

# KEYSQL® DATA MODELING TOOL USER GUIDE

24-MAY-2022

The KeySQL® Data Modeling Tool, described here, is an easy-to-use utility for creating and modifying non-flat data models such as native to the KeySQL Server and as seen in JSON and XML data.

This tutorial is a companion to the KeySQL Studio User Guide and KeySQL Definitive Guide.

The KeySQL Definitive Guide is the primary reference for the KeySQL language and provides a complete explanation of the KeySQL data model and modeling elements.

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Help is available from four sources:

- User guide as an online wiki
- User guide as downloadable PDF
- Tutorials published on Keyark's YouTube channel
- Tooltips shown when the cursor is positioned over a control

The User guide is accessed from the ? (help) button at the far right:



The online version of the User guide can be searched by clicking CTRL+F (Windows) or Command+F (Mac).

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# 1 KEYSQL DATA MODELING TOOL

The KeySQL® Data Modeling Tool is a state-of-the-art web application for modeling complex, non-flat data. It is useful for:

- Design and revision of non-flat data models
- Creation of KeySQL catalogs with their k-objects
- Documenting and sharing data models via on-screen and printed JPEG and SVG diagrams
- Deciphering the schema of complex data, whether it be from JSON, XML, MongoDB® or other NoSQL databases

The Data Modeling Tool (“tool”) can be run stand-alone but works in tandem with KeySQL Studio to deliver additional functionality. KeySQL Studio can be used to load your data into KeySQL Server, automatically generating a data catalog from a variety of data sources, both flat (e.g., SQL) and non-flat (e.g., MongoDB). With that catalog, the Data Modelling Tool can render the data model in your choice of layout. The data model is rendered as an image file that can be shared and/or printed out.

The user interface is simple and powerful, enabling database developers, data analysts and business users to share the same data model. Data models of any complexity can be created, making the tool useful for not only KeySQL but also any NoSQL database or application that handles non-flat data.

In terms of common terminology for SQL data modeling tools, this tool most closely resembles a “logical” data modeling tool. It is far more than just a design time or documentation tool. It generates KeySQL statements that can create a KeySQL schema, ready for data loading, or which can alter an existing KeySQL schema.

## 1.1 LAUNCHING

The Data Modeling Tool can be run stand-alone or launched from KeySQL Studio.

**FYI: A trial account for KeySQL Studio is available at no cost. You can register on the KEYARK.COM home page. Upon registration, you receive login credentials and the launch URL.**

### 1.1.1 LAUNCHING STAND-ALONE FROM THE KEYARK HOME PAGE

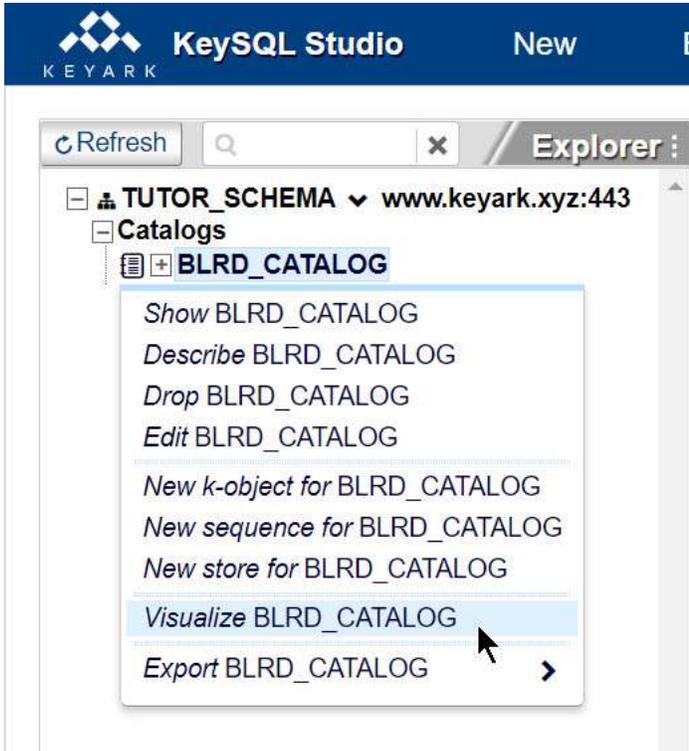
Credentials are unnecessary to launch the Data Modeling Tool. You can launch from this URL:

**<https://www.keyark.com/modeltool/>**

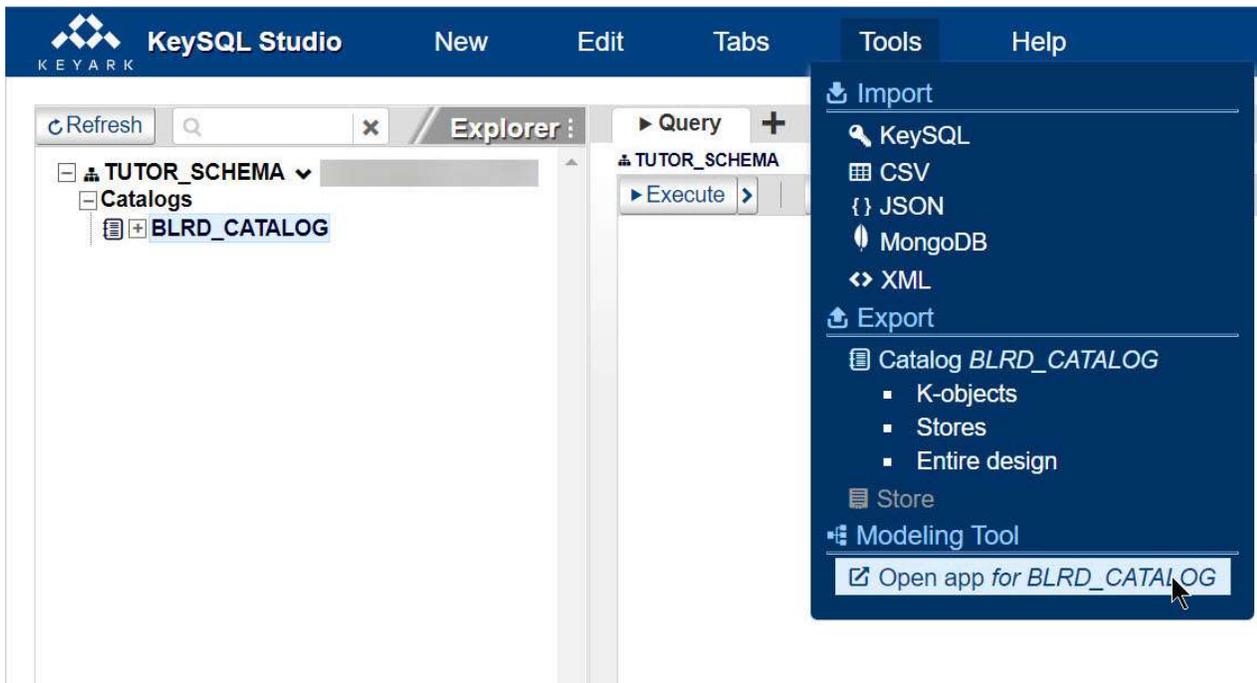
You should now jump to section 1.1.3 to begin your mastery of the Data Modeling Tool.

### 1.1.2 LAUNCHING FROM KEYSQL STUDIO

The Data Modeling Tool can be launched by clicking on a catalog in Explorer and selecting the Visualize menu option:

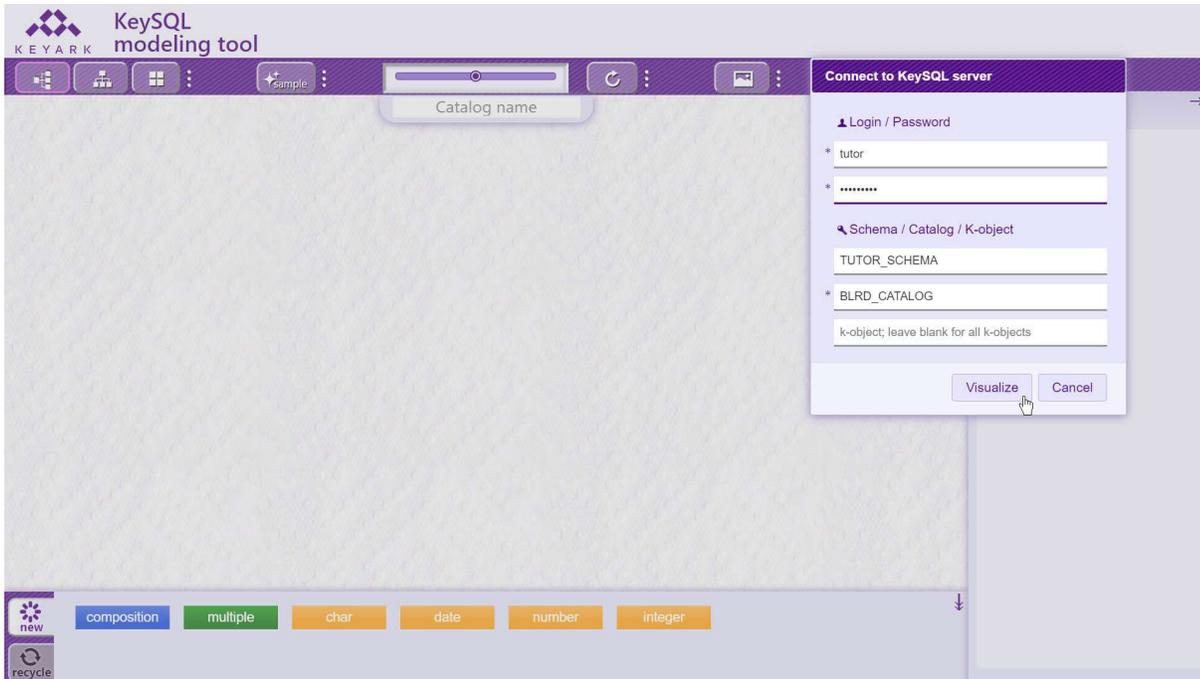


You can also launch from the Tools menu:

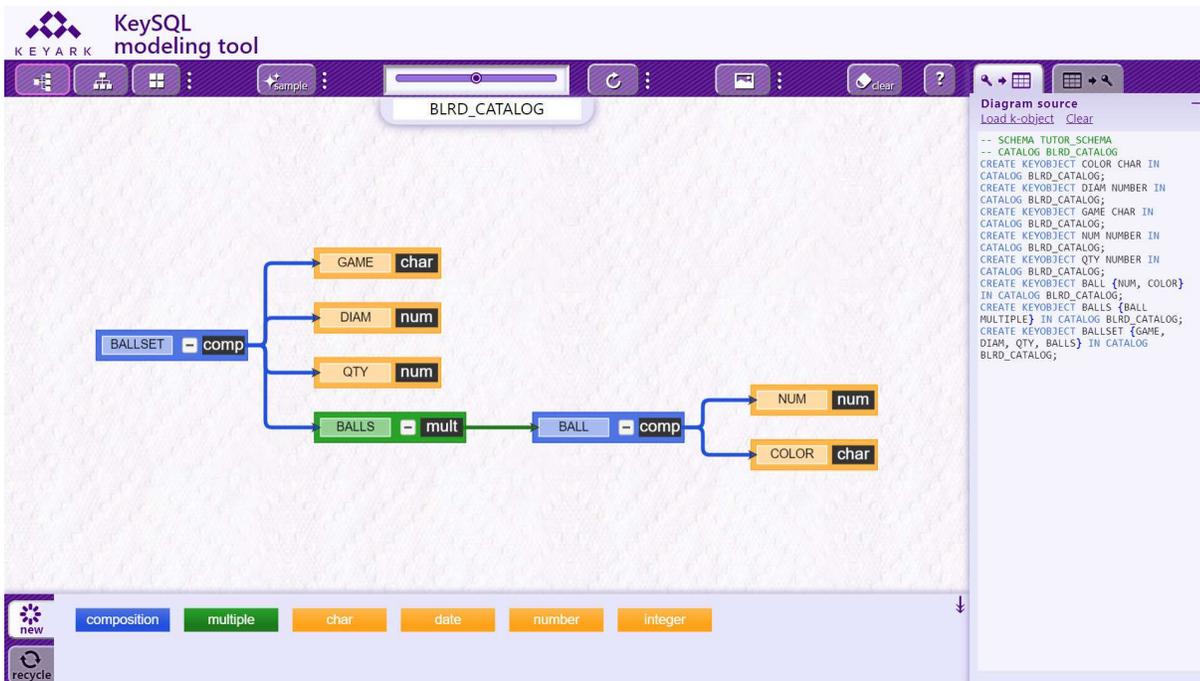


### 1.1.2.1 CHOOSING ALL OR PART OF A CATALOG

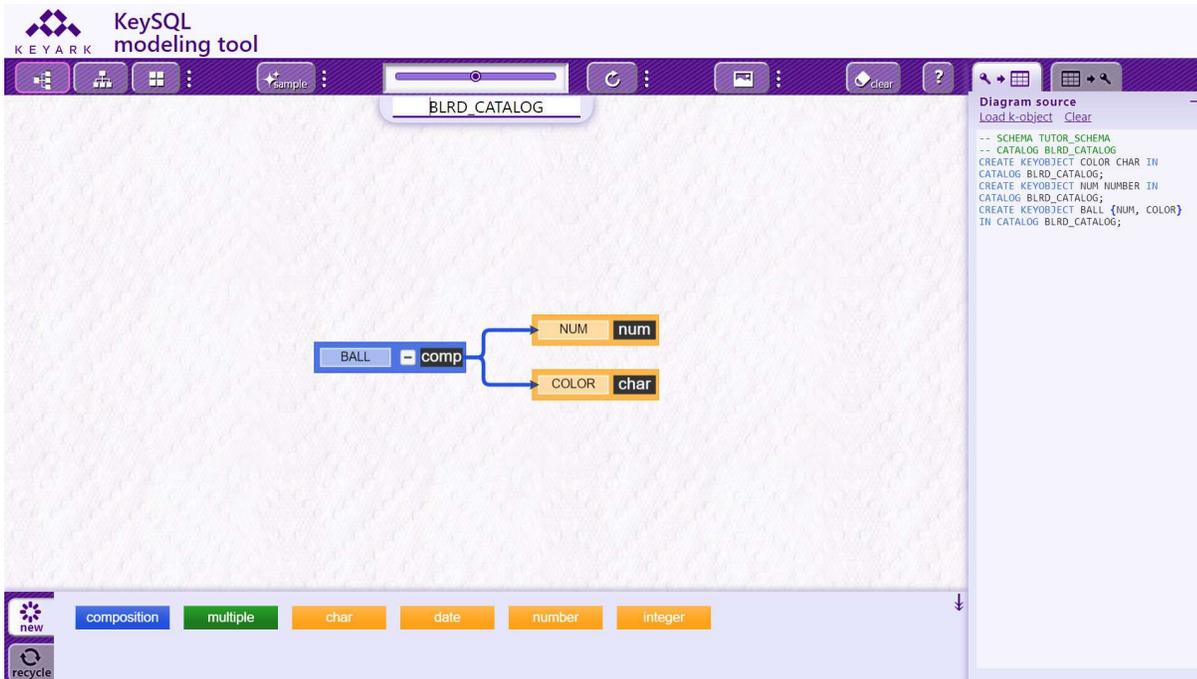
When the Data Modeling Tool is launched from KeySQL Studio it will assume you wish to start with an existing catalog on KeySQL Server, and automatically displays the **Connect to KeySQL server** connection dialogue:



When you click the **Visualize** button the chosen catalog will be visualized in the default horizontal layout:

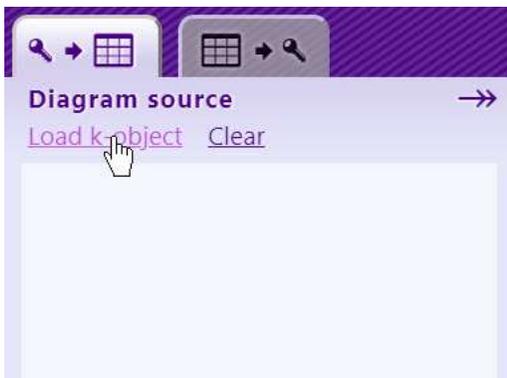


When you connect, you can also choose just part of the catalog, which is especially helpful for large catalogs. In this example the k-object BALL within the BLRD\_CATALOG was selected, and only that part of the catalog is visualized:

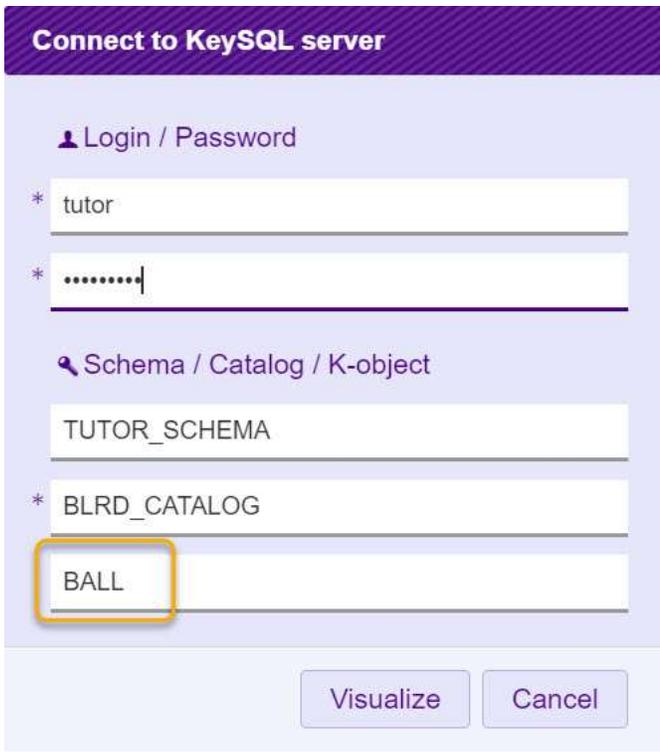


The next two screenshots will explain how the scope of the visualization was narrowed.

To change the source of the visualization, click **Load k-object**, which redisplay the connection form:



In the screenshot below, schema and catalog are unchanged, but the optional text field for specifying a k-object is used to narrow the visualization to just the BALL composite k-object:



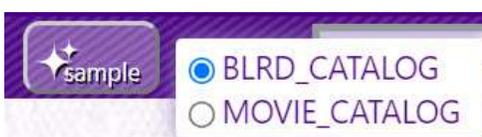
### 1.2 LOADING A SAMPLE CATALOG

A set of sample catalogs are provided, including the BLRD\_CATALOG shown in this guide.

To load or reload a sample catalog, click the **sample** button:



To choose among the samples, click the triple dot **options button** to the right of the **sample** button:



## 1.3 CHANGING THE MODEL DISPLAY

This guide so far has displayed a data model with these default settings:

- Horizontal layout (versus Vertical or Nested)
- Color (versus grayscale)
- Center (versus left flush)
- Neutral zoom setting (model comfortably fits the model canvas)

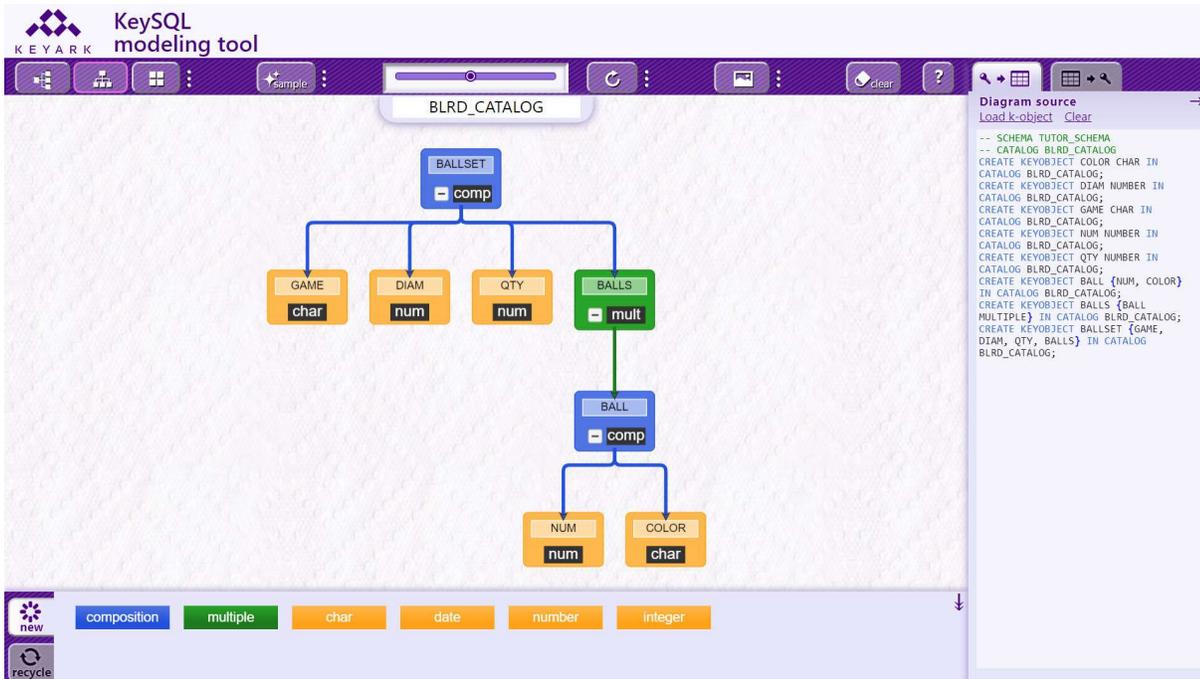
### 1.3.1 ALTERNATIVE LAYOUTS



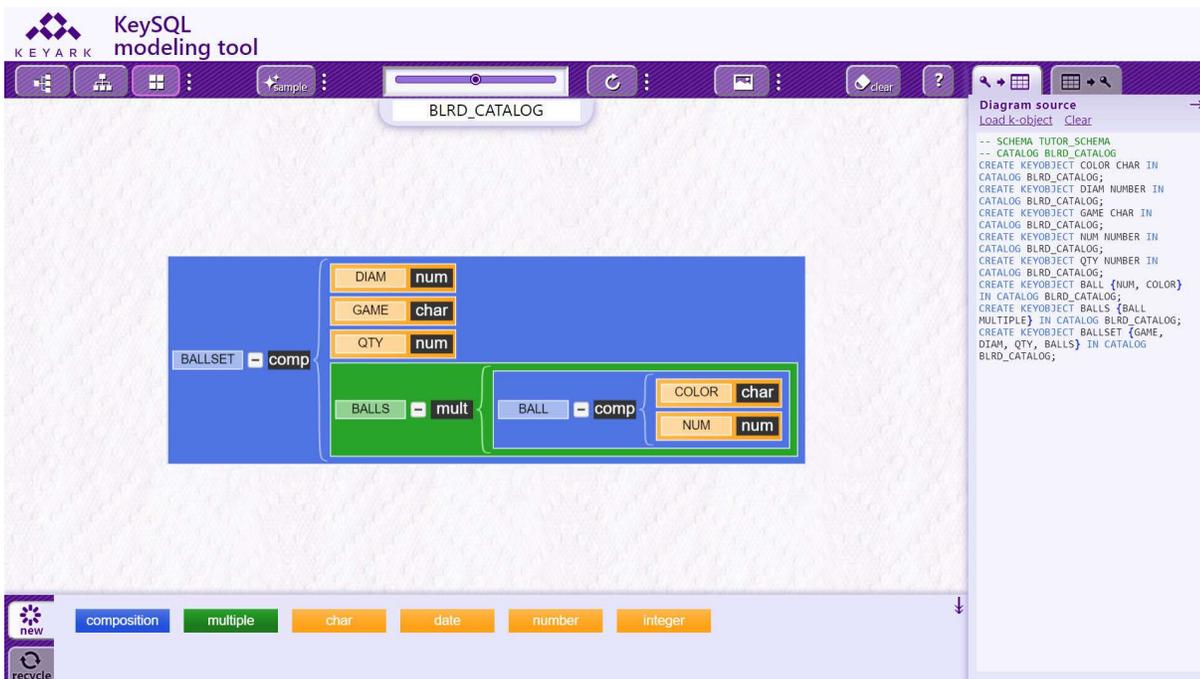
The layout buttons at the top left provide for toggling between three layouts:

- Horizontal
- Vertical
- Nested

In addition to the Horizontal layout shown so far, here is the Vertical layout:



And the Nested layout:

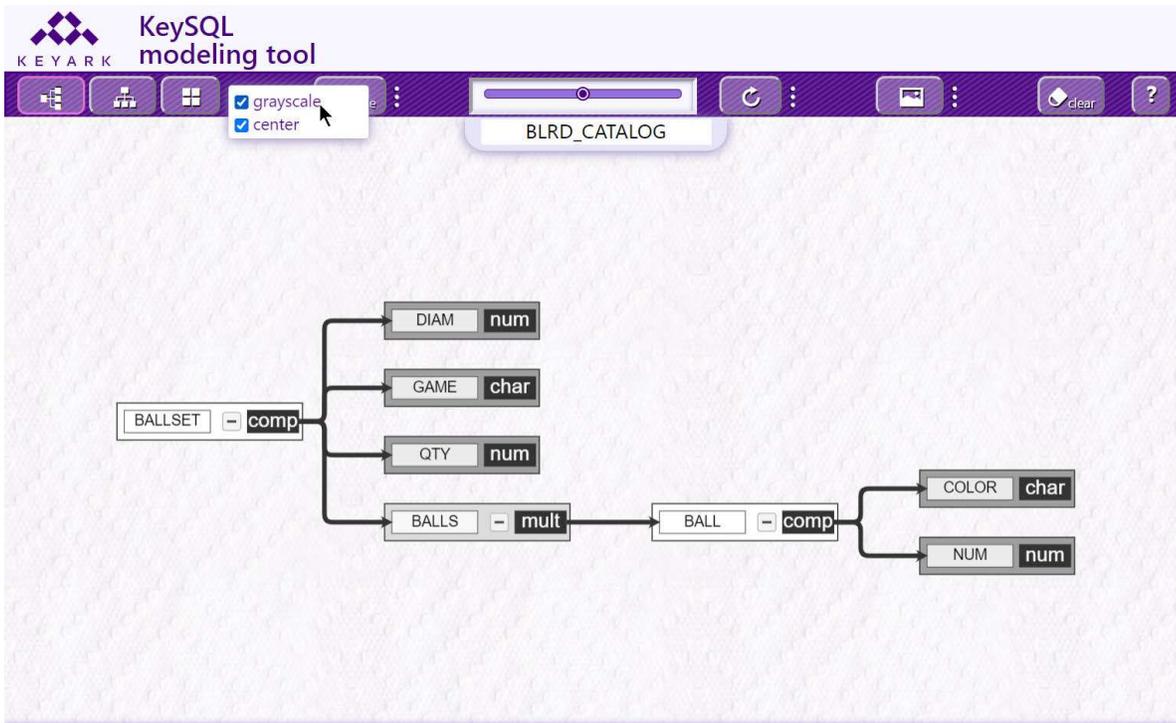


### 1.3.2 COLORATION AND CENTERING

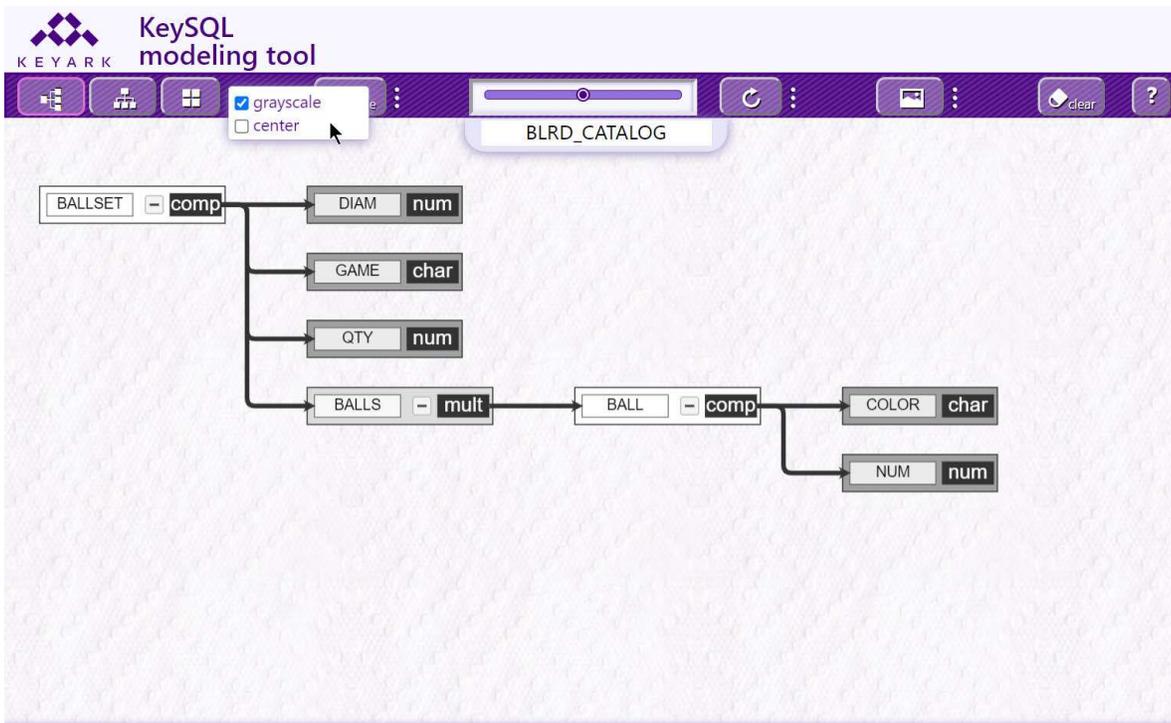
Clicking the three stacked dots at the far right displays additional options:



Here is a model with the default Horizontal layout, but switched to gray scale:



And now **center** is unchecked, causing the model to appear left and top flush:

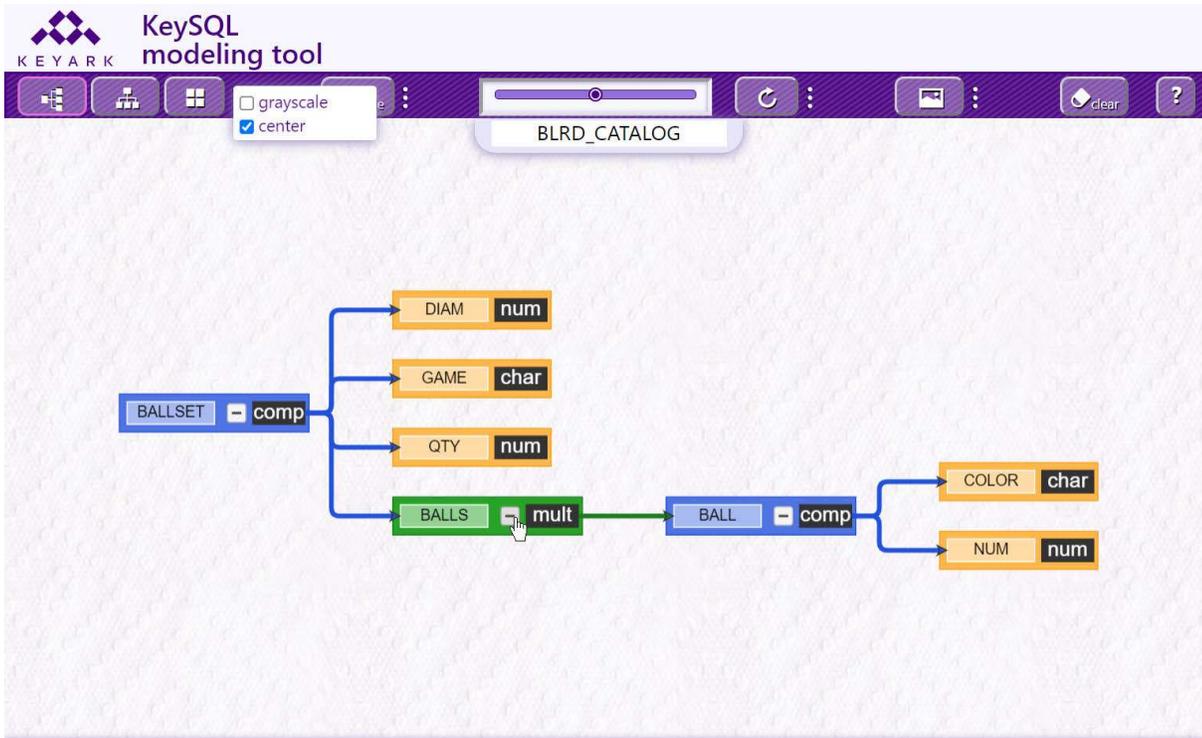


### 1.3.3 ZOOM AND REFRESH

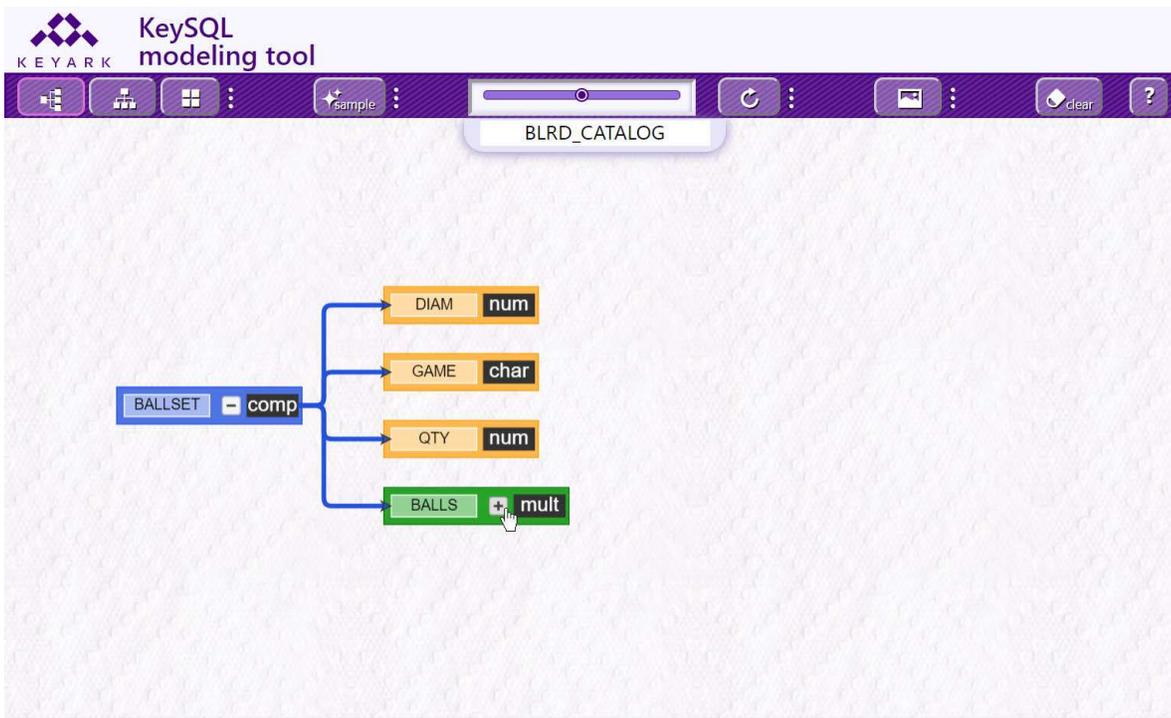
In most cases there is no need to adjust the Zoom (magnify) the model display because you can selectively expand and compact composites.

#### 1.3.3.1 COMPACT AND EXPAND COMPOSITE DISPLAY

In the screenshot below, the cursor is placed over the minus sign (-) for the green BALLS multi-composite. The minus sign indicates this k-object can be compacted to hide detail:



This screenshot shows the model with the BALLS multi-composite k-object shown as compacted. Note that a plus sign (+) now appears, indicating that the BALLS k-object can be expanded to show detail:



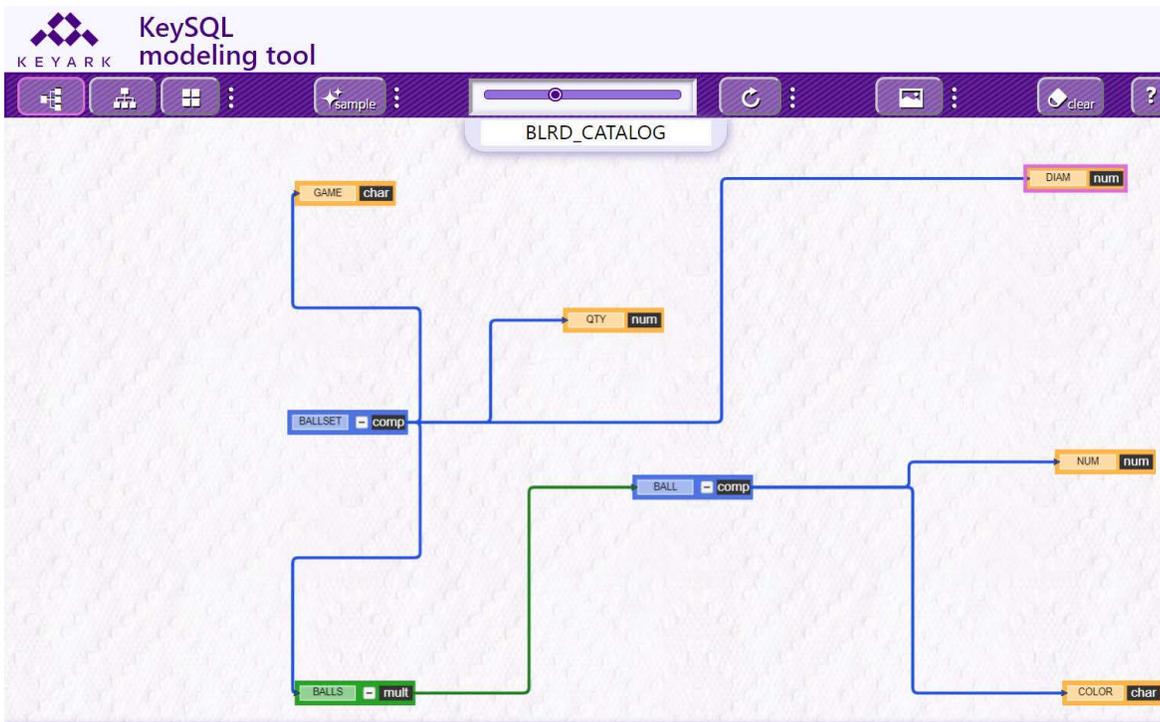
1.3.3.2 ZOOM IN AND OUT



The third group of controls serve to adjust the Zoom (magnification) of the model within the model canvas and will also refresh the model display such that it has a pleasing, consistent layout.

FYI: When the model is refreshed, the KeySQL code displayed in the **KeySQL result** tab will also be refreshed.

Note how the zoom slider has been adjusted to the left, leaving ample space for adding more k-objects to the model. And then several k-objects were dragged to a new position:



1.3.3.3 REFRESH

Clicking the Refresh button, shown below, rearranges the model to a pleasing, consistent look:



FYI: The first click of Refresh establishes horizontal symmetry, and the second click establishes vertical symmetry. If you did a manual layout, such as shown in the prior screenshot depicting Zoom, your custom positioning will be undone.

Clicking the three dots reveals the automatic refresh option:



By checking the **auto refresh** check box, the model refresh is automatic. This means that after you rearrange k-objects, including addition and deletion, your diagram will automatically adjust for a pleasing look.

### 1.4 OUTPUT TO A GRAPHICS FILE

You can output the model as either a JPEG or SVG image file which can then be printed or shared. And you can choose to output either the entire diagram, just the selected k-object, or just the part of the diagram visible without scrolling:



#### 1.4.1 CUSTOM MODEL NAME

The Model name is shown just below the Refresh button. The default name is the same as the catalog. You can change the Model name by clicking in the Model name text area. When you click outside the text area, the name will be preserved.

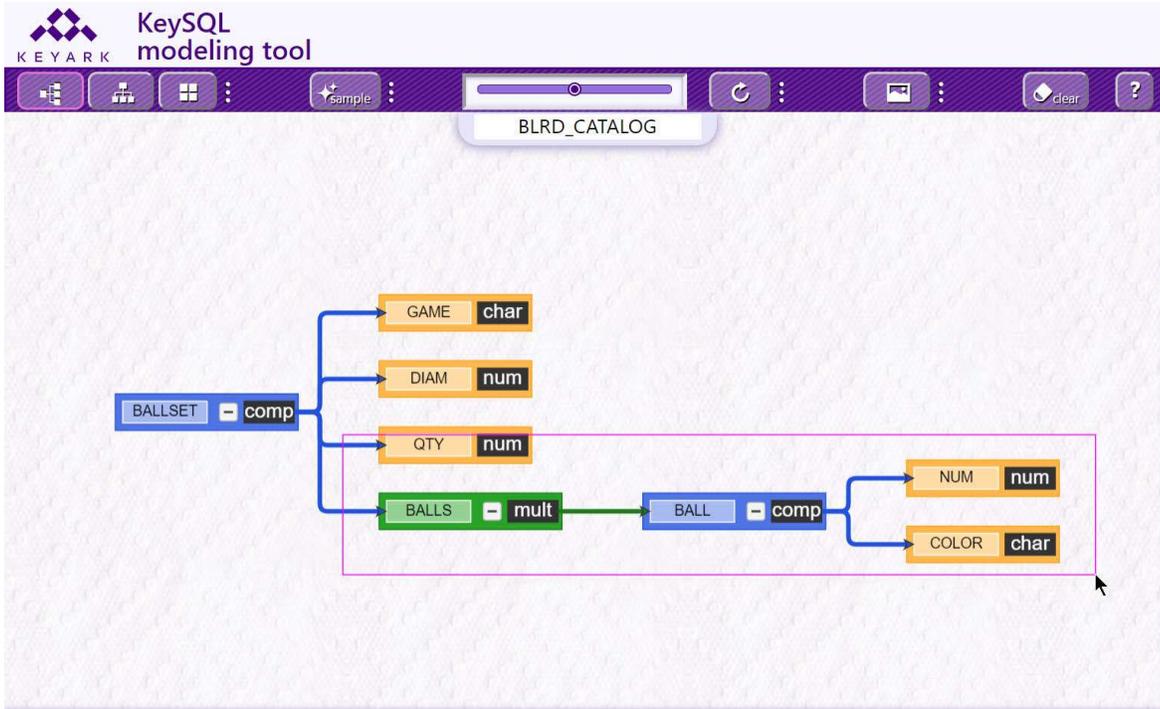


#### 1.4.2 GRAPHICS FILE TYPE AND NAME

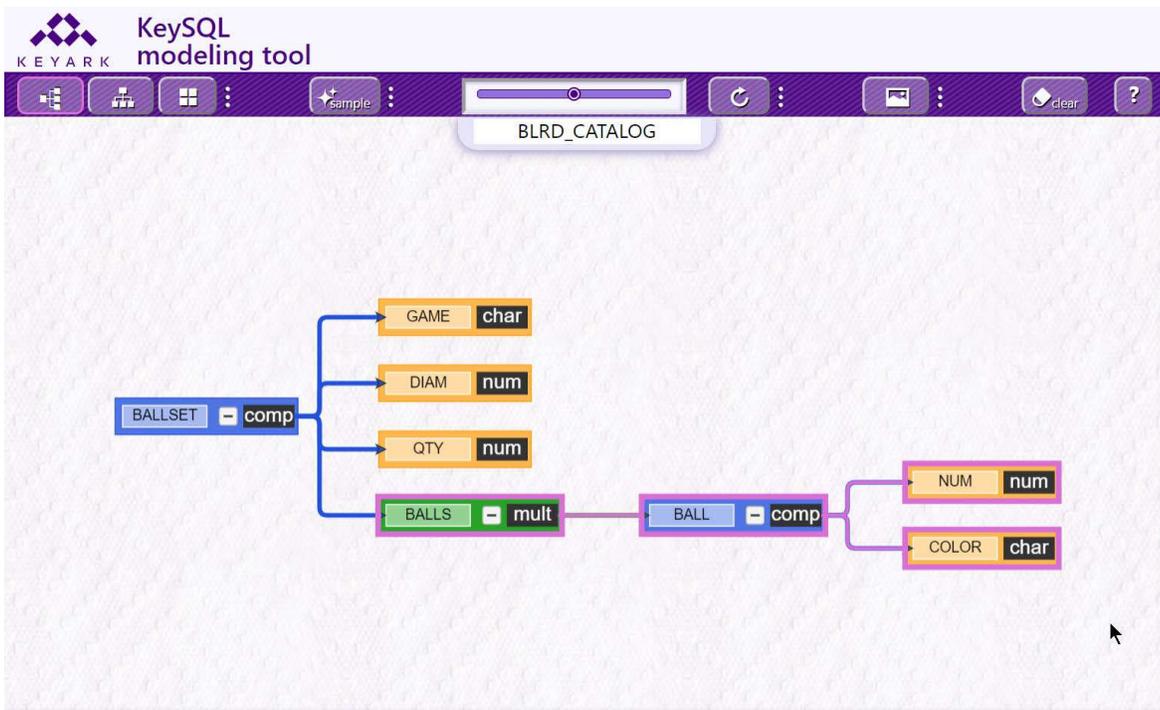
Click either the jpg or svg button to save as that file type. A file will be written to your browser's download folder, with a name like BLRD\_CATALOG\_diagram which concatenates the model name + "\_diagram".

#### 1.4.3 K-OBJECT SELECTION

By default, the **entire diagram** checkbox is selected. This causes the entire data model to be output to a graphics file. To output only selected k-objects, choose **selection**. You can lasso a rectangular area, selecting k-objects entirely within that area, via a mouse drag, as shown below:

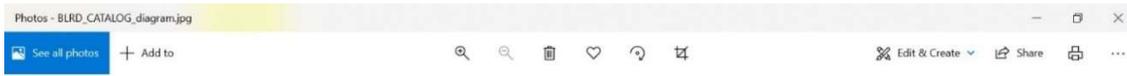


Once you “let go” of the selection, all k-objects (and connectors) that were totally contained within the orchid color rectangular lasso are then shown with an orchid boundary, as shown in the next screenshot:



Tip: To select by this rectangular lasso, rather than inadvertently drag, make certain to click on the canvas, not on a k-object. Do a regular click (left click), pause and then move the cursor to the opposite end of the rectangular region you wish to select. Then release the mouse button.

These are the sole k-objects that will be printed to the graphics file:

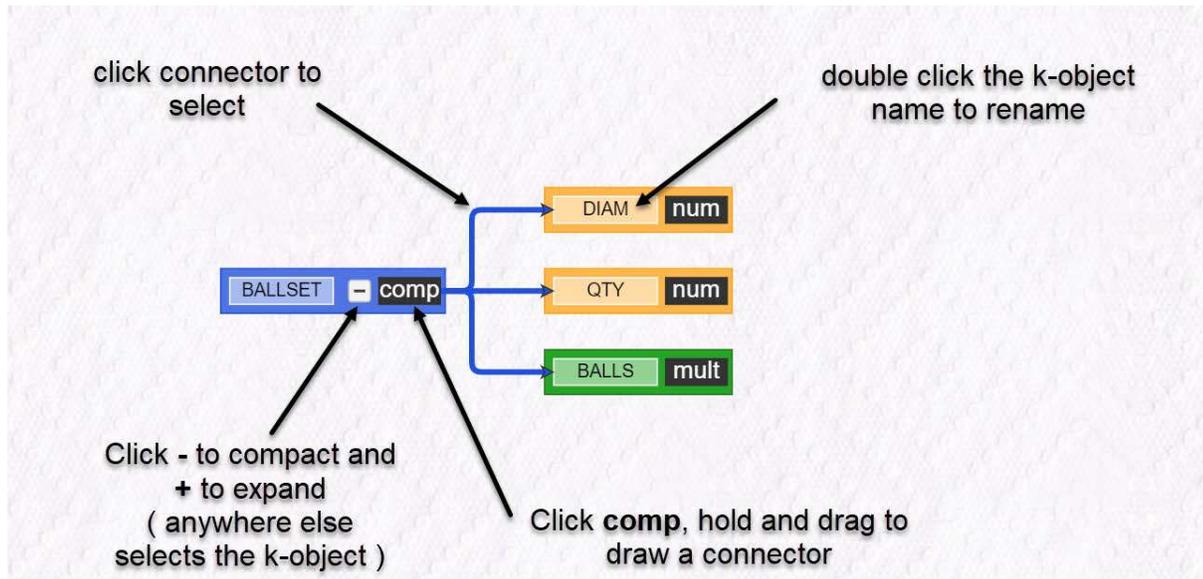


### 1.5 DESIGN OR REDESIGN THE DATA MODEL

This section explains the most basic operations for how to alter the data model, adding and removing k-objects. It's also possible to create a data model from scratch. During this tutorial, you will be exposed to the **Recycle** tab, an efficient aid in building a complex data model by re-use of existing components. See *1.6 Advanced Techniques* for more advanced techniques.

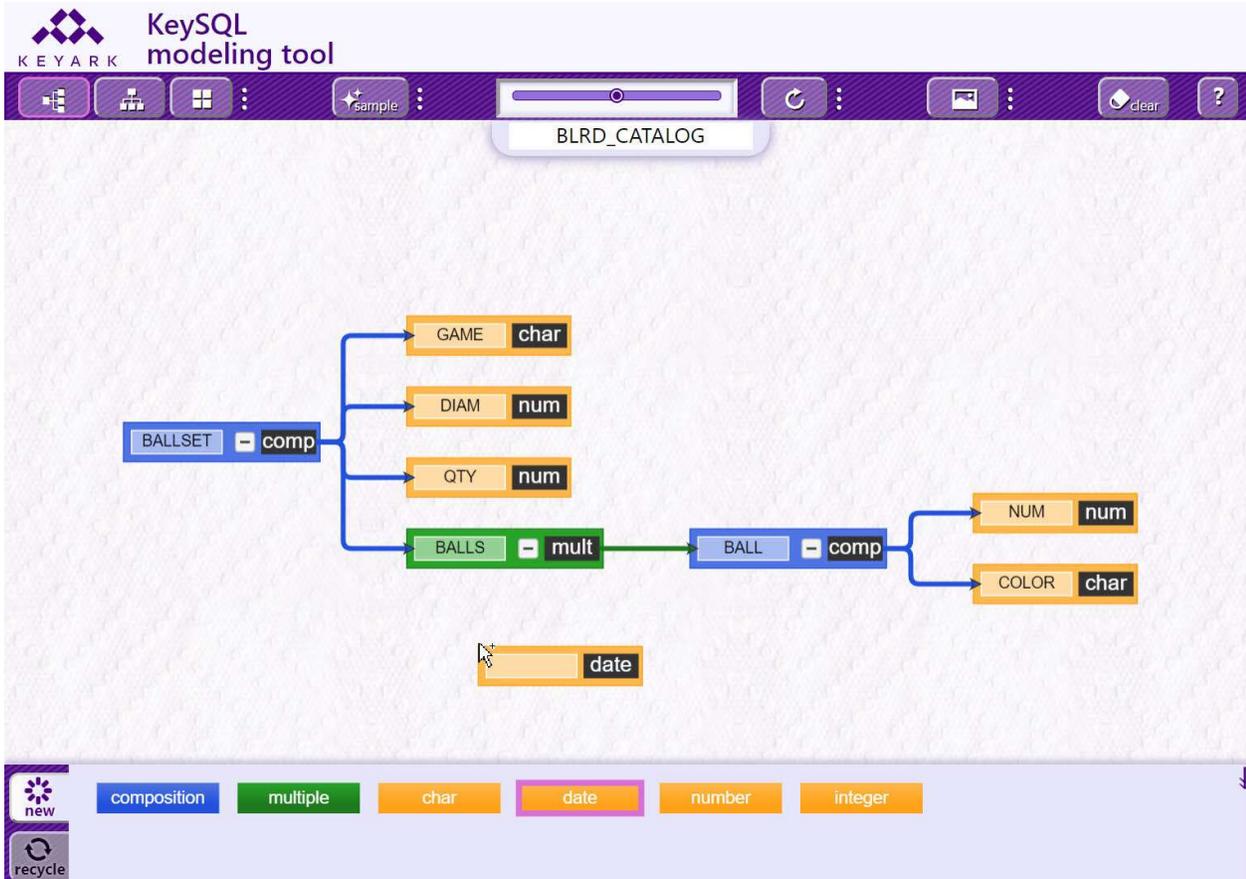
**FYI:** The Data Modeling Tool supports 'undo'.

The following screenshot provides a quick reference for where to click and double-click on the model:

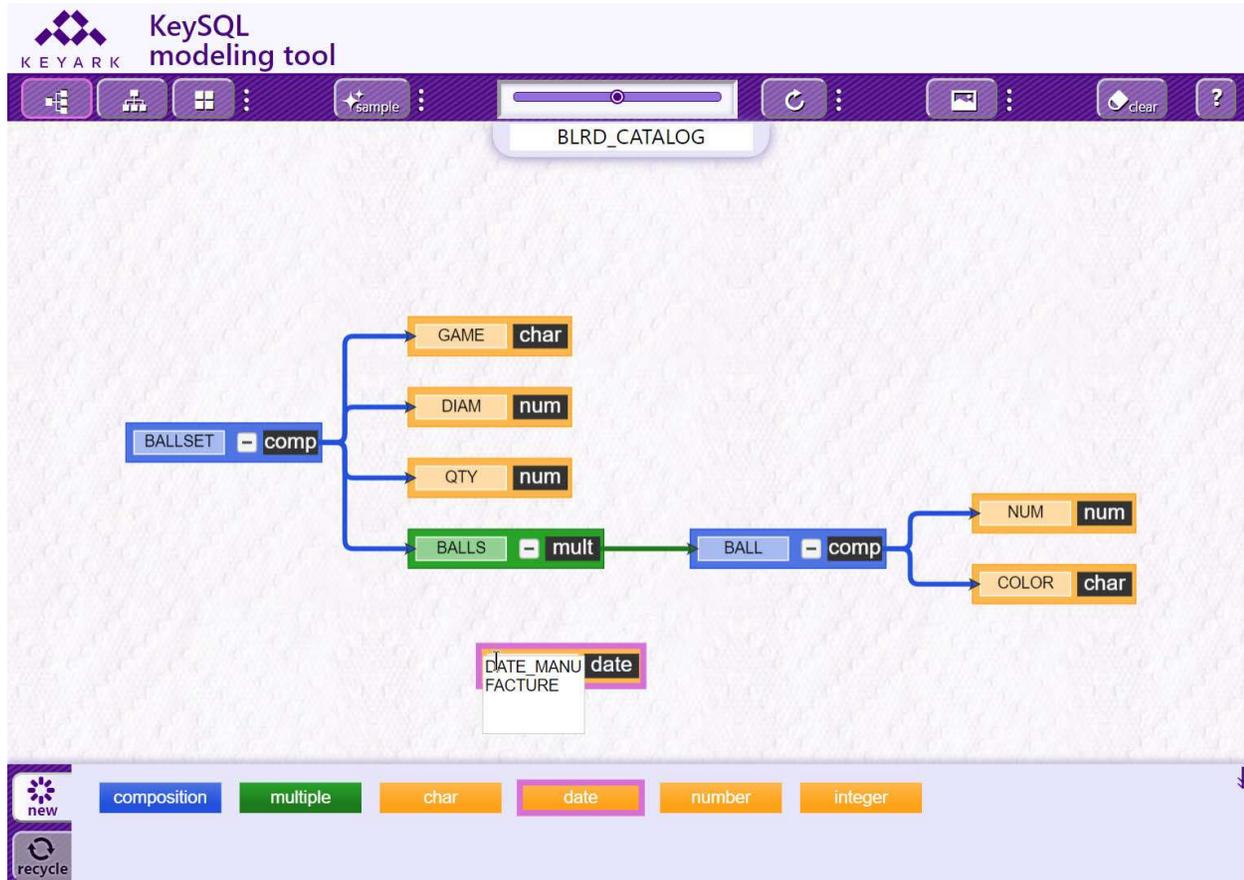


#### 1.5.1 ADDING OBJECTS

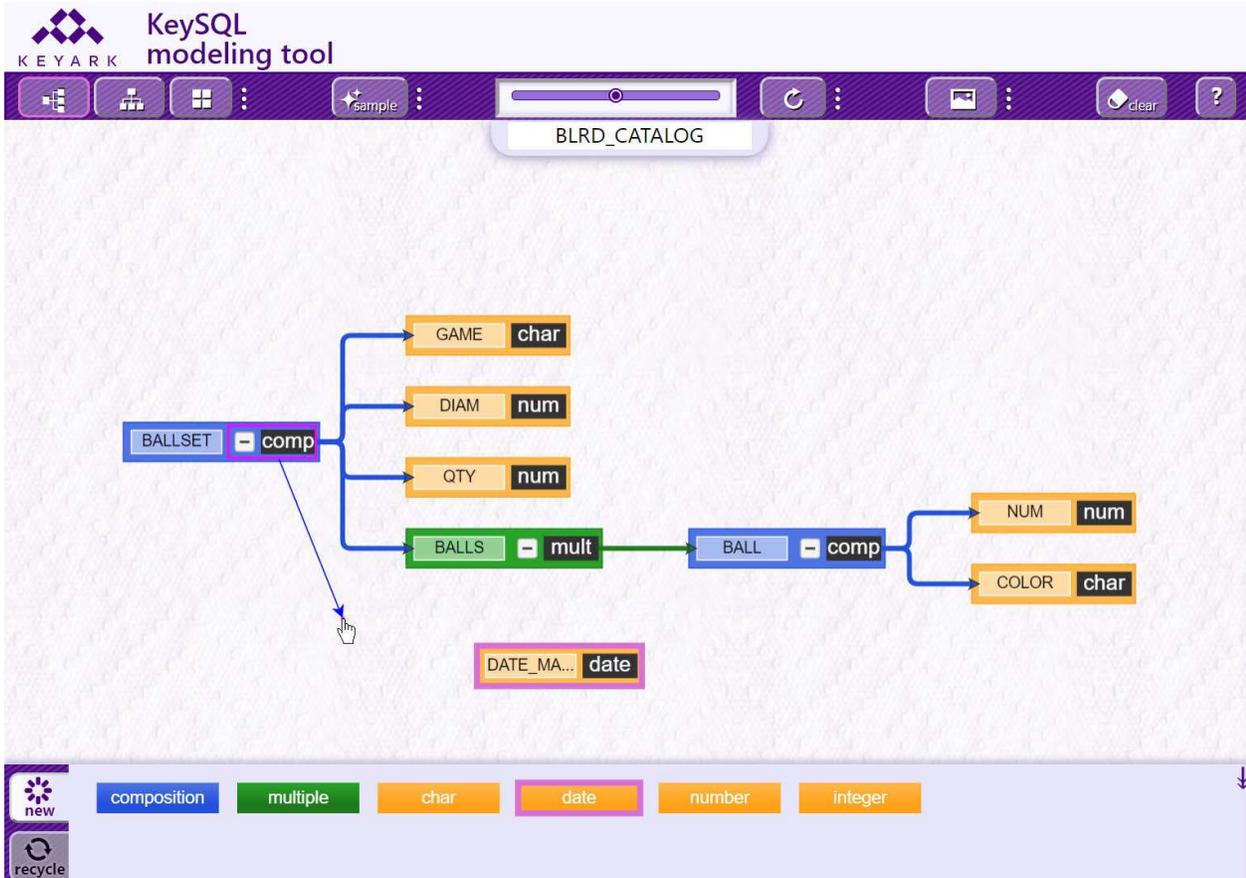
The screenshot below captures the moment that a new **date** k-object is being dragged from the **new** tab, a palette of four elementary objects, plus composition and multi-composition, with which any data model can be constructed:



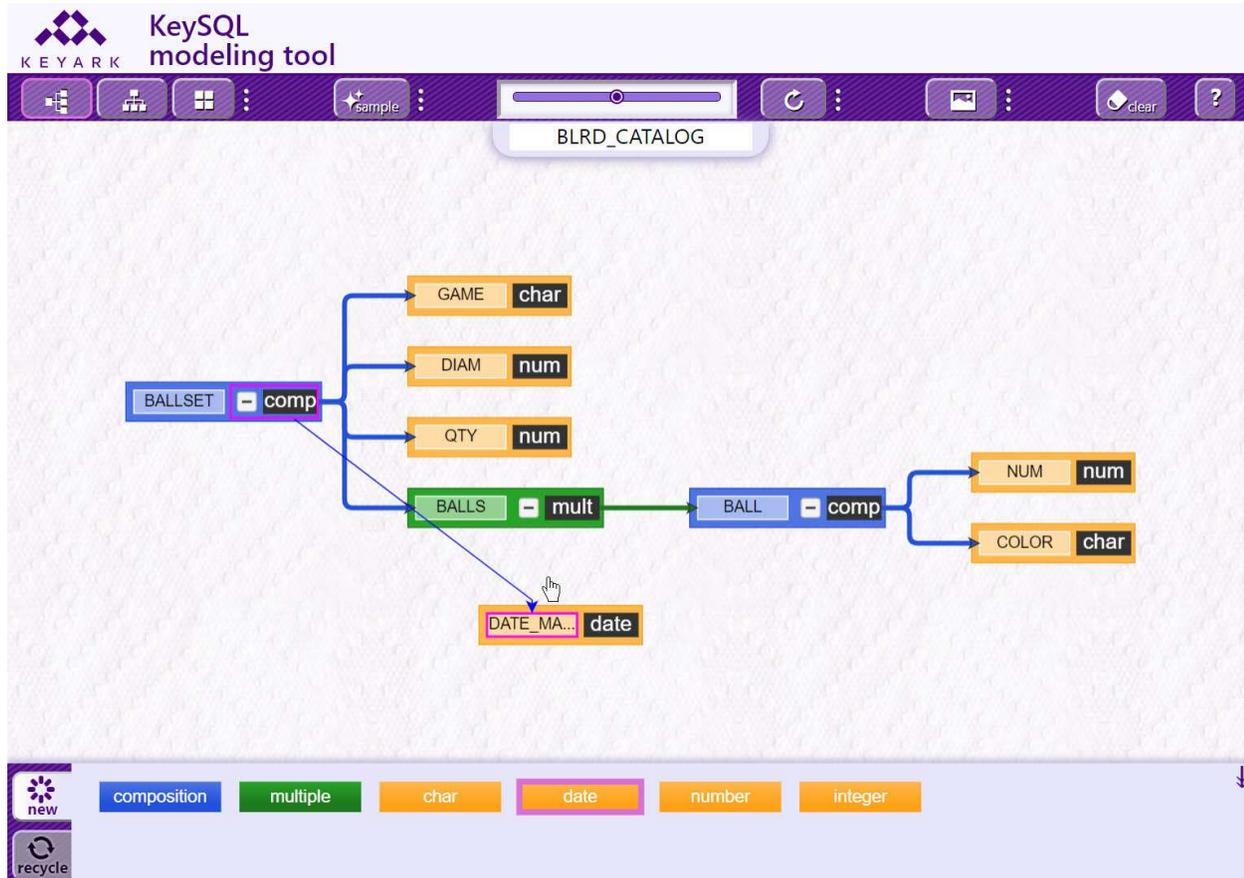
After being dragged onto the model canvas, double click on the blank name text area, and type the k-object name. In this case it is DATE\_MANUFACTURE. Click outside the k-object to complete:



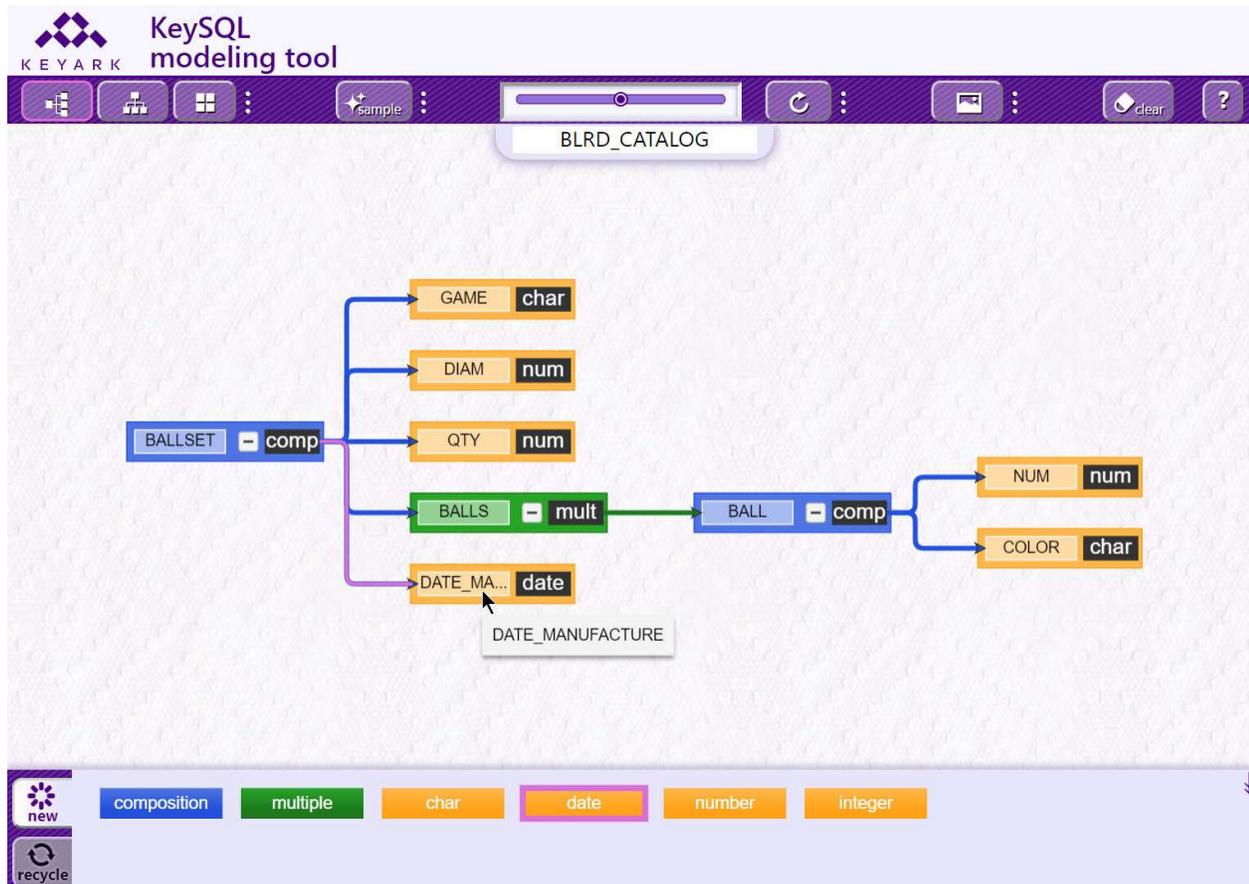
The next step is to connect the DATE\_MANUFACTURE date object to a composition k-object. To do so, place your cursor over the object type descriptor *comp* in the chosen composition and drag, which causes a connecting element to appear:



When you drag the connecting line close to the DATE\_MANUFACTURE elementary k-object, the line will snap in place:



If the tool does not automatically adjust for a pleasing alignment, click the Refresh button to force a realignment:

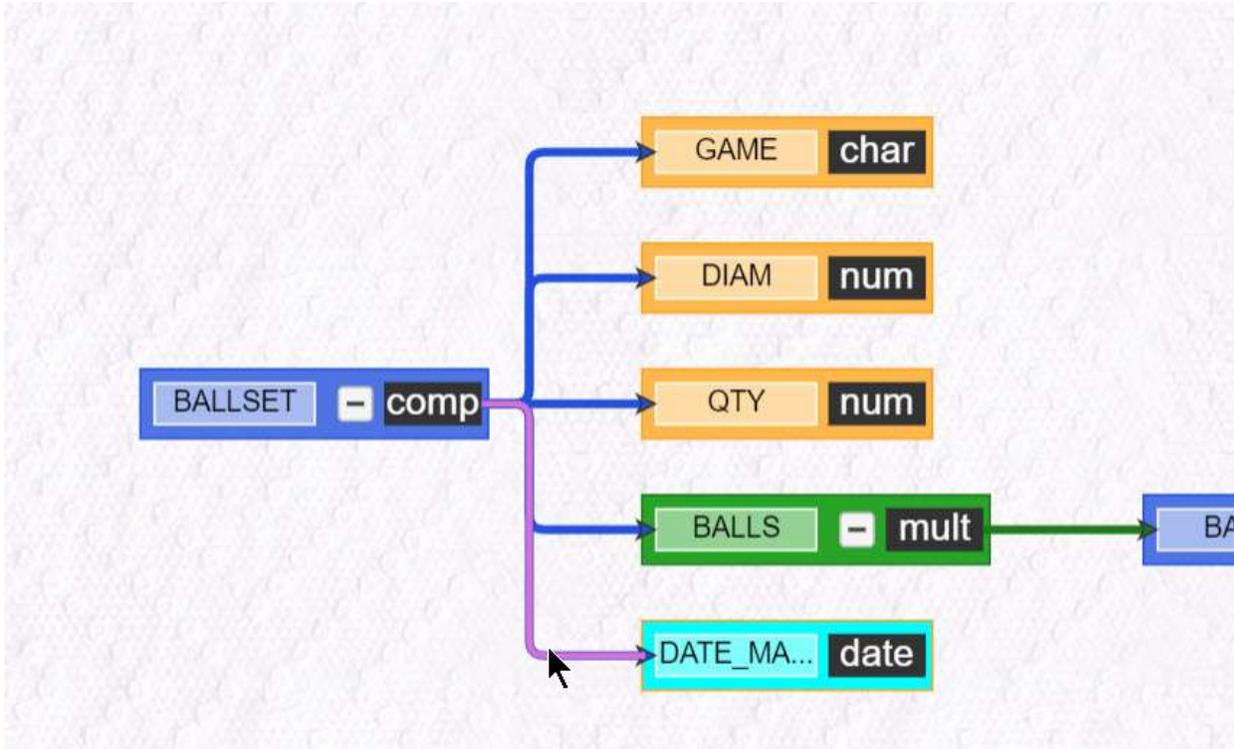


### 1.5.2 REMOVING OBJECTS

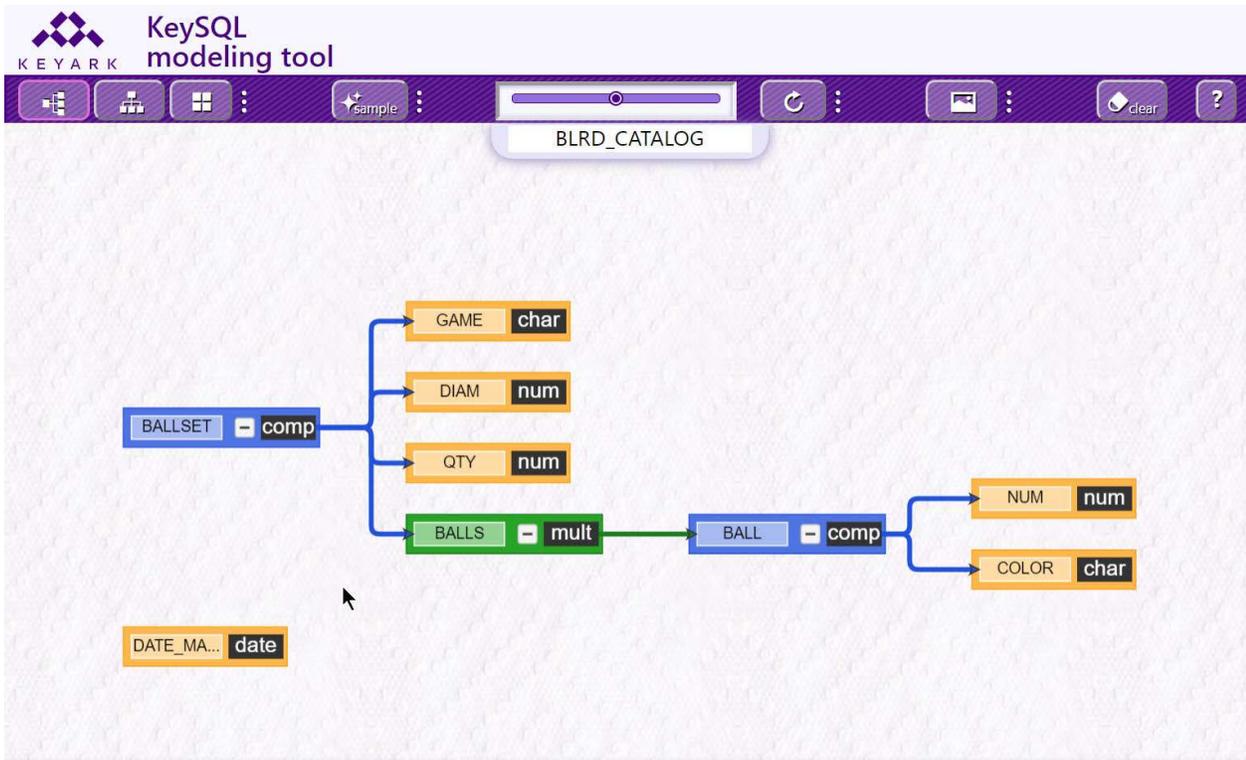
You can remove an individual connector, an individual k-object, or a group of k-objects.

#### 1.5.2.1 REMOVE A CONNECTOR

In this example the connector between BALLSET and DATE\_MANUFACTURE will be removed, so that DATE\_MANUFACTURE can be potentially connected to a different composite. First click on the connector:



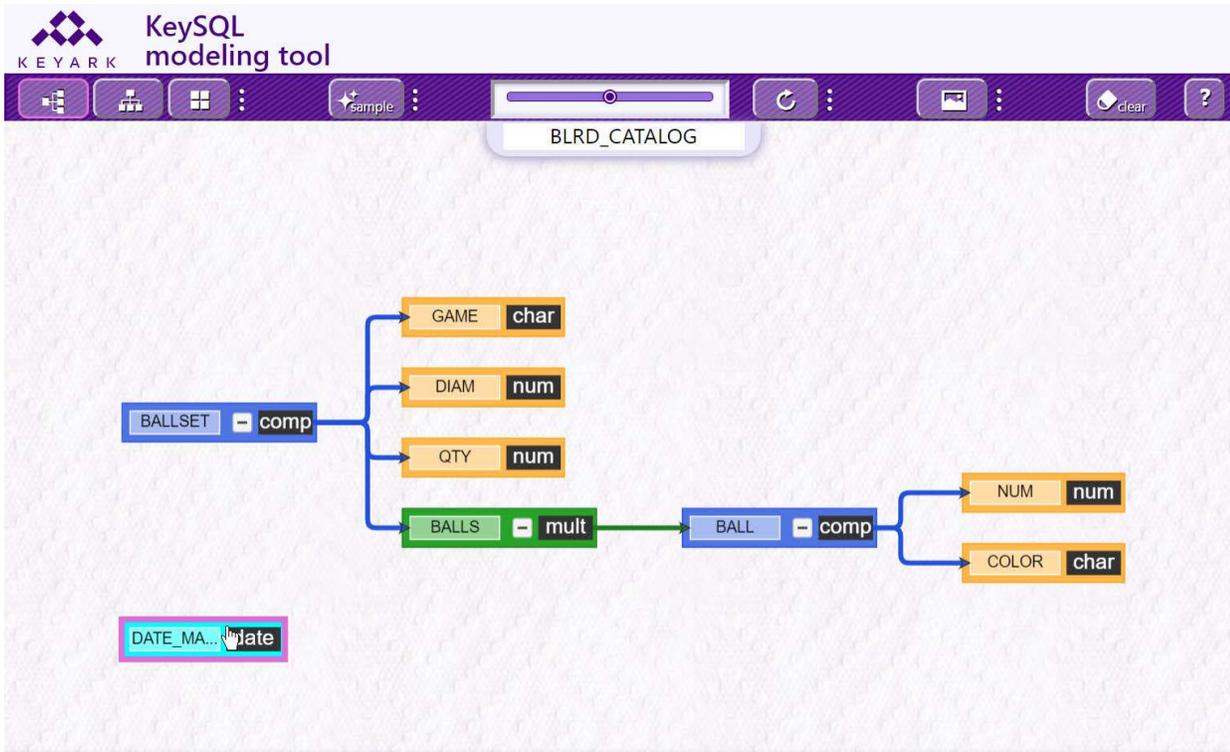
Use the Delete key to remove the connector:



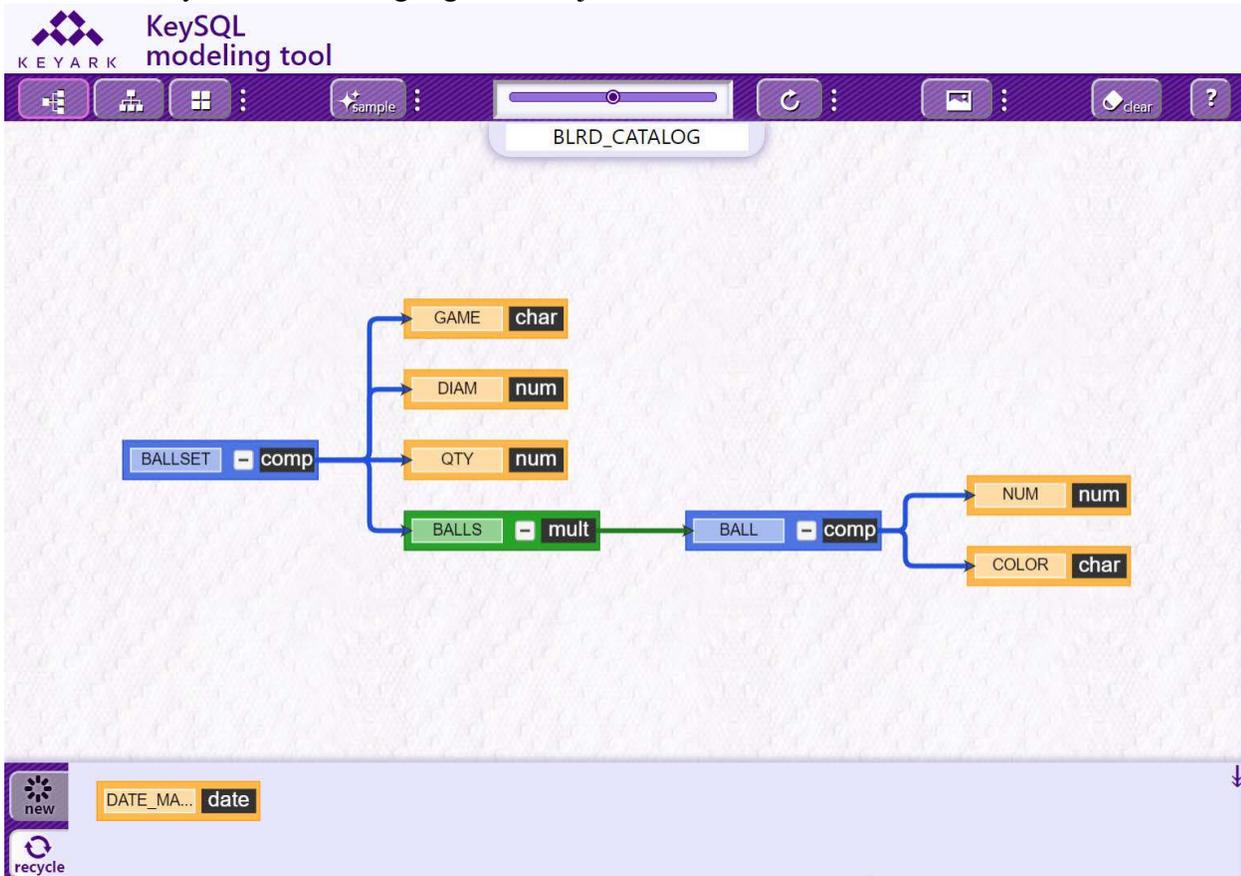
The same technique can be employed to split off a branch of the diagram, formed by use of a composite k-object. The branch can then be removed or reattached to another part of the diagram.

### 1.5.2.2 REMOVE AN ELEMENTARY K-OBJECT

Removing an elementary k-object is just as easy. Here we select the same k-object we just added:



The Delete key removes the highlighted k-object:

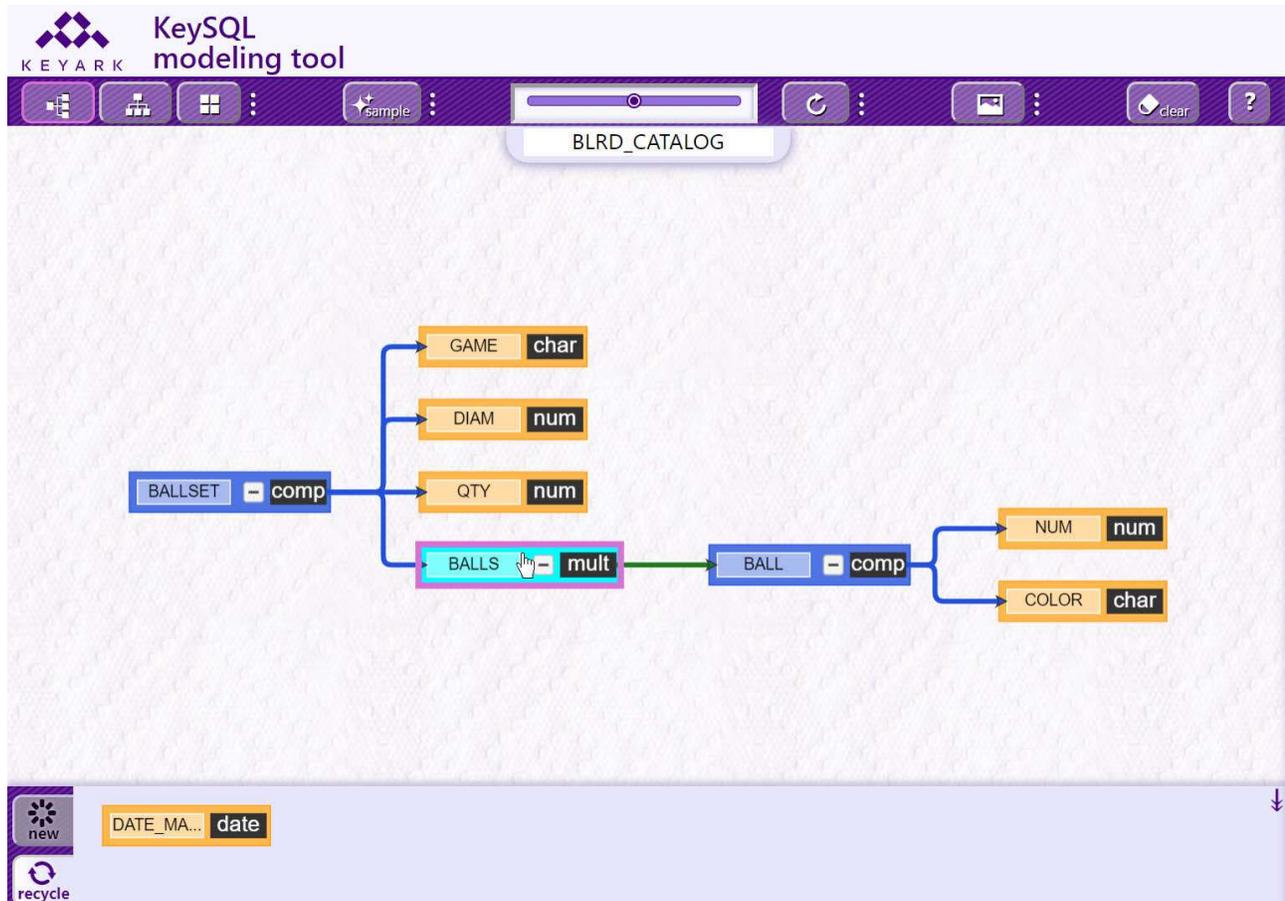


The original data model, before adding and removing DATE\_MANUFACTURE, is restored. Note one difference in the tool display. The just removed DATE\_MANUFACTURE k-object is shown in the

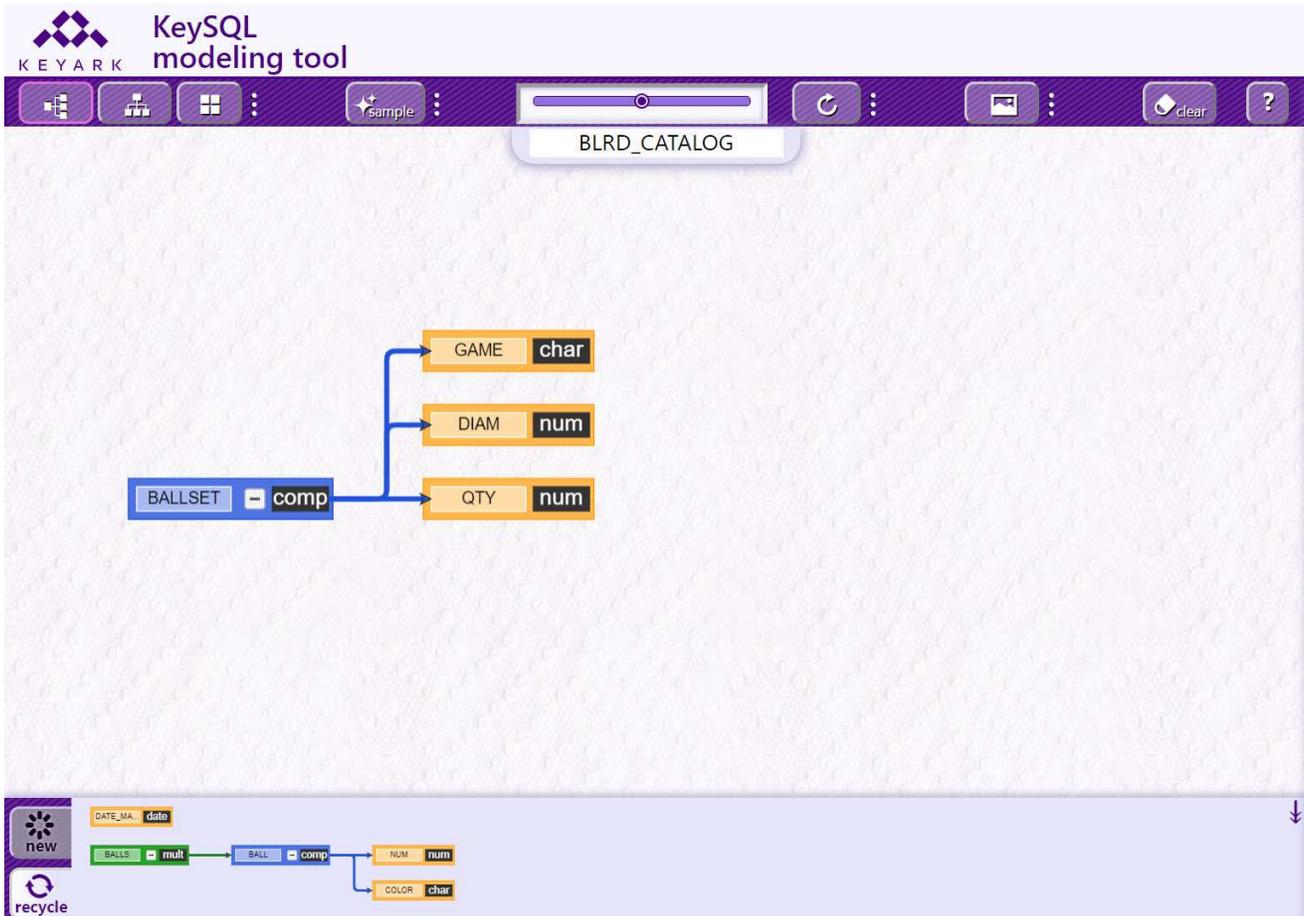
recycle tab, ready for re-use, as will be explained in the next section. It's not shown in this example, but if there was a connecting line, it will be automatically removed as well.

### 1.5.2.3 REMOVE A BRANCH (COMPOSITE K-OBJECT)

Removing a branch of a tree is accomplished by selecting the multi-composite or composite k-object that defines that branch:



When you click the Delete key, the entire branch is moved to the recycle tab, available for attaching elsewhere:



#### 1.5.2.4 REMOVE A GROUP

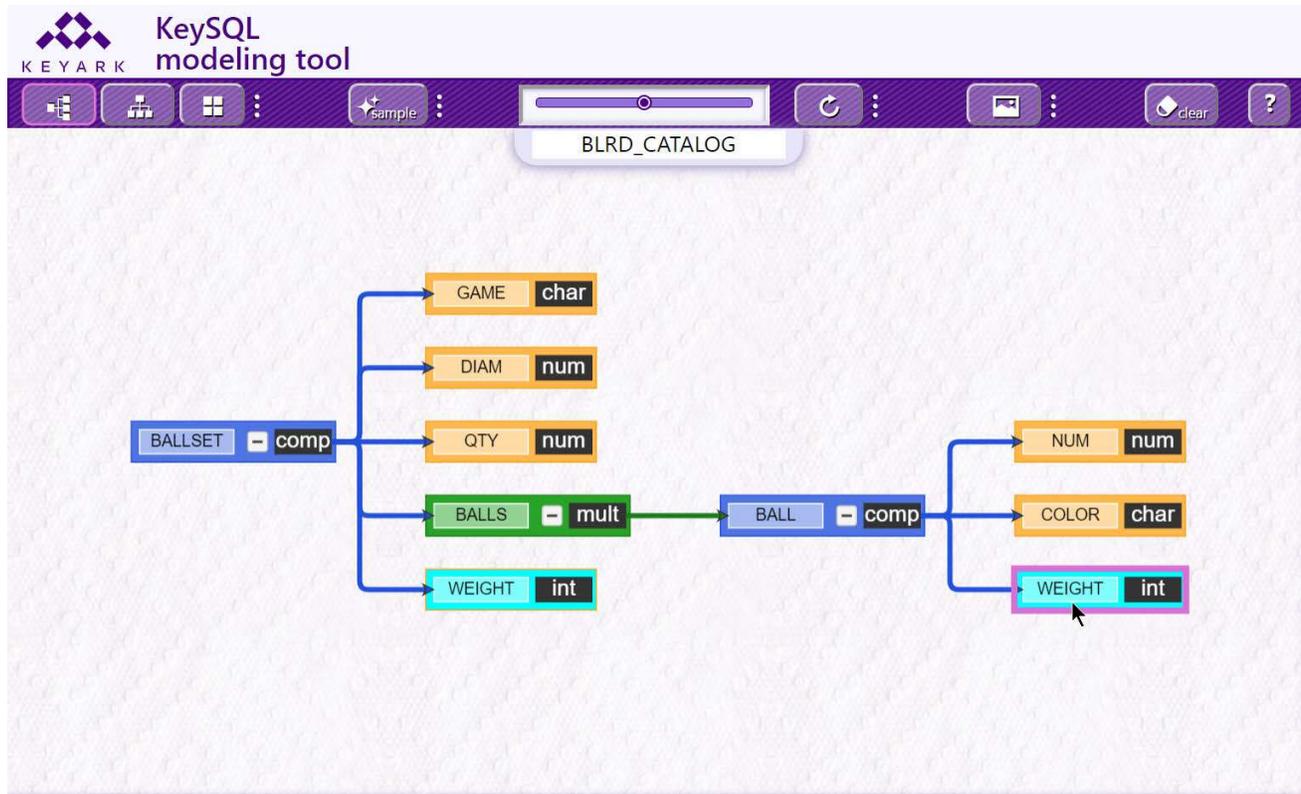
To remove a group of k-objects, lasso a group of contiguous k-objects. Then click the Delete key. All elements – both k-objects and connectors – that are completely contained within the rectangular lasso will be removed.

**FYI:** There is no mechanism to select individual elements via use of special keys such as **Alt** or **Ctrl**.

#### 1.5.3 LOCATING ALL OCCURRENCES

The screenshot below shows the data model with the addition of a newly created WEIGHT k-object in two locations, part of both BALLSET composite and BALL composite.

Look for the black mouse cursor on WEIGHT. That k-object was selected by a single mouse click:



As usual, the tool denotes the selected k-object with an orchid boundary and by changing the interior color to aqua. Note how all other occurrences of WEIGHT are made readily apparent by use of the same aqua coloration.

### 1.5.4 RECYCLING K-OBJECTS

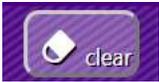
Once a k-object has been deleted from the model, it becomes visible in the **recycle** tab. Same as new k-objects in the **new** tab, you can drag an object from the **recycle** tab to the model canvas.

To toggle between the **new** tab and the **recycle** tab, click on the desired tab.

Tip: If the recycle tab becomes too crowded, you can select and delete k-objects that are no longer necessary.

### 1.5.5 CLEAR THE MODEL CANVAS

The model canvas area can be cleared by selecting the **clear** button:



This also clears the **recycle** tab.

### 1.5.6 EXPAND THE MODEL CANVAS

To provide for a more spacious viewing area, the model canvas can be enlarged by hiding the **Action pane** on the right, as well as hiding the k-object **Tabs** on the bottom.

#### 1.5.6.1 ACTION PANE

The **Action pane** is hidden by clicking on the horizontal double headed arrow pointing to the right:



Once hidden, it is revealed by clicking double headed arrow pointing to the left:



#### 1.5.6.2 K-OBJECTS TABS

The k-object **Tabs** are hidden by clicking the vertical double head arrow that points down:



Once hidden, the **Tabs** are revealed by clicking double headed arrow that points up:



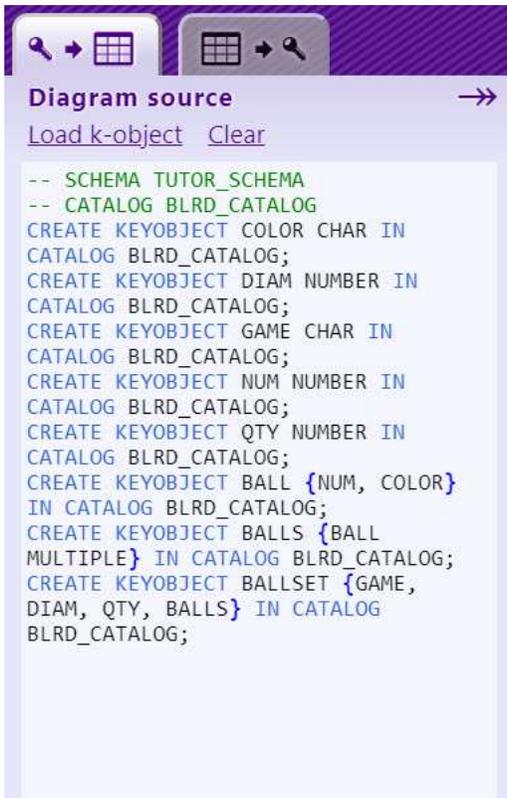
## 1.6 KEYSQL STATEMENTS FOR GENERATING THE MODEL

The **Action** pane contains two tabs:

- **Diagram source** which presents the k-object statements that underly the data model, from its initial display
- **KeySQL result** which presents the k-object statements that reflect the data model in its current form

### 1.6.1 DIAGRAM SOURCE

The screenshot below shows the **Diagram source** tab, which presents the KeySQL statements that represent the data model as it was first read by the tool. Note that the CREATE KEYOBJECT commands map one-to-one with the k-objects you see in the model diagram:



**FYI:** These commands are the same commands generated using KeySQL Studio’s K-objects export command.

This **Action tab** includes a few controls:

Control	Purpose	Notes
<a href="#">Load k-object</a>	Load a fresh data model, showing the commands in the Diagram source tab that reflect the initial state of the model.	Loads all or part of an existing Catalog. A pop-up form appears for specification of the schema, catalog, and optionally a (composite) k-object within the catalog.
<a href="#">Clear</a>	Clear the current data model, so you can begin afresh.	
	Hide the Action pane	Allows for a large area for display of the diagram
	Reveal the Action pane	Allows for a large area for display of the diagram

1.6.2 KEYSQL RESULT

This **Action tab** includes a few controls: `

Control	Purpose	Notes
<input checked="" type="radio"/> Create	Shows KeySQL CREATE statements for this model	Execution of these statements by KeySQL Studio would create a Catalog that matches the Model
<input type="radio"/> Alter	Shows KeySQL ALTER statements for this model	Execution of these statements by KeySQL Studio would modify the original catalog, which served as the starting point, to now match the Model
Copy	Copy to your computer’s clipboard	
Clear	Clear the current data model, so you can begin afresh.	
→	Hide the Action pane	Allows for a large area for display of the diagram
←	Reveal the Action pane	Allows for a large area for display of the diagram

The screenshot below shows the **KeySQL result** tab, with the default **Create** radio button selected. This presents the KeySQL statements that represent the data model in its current state. The areas denoted by a red box (drawn on the screenshot) reflect the k-object DATE\_MANUFACTURE, which is a k-object addition to the original data model. Compare this tab against the **Diagram source** tab in the prior screenshot:

The screenshot displays the KeySQL result pane with the following SQL statements:

```

CREATE CATALOG
BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT COLOR CHAR IN
CATALOG BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT DIAM NUMBER IN
CATALOG BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT GAME CHAR IN
CATALOG BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT NUM NUMBER IN
CATALOG BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT QTY NUMBER IN
CATALOG BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT DATE_MANUFACTURE
DATE IN CATALOG
BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT BALL {NUM, COLOR}
IN CATALOG BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT BALLS {BALL
MULTIPLE} IN CATALOG
BILLIARD_BLRD_CATALOG;
CREATE KEYOBJECT BALLSET {GAME,
DIAM, QTY, BALLS, DATE_MANUFACTURE}
IN CATALOG BILLIARD_BLRD_CATALOG;
    
```

Now you are shown the **KeySQL result** tab with the **Alter** radio button selected instead of **Create**:

A screenshot of the KeySQL result tab in a software application. The tab is titled "KeySQL result" and has a right-pointing arrow icon. Below the title, there are two radio buttons: "Create" (unselected) and "Alter" (selected). To the right of the radio buttons are two links: "Copy" and "Clear". The main area of the tab contains the following SQL code:

```
-- SCHEMA TUTOR_SCHEMA
CREATE KEYOBJECT DATE_MANUFACTURE
DATE IN CATALOG BLRD_CATALOG;
ALTER KEYOBJECT BALLSET=BALLSET
{GAME, DIAM, QTY, BALLS,
DATE_MANUFACTURE} IN CATALOG
BLRD_CATALOG;
```

As you can see above, there are two KeySQL statements required to alter the original catalog so that it includes the new DATE\_MANUFACTURE k-object.

## 1.7 ADVANCED TECHNIQUES

This section presents more advanced techniques for building your data model, which can also be time-savers.

### 1.7.1 CUT AND PASTE

Familiar cut-and-paste is available via keyboard short cuts. Note that as in the case of many graphic applications, the pasted object may be placed directly on top of the original object. When you drag the topmost k-object, you will see the original, underlying one.

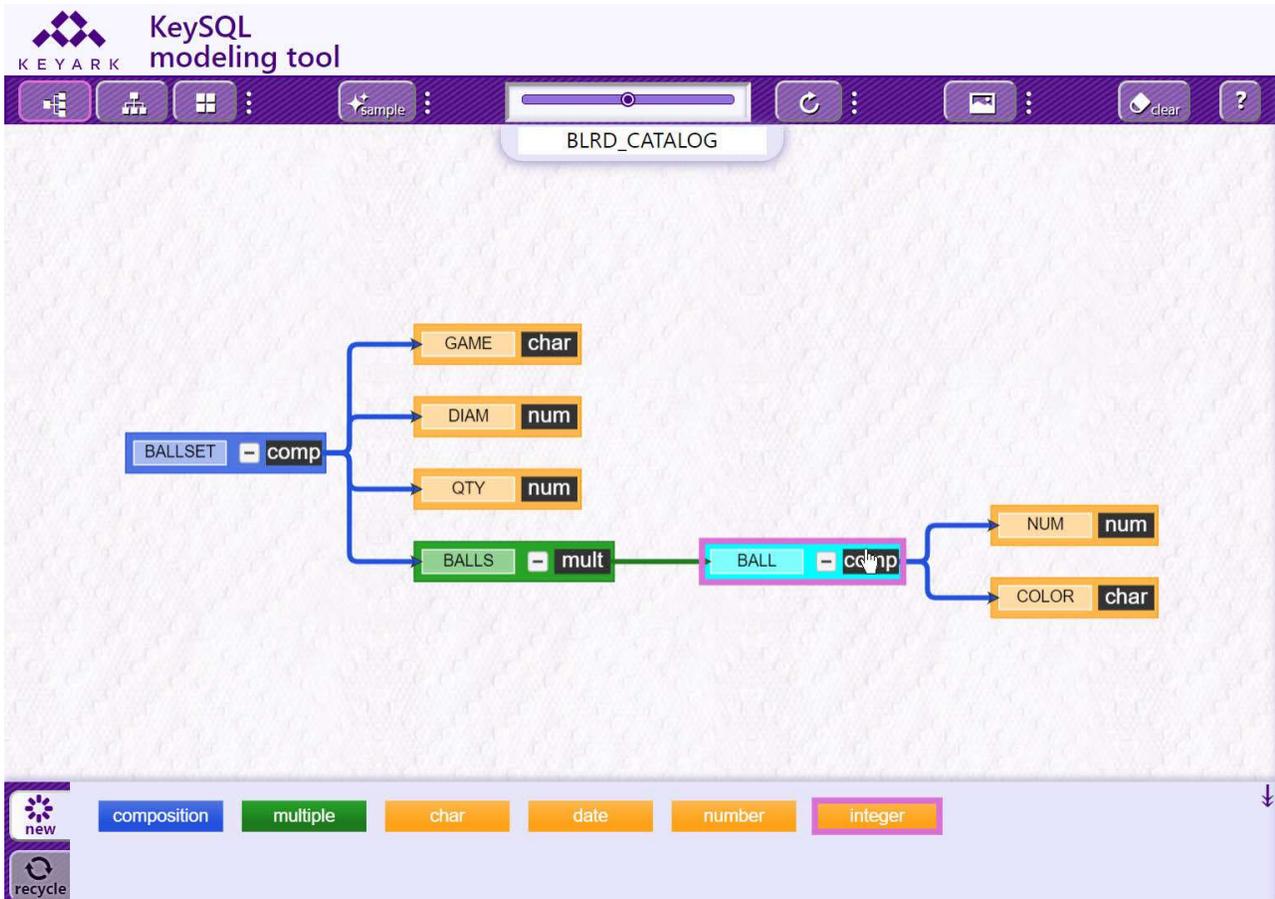
### 1.7.2 SELECT COMPOSITE FAMILY

When you click on an elementary k-object in the data model, you select just that object. And the behavior is how you'd expect, in terms of deletion and dragging that k-object.

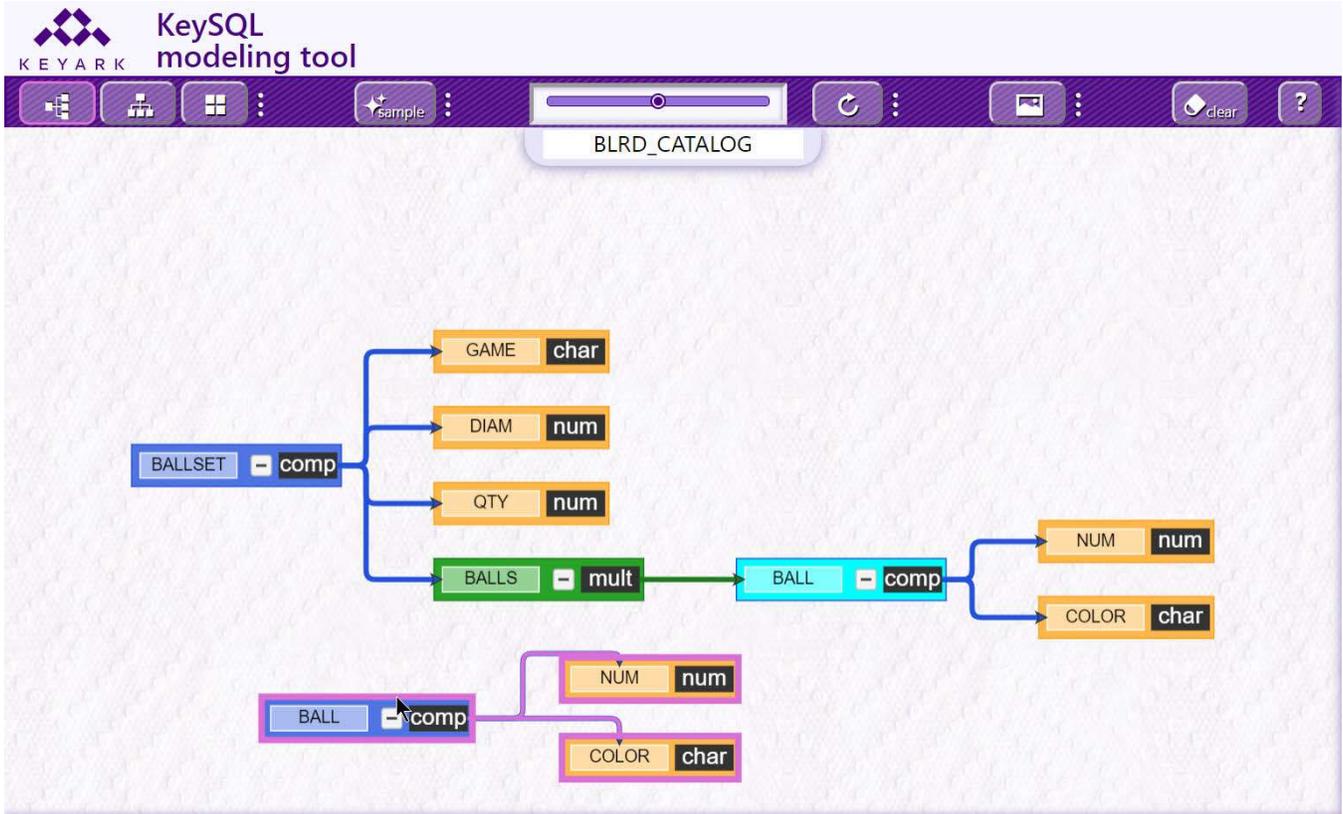
In contrast when you select a composite k-object, the behavior is more complicated:

- The selected composite k-object is indicated by an orchard box, same as for an elementary k-object. While an orchard box appears only for the selected composite k-object, all of the constituent k-objects are also selected
- Drag for a composite k-object is same as for an elementary k-object, meaning that the composite k-object moves independently of the constituent k-objects
- As selection of the composite includes the constituent k-objects, the operations of cut, copy and paste are operations that effect *both* the composite k-object and all of its constituent k-objects

The screenshot belows depict a copy-and-paste operation (for Windows this would be Ctrl-C followed by Ctrl-V) performed on BALL. The first step is selecting the BALL composite, and clicking the copy key combination:



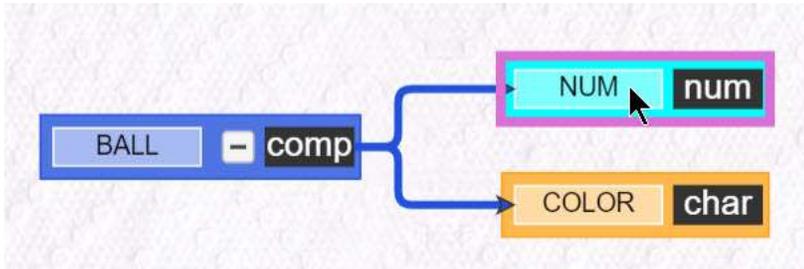
The second step is clicking the paste key combination, and dragging the composite k-object family to a new location on the canvas. Note how the composite and constituent k-objects have the orchard color selection box, which indicates these can be dragged as a group:



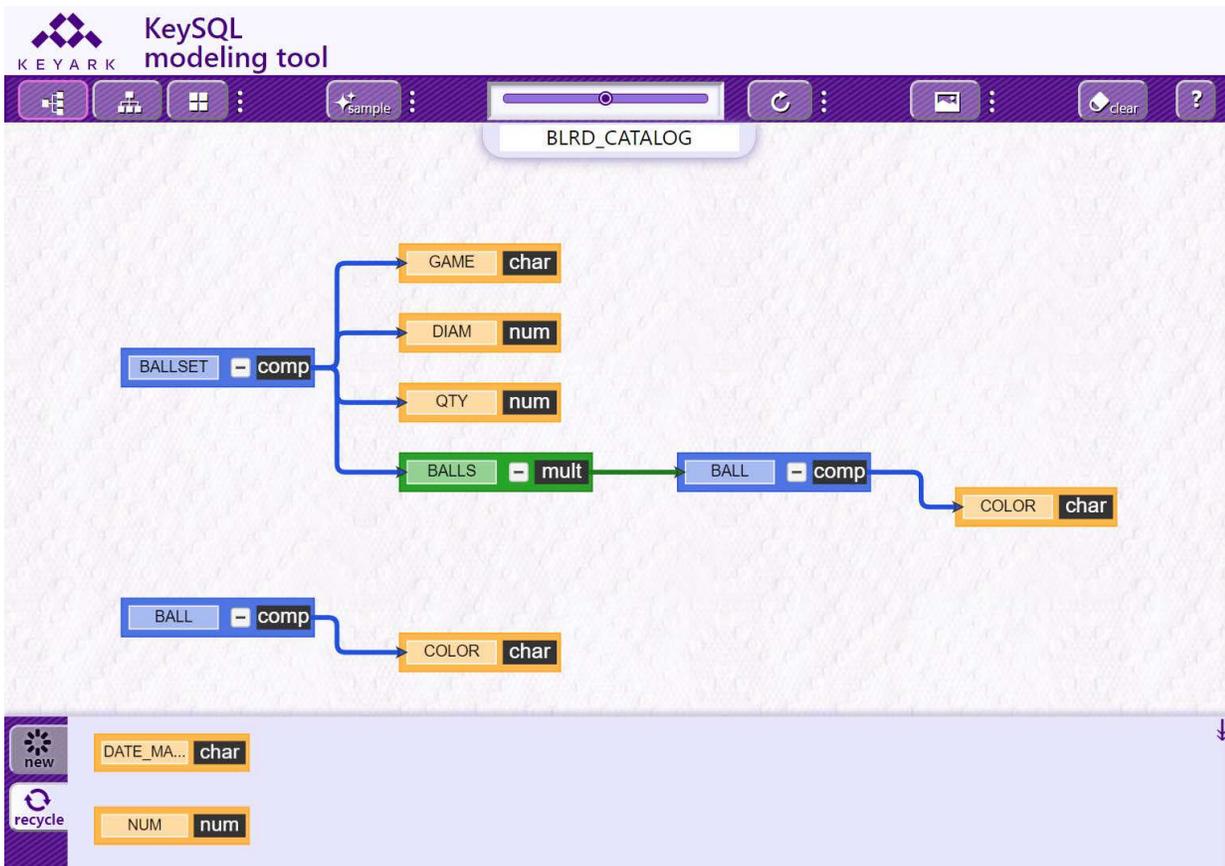
Tip: By a double-click on a composite k-object, you can select and drag the composite k-object and its constituent k-objects as a group.

### 1.7.3 ADDING AND DELETING CLONE CHILDREN

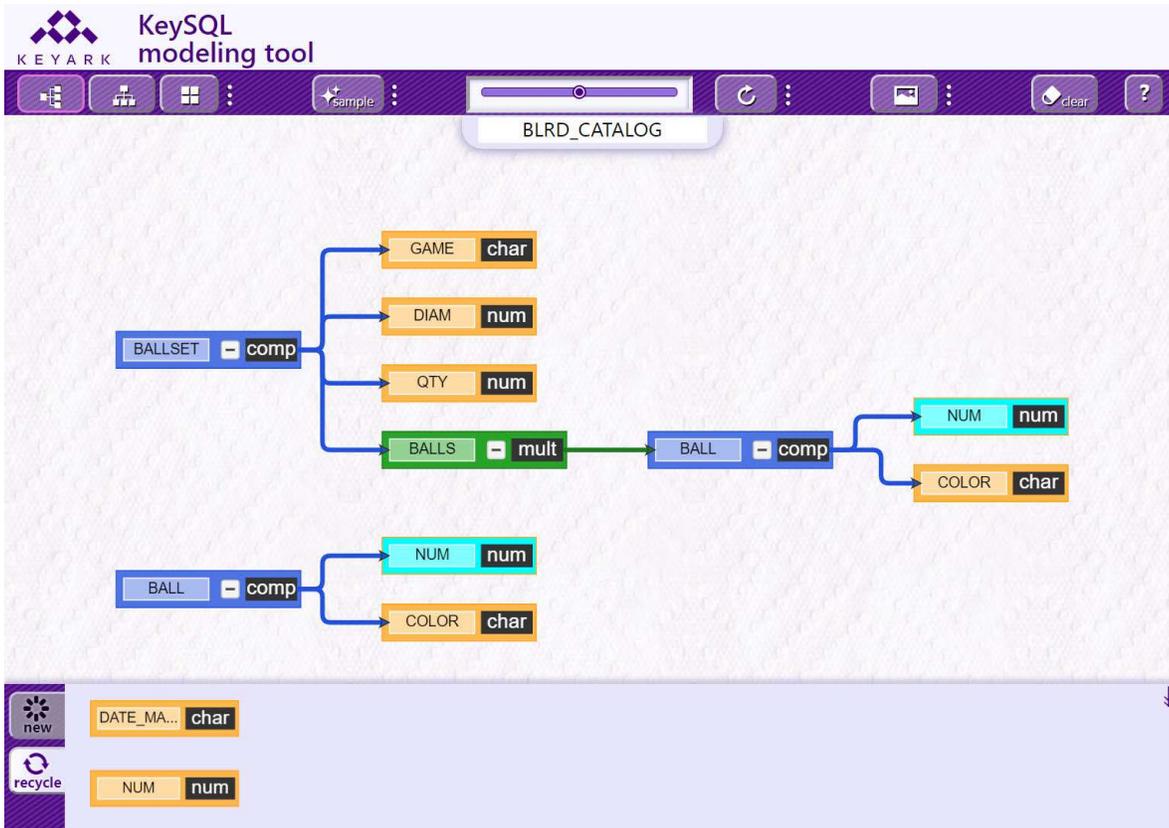
A real time saver is that the Data Modeling Tool automatically updates every occurrence of a cloned k-object, such as BALL, should you rename, add, or remove a child component of that clone. Note in the screenshot below how the elementary NUM k-object has been selected:



Upon clicking the **Delete** key, NUM is removed from all the clones. Note how NUM is automatically placed in the **recycle** tab, accompanied by the DATE\_MANUFACTURE k-object which was removed earlier. Both are available for re-use:

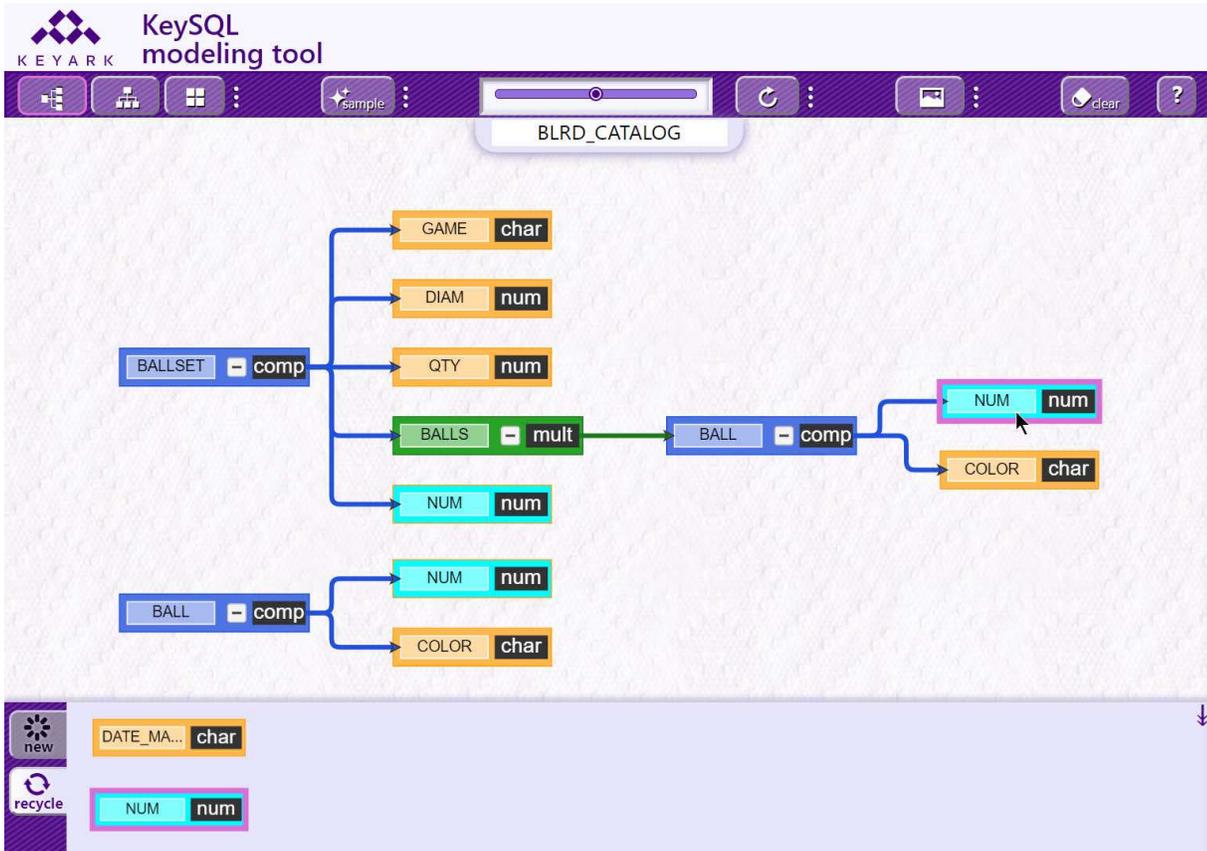


With the Undo shortcut key, we restore the original composite which included NUM. Note how NUM continues to be available in the **recycle** tab:

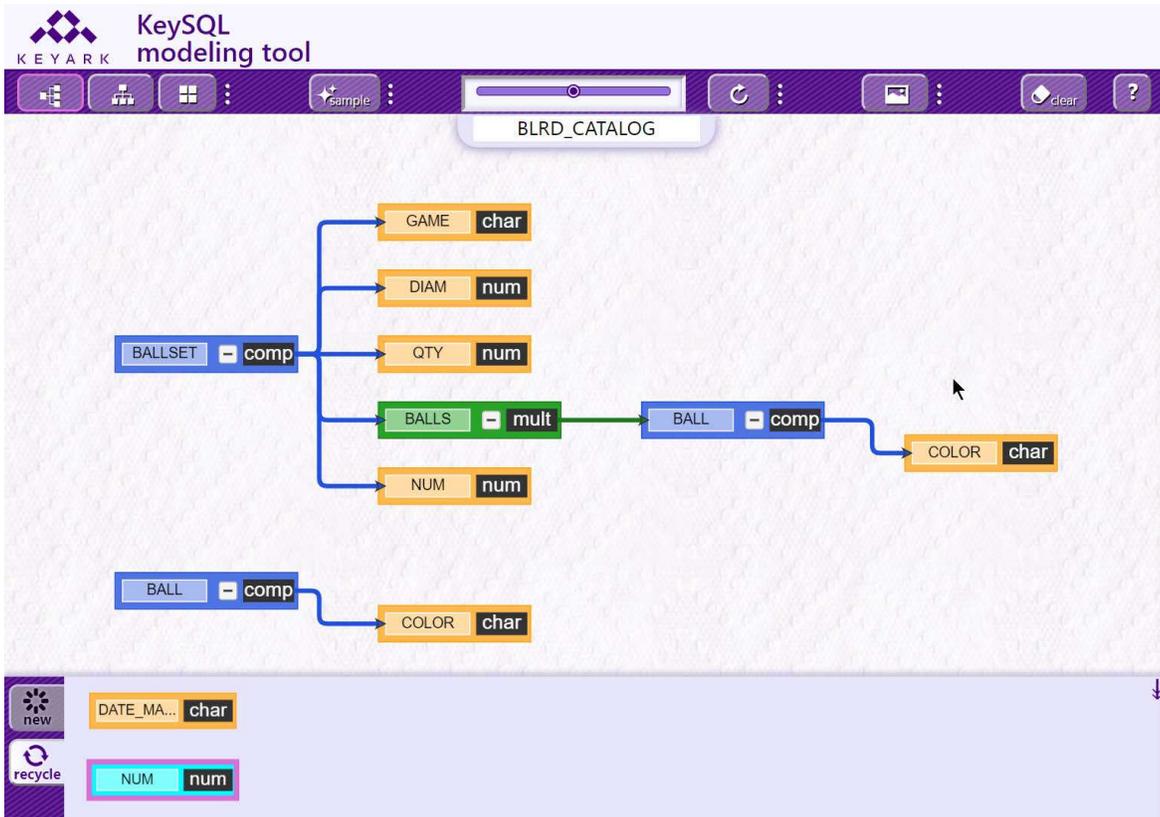


For the next demonstration, we attach NUM to the host k-object BALLSET. We then select the NUM found in either of the two BALL composites. As usual, when a k-object is selected it appears in aqua

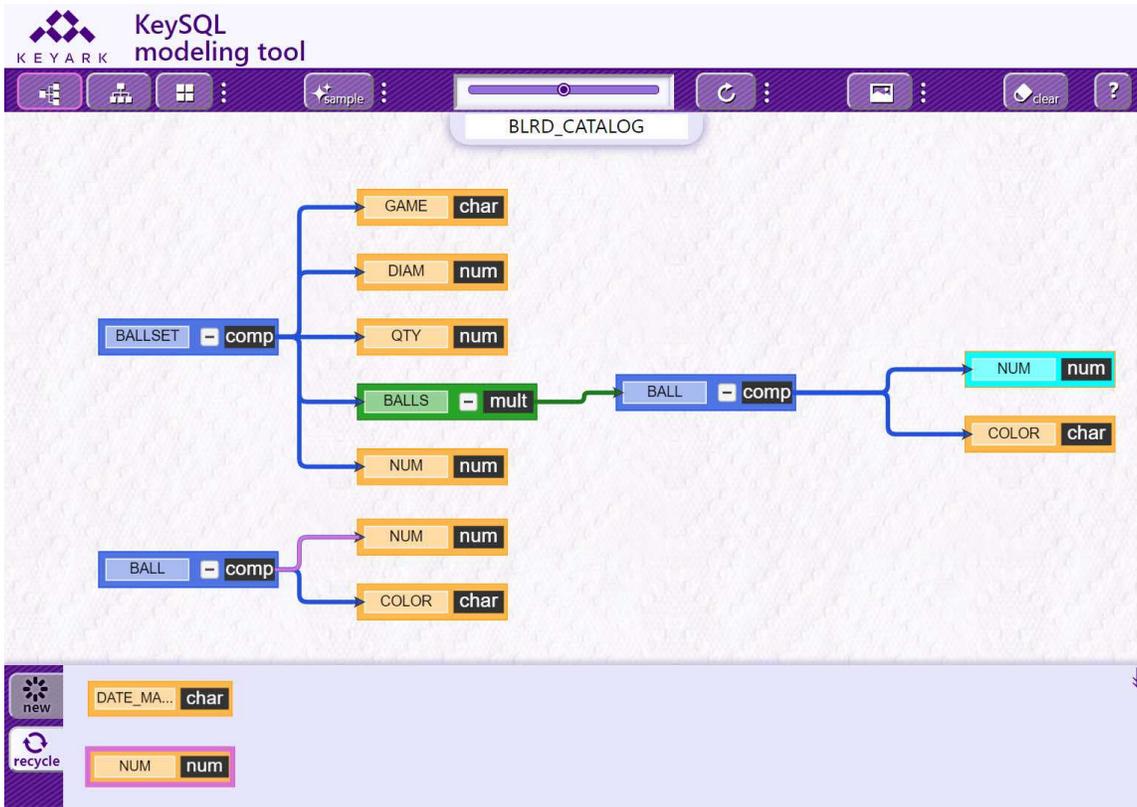
with an orchid box, and every occurrence of the same k-object throughout the data model also appears in aqua:



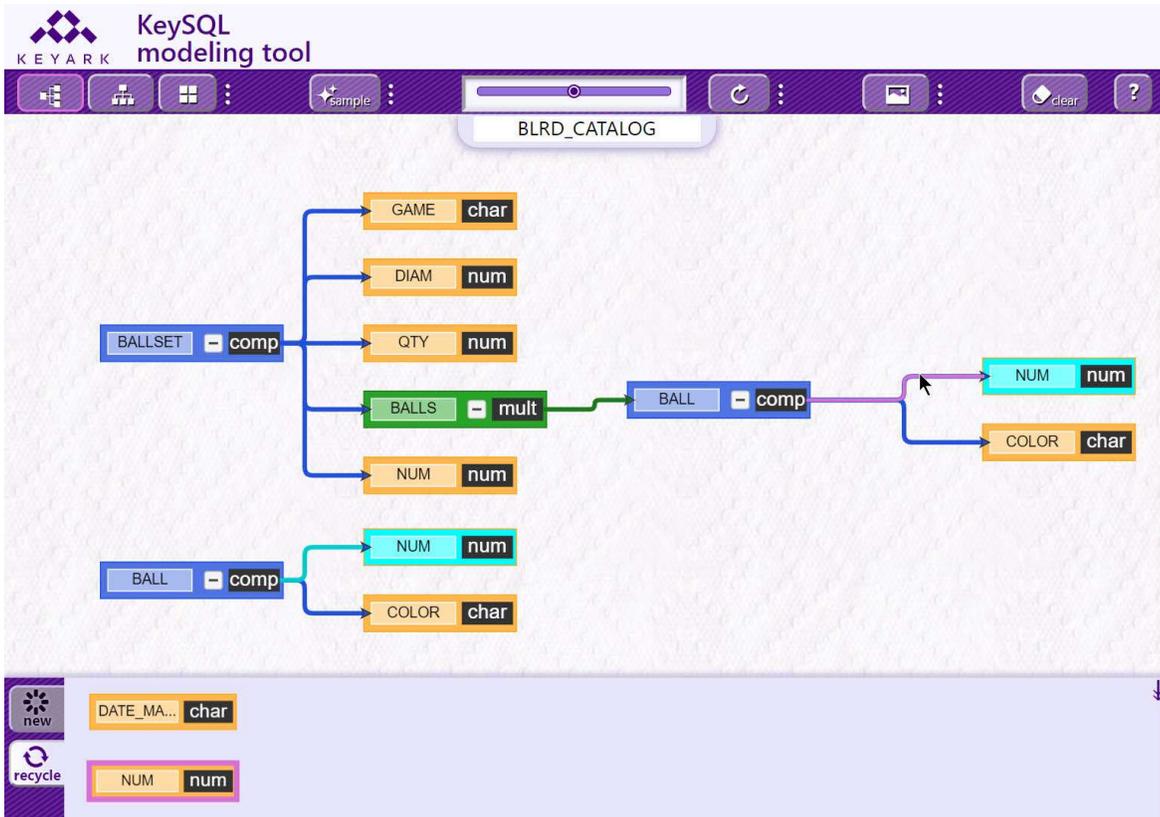
When the **Delete** key is clicked, NUM is removed from the two BALL clones. Note how NUM is still connected to BALLSET, as the BALLSET composite is not a clone of the BALL composite:



As a convenience the tool can show you in advance which k-objects will be impacted by a delete or addition. Let's add NUM back to the BALL composite. Drag and connect it to either BALL. Notice how both BALL clones now incorporate NUM, for a total of three occurrences of NUM:



Now click on the connector for the furthest right NUM, as shown below. The connector line displays as orchid, denoting its selection. Note how only two NUM, those found in the BALL clones, now appear in aqua color. This technique shows in advance which NUM will be affected should we add or delete:



### 1.8 KEYSQL STUDIO INTEGRATION

Additional functionality is available when the KeySQL Data Modeling Tool is launched from KeySQL Studio. From Studio you can:

- Preserve the data model for fine tuning, sharing, or loading data
- Translate the data model from KeySQL to JSON

The tool’s **KeySQL result** tab provides the KeySQL statements that define the data model. By copying these statements, and execution by KeySQL Studio, you preserve the data model as a catalog on KeySQL Server. Via the tool’s Configuration form, you can re-import the catalog.

KeySQL Studio can output the design of a catalog as JSON statements, allowing your data model to be shared with other software tools and systems.