User Reference

BI Catalog Builder - ADF Tool

By CMiC

CMiC
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Proprietary Notice

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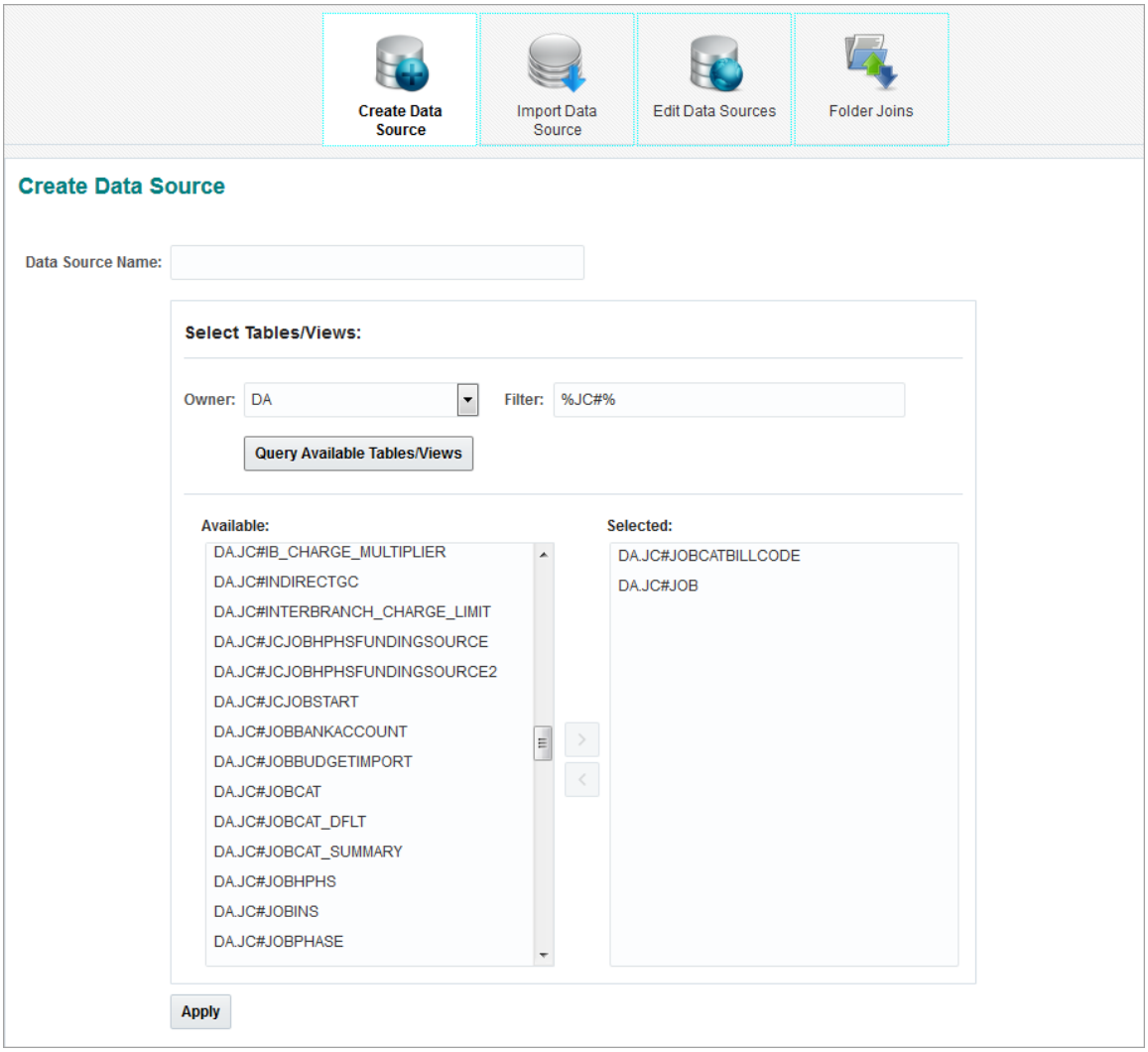
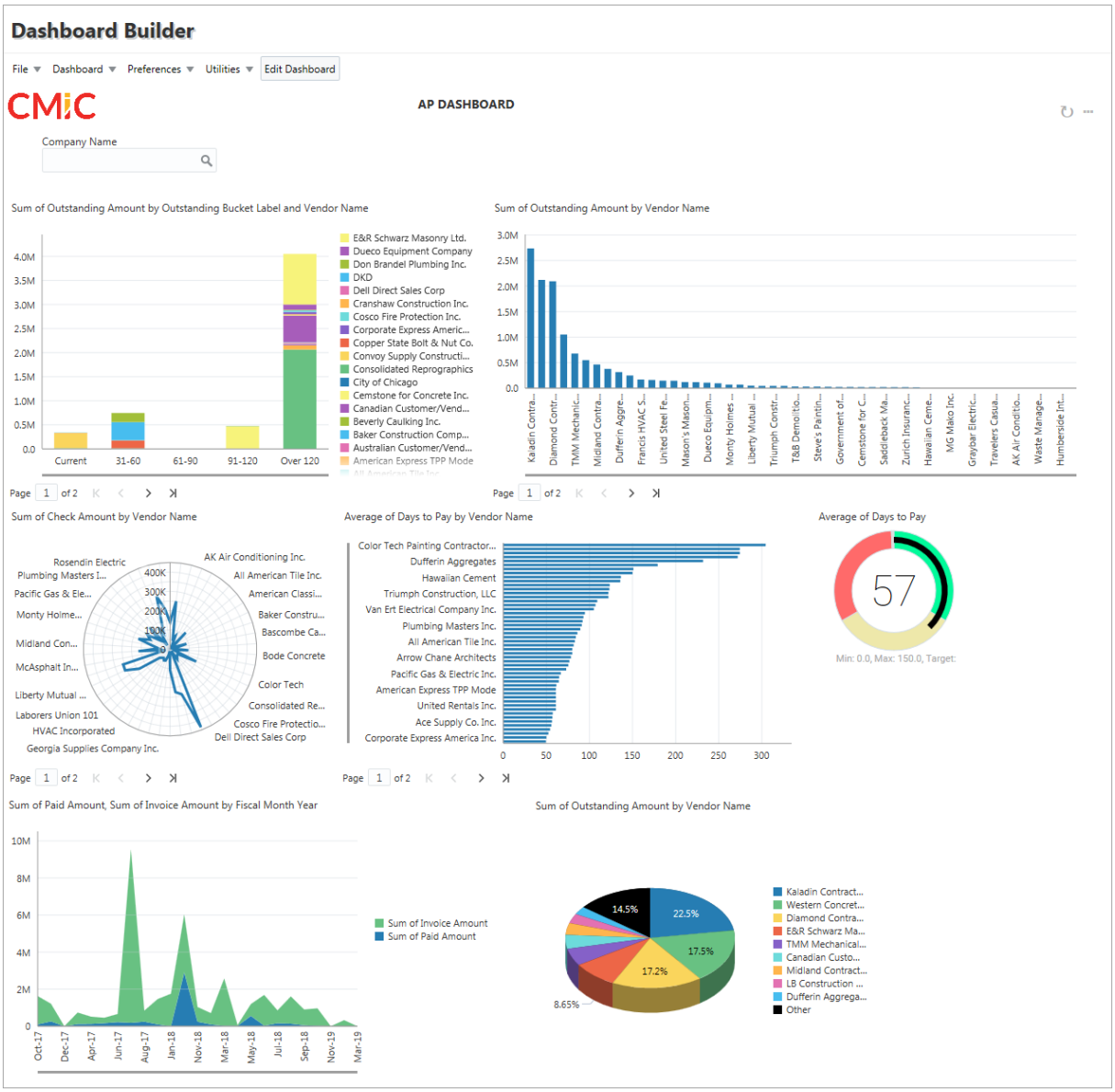


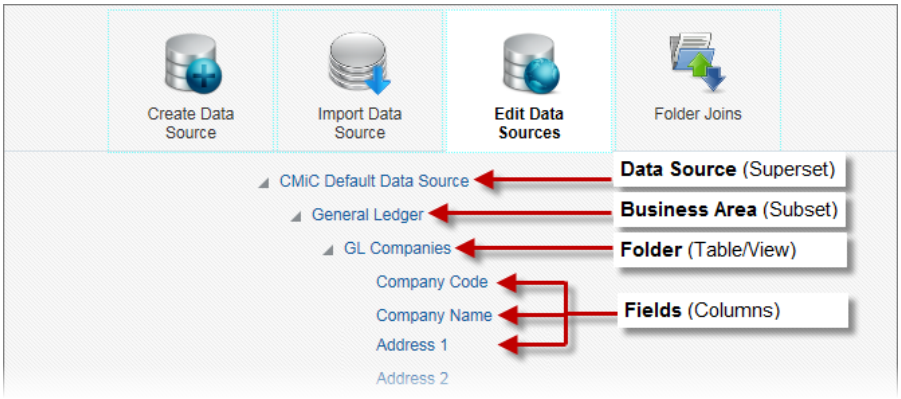
BI Catalog Builder – ADF Tool

The BI Catalog Builder tool, shown above, works in conjunction with the BI Dashboard Builder tool to create custom, dynamic dashboards, as shown in the following screenshot. The BI Catalog Builder tool is used to create a catalog of data sources, and the BI Dashboard Builder tool uses these data sources to create custom dashboards that provide high-level overviews, operational metrics and KPIs.



Dashboard created using BI Dashboard Builder tool

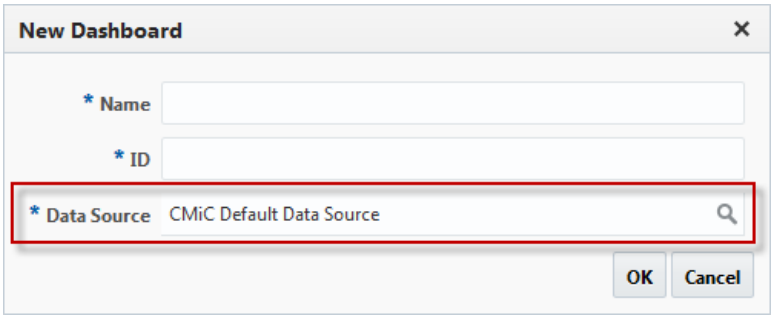
Data Sources, Business Areas, Folders, & Fields



The following provides details about the objects created in BI Catalog Builder.

Data Source (Superset of Database Objects)

In BI Catalog Builder, a data source is a master set of database objects (i.e., tables, views) that have been logically organized into subsets referred to as business areas.



Pop-up window launched when creating a new dashboard in BI Dashboard Builder tool

In BI Dashboard Builder, a data source is selected when creating a new dashboard (as shown above), and its folders (i.e., tables/views), and the results (rows) returned by their joins are used to create the dashboard's visualizations (i.e., charts, gauges, tables).

Business Area (Subset of Data Source)

A business area is a subset of the data source that contains a logical grouping of tables/views (i.e., folders) pertinent to a dashboard to be created in BI Dashboard Builder.

Folder (Table/View)

A folder is a single table or view, which contains rows of records comprised of fields (i.e., columns).

Field (Column in Row of Table/View)

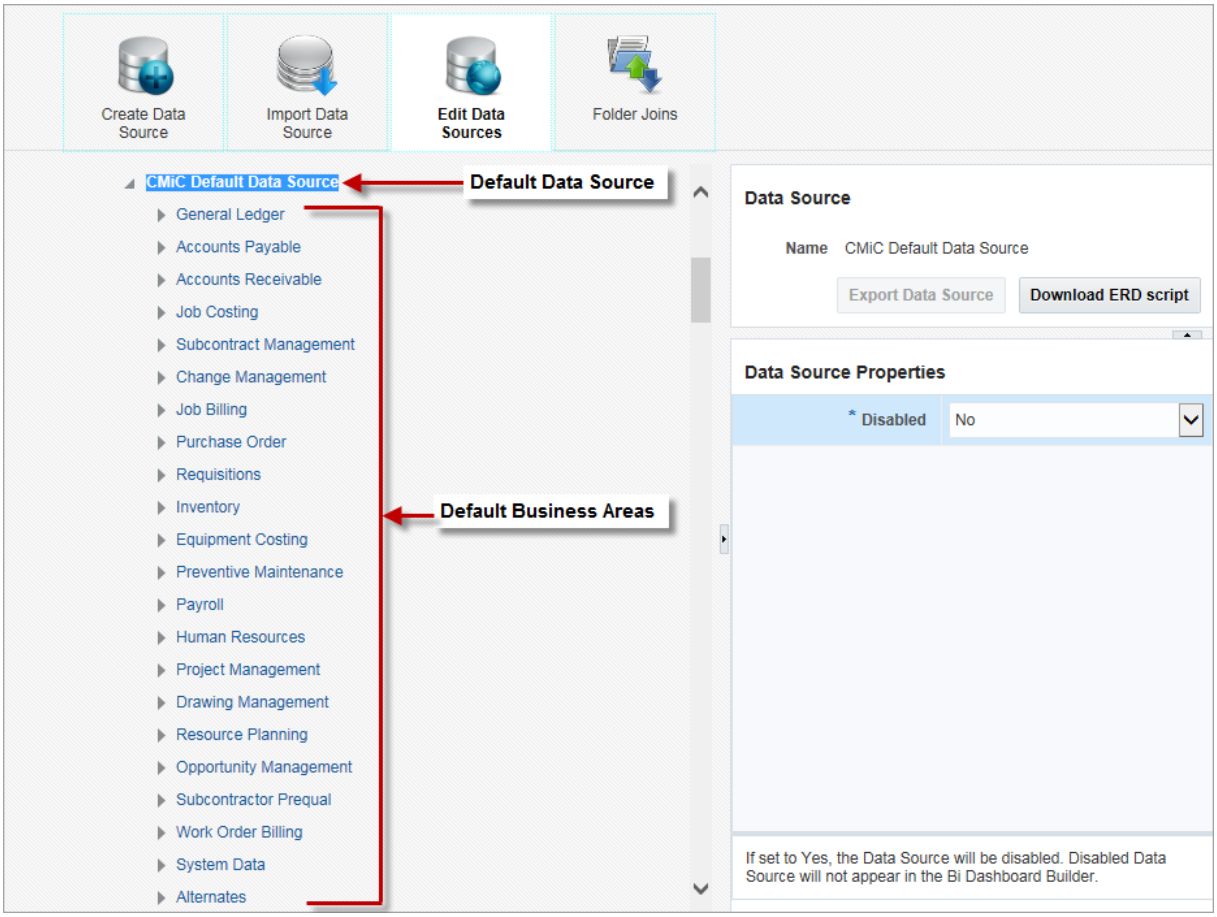
For a table's or view's row, its data is stored in fields (i.e., columns).

CMiC Default Data Source – Predefined Data Source

A default data source is provided with BI Dashboard Builder, CMiC Default Data Source, which contains nearly every table and view in the system, with nearly all the joins that could be required between them optimally predefined. To create new dashboards, this provided data source likely contains the required tables, views and joins.

NOTE: The CMiC Default Data Source should not be modified, as patch installations and hotfixes update this default data source, overwriting any changes made to it and making any dependent dashboards unusable.

As shown below, CMiC Default Data Source is comprised of subsets of tables and views that are grouped by Enterprise modules:



If CMiC Default Data Source is not sufficient to create a desired dashboard, because a different join type is required (e.g., left outer join required instead of inner) or a table\view needs to be added to it, it is recommended that a copy of CMiC Default Data Source is created for modification and use.

NOTE: Once again, it is recommended to not modify the CMiC Default Data Source, as patch installations and hotfixes update this default data source, overwriting any changes made to it and making any dependent dashboards unusable.

For details about creating a copy of CMiC Default Data Source, please refer to the following section in this guide about the “Copy” context menu option of the Edit Data Source screen: *Context Menu (Right-Click Menu)*.

If a new data source is required, and it does not make sense for it to be a copy of the CMiC Default Data Source, only then would the Create Data Source screen be used to create it.

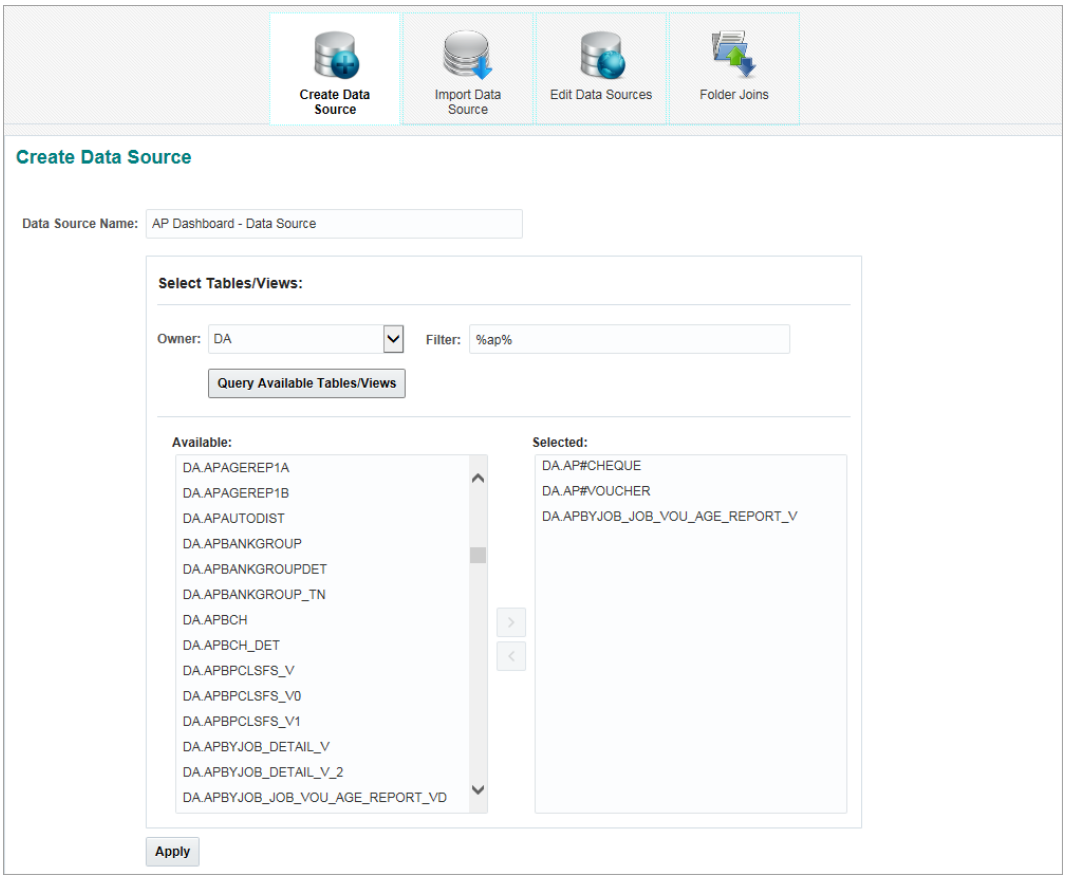
NOTE: If required, security roles can be assigned to the CMiC Default Data Source at any level, including data source, business area, and folder level. Please refer to the *CMiC BI Security – BI Catalog Builder* section in this guide for more information.

Auto-Saving

In BI Catalog Builder, saving occurs every time a change is made on the screen. Once finished using BI Catalog Builder, simply close the browser window, as all changes have been saved.

Create Data Source – Screen

Overview – Create Data Source



Create Data Source screen

The Create Data Source screen of BI Catalog Builder is used to create a new data source to add to the catalog of data sources available for the BI Dashboard Builder tool. The list of created data sources is available on the Edit Data Source screen.

Using this Screen

This screen would typically not be required, as the default data source provided with this application, CMiC Default Data Source, has been created to contain nearly all the tables and views in the system, with nearly all the joins that could be required between them optimally predefined. If CMiC Default Data Source is insufficient, because a different join type is required or a table\view needs to be added to it, it is recommended that a copy of CMiC Default Data Source is created for modification and use.

NOTE: It is recommended that CMiC Default Data Source is not modified, as patch installations and hotfixes update this default data source, overwriting any changes made to it and making any dependent dashboards unusable.

For details about creating a copy of CMiC Default Data Source, please refer to the following documentation about the "Copy" context menu option of the Edit Data Source screen: *Context Menu (Right-Click Menu)*.

If a new data source is required, and it does not make sense for it to be a copy of CMiC Default Data Source, then this screen would be used to create it, as outlined by the following steps.

NOTE: For CLOB type table/view columns, Catalog Builder will generate calculated fields that will truncate CLOB values if they are longer than 4000 characters, adding "[TEXT TRUNCATED]" to the truncated value if truncation occurred. Users can modify this calculation if necessary. This applies when fields are being generated, such as when a new data source is created on the Create Data Source screen or when a data source is edited on the Edit Data Source screen using the context menu options "Edit Business Area" or "Refresh".

Creating Data Source – Steps

The following three steps are taken to create a new data source when it does not make sense for it to be a copy of CMiC Default Data Source.

Step 1: **Create Data Source**

First, the following actions are performed via the Create Data Source screen:

Part 1: Data source is created and defined.

Part 2: Data source's business areas are created and defined.

Step 2: **Edit Data Source**

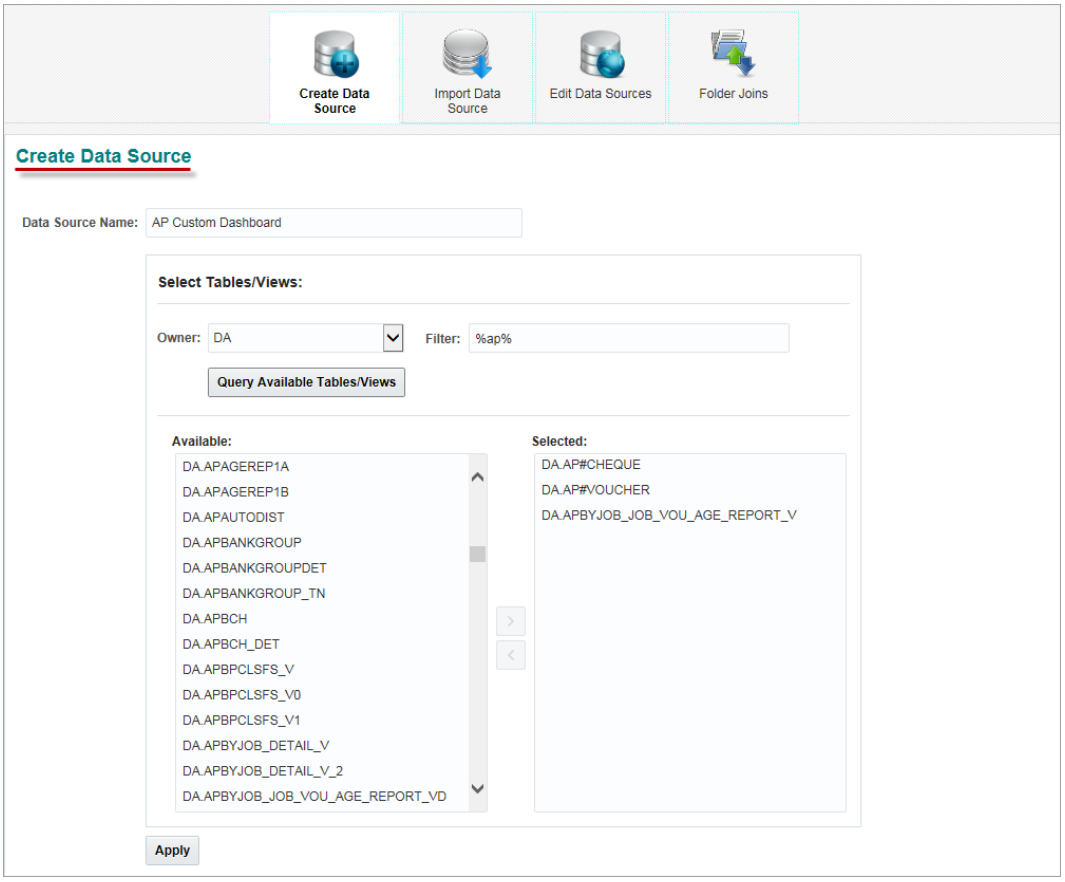
Second, the following actions are performed via the Edit Data Source screen:

- Provide more meaningful names for folders and files of new data source's business areas.
- Set the default aggregate function for the fields.
- Set which fields are visible in the BI Dashboard Builder tool, for simplification's sake.

Step 3: **Modify Folder Joins**

Third, the Modify Folder Joins screen is used to define the joins between the tables/views that will return the desired data to be charted in the BI Dashboard Builder tool.

Part 1: **Create Data Source**



The Create Data Source screen is used to create a new data source.

In BI Catalog Builder, a data source is a master set of database objects, from which pertinent subsets, known as business areas, are defined.

A data source is created by providing it a name and specifying which tables/views it contains.

Screen's Fields & Buttons

Data Source Name

Name for data source being created.

Owner

Owner of database object; after selecting relevant owner via this field, click [**Query Available Tables/Views**] to display all objects belonging to owner in the Available field's list.

Filter

Used to filter results returned for selected owner. The following wildcard characters can be used:

I. **%** (any string of characters)

II. **_** (any single character)

Click [**Query Available Tables/Views**] to view all objects belonging to selected owner and satisfy entered filter expression in the Available field's list.

[**Query Available Tables/Views**] – Button

If values for Owner or Filter field are changed, click this button to refresh the results for the Available field's list.

Available – List

Lists all database objects that belong to selected owner and satisfy the entered filter.

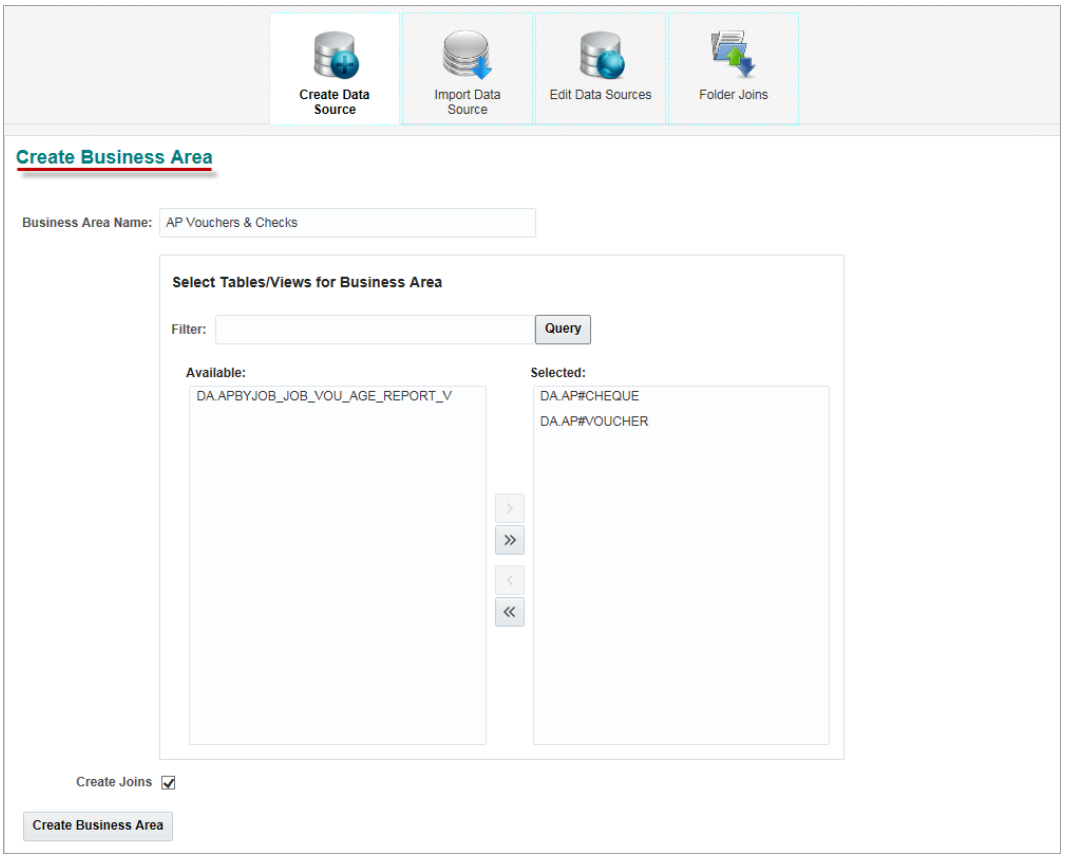
Selected – List

Lists database objects selected for data source being created; use arrow buttons to add or remove objects from this list - single arrows move one selected object, and double arrows move all objects.

[**Apply**] – Button

Once the new data source is defined, click [**Apply**] to save it, and to move to the next step, which is to create business areas for the new data source.

Part 2: **Create Business Areas**



The Create Business Area screen is used to define the subsets of a data source, known as business areas, which are pertinent to dashboards to be created in the BI Dashboard Builder tool.

Screen's Fields & Buttons

Business Area Name

Name for business area being created.

Filter

Used to filter database objects listed in the Available field's list. The following wildcard characters can be used:

I. **%** (any string of characters)

II. **_** (any single character)

Click [**Query**] to filter objects in the Available field's list according to entered filter expression.

[**Query**] – Button

If filter expression is changed, click this button to refresh the filtered results for the Available field's list.

Available

Lists all database objects contained in data source, and that satisfy the entered filter expression.

Selected

Lists database objects selected for business area being created; use arrow buttons to add or remove objects from this list - single arrows move one selected object, and double arrows move all objects.

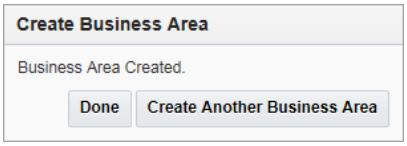
Create Joins – Checkbox

If checked, all existing joins between the tables/views of this business area (listed in Selected field's list) will automatically be created, based on constraints defined in the database. Please note that this will create some, but not all, of the required joins. Use the Modify Folder Joins screen to review the current joins, and to create additional joins.

NOTE: This process creates joins for tables using their foreign keys definitions and creates joins for views using existing joins in the Default Data Source.

[**Create Business Area**] – Button

Once a new business area is defined, click this button to save it, which brings up the following pop-up:



Click [**Done**] if another business area does not need to be created, or [**Create Another Business Area**] to create another one.

Import Data Source – Screen

Overview – Import Data Source

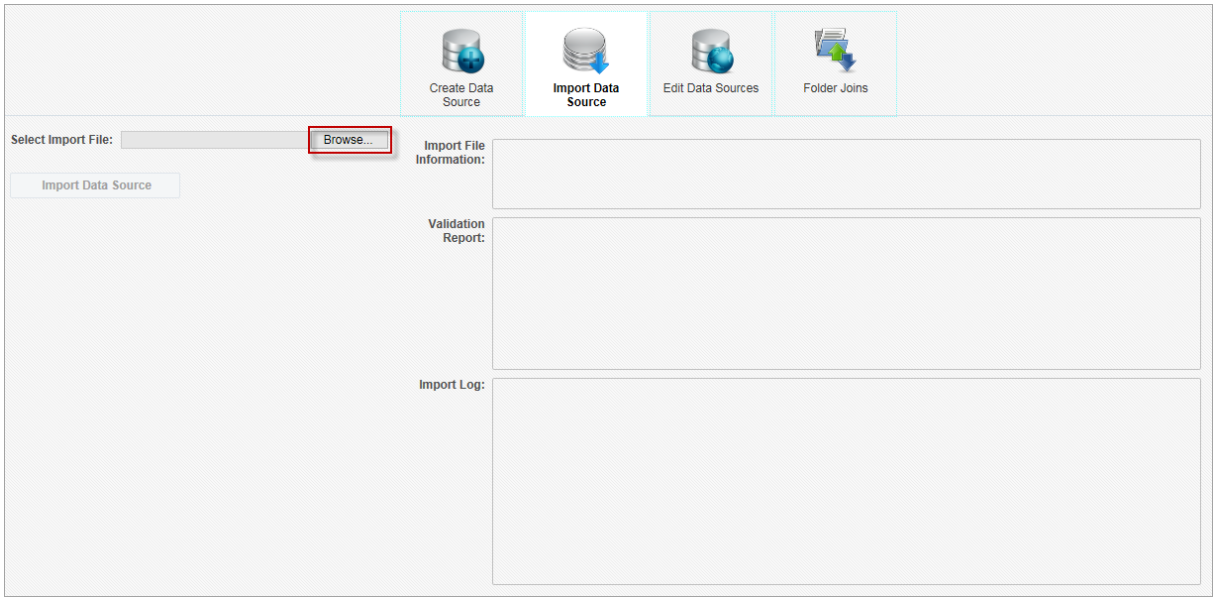
Import Data Source screen

This screen is used to import data sources.

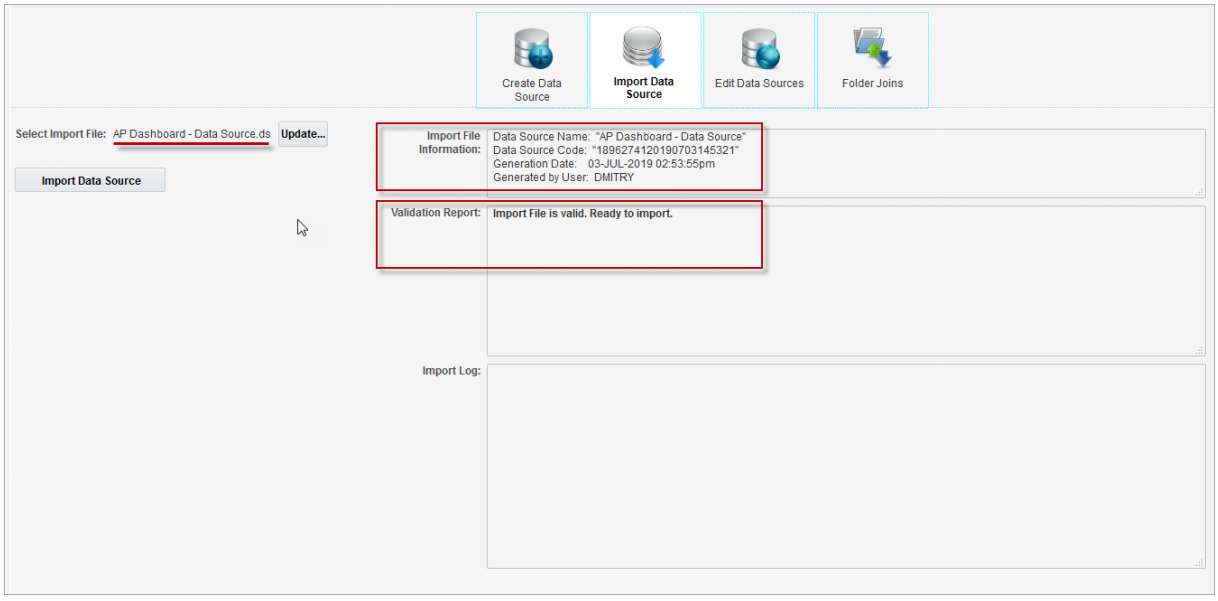
Importing Data Sources

To import a data source, complete the following steps:

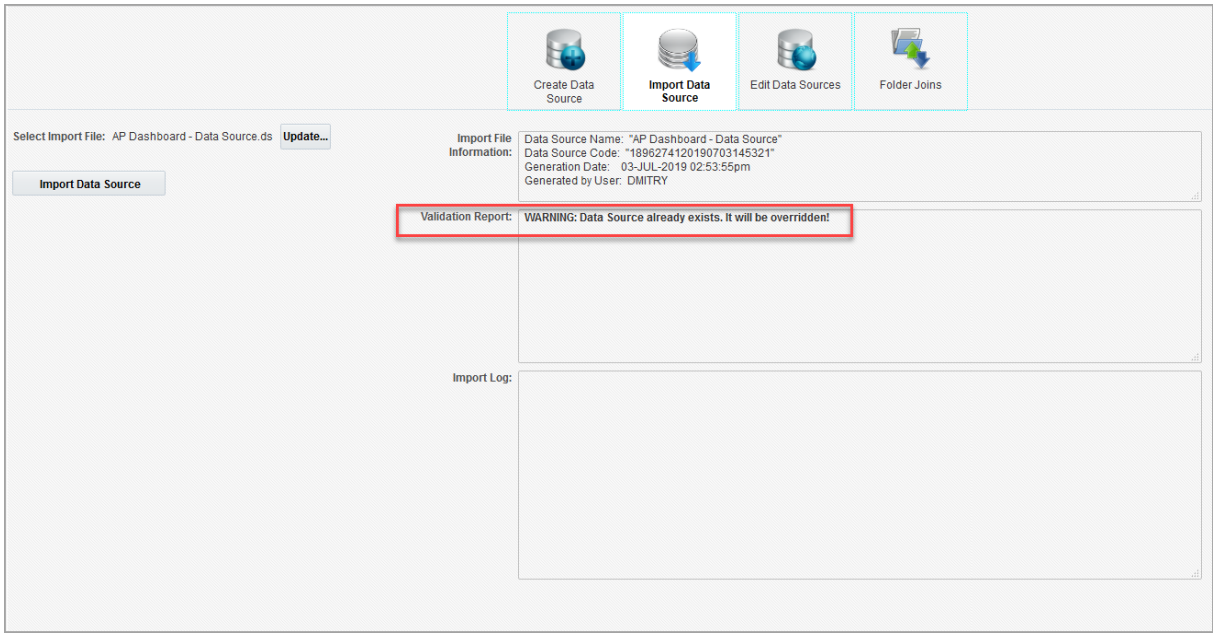
1. On the Import Data Source screen, click the [**Browse**] button and select a valid .ds file (e.g. my_datasource.ds).



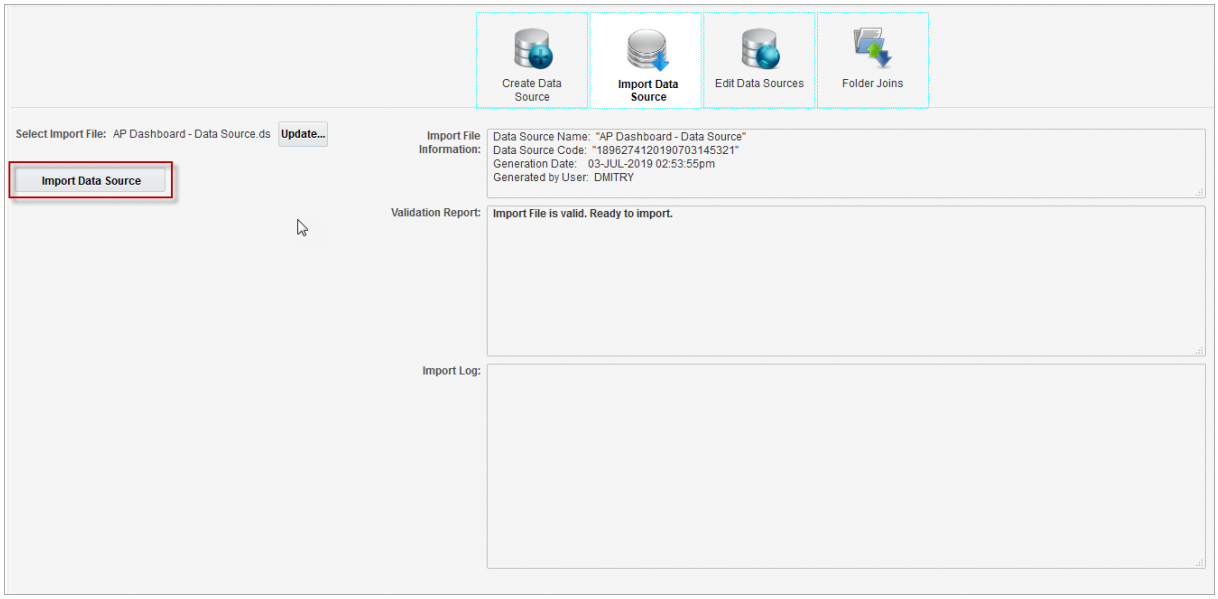
2. Once a file is selected, it will be validated before it is imported, and import file information and a validation report will be presented.



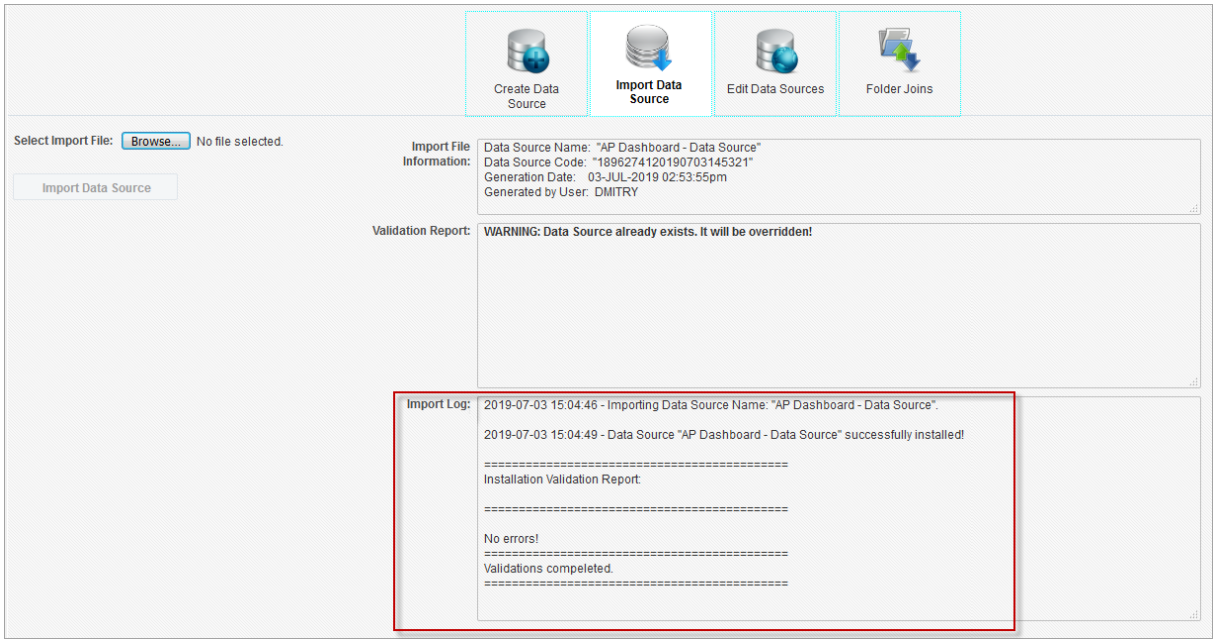
3. If a data source to be imported already exists, the validation report will issue a warning. It is recommended to always review the Validation Report panel before importing, as it may contain important warnings depending on a specific use case.



4. If validation passes and no critical errors are found, the [**Import Data Source**] button will become enabled. Click this button to start the import process.

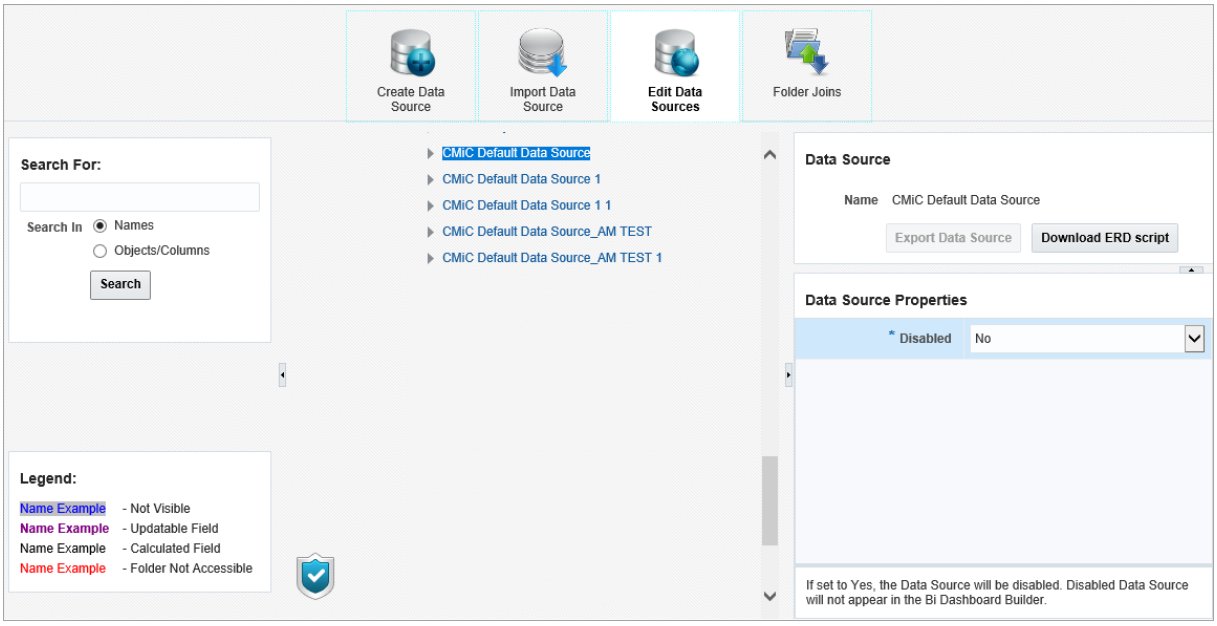


5. When the import is complete, review the import log.



Edit Data Source – Screen

Overview – Edit Data Source



Edit Data Source screen

This screen is used to edit existing data sources and to create new data sources via the following actions:

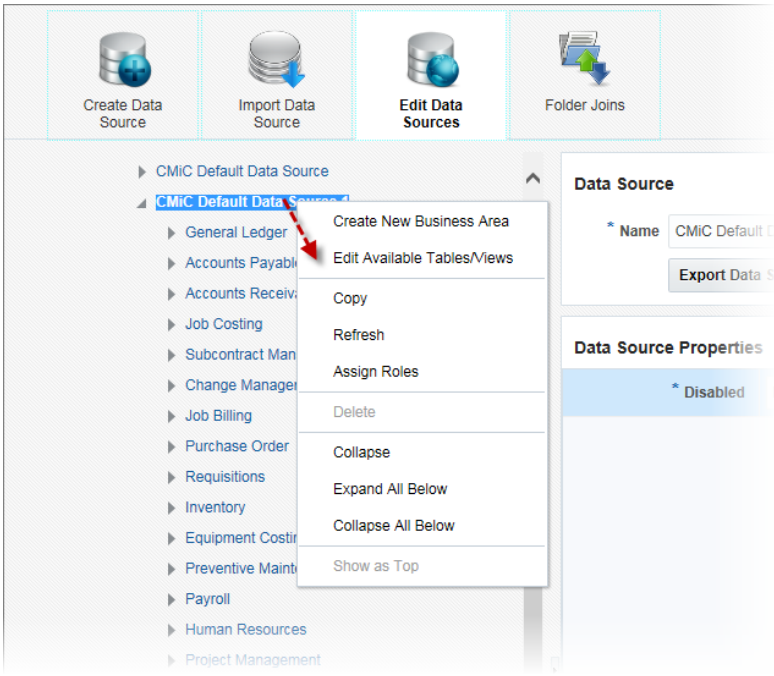
- Provide more meaningful names for folders and files of new data source's business areas.
- Set the default aggregate function for the fields.
- Set which fields are visible in the BI Dashboard Builder tool, for simplification's sake.
- Restrict access to data source by associating security role(s) to it.

A Search panel is provided on this screen to search a data source's tree for specified text or for specific objects/columns. Refer to *Searching Tree Nodes* section of this guide for more details.

A Legend is also available on this screen to explain what the colors represent for the folders and fields in the data source tree.

Operations to a data source and its components are made via this screen's context menu, which is launched via a right-click.

Context Menu (Right-Click Menu)



Example of context menu for a data source (options vary between objects)

The following section provides details about the options available via the context menu of the Edit Data Source screen, which is launched by right-clicking a data source, business area or folder.

Create New Business Area (Data Sources, Business Areas)

This option is enabled for data sources and business areas. It launches the Create Business Area screen to create a new business area for the data source. For details about this screen, please refer to the *Part 2: Create Business Areas* subsection of this guide.

Edit Business Area (Business Areas)

This option is enabled for business areas. It launches the Edit Business Area screen to edit the selected business area. For details about this screen, please refer to the *Part 2: Create Business Areas* subsection of this guide.

Edit Available Tables/Views (Data Sources)

This option is enabled for data sources. It launches the Edit Data Source screen to edit the available tables/views of the selected data source. For details about this screen, please refer to the *Part 1: Create Data Source* subsection of this guide.

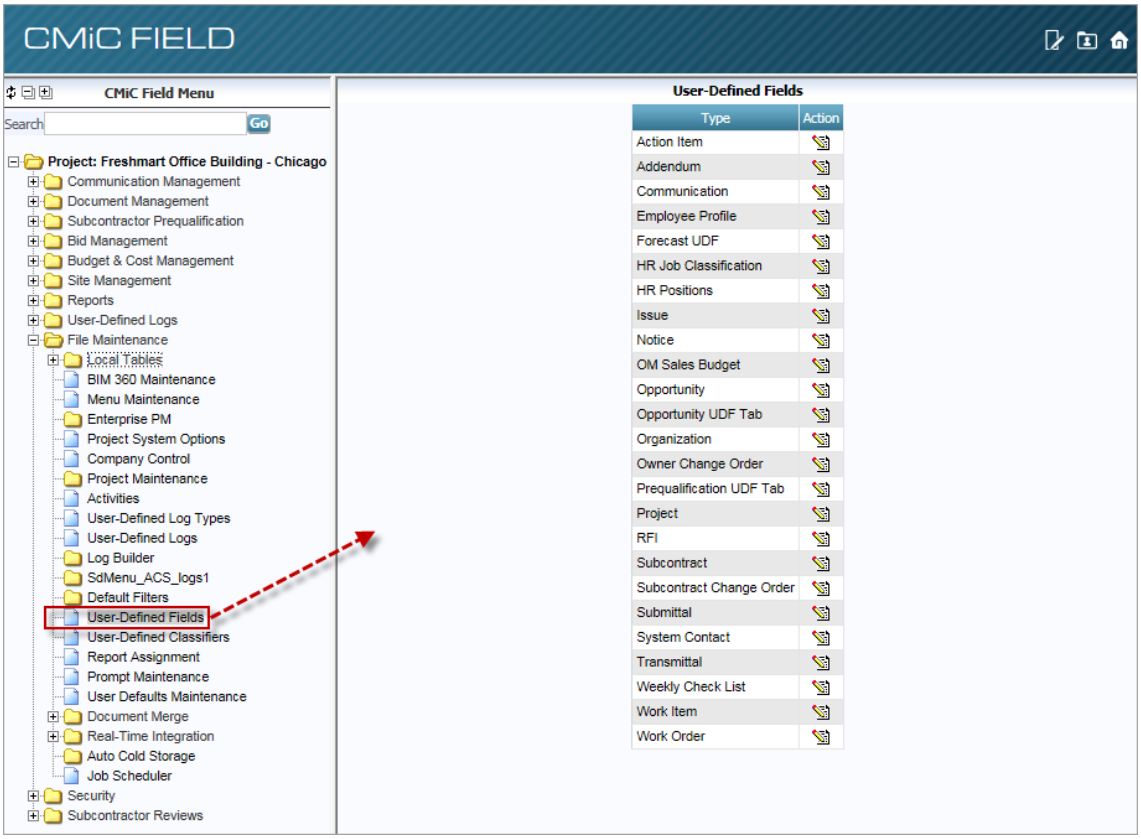
Add/Remove User-Defined Fields (Folders)

This option is enabled for folders, if the corresponding table/view in the database has user-defined fields.

Add UDFs to System for Use in BI Catalog Builder

There are two ways in which user defined fields (UDFs) can be added to the system for use in BI Catalog Builder.

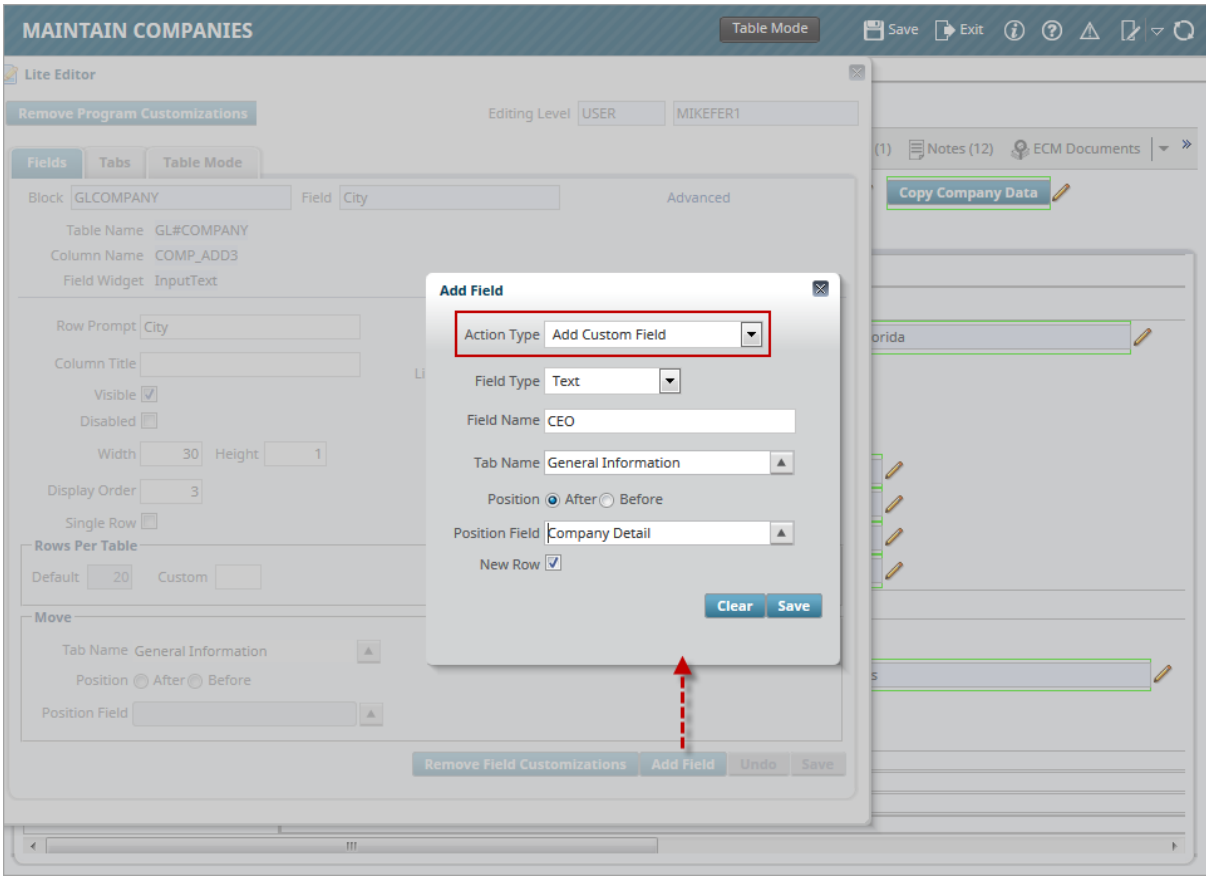
1. UDFs can be added in CMiC Field (the JSP Project Management module), as shown below:



User-Defined Fields; standard Treeview path: CMiC Field > File Maintenance > User-Defined Fields

For details, please refer to the *xProjects* reference guide.

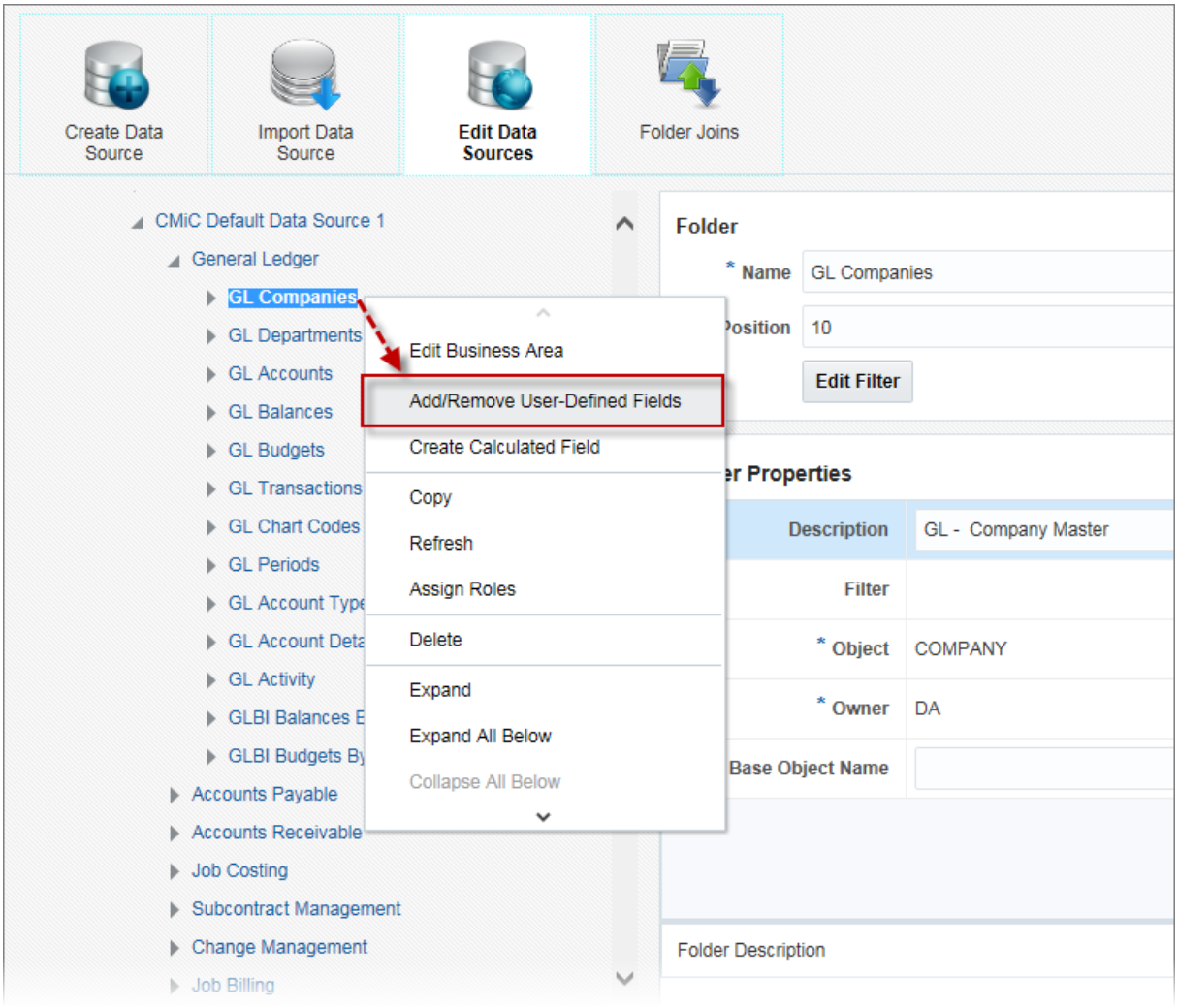
2. UDFs can be added using the Lite Editor tool, as shown below:



For details, please refer to the *Lite Editor* reference guide.

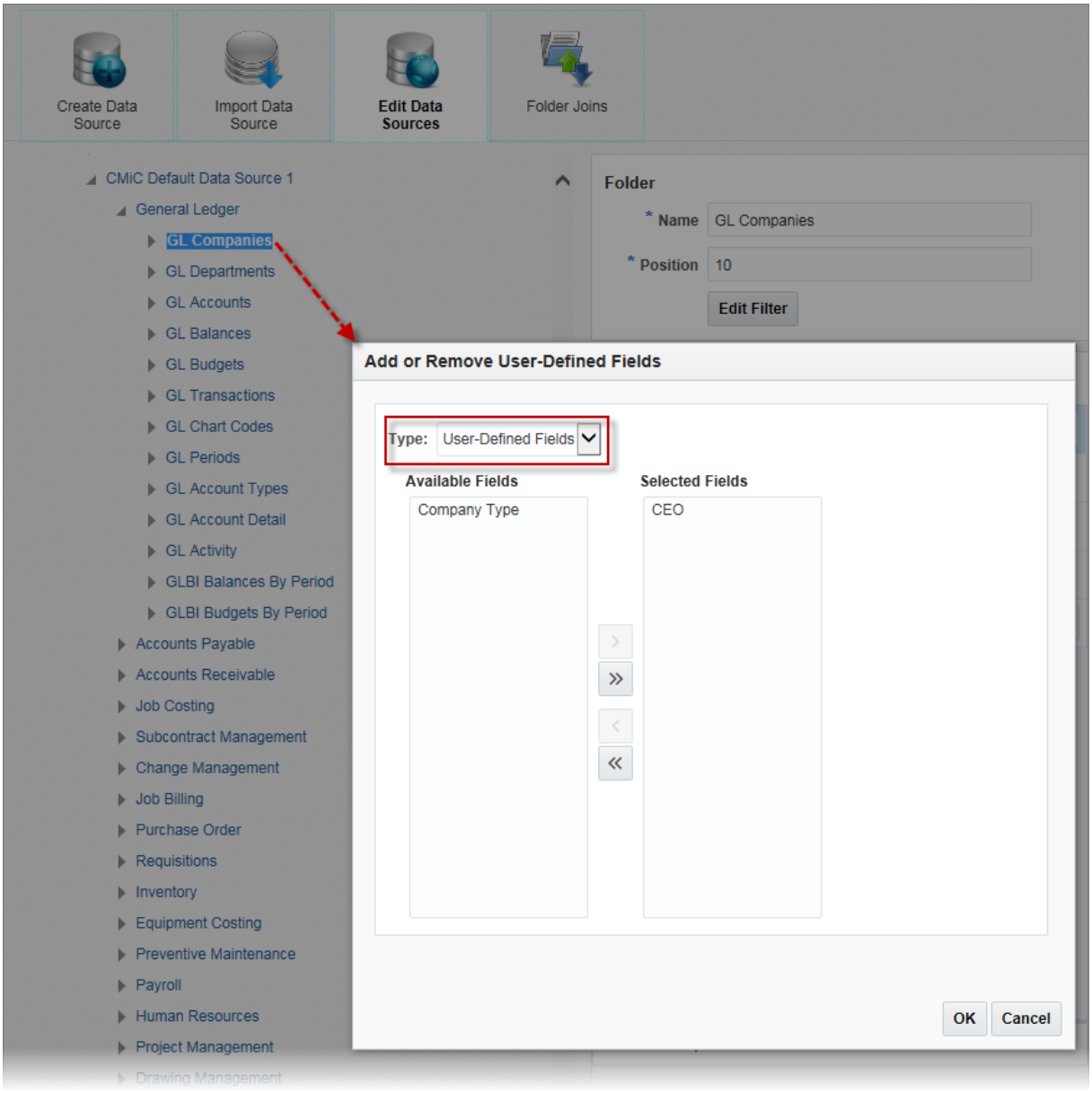
Add UDF to Folder in BI Catalog Builder

Once a UDF has been added to the system through either CMiC Field (formerly xProjects) or through the Lite Editor, it can be added to the appropriate folder, as shown below:



In the Add or Remove User-Defefine Fields pop-up window, shown below, for the Type field:

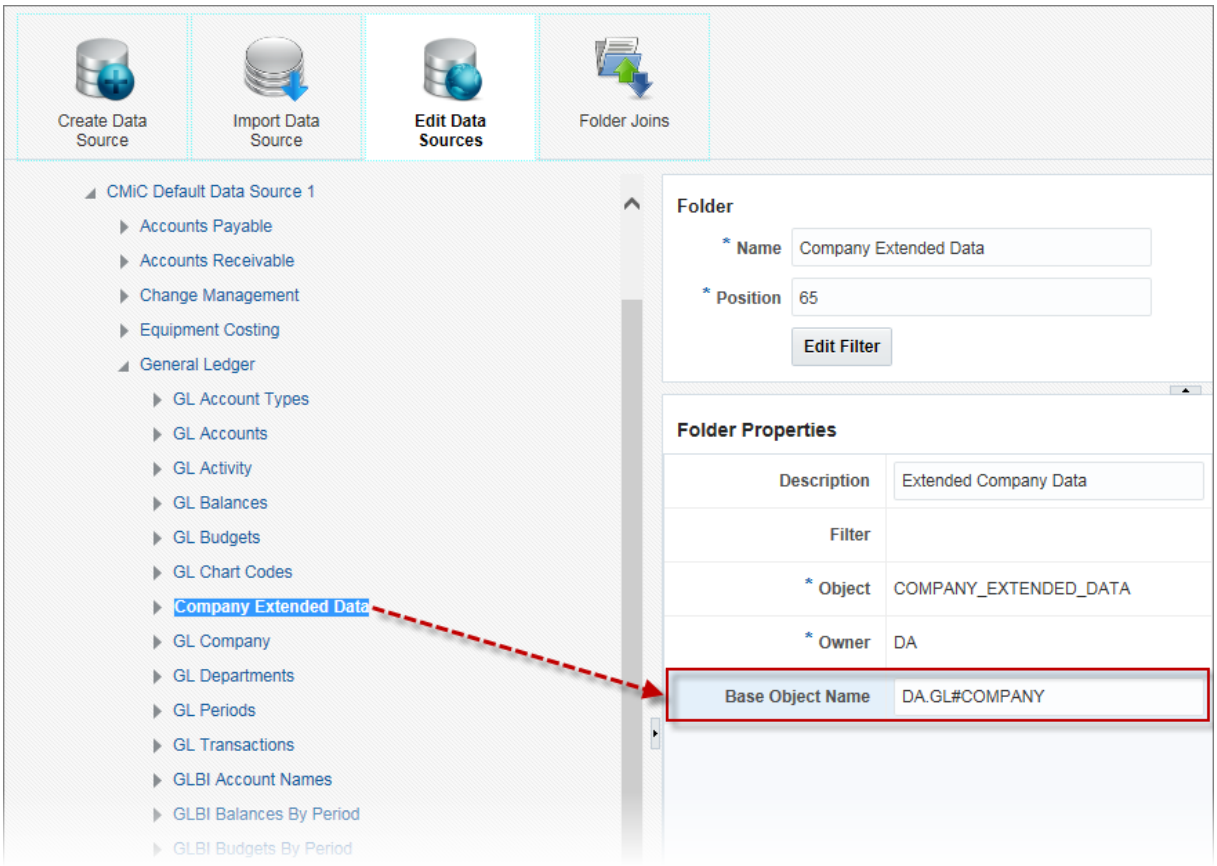
- If the UDF was added via CMiC Field, select its CMiC Field UDF type.
- If it was added via the Lite Editor tool, select “User-Defined Fields”.



Add User-Defined Fields to Custom Folders

As UDFs are linked to specific tables/views, the option to add/remove UDFs is disabled for folders that correspond to user created tables/views.

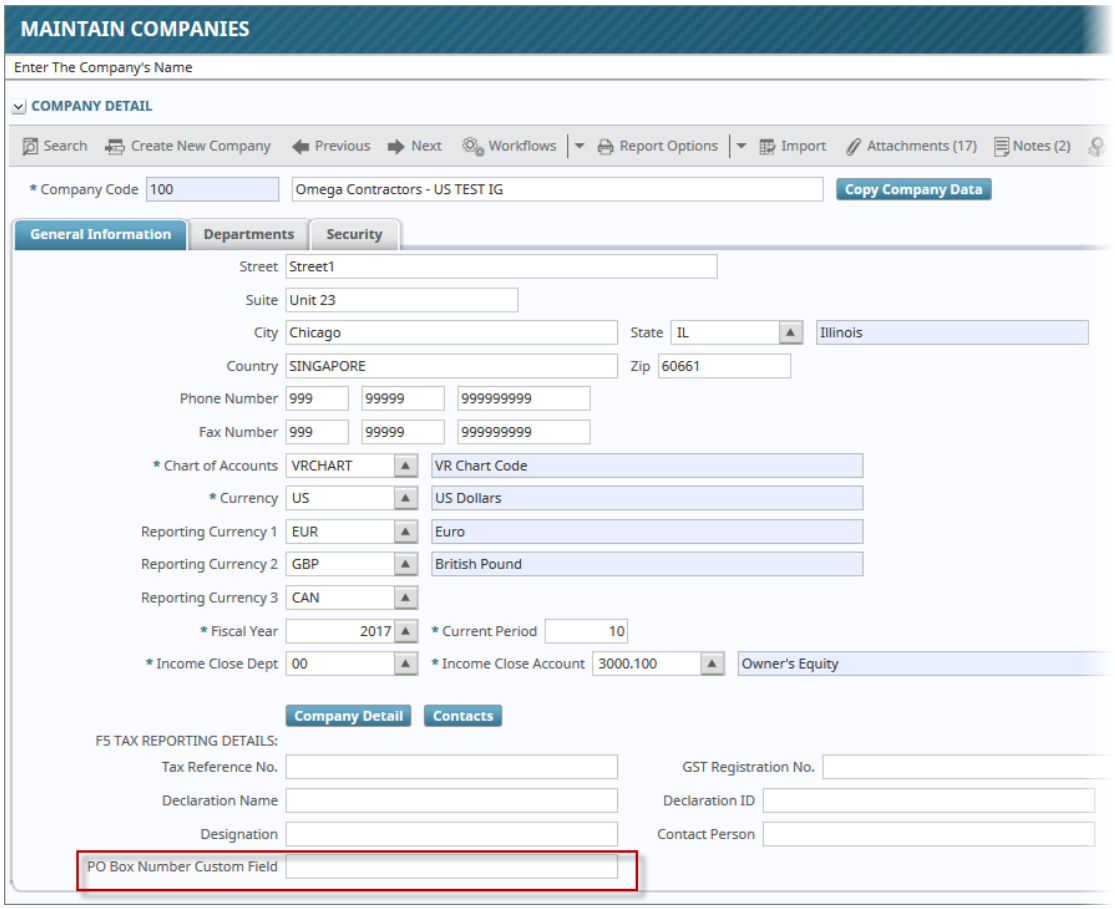
However, if users know that their custom view corresponds to a specific CMiC table/view, it is possible to enable UDFs (added via Lite Editor) for folders that correspond to user-created views/tables by specifying the corresponding CMiC table/view via the Base Object Name folder property, as shown below:



Example:

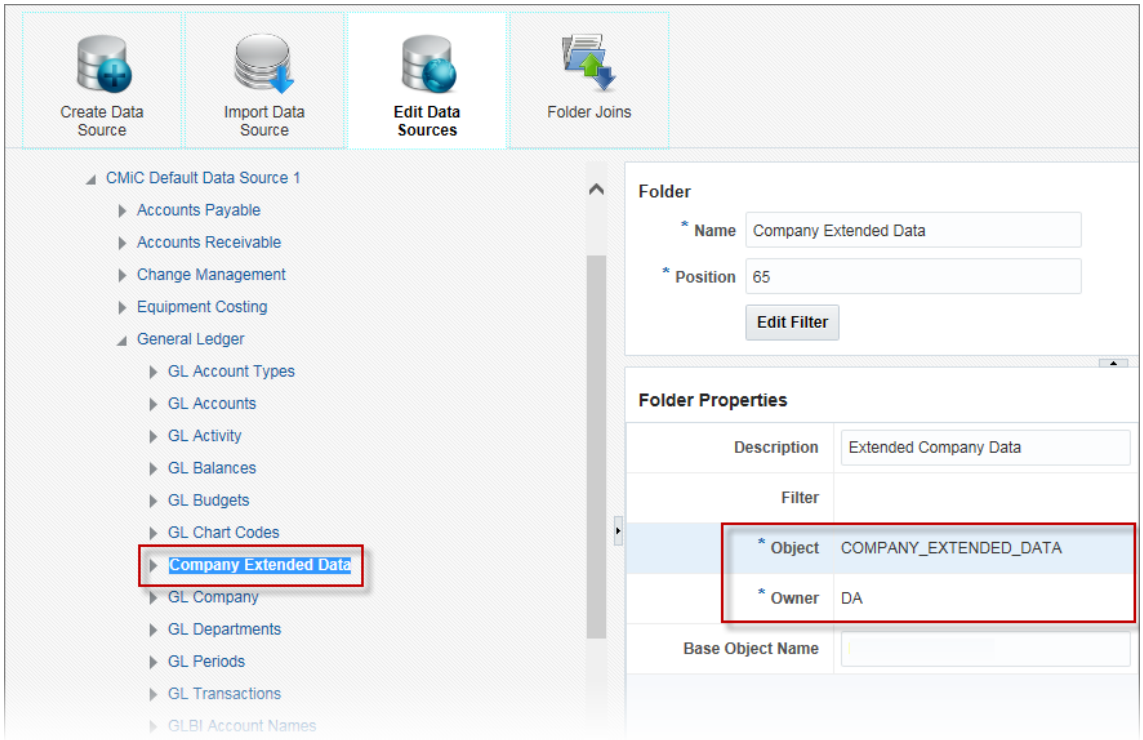
A customer:

1. Added a UDF, PO Box Number Custom Field, via the Lite Editor:



2. Created their own view “DA.COMPANY_EXTENDED_DATA”, which queries data found in the Company Setup screen.

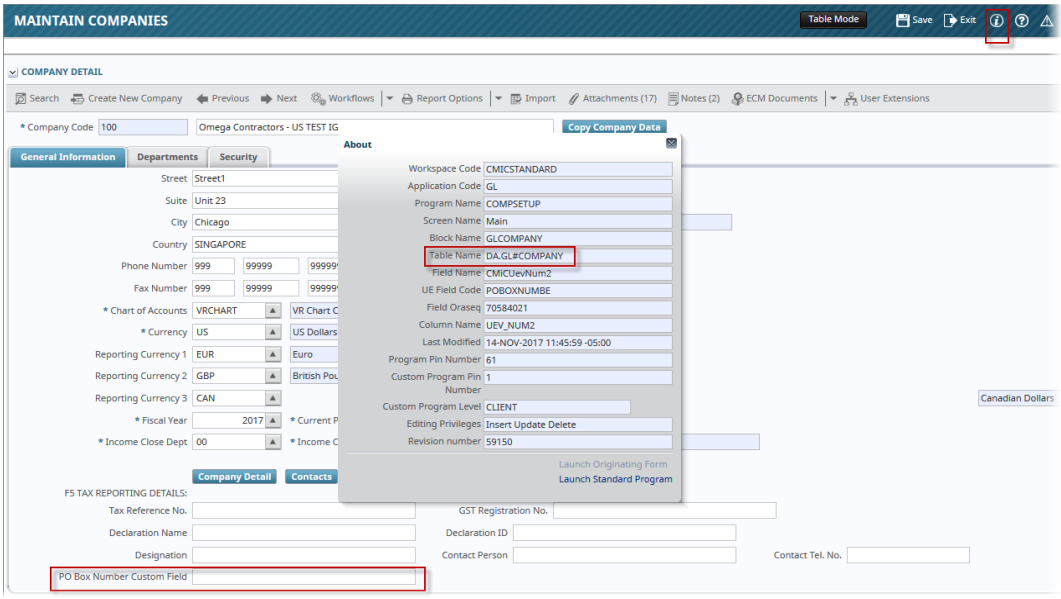
3. Added their view into their data source as a folder titled “Company Extended Data”.



Now, the customer would like to add this UDF into their custom Company Extended Data folder.

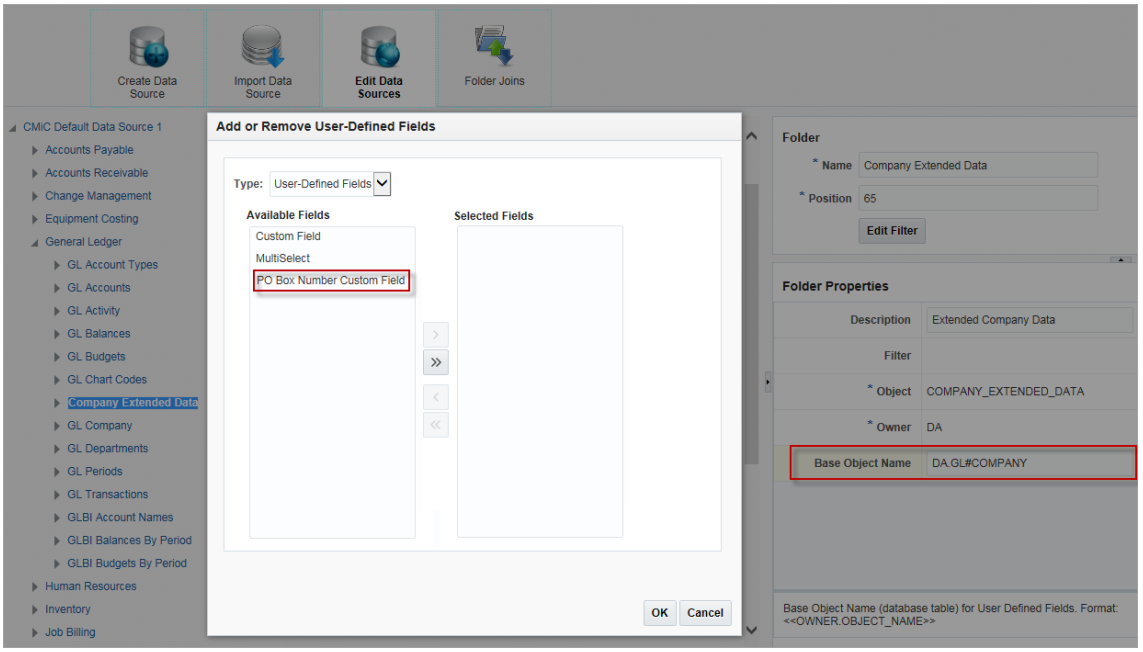
To do so, we need to provide the correct value into the Base Object Name Folder property, as follows:

1. Open the Maintain Companies screen, put the cursor on the UDF field, and click the About toolbar icon (ⓘ):



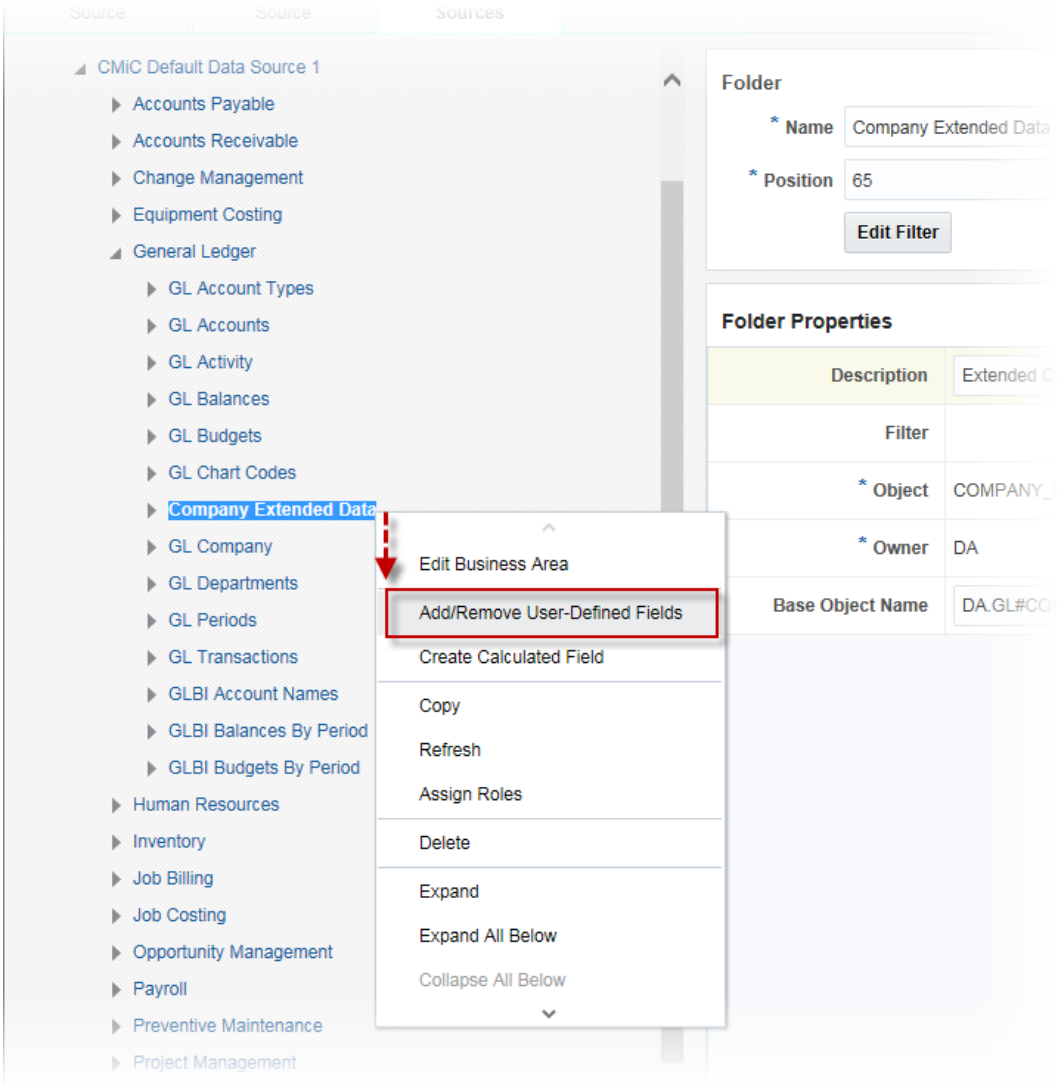
Pgm: COMPSETUP – Maintain Companies; standard Treeview path: General Ledger > Setup > Company Setup

2. Copy the value from the Table Name field into the Base Object Name folder property:



NOTE: For a user to be able to update the Base Object Name property, the user must have the following system privilege: 'BIUDFSETUP - Allow users to modify setup for User Defined Fields definitions'.

After the Base Object Name folder property is provided, the Add/Remove User-Defined Fields context (right-click) menu option for the custom folder (Company Extended Data) will be enabled for users to add the UDF field to the folder:



Different Environment Considerations

When users copy their own data sources to a different environment (for example, when they copy a data source from DEV environment to TEST environment), they must make sure that the added UDFs exist in the destination environment.

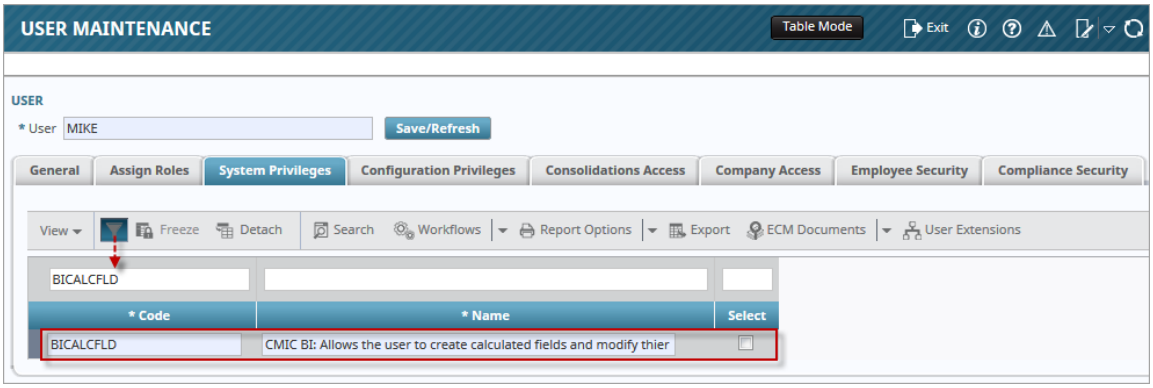
For example, while in the DEV environment, if a new custom field is added via the Lite Editor, and then add this field is added to a folder in the user's data source, before installing this data source into the user's other environments, the user should make sure that the added custom field already exists in the destination environment.

Best Practice

The best practice would be to never add a new custom field via the Lite Editor in a TEST or DEV environment. Instead, always add these fields in PROD, and have them copied into other environments by database clonning.

Create Calculated Field (Folders, Fields)

This option is enabled for folders and fields, and it is available to users with the BICALCFLD system privilege, which is granted to a user via the System Privileges tab of the User Maintenance screen, as shown below:



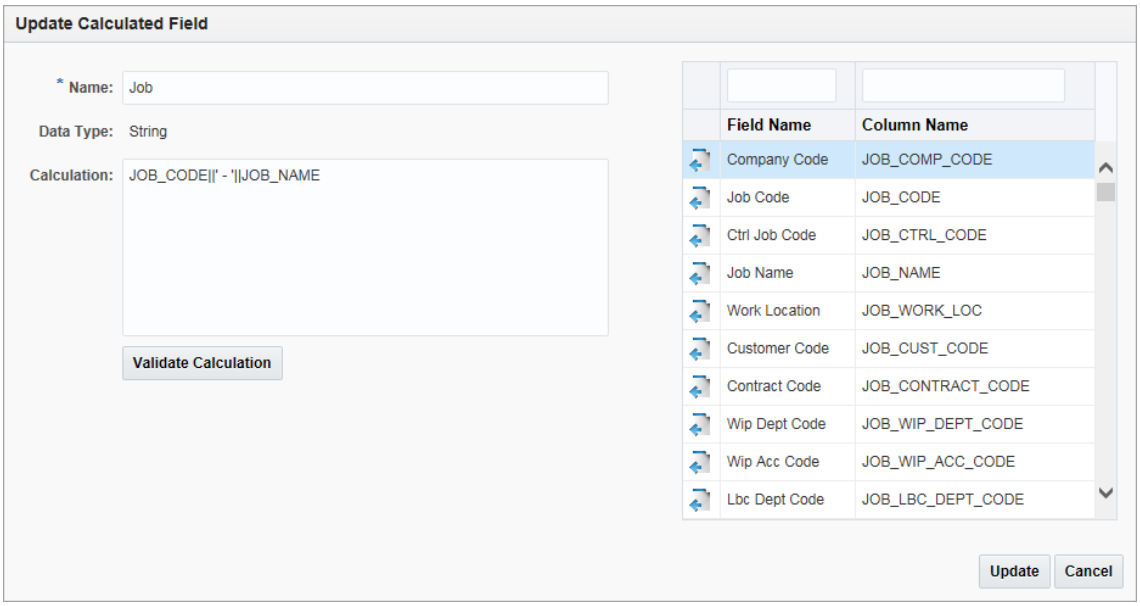
Pgm: SDUSRMNT – User Maintenance; standard Treeview path: System > Security > Users > User Maintenance – System Privileges tab

The BICALCFLD system privilege can also be granted to a user by adding the privilege to their security role via the [**System Privileges**] button at the bottom of the Define Roles screen (standard Treeview path: *System > Security > Roles > Define Roles*).

In launching the context menu to create a calculated field, if a folder was right-clicked, the new calculated field will be added to the bottom of its list of fields. If a field was right-clicked, the new calculated field will be added after the clicked field.

In BI Dashboard Builder, visualizations can use these created calculated fields.

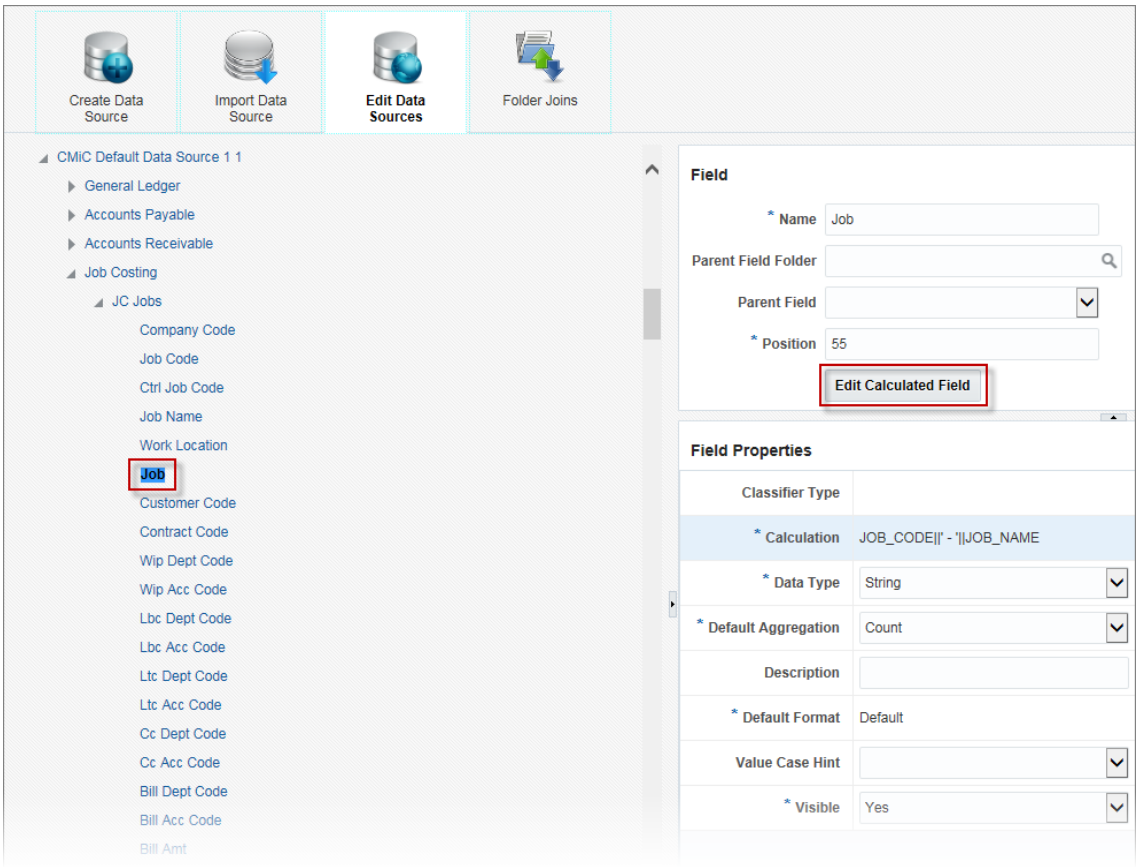
When a calculated field is added to a folder (table/view), a column for the new field is added to it, and each of its rows has the new calculated field. For each row, the calculated field's value is the result of an SQL expression, which can contain references to any fields in the folder to specify values. A field referenced in an SQL expression represents the value of that field in the row of the calculated field being evaluated.



To create a calculated field, in this option's pop-up (shown above) enter the field's name and specify its data type. Next, enter a valid SQL expression in the Value textbox to set its value. Any Oracle SQL functions and operators can be used, and any other fields in the folder can be referenced. For convenience, the folder's fields are listed in a pane on the right side of the pop-up, and they are filterable (using search boxes over the columns) and sortable (using sort-arrows in column headers). To add a field to the SQL expression from this pane, at the cursor's location in the Value textbox, select it and click its corresponding left-arrow, or double-click it.

Users can validate the calculation syntax using the [**Validate Calculation**] button.

Once finished, click [**Create Calculated Field**], which also validates the SQL expression.



As shown above, calculated fields are identified by their black text, and when they are selected, the [**Edit Calculated Field**] button is made available for them to edit their calculated value, if they have the BICALCFLD system privilege. To edit a calculated field, click the [**Edit Calculated Field**] button and use the Update Calculated Field pop-up to edit its name, data type or what is displayed by it, then click [**Update**].

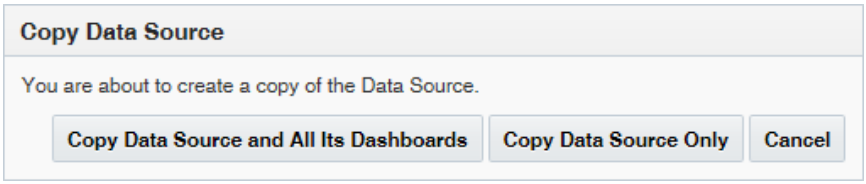
Copy (Data Sources, Business Areas, Folders)

This option is enabled for data sources, business areas and folders.

NOTE: When one of these database objects are copied, their assigned security roles are also copied.

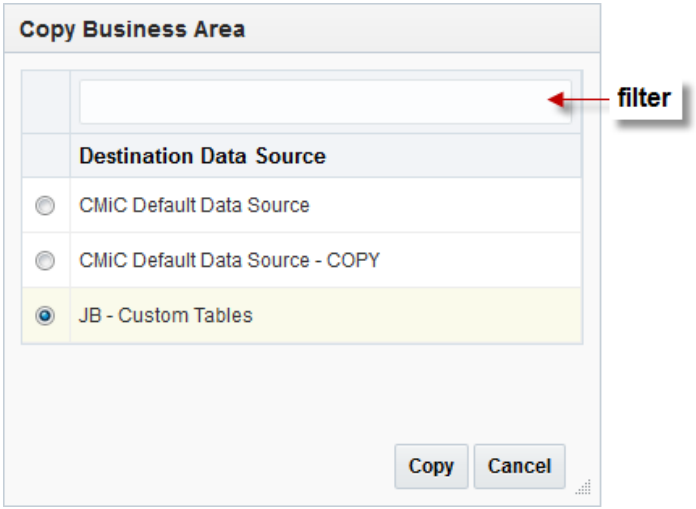
Data Source Copying

For a data source, this option is used to create a copy of the selected data source, and optionally, copies of its dashboards can also be created:



Business Area Copying

For a business area, the pop-up asks to which data source it is to be copied:

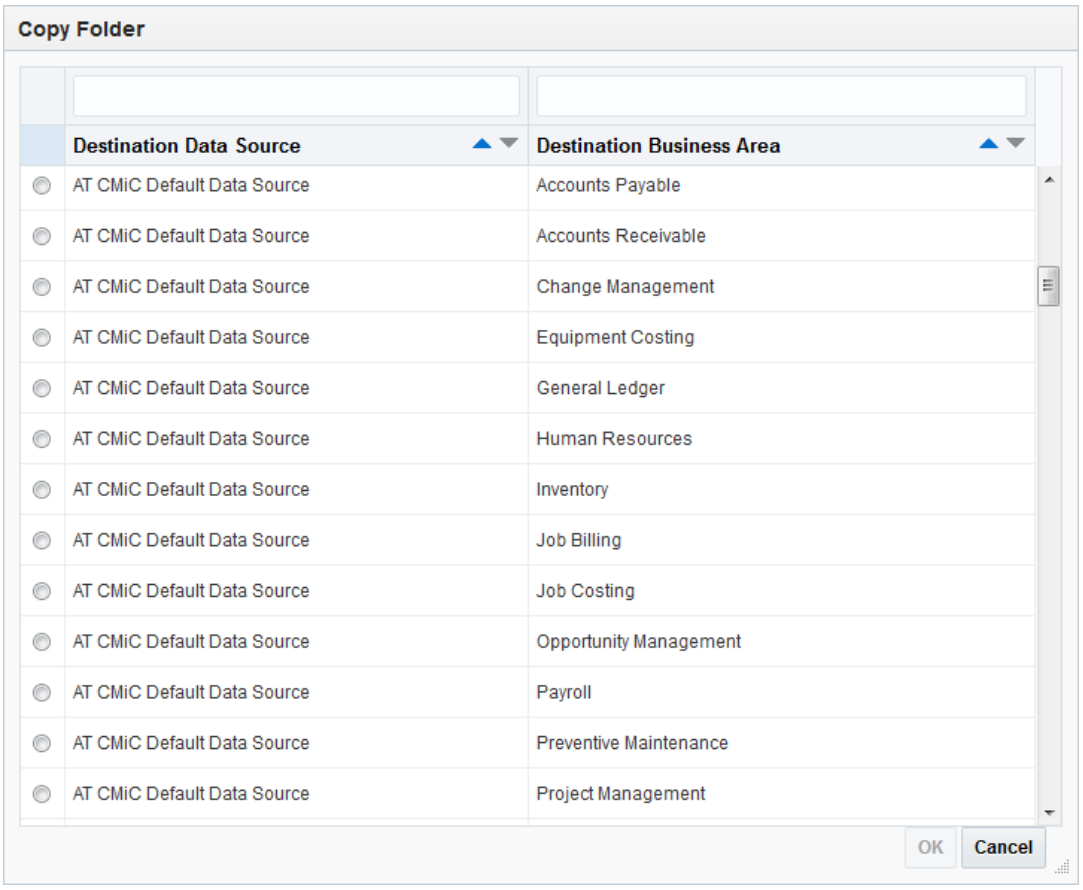


Folder Copying

Folders can be copied into the same business area, or into a different business area inside the same or different data source.

When a folder is copied, the folder's joins will also be copied.

NOTE: This functionality is particularly useful for Cloud customers who don't have the ability to modify joins. When a new folder is added to the default data source by CMiC, Cloud customers can just copy this new folder into their own custom data source, and it will automatically be joined to all the same folders (database objects) as in the default data source.



Refresh (Data Sources, Business Areas, Folders)

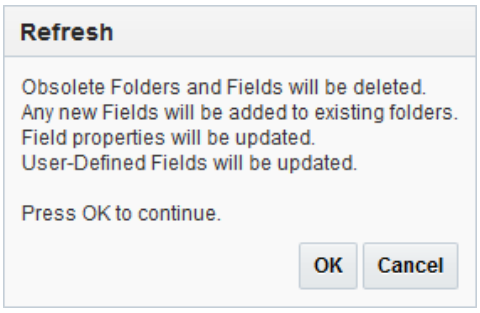
This option is enabled for data sources, but for the provided default data source, CMiC Default Data Source, this option is only available to Enterprise clients.

NOTE: It is recommended that CMiC Default Data Source is not modified, as patch installations and hotfixes update this default data source, overwriting any changes made to it and making any dependent dashboards unusable.

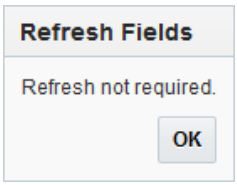
This option is also enabled for business areas, and folders.

Refreshing is required for data sources, business areas or folders if it is suspected that they have been altered (e.g., fields were added).

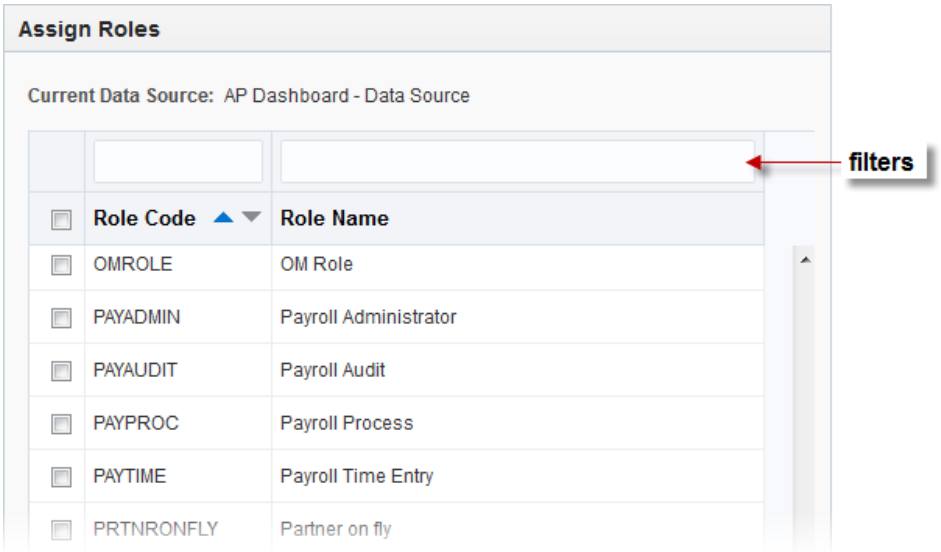
If this option is clicked and refreshing is required, the pop-up informs the user of what will happen and asks for confirmation:



If refreshing is not required, the pop-up informs the user:

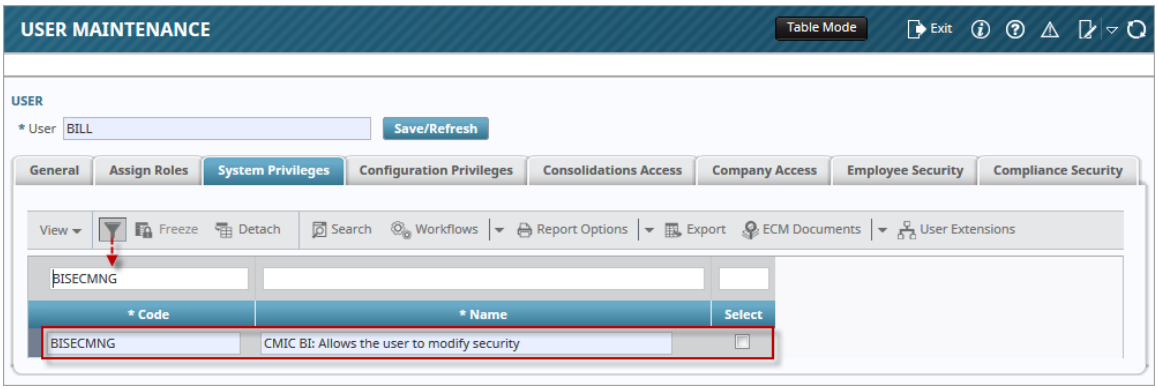


Assign Roles (Data Sources, Business Areas, Folders)



Pop-up window launched from Assign Roles context menu

This option is enabled for data sources, business areas and folders. It is only available to users with the BISECMNG system privilege, which is granted via the System Privileges tab of the User Maintenance screen, as shown below:



Pgm: SDUSRMNT – User Maintenance; standard Treeview path: System > Security > Users > User Maintenance – System Privileges tab

The BISECMNG system privilege can also be granted to a user by adding the privilege to their security role via the [**System Privileges**] button at the bottom of the Define Roles screen (standard Treeview path: *System > Security > Roles > Define Roles*):

This option's pop-up (first screenshot) is used to specify which security roles have access to a data source, business area or folder.

If Catalog Security is not enabled, everyone with access to BI Catalog Builder can access the data sources; otherwise, only members with the assigned security roles can access them. For details about BI Catalog Builder's security options and rules, please refer to the following section in this guide: *CMiC BI Security – BI Catalog Builder*.

The Roles screen in the System Data module is used to maintain these security roles (standard Treeview path: *System > Security > Roles > Define Roles*).

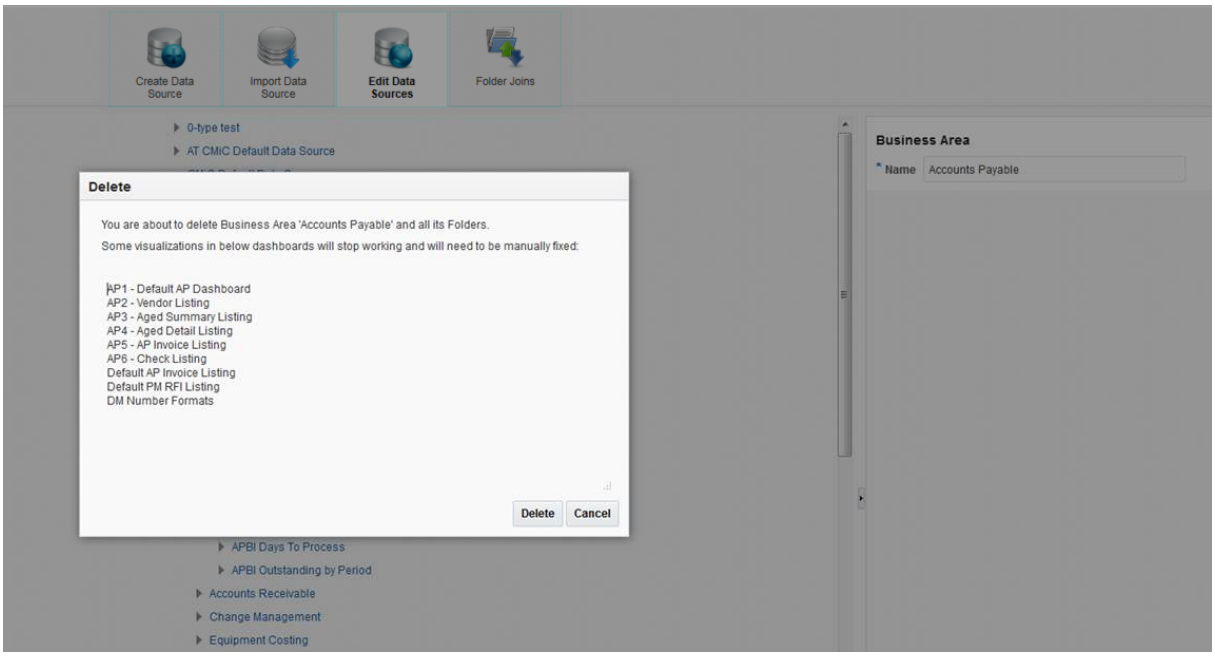
Delete Data (Sources, Business Areas, Folders)

This option is used to delete data sources, business areas, and folders.

It is particularly useful to customize copies of data sources, by deleting business areas and folders from the copy that are not required for the customized version.

NOTE: If a data source has business areas, it cannot be deleted until all of its business areas are deleted.

When users try to delete a business area or a folder, the program will check if the folders are actually used in any dashboards and if they are, it will display a list of those dashboards in a pop-up window with a warning that visualizations in these dashboards will stop working if the folders are deleted. If the folders are subsequently deleted, an error message will appear on affected visualizations indicating that some folders cannot be accessed because they have been removed.



Example of pop-up window launched when users attempt to delete a business area or a folder, and folders are being used in dashboards

Expand

Expands the selected node to reveal its contents. Note, the ▶ icon next to the node can also be used to expand the node's contents.

Expand All Below

Expands the selected node and its sub-nodes to reveal their contents.

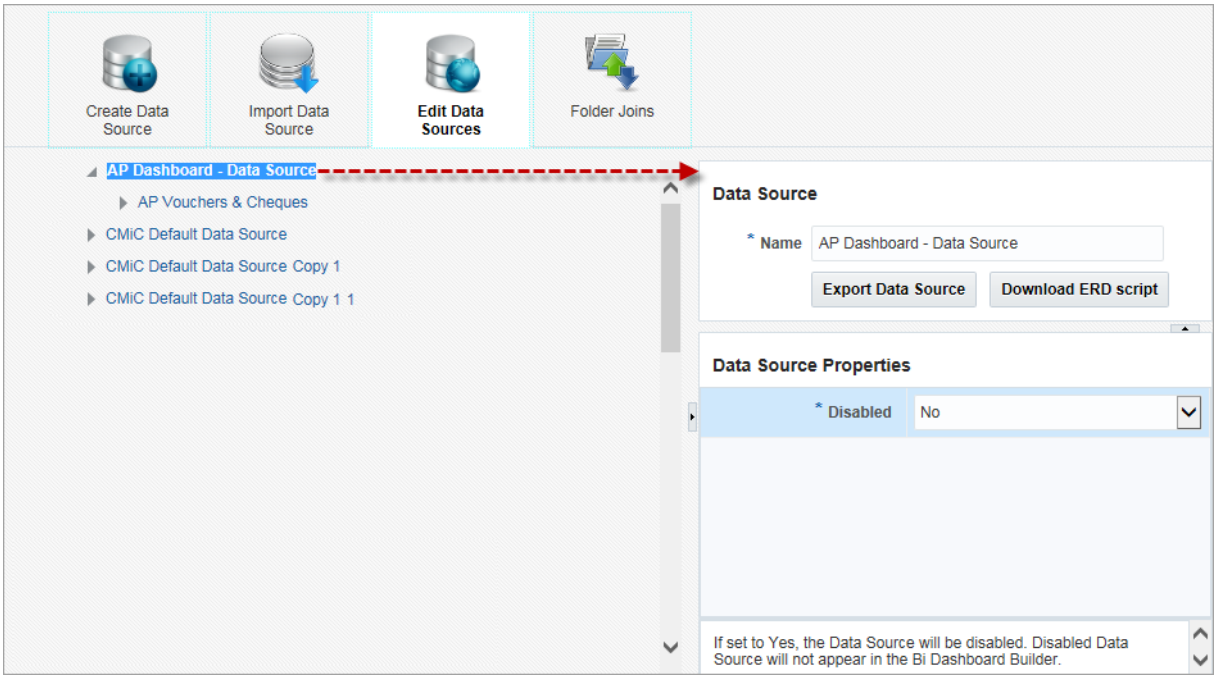
Collapse

Collapses selected node to hide its contents. Note, the ◢ icon beside the node can also be used to collapse the node.

Collapse All Below

Collapses the selected node and its sub-nodes to hide their contents.

Editing Data Sources



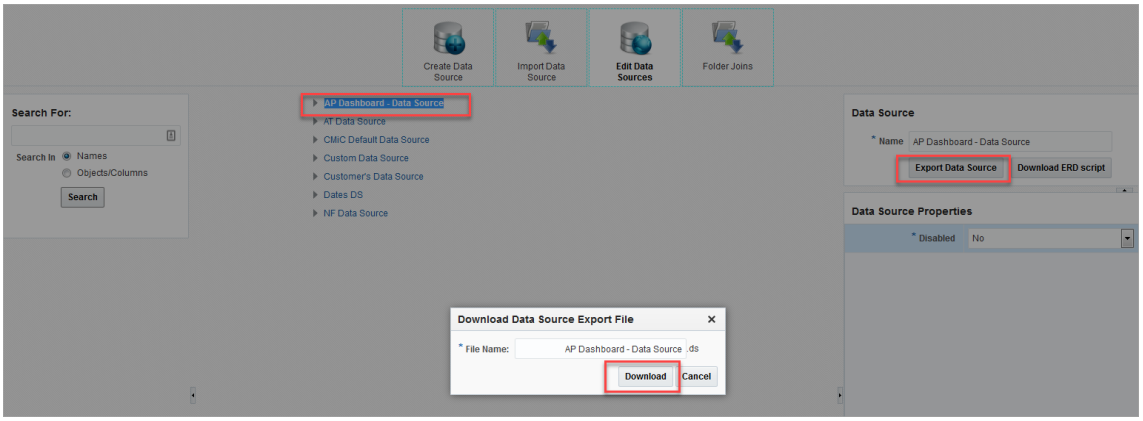
To edit a data source, click it, and use the Property pane on the right to edit it.

Data Source – Property Pane Section

Name

Name of data source.

[**Export Data Source**] – Button



This button is used to export data sources. Users can export any data source into a file and then import it into another or the same environment. Refer to the *Import Data Source – Screen* section in this guide for more information on importing data sources.

To export a data source, select the data source and click on the [**Export Data Source**] button. In the Download Data Source Export File pop-up window, specify a file name for the data source and press [**Download**]. Once file generation is complete, depending on the browser's download settings, the browser will either prompt the user for a location to store the downloaded file, or the file will

automatically be stored in the browser's download location. The downloaded file will have the extension .ds (e.g. my_datasource.ds).

[**Download ERD script**] – Button

This button allows users to download a DDL script for a selected data source so that it can be imported into a data modeling tool, such as Oracle's SQL Developer Data Modeler, to create Entity-Relationship Diagrams (ERDs) for that data source.

Refer to the *Generating ERDs for Data Sources* section in this guide for more information.

Data Source Properties – Property Pane Section

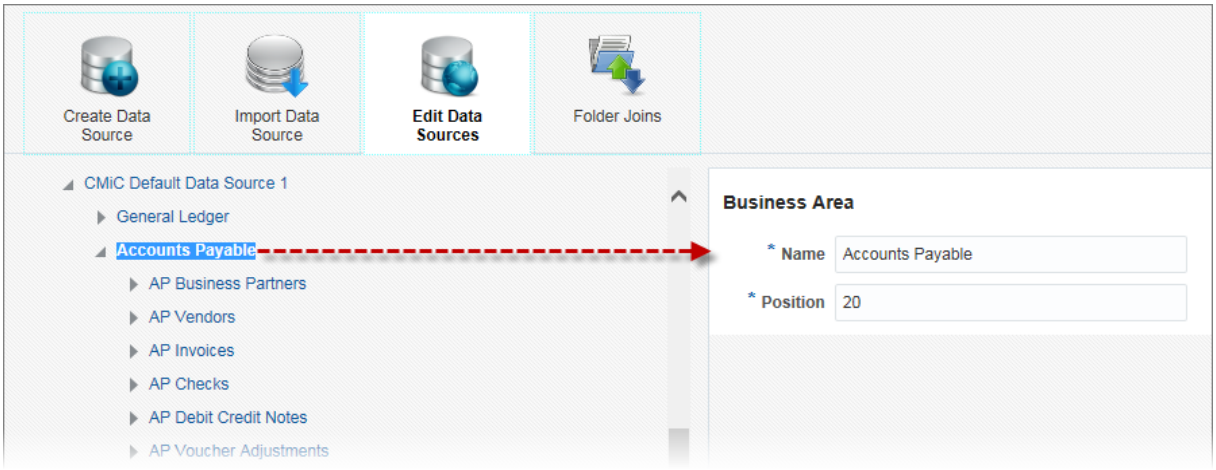
Disabled

If set to "No", data source will not be available in the BI Dashboard Builder tool; otherwise it will.

Property Description – Property Pane Section

This section provides a description for the selected data source property in the Data Source Properties section.

Editing Business Areas



To edit a business area, click it, and use the Property pane on the right to edit it.

Business Area – Property Pane Section

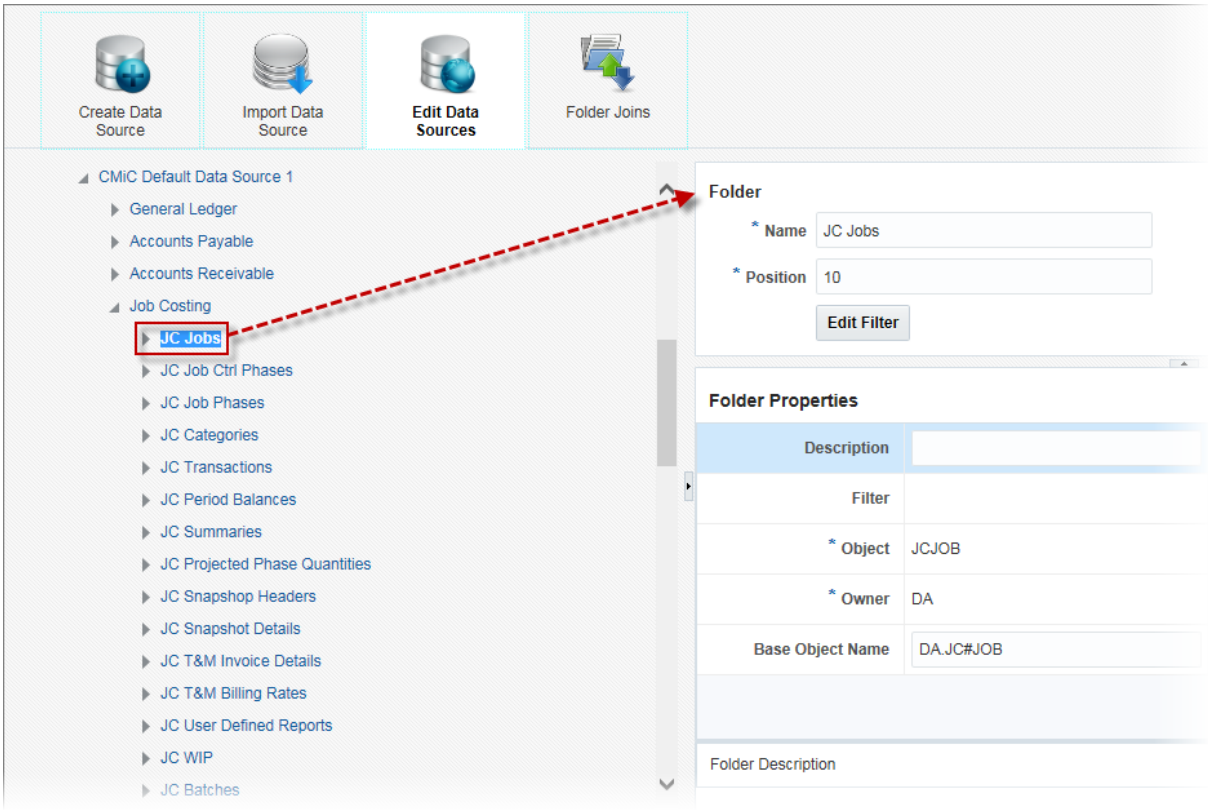
Name

Name of business area; editable to provide a more meaningful name.

Position

Position of business area node inside branch; editable to change the position of a node to control in what order business areas are displayed in a data source.

Editing Folders



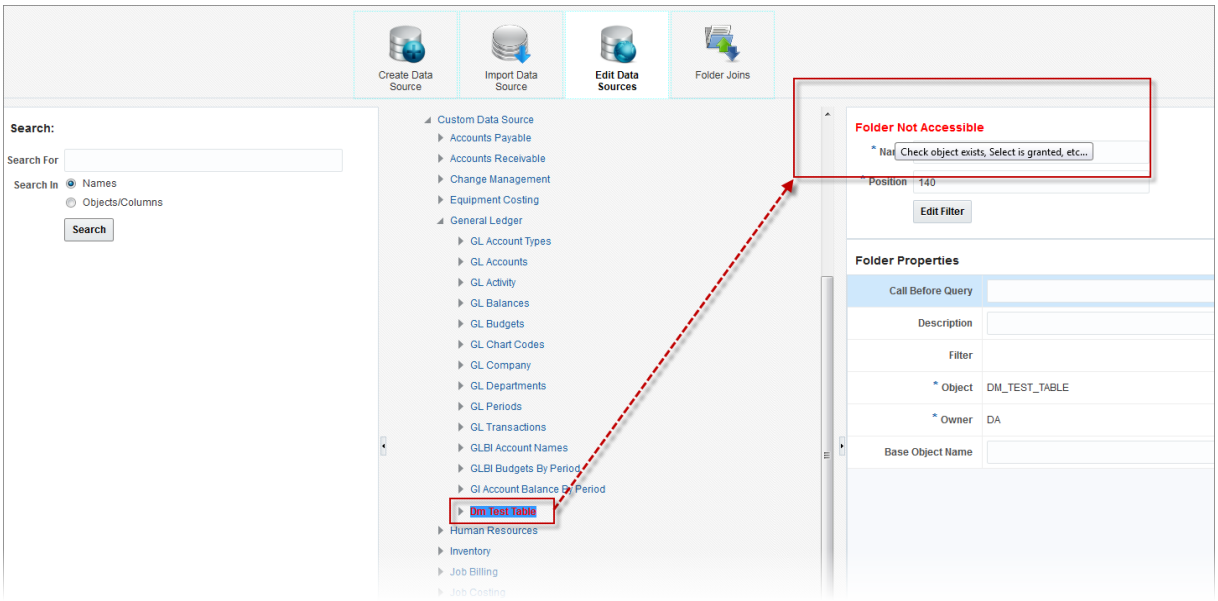
To edit a folder, click it, and use the Property pane on the right to edit it.

Folder – Property Pane Section

Name

Name of folder (table/view); name initially set to default name of table/view, but can be edited to provide a more meaningful name.

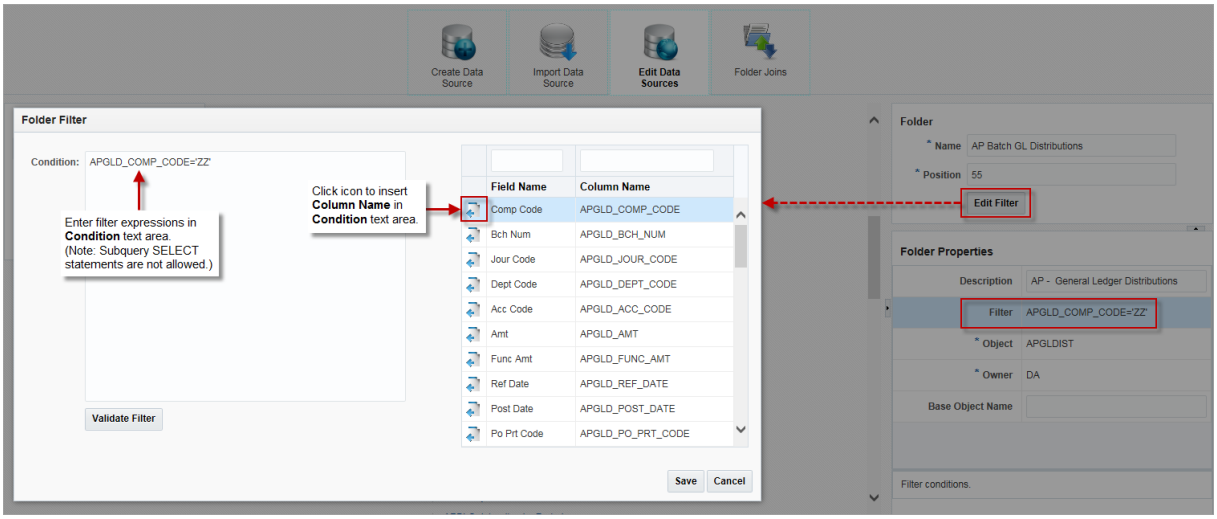
If a folder is not accessible in BI Dashboard Builder, it will appear in red, as shown in the screenshot below. This feature is useful for Enterprise customers that use their own tables/views. To resolve the folder's accessibility issue, please refer to the *Adding Custom Tables/Views to Data Sources* section of this guide.



Position

Position of folder node inside branch; editable to change the position of a node to control in what order folders are displayed in a business area.

[**Edit Filter**] – Button



The [**Edit Filter**] button's pop-up is used to create a filter for the selected folder.

This feature is available to Enterprise and Cloud Catalog Builder clients only, and users must have the system privilege 'BICFDRFLTR' to use it; otherwise, the button will be hidden.

Filter expressions are created in the Condition text area using valid SQL syntax for WHERE clause of SELECT statements. (Note that subquery SELECT statements are not allowed.) A Column Name can be added to the Condition text area by clicking the Column Name's corresponding Insert icon, as shown above.

Filter expressions can range from simple to complex. For example, to create a simple filter expression, use single quotes around values to compare against, and the following wildcard characters:

I. **%** (any string of characters)

II. **_** (any single character)

For the creation of a more complex filter expression, the [**Validate Filter**] button can be used to validate an expression as it is being entered without it being saved. An error message will only appear if the expression is not valid. If the expression is valid, no message will appear.

The [**Validate Filter**] button is available for convenience only, as the same validation process occurs when the user clicks on the [**Save**] button.

Folder Properties – Property Pane Section

Description

Description for folder (table/view); description initially set to default description of table/view, but can be edited to provide a more meaningful description.

Filter

If a filter was created for the folder via the [**Edit Filter**] button in the previous section, this field displays the filter expression.

Object

Database name of table/view; display-only.

Owner

Owner of table/view; display-only.

Base Object Name

Used to specify corresponding CMiC table/view when defining UDFs in folders.

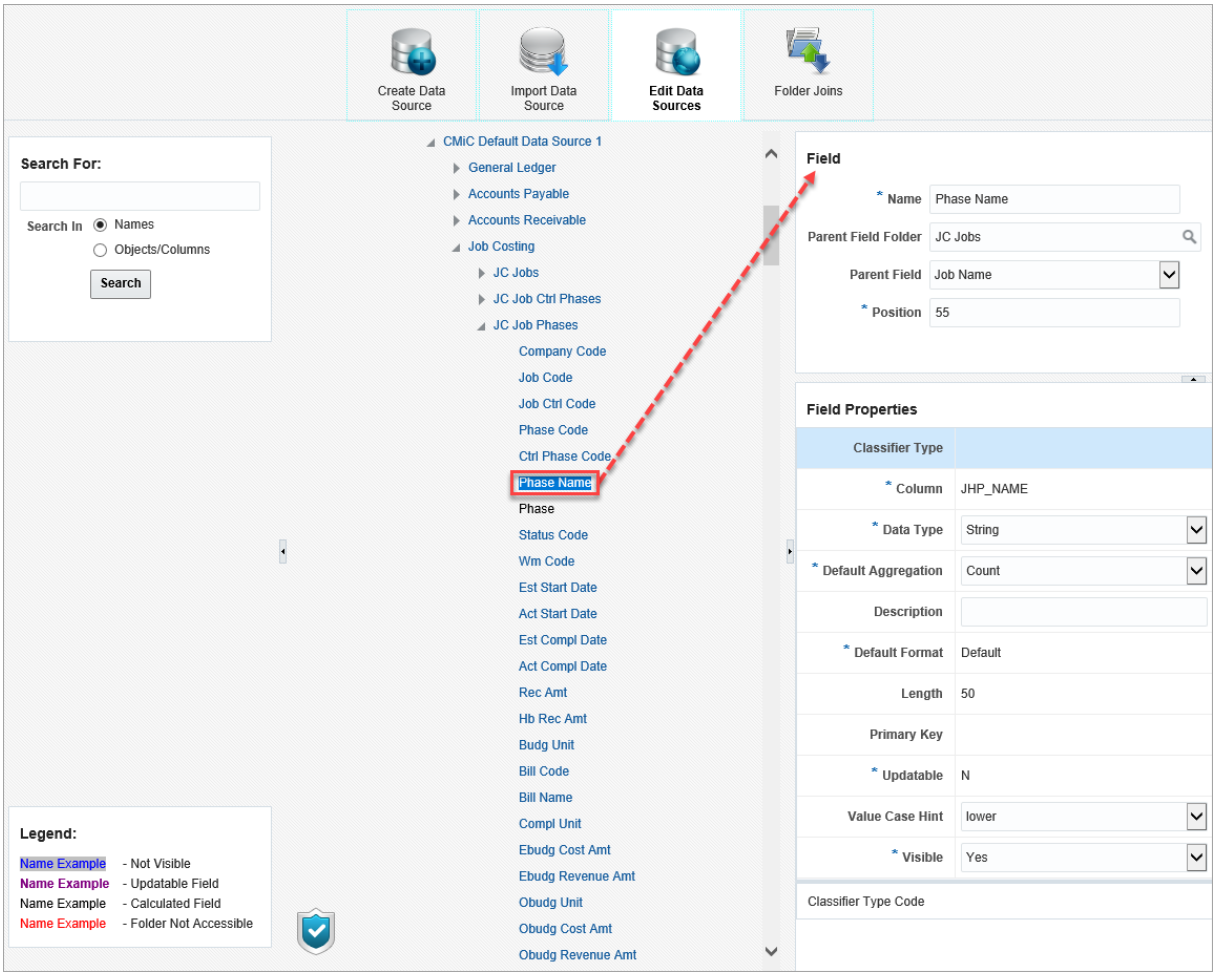
NOTE: For a user to be able to update the Base Object Name property, the user must have the following system privilege: 'BIUDFSETUP - Allow users to modify setup for User Defined Fields definitions'.

Refer to the *Add/Remove User-Defined Fields (Folders)* section in this guide for more details on using this folder property.

Property Description – Property Pane Section

This section provides a description for the selected folder property in the Folder Properties section.

Editing Fields



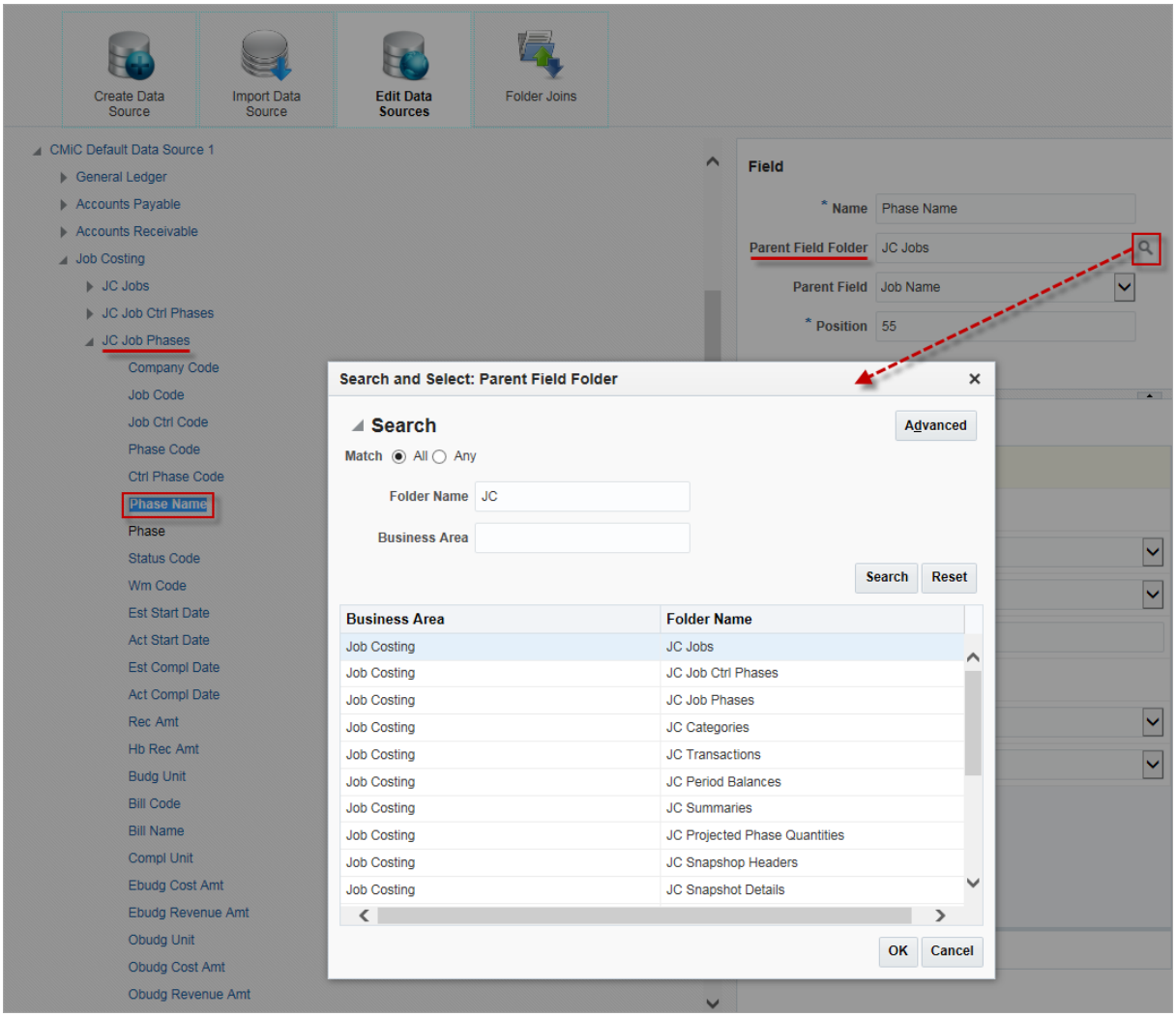
To edit a field, click it, and use the Property pane on the right to edit it. It is also possible to select multiple fields and update properties for all selected fields at once (for more information, please refer to section *Editing Multiple Fields* in this guide).

Field – Property Pane Section

Name

Name of field; initially set to default name of field (column) but can be edited to provide a more meaningful name.

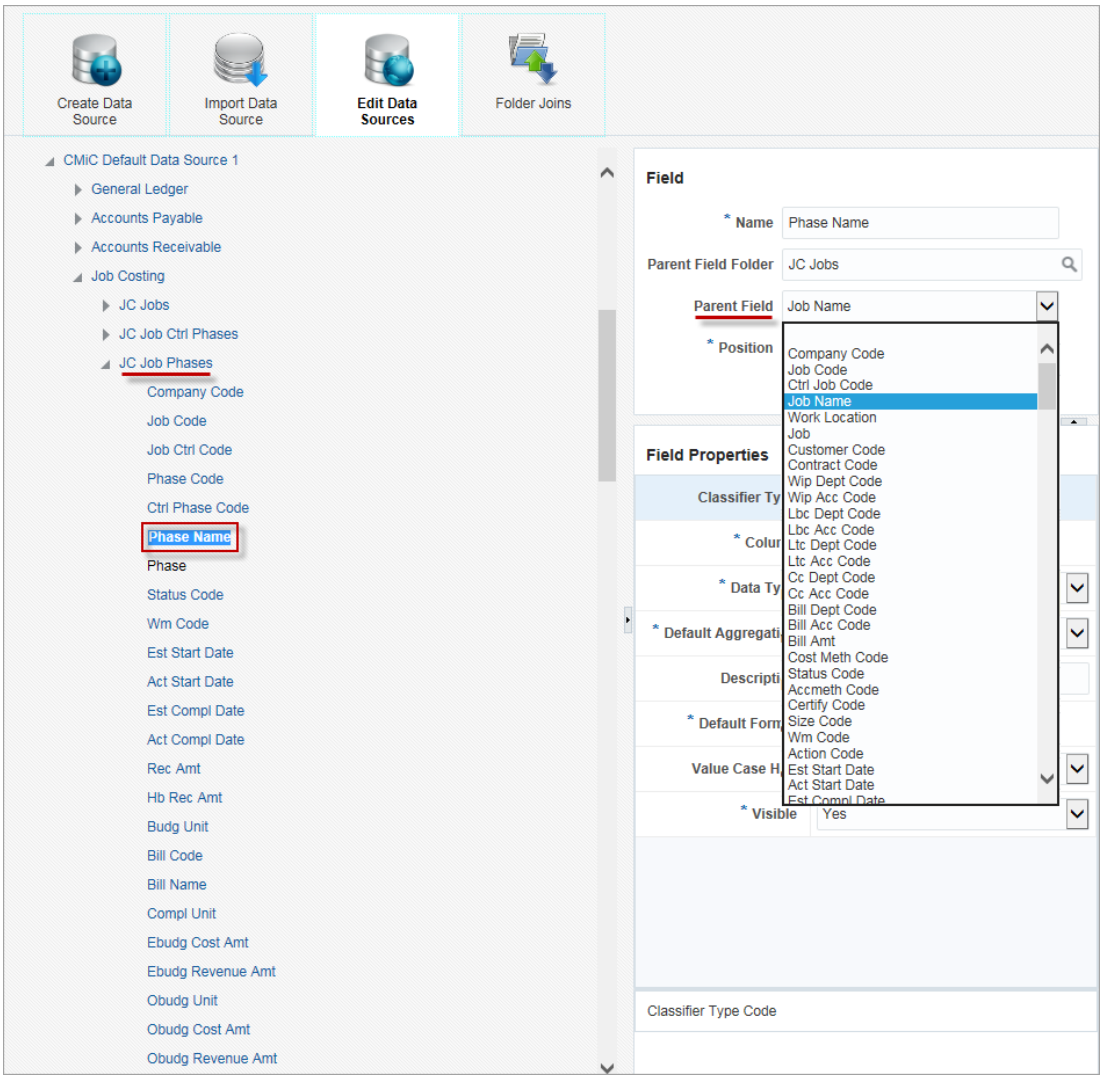
Parent Field Folder, Parent Field



Pop-up window launched from Parent Field Folder LOV in Field Pane Section

The Parent Field Folder property provides an LOV where the user can select a parent field folder for a parent field to enable field hierarchy in BI Dashboard Builder.

A parent field folder must be selected using the LOV before a parent field can be selected from the Parent Field drop-down menu.



For example, to enable a Company Name/Job Name/Phase Name/Category Name hierarchy, the field structure would appear as follows:

Folder	Field	Parent Field Folder	Parent Field
JC Categories	Category Name	JC Job Phases	Phase Name
JC Job Phases	Phase Name	JC Jobs	Job Name
JC Jobs	Job Name	GL Companies	Company Name

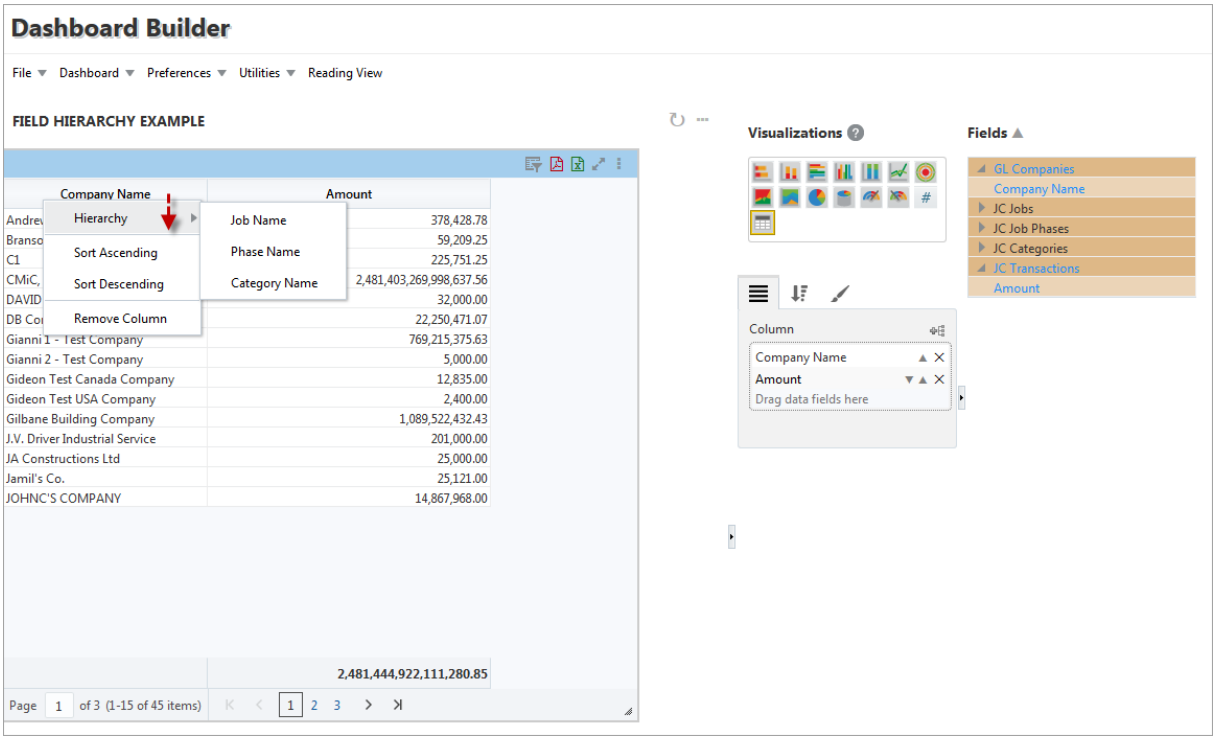
Once the above setup is complete in BI Catalog Builder, to enable the hierarchy functionality in a BI Dashboard table, the following steps must be taken:

- Add at least one of the above fields to the table.
- Ensure parent field folders are added into list of selected folders for the table.

Once the above steps are taken, if the user's BI Dashboard table visualization contains any of the fields below, their parent field will be available to be added into the table via column hierarchy context menu, if it doesn't exist already.

- JC Categories.Category Name
- JC Job Phases.Phase Name
- JC Jobs.Job Name
- GL Companies.Company Name

For example, if the user's table visualization is based on "JC Transactions" and "GL Companies.Company Name" field is added, then the hierarchy functionality will be enabled for the Company Name field, allowing users to add any of the related fields (e.g. Phase Name, Job Name, or Category Name).



Field Hierarchy enabled in BI Dashboard Builder table visualization

Position

Position of field node inside branch; editable to change the position of a node to control in what order fields are displayed in a folder.

Field Properties – Property Pane Section

Column

Name of field (column); display-only.

Data Type

Field's data type: String, Number, Date.

If the data type is "String", users can select "URL" from this LOV instead; if set to "URL", the field's value is expected to be a URL and it is displayed as a hyperlink in dashboards.

Default Aggregation

Default aggregate function to use in BI Dashboard Builder for the field. This default can be changed in BI Dashboard Builder.

The aggregate functions available in this property's LOV depend on the field's data type.

An aggregate function is one in which a single value is outputted for multiple inputted values, e.g., SUM(), COUNT().

Description

Description of field; initially set to default description but can be edited to be more meaningful.

Default Format

If the field is of the date or number data type, this property has an LOV from which users can select its format for dashboards.

Length

Maximum length for field string value.

Primary Key

Indicates if this field is a primary key field.

Updatable

Indicates if this field is updatable in Card View.

Value Case Hint

Use this field property to set whether values in a field are always uppercase or lowercase, which allows a faster case-sensitive search in dashboard filters. Available options are "UPPER" or "lower".

For example, since company codes are always uppercase, setting the Value Case Hint property to "UPPER" allows for faster filter searches by only returning values that are in uppercase.

The BI Catalog Builder tool automatically sets this property to "UPPER" for fields that have a common name which ends with "_CODE" or "_FLAG" (e.g. COMP_CODE, JOB_ACTIVE_FLAG, etc.).

If this property is set incorrectly, then the filters search will not return results with values that are not in the case specified in this property. For example, if the property is set to "UPPER", but the actual column contains values in mixed case, values that contain lowercase won't be returned.

NOTE: In order to have performance improvements, the corresponding database column must be indexed.

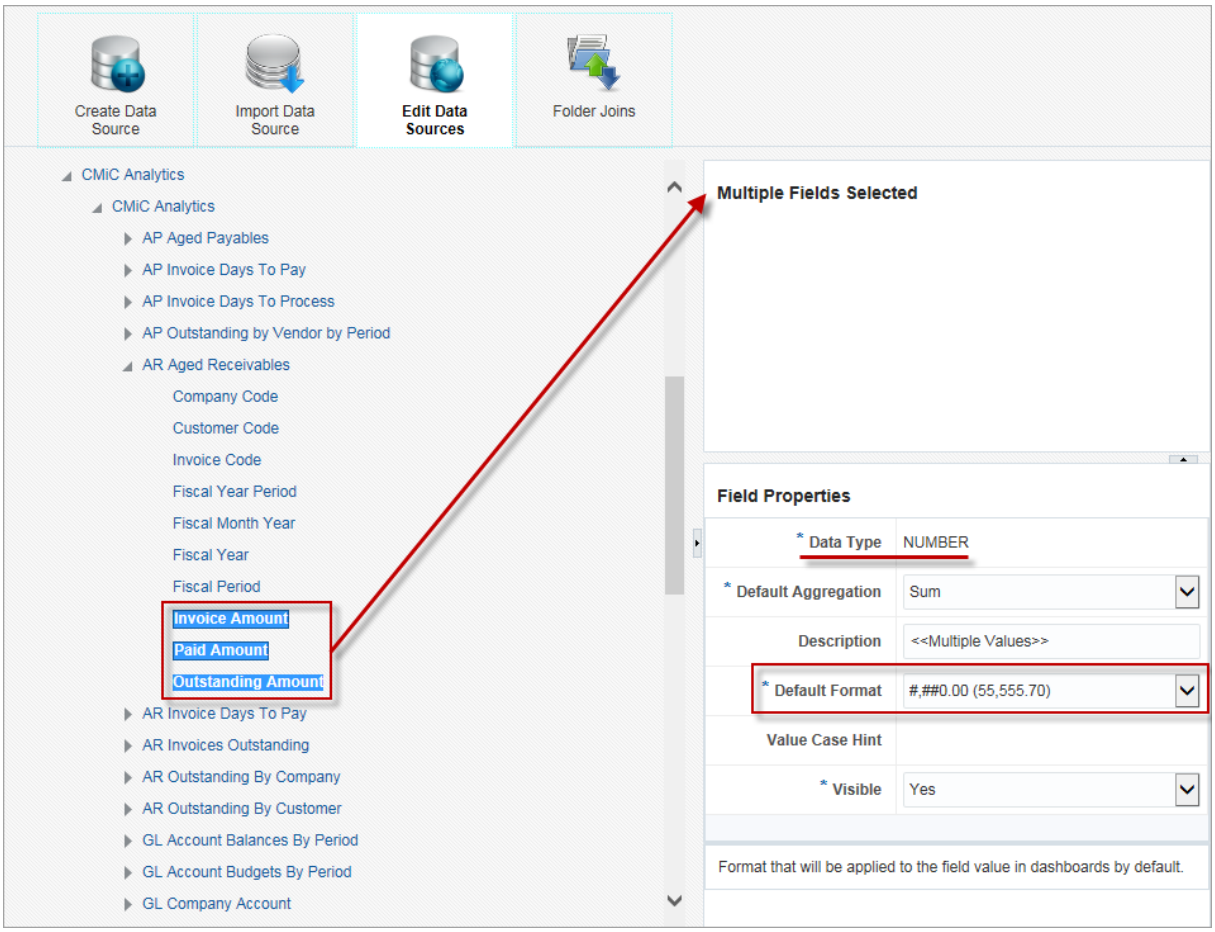
Visible

If set to “No”, field will not be visible in the BI Dashboard Builder tool, for simplification’s sake; otherwise it will be visible.

Property Description – Property Pane Section

This section displays a description for a selected property in the Field Properties section.

Editing Multiple Fields



Example of selecting multiple fields and updating properties for all selected fields at once

Users can select multiple fields and update properties for all selected fields at once. To select multiple fields, use Ctrl + mouse click to select individual fields or use Shift + mouse click to select a range of fields. Users can also select multiple fields using the Search panel (for more information on search functionality, refer to the section *Searching Tree Nodes* in this guide).

The Field Properties section in the property panel will only display those properties and LOVs that are applicable for the data type of the selected fields.

For example, users can select multiple fields in a folder with the same data type (e.g. amount fields in a folder which all use the NUMBER data type), as shown in the screenshot above, and update the Default Format property for these fields all at once.

If the selected fields have different data types (e.g. some of them are STRING and others are NUMBER), then the Default Format property, as well as other type-specific properties, won't appear in the property panel.

If the selected fields have different values for a property, then such a property value will be displayed as "<<Multiple Values>>". Users can modify this value as required.

For example, if the following two fields were selected:

- Salary
    - Description property value: "Employee Salary"
- Rate
    - Description property value: "Hourly Rate"

Since each field has a different description, the Description property value on the Field Properties panel would display "<<Multiple Values>>". Users could update this property with the same value for both fields at once by replacing "<<Multiple Values>>" with a new description such as "This field is used for salary calculations."

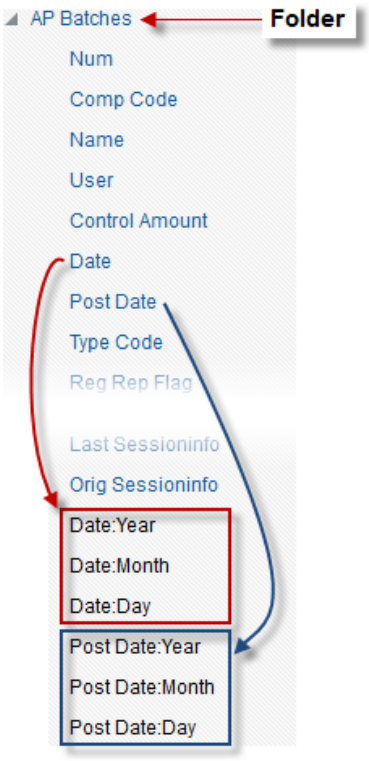
The descriptions for each of the fields would be updated as follows:

- Salary
    - Description property value: "This field is used for salary calculations."
- Rate
    - Description property value: "This field is used for salary calculations."

The same logic applies to properties with LOVs. "<<Multiple Values>>" will be one of the values in a drop-down list and if it's changed, the new value will be applied to all selected fields.

Date Fields

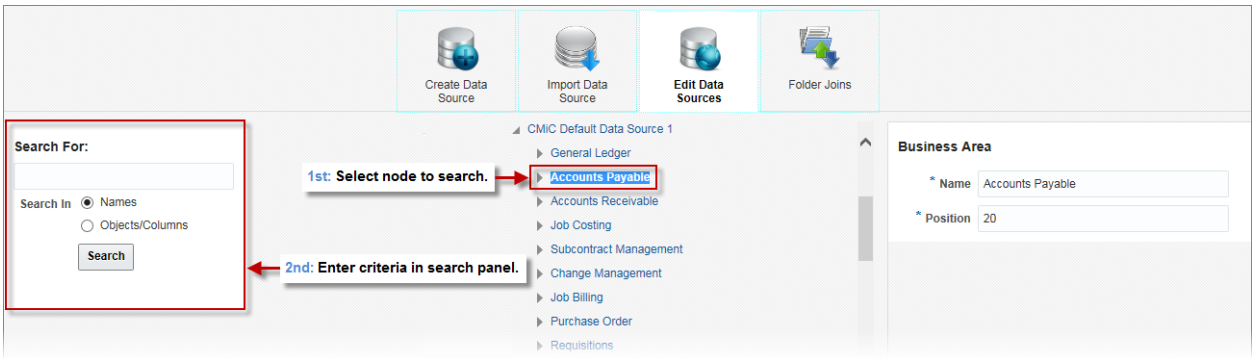
As shown below, every field that is of the date data type has three corresponding calculated fields: one for the year component, one for the month component and one for the day component. As shown below, these corresponding calculated fields are added to the end of a folder's list of fields:



In BI Dashboard Builder, these date calculated fields can be added to visualizations in order to sort or group their data by year, month or day.

NOTE: Date calculated fields cannot be deleted from a data source.

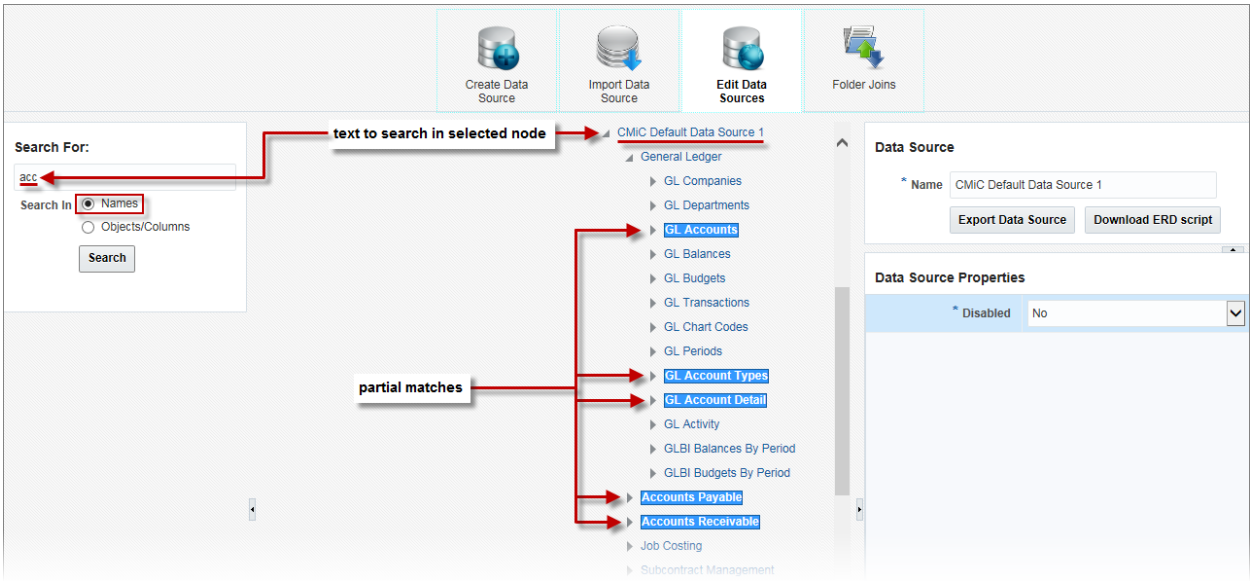
Searching Tree Nodes



As shown above, on the Edit Data Source screen, users can search a data source's tree for specified text or for specific objects/columns using the Search panel.

NOTE: If no search results are found, the Search panel will display a message “NOT FOUND”.

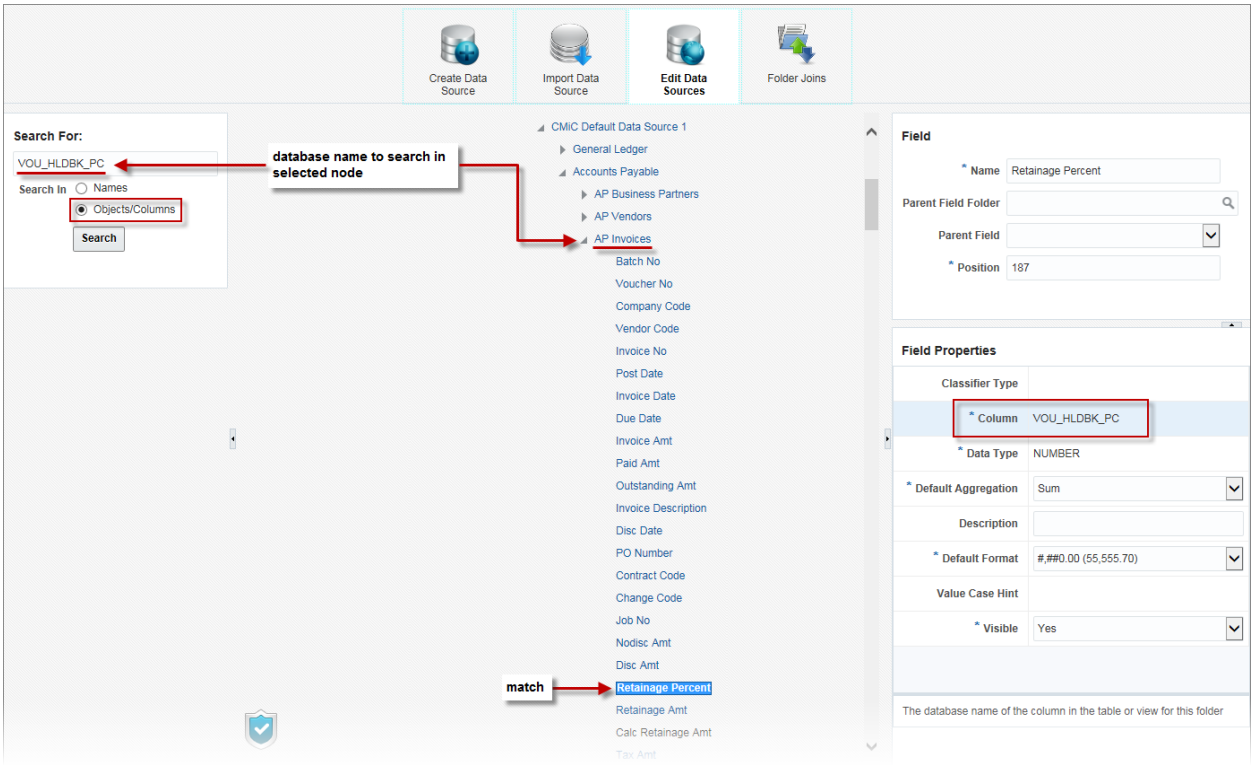
Search in Names



To search a data source’s tree for specified text, select a data source tree or any of its sub-nodes (business area or folder), as shown above. Searching will take place for the selected tree-node and all of its sub-nodes, however, fields will not be searched unless a specific folder is selected.

Next, enter the text to search for in the Search For field, select the ‘Names’ radio button in the Search In field, and click [**Search**]. All matches, including partial ones, will be highlighted in the selected tree/sub-node, as shown above.

Search in Objects/Columns



Example of searching for database name of a column in a table or view for a selected folder

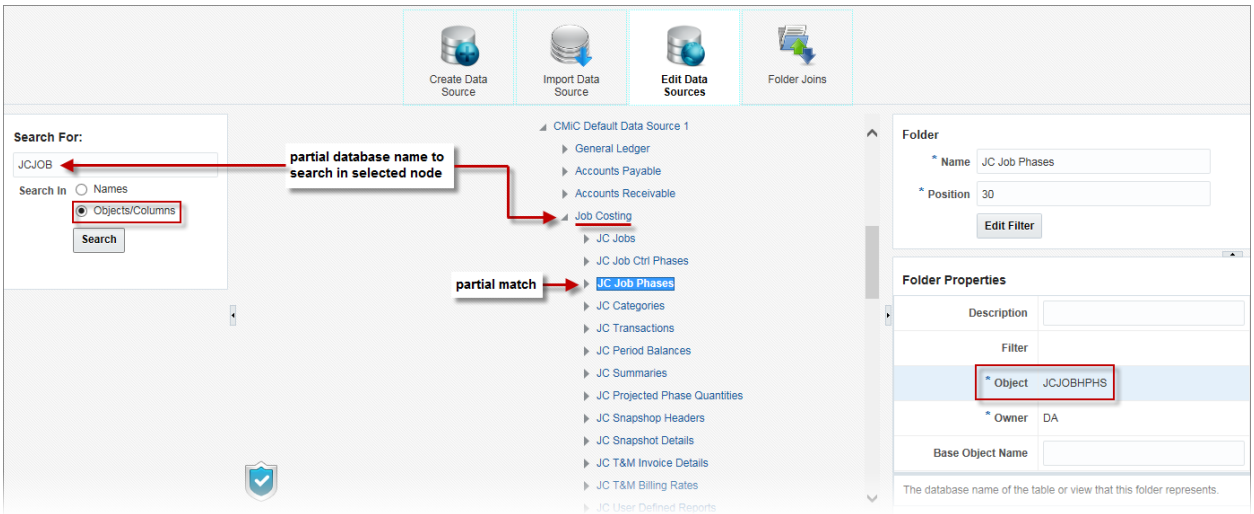
This function allows users to search a data source tree for folders and fields using their corresponding database names or calculation expressions.

Select a data source tree or any of its sub-nodes (business area or folder), as shown above.

NOTE: Fields will not be searched unless a specific folder is selected.

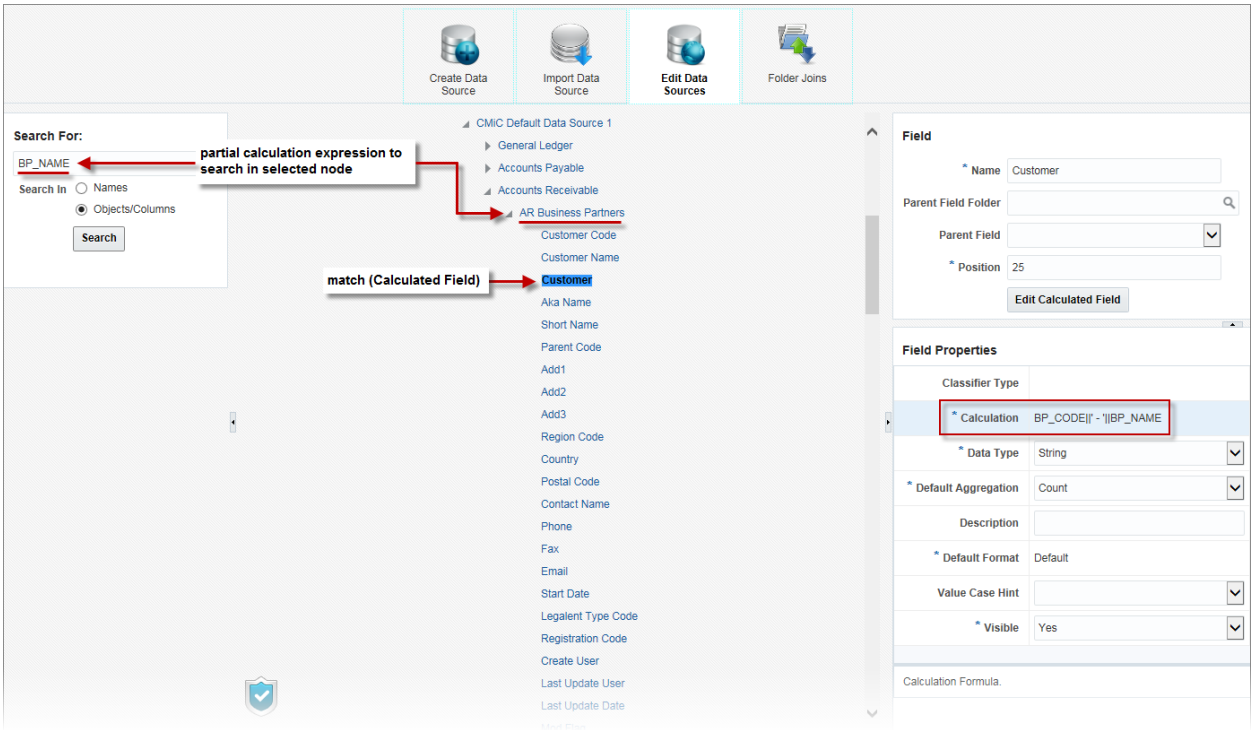
Next, to search for a database name for example, enter the database name in the Search For field. Select the 'Objects/Columns' radio button in the Search In field and click [**Search**]. All matches, including partial ones, will be highlighted in the tree/sub-node, as shown above.

If there is only one matching result, it will automatically be displayed in the Folder or Field Properties panel. If there is more than one result, users will need to click on each of the highlighted matches in the data source tree to view the results in the property panel.



Example of searching for database name of an Object (table or view) in a selected Folder

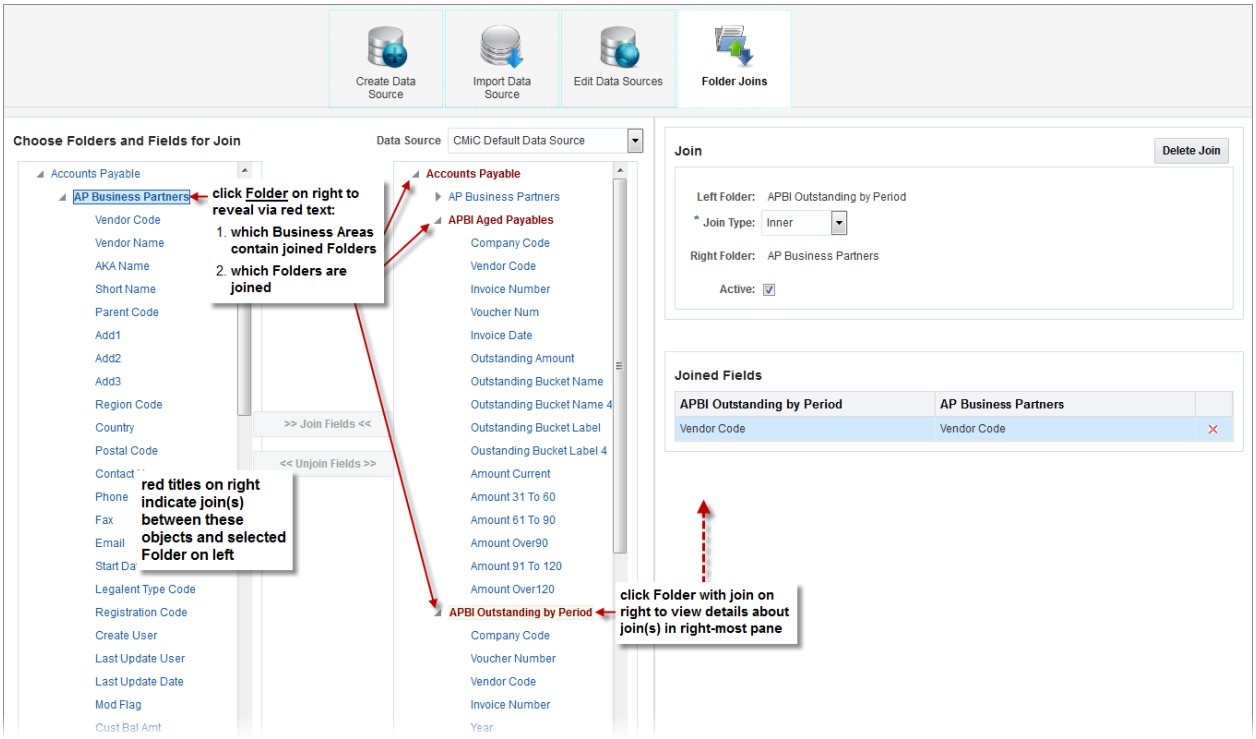
The Objects/Columns search also searches inside calculation expressions for calculated fields, as shown in the screenshot below. In this example, the search results found the calculated field “Customer” that has BP_NAME inside its calculation expression.



Example of searching for calculation expression to find calculated fields

Folder Joins – Screen

Overview – Folder Joins



This screen is used to create the joins between folders (tables/views) that will return the desired data to chart in BI Dashboard Builder. Also, in BI Dashboard Builder, filters and sorts for the returned data can be specified.

NOTE: To modify folder joins, the user must have the following system privilege: 'BIMODJOINS - Allows the user to modify Folder Joins in BI Catalog Builder'.

View Joins

As shown in the previous screenshot, when a folder is selected in the left pane, if joins exist between it and any other folders, the titles of the folders with joined fields are highlighted with red text in the right pane, along with the titles of business areas that also contain joined folders.

If a required, logical join does not exist, users can create it, as per the *Create Joins* subsection in this guide.

To view the joined fields between the folder on the left and the folder on the right, click the folder on the right, and the joined field(s) will be listed in the Joined Fields section of the property pane (right-most pane).

Import Joins

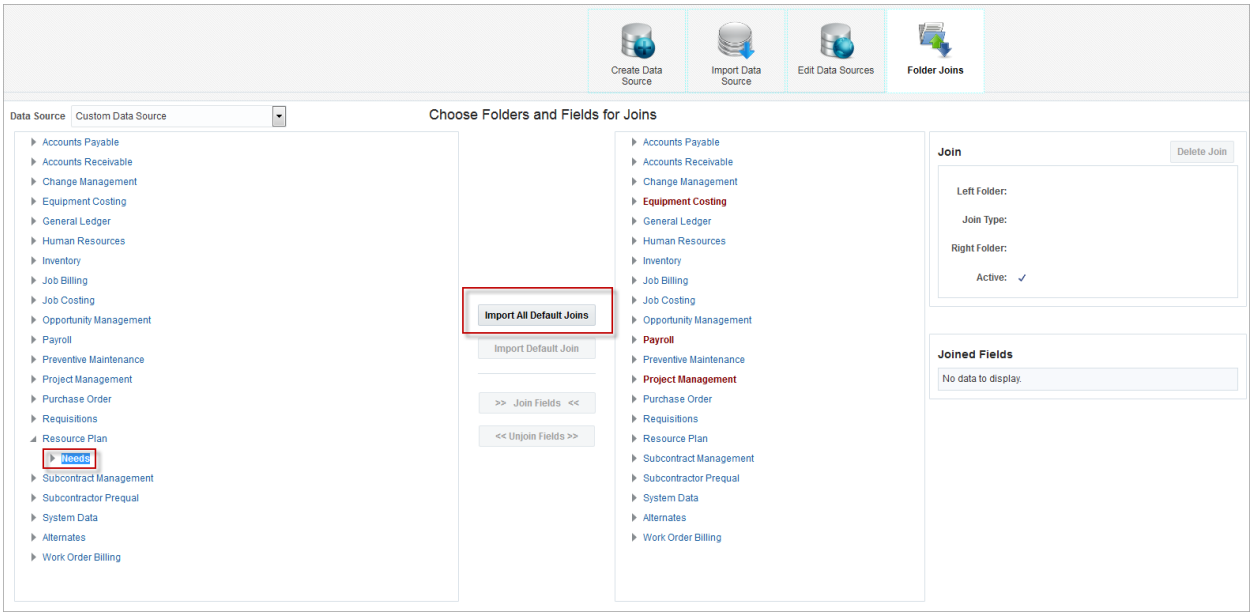
This feature allows users to import joins from the Default Data Source, which is particularly useful for customers that have access to BI Catalog Builder, but don't have the ability to modify joins (e.g. Cloud customers).

Users can import all joins for a specific folder or for a specific folder pair from the Default Data Source and use them with their own folders.

Also, when CMiC introduces new joins or modifies existing ones in the Default Data Source, users will be able to import these new joins into their custom folders.

Import All Joins for a Selected Folder

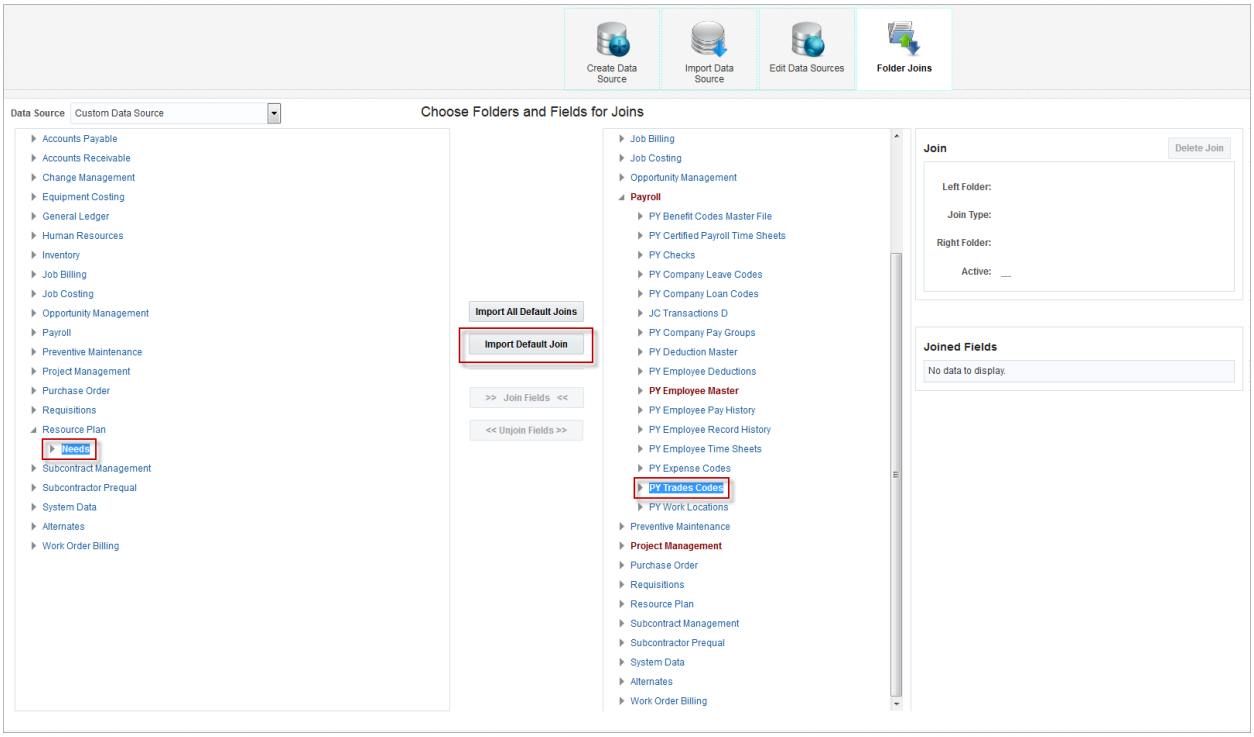
The [**Import All Default Joins**] button becomes enabled when a folder is selected in the left pane. Clicking this button will copy all joins for the corresponding database object of this selected folder. If the folder has joins that don't exist in the Default Data Source, those joins won't be modified. Other joins will be overridden.



Example of importing all default joins for a selected folder

Import a Join for a Specific Folder Pair

The [**Import Default Join**] button becomes enabled when a folder pair is selected on the left and right panes, indicating that a join will be created between these two selected folders. Clicking this button will copy the join between corresponding database objects of the selected folders from the Default Data Source. If there is already an existing join, it will be overridden.



Example of importing a join for a specific folder pair

Create, Delete Joins

Joins between folders determine what gets charted in BI Dashboard Builder, as each returned row gets charted. Thus, the join type (Inner, Left Outer, Right Outer) is quite important, as the set of returned results for each type can vary greatly.

The following guidelines are recommended when creating joins:

1. When creating an INNER join, always keep Lookup folders on the right side, as this will allow the join to appear correctly in ERD diagrams.

2. Don't forget to make OUTER joins, as required.

    - If at least one of the joined fields is optional, most likely the join must be an OUTER type join.
    - The direction of the OUTER join (LEFT or RIGHT) should be pointing to a Detail folder.

      For example, for an OUTER join:

      Left Folder: "JC Jobs"
      Right Folder: "SD Regions"
      Join Fields: "JC Jobs – Location Code" and "SD Regions – Region Code"

      As Location Code field in JC Jobs is optional, the join must be an OUTER type join. In this case, "JC Jobs" is a "Detail" folder and "SD Regions" is a "Lookup" folder. Therefore, the OUTER join should be a "LEFT OUTER" join pointing to the "JC Jobs" folder side.

Create Joins

To create a join, select the left Folder's Field from the left pane, and select the right Folder's Field from the right pane, which causes the [>> **Join Fields** <<] button between the panes to become enabled. Click the button

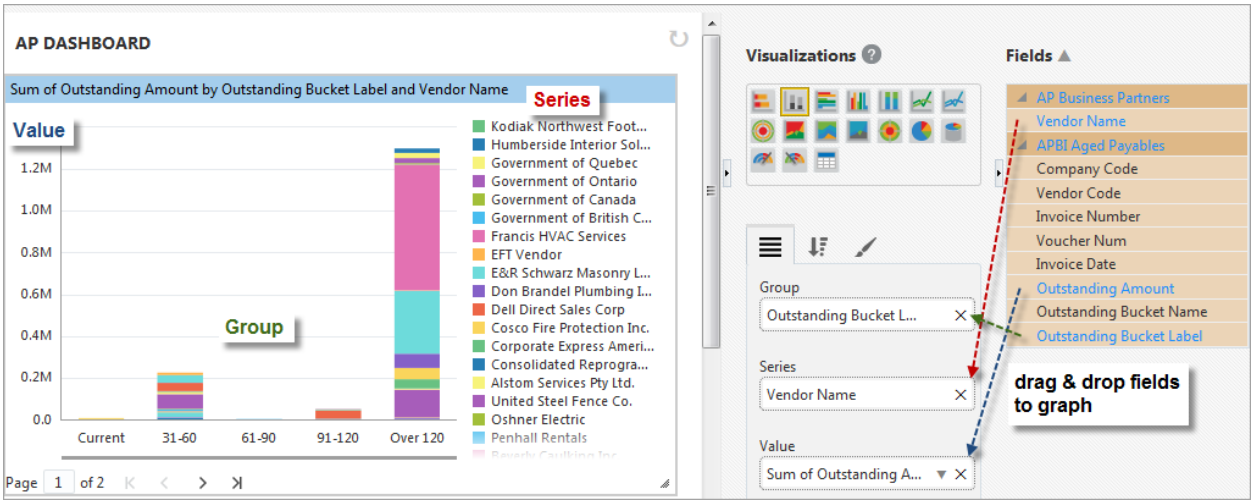
to create the join, and the joined fields will be listed in the Joined Fields section (rightmost side of screen). Then, use the Join section to set the join's type (Inner, Left Outer, Right Outer) via the Join Type field.

Delete Joined Fields

To delete joined fields, either select the two joined fields via the panes and click the [<< **Unjoin Fields** >>] button between the panes, or click the ✕ icon of the joined fields in the Joined Fields section.

Also, the [**Delete Join**] button in the Join section can be used to delete all of a join's joined fields, deleting the join entirely.

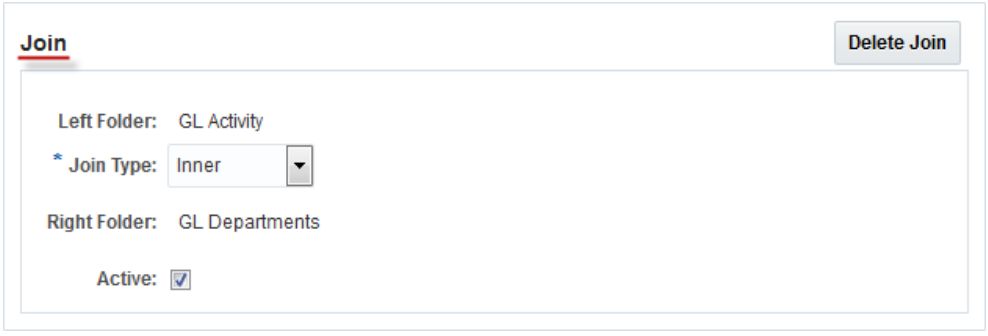
Joining Three or More Tables – Example Relating to Data Query



Example of BI Dashboard Builder, using three joined tables from a data source created in BI Catalog Builder

To set up joins for a query statement that joins three or more folders (tables/views), simply specify the join between the first two folders, then the join between the second and third folder, and so on. In BI Dashboard Builder, the application is smart enough to know how to combine them to return the specified columns.

Join – Property Pane Section



Sample of Join section used to define joins.

The following provides details about this section's button and fields:

[**Delete Join**] – Button

Deletes the join.

Left Folder

Name of join's left folder.

Join Type

Since each returned result for joined folders gets charted, the join type affects what gets charted in BI Dashboard Builder.

Join Type	Description
Inner	A row is returned only for matched rows of joined folders.
Left Outer	A row is returned for every row of left folder, with every field from the right folder set to NULL if there was no match between the left folder's row and a row in the right folder.
Right Outer	A row is returned for every row of right folder, with every field from the left folder set to NULL if there was no match between the right folder's row and a row in the left folder.

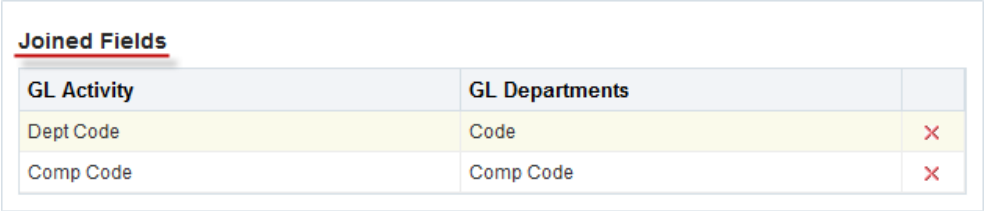
Right Folder

Name of join's right folder.

Active – Checkbox

If checked, join is active for data source.

Joined Fields – Property Pane Section



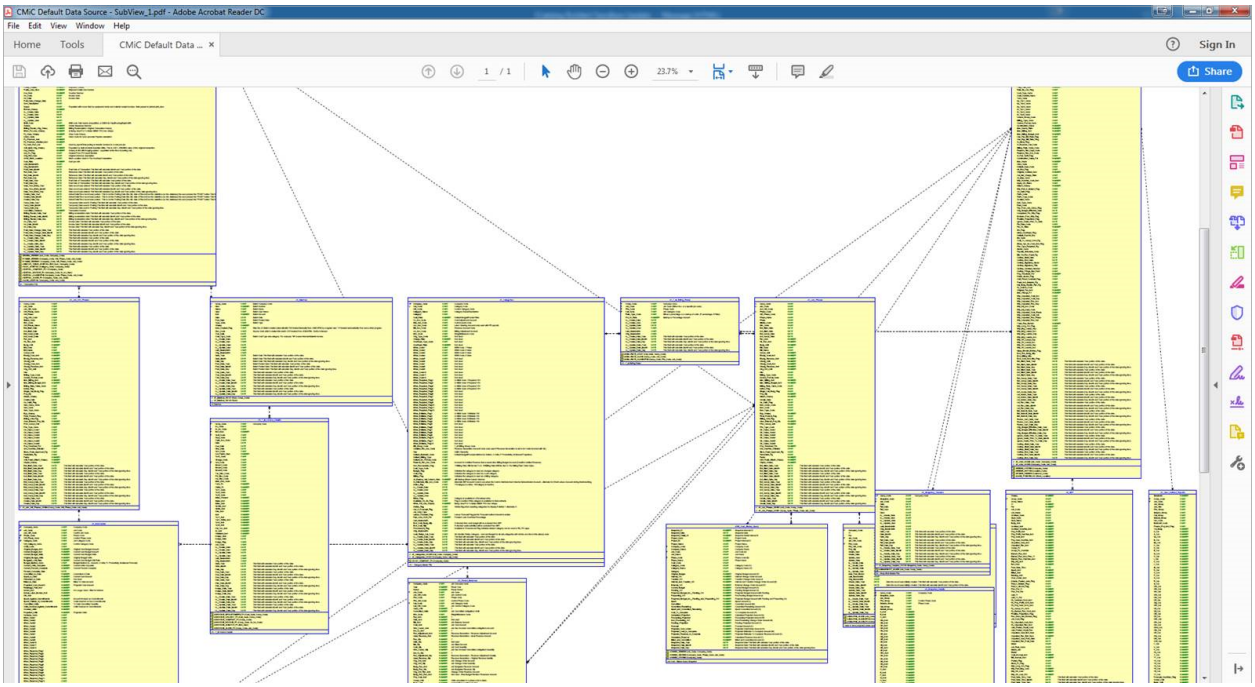
Example of Join Fields section, which lists joins between fields of selected folders

This section lists the joined fields between the selected folder on the left and the selected folder on the right.

The ✕ icon is used to delete the corresponding joined fields.

Generating ERDs for Data Sources

Overview



Example of Entity-Relationship Diagram

BI Catalog Builder allows users to generate a script for drawing Entity-Relationship Diagrams (ERDs) for any data source.

Users simply download a DDL script for any data source and then import it into any tool that creates entity-relationship diagrams.

CMiC recommends Oracle's SQL Developer Data Modeler, as it's free to use and powerful enough to draw quite sophisticated diagrams. The data modeler can be downloaded from Oracle's website: https://www.oracle.com/database/technologies/appdev/datamodeler.html.

Relationships Generated in ERDs

Relationships are generated as follows in ERDs:

- The generated ERDs will use "One-To-Many" relationships between entities (folders).
- In order to correctly determine "One" and "Many" sides of the relationship, the Catalog Builder will use "Join Type" information (see screenshot below).
- In case of OUTER joins, the join direction (LEFT or RIGHT) will always point to a folder associated with the "Many" side of the relationship.

- In case of INNER joins, Catalog Builder will always use “Right Folder” as the one to be associated with “ONE” side of the relationship and the “Left Folder” will be associated with the “MANY” side of the relationship.

When building a custom data source, in order to have correct relationships in your ERDs, always use “Lookup” folders on the right side of the joins. The CMiC Default Data Source functions according to this rule.

Example

Join Setup:

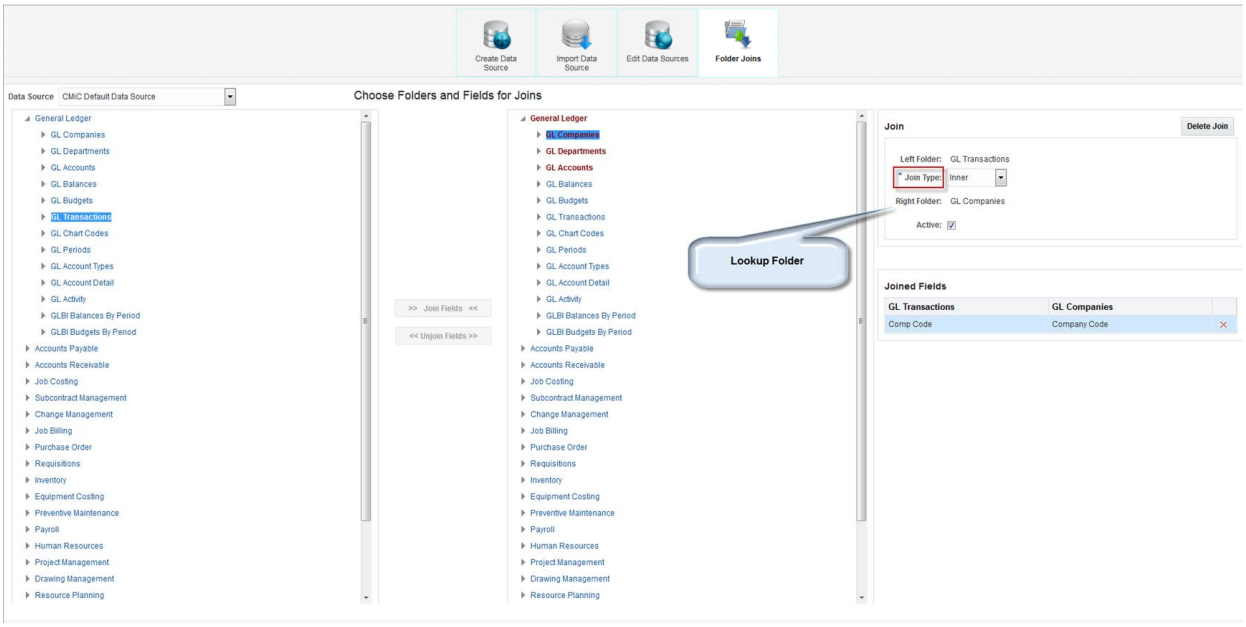
Left Folder: GL Transactions

Right Folder: GL Companies

Join Type: Inner

Produced Relationship in ERD:

“GL Transactions” >------- “GL Companies”

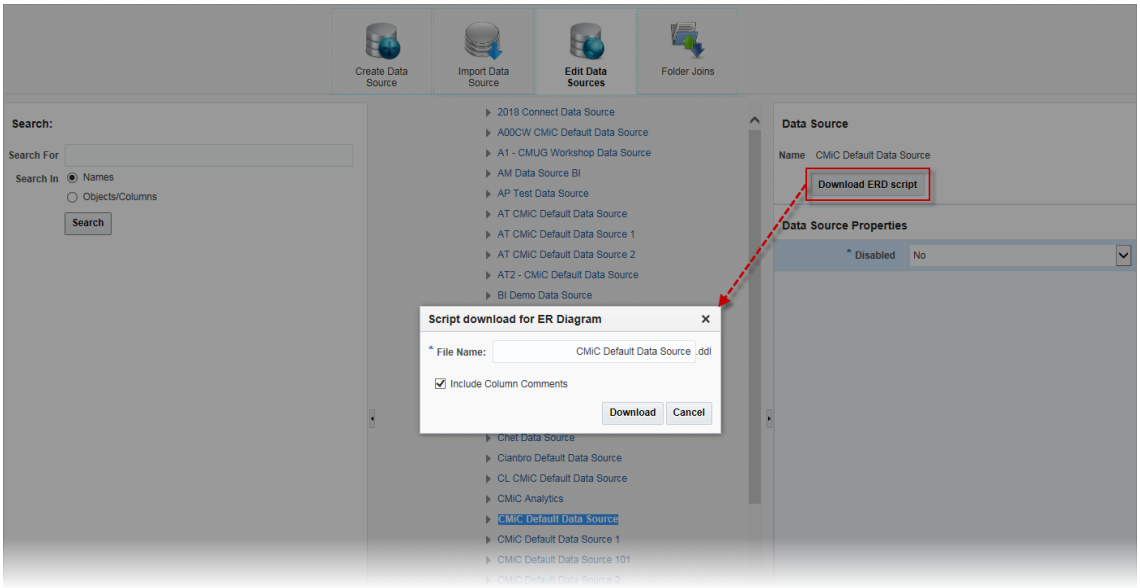


Example of Join Type to be used for Entity Relations

Building an ERD using Oracle Data Modeler

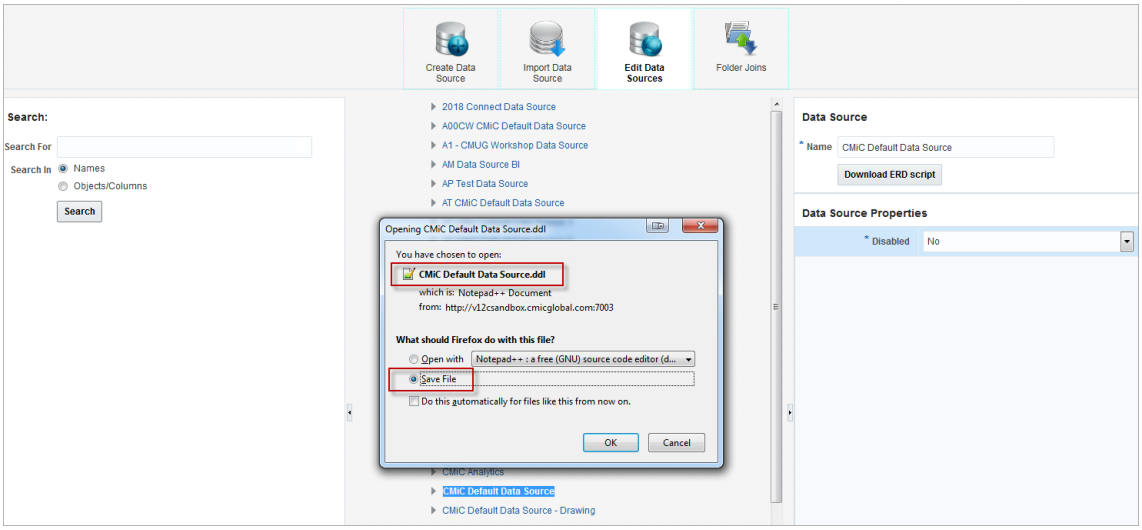
Step 1: Download ERD script for your data source.

- Select your data source.
- Press [**Download ERD script**] button. A pop-up with the suggested file name will appear.



*Pop-up window launched from [**Download ERD script**] button*

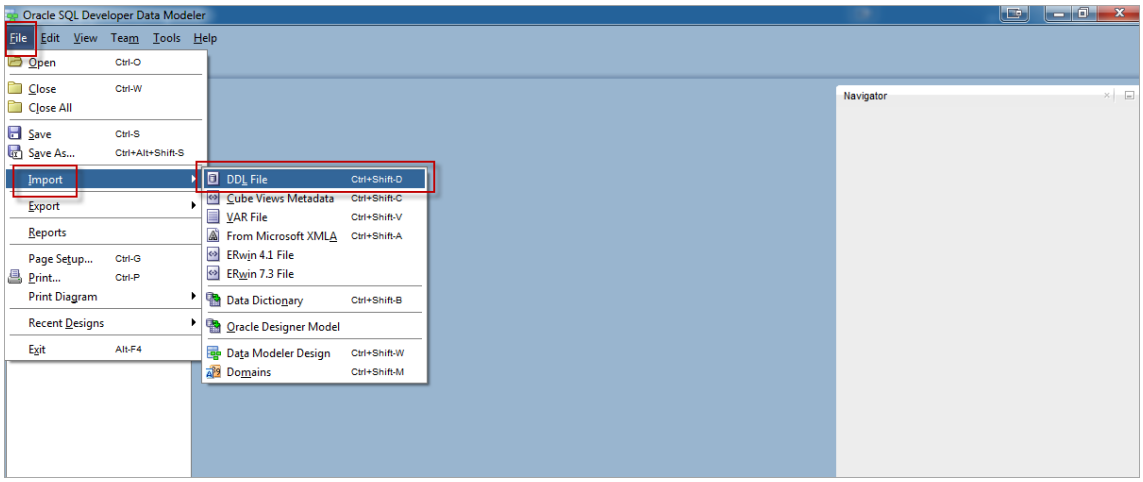
- Select the 'Include Column Comments' checkbox if you wish to generate column comments. When selected, Field Description property will be used as a source for the generated column comments.
- Press [**Download**] button.
- Once the file is generated, the browser's Save dialog will appear. Save the file to the desired location.



Example of browser's pop-up window used for saving DDL script

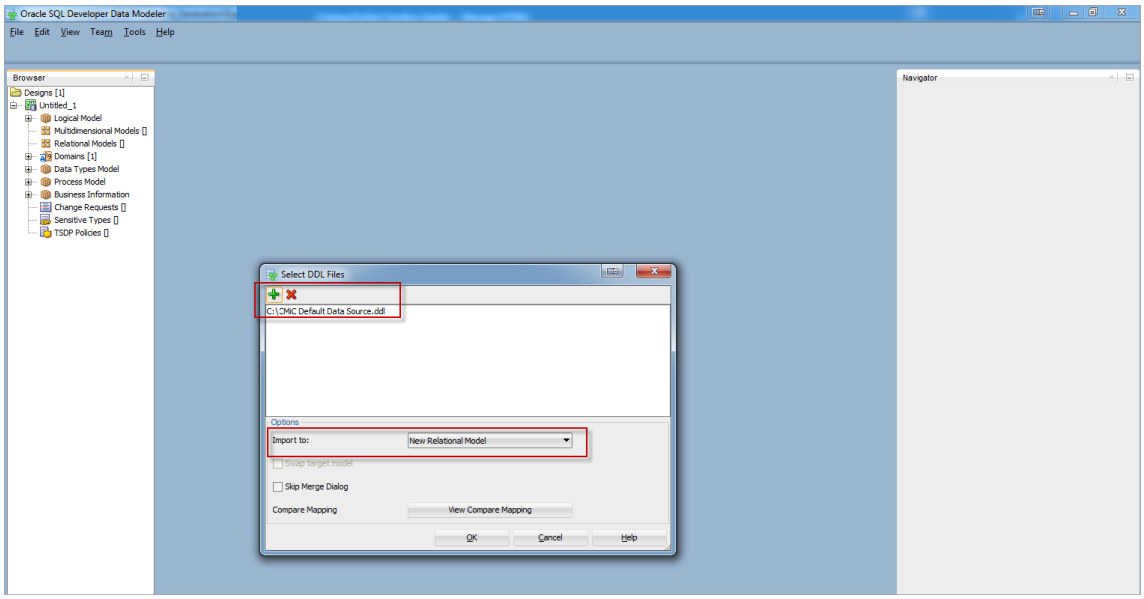
Step 2: Use Data Modeler to draw ERD.

- Open Data Modeler, then go to “File”=>“Import”=>“DDL File”.

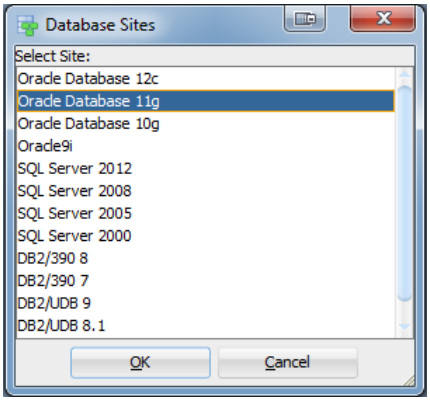


Importing a DDL file in Oracle SQL Developer Data Modeler

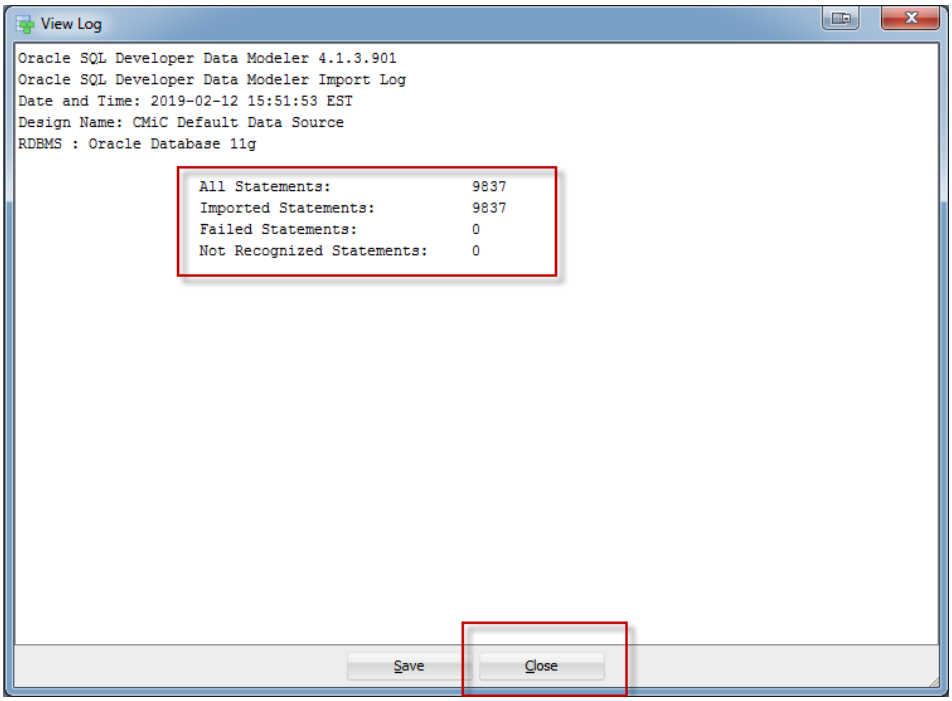
- Select the generated DDL script. Make sure **Import to:** option is set to “New Relational Model” and click [**OK**].



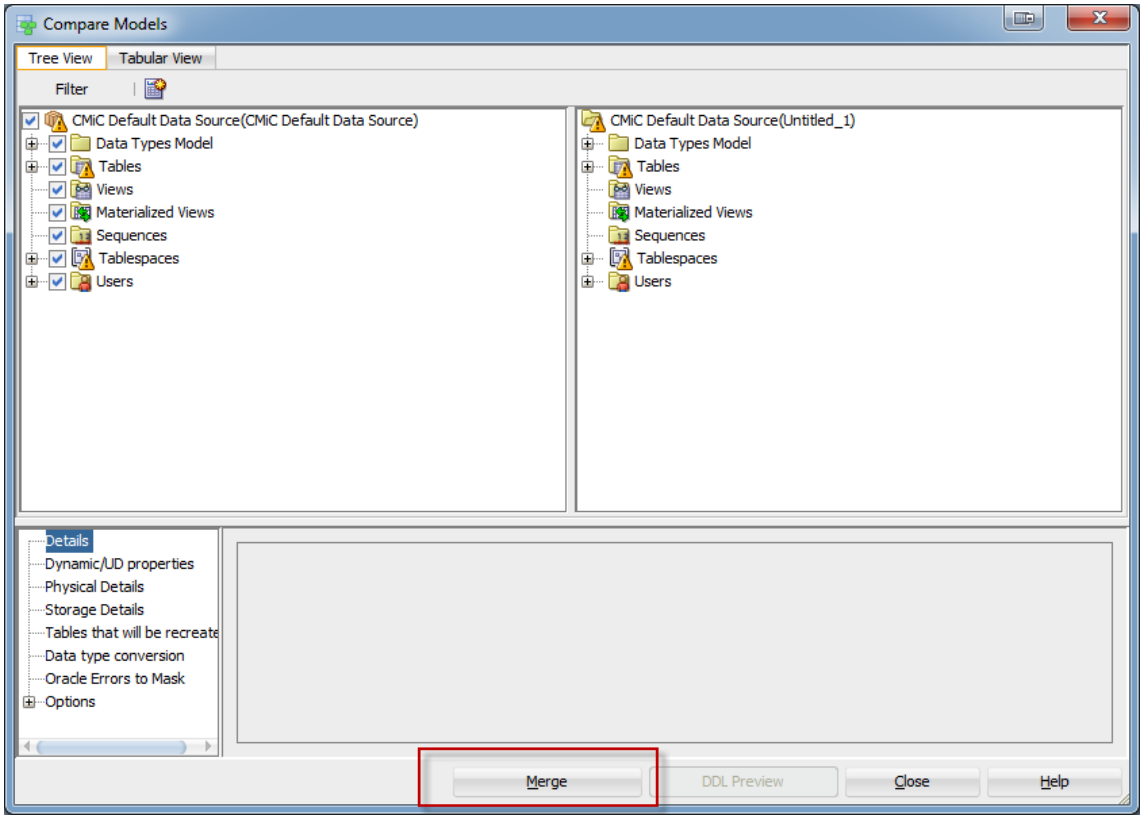
- Select “Oracle Database 11g” and click [**OK**].



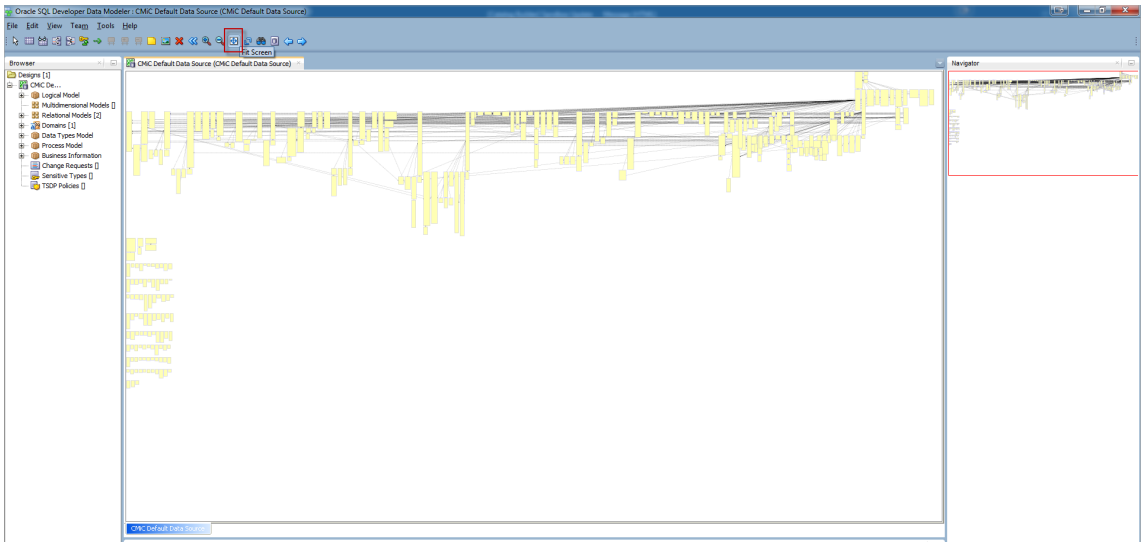
- Review the import log and click [**Close**].



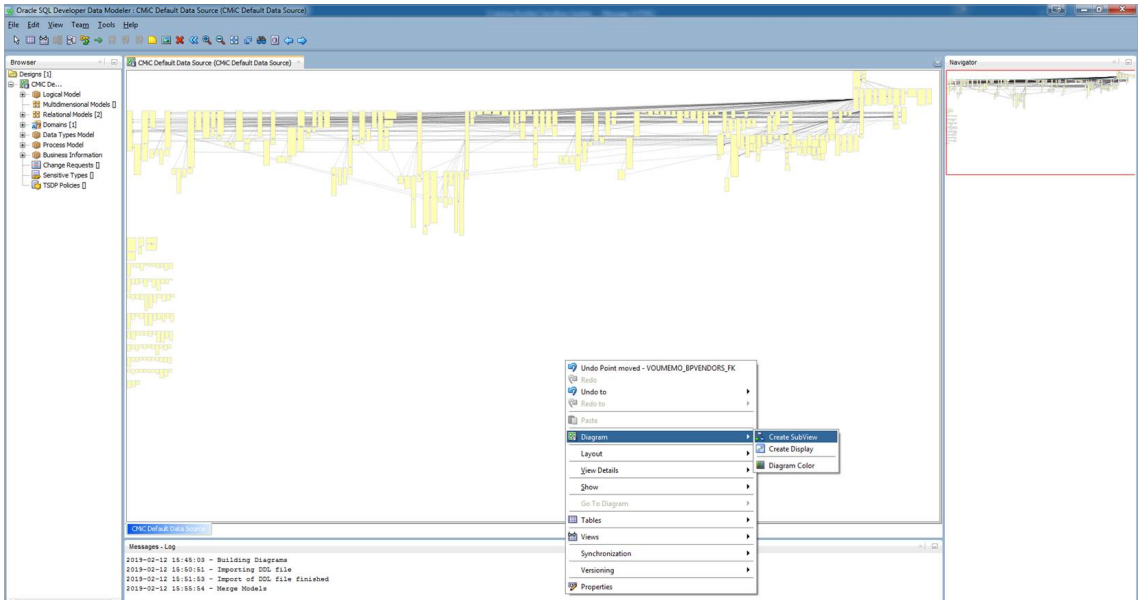
- Click [**Merge**] in the Compare Models dialog window. If you wish, you can explore this dialog and select only those items that you would like to import. CMiC recommends that you use defaults and import everything.



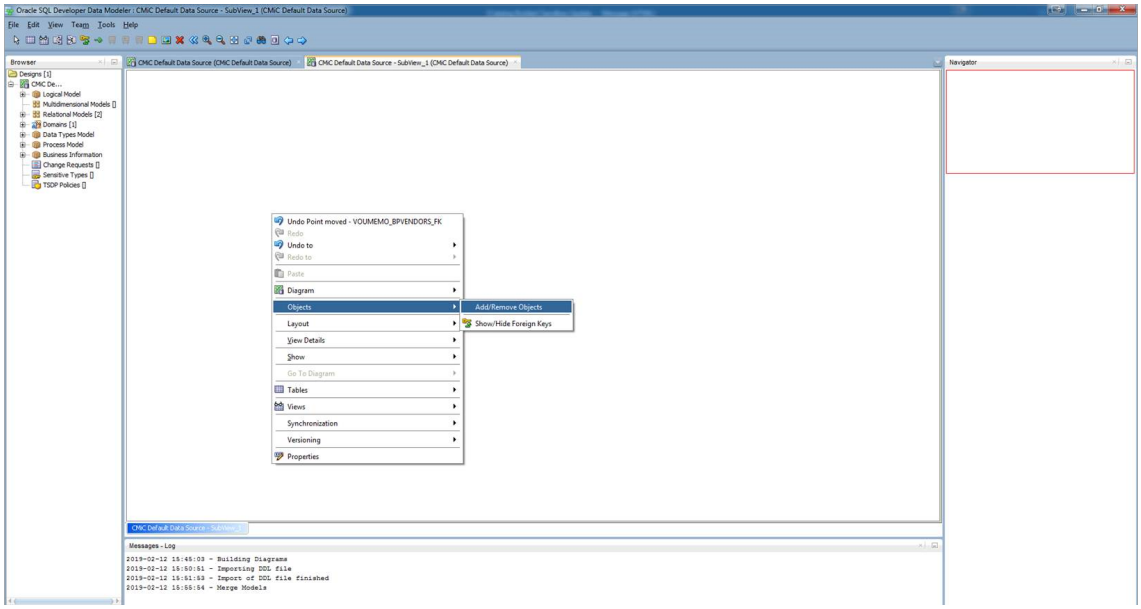
- Once the merge process is completed, use Fit Screen or Zoom toolbar buttons to make the diagram visible. If your data source includes a lot of folders, a diagram created by default may be too big, as shown in the screenshot below.



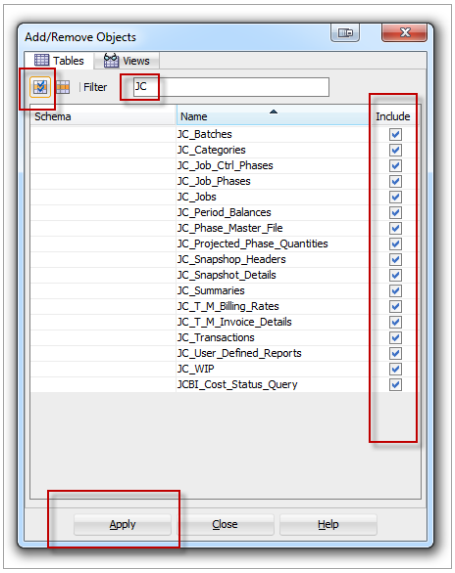
- To create a new diagram with a smaller number of folders, right-click on the default diagram and select menu item “Diagram”=>“Create SubView”.



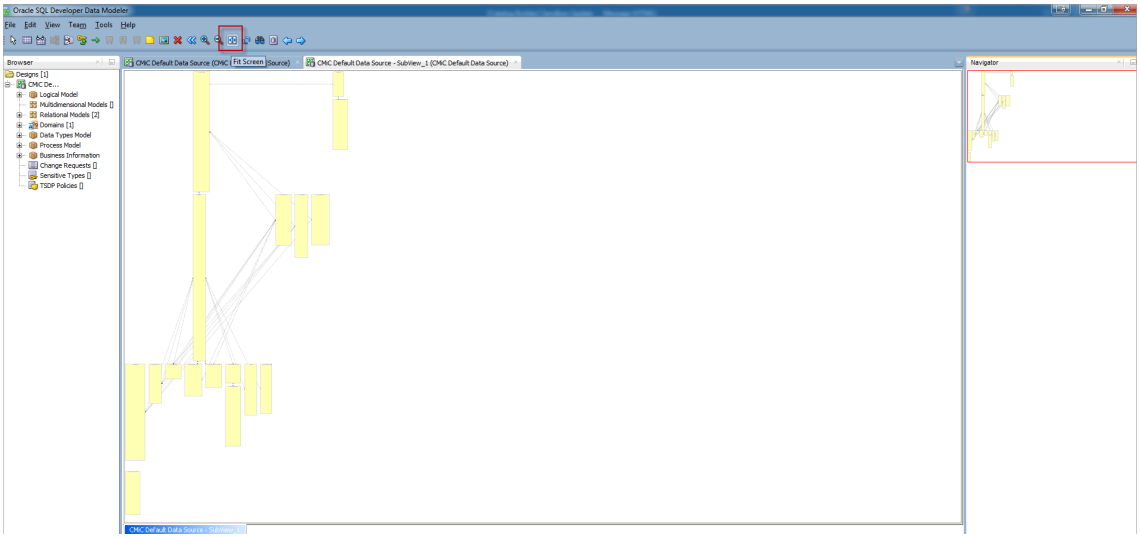
- Then right-click on the new diagram and select “Object”=>“Add/Remove Objects”.



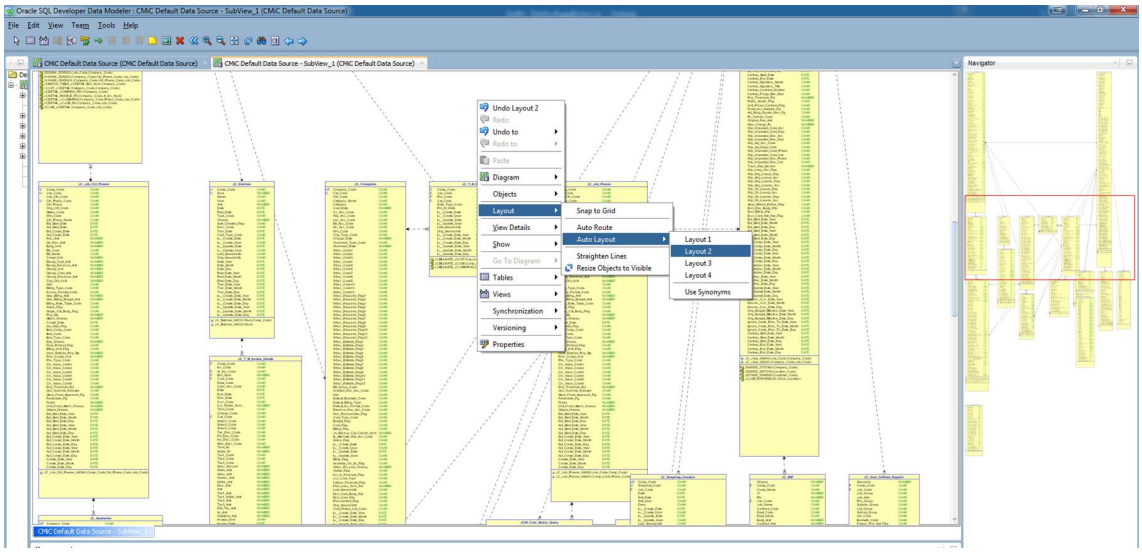
- In the Add/Remove Objects pop-up, select only those objects that you would like to include into your diagram. In example below, we include all JC objects. When finished, click [**Apply**] and [**Close**].



- If new objects are not visible in the diagram, click **Fit Screen** toolbar button.

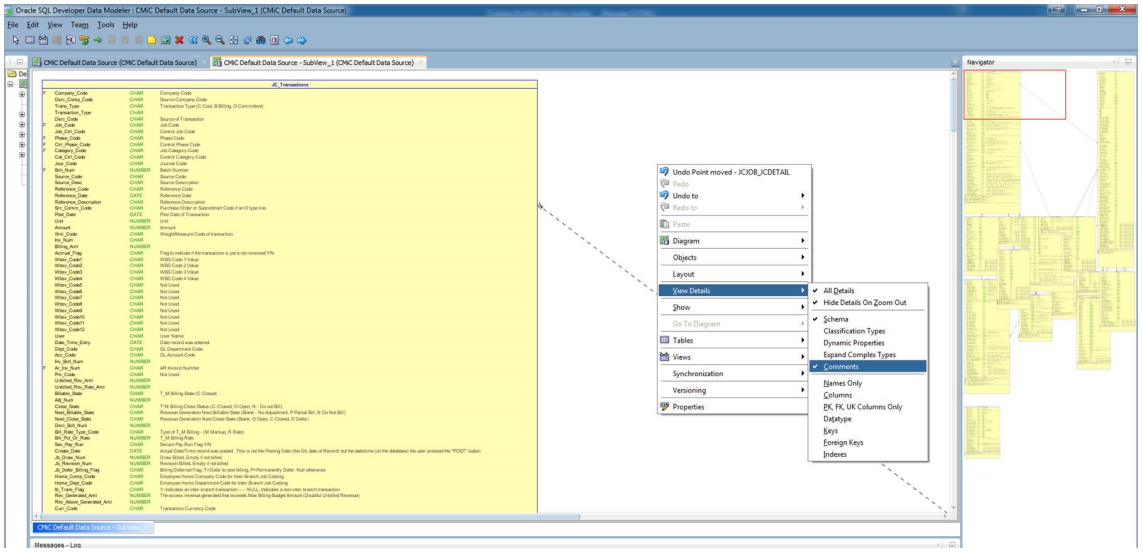


- You can also automatically arrange the objects using the Auto Layout function, as shown in the screenshot below.



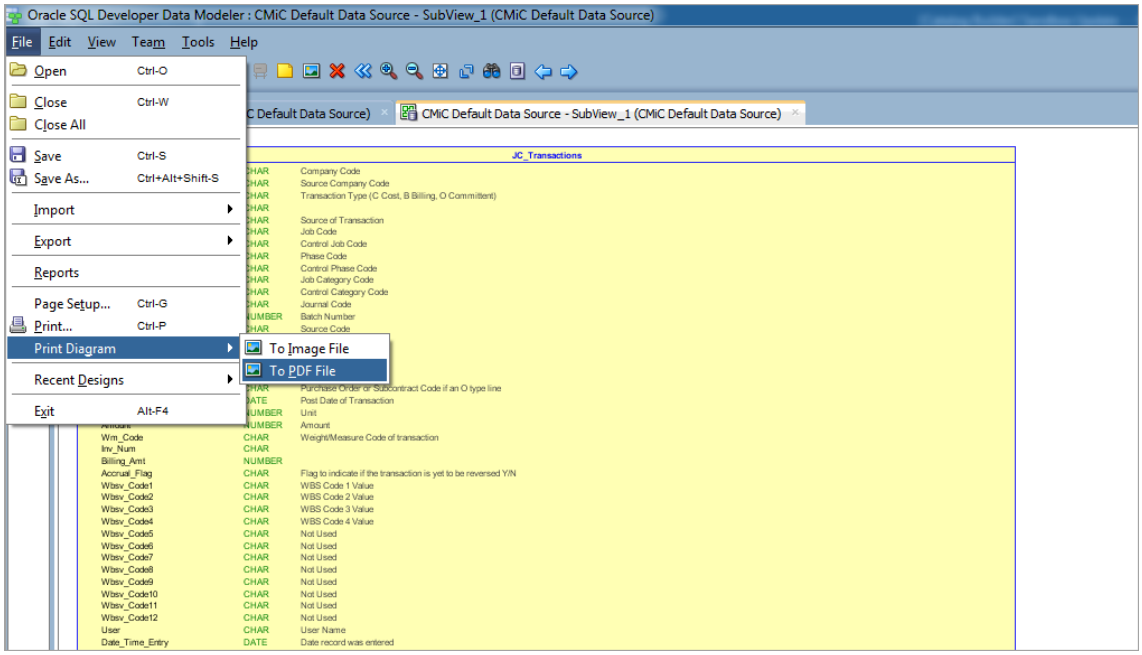
Auto Layout function in Oracle SQL Developer Data Modeler

- You can also select what information will be visible in the diagram. In the screenshot below, we included "Comments".



Example of selecting details, such as Comments, to be visible in the diagram

- You can export the diagrams to a PDF or Image file by selecting “File” => “Print Diagram” => “DDL File”.

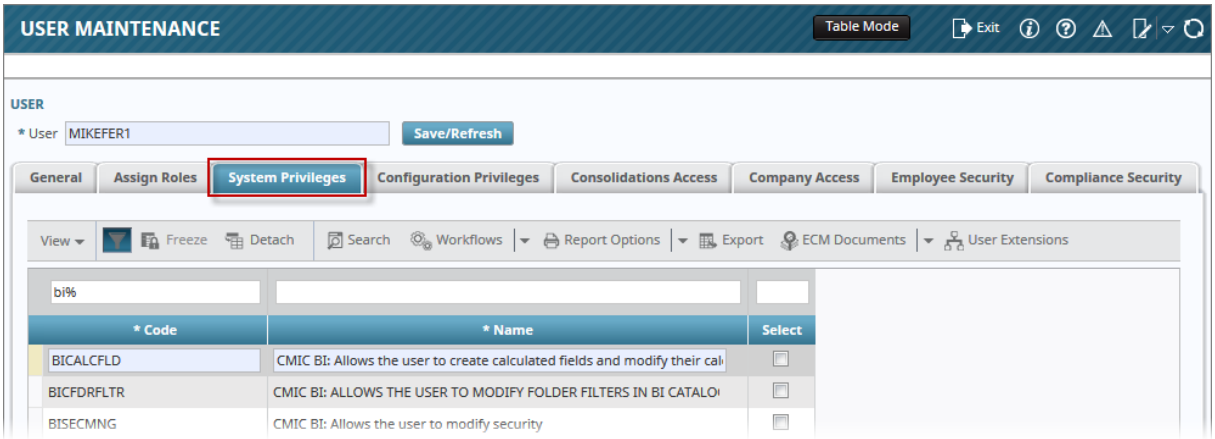


Exporting a diagram to PDF

Setup

CMiC BI Security – BI Catalog Builder

System Privileges



The following system privileges pertain to BI Catalog Builder:

System Privilege	Description
BICALCFLD	Allow user to create calculated fields and to modify their calculation. Refer to following section for details: *Context Menu (Right-Click Menu)*.
BICFDRFLTR	Allow user to modify folder filters in BI Catalog Builder. Refer to following section for details: *Editing Folders*.
BICTLGBLDR	Allow user access to BI Catalog Builder.
BISECMNG	For details, see part 2 in the following *Security Setup & Rules – Catalog Security* section.
BIUDFSETUP	Allows BI Developer to modify the Base Object Name property of User Defined Fields in folders.
BIMODJOINS	Allows the user to modify Folder Joins in BI Catalog Builder. Refer to the following section for details: Modify Folder Joins – Screen.

Security Setup & Rules – Catalog Security

1. **BICTLGBLDR System Privilege**: Allow Access to Catalog Builder

   Only users with the BICTLGBLDR system privilege can run BI Catalog Builder.

2. **BISECMNG System Privilege for BI Administrators**: Allow Modification of Security

   I. Only users with the BISECMNG system privilege, which is required to modify security in BI Catalog Builder (assign/revoke security roles), can access the following options:

   - **Assign Roles**
   - **Create Data Source**
   - **Edit Business Area**
   - **Edit Available Tables/Views**
   - **Create New Business Area**

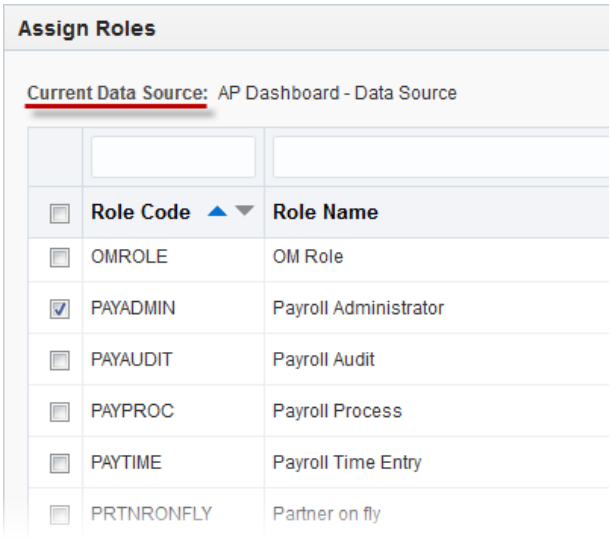
   II. In BI Catalog Builder, not in BI Dashboard Builder, users with the BISECMNG system privilege can access all data sources, business areas and folders, regardless of the security role assignments.

3. **Catalog Security Not Enabled**

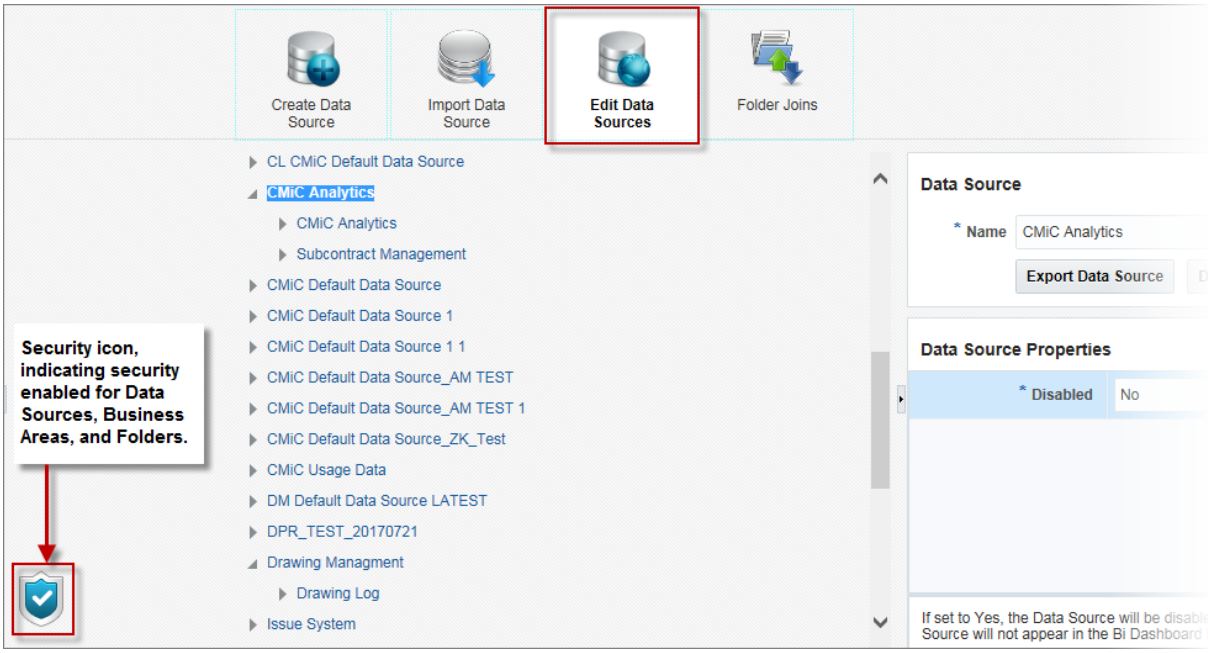
   If no security roles are assigned to any data sources, business area or folder, Catalog Security in BI Catalog Builder is not enabled, and all data sources, business areas and folders are available to everyone.

4. **Enabling Catalog Security**

   If at least one security role is assigned to any data source, business area or folder, via the **Assign Roles** context menu option for them (shown below), Catalog Security is enabled.



Once Catalog Security is enabled, for each data source, business area and folder, only users belonging to the security role(s) assigned to them can access them; also, the Security icon appears at the bottom-left side of the Edit Data Sources screen, as shown below:



5. **Catalog Security & Dashboard Builder**

In BI Dashboard Builder, if a BI Developer has rights to a data source, but not all of its business areas and folders, the business areas and folders to which the user does not have rights are hidden from the user. If a user does not have rights to a data source, the data source and any dashboards using it are hidden from the user.

6. **Security Role Inheritance**

When a security role is assigned to a top-level data object (data source/business area), the security role is automatically inherited by all lower level data objects. For example, when a role is assigned to a data source, all of its business areas and folders are assigned the role.

7. **Copying Data Objects & Security Roles**

When a data source, business area or folder is copied using the “Copy” context menu option, its assigned security roles are also copied.

8. **New Data Objects & Security Roles**

When any new data source, business area or folder is created, security roles are not automatically assigned to it, even for new business areas and folders of a data source that has assigned security roles. All newly created data sources, business areas and folders must have security roles manually assigned to them.

Adding Custom Tables/Views to Data Sources

To add a custom table or view to a data source in order for it to be used in dashboards, the CMIC_BI_RUNTIME schema must be granted the SELECT privilege for that custom table or view, otherwise, dashboards that use that data source will not function.

For example, to grant the CMIC_BI_RUNTIME Schema the SELECT privilege for a custom table/view, such as *CUSTOM_SCHEMA.CUSTOM_TABLE*, the following GRANT statement must be issued in the database:

grant SELECT on <*CUSTOM_SCHEMA.CUSTOM_TABLE*> **to CMIC_BI_RUNTIME**

NOTE: CMiC automatically grants SELECT privilege on all views and tables located in DA and CMIC_BI schemas during patch installations. In order to access tables/views from other schemas, users need to grant SELECT privilege on those tables/views to CMIC_BI_RUNTIME schema manually.

Steps for Adding a Custom Table/View to a Data Source

To add a custom table/view to a data source:

1. Grant the SELECT privilege to CMIC_BI_RUNTIME schema for the custom table/view, as described above.
2. Add the custom table/view to the data source by right-clicking on the data source and selecting “Edit Available Tables/Views” from the drop-down menu. For more details, please refer to the subsection *Edit Available Tables/Views (Data Sources)* in this guide.
3. Add the custom view/table into the business area by right-clicking on the business area and selecting “Edit Business Area” from the drop-down menu. For more details, please refer to the section *Edit Business Area (Business Areas)* in this guide.

NOTE: Custom tables/views and their columns must have basic Oracle names not enclosed in quotation marks.

Appendix

Export/Import Data Source

Users can export any data source into a file and then import it into another or the same environment.

For details on exporting data sources, refer to the [**Export Data Source**] button in the *Editing Data Sources* section of this guide. For details on importing data sources, refer to the *Importing Data Sources* section of this guide.

Working with Multiple Environments

When working with multiple environments, where you are planning on developing in one environment (e.g. TEST or DEV) and then promoting these changes into another environment (e.g. PROD), the following rules and best practices for import/export should be considered:

1. Always make changes to your data source and dashboards in your development environment (e.g. TEST, DEV, etc.).
2. Once changes are completed and ready to be promoted into your production environment (e.g. PROD):
    a. Export your data source from the development database and import it into your production database. For details on exporting data sources, refer to the [**Export Data Source**] button in the *Editing Data Sources* section of this guide. For details on importing data sources, refer to the *Importing Data Sources* section of this guide.
    b. Export your dashboards from the development environment and import them into your production environment. For more details, refer to the *Export – Menu Option* and *Import - Menu Option* sections of the BI Dashboard Builder guide.
3. Importing a data source will override the existing data source in the destination environment, therefore, it's important to follow Rule 1.
4. If users modify a dashboard in the "source" environment, and these changes don't require any modifications in the corresponding data source, then it's not necessary to export/import the data source. In this case, users can skip Rule 2a.
5. If you are planning to clone one environment into another (e.g. clone PROD to DEV) and you have data sources and/or dashboards in the destination environment (e.g. DEV) that don't exist in the source environment (e.g. PROD), or you don't want some of them to be overridden by cloning, you will need to export these data sources and dashboards before cloning and import them back after cloning.

NOTE: If you export/import a dashboard between different environments and the dashboard required any changes in the corresponding data source, then you first need to export/import your data source.

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