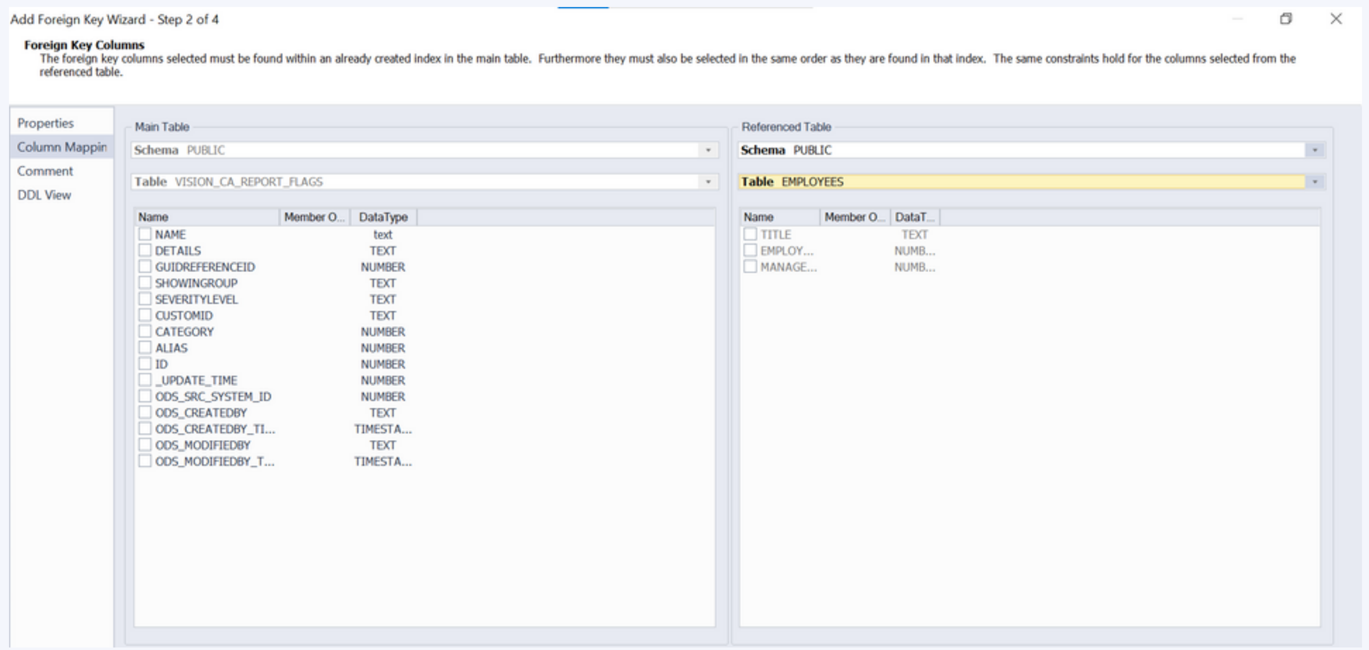
Tables - iderapartner.snowflakecomputing.com\AQUA\accoliteQA

figure: **Columns tab Table**



Add Foreign Key Wizard - Step 2 of 4

Foreign Key Columns
The foreign key columns selected must be found within an already created index in the main table. Furthermore they must also be selected in the same order as they are found in that index. The same constraints hold for the columns selected from the referenced table.

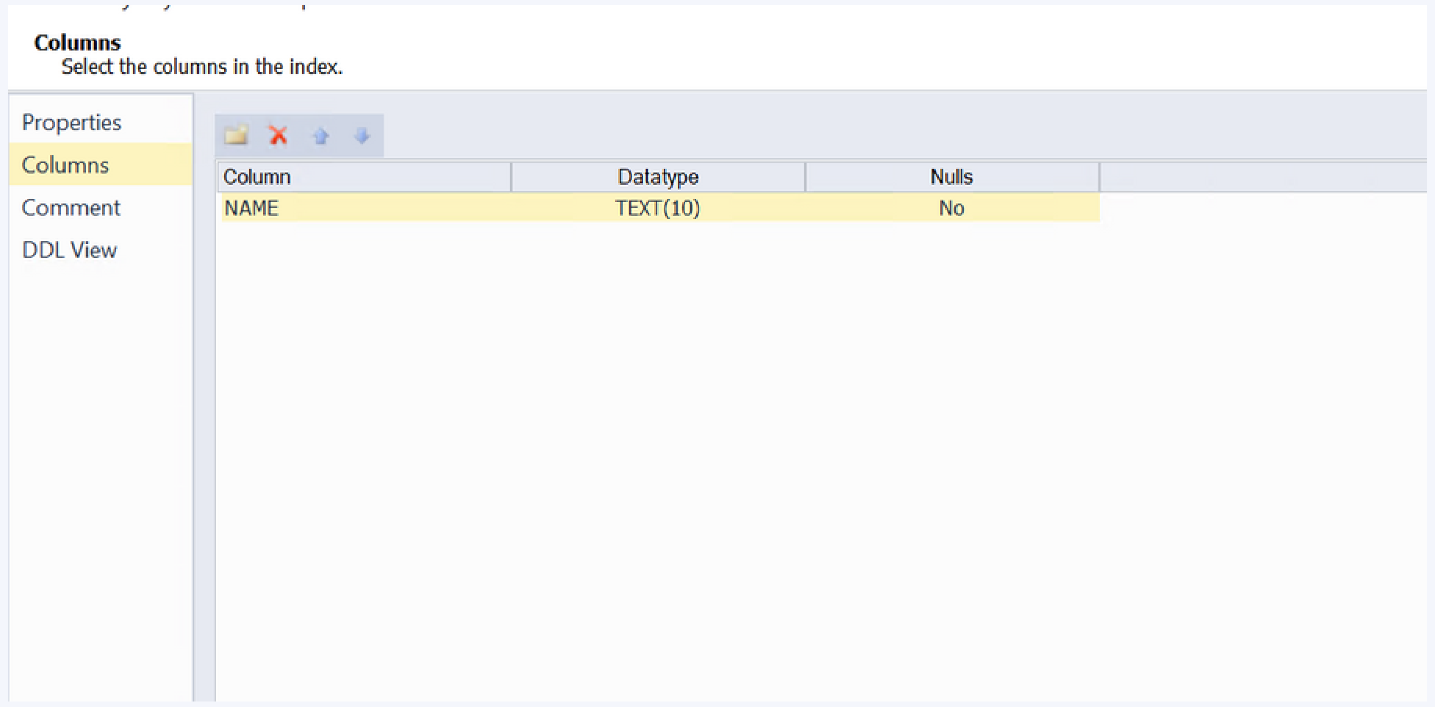
Main Table
Schema PUBLIC
Table VISION_CA_REPORT_FLAGS

Name	Member O...	DataType
☐ NAME		text
☐ DETAILS		TEXT
☐ GUIDREFERENCEID		NUMBER
☐ SHOWINGGROUP		TEXT
☐ SEVERITYLEVEL		TEXT
☐ CUSTOMID		TEXT
☐ CATEGORY		NUMBER
☐ ALIAS		NUMBER
☐ ID		NUMBER
☐ _UPDATE_TIME		NUMBER
☐ ODS_SRC_SYSTEM_ID		NUMBER
☐ ODS_CREATEDBY		TEXT
☐ ODS_CREATEDBY_TI...		TIMESTA...
☐ ODS_MODIFIEDBY		TEXT
☐ ODS_MODIFIEDBY_T...		TIMESTA...

Referenced Table
Schema PUBLIC
Table EMPLOYEES

Name	Member O...	DataT...
☐ TITLE		TEXT
☐ EMPLOY...		NUMB...
☐ MANAGE...		NUMB...

figure: **Column Mapping FK**



Columns
Select the columns in the index.

Column	Datatype	Nulls
NAME	TEXT(10)	No

figure: **Columns PK**

Actions in Object Editors

CREATE
There is an action handler in each object editor which helps us to create an object based on the object selected.

ALTER
There is also an action handler in the object editor using which we can alter content of any tab for a object in the editor.

DROP
Each object editor also contains an action handler which will execute drop action on any existing object which removes or deletes the object.

EXTRACT
There is an action handler for each object which will execute extract action after which we can see the SQL query with its output.

RENAME
Using this action we can rename the objects.

Updating the Platforms

We updated the driver support for two of the datasources i.e DB2 LUW and Sybase IQ. These drivers(JDBC/ODBC) are responsible for setting up connection of our application with these datasources

Description of the drivers

- We updated jTDS for DB2 which is open source driver for JDBC. (IBM)
- We used jConnect for Sybase IQ which is also a high-performant JDBC driver. (oracle)
- We updated the ODBC drivers on C++ side which is distributed by Microsoft

DBOptimizer Trial Licence

Our task was to bring trial licensing, so users can first try the product with some of the premium features (like SQL profiling, SQL tuner etc.) either restricted or limited to "x" number of times before having a full version of the product.

Bugs

DB2 lacking Security -> Roles

- In the DB2 database, under the security node, object Role was missing.
- A new TOT string and a version check were to be implemented.
- Query for retrieving Roles and the UI for the editor were to be implemented.

Performance issues with DBArtisan 18.0

- In the Oracle database, running the same query again took a lot of time.
- The cache was not getting used correctly as the root for the cache was not being set correctly.
- A new member variable for cached root was formed with its getter, setter and clear function.

Bugs

Getting Error in DBArtisan: Oracle 19c and 21c: Instance -> Contexts and Schema -> Audit Unified Policies trees nodes

- In Oracle database in the object ’Audit Unified Policies’ and the object 'Contexts' all the tree nodes threw errors while opening.
- For the ’Audit Unified Policies’ the SQL query to retrieve them was changed compared to version 12.
- For the 'Contexts', a Java method called set_Package() needed to be debugged and fixed.

Bugs

DBArtisan not recognizing the cache type "lockless"

- In the Sybase ASE, in the object DataCache, the type "lockless" was not recognized.
- So the support for the data cache "lockless" was added.

Getting error while opening the table in DB2 Servers database

- In the DB2 database on opening table an error saying that there was some error in HistoryTable java of DB2.
- The conversion it was using was the invocationHandler conversion but we needed to use ObjectRootConversion.

Bugs

Sybase ASE Data Cache window does not properly show bound objects in the cache

- In Sybase datasource, on opening the "Objects" tab for data cache object editor functionally should show all the objects.
- We found that objects were not bound correctly as the root was passed wrong.
- Instead of creating a bind object for the current root we were passing root of a already present bind object.

Conclusion

- In this project we learned how to use JDBC/ODBC drivers to fetch data from database and show them in a UI.
- We learned how to handle a large code base and interpret code already written by others and make changes to it to fix the existing bugs and include new feature to the application.
- We fixed all the bugs we were expected to fix and added Snowflake database support with most of features working.

Thank You

References:

https://docs.snowflake.com/en/

https://www.idera.com/dbartisan-database-administration-solution