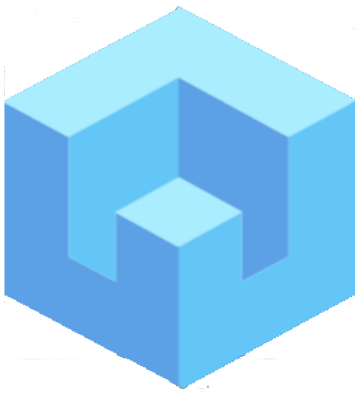

Qvu Data Service

Help

Last Updated: 09/13/2023

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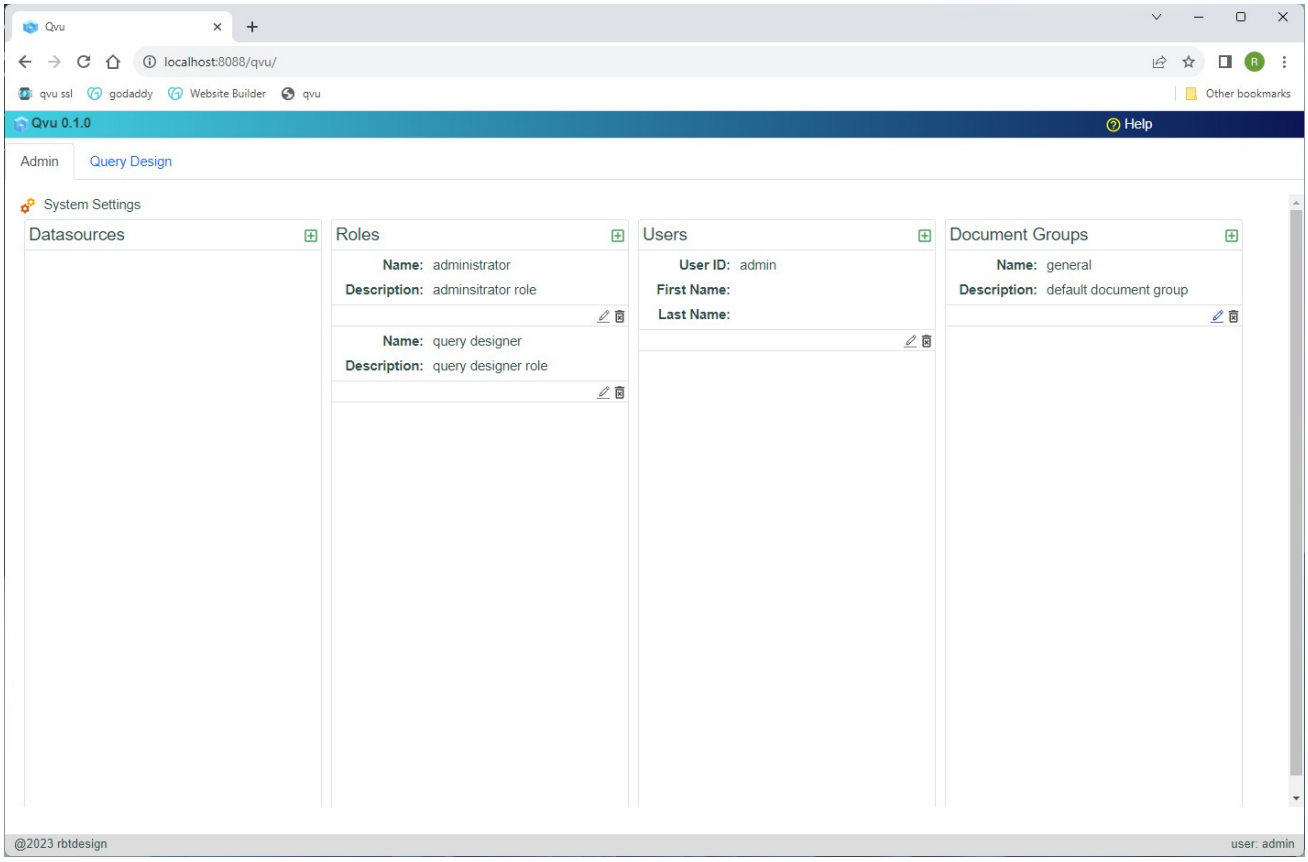
Overview

Qvu Data Service is an ad-hoc query and api data service design tool that allows users to create and save query designs in a user-friendly, web-based UI. Qvu Data Service provides REST API endpoints for users and applications to execute saved query documents and return results in tabular or json formatted result sets. Qvu Data Service provides role-based datasource, table column and document group access control and supports both Basic and OIDC authentication.

Administration

The Qvu Admin tab allows users with the administration role to add and configure datasources, users, roles and document groups as well as the desired authentication scheme. After initializing the Qvu repository (see qvu-gettingstarted.pdf), start Qvu and login as the admin user – you should see the screen below:



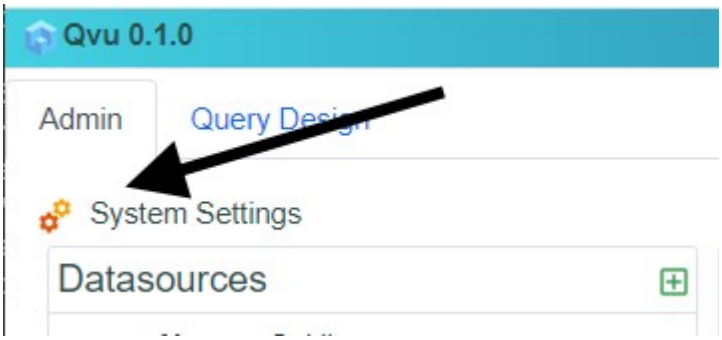
The initial admin tab will have no datasources, 2 default roles – **administrator** and **query designer** and one user – **admin**.

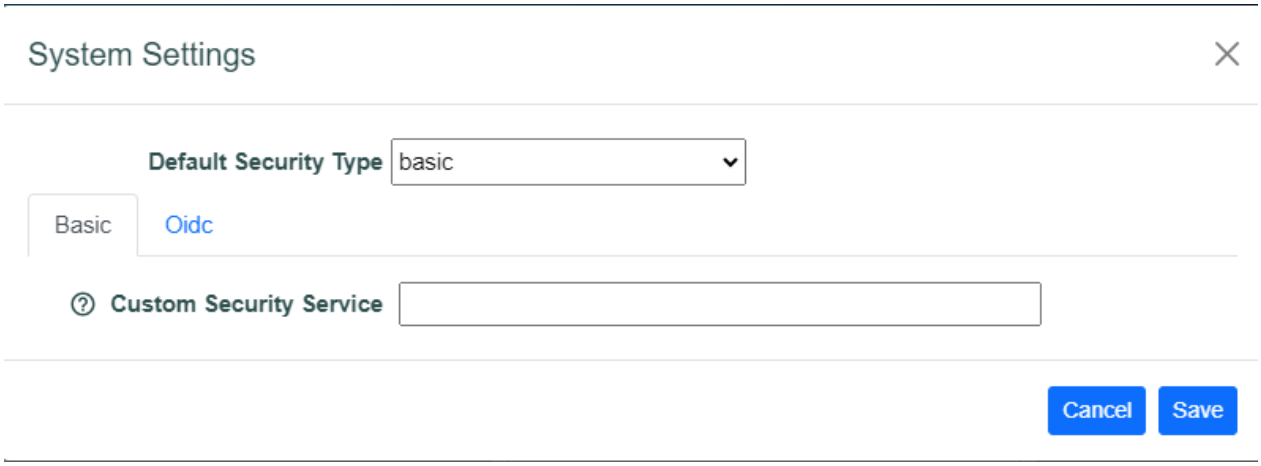
System Settings

System Settings is used to configure Qvu Data Service authentication. There are 3 choices:

1. Basic Authentication
2. OIDC
3. Custom Authentication

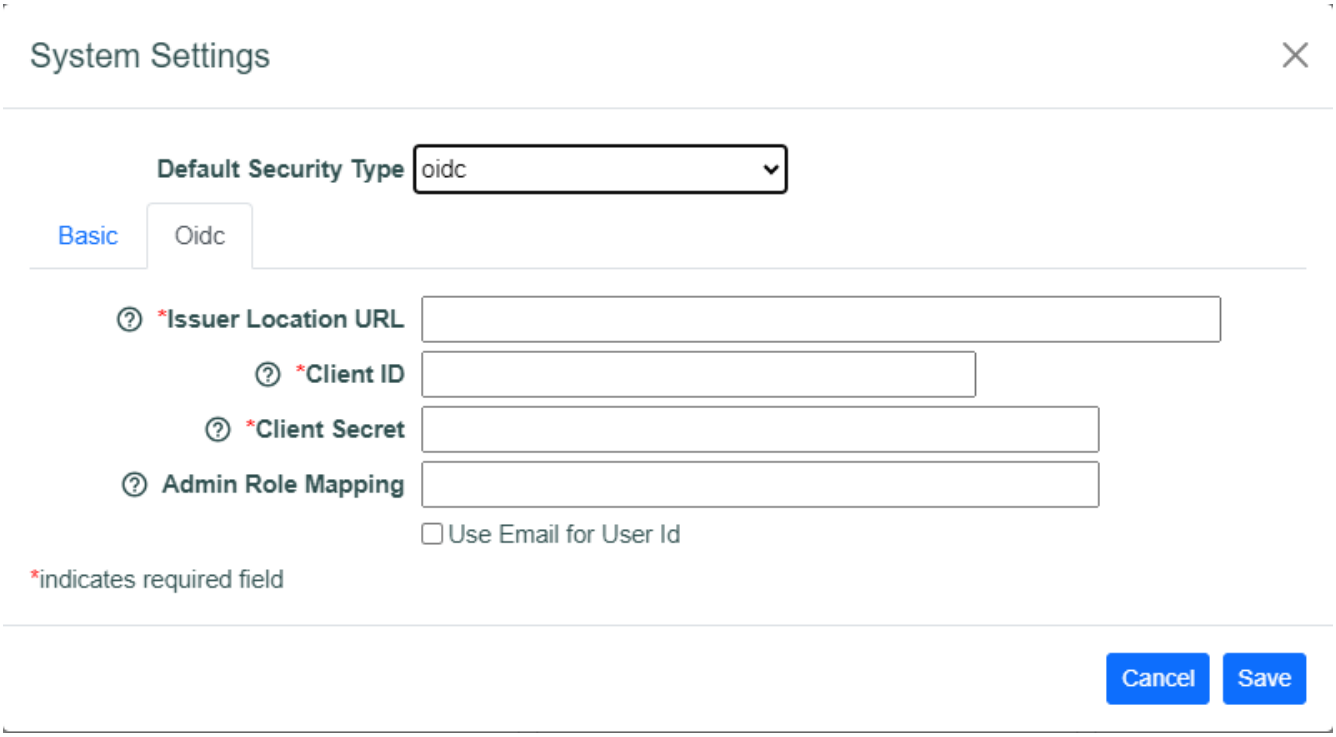
Click the System Settings icon in the Admin tab to display the System Settings dialog:





Select the desired Default Security Type and complete the associated entry fields. If **basic** is selected then no other action is required. Security objects will be stored locally in the configured Qvu repository. If you wish to use a custom security implementation then a Java class must be entered in the Custom Security Service field. See the Custom Security section in this document for more information on this topic.

If **oidc** is chosen as the Default Security Type complete the required entries on the Oidc tab



Issuer Location URL, Client ID and Client Secret are standard OIDC entries associated with your identity provider.

The Admin Role Mapping is used to map incoming OIDC role claims to the Qvu **administrator** role. Add a comma-delimited list of roles in this field if desired.

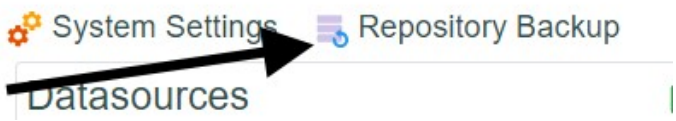
Repository Backup

Click the Repository Backup icon to backup the repository:

Add/Edit a Datasource

To add a datasource, click the add icon on the Datasources control:

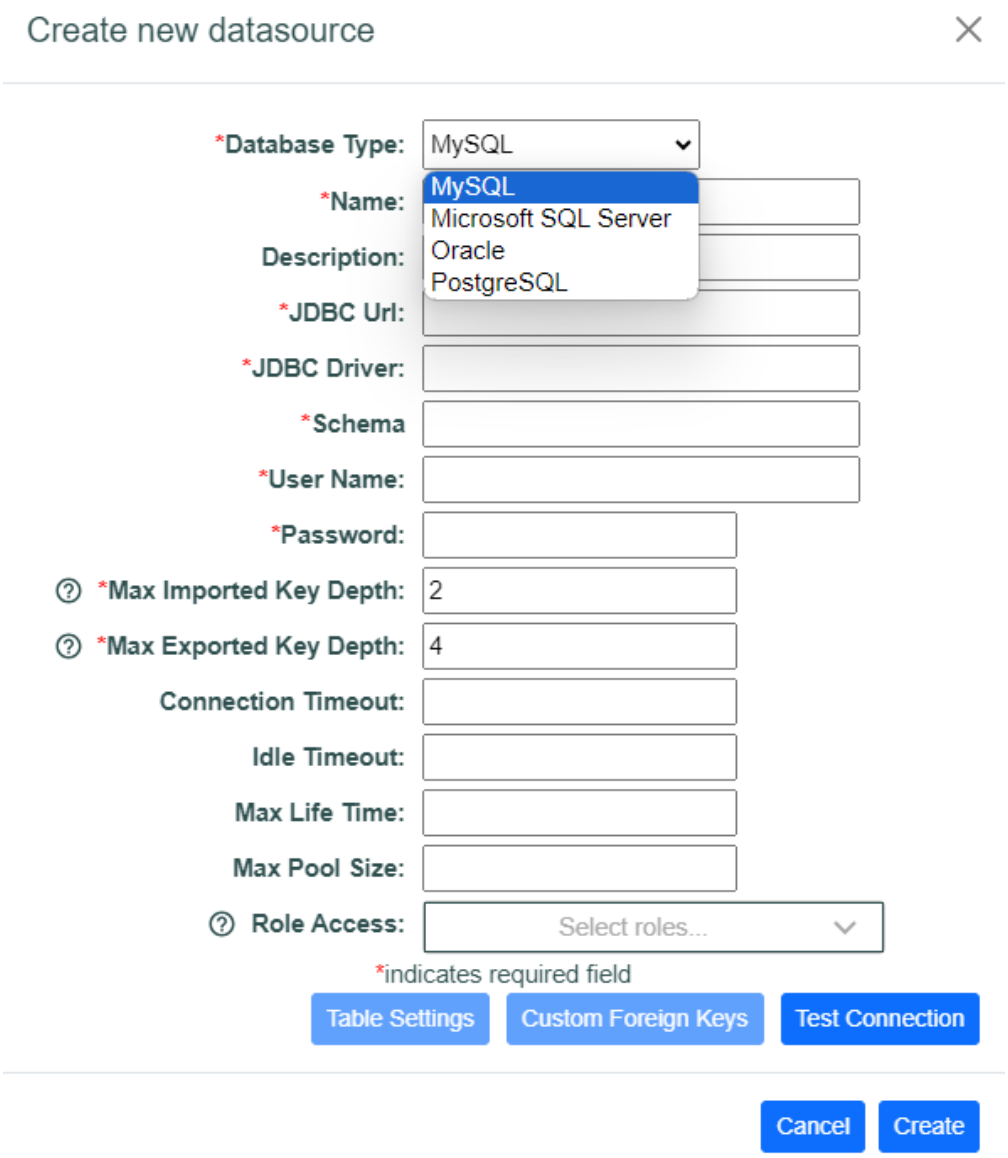
The Create new datasource dialog should display:



A backup file target folder is specified in the <respository-folder>/config/application.properties file. This defaults to <respository-folder>/backups but can be changed (must restart the server).

backup.folder=c:/dev/qvu/backups

The backup file format is qvu-backup-yyyyMMddhhmmss.zip.



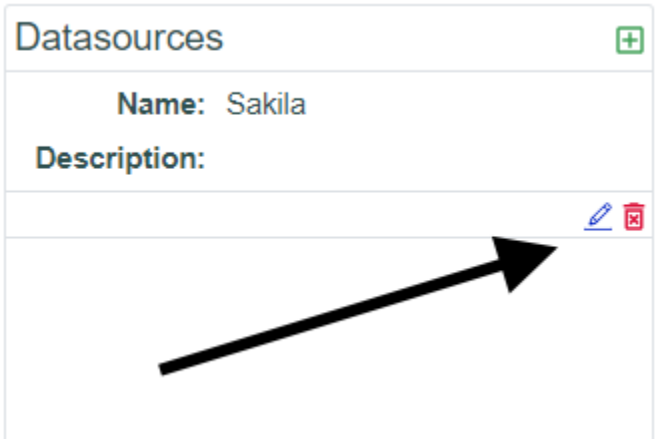
Select the desired database type and fill in the required entries. The table below describes each entry field:

Datasource Entry Fields

Database Type	MySQL, Microsoft SQL Server, Oracle or PostgreSQL
Name	This is the datasource name which will show up in the Datasource selection drop down and be associated with the query document. The name must be unique
Description	A description of this datasource
JDBC Url	The database-specific JDBC URL to connect to the database. When specifying a Url for MySQL be sure to include nullDatabaseMeansCurrent=true, for Microsoft SQL Server you may need to include encrypt=true;trustServerCertificate=true
JDBC Driver	The JDBC Driver java class name
Schema	The database schema for this datasource
User Name	Database user name to use to connect to the database
Password	User password ti use to connect to the database
Max Imported Key Depth	The max depth to recurse through the imported (parent table) foreign key definitions when building table relationships.
Max Exported Key Depth	The depth max depth to recurse through the exported (child table) foreign key definitions when build table relationships
Connection Timeout	the maximum number of milliseconds to wait for a database connection checkout. Defaults to 30000 (30 seconds)
Idle Timeout	Maximum amount of time (in milliseconds) that a connection is allowed to sit idle in the pool. Defaults to 600000 (10 minutes)
Max Life Time	Maximum lifetime (in milliseconds) of a connection in the pool. An in-use connection will never be retired, only when it is closed will it then be removed. Defaults to 1800000 (30 minutes)
Max Pool Size	Maximum size that the connection pool is allowed to reach, including both idle and in-use connections. Basically this value will determine the maximum number of actual connections to the database backend. Defaults to 10.
Role Access	Roles required to access this datasource – no selections

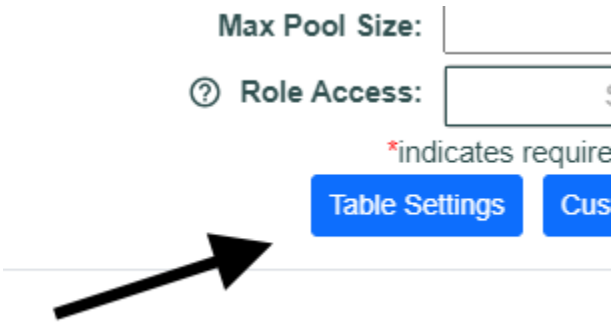
	indicates datasource is available to all users

To edit/delete a datasource click the Edit/Delete icon

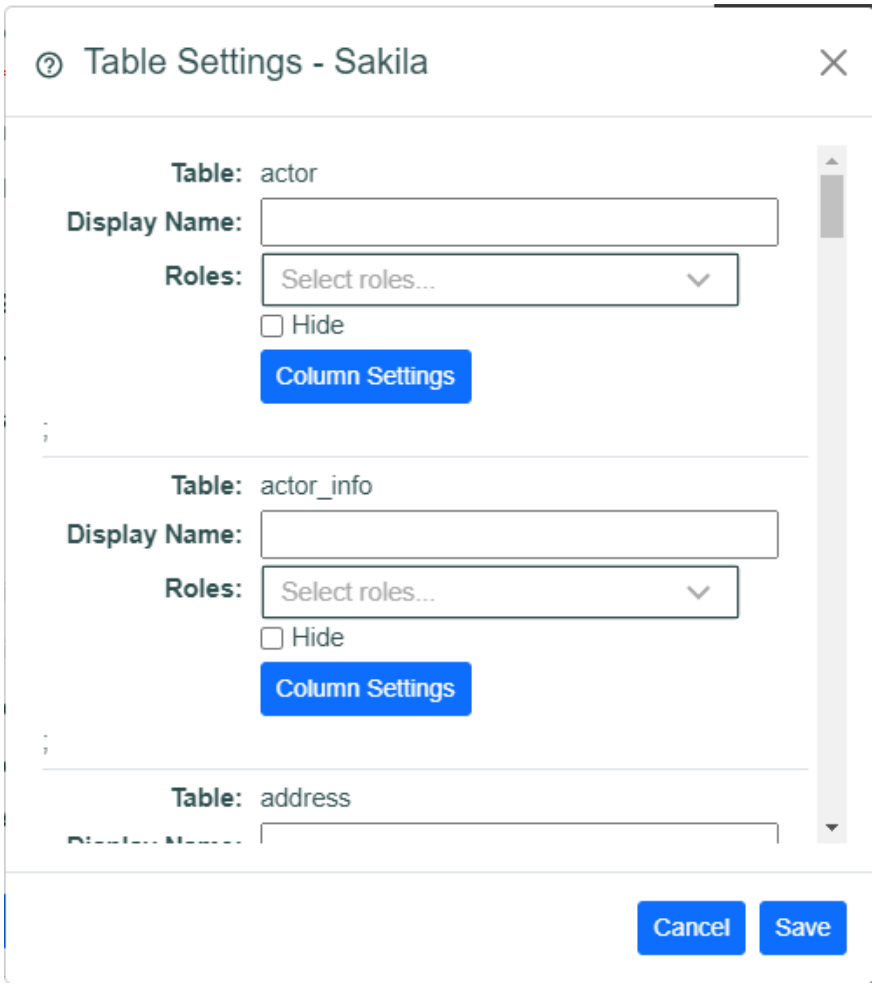


Datasource Table Settings

A user can customize how datasource tables and columns are displayed in the UI and control user access to tables and columns by role assignment. To modify these setting clock the Table Settings button to display the Table Settings dialog::



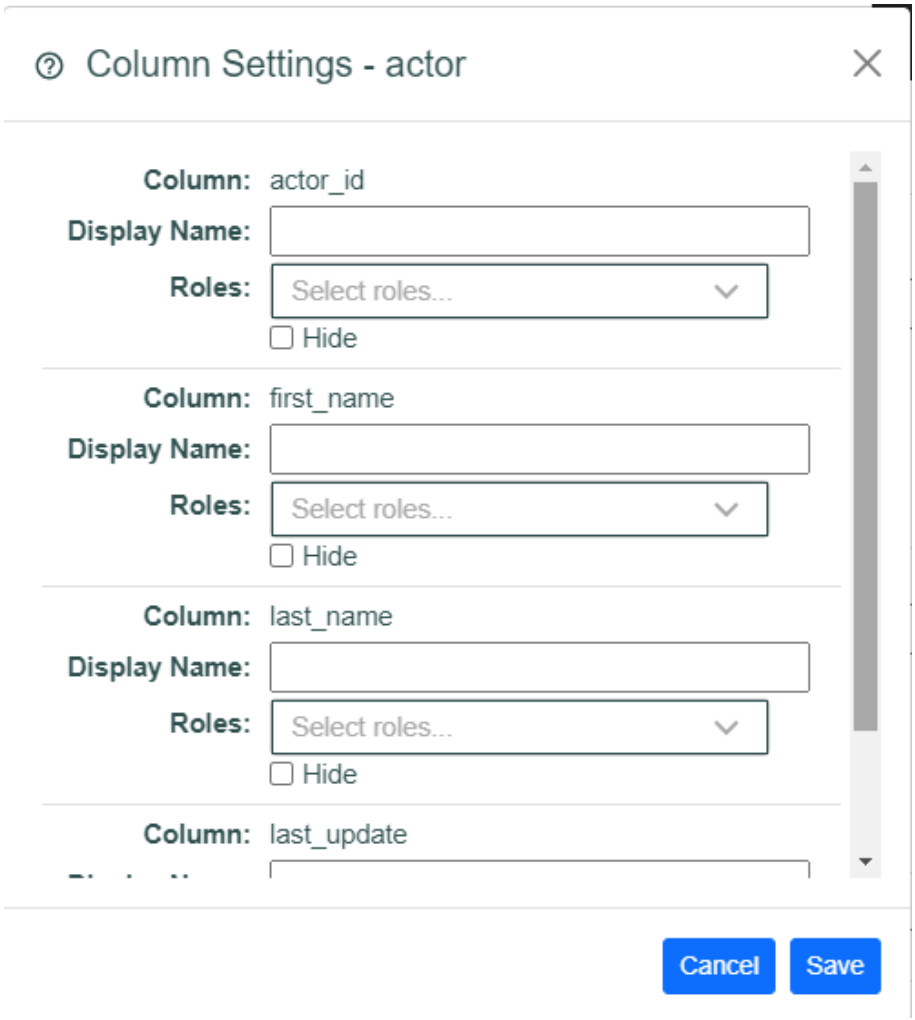
The Table Settings dialog will display a list of tables associated with the datasource. For each table the following fields can be set to handle the way the table is presented to the user in the UI:



Display Name	A user friendly name can be entered that will be used in the UI whenever the table is presented to the end user
Roles	Roles can be associated with the table and only users that are members of the selected roles will be able to see the table in the UI. No selection means the table is available to all users.
Hide	When checked the table will not be displayed in the UI for any user.

Table Column Settings

Click the Column Settings button on any table in the Table Settings dialog to configure how the associated columns are displayed in the UI for the table. When clicked the Column Settings dialog will display:

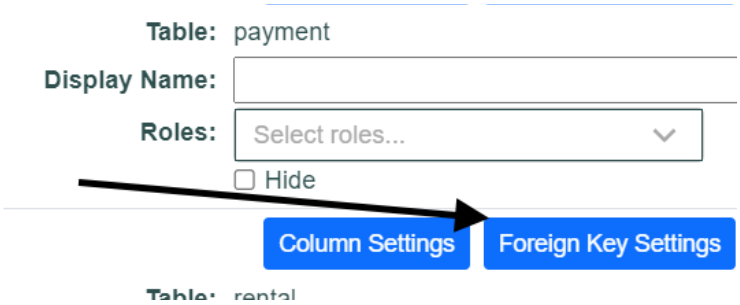


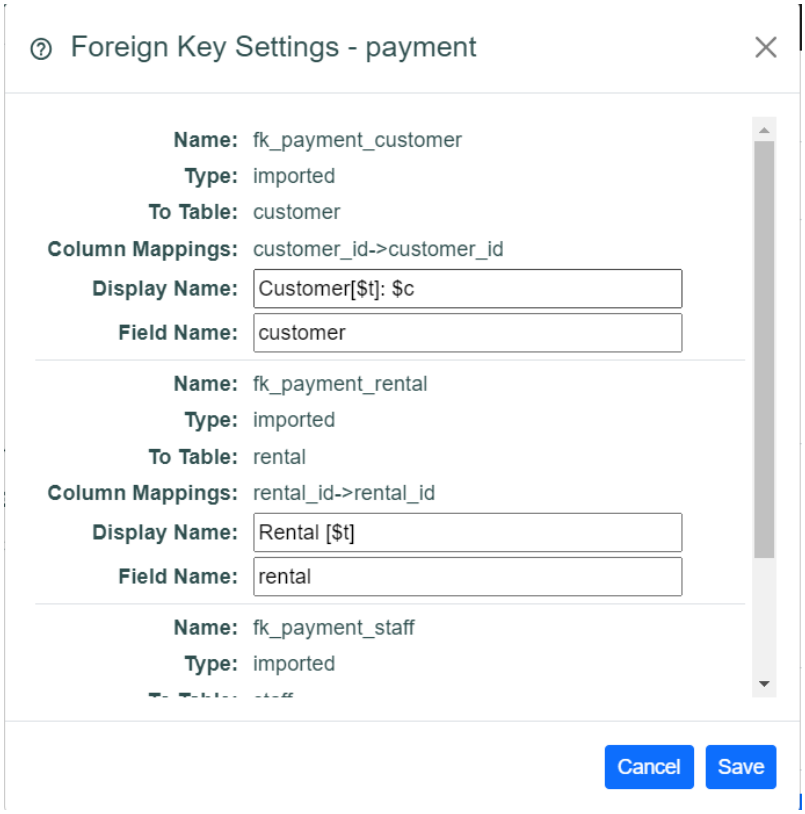
The Column Settings dialog will display a list of columns associated with the table. For each column the following fields can be set to handle the way the column is presented to the user in the UI:

Display Name	A user friendly name can be entered that will be used in the UI whenever the column is presented to the end user
Roles	Roles can be associated with the column and only users that are members of the selected roles will be able to see the column in the UI. No selection means the column is available to all users.
Hide	When checked the column will not be displayed in the UI for any user.

Table Foreign Key Settings

The table foreign key settings allow an administrator to customize how foreign key tables are displayed in the data select tree. The foreign key settings also provides a means to set the field name for the child data field of foreign key data when retrieving data as an object graph. T add foreign key settings click the Foreign Key Settings button for the desired table in the Table Settings dialog to display the Foreign key settings dialog:





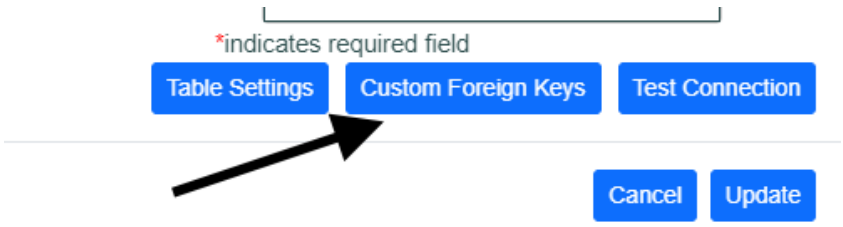
Enter the desired Display Name and/or Field Name for the selected table foreign key relationship. By default the foreign key is displayed as:

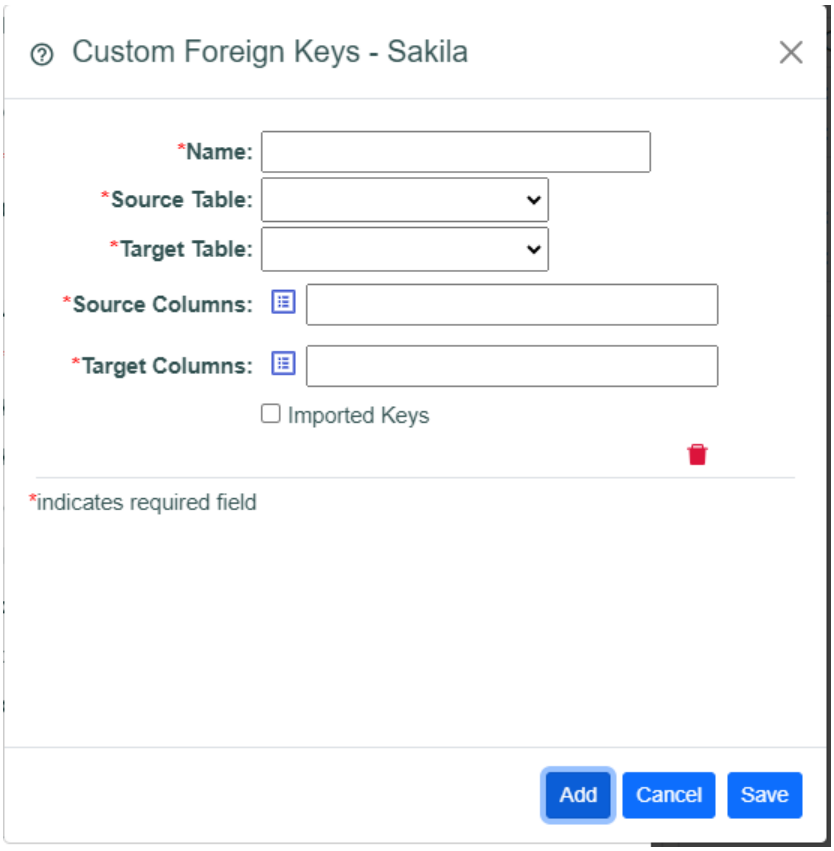
<foreign-table-name>: fromColumn1→toColumn1, fromColumn2→toColumn2…

You can enter a $t in the Display Name to include the foreign table in the Display Name. You can add $c to include the foreign key column mappings in the Display Name.

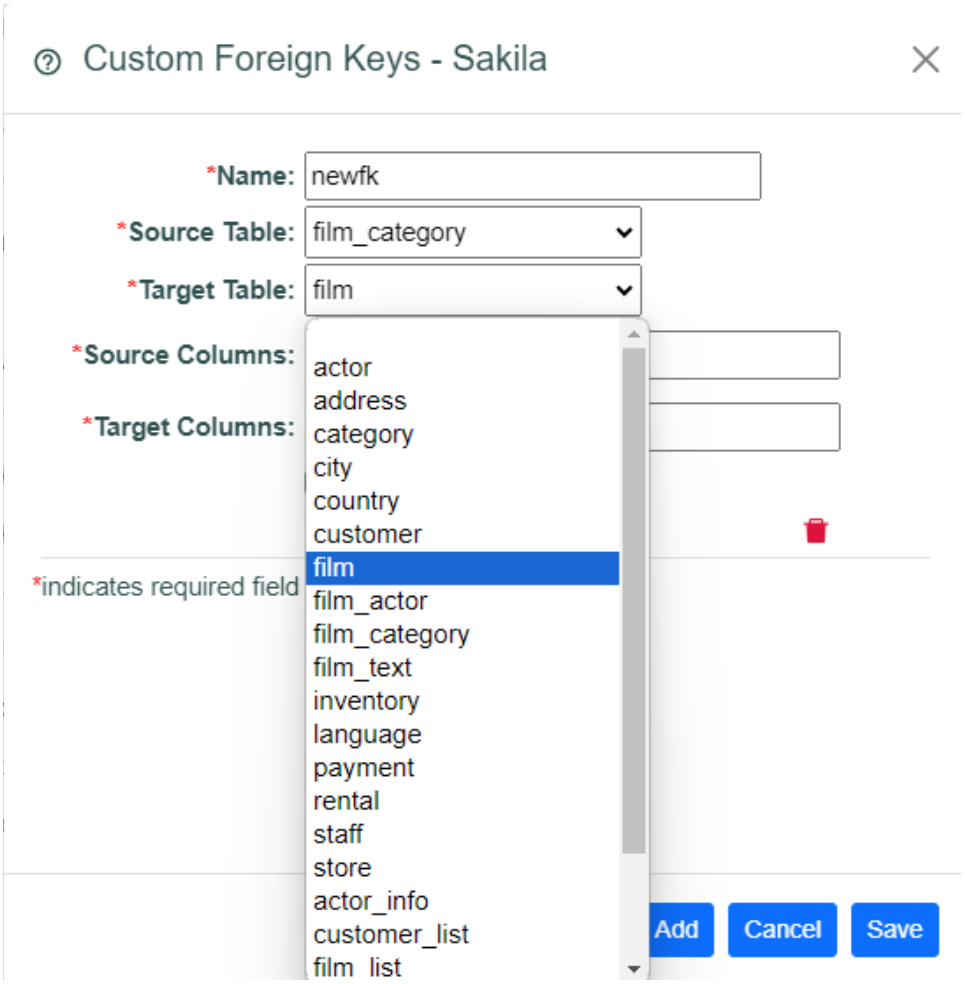
Custom Foreign Keys

Configured database foreign keys are used by Qvu to define the table relationships for query design. In cases where a desired foreign key does not exist in the database Qvu supports defining pseudo foreign key definitions. To create a pseudo foreign key click the Custom Foreign Key button to display the Custom Foreign Key dialog

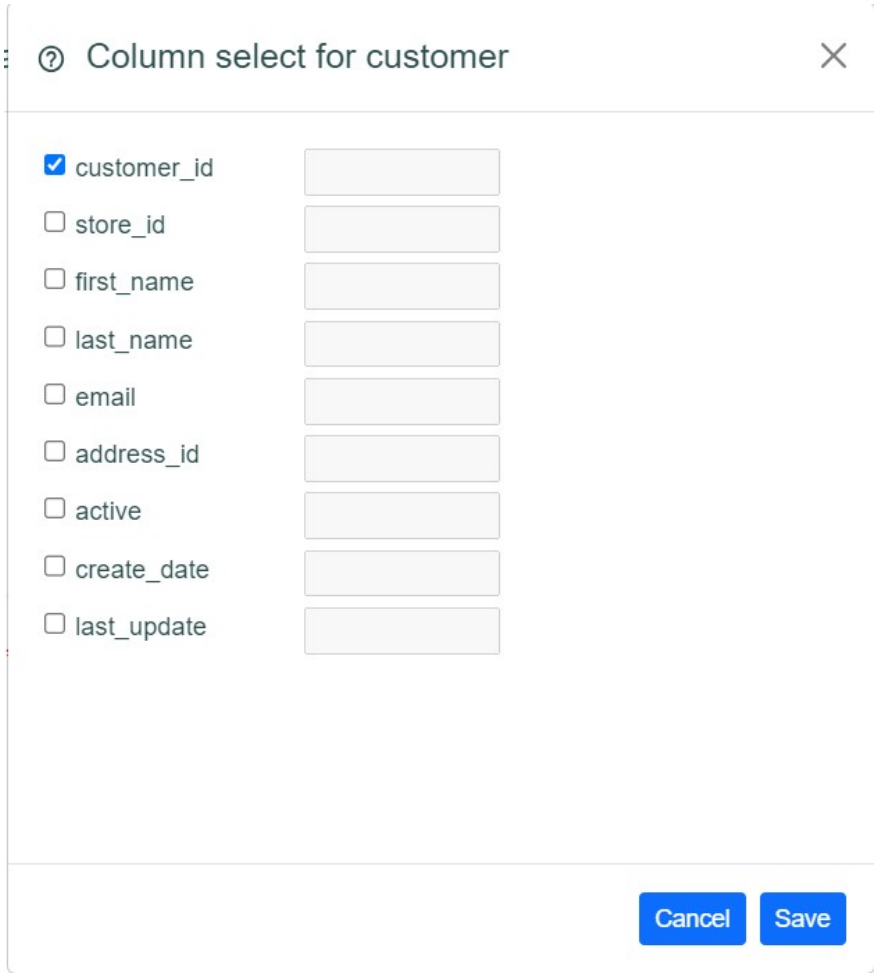




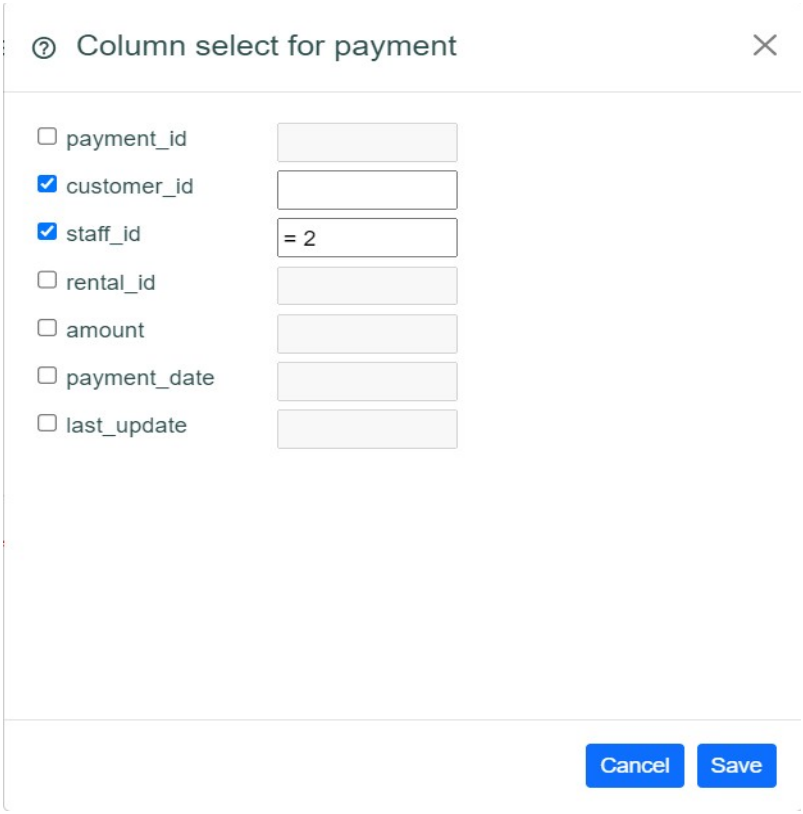
Enter a unique name for the foreign key, select the source and target tables from the associated drop downs:



Now choose source and target foreign key columns. When choosing the foreign key columns you will be presented with a multi-select control. Selection order is import. The columns will added as a comma-delimited list in the order selected, make sure you choose the associated columns in the correct order to map the table relationship correctly.



For exported foreign tables a user can enter a raw comparison value in the text entry field if desired as shown below:



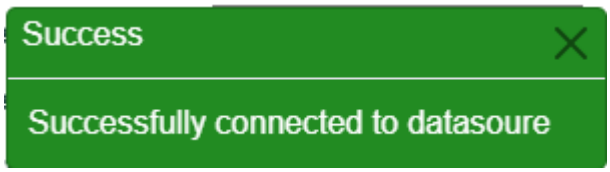
This will produce a join clause similar to this:

```
FROM `customer` `t0`
     left outer join `payment` `t1` ON
          (`t1`.`customer_id` = `t0`.`customer_id` and
`t1`.`staff_id` = 2)
WHERE
```

Check the Imported Key checkbox if this relationship is to a parent table – leave blank if it is to a child table.

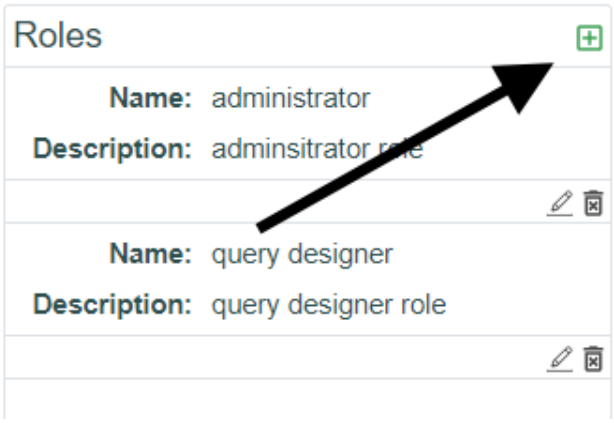
Testing the Database Connection

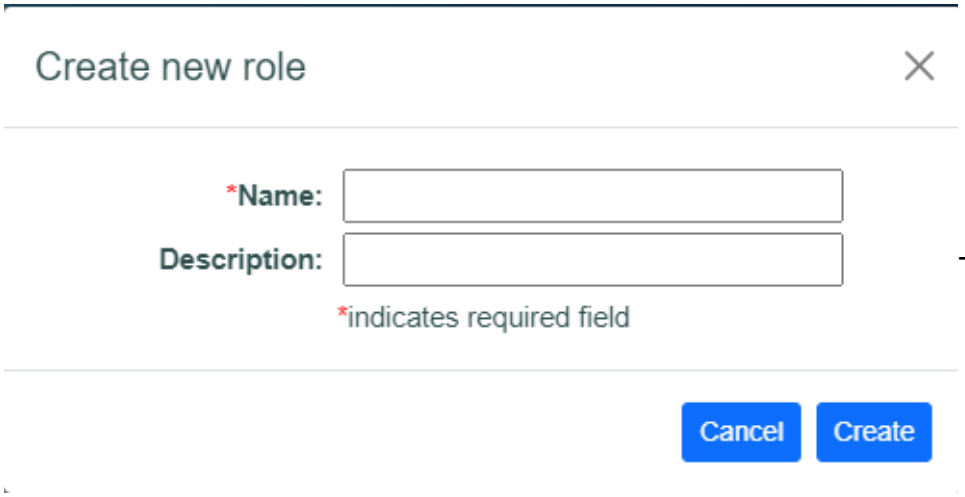
Once the datasource entries are complete you can test the database connection by clicking the Test Connection button. If the connection succeeds you will receive a success message:



Add/Edit a Role

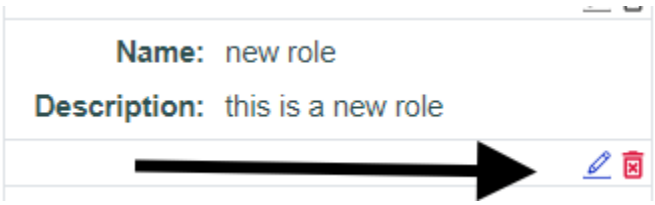
To add a new role click the Add icon to display the Create new Role dialog::



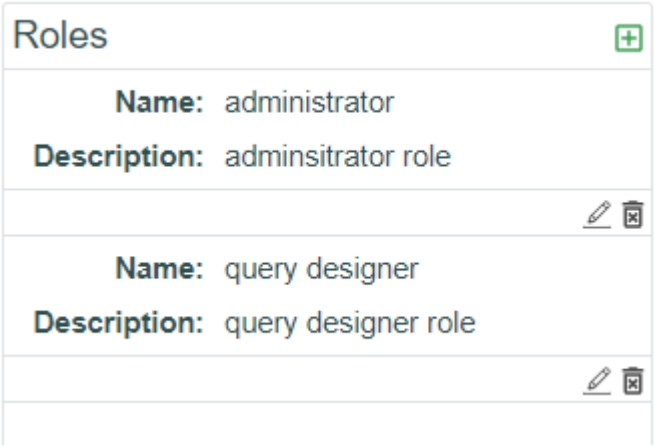


T

To edit/delete a role click the Edit/Delete icon:



There are 2 canned system roles that cannot be edited or deleted – **administrator** and **query designer.** On these roles the edit/delete icons are disabled.



Add/Edit a User

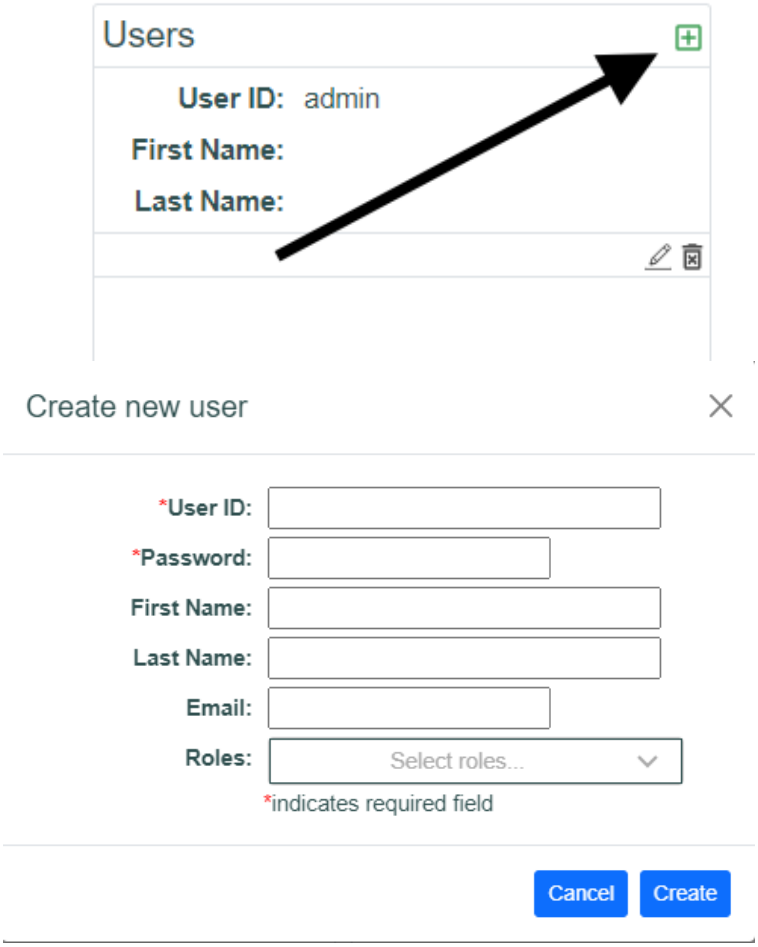
Qvu Users are handled a bit differently than other security-related entities. If Qvu is configured to use the local Qvu repository for authentication then a user can be added, edited and deleted.

If authentication is configured to use OIDC, when an authenticated user does not exist in the local Qvu repository that user will be added for user information purposes – authentication will is handled by the OIDC identity provider. A role mapping can be setup to map incoming role claims to the administration role if desired – see the System Settings section for more information on this topic.

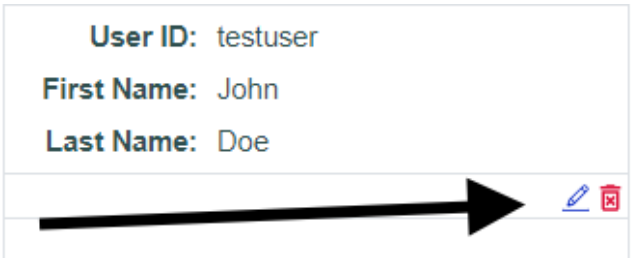
If the custom authentication plugin is enabled then the custom authentication service is responsible for providing user information and expected roles (administrator and query designer). The user will be read only in the Qvu application.

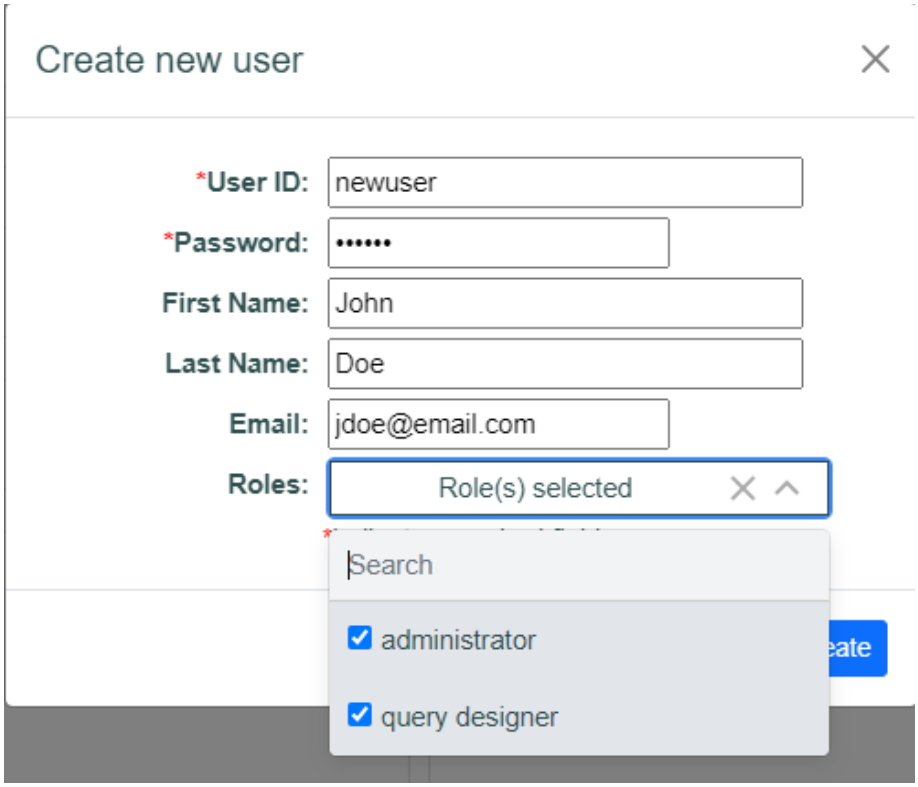
There is a canned system user – Admin – which cannot be edited or deleted.

To add a new user when Qvu is configured to use local repository authentication click the Add icon to display the Create new User dialog:



Complete the required and entries and save the user. To assign roles to the user, click the Roles drop down and select the desired roles:



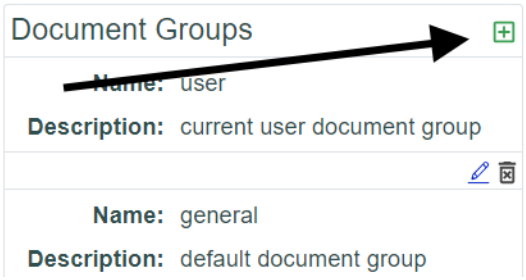


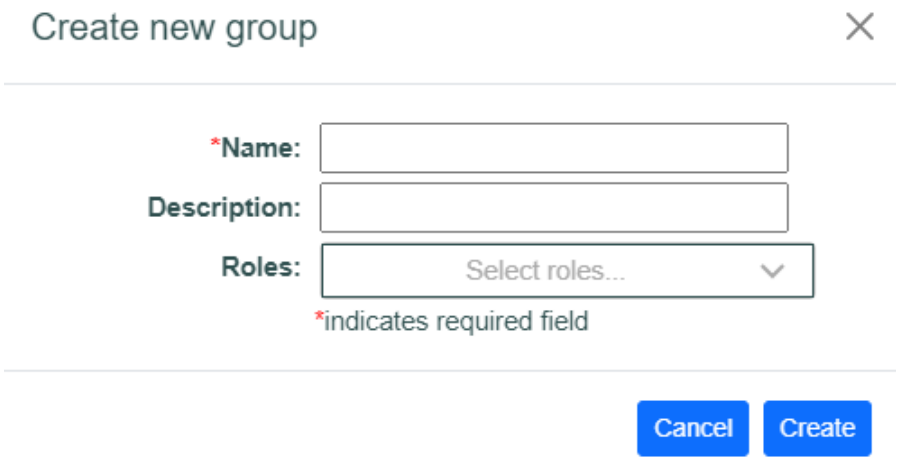
User passwords are stored locally as a md5 hash of the entered passwords. See the **Qvu Repository** section for more information.

To edit/delete a user when enabled click the Edit/Delete icon:

Add/Edit a Document Group

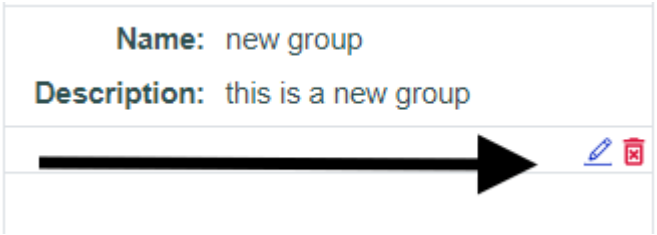
When query documents are saved they must be assigned a document group. A canned, default document group **user** is always available and cannot be edited or deleted. Documents in the user document group can only be seen by the current user. Additional document groups can be created as desired.
To add and new Document Group click the Add icon to display the Create new Group dialog:





Enter the required fields – the name must be unique. Roles can be assigned to a document group. Only users that are members of the selected roles will be able to see the documents in the group. If no role is selected, all users can access the documents in the group.

To edit/delete a document group click the Edit/Delete icon:



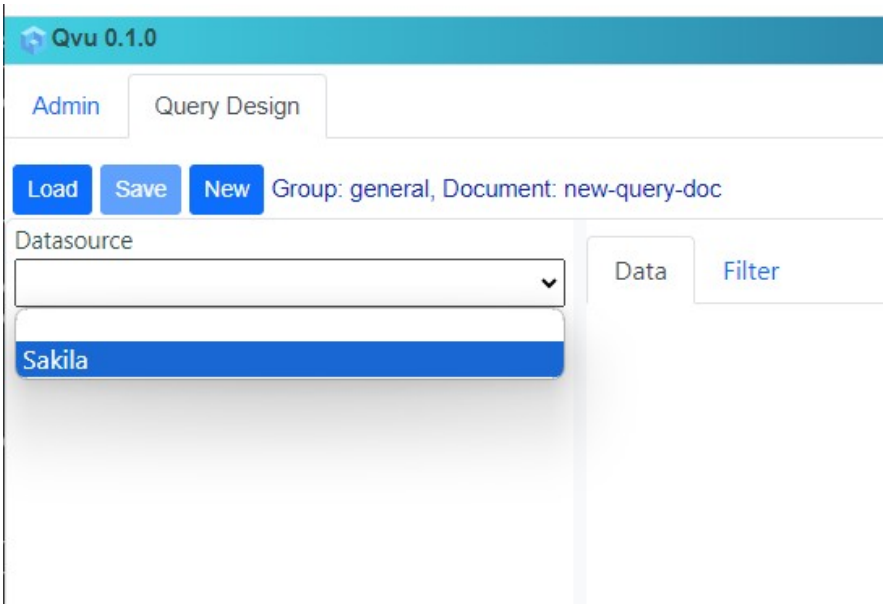
If a document group is deleted all the documents in that group will also be deleted. A query document can be assigned a new document group. See **Saving a Query Document** for more information on this topic.

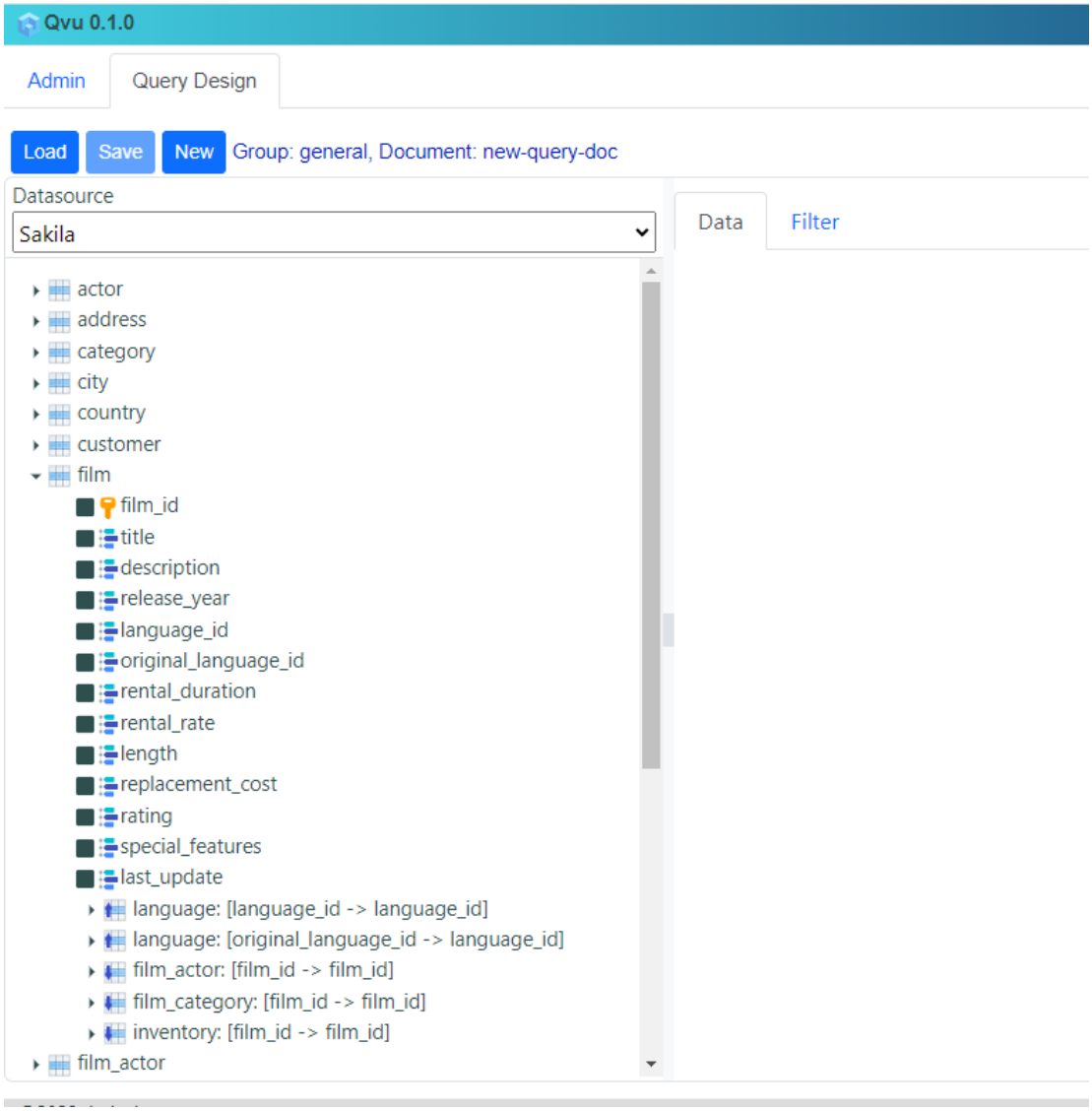
Query Design

The Qvu UI is built on React and provides a rich, user-friendly interface for query design. Query design is based on a root table selection from a selected datasource. Defined table relationships associated with the selected root table are displayed in a tree view that allows users to select data columns as desired.

Column Select Pane

From the Qvu Query Design tab select the desired datasource to display the table hierarchy tree:





Tables and columns displayed in the tree are based on the role settings discussed in the **Administration** section above. The user can now select the desired columns. Column selection order determines the initial order of the result set columns. This can be changed in the Data tab on the right split pane. As columns are selected the Data tab will populate with column configuration panes.

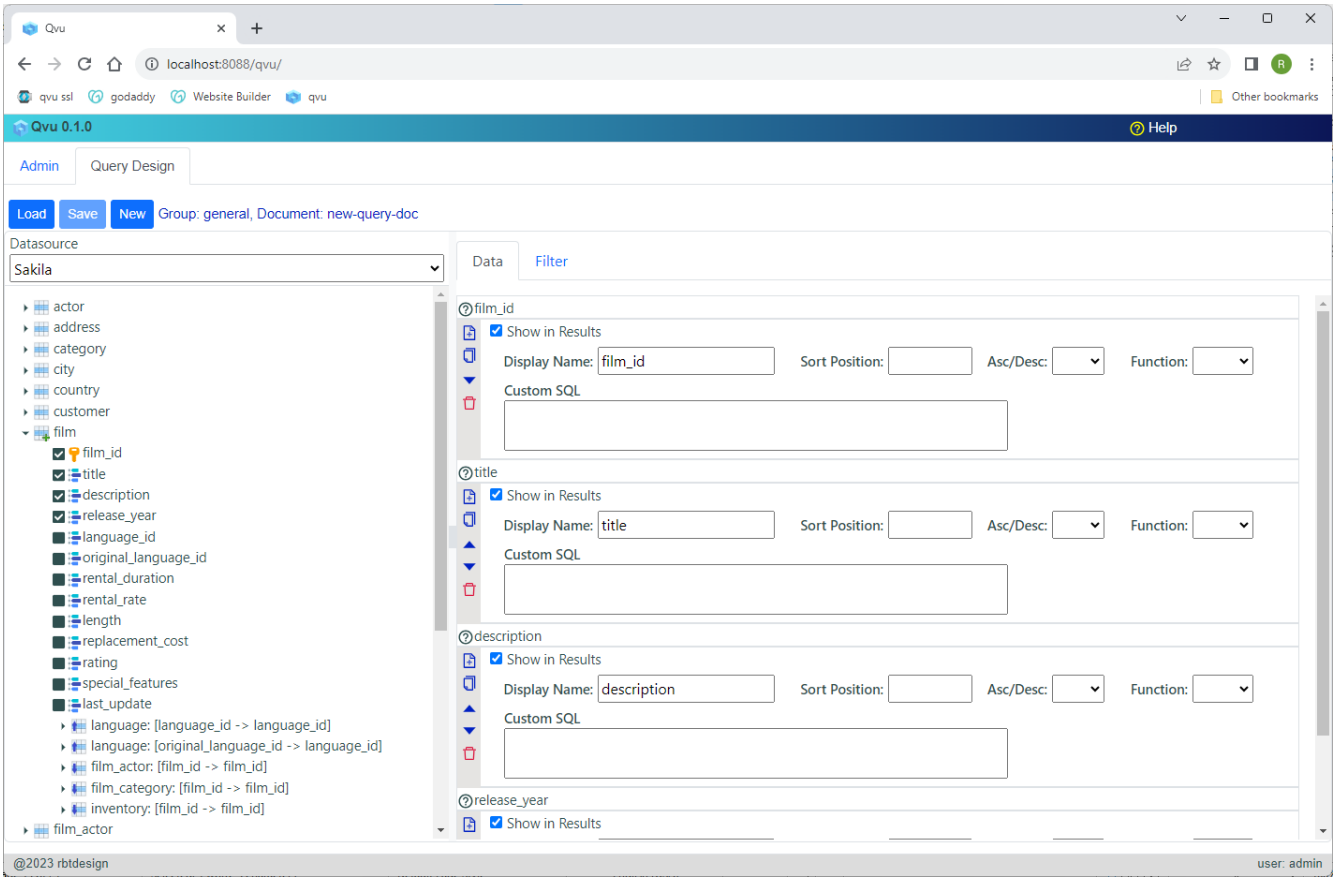


Table Tree Icon Descriptions

Below is described the various icons you see in the table tree:

Root Table

Imported Foreign Key Table (parent)

Exported Foreign Key Table (child)

Root Table with Column Selections

Imported Table with Column Selections

Exported Table with Column Selections

Imported Table with Inner Join (joins default to outer)

Imported Table with Inner Join and Column Selections

Exported Table with Inner Join (join defaults to outer)

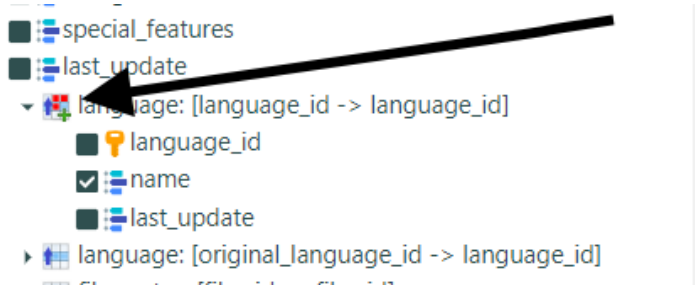
Exported Table with Inner Join and Column Selections

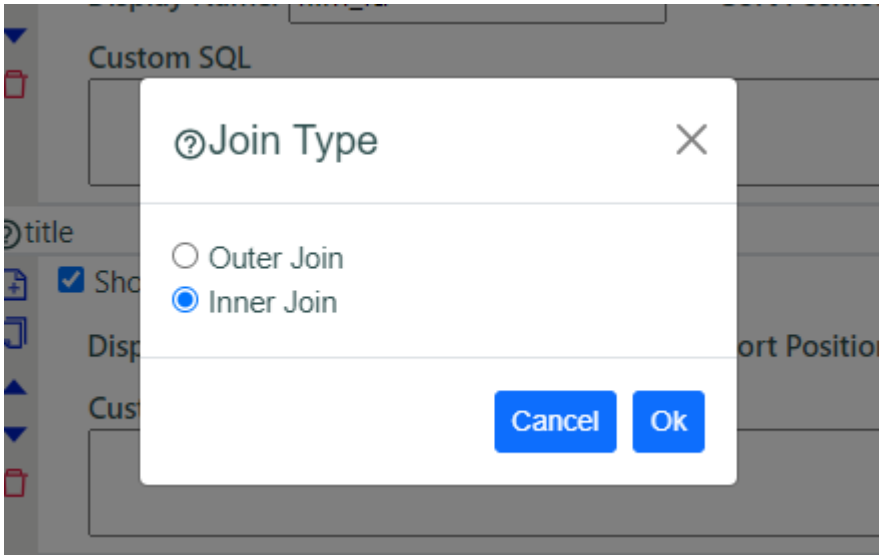
Column

Primary Key Column

Setting Join Type

Right click on a related table to display the Join Type dialog and select the desired join type:

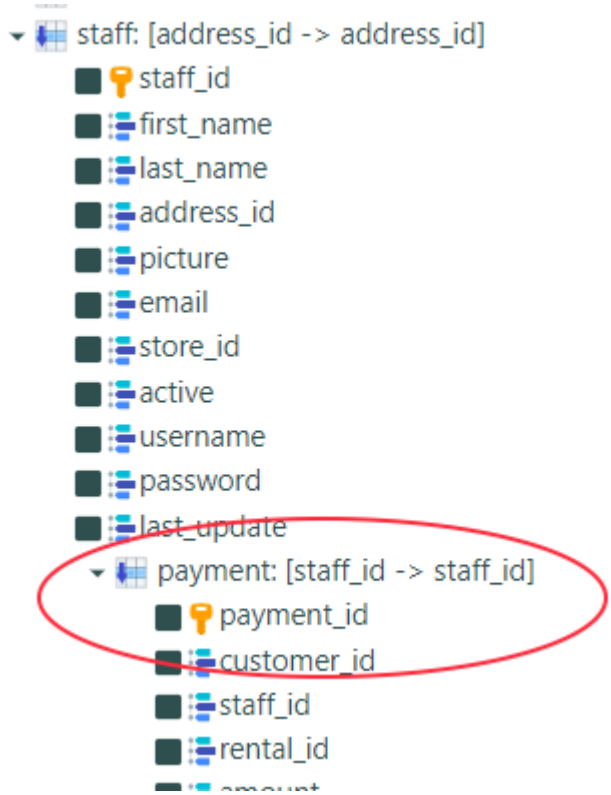




Related Table Display

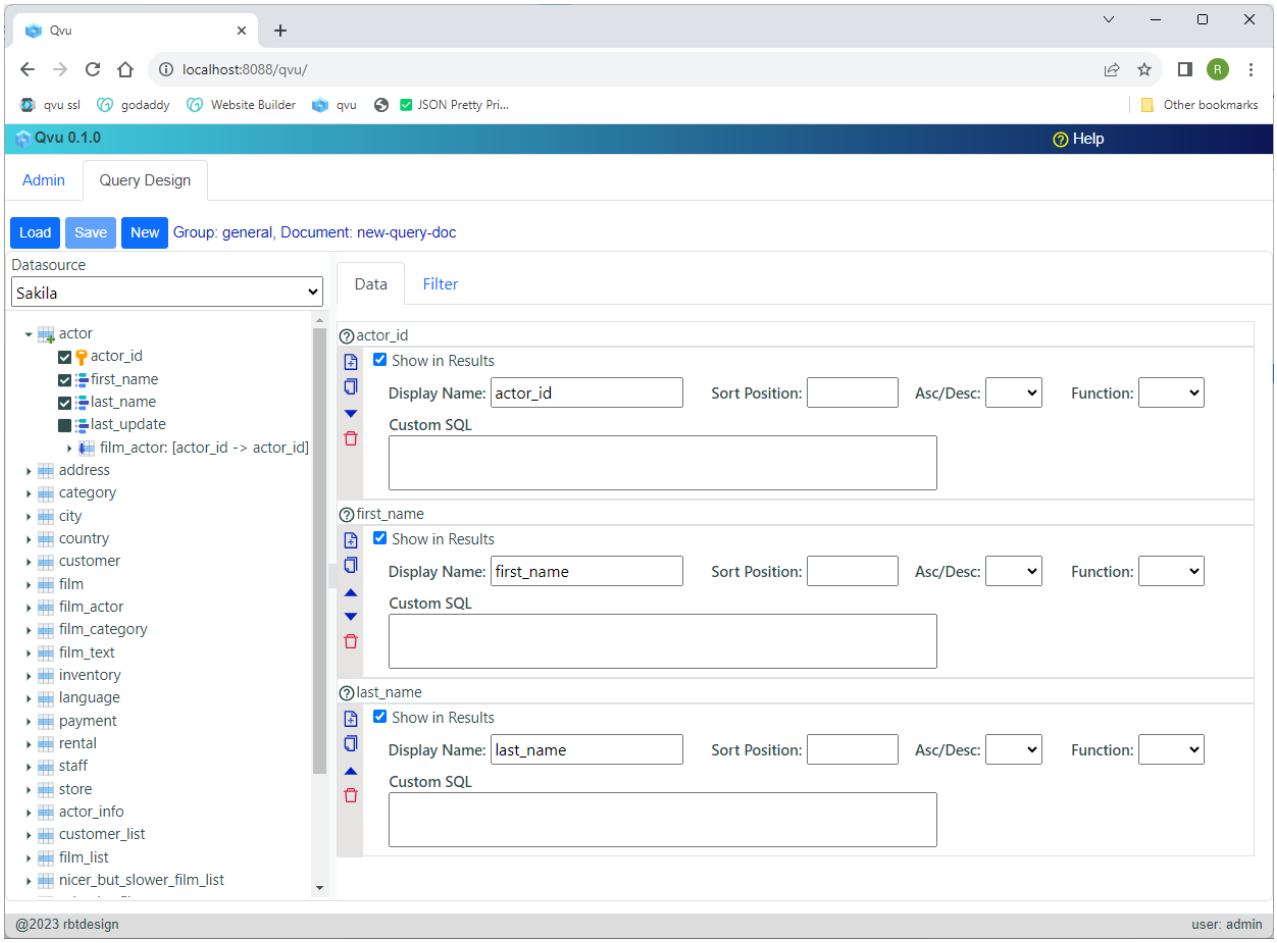
Related tables are displayed in the following format in the table tree:

to_table_name[to_column1→from_column1, to_column2→from_column2…]



Query Design Data Tab

For each column selected in the data select tree pane an associated column configuration panel will display in the Data tab.

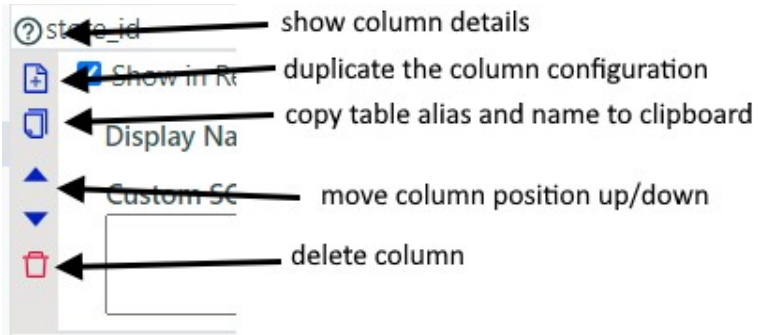


Data Column Configuration Description

The user can apply various options to each selected data column. In addition, the column configuration panel support deleting, moving and duplication the associated column.

Data Column Configuration Panel Icons

Below you will find a description of the icon functionality on panel:

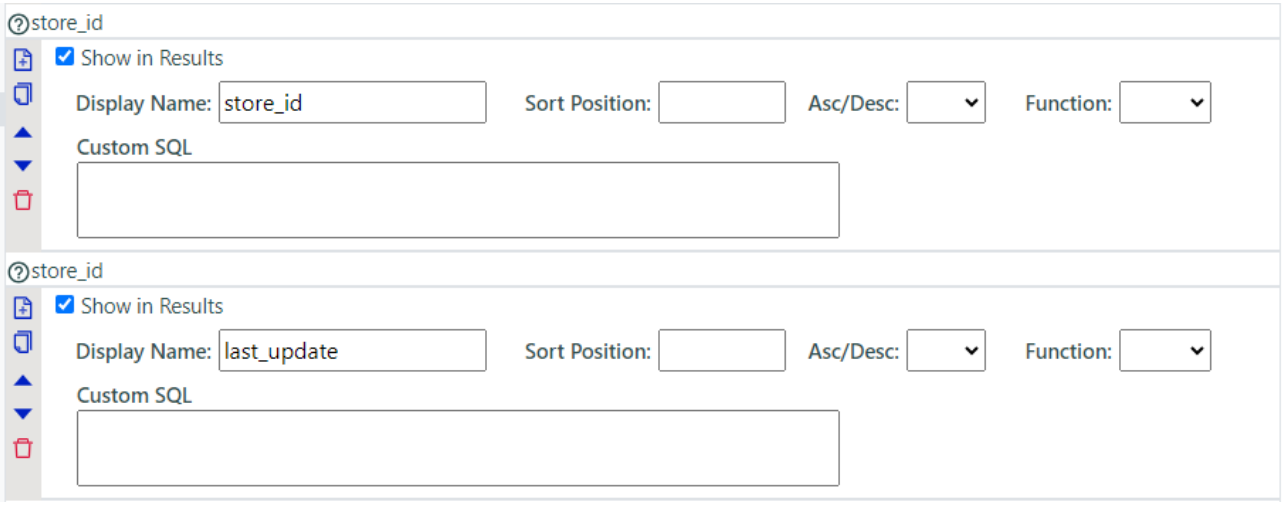


Column Details Icon

Clicking the column details icon display more information about the column:

Duplicate Column Icon

Clicking the duplicate column icon will create a duplicate column definition which the user can then configure in a different manner than the original. This allows for the same column to be selected in different ways in final select statement.



Copy Table Alias and Name to Clipboard

This is a useful tool when making a custom SQL entry. A custom SQL entry must contain database-specific valid SQL with the associated raw base table aliases and column names. Name. Clicking this icon will copy this name to the clipboard – for example: *t2.store_id*

Move Column Position

The generated SQL select column order will be in the order of the columns listed in the **Data** tab. To change this order the user can click the associated arrow icons to move a column up and down. The column can also be dragged by clicking on the name bar and dragging the column configuration to the desired position.

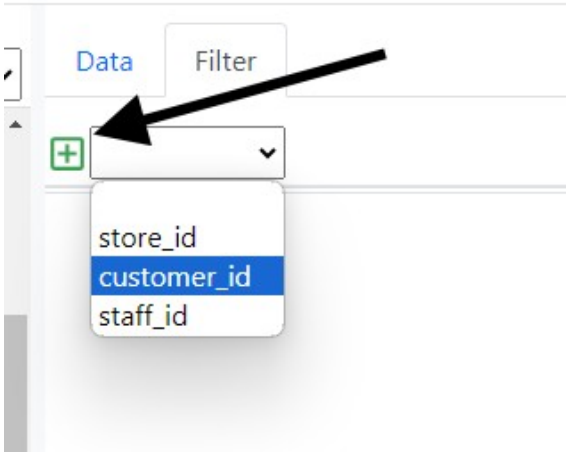
Data Column Entry Fields

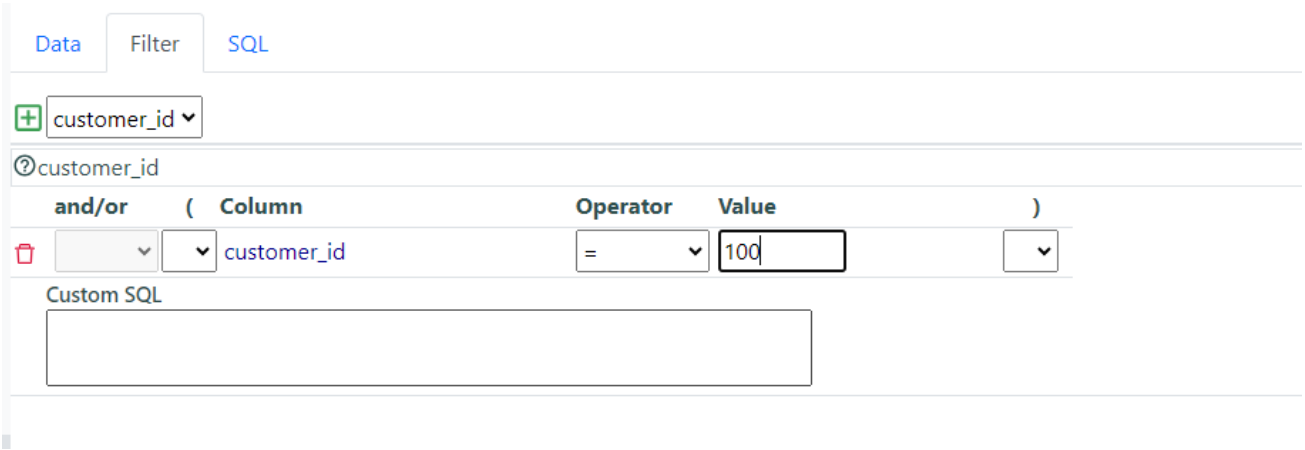
The entry fields are described in the table below:

Display in Results	This is checked by default. If unchecked, column is still available for filtering but will not appear in the result set data
Display Name	This will be the column name return from the SQL query – will become the “as” clause in the select.
Sort Position	Enter an integer sort position greater than 0 here if you want to sort by this column
Asc/Desc	Select sort direction – defaults to Asc
Function	Aggregate functions can be applied to the column based on type. Select the function as desired. Qvu will handle building the appropriate Group By and Having clauses
Custom SQL	The user can enter database-specific SQL here to perform any query operation desired. The entered SQL must be valid for the database type. This is where the **Copy Table Alias and Name** clipboard functionality discussed above comes into play. The user can sum multiple columns, apply database-specific functions etc. When this field is populated the actual column associated with the panel is ignored and the select SQL is replaced by the custom SQL entered.

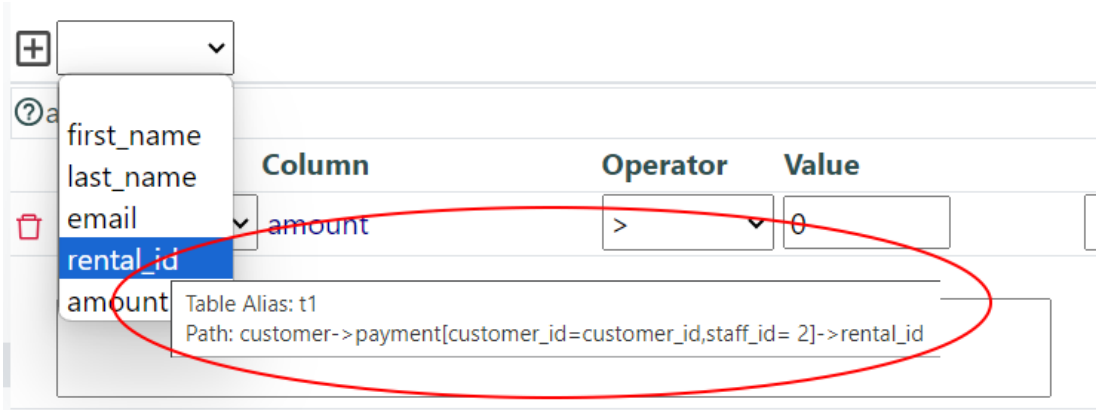
Query Design Filter Tab

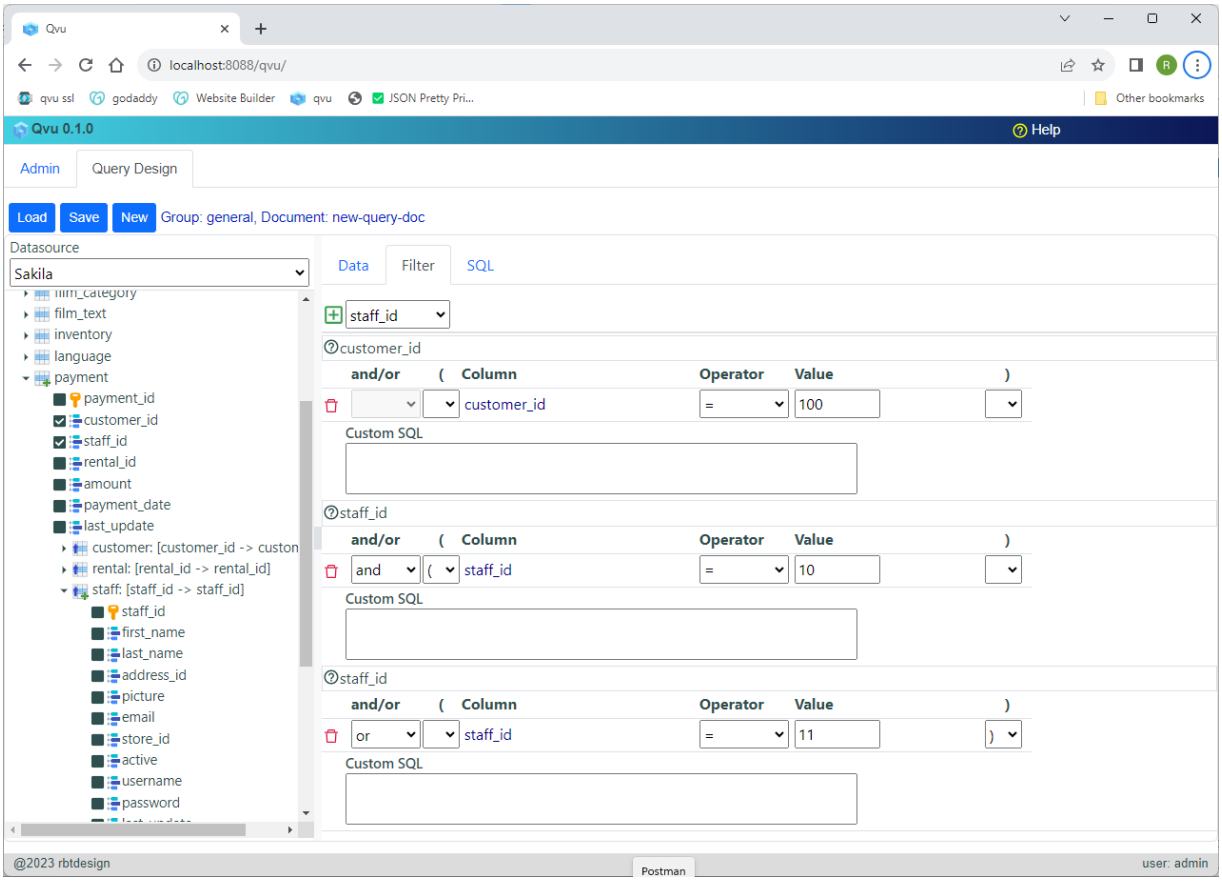
The filter tab allows the user to build the SQL where clause. In order to execute a query it must have a filter configuration – no open-ended queries are allowed.
To add a filter column select the desired column from the drop down and click the Add icon:



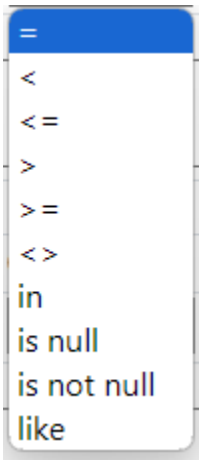


The user can select parenthesis and the and/or operators as required. If the user hovers over the filter select drop down additional column details will display:





The available comparison operators are shown below:



When entering comparison operator enter the value only – no quotes are required. When using the “in” operator, enter a comma-delimited list of values. When using the “like” operator enter the appropriate wildcard characters (% and _).

Similar to the data select entry, custom SQL can be entered in the Custom SQL field – see the discussion of the custom SQL entry in the Data Column Entry Fields table for more information.

Query Design SQL Tab

Once filter entries have been created the SQL Tab becomes visible

The SQL tab is a split pane with 2 sections – the upper section displays the generated SQL and action icons and the lower pane displays the query results after the query is run.

SQL Tab SQL Pane

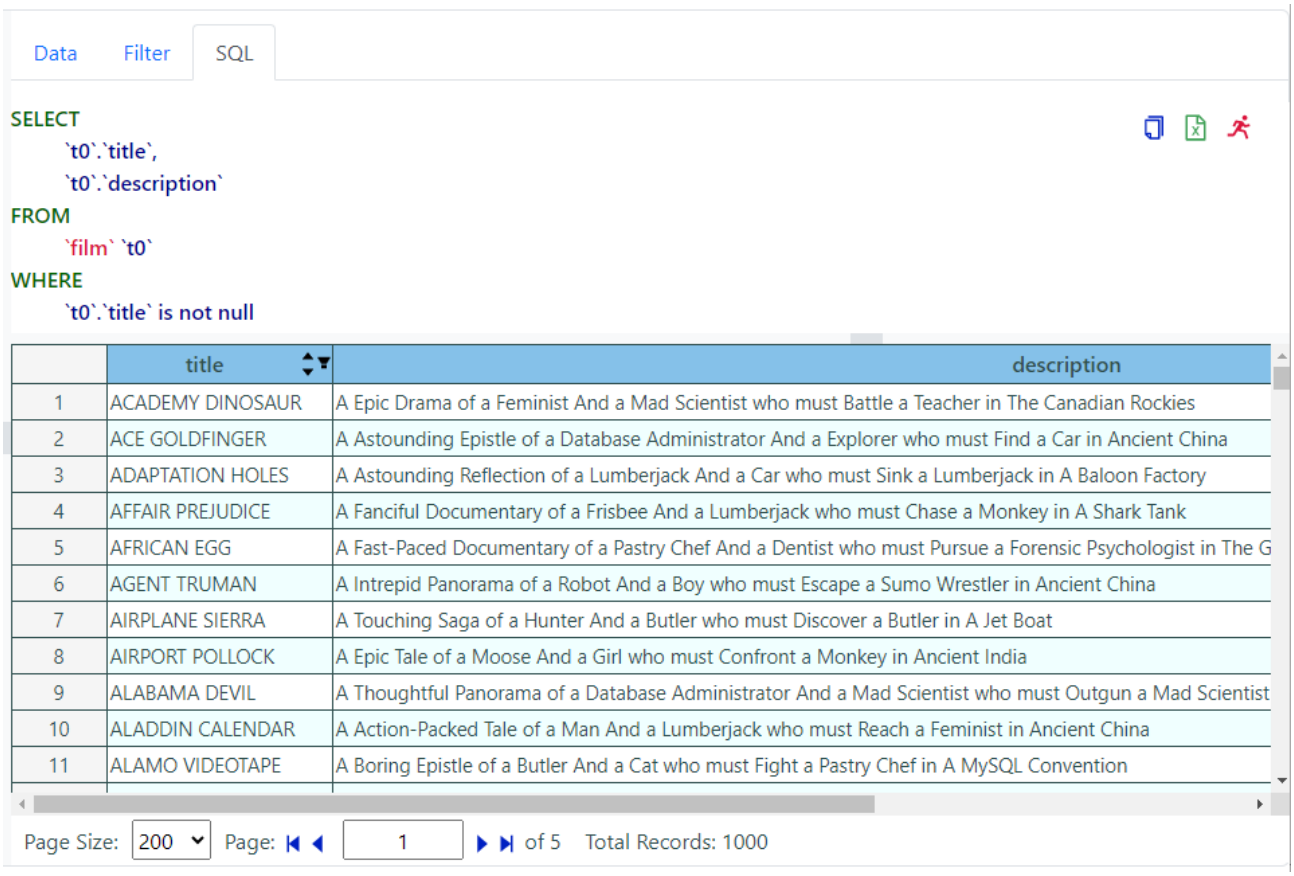
The **SQL** Pane displays the database-specific generated SQL statement as well as action icons. The icons functions are described below:

Clicking this icon will copy the SQL statement to the clipboard

Clicking this icon will export query results to excel – icon is disabled if no results available.

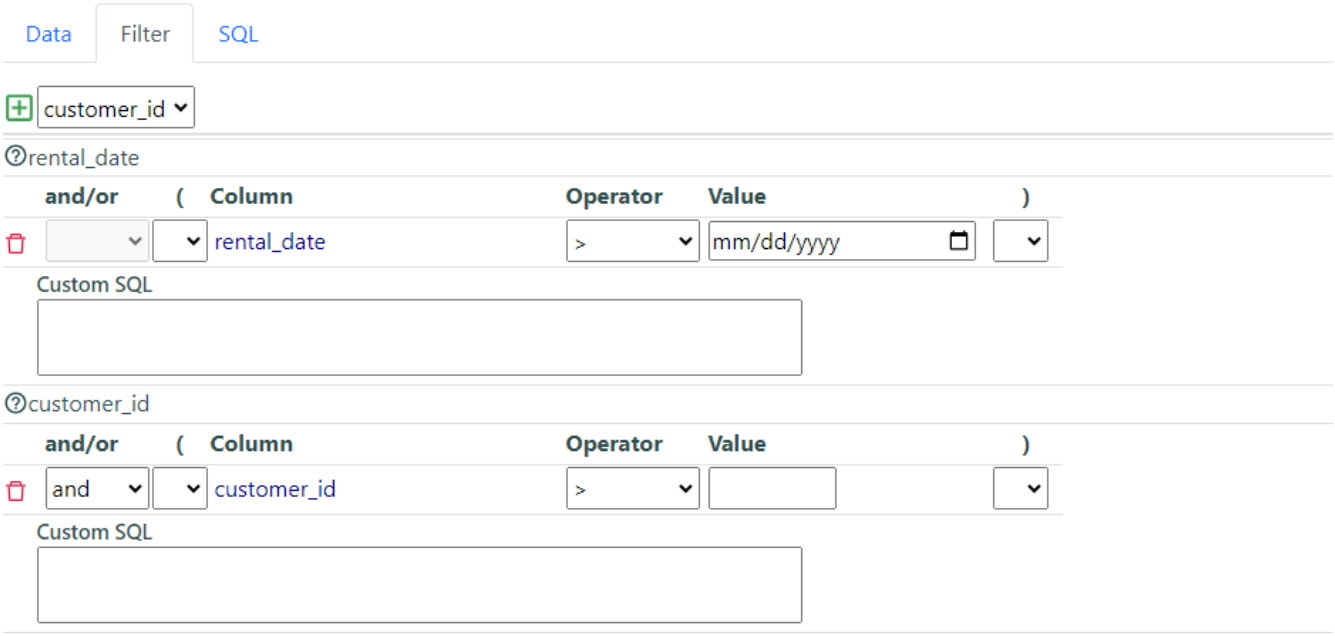
Clicking this icon will run the query.

When the run icon is clicked, the query will execute and results will populate the results table in the bottom SQL Tab pane:



Filter Values Prompts

When a defined filter value is left blank in the Filter Tab the user will be prompted for entry when running the query – for example if the user creates this filter:

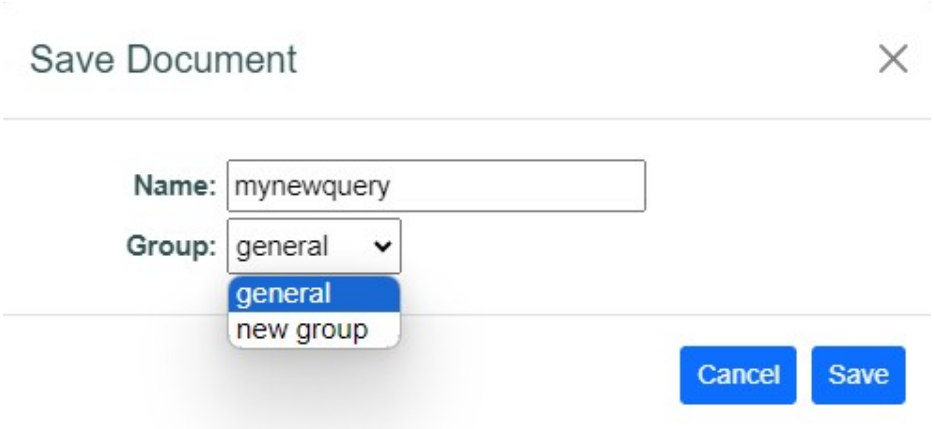


Then when the r**un** icon is clicked the Run query value entry dialog will display to prompt for user input:

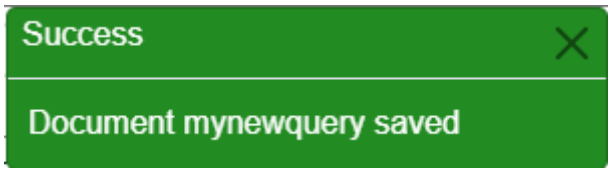
Saving a Query Document

Once a user has created a query the query can be saved as a re-usable Query Document. To save a query click the Save button

to display the Save Document dialog:

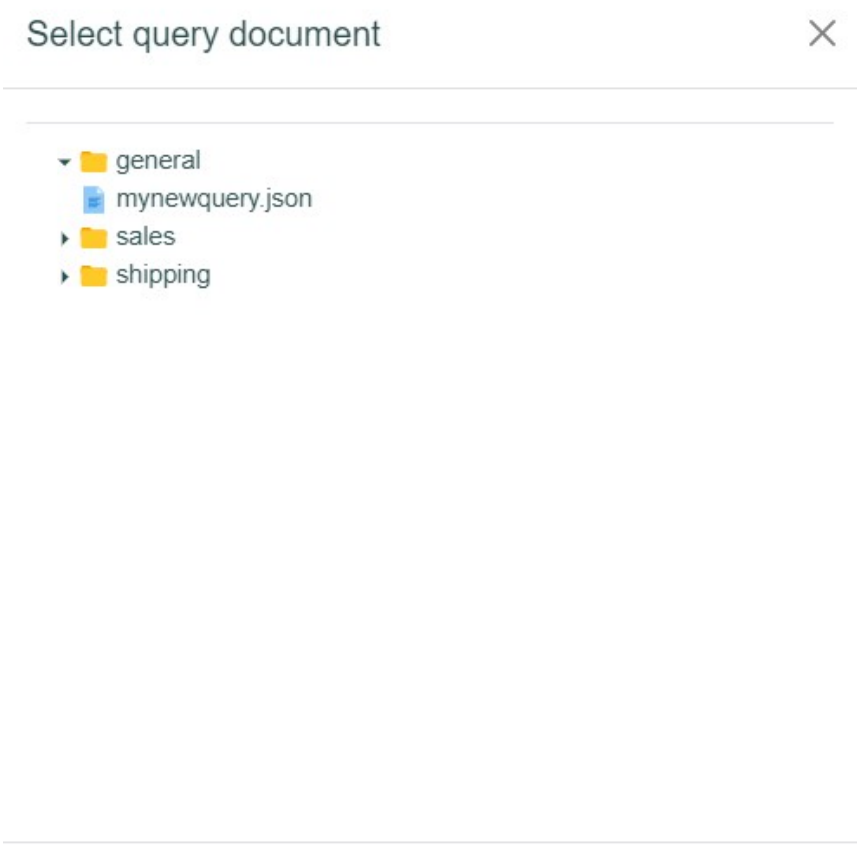


Enter a unique name for the new Query Document and select an appropriate Document Group then click Save. If document saves successfully you should see a success message:

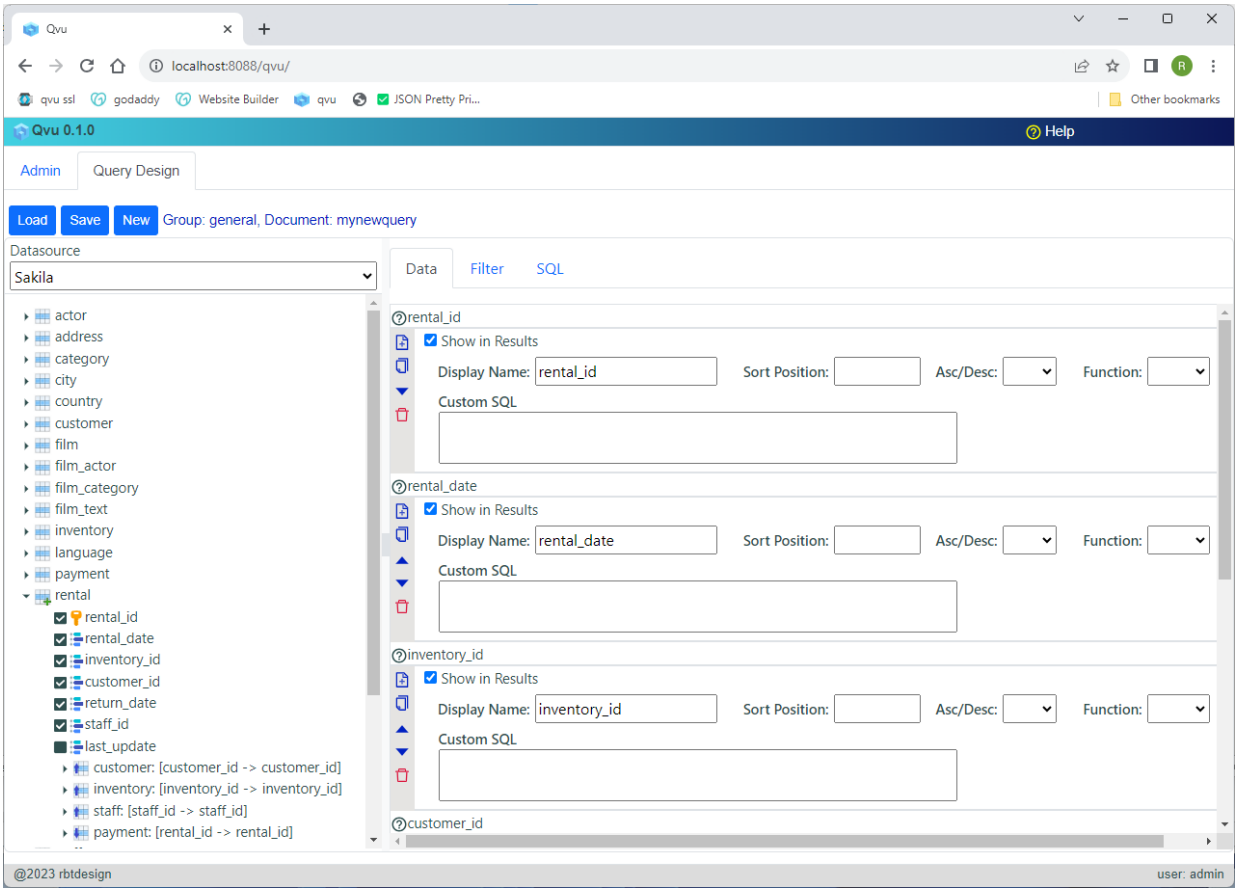


Loading a Saved Query Document

To load a saved query document click the Load button to display the Select query document dialog, open the appropriate document group and select the desired document.



The Query Design tab should populate with the selected query document setting.



REST API

The Qvu Data Service provides REST API endpoint to execute created query documents. The requesting application must successfully authenticate when using the API. For Basic Auth this consists of sending an appropriate username and password in the header. For OIDC this is dependent open the identity provider.

The API calls to retrieve data are shown below:

- <qvu-hostname>/qvu/api/v1/query/run/json
- <qvu-hostname>/qvu/api/v1/query/run/json/objectgraph
- <qvu-hostname>/qvu/api/v1/query/run/tabular

The **/run/json** endpoint return results as an array of flat JSON records. The **/run/json/objectgraph** endpoint returns a json object graph with parent child relationships. and the **/run/tabular** returns a JSON object with tabular results in the following format:

```
{
        "rowCount": 100,
        "header”: ["header1”, "header2”…],
        "columnTypes”: [jdbcType1, jdbcTy2…],
        "initialColumnWidths”: [column1Width, column2Width…],
        "data”: [[row1col1, row1col2…], [row2col1, row2col2…]]
}
```

The fist data column in the tabular results will hold the row number.

All endpoints expect a POST request with a JSON body in the following format:

```
{
   "documentName": "query-document-name",
   "groupName": "query-document-group",
   "user": "current-user-name",
   "parameters": [
        {"dataTypeName": "integer", "value": someIntValue},
        {"dataTypeName": "string", "value": “someStringValue”},
        {"dataTypeName": "date", "value": "1990-01-01"}]
}
```

Where parameters are any required runtime parameters. The runtime parameter types supported are listed below:

- string
- float
- integer
- date
- timestamp
- time
- boolean

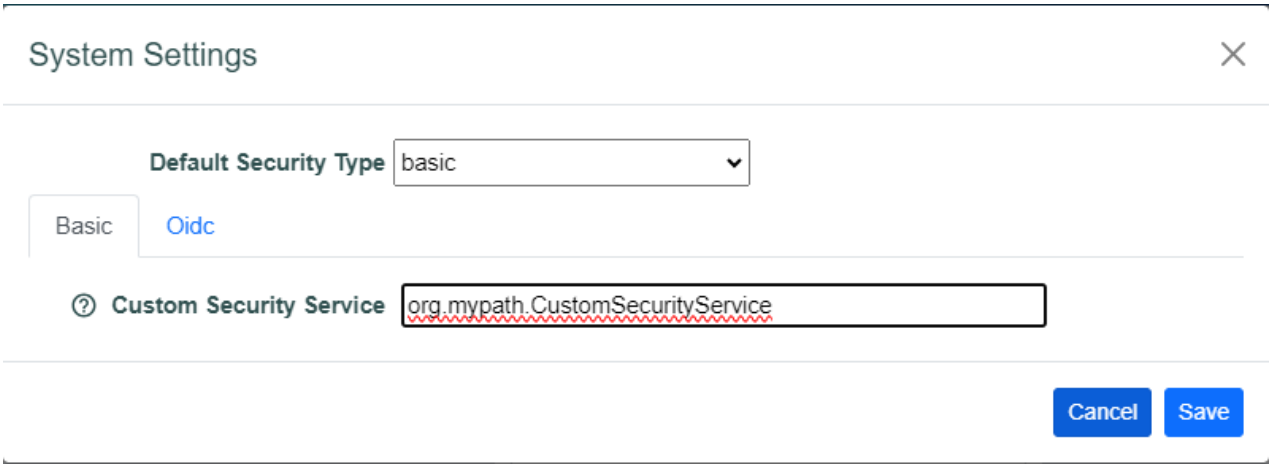
Custom Security

To implement a custom security scheme in Qvu Data Service follow the following steps:

1. Clone the qvu-client-utils git project found at: https://rbtucker@github.com/rbtucker/qvu-client-utils.git
2. Build the project with “mvn clean package”

3. Install the qvu-client-utils-1.0.0.jar in your local git repository using the following command:
   mvn install:install-file -Dfile=qvu-client-utils-1.0.0.jar -DgroupId=org.rbtdesign -DartifactId=qvu-client-utils -Dversion=1.0.0 -Dpackaging=jar
4. Build a custom service class that implements the org.rbtdesign.qvu.client.utils.SecurityService interface from the library built in step 3. Make sure that the maven dependency for the qvu-client-utils is set to scope "provided"
5. An example project can be found at https://rbtucker@github.com/rbtucker/qvu-custom-security-example.git
6. Copy the SecurityService implementation jar to the <qvu-repositiitory-folder>/extlibs
7. Now start the qvu data service with the system parameter:
   -Dloader.path=<qvu-respository-folder>/extlibs

You can now enter your custom java class in the System Settings Custom Security Service field as shown below:



Restart the Qvu Data Service and the custom class should be used for user authentication.

Qvu Repository

The Qvu repository is where all the Qvu artifact and configuration is stored – the layout is shown below:

<repository-root>
|
|_____ config
|_____ documents

```
|_____ extlibs
|_____ help
|_____ logs
```

Below is a description of each folder:

Qvu Repository config Folder

The config folder holds the following configuration files used by the Qvu Data Service:

- application.properties – contains basic server configuration information such as root context, SSL properties and server port
- qvu-datasources.json – contains the configured Qvu datasources
- qvu-document-groups.json – contains the configured document groups
- qvu-language.json - contains the Qvu language text setup
- qvu-security.json – contains the authentication setup and the configured users and roles

Qvu Repository documents Folder

The documents folder contains query documents stored by group name in the following layout:

```
documents
    |____ group1
    |          |_____query
    |                  doc1.json
    |                  doc2.json
    |____group2
               |_____query
                        doc1.json
                         doc2.json
```

Qvu Repository help Folder

Contains Qvu help and getting started documents. Document names are in the format qvu-gettingstarted-<language-property>.pdf and qvu-help-<language-property>.pdf. The default files are qvu-gettingstarted-EN-us.pdf and qvu-help-EN-us.pdf. Other language help files can be added as desired. If no file for a particular language exists then the EN-us version will be used.

Qvu Repository logs Folder

Holds the Qvu server logs and archived logs

Language Support

The Qvu Data Service is designed to support multiple languages. The base language file is found in the Qvu repository at config/qvu-language.json. A snippet of the file is shown below:

```
{
   "en-US": {
      "?": "?",
      "Add datasource": "Add datasource",
      "Add group": "Add group",
      "Add role": "Add role",
      "Add role": "Add role",
      "Add user": "Add user",
      "Add user": "Add user",
      "Admin": "Admin",
         .
         .
         .
```

To add another language add the associated language property and replace the JSON value fields with the appropriate text. You can also modify the existing text to customize the UI display as desired.

The default help files are located in the Qvu repository under the help folder:

qvu-gettingstarted-en-US.pdf
qvu-help-en-US.pdf

Custom help files can be created with the appropriate language property included in the name and those will display based on the language property provided by the browser.