
# Using the DeepSee Architect

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*Using the DeepSee Architect*
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# About This Book

This book describes how an implementer can use DeepSee Architect to create a DeepSee model for use in pivot tables. It contains the following sections:

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For more information, see the following books:

- *Introduction to InterSystems DeepSee*, an introductory guide for all users.
- *Using the DeepSee Analyzer*, a guide for implementers and advanced users who want to create pivot tables to embed in applications — or who simply want to explore their data.
- *Using the DeepSee Dashboard Designer*, a guide for implementers who are creating dashboards.
- *Using the DeepSee Connector*, a guide for implementers who are using the DeepSee Connector to access externally stored data. Note that the DeepSee Connector is available only with Ensemble.

- *DeepSee Site Configuration and Maintenance Guide*, a guide for implementers and system administrators. This book describes how to configure and maintain a DeepSee site. It also includes a chapter on troubleshooting.
- *DeepSee User Guide*, a user manual for your end users. This book describes how to work with deployed dashboards and pivot tables.

For general information, see the *InterSystems Documentation Guide*.

# 1

# Introduction to the DeepSee Architect

This chapter introduces the DeepSee Architect. It discusses the following topics:

- Purpose of the Architect
- How to log into DeepSee
- How to access the DeepSee Architect
- How to switch to another namespace

Be sure to consult *InterSystems Supported Platforms* for information on system requirements.

## 1.1 Purpose of the DeepSee Architect

You use the DeepSee Architect to create DeepSee models, which in turn are needed for in creating pivot tables and for using the Analyzer in general. When you are done using the Architect, you will have set up all the following elements:

- BI-enabled classes.
- Dimensions based on properties of those classes.
- Automatically created measures based on properties. You can add more measures with the DeepSee Analyzer, which is discussed in another book.
- Detail listing fields based on properties.
- Detail listings associated with different user roles, as needed.

- Subject areas associated with different user roles, as needed.

# 1.2 Logging Into DeepSee

To log into DeepSee:

1. Click the InterSystems Launcher.

   When you do so, the system displays a menu.

2. Click **DeepSee**.

   If you have not yet specified a namespace, the system displays a page that prompts you for a namespace.

   Otherwise, the system displays the DeepSee login page.

3. If you are prompted for a namespace, type the name of the namespace you want to work in and then click **Logon to DeepSee**.

   The system then displays the DeepSee login page.

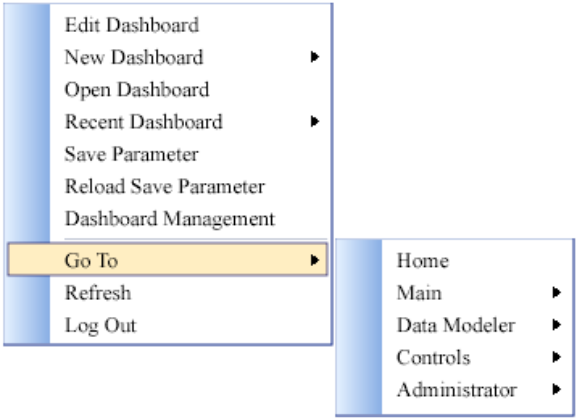
4. On the DeepSee login page, enter a DeepSee username and password. For example, you can use the username `demo` with the password `demo`.

5. For **Role**, select `demo`.

6. Click **Login**.

DeepSee displays the home page, which depends upon the user ID you used to log in. In general, the home page is either a DeepSee module or a dashboard. If the page is a DeepSee module, it has a row of buttons at the top as follows:


If the page is a dashboard, the right-click menu provides access to all the same options provided by these buttons, in addition to options that apply to dashboards:

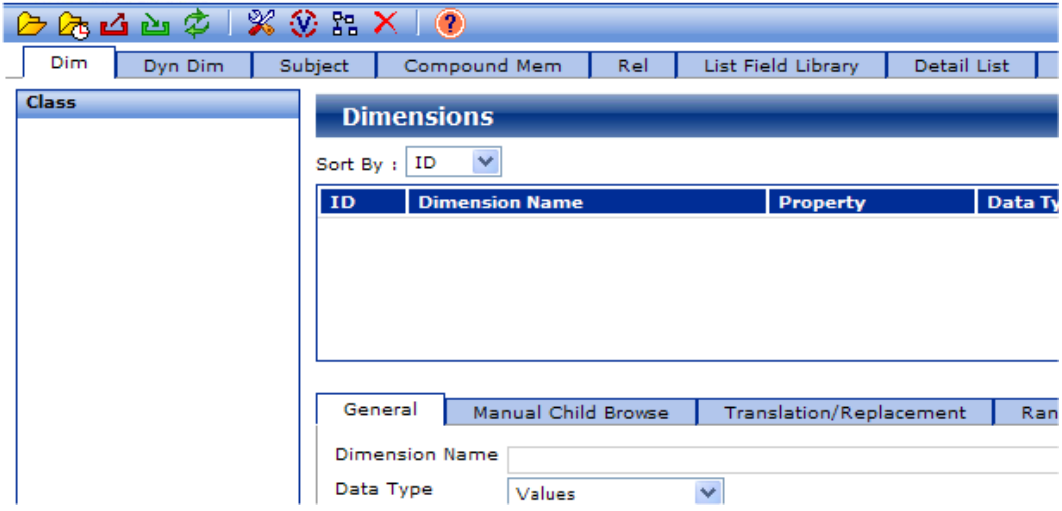



# 1.3 Accessing the DeepSee Architect

To access the Analyzer:

- If you are currently viewing a DeepSee module, click **Data Modeler > Architect**.
- If you are currently viewing a dashboard, right-click and then click **Go To > Data Modeler > Architect**.

The Architect looks like this:



# 1.4 Switching to Another Namespace

To switch to a different namespace:

1. Log out. To do so, do one of the following, depending on what you are currently viewing:
   - If you are currently viewing a DeepSee module, click the **Log Off** button in the upper right.
   - If you are currently viewing a DeepSee dashboard, right-click and then click the **Log Out** option.

   The system logs you out of DeepSee.
2. Click **Switch Namespace**.
3. For **Namespace**, type the name of the namespace you want to work in.
4. Click **Logon to DeepSee**.

   This displays a login page.
5. Log in as usual.

# 2

# Tutorial

This tutorial starts with a BI-enabled class and ends with a simple but complete DeepSee model that you can use in the Analyzer. It consists of the following parts:

1. Setup work
2. Creating a basic DeepSee model in the Architect and checking your work in the Analyzer
3. Adding a detail listing to the model in the Architect and checking your work in the Analyzer

Because all this work is within a single namespace, you can open two browser tabs and use one for the Architect and the other for the Analyzer. The tutorial does not describe this technique specifically, but it can be a convenient way to work.

## 2.1 Tutorial Part 1: Setup

This tutorial continues the tutorial in *Using the DeepSee Connector*. If you plan to use the Connector, that tutorial is a useful starting point.

However, if you do not plan to use the Connector or if you do not want to perform that tutorial now, you can get a sample database from InterSystems that consists of the CACHE.dat file that you would have if you had used the tutorial.

To install this database:

1. Shut down Caché.
2. Rename the file *install-dir*/Mgr/User/CACHE.DAT, so that you can restore this file later if needed.
3. Place the new database file into *install-dir*/Mgr/User/ and rename it to CACHE.DAT.
4. Start Caché.

In either case, notice the following items within the USER namespace:

- The classes Sample.Categories, Sample.Customers, Sample.Employees, Sample.Orders, Sample.OrderDetails, Sample.Products, Sample.Shippers, and Sample.Suppliers.

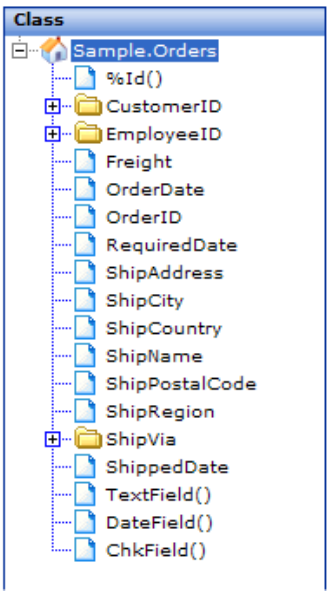
  The class Sample.Orders is BI-enabled; that is, its superclass list includes %BI.Adaptor. None of the other classes are BI-enabled.

- Data for each of these classes. For reference, Sample.Orders has 830 records. Sample.OrderDetails has 2155 records.

# 2.2 Tutorial Part 2: Creating a Basic DeepSee Model

In this part of the tutorial, you create dimensions, a measure, and a subject area, using `Sample.Orders` as the base class.

1. Log into the DeepSee Architect as described earlier.
2. Click the open class button (  ) in the Architect menu bar.
3. Click the `Sample.Orders` class and then click **OK**.
4. Click the plus sign (+) beside `Sample.Orders`. DeepSee displays the following:



Notice that here you can view the `Sample.Orders` class as well as (via properties) the classes Sample.Customers, Sample.Employees, Sample.Orders, and Sample.Shippers. The other classes are not visible, because they are not available via properties, but we can still use them in DeepSee, as you will see later in this tutorial.

5. Expand the folders and double-click each of the following properties (or drag and drop them to the **Dimensions** table):

   - `Freight`
   - `ShipCity`
   - `ShipCountry`
   - `ShipRegion`
   - `ShippedDate`
   - Within `CustomerID`, `CompanyName`
   - Within `ShipVia`, `CompanyName`
   - Within `EmployeeID`, `LastName`

   As you do this, the Architect defines a dimension based on each of these properties. When you are done, DeepSee displays something like the following (your ID values might be different from this):

**Dimensions**

Sort By : ID

| ID | Dimension Name | Property | Data Type |
|---|---|---|---|
| 10017 | Freight | Freight | Number |
| 10018 | ShipCity | ShipCity | Values |
| 10019 | ShipCountry | ShipCountry | Values |
| 10020 | ShipRegion | ShipRegion | Values |
| 10024 | ShippedDate | ShippedDate | Date |
| 10025 | CompanyName | CustomerID.CompanyName | Values |
| 10026 | CompanyName | ShipVia.CompanyName | Values |
| 10027 | LastName | EmployeeID.LastName | Values |

   The `Freight` dimension is also a measure, because **Data Type** is **Number**. In fact, this is the process to define measures: add a numeric dimension.

6. Now rename most of these dimensions, as follows:

   a. Click the dimension in the table.

b. The tabs below the table now show details for this dimension.

c. Edit **Dimension Name** within the **General** tab.

d. Click **Update** to save this change.

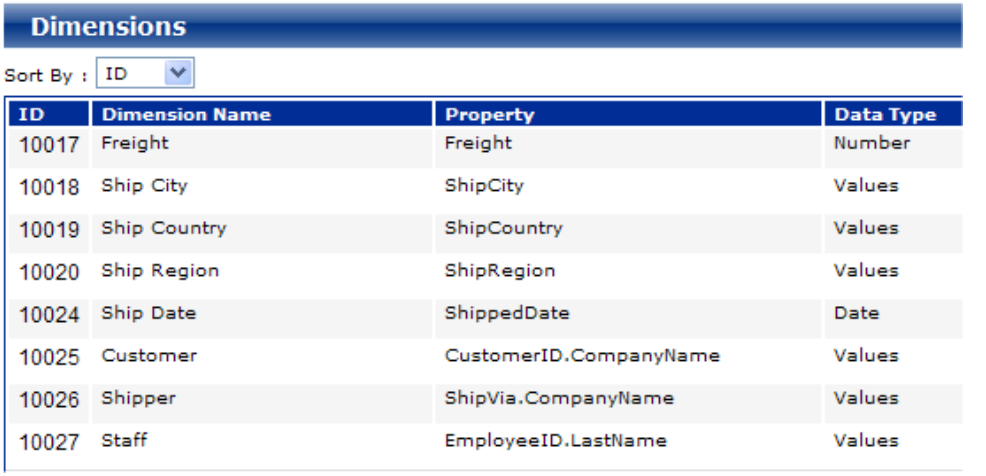
The buttons in the lower right apply to the currently selected dimension. If you do not save changes before selecting another dimension, your changes to that dimension are discarded.

Use the following new names:

| Old Name | New Name |
|---|---|
| `ShipCity` | `Ship City` |
| `ShipCountry` | `Ship Country` |
| `ShipRegion` | `Ship Region` |
| `ShippedDate` | `Ship Date` |
| `CompanyName` (based on `CustomerID.CompanyName`) | `Customer` |
| `CompanyName` (based on `ShipVia.CompanyName`) | `Shipper` |
| `LastName` | `Staff` |

Do not forget to click **Update** after you modify a dimension.

Now DeepSee displays something like the following:




7. Next we modify the definition of the `Staff` dimension so that it uses both the first and last names. To do this:

a. Click `Staff` in the **Dimensions** table.

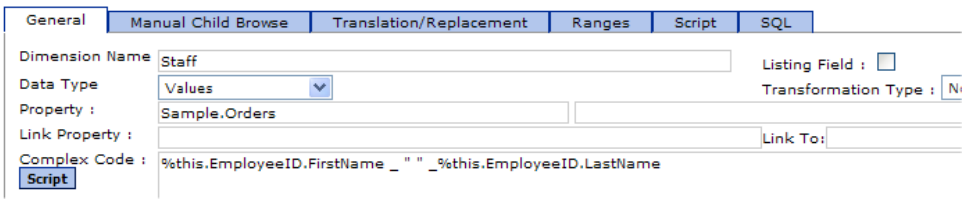
b. On the **General** tab, type the following Caché ObjectScript expression into **Complex Code**:

```
##this.EmployeeID.FirstName _ " " _##this.EmployeeID.LastName
```

c. Delete the string `EmployeeID.LastName` contained in the second property field (this step is optional but makes the definition less confusing to view, here in the Architect).

d. Click **Update** to save this change.

The details for this dimension are now as follows:




8. In this step, we modify `Ship Region` so that it replaces any null values with the string `No Region`.

a. Click `Ship Region` in the **Dimensions** table.

b. Click the **Translation/Replacement** tab.

c. For **Null field Replacement**, type `No Region`.

d. Click **Update** to save this change.

There are other ways to handle null values, and they are discussed later in this manual.

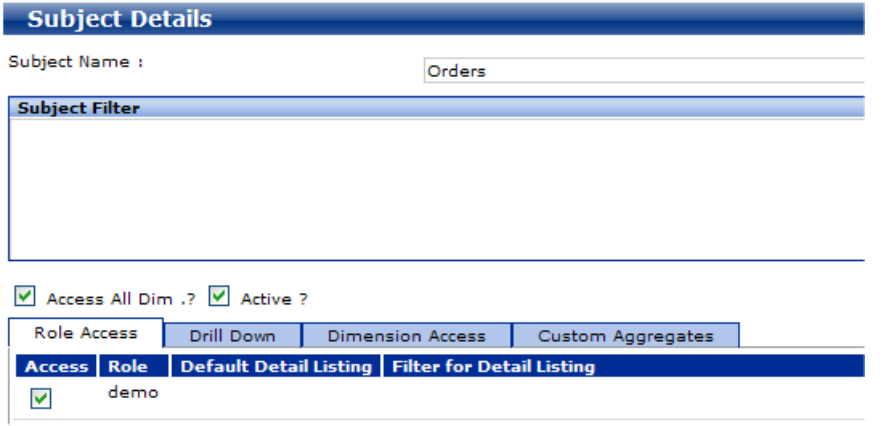
Also, in this example, this is the only dimension we are defining that happens to contain null values. In practice, you would examine all your dimensions carefully to determine whether they contain null values (or whether they might later contain null values, as new data becomes available).

9. Next, we define a subject area so that we can see these dimensions in the Analyzer. To do this:

a. Click the **Subject** tab.

b. In **Subject Area**, type the name `Orders`.

c. On the **Role Access** tab, click the check box next to the `demo` role.




d. Click **Add**.

10. Compile these classes and rebuild the DeepSee indices. To do so:

    a. Click the process button (  ) in the menu bar.

    b. Click **Rebuild**. This option recompiles and then rebuilds.

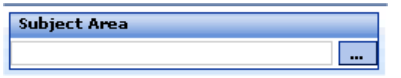
    c. Click **Cancel**.

    **Tip:** This dialog box is not always automatically refreshed when the compilation or rebuild status changes. To refresh the display and see the current status, click **Refresh**.

11. Verify that you can access this model from the Analyzer. To do so:

    a. Click **Main > Analyzer**.

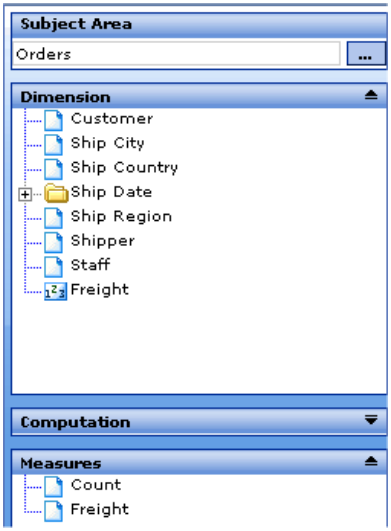
    b. Click the browse button (...) in the **Subject Area** panel.




    c. Click `Orders` and then click **OK**.

    If `Orders` is not listed, make sure you gave access to this subject area to the `demo` role.

Now the Analyzer displays the following:




If you do not see these dimensions and measures, make sure that you have rebuilt the DeepSee indices.

In theory, you could now start to create pivot tables, as described in *Using the DeepSee Analyzer*. In practice, however, you may want to continue to use the Architect to do some or all of the following:

- Add detail listings (as discussed in the next part of the tutorial).
- Add other special types of dimensions.
- Add more subject areas, filtered for different user roles.
- Define and use transformations to modify data in dimensions and in detail listings.

# 2.3 Tutorial Part 3: Adding a Detail Listing to the Model

In this part of the tutorial, we add a simple detail listing. In general, first we create listing fields and then we use them to create detail listings.

There are two general kinds of listing fields:

- A *dimension-type listing field* is a listing field whose definition is owned by a dimension definition. If you redefine the dimension, the listing field is automatically redefined as well. (Similarly, if you delete the dimension, the listing field is automatically deleted.)

The data used by the listing field is stored in a DeepSee global, which means that its performance is fast. This kind of listing field, however, requires more disk space than the other kind.

There is one way to create this kind of listing field.

- An *independent listing field* is a listing field that has an independent definition (not dependent on the definition of any dimension).

  For this kind of listing field, DeepSee does not access the data until the user displays the detail listing; then DeepSee directly accesses the source data.

  There are two ways to create this kind of listing field.

In this part of the tutorial, we will try all three ways of creating listing fields.

1. At the top of the page, click **Data Modeler > Architect**.
2. Click the open class button (  ) in the Architect menu bar.
3. Click the `Sample.Orders` class and then click **OK**.
4. In the **Dimensions** table, notice that the **Listing** check box is already selected for `Freight` and `Ship Date`. This is the default setting for date and numeric dimensions. So we already have two listing fields (and they are dimension-type listing fields).
5. We add `Ship Region` as another dimension-type listing field. To do so:
   a. In the **Dimensions** table, click `Ship Region`.
   b. On the **General** tab, click the **Listing Field** check box.
   c. Click **Update** to save this change.

   Now the **Dimensions** table looks like this:

| Dimension Name | Property | Data Type | Active | Complex | M.C.B | Initial | Trns/Rng | Listing | Select |
|---|---|---|---|---|---|---|---|---|---|
| Freight | Freight | Number | ☑ | ☐ | ☐ | ☐ | ☐ | ☑ | ☐ |
| Ship City | ShipCity | Values | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Ship Country | ShipCountry | Values | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Ship Region | ShipRegion | Values | ☑ | ☐ | ☐ | ☐ | ☐ | ☑ | ☐ |
| Ship Date | ShippedDate | Date | ☑ | ☐ | ☐ | ☐ | ☐ | ☑ | ☐ |
| Customer | CustomerID.CompanyName | Values | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Shipper | ShipVia.CompanyName | Values | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Staff | | Values | ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

6. We add `Ship Country` as an independent listing field by copying a dimension. We then apply an existing sample transformation to it so that the listing field is shown as a bitmap (the flag for the country).
   a. Right-click `Ship Country` and then click **Add To Listing Fields**. This listing field is immediately added; its current definition is similar to the dimension we copied.

b. Click the **List Field Library** tab. The purpose of this tab is to list all the independent listing fields, so this tab displays only one listing field: `Ship Country`.

c. In the **Listing Field** table, click `Ship Country`. The tabs below the table show details for this listing field.

d. For **Transformation Type**, click `Convert to flag`.

e. Click **Update** to save this change.

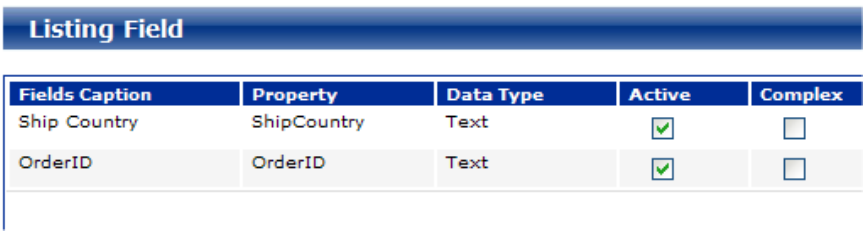
`Convert to flag` is a transformation that is defined elsewhere. It is a sample that you can redefine or delete.

7. We add another listing field, `OrderID`, from scratch. To do so:

a. On the **List Field Library** tab, expand the class hierarchy on the left.

b. Double-click `OrderID`. A new listing field is immediately added.

The right area looks as follows:




8. Now create a detail listing that includes all these listing fields.

a. Click the **Detail List** tab.

b. In **Listing Name**, type `Basic Details`.

c. In **Available Fields**, expand the two folders so that you can see all the available listing fields.

The **Dimension ListingField** folder lists the dimension-type fields. The **ListingFields Library** folder lists the independent listing fields.

d. Double-click each of the five listing fields. When you double-click a field, it is added to the area on the right, which lists the contents of this detail listing.

The order of the listing fields here controls the order of the fields in the actual detail listing. However, you can add fields in any order and change the order later. To change the position of a listing field, right-click it and click **Move Up** or **Move Down**.

e. Click the **Role Access** tab.

f. On the **Role Access** tab, click the check box next to the `demo` role.

g. Click **Add**.

The detail listing is added and the tab is immediately cleared, which can be confusing. To double-check this detail listing, click the browse button (...), click the detail listing name, and click **OK**. This redisplays the definition of the detail listing, which you can now modify.

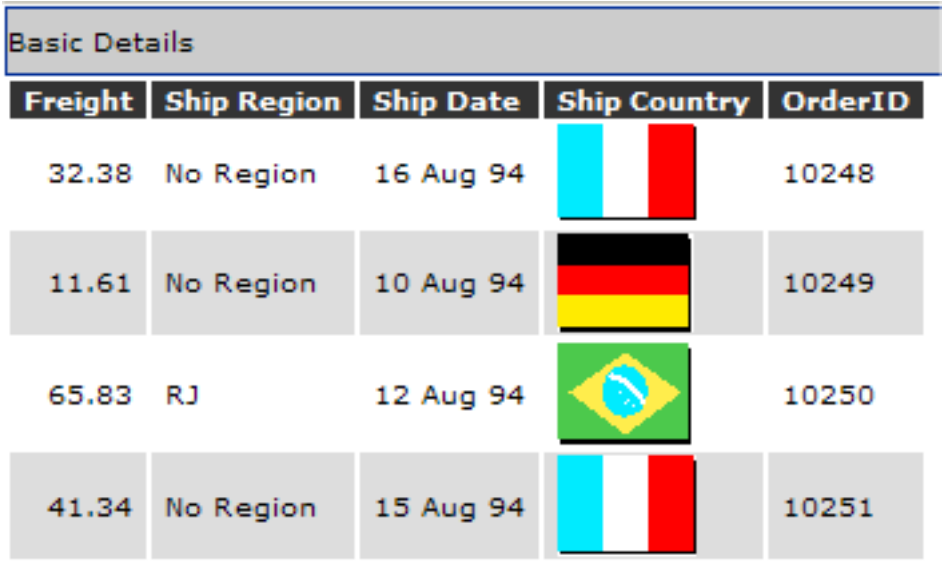
9. Recompile these classes and rebuild the DeepSee indices, as in the previous part of this tutorial.
10. Verify that you can access this detail listing in the Analyzer. To do so:
    a. Click **Main > Analyzer**.
    b. The `Orders` subject area should be displayed from the last time you used the Analyzer. However, if it is not, click the search button (...) in the **Subject Area** panel. Then click `Orders` and then click **OK**.
    c. Click **Find** in the upper right. The Analyzer then displays a pivot table that counts the records in this subject area. It looks like this:

| | Count |
|---|---|
| All | 830 |

    d. Right-click on the white cell and then click **Listing to Screen**.

       If `Basic Details` is not listed, make sure you gave access to this detail listing to the `demo` role. If correcting that does not fix the problem, make sure that you recompiled and rebuilt.

DeepSee then displays something like the following:



Basic Details

| Freight | Ship Region | Ship Date | Ship Country | OrderID |
|---|---|---|---|---|
| 32.38 | No Region | 16 Aug 94 | | 10248 |
| 11.61 | No Region | 10 Aug 94 | | 10249 |
| 65.83 | RJ | 12 Aug 94 | | 10250 |
| 41.34 | No Region | 15 Aug 94 | | 10251 |

If you do not see a result similar to this, make sure that you recompiled and rebuilt.

# 3

# Enabling Classes for Use in DeepSee

Within the Architect, you can perform most activities in nearly any order. In all cases, however, you start by enabling Caché class definitions for use with DeepSee. This process is known as BI-enabling the classes. This chapter discusses the following topics:

- What it means to BI-enable a class
- How to BI-enable a class in general
- How to open a class definition from the Architect
- How to open a BI-enabled class in the Architect
- A summary of the properties and methods available for a BI-enabled class
- How to recompile the classes and rebuild the indices
- How to selectively rebuild the indices
- How to specify the number of processors used when DeepSee rebuilds the indices
- How to clear unsaved work in the Architect
- How to create SQL shortcuts to manage confusing property names

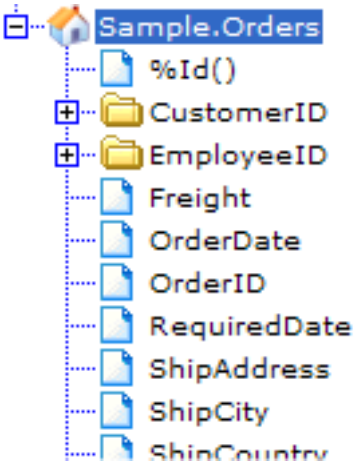
## 3.1 Overview

A BI-enabled class is a class that inherits from %BI.Adaptor. When you BI-enable a class, that class and all classes related to it are automatically included in the generated cube. Consider a simple example:

- The `MyApp.Customer` class defines customers.
- The `MyApp.Shipper` class defines shippers.
- The `MyApp.Orders` class defines orders placed by customers and shipped by various shippers. It includes the properties `Customer`, which is of type `MyApp.Customer`, and `Shipper`, which is of type `MyApp.Shipper`.

If you BI-enable `MyApp.Orders`, and recompile and rebuild the classes, you automatically create a DeepSee cube that contains all the data from these three classes (and any other related classes).

In general, any property of these classes can be used as either a dimension, a listing field, or both. When you define dimensions and listing fields, you work in the DeepSee Architect, which displays these classes in a hierarchical format as follows:




The root item and the items shown as folders represent the class definitions. The other items are properties. You can expand the folders, which contain more properties and possibly more class definitions.

The root item is special; this class is the *base class* in this cube. The base class determines the meaning of the predefined `Count` measure, as we will see later in this chapter.

# 3.2 BI-enabling Your Classes

The first step depends on where your data is now:

- If you have Caché classes, you can open them from within Architect. This automatically adds the DeepSee superclass (%BI.Adaptor) to the superclass list. See the following section.

In some cases, you cannot modify the class or you have an existing complex query that you want to use. DeepSee supports an alternative approach in which you create and BI-enable a class query; see "Using a Class Query," later in this book.

- If you are creating a new application, you can create it in Studio in the same way you create any other Caché application. For any class that needs it, you include the DeepSee superclass (%BI.Adaptor) in the superclass list.
- If you are starting with an existing Caché application that does not use Caché class definitions, map the existing globals to class definitions and then add the DeepSee superclass (%BI.Adaptor) to the superclass list.
- If your data is stored outside of Caché, you can first use the DeepSee Connector to browse the data and generate BI-enabled class definitions.

In all cases, the Architect automatically has access to any classes that extend %BI.Adaptor.

The Architect accesses and modifies the same class definitions that you see directly in the Studio. This means that if you make a change in one location and save it, that change is immediately available in the other.

For convenience, you can recompile and rebuild the classes as needed from Architect.

# 3.3 Opening a Class Definition

When you open a class definition in the Architect, the Architect automatically adds %BI.Adaptor to its superclass list, if that is not yet included.

To open a class definition in the Architect:

1. First, do any of the following:
   - Click the open class button (  ) in the Architect menu bar. The Architect displays a dialog box. Click the **Add** button in the lower left of this dialog box. Then click **Search**.
   - Click the **Base Class** link in the lower left. The Architect displays a dialog box. Click the **Add** button in the lower left of this dialog box. Then click **Search**.
   - Click the **Add** button in the lower left.

   In all cases, the Architect displays a search dialog box. The appearance of this dialog box depends on the path you used.
2. In the search dialog box, optionally type the name of the package that contains the class. If you do not specify a package name, the Architect searches all packages in this namespace.

3. Click **Search**.

   The dialog box then displays all classes in this namespace or all classes in this package.

4. Click the class name and then click **OK**.

# 3.4 Opening a BI-enabled Class

If a given class already extends %BI.Adaptor, you can open it in fewer steps (no search is required).

To open a BI-enabled class definition in the Architect:

1. First, do either of the following:

   - Click the open class button (  ) in the Architect menu bar.
   - Click the open recent class button (  ) in the Architect menu bar.

2. Click the class name and then click **OK**.

# 3.5 Available Properties and Methods of a BI-enabled Class

The following rules govern the display of a class in the Architect:

- For a BI-enabled class, all properties are shown except for the parent side of a parent-child relationship.
- This display is recursive; that is, properties of properties are shown.
- If a property is a collection (a list or an array), it is shown as a folder that contains the properties and methods of the collection.
- If a property is of type %List (which is the object equivalent of **$LISTBUILD**), it is not shown as a folder.
- If a property is a relationship, it is not shown as a folder.
- If a class is not accessible from the base class via Caché dot syntax, it is not shown by default.

- The Architect does not display properties and methods inherited from superclasses. You can use these properties and methods anyway.

This view of the class provides a useful starting point for creating dimensions, measures, and listing fields. In many cases, you can simply create an element by double-clicking a property within this hierarchy, as seen in the tutorial.

But it is important to know that although this view provides a convenient way to access some properties, you can in fact access any property, and you can access data in any table by using **Complex Code**.

# 3.6 Recompiling and Rebuilding

To recompile, rebuild, or both:

1. Click the process button (  ) in the menu bar.

   DeepSee displays a dialog box that shows the results from the last time you recompiled or rebuilt.

2. In this dialog box, do one of the following:

   - To recompile the BI-enabled class and any related classes, click **Compile**.
   - To recompile the classes and rebuild the indices, click **Rebuild**.

   **Tip:** This dialog box is not always automatically refreshed when the compilation or rebuild status changes. To refresh the display and see the current status, click **Refresh**.

3. When you are done, click **Cancel**.

You can also recompile the classes in the Studio, in the same way that you recompile any other class definitions.

To rebuild all the indices programmatically, use the Caché Terminal, go to the appropriate namespace, and enter the following command, where *classname* is the package and class name of the BI-enabled class:

```
Do ##class("classname").HiRebuild(0)
```

## 3.6.1 Incremental Rebuilds

After initial development, it is not generally desirable to rebuild all the indices, because that can be time-consuming. Instead, your application should detect data changes and update the indices for only the affected objects. There are three parts to this approach:

- You must enable DeepSee to rebuild the indices incrementally. To do this, enable the site option **ETL > Incremental Index Update** and recompile the classes. See the *DeepSee Site Configuration and Maintenance Guide*.

  Despite the fact that this option is in the **ETL** group, it does apply to all BI-enabled classes in this namespace (it is not specific to classes created via the DeepSee Connector).

- If a data change affects a record in the base BI-enabled class itself, DeepSee automatically detects that change and updates the indices for that record.

  This occurs because the base BI-enabled class inherits from %BI.Adaptor, which provides the method %OnAfterSave() and the triggers **HyperDelete**, **HyperInsert**, and **HyperUpdate**. When an object is saved, Caché runs the method %OnAfterSave(), which updates the DeepSee indices for this object. Similarly, when an record is deleted, inserted, or updated via SQL, Caché fires the corresponding trigger, which updates the DeepSee indices for this object.

- If a data change affects a record in another class to which the base BI-enabled class refers, it is the responsibility of your application to do the following:

  1. Determine the IDs of the affected objects in the base BI-enabled class.
  2. Update the DeepSee indices for those objects by using the **zzBuildOne()** method of the base class (inherited from %BI.Adaptor). The first argument for this method is the ID of the object whose indices need to be updated.

# 3.7 Rebuilding Selectively

To rebuild a subset of dimensions and listing fields:

1. Click the selective processing button (  ) in the menu bar.
2. You are prompted to confirm this action. Click **OK**.

Also see "Controlling Whether a Dimension Is Selectively Rebuilt" and "Controlling Whether a Listing Field Is Selectively Rebuilt."

# 3.8 Specifying the Number of Processors

If you are rebuilding the DeepSee indices on a machine that has multiple CPUs, you can increase the number of processors used when DeepSee builds the indices for this class. To do so:

1. Click the **Sys** tab.
2. For **Number of Processors**, specify an integer. Typically you use a number that is the same as or slightly larger than the number of processors.
3. Click **Save**.

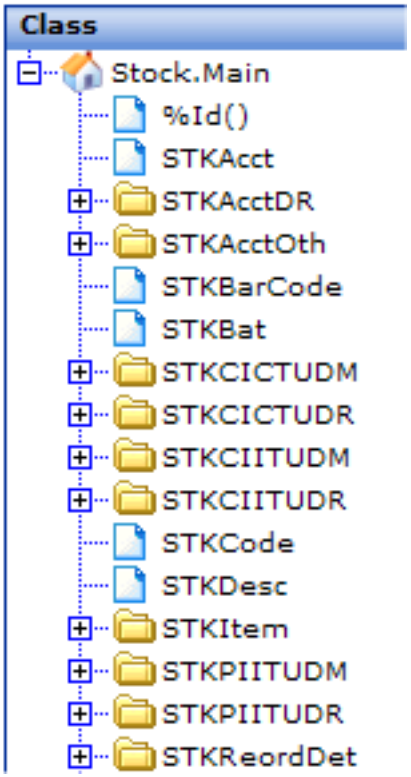
# 3.9 Clearing Unsaved Work

To clear any unsaved work in the Architect, click the refresh button (  ). The unsaved changes are immediately cleared.

# 3.10 Defining SQL Shortcuts

If the property names in your classes are confusing and if you have many properties, you might find it convenient to define *SQL shortcuts* before you start to use your BI-enabled classes. In DeepSee, an SQL shortcut is an alias that provides a new name for a class property (or property of a property), to make it easier to identify the properties you want to use in DeepSee.

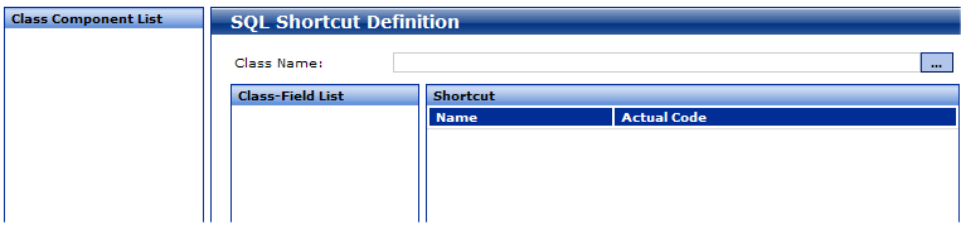
In contrast to the example used in the tutorial, not all class definitions contain only simple, easy-to-read property names. For example:




To define SQL shortcuts:

1. At the top of the Architect page, click **Data Modeler > SQL Field Shortcuts**.

   The system then displays a page like the following:



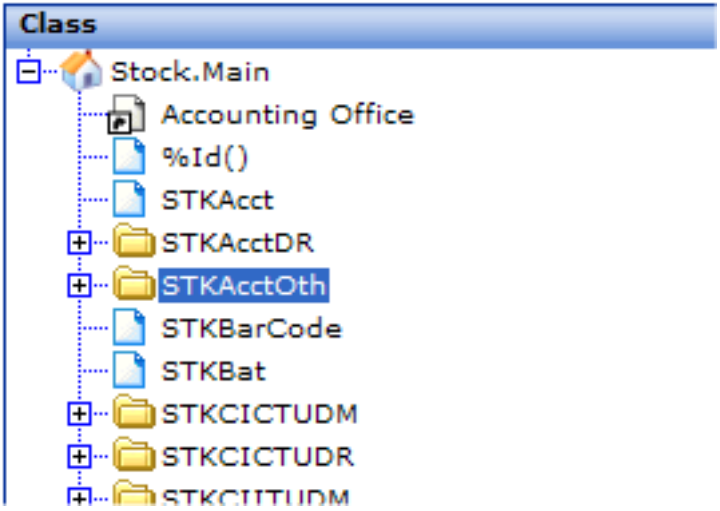

2. Click the browse button (...) next to **Class Name**.
3. Click a class name and then click **OK**.

   The class is displayed in **Class-Field List**.
4. Expand the class folder and subfolders in **Class-Field List**, as needed.

5. To create an SQL shortcut for any property, double-click that property. When you do, the system adds a row to the Shortcut table. For example, if you double-clicked the property `STKZOL` within the property `STKAcctOth`, you would see the following:


6. Type a string into **Name** in the same row. Typically, this string is easier to remember and understand than the field name. For example: `Accounting Office`.
7. Optionally type a tooltip into **Tooltip**.
8. Click **Save**.

When you next view the class in the Architect, the shortcuts are shown at the top, as follows:




If you hover the cursor over a shortcut, the Architect displays the tooltip for the shortcut. You can use these shortcuts when you define dimensions and listing fields.

# 4

# Defining Dimensions

This chapter describes how to create most kinds of dimensions. It discusses the following topics:

- An overview of the Dimension tab
- How to define a dimension in general
- How to specify the value on which a dimension is based
- How to choose a dimension data type
- How to define a dimension based on a date
- How to define a dimension based on a time
- How to define a dimension based on a collection
- How to modify a dimension in general
- How to control whether a dimension is included in the subset that can be selectively rebuilt
- How to activate or deactivate a dimension
- How to delete a dimension
- How to make your changes visible in the Analyzer

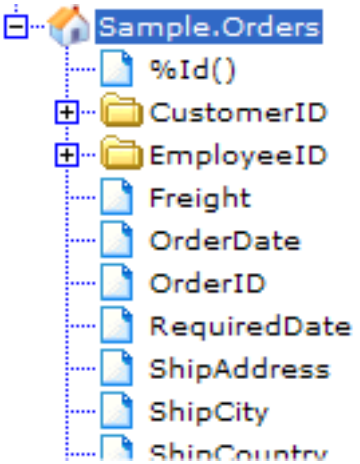
Also see the chapters "Defining Special Dimensions" and "Using Other Tables to Define Dimensions, Measures, and Listing Fields."

## 4.1 Overview of the Dimension Tab

You use the **Dim** tab to add, modify, and delete dimensions. This tab has three main areas.

## 4.1.1 Class Hierarchy

The class hierarchy on the left shows the BI-enabled classes you are working with:




Here you can do the following:

- Expand a collapsed folder by clicking the plus sign (+) to its left.
- Collapse an expanded folder by clicking the minus sign (-) to its left.
- Double-click a property to create a new dimension definition based on it.
- Drag and drop a property, instance method, or SQL shortcut to the **Dimensions** table on the right, to create a new dimension definition based on it.

  Any instance methods are shown alphabetically after the properties.

## 4.1.2 Dimensions Table

The **Dimensions** table on the right summarizes the currently defined dimensions:


Each row corresponds to a dimension. For **Sort By**, click either **ID** or **Name**, to control how the rows are sorted. In this table:

- **Dimension Name** is the name of the dimension, as seen in the Analyzer and in any pivot tables that include this dimension. When you first create a dimension, this is the same as the name of the property, instance method, or SQL shortcut.

  **Note:** You can include a question mark (?) or a single quote (') in the name, but avoid other non-alphanumeric characters. In particular, do not use a period.

  Also, dimension names must be unique, and dimensions and measures cannot have the same name.

- **Property** is the class property or instance method on which the dimension is based.

  In the tutorial, all dimensions were based on properties. In other cases, however, a class may have an instance method that returns an identifier or other piece of data, perhaps formatted in a particular way; you can use such instance methods in addition to properties.

  This field is ignored if the dimension is based on complex code.

- **Data Type** affects how members are defined, as well as their default names. The data type is set automatically based on the data type of the field you are using, but you can change it. See "Specifying the Dimension Data Types."

- **Active** controls whether this dimension is active (visible in the Analyzer and in pivot tables). When you create a dimension, it is active by default. See "Deactivating or Activating a Dimension."

- **Complex** indicates whether this dimension is based on a Caché ObjectScript expression, instead of on a single class property. See "Basing a Dimension on a Caché ObjectScript Expression."

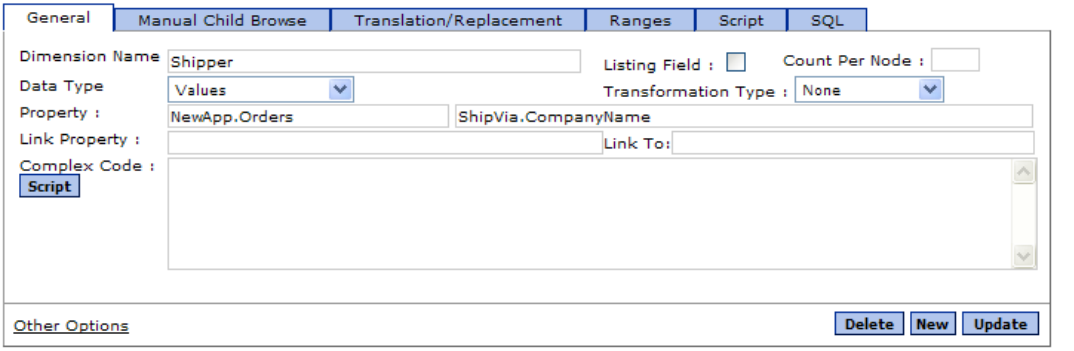
- **M.C.B.** indicates whether the **Manual Child Browse** tab contains information for this dimension. You use this tab to describe how to index the values in dimension that is based on a list-type property. See "Defining a Dimension Based on a Collection."

- **Trns/Rng** indicates whether you have entered information on the **Translation/Replacement** or **Range** tabs. See the chapter "Using Replacements, Ranges, and Transformations."
- **Listing** indicates whether this dimension definition also defines a listing field. See the chapter "Defining Listing Fields."
- **Select** controls whether this dimension is included in the subset that can be selectively rebuilt. See "Controlling Whether a Dimension Is Selectively Rebuilt."

In this table, when you click the dimension that you want to work on, the tabs in the lower right display details for that dimension.

## 4.1.3 Tabs

The tabs in the lower right display details about the currently selected dimension:




The following table summarizes the options on these tabs. Unless otherwise noted, the sections listed here are in this chapter.

*Options on the Dimension Tabs*

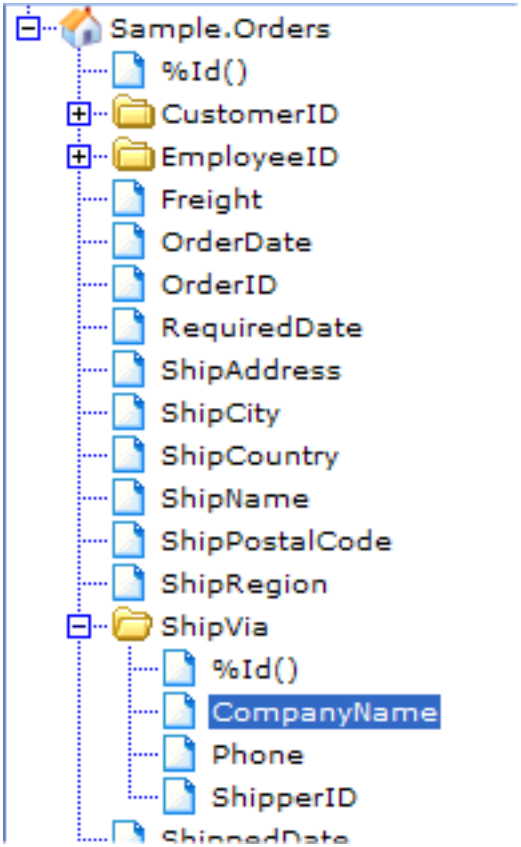
| Option | Purpose |
|---|---|
| **General** tab: **Listing Field** option | Reuses this definition as a listing field as well. See the chapter "Defining Listing Fields." |
| **General** tab: **Count Per Node** option | For advanced use only. When a dimension is used as a listing field, this option controls the size of nodes in the global. The default is 500. If you encounter <MAXSTRING> errors when you rebuild indices, then use a smaller number. |

| Option | Purpose |
|---|---|
| **General** tab: **Data Type** option | Controls how members are defined, as well as their default names. The data type is set automatically based on the data type of the field you are using, but you can change it. Several of the following section discuss the types. |
| **General** tab: **Transformation Type** option | Applies a transformation that affects how the dimension members are defined and displayed. See the chapter "Using Replacements, Ranges, and Transformations." If you apply a transformation, you generally do not use the **Translation/Replacement** and **Ranges** tabs. |
| **General** tab: **Property** options and **Complex Code** option | Specifies the data on which this dimension is based. See "Defining a Dimension." |
| **General** tab: **Link Property** and **Link To** options | Ignore these. |
| **Manual Child Browse** | Applies only to dimensions based on list-type properties. This tab specifies how to index the values in the list. See "Defining a Dimension Based on a Collection." |
| **Translation/Replacement** tab | Defines a set of replacements that alter the names of the dimension members. See the chapter "Using Replacements, Ranges, and Transformations." |
| **Ranges** tab | Defines the dimension members as a set of ranges of values (applies to numeric-valued and time-valued dimensions). See the chapter "Using Replacements, Ranges, and Transformations." |

# 4.2 Defining a Dimension

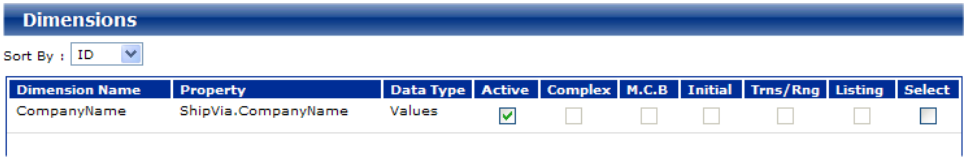
This section describes the basic method for defining dimensions:

1. Open a BI-enabled class as described in the previous chapter.
2. Click the **Dim** tab.
3. Expand the class hierarchy in the left area as needed.




4. Drag and drop a property, instance method, or SQL shortcut from the class hierarchy to the **Dimensions** table on the right. Or double-click the property, instance method, or SQL shortcut.

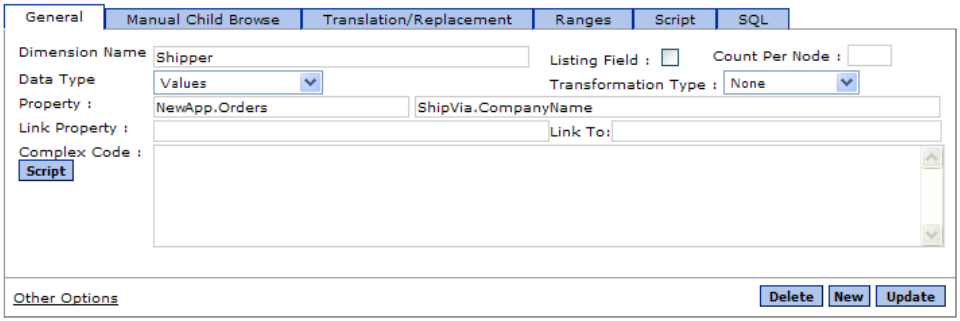
   In either case, the **Dimensions** table now includes a dimension that is based on your selection. For example:




5. Click this new row so that it is selected. The bottom right area of the page then shows details for this dimension.

6. Optionally rename the dimension by changing the value in **Dimension Name** on the **General** tab. This name is shown in the Analyzer and is also used as the default column or row label in any pivot tables that include this dimension.

The dimension name should make sense on its own; notice that it does not indicate the table that owns this property. In the example here, `CompanyName` might be ambiguous, so you might rename this dimension to `Shipper`. Also, the dimension name can use only alphanumeric characters.




In the **General** tab, the editable two **Property** fields contain the following data:

a. The first field, which is required, shows the package and class name of the BI-enabled class from which you started, in the form *package*.*class*.

b. The second field, which is optional, shows the name of the property or instance method on which this dimension is based, relative to this class. This is expressed in the form *property* or *property*.*subproperty* and so on, in exactly the same way you would refer to that property in Caché ObjectScript.

   This field is optional because there are other ways to specify the data on which the dimension is based; see the next section.

7. Click **Update** to save your changes.

**Tip:** You can also start to create a dimension by clicking the **New** button in the lower right. When you add a dimension this way, note that the **Active** check box is cleared by default for the dimension. After creating and saving the dimension, select the **Active** check box for the dimension and save it again.

# 4.3 Specifying the Data on Which a Dimension Is Based

There are three general options for specifying the value on which the dimension is based:

- Base it directly on a single class property, as in the preceding section.

- Use **Complex Code** and base the dimension on a Caché ObjectScript expression, possibly using multiple class properties, as described in the following subsection.

  This option takes precedence over the preceding option.

- Use the **Manual Child Browse** option to generate a set of values, typically from a collection property. See "Defining a Dimension Based on a Collection," later in this chapter. When you do this, the dimension is based on these values.

  This option takes precedence over the preceding two options.

If you use **Complex Code** or **Manual Child Browse** option, DeepSee ignores the setting of **Null Field Replacement** (on the **General** tab).

## 4.3.1 Basing a Dimension on a Caché ObjectScript Expression

To redefine a dimension so that it is based on a Caché ObjectScript expression:

1. In the **Complex Code** field, type a Caché ObjectScript expression that returns a different value for each dimension member. The expression can use the variable *##this*, which refers to the BI-enabled class you started from.

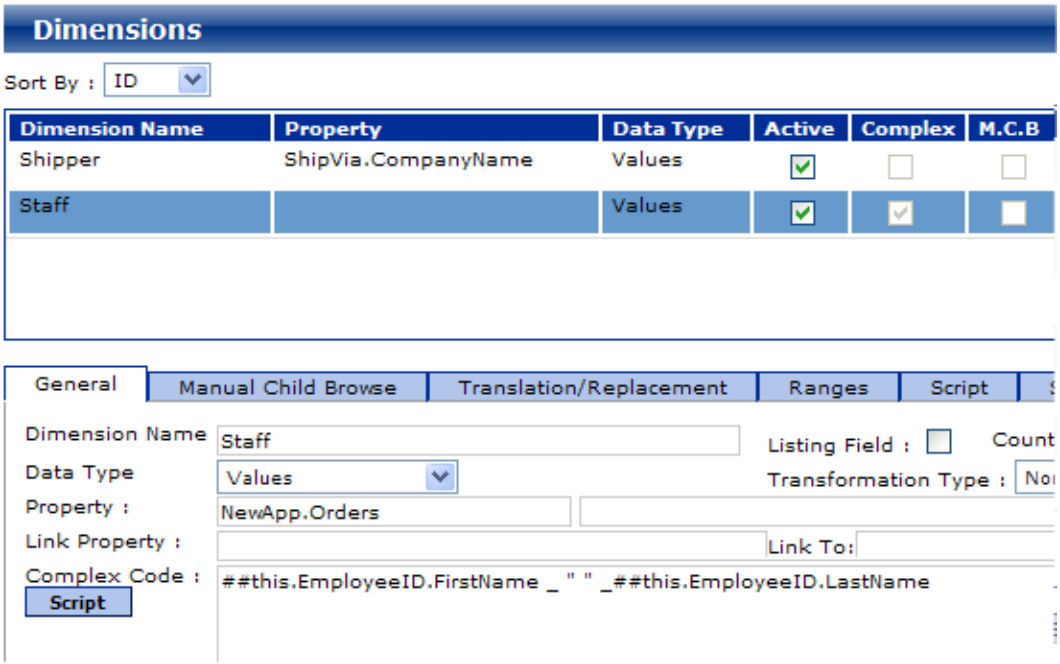
   Or click the **Script** button, which displays an editor where you can build an expression from existing dimensions, data fields, and Caché ObjectScript functions.

   You can use any Caché ObjectScript, which means that you can also invoke methods or routines in this namespace.

2. Delete the contents of the second **Property** field.

   This step is optional, because this field is ignored if there is data in **Complex Code**.

Consider the following example:




This dimension (`Staff`) groups the source records into buckets based on the following string, which is based on two properties:

```
##this.EmployeeID.FirstName _ " " _ ##this.EmployeeID.LastName
```

Each first name/last name combination that is present in the data receives a separate bucket. Each member of this dimension corresponds to one of these buckets.

Also notice that the **Complex** check box is checked in the table at the top of the page; this happens automatically when you enter data into the **Complex Code** field.

When you use **Complex Code**, DeepSee ignores the setting of **Null Field Replacement** (on the **General** tab). This means that if you want to replace null values with a string such as `"No Assigned Staff"`, you must check for the null value within the expression used in **Complex Code**.

# 4.4 Specifying the Dimension Data Type

The **Data Type** option of a dimension affects how members are defined. The following table summarizes the options.

*Data Types for Dimensions*

| Dimension Data Type | Purpose and Comments |
|---|---|
| **Values** | Creates a dimension that has a member for each unique value of the dimension data. By default, these are collated as strings. Can be used with any type of data. This is the most commonly used option. |
| **Reference** | Creates a dimension that has a member for each unique internal identifier. Use this type of dimension if you expect the dimension data values to change and if you do not want to rebuild the indices when that occurs. For example, if you use the customer name as a dimension, you might use the **Reference** type for this dimension. Then if a customer company changes its name, it would not be necessary to rebuild the indices to accommodate that change.<br>Can be used with any type of data. |
| **Date** | See the section "Defining a Dimension Based on a Date," later in this chapter. |
| **Number** | Creates a series object dimension and a measure. Appropriate only for numeric data.<br>Note that you can use **Null Field Replacement** with this type, as you can with the other types. |
| **Boolean** | Creates a dimension that has two members:<br>• `No` groups records for which the dimension data equals 0, `"N"`, `"NO"`, `"F"`, or `"FALSE"` (case insensitive).<br>• `Yes` groups records for which the dimension data equals 1, `"Y"`, `"YES"`, `"T"`, or `"TRUE"` (case insensitive). |
| **Words** | Treats the property as a space-separated collection of words and creates a dimension for each word. DeepSee considers case; for example, it treats `AllergyCode1` and `allergycode1` as different words. See "Defining a Dimension Based on a Collection" , later in this chapter. |
| **Date** and format | See the section "Defining a Dimension Based on a Date," later in this chapter. |

| Dimension Data Type | Purpose and Comments |
|---|---|
| **Time** | Use this only if you also specify a **Range Dimension Suffix**. Note that you can also use **Values** to create dimensions based on time. See the section "Defining a Dimension Based on a Time," later in this chapter. |

In this table, the phrase "dimension data" refers to the data on which the dimension is based (whether that is a single field or an expression).

The drop-down list also includes any custom types that have been defined.

### 4.4.1 Creating a Custom Data Type

If the standard types do not meet your needs, you can create and use custom data types, as follows:

1. At the top of the Architect page, click **Data Modeler > Abstract Data Type**.

   The **Date Type Name** list shows any custom types that have been defined. The right area shows the details for the currently selected type, if any.

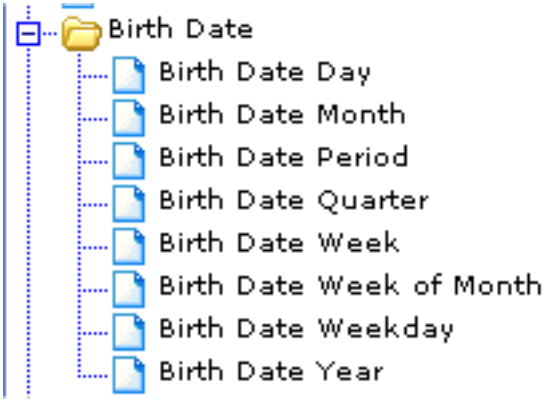
2. Type a name into **Type Name**.
3. Click the **Base Type** drop-down list and then choose a type upon which to base the new type.
4. Specify details for this type. The details depend upon the base type.
5. Click **Add**.

For example, the standard type **Values** uses string collation, which is often unsuitable for numeric data. For example, if you create a dimension based on age, you would generally prefer to sort the ages in numeric order rather than in string order. For such a dimension, you would create a custom type based on **Values**, but you would set **Collating Sequence** equal to **Numeric**. You would use this type as the type for your dimension.

Listing field definitions, described later in this book, are similar in many ways to dimension definitions. However, custom data types are available only for dimensions.

## 4.5 Defining a Dimension Based on a Date

Date values are special; when you create a dimension that uses a date, DeepSee automatically generates a set of dimension variations that group data by weekday, week, month, quarter, and so on. For example, if you define the `Birth Date` dimension, DeepSee creates the following dimensions (as seen in the Analyzer):




DeepSee automatically recognizes dates of type %Date and %TimeStamp, but also accepts several string forms, and you can convert from any other format. This section describes how to use date-valued properties as dimensions and gives details on the resulting dimension variations.

## 4.5.1 Recognized Date Formats

If you start with a property of type %Date or %TimeStampand you create a dimension based on the property, then DeepSee automatically sets **Data Type** equal to **Date**, the default date format. In other cases, you must set **Data Type** appropriately as follows:

| Property Type | String Format (If Applicable) | Appropriate Setting for Data Type of Dimension* |
|---|---|---|
| %Date | | **Date** |
| %TimeStamp | | **Date** or **Date YYYY-MM-DD** |
| %String | YYYY-MM-DD plus optional trailing time piece | **Date** or **Date YYYY-MM-DD** |
| | YYYY/MM/DD plus optional trailing time piece | **Date YYYY/MM/DD** |
| | DD-MM-YYYY plus optional trailing time piece | **Date DD-MM-YYYY** |
| | DD/MM/YYYY plus optional trailing time piece | **Date DD/MM/YYYY** |

The logical value for a property of type %TimeStamp includes the time, which the predefined dimension data types ignore. For a property of type %String, if the date piece is followed by a space and then a time piece, the time piece is ignored.

## 4.5.2 Converting Other Date Formats

If the date dimension is not in one of the preceding formats, you must use the **Complex Code** option to reformat it.

For example, suppose the property `BirthDateVar5` is in the format YYYYMMDD. To use this property as a date dimension, you could do the following:

- Specify the following for **Complex Code**:

  ```
  $ZDATEH(##this.BirthDateVar5,8)
  ```

- Set **Data Type** equal to **Date**.

For information on the **$ZDATEH** function, see the book *Caché ObjectScript Reference*.

## 4.5.3 Date Dimension Details

This section describes the behavior of the dimension variations that DeepSee automatically generates, using the `Birth Date` dimension as an example:

- The `Birth Date Day` dimension has one member for each day of the month, 1 through 31. Any given member uses data for the corresponding day of the month, ignoring the year and month used in the data. For example, the member 2 uses data for all records where the birth date is the second day of the month, for any month and year.
- The `Birth Date Month` dimension has one member for month, January through December. Any given member uses data for the corresponding month. For example, the member March uses data for all records where the birth date is in March, for any year.
- The `Birth Date Period` dimension has one member for year-month combination. For example, the member 2005-11 uses data for all records where the birth date is in November 2005.
- The `Birth Date Quarter` dimension has four members: Q1, Q2, Q3, and Q4. Any given member uses data for the corresponding quarter. For example, the member Q1 uses data for all records where the birth date is in Q1, for any year.
- The `Birth Date Week` dimension has one member for each week number of the year. Any given member uses data for the corresponding week. For example, the member 7 uses data for all records where the birth date is in the seventh week of the year, for any year.
- The `Birth Date Week of Month` dimension has one member for week number of the month. Any given member uses data for the corresponding week of the month. For example, the member 3 uses data for all records where the birth date is in the third week of the month, for any month and year.

- The `Birth Date Weekday` dimension has one member for each day of the week, Sunday through Saturday. Any given member uses data for the corresponding weekday, ignoring the year and month used in the data. For example, the member Wednesday uses data for all records where the birth date is on a Wednesday, for any month and year.
- The `Birth Date Year` dimension has one member for each year.

# 4.6 Defining a Dimension Based on a Time

You can define dimensions based on time data. Typically you would do this to look at periodicity over the course of the day, and you would group data by hour or perhaps into larger buckets. This section describes three possible techniques:

- Creating hourly buckets
- Creating buckets by parsing the time as a string
- Creating custom ranges

## 4.6.1 Creating Hourly Buckets

If you use the **Time** dimension data type and specify a **Range Dimension Suffix**, DeepSee generates a set of hourly buckets as follows:

Birth Time (Hourly Ranges

| Birth Time Hour Range | Count |
|---|---|
| 00:00 - 00:59 | 103 |
| 01:00 - 01:59 | 118 |
| 02:00 - 02:59 | 112 |
| 03:00 - 03:59 | 93 |
| 04:00 - 04:59 | 96 |
| 05:00 - 05:59 | 102 |

To create a dimension with hourly buckets as shown in this example:

1. Set **Data Type** to **Time**.

   For this dimension data type, DeepSee correctly handles properties of type %TimeStamp, %Time, or even a string with the format hh:mm:ss. You do not need to specify any conversion of format.

2. Click the **Ranges** tab.
3. For **Range Dimension Suffix**, type a string such as `Hours`.
4. Click **Update** to save your changes.

## 4.6.2 Creating Time Buckets by Parsing the Time as a String

You can also create the dimension data as string data and pick out the part to use as the dimension. For example:

| Birth Hour | Count |
|---|---|
| 00 | 113 |
| 01 | 112 |
| 02 | 104 |
| 03 | 120 |
| 04 | 98 |
| 05 | 113 |

To create such a dimension:

1. Set **Data Type** to **Values**.
2. For **Complex Code**, use an expression that extracts the part that you want to use as the dimension. For example, the following extracts the hour piece from a date in ODBC format:

   ```
   $PIECE($PIECE(##this.BirthDateTimeStamp," ",2),":",1)
   ```

3. Click **Update** to save your changes.

## 4.6.3 Defining Time Ranges

You can also create custom time ranges as in the following example:

| Birth Time (Ranges) | |
|---|---|
| *Birth Time* | Count |
| before 8 am | 849 |
| 8 am to 4 pm | 815 |
| 4 pm to midnight | 836 |

To create custom time ranges:

1. Set **Data Type** to **Values**.
2. If the source data is not expressed in terms of seconds since midnight, convert it to that format. For example, suppose that the property `BirthDate` contains dates in ODBC format (YYYY-MM-DD HH:MM:SS). To determine the number of seconds since midnight, you would use the following for **Complex Code**:

   ```
   $ZTIMEH($PIECE(##this.BirthDate," ",2),3)
   ```

3. Click the **Ranges** tab and define ranges. You can use Caché ObjectScript expressions for the **From** and **To** values. For example:

   | Caption | From | inclusive | To | inclusive |
   |---|---|---|---|---|
   | before 8 am | | ☐ | $ZTIMEH ("08:00",2) | ☐ |
   | 8 am to 4 pm | $ZTIMEH ("08:00",2) | ☑ | $ZTIMEH ("16:00",2) | ☐ |
   | 4 pm to midnight | $ZTIMEH ("16:00",2) | ☑ | | ☐ |

   The dimension has one member for each range that you define.

4. Click **Update** to save your changes.

**Note:** By default, the members of this dimension are sorted alphabetically, but when you use this dimension in a given pivot table, you can easily modify the sort order; see the chapter "Creating and Customizing Dimensions" in the book *Using the DeepSee Analyzer*.

# 4.7 Defining a Dimension Based on a Collection

In many cases, the BI-enabled class includes properties that contain collections. You can define dimensions based on collections. This section describes the following:

- How to use the Words dimension data type
- How to use the Words dimension data type with custom code
- How to use the M.C.B. feature with a list property
- How to use the M.C.B. feature with an array property
- How to interpret such dimensions

## 4.7.1 Using the Words Dimension Data Type

The simplest kind of collection is a space-separated list. The **Words** dimension data type removes non-alphanumeric characters (other than spaces) from the dimension data, parses the data into space-delimited words, and creates a member for each unique word. DeepSee considers case; for example, it treats `AllergyCode1` and `allergycode1` as different words. For example, suppose that your BI-enabled class included the property `FavoriteColors`, which might have values like the following:

- `Red`
- `Green Red`
- `Blue`
- `Pink Red`

If you use this property as a dimension and you set **Data Type** to **Words**, you create the members `Red`, `Green`, `Blue`, and `Pink`.

## 4.7.2 Using the Words Dimension Data Type with Complex Code

You may be able to convert a collection property to a space-separated list so that you can use the **Words** dimension data type. You might find it convenient to create class methods or routines to perform the conversion.

For example, suppose that your BI-enabled class represents patients and that it has a property called `Diagnoses`, which is an array. To create a dimension based on diagnoses, you could do the following:

1. Click the **Dim** tab.
2. Click **New** in the lower right area.

DeepSee automatically sets **Property** to the name of the BI-enabled class, and you should not change this.

3. For **Dimension Name**, type the dimension name.
4. For **Data Type**, click **Words**.
5. For **Complex Code**, type an expression that returns a space-separated list. For example:

   ```
   ##class(Dev.Utils).ArrayToString(##this.DiagnosesAsArray)
   ```

   This class method iterates through the array, extracts the values, and returns a string consisting of a space-separated list of the values.
6. Click **Add** in the lower right area.

The class method used here is defined as follows:

```
ClassMethod ArrayToString(input, delimiter As %String)
{
   If '$Data(delimiter) set delimiter=" "
   set string=""
   Set i=""
   for
      {
      Set i=input.Next(i)
      Quit:(i="")
      If i=1 {Set string=input.GetAt(i)}
      Else {Set string=string_delimiter_input.GetAt(i)}
      }

    If string="" Set string="None"
    Quit string
}
```

This technique is not suitable if the resulting string is longer than 32 kB (unless long strings are enabled). Also remember that non-alphabetic characters are stripped from the string and are not used in the dimension.

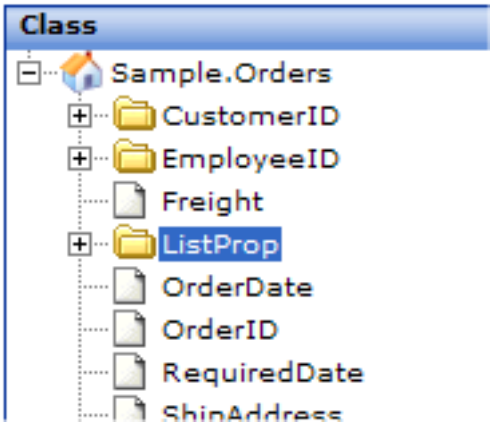
## 4.7.3 Using the M.C.B Feature with a List-type Property

To see how to use the **M. C. B. (Manual Child Browse)** feature, it is best to consider an example.

In this example, we have added (for demonstration purposes) a property to the `Samples.Orders` class. As seen in the Studio, the property definition is as follows:

```
Property ListProp As list Of %String;
```

Within the Architect, this property is shown as a folder:




For this example, to use this list property as a dimension:

1. Drag and drop the entire property folder from the **Class** list to the **Dimensions** table. This adds a dimension whose default name is the folder name.
2. Set **Data Type** to **Values**.
3. Click the **Manual Child Browse** tab. Here you specify how to iterate through the elements of the list and how to get the dimension data that corresponds to each element.

   You can access all elements of the list or a subset according to your own logic.
4. For **Loop Coding**, specify a fragment of Caché ObjectScript code that iterates through the list (or click **Sample** to insert an editable sample). For example:

   ```
   For wI=1:1:##this.ListProp.Count()  Do
   ```

   **Important:** You must include two spaces before **Do** and one space after **Do**. There must not be any empty lines after that.

   To refer to the list property, use the syntax **##this.***PropertyName* as shown.

   You can include complete statements before the fragment, but do not include manual line breaks. (That is, type on a single line within **Loop Coding**. The text wraps automatically so that you can see all of it.) For example:

   ```
   Set max=##this.ListProp.Count()  For wI=1:1:max  Do
   ```
5. For **Each Fetch**, specify one or more Caché ObjectScript statements that assign a value to the variable `val` (or click **Sample** to insert an editable sample). For example:

   ```
   Set val=##this.ListProp.GetAt(wI)
   ```

Your code can refer to the variables used in **Loop Coding**. If you use multiple statements, do not include manual line breaks. (That is, type on a single line within **Each Fetch**. The text wraps automatically so that you can see all of it.)

6. Click the **General** tab and then delete the contents of the second **Property** field.

   This step is optional, because this field is ignored if there is data on the **Manual Child Browse** tab.

Notice that in the **Dimensions** table, the **M.C.B.** check box becomes selected automatically for this dimension. This indicates that this dimension has information specified on the **Manual Child Browse** tab.

## 4.7.4 Using the M.C.B Feature with an Array-type Property

For an array-type property, you would use a similar technique.

For **Loop Coding**, you would use something like the following:

```
Set wI="" For  Set wI=##this.Categories.Next(wI) Quit:wI=""  Do
```

**Important:** You must include two spaces before **Set**. Also, there must be two spaces before **Do** and one space after **Do**. There must not be any empty lines after that.

To refer to the array property, use the syntax **##this.***PropertyName* as shown.

For **Each Fetch**, you would use something like the following:

```
Set val=##this.Categories.GetAt(wI)
```

## 4.7.5 Understanding Dimensions Based on Collections

When you use dimensions that are based on collections, it is important to remember that, as always, the items being counted are the items in the base class, not the items of the collection.

For example, a company generally has multiple employees, and each employee has a single home town. Suppose that your base class is Company, and suppose that you use **Manual Child Browse** to create a dimension called Employee Home Town.

If you performed a breakout by Employee Home Town, you might see a pivot table like the following:

| Employee Home Town | Count |
|---|---|
| Beverly | 4 |
| Cambridge | 59 |
| Dedham | 16 |
| ... | ... |

Because Company is the base class, this pivot table is counting companies. The row for Beverly indicates that 4 companies have at least one employee whose home town is Beverly. It does *not* indicate the number of employees who live in Beverly.

It is also important to remember that, as always, the items being correlated are the items in the base class, not the items of the collection. Let us expand the previous example by adding the Employee Gender dimension. If we add this dimension to the preceding pivot table, we might see this:

| | Female | Male |
|---|---|---|
| **Employee Home Town** | **Count** | **Count** |
| Beverly | 2 | 4 |
| Cambridge | 34 | 30 |
| Dedham | 8 | 7 |
| ... | ... | |

Let us examine the cells in the Beverly row. Notice that the count for Female and the count for Male total to more than the count for Beverly in the preceding example.

The Beverly, Female=2 cell means that there are two companies that have at least one employee living in Beverly and at least one female employee. There is no guarantee that these employees are the same people. If Teradyne Corp. has 1296 male employees who live in Beverly and one female employee who lives on Martha's Vineyard, that company is counted once for the Beverly, Female cell.

**Tip:** As you can see, the default measure name Count can be misleadingly generic. When you use this measure in a pivot table, It is good practice to rename it as appropriate for your base class (for example, Company Count or Companies). See "Defining Measures" in the book *Using the DeepSee Analyzer*.

# 4.8 Modifying a Dimension

In general, to modify the definition of a dimension:

1. Open a BI-enabled class as described in the previous chapter.
2. Click the **Dim** tab.
3. Click the dimension in the **Dimensions** table.
4. Make the changes.
5. Click **Update** to save your changes.

# 4.9 Controlling Whether a Dimension Is Selectively Rebuilt

The Architect provides an option to rebuild only a subset of the dimensions. Within the definition of each dimension, you specify whether that dimension is included within the selective rebuild. To do so:

1. Open a BI-enabled class as described in the previous chapter.
2. Click the **Dim** tab.
3. To enable this dimension to be rebuilt selectively, click the **Select** check box for the dimension in the **Dimensions** table.
4. Click **Update** to save your changes.

See "Rebuilding Selectively," earlier in this book.

# 4.10 Deactivating or Activating a Dimension

When you create a dimension, it is automatically activated. You can deactivate it so that it is no longer available in the Analyzer.

To deactivate or activate a dimension:

1. Open a BI-enabled class as described in the previous chapter.
2. Click the **Dim** tab.
3. Click the dimension in the **Dimensions** table.
4. To deactivate the dimension, clear the **Active** check box on the **General** tab.

   Or to activate the dimension, click the **Active** check box.
5. Click **Update** to save your changes.

# 4.11 Deleting a Dimension

To delete a dimension, do the following:

1. Open a BI-enabled class as described in the previous chapter.
2. Click the **Dim** tab or **Compound Mem** tab.
3. Click the dimension in the **Dimensions** table.
4. Click **Delete**. You are prompted to confirm this action.

# 4.12 Next Steps

After you define, modify, or delete a dimension, do the following to make your changes visible in the Analyzer:

1. Recompile and rebuild, as described in "Recompiling and Rebuilding" earlier in this book.
2. Define a subject area, as described later in this book.

   If you have added dimensions, make sure the subject area includes all dimensions (the default).

   When you define the subject area, make sure to give access to it to all suitable roles.
3. If the subject area is already open in the Analyzer, you may need to reopen it.

# 5

# Defining Special Dimensions

This chapter describes how to define special kinds of dimensions. It discusses the following topics

- How to create dynamic dimensions for use in filters
- How to create compound dimensions based on filter expressions
- How to make your changes visible in the Analyzer

Also see the chapter "Defining Dimensions."

## 5.1 Creating a Dynamic Dimension

A dynamic dimension is a dimension whose members are defined by Caché ObjectScript statements, using the value given by a filter at run time. Dynamic dimensions can be used only for filtering.

### 5.1.1 Run-time Filter Values

Before discussing how you create a dynamic dimension, it is useful to understand how filter values are available at run time:

- When you add a data element (such as a pivot table) to a dashboard, you can apply a hardcoded filter directly to it. In general, you specify a filter expression like the following example:

  ```
  [Ship Country = Canada]
  ```

  For syntax and other details, see the appendix "Expressions and Scripts in DeepSee Architect."

- You can configure a data control (such as a drop-down list or a text box) to act as a filter. You associate the data control with a dimension, so that DeepSee knows which dimension to use on

the left side of the filter expression. The user selects or enters a value, and that is used as the value on the right side of the filter expression.

In either case, at run time DeepSee obtains the value of the right side of the filter expression and writes that value to the variable PARAM, which you can use within any dynamic dimension.

## 5.1.2 Creating a Dynamic Dimension

You use the **Dyn Dim** tab to define dynamic dimensions. To define a dynamic dimension:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Dyn Dim** tab.

   The tab lists any dynamic dimensions that are already defined.
3. Right-click and then click **Add Line**.

   DeepSee adds a new, blank line to the table in this tab.
4. For **Dimension Name**, type the name of the dimension, exactly the same as you will use later in the filter. For example: `MyDim`
5. For **Script**, type a Caché ObjectScript statement that specifies which objects to use in the base BI-enabled class. This statement typically calls your custom routine or class method. In your custom code, do the following:
   - Use the variable named PARAM, which will contain the value used in the right-hand side of the filter expression.
   - To use one object in the base class, set the variable `val` equal to an ID of an object in the base class.
   - To use multiple objects in the base class, set nodes of the multidimensional array `OLIST`. For example, to use three objects:

     ```
     Set OLIST=3
     Set OLIST(1)=id1
     Set OLIST(2)=id2
     Set OLIST(3)=id3
     ```

     Where *objectid1*, *objectid2*, and *objectid3* are IDs.
   - If no ID is appropriate, set `val` or `OLIST` equal to null.
6. Click **Save**.

## 5.1.3 Example 1

In the `Sample.Orders` class, you might create a dynamic dimension as follows:

| Dimension Name | Script |
|---|---|
| MyDim | set val=PARAM |

Then in a pivot table or in a dashboard, you might use a filter like the following:

```
[MyDim = 10248]
```

At run time, the variable PARAM equals 10248. Then the definition of MyDim becomes set val=10248, which opens the Orders object that has the ID 10248.

### 5.1.4 Example 2

In the Sample.Orders class, you might create a dynamic dimension as follows:

| Dimension Name | Script |
|---|---|
| MyDim2 | set OLIST=3, OLIST(1)=PARAM, OLIST(2)=PARAM+1, OLIST(3)=PARAM+2 |

Then in a pivot table or in a dashboard, you might use a filter like the following:

```
[MyDim = 10248]
```

At run time, DeepSee retrieves the orders with ID 10248, 10249, and 10250.

## 5.2 Creating a Compound Dimension

A compound dimension is a dimension whose members are defined by DeepSee filter expressions. You use these in two different cases:

- If you want to group data at a higher level than is directly supported by the object model. In such a case, you can define a dimension whose members are groups of lower-level data. For example, you can define the continent dimension. The North American member would be defined by a filter that selected the North American ship countries. For example:

  ```
  [Ship Country = Canada] OR [Ship Country = Mexico]
  OR [Ship Country = USA]
  ```

- If you want to define a dimension whose members are determined by complex logic.

  For example:

  ```
  [Item Group = ABC] AND [Item Status IN Planned,Executed]
  ```

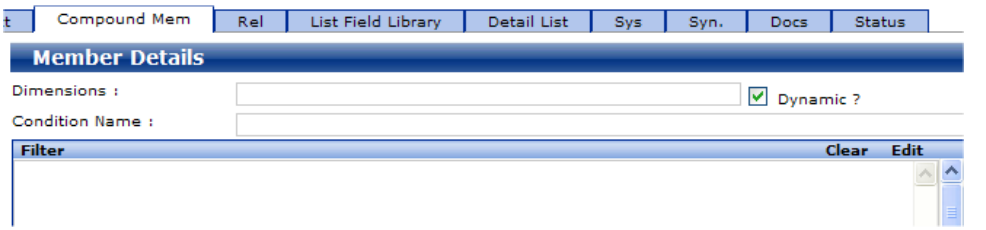
In either case, you define each member separately with its own filter expression:

A compound dimension can be indexed (and thus available for use as columns or rows), but does not have to be.

You use the **Compound Mem** tab to define compound dimensions. To define a compound dimension:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Compound Mem** tab.

   The left side of the page lists any compound dimensions that are already defined, along with their members.
3. Click **New** in the lower right, to ensure that any existing data is cleared.




4. For **Dimensions**, type the name of the new dimension. For example: Continent.
5. Optionally clear the **Dynamic?** check box if you want this dimension to be indexed (dynamic dimensions are not indexed).
6. For **Condition Name**, type the name of a member of this dimension. For example: North America.
7. In the **Filter** box, type a filter expression that selects the data for this member. For example:

   ```
   [Ship Country = Canada] OR [Ship Country = Mexico]
   OR [Ship Country = USA]
   ```

   Or click the **Edit** option and define the filter expression interactively. For syntax and other details, see the appendix "Expressions and Scripts in DeepSee Architect."
8. Click **Add**.

   Repeat as needed until you have defined all members.

# 5.3 Next Steps

After you define, modify, or delete a dynamic or a compound dimension, do the following to make your changes visible in the Analyzer:

1. Recompile, as described in "Recompiling and Rebuilding" earlier in this book.
2. Define a subject area, as described later in this book.

   If you have added dimensions, make sure the subject area includes all dimensions (the default).

   When you define the subject area, make sure to give access to it to all suitable roles.
3. If the subject area is already open in the Analyzer, you may need to reopen it.

# 6

# Defining Relationships between Dimensions

Where appropriate, you use the **Rel** tab to define relationships between dimensions, which improves performance when you use the dimensions together.

For example, suppose that you create one dimension based on a unique item code and another dimension based on the corresponding unique item description. In this case, you should also define a one-to-one relationship between these dimensions.

This chapter describes how to define relationships between dimensions.

## 6.1 Defining a Relationship

To define a relationship between dimensions, do the following:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Rel** tab.

   The tab lists any relationships that are already defined.
3. Right-click and then click **Add Line**.
4. Double-click in the row, within the column for **Source Dimension**. DeepSee then displays a drop-down list of the dimensions (not including any dynamic dimensions).
5. Click a dimension in the column for **Source Dimension**.
6. Double-click in the row, within the column for **Relationship**. DeepSee then displays a drop-down list of the available types of relationships: **Parent of**, **One to One**, **Many to Many**

7. Click a relationship type.
8. Double-click in the row, within the column for **Target Dimension**. DeepSee then displays a drop-down list of the dimensions (not including any dynamic dimensions).
9. Click a dimension in the column for **Target Dimension**.
10. Click **Save**.

For example, the following relationship states that the `Home ZIP` dimension is the parent of the `Home City` dimension:

| Source Dimension | Relationship | Target Dimension |
|---|---|---|
| Home ZIP | Parent of | Home City |

# 6.2 Next Steps

After you define, modify, or delete a relationship, do the following to make your changes visible in the Analyzer:

1. Recompile and rebuild, as described in "Recompiling and Rebuilding" earlier in this book.
2. Define a subject area, as described later in this book.

   When you define the subject area, make sure to give access to it to all suitable roles.
3. If the subject area is already open in the Analyzer, you may need to reopen it.

# 7

# Defining Measures

This chapter describes how to define measures in the Architect. You can define additional measures within the Analyzer, using these measures as a basis.

Also see "Defining Custom Aggregates for Use in Measures," later in this book, and see the chapter "Using Other Tables to Define Dimensions, Measures, and Listing Fields."

## 7.1 The Default Measure

DeepSee automatically creates a default measure called `Count`. This measure is not visible in the Architect, but is available in the Analyzer, in pivot tables, and in dashboards.

The `Count` measure counts the number of records (from the base class) used in any context. For example, if you create a pivot table in the Analyzer without specifying any dimensions or measures, the Analyzer displays the following, which indicates the number of records in the subject area:

| | Count |
|---|---|
| All | 830 |

When you use the `Count` measure in the Analyzer, It is good practice to rename it as appropriate for your base class. For example, if the base class is Orders, you could rename `Count` to `Orders` or `Order Count`. See "Defining Measures" in the book *Using the DeepSee Analyzer*.

# 7.2 Defining a Measure

To define a measure, define a dimension as described in "Defining a Dimension: The Basics." When you do so, make sure of the following:

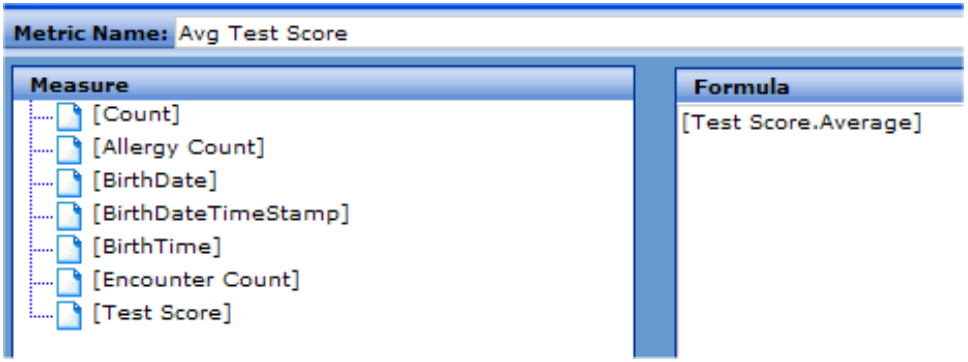
- Use a numeric field or a numeric-valued expression as the dimension data. (All measures are based on numeric data.)
- For **Data Type**, choose **Number**.
- Use a unique name for the measure name. Note that the name of the measure cannot be the same as the name of any dimension. Otherwise, the measure is not available in the Analyzer. Also, the measure name can use only alphanumeric characters.
- When you define a measure in the Architect, DeepSee truncates any data after two decimal places, so that the measure can also be used as a dimension. If this is undesirable, use the following workaround: Within the measure definition in Architect, apply a multiplicative factor to it, such as 100. Then in the Analyzer, create a new measure that divides this measure by that same factor.

By default, the measure is aggregated by summing. Within the Analyzer, you can redefine it to aggregate in a different way (such as by averaging). Also in the Analyzer, you can use this measure as the basis of another measure.

# 7.3 Next Steps

After you define, modify, or delete a measure, do the following to make your changes visible in the Analyzer:

1. Recompile and rebuild, as described in "Recompiling and Rebuilding" earlier in this book.
2. If you have not yet done so, define a subject area, as described later in this book. Be sure to give access to it to all suitable roles.
3. If the subject area is already open in the Analyzer, you may need to reopen it.
4. In the Analyzer, optionally create additional measures based on the measures you created in the Architect. For example:




For **Formula**, specify a Caché ObjectScript expression in which the syntax `[measure name]` represents a measure.

When you define a measure in the Analyzer, you specify how to aggregate it; you can sum the values, average them, select the highest or lowest, and so on.

For information, see *Using the DeepSee Analyzer*.

# 8

# Defining Subject Areas

This chapter describes how to create subject areas. It discusses the following topics:

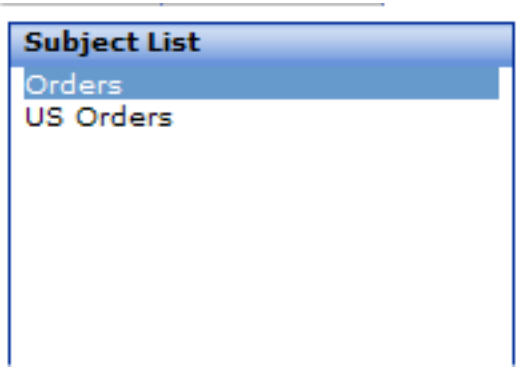
- An overview of the Subject tab
- The basic process to define a subject area
- How to modify a subject area in general
- How to filter a subject area
- How to specify the roles that have access to a subject area
- How to specify dimension-to-dimension drill options
- How to specify the dimensions included in a subject area
- How to define custom aggregates for use in measures
- How to activate or deactivate a subject area
- How to delete a subject area
- How to make your changes visible in the Analyzer

## 8.1 Overview of the Subject Area Tab

You use the **Subject** tab to define, redefine, and delete subject areas. This screen has two main areas.

### 8.1.1 Subject List

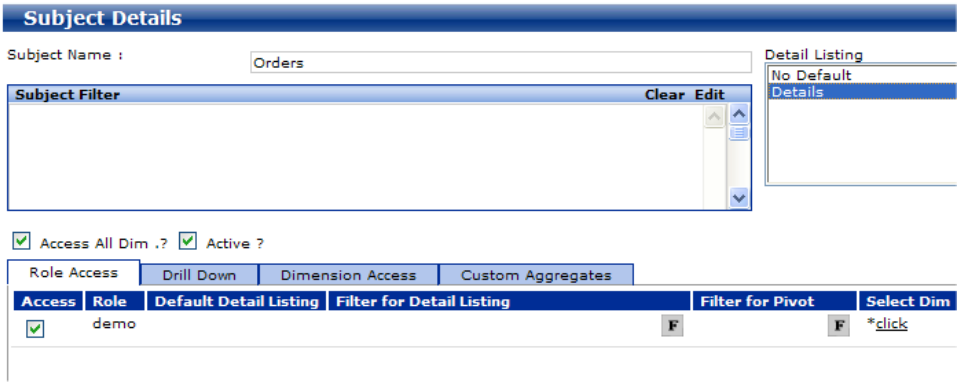
The left area lists the subject areas that have already been defined.




Here you click the subject area that you want to work on.

## 8.1.2 Subject Details

The right area displays details for the currently selected subject area.




The following table summarizes the options. Unless otherwise noted, the sections listed here are in this chapter.

*Options for Subject Areas*

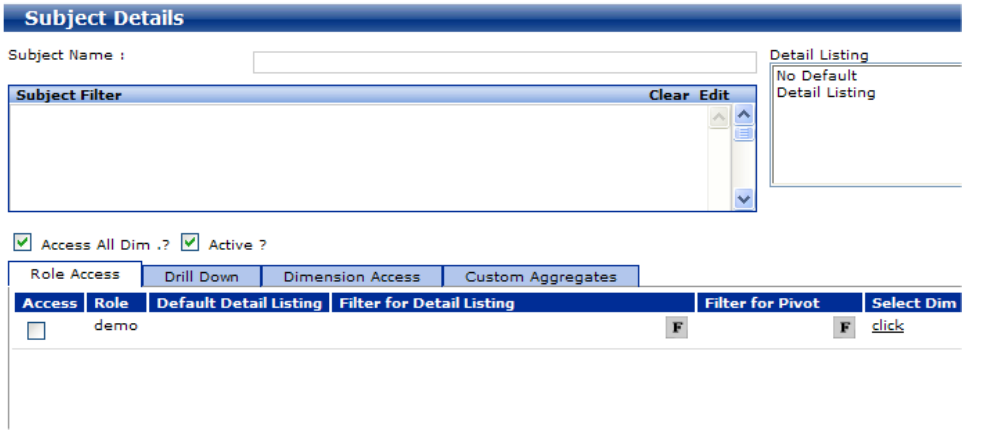
| Option | Purpose |
|---|---|
| **Subject Name** | Name of currently selected subject area; you can change this name. |
| **Detail Listing** | This list shows all the available detail listings. The highlighted detail listing is the default detail listing, if any, for this subject area. |

| Option | Purpose |
|---|---|
| **Subject Filter** options | Optionally specifies how this subject area is filtered. See "Filtering a Subject Area." |
| **Access All Dim.** check box | Controls whether the subject area includes all dimensions. See "Specifying the Available Dimensions in a Subject Area." |
| **Active?** check box | Controls whether this subject area is active (visible in the Analyzer). When you create a subject area, it is active by default. See "Deactivating or Activating a Subject Area." |
| **Role Access** tab | Lists the roles that have access to this subject area. See "Specifying Role Access to a Detail Listing." |
| **Drill Down** tab | Optionally defines the dimension-to-dimension (double-click) drill options available in this subject area. See "Defining Dimension-to-dimension Drill Options." |
| **Dimension Access** tab | Optionally specifies the subset of dimensions included in this subject area. See "Specifying the Available Dimensions in a Subject Area." |
| **Custom Aggregates** tab | Optionally specifies custom aggregates, for use in defining measures. See "Defining Custom Aggregates for Use in Measures." |

# 8.2 Defining a Subject Area: The Basics

This section describes the basic method for defining a subject area:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click **New** in the lower right, to ensure that the screen is clear.




4. In **Subject Area**, type the name of this subject area.
5. In **Detail Listing**, optionally click the detail listing to use as the default within this subject area.
6. On the **Role Access** tab, click the check box next to each role that should have access to this subject area.

   By default, no roles are selected.
7. Click **Add**.

This new subject area has access to all the dimensions associated with the BI-enabled class and all the data that is currently in the database. You can immediately use the subject area in the Analyzer.

# 8.3 Modifying a Subject Area

In general, to modify the definition of a subject area:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click the subject area in the **Subject List** area.
4. Make the changes.
5. Click **Update** to save your changes.

# 8.4 Filtering a Subject Area

By default, a subject area provides access to all records in the associated tables. You can filter a subject area to restrict the number of records that it can access, for security or for performance.

To filter a subject area:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click the subject area in the **Subject List** area.
4. In the **Filter** box, type a filter expression that selects the data for this subject area. For example:

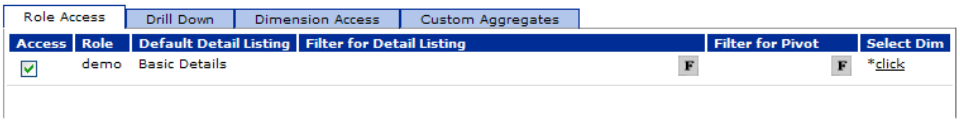
   ```
   [Ship Country = Canada]
   ```

   Or click the **Edit** option and define the filter expression interactively. For syntax and other details, see the appendix "Expressions and Scripts in DeepSee Architect."

# 8.5 Specifying Role Access to a Subject Area

To specify the roles that have access to a subject area:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click the subject area in the **Subject List** area.
4. Click the **Role Access** tab.
5. Click the check box next to each role that should have access to this subject area. Clear the check box for any roles that should not have access.




6. Click **Save**.

### 8.5.1 Advanced Role Options

You can also make the following additional changes in the row for a given role:

- In the **Default Detail Listing** field, double-click to display the drop-down list. Then select a detail listing to use as the default for users of this role. This option overrides the default detail listing for the subject area.
- In the **Filter for Detail Listing** field, type a filter expression to be applied to any detail listing that is displayed by users of this role. Or click the **F** option and define the filter expression interactively.
- In the **Filter for Pivot** field, type a filter expression to be applied to any pivot table that is displayed by users of this role. Or click the **F** option and define the filter expression interactively.

For filter syntax and other details, see the appendix "Expressions and Scripts in DeepSee Architect."

You can also filter the subject area itself; see "Filtering a Subject Area."

## 8.6 Defining Dimension-to-dimension Drill Options

DeepSee provides support for dimension-to-dimension drill through. For example, a user might double-click on a ship date year in a pivot table and immediately see a drill through by ship date month, for that year.

Or, if the user is viewing the pivot table in graph mode, the user might right-click a year and select **Drill Down**. DeepSee would then display a graph showing the ship date months for that year.

In either case, if more than one drill option is available, DeepSee displays a list of the available options, and the user can choose one.

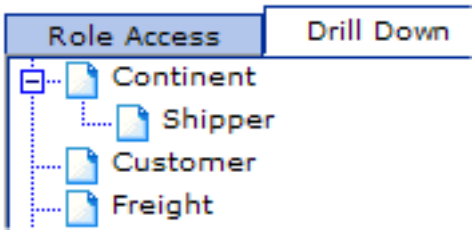
This type of drilling is configured separately for each dimension; that is, the available behavior is potentially different for each dimension.

To define dimension-to-dimension drill options:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click the subject area in the **Subject List** area.
4. Click the **Drill Down** tab. This tab displays all dimensions in the subject area.

   **Note:** Despite the tab name, here you are defining drill through, not drill down.

5. To enable drill options in a given dimension, drag and drop other dimensions to that dimension. For example, drag and drop Shipper to Continent. Then you see the dimension that you dragged shown as a node beneath the dimension you dragged it to; for example:




6. Click **Update** to save your changes.

# 8.7 Specifying the Available Dimensions in a Subject Area

By default, when you create a subject area, it includes all dimensions that are defined for the BI-enabled classes. You can define the subject area so that it includes only a subset of those. To do so:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click the subject area in the **Subject List** area.
4. Clear the **Access All Dim.** check box.
5. Click the **Dimension Access** tab. This tab displays all dimensions that are defined for the BI-enabled classes.
6. Click the check box for each dimension to include in this subject area.
7. Click **Update** to save your changes.

# 8.8 Defining Custom Aggregates for Use in Measures

A subject area can include *custom aggregates*. A *custom aggregate* uses a Caché ObjectScript expression to retrieve data directly from the globals that store data for your application. When you define custom aggregates, they are available as additional building blocks within the measures editor in the DeepSee Analyzer (in addition to `Count`, for example).

To define a custom aggregate:

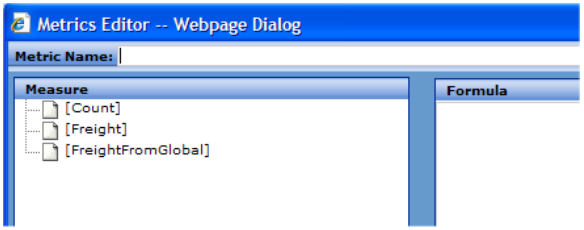
1. Make sure you understand the structure of the globals that store your data.
2. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
3. Click the **Subject** tab.
4. Click the subject area in the **Subject List** area.
5. Click the **Custom Aggregates** tab.
6. Right-click and then click **Add Line**. A new, empty line is added to the table on this tab.

   Click within this line and type.
7. For **Aggregate Name**, specify a user-friendly name (for example `FreightFromGlobal`). Any user who is going to define measures in the Analyzer should be able to understand what this custom aggregate is.

   **Note:** Do not use spaces in the name. (If you do, the custom aggregate cannot be used.)
8. For **Aggregate Access Code**, specify a Caché ObjectScript expression that retrieves data from the appropriate global. In this expression, use `Id` to refer to the object ID. For example:

   ```
   $LG(^Sample.OrdersD(Id),4)
   ```
9. Click **Update** to save your changes.

The new custom aggregate is shown in the measures editor in the DeepSee Analyzer as follows:



# 8.9 Deactivating or Activating a Subject Area

When you create a subject area, it is automatically activated. You can deactivate it so that it is no longer available in the Analyzer.

To deactivate or activate a subject area:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click the subject area in the **Subject List** area.
4. To deactivate the subject area, clear the **Active?** check box.

   Or to activate the subject area, click the **Active?** check box.
5. Click **Update** to save your changes.

# 8.10 Deleting a Subject Area

To delete a subject area:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Subject** tab.
3. Click the subject area in the **Subject List** area.
4. Click **Delete**.

# 8.11 Next Steps

After you define, modify, or delete a subject area, your changes are usually immediately visible in the Analyzer.

If the subject area is already open in the Analyzer, in some cases, you may need to reopen it.

# 9

# Defining Listing Fields

This chapter describes how to create listing fields. It discusses the following topics:

- An overview of the List Field Library tab
- The basic process to define a listing field
- How to modify a listing field
- How to specify the data on which a listing field is based, particularly if you do not want to base it on a single class property as in the basic technique
- How to choose a data type for a listing field
- How to control whether a listing field is included in the subset that can be selectively rebuilt
- How to activate or deactivate a listing field
- How to delete a listing field
- How to make your changes visible in the Analyzer

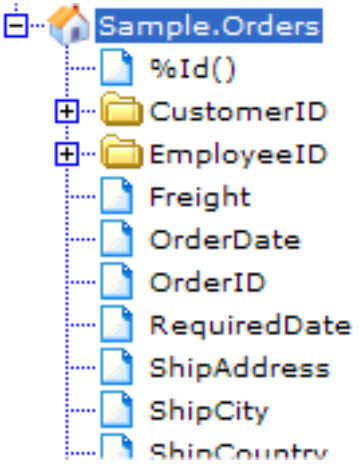
Also see the chapter "Using Other Tables to Define Dimensions, Measures, and Listing Fields."

## 9.1 Overview of the List Field Library Tab

You use the **List Field Library** tab to add, modify, and delete the independent listing fields; it does not display the dimension-type listing fields. This tab has three main areas.

### 9.1.1 Class Hierarchy

The class hierarchy on the left shows the BI-enabled classes you are working with.




Here you can do the following:

- Expand a collapsed folder by clicking the plus sign (+) to its left.
- Collapse an expanded folder by clicking the minus sign (-) to its left.
- Double-click a property to create a new listing field definition based on it.
- Drag and drop a property, instance method, or SQL shortcut to the **Listing Field** table on the right, to create a new listing field definition based on it.

  Any instance methods are shown alphabetically after the properties.

## 9.1.2 Listing Field Table

The **Listing Field** table on the right summarizes the currently defined independent listing fields:

**Listing Field**

| Fields Caption | Property | Data Type | Active | Complex |
|---|---|---|---|---|
| OrderID | OrderID | Text | ☑ | ☐ |
| Order Date | OrderDate | Text | ☑ | ☐ |
| Ship Date | ShippedDate | Text | ☑ | ☐ |

Each row corresponds to a listing field. Here you click the listing field that you want to work on.

- **Fields Caption** is the name of the listing field, as seen in any detail listings that include it. When you first create a listing field, this is the same as the name of the property, instance method, or SQL shortcut.

- **Property** is the property or instance method on which it is based. This field is empty if the listing field is based on complex code.

  If you use an SQL shortcut, **Property** shows the property used in that shortcut.

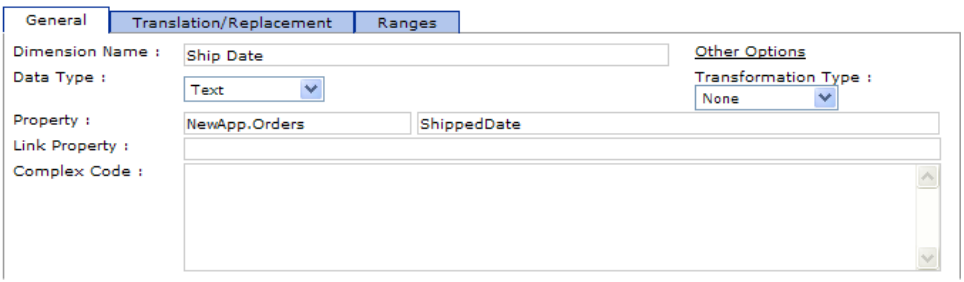
- **Data Type** controls how the data is displayed. The data type is set automatically based on the data type of the field you are using, but you can change it. See "Specifying the Data Type for a Listing Field."

- **Active** controls whether this listing field is active (visible in the Analyzer and in pivot tables). When you create a listing field, it is active by default. See "Deactivating or Activating a Listing Field" later in this chapter.

- **Complex** indicates whether this dimension is based on a Caché ObjectScript expression. See "Specifying the Data on Which a Listing Field Is Based" later in this chapter.

## 9.1.3 Tabs

The tabs in the lower right display details about the currently selected listing field:




The following table summarizes the options on these tabs. Unless otherwise noted, the sections listed here are in this chapter.

*Options on the List Field Library Tabs*

| Option | Purpose |
|---|---|
| **General** tab: **Other Options** link | Provides miscellaneous options. See "Deactivating or Activating a Listing Field" and "Controlling Whether a Listing Field Is Selectively Rebuilt." |
| **General** tab: **Data Type** option | Controls how the data is displayed. The data type is set automatically based on the data type of the field you are using, but you can change it. See "Specifying the Data Type for a Listing Field." |

| Option | Purpose |
|---|---|
| **General** tab: **Transformation Type** option | Applies a transformation that affects how the listing field data is defined and displayed. See the chapter "Using Replacements, Ranges, and Transformations." If you apply a transformation, you generally do not use the **Translation/Replacement** and **Ranges** tabs. |
| **General** tab: **Property** field and **Complex Code** field | Specifies the data on which this listing field is based. See "Specifying the Data on Which a Listing Field Is Based." |
| **Translation/Replacement** tab | Defines a set of replacements that alter the listing field data. See the chapter "Using Replacements, Ranges, and Transformations." |
| **Ranges** tab | Defines a set of ranges to display instead of the listing field data (applies only to numeric-valued listing fields). See the chapter "Using Replacements, Ranges, and Transformations." |

# 9.2 Defining a Listing Field: The Basics

Listing fields and dimensions are defined in similar ways; the difference is that a dimension definition includes more information than the listing field definition. Sometimes you want to define both a dimension and a listing field using the same basic definition; the Architect provides a couple of ways to do this.

As a result, there are two general kinds of listing fields:

- A *dimension-type listing field* is a listing field whose definition is owned by a dimension definition. If you redefine the dimension, the listing field is automatically redefined as well. (Similarly, if you delete the dimension, the listing field is automatically deleted.)

  The data used by the listing field is stored in a DeepSee global, which means that its performance is fast. This kind of listing field, however, requires more disk space than the other kind.

  To define this kind of listing field, when you define the dimension, click the **Listing Field** check box. See the subsection "Creating a Dimension-type Listing Field."

- An *independent listing field* is a listing field that has an independent definition (not dependent on the definition of any dimension).

  For this kind of listing field, DeepSee does not access the data until the user displays the detail listing; then DeepSee directly accesses the source data.

You can define this kind of listing field in a couple of equivalent ways:

- You can copy a dimension definition and use it as the basis of a listing field definition, which you can then modify. That is, right-click the dimension definition and then click **Add To Listing Fields** or **Add All To Listing Fields**. See the subsection "Creating an Independent Listing Field by Copying a Dimension." Then if you redefine or delete either the dimension or the listing field, the other is unaffected.
- You can create a listing field definition from scratch. See the subsection "Creating an Independent Listing Field from Scratch."

## 9.2.1 Creating a Dimension-type Listing Field

To use a dimension as a listing field:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Dim** tab.
3. Click the dimension in the **Dimensions** table to select it.
4. In the **General** tab, click the **Listing Field** check box.

   Notice that at the top of the page, the **Listing** check box is checked; this indicates that this definition specifies both a dimension and a listing field.
5. Click **Update** to save your changes. The listing field is now created.

## 9.2.2 Creating an Independent Listing Field by Copying a Dimension

To create independent listing fields by copying one or more dimension definitions:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Dim** tab.
3. Then do one of the following:
   - To copy the dimension definition, right-click the dimension in the **Dimensions** table and click **Add To Listing Fields**.
   - To copy all the dimension definitions, right-click anywhere in the **Dimensions** table and click **Add All To Listing Fields**.

     If you already have a dimension-type listing field that uses a given dimension, that dimension is ignored. You can, however, copy the definition for that dimension by using **Add To Listing Fields**; see the previous bullet.

The definition or definitions are copied immediately.

4. Click the **List Field Library** tab and make edits as needed.

## 9.2.3 Creating an Independent Listing Field from Scratch

To define an independent listing field manually, do the following:

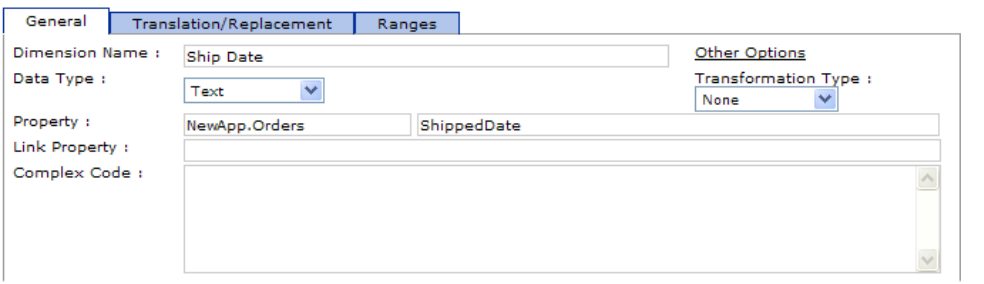
1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **List Field Library** tab.

   Although it is useful to become acquainted with all the options on this tab, in many cases you can define listing fields very simply, without knowing these options in detail. This section describes the basic method, which is a suitable start in all cases:
3. Expand the class hierarchy in the left area so that you can see the class property that you want to use.
4. Drag and drop the property, instance method, or SQL shortcut from the class hierarchy to the **Listing Field** table on the right. Or double-click the property, instance method, or SQL shortcut.

   In either case, the **Listing Field** table now includes a listing field that is based on your selection. For example:


5. Click this new row so that it is selected. The bottom right area of the page then shows details.
6. Optionally rename the listing field by changing the value in **Dimension Name** on the **General** tab. This name is shown in the Analyzer and is also used as the default column header in the detail listings. The name should make sense on its own; notice that it does not indicate the table that owns this property.

   For example, you might rename this listing field to Ship Date:



7. Optionally make additional changes as described in the rest of this chapter.
8. Click **Update** to save your changes.

# 9.3 Modifying a Listing Field

The way to modify a listing field depends on its type:

- If the listing field is a dimension-type listing field, modify the dimension definition. See "Modifying a Dimension," earlier in this book.
- If the listing field is an independent listing field, modify its definition on the **List Field Library** tab, as described in the following steps.

In general, to modify the definition of an independent listing field:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **List Field Library** tab.
3. Click the listing field in the **Listing Fields** table.
4. Make the changes.
5. Click **Update** to save your changes.

To modify the definition of a dimension-type listing field, modify the dimension itself. See the chapter "Defining Dimensions."

# 9.4 Specifying the Data on Which a Listing Field Is Based

In general, a listing field of any kind is based on data in the same way that a dimension is. There are two cases:

- A listing field can be based on a single class property, instance method, or SQL shortcut.
- A listing field can be based on a Caché ObjectScript expression, possibly using multiple class properties.

The techniques are the same as they are for dimensions. See the section "Basing a Dimension on a Caché ObjectScript Expression," earlier in this book.

# 9.5 Specifying the Data Type for an Independent Listing Field

The data type of a listing field affects how its data is displayed. To specify the data type for an independent listing field, choose a value for **Data Type** on the **General** tab. Depending on your choice, the page then shows another field that you can use to specify an appropriate formatting option.

The following table describes the options.

In the following table, the phrase "dimension data" refers to the data on which the dimension is based (whether that is a single field or an expression).

*Data Types for Listing Fields*

| Listing Field Data Type | Purpose and Comments |
|---|---|
| **Text** | Displays the data as text.<br>This is recommended for date values other than Caché dates. |
| **Check Box** | Display a check box instead of the data:<br>• The check box is cleared if the data equals 0 or false.<br>• The check box is selected if the data equals 1 or true. |
| **CacheDate** | Displays the data as a date. If you select this, the system displays a drop-down list that you can use to select a display style. This is suitable for use with Caché date-type data (dates in **$HOROLOG** format). |
| **CacheTime** | Displays the data as time. If you select this, the system displays a drop-down list that you can use to select a display style. |
| **Number** | Displays the data as a number. |
| **Currency** | Displays the data as currency. If you select this, the system displays another field in which you can type the number of decimal places to display. The default is 1. |

# 9.6 Controlling Whether a Listing Field Is Selectively Rebuilt

The Architect provides an option to rebuild only a subset of the listing fields. Within the definition of each listing field, you specify whether that listing field is included within the selective rebuild. To modify this for an independent listing field:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **List Field Library** tab.
3. Click the listing field.
4. On the **General** tab, click the **Other Options** link, which displays a dialog box.
5. To enable this listing field to be rebuilt selectively, click **Selective Rebuild** and click **OK**.
6. Click **Update** to save your changes.

For a dimension-type listing field, the listing field is rebuilt selectively if the dimension is rebuilt selectively. See the chapter "Defining Dimensions."

See "Rebuilding Selectively," earlier in this book.

# 9.7 Deactivating or Activating a Listing Field

When you create a listing field, it is automatically activated. You can deactivate it so that it is no longer available in the Analyzer.

To deactivate or activate an independent listing field:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **List Field Library** tab.
3. Click the listing field.
4. On the **General** tab, click the **Other Options** link, which displays a dialog box.
5. To deactivate the listing field, clear the **Active?** check box.

   Or to activate the listing field, click the **Active?** check box.
6. Click **OK** to exit the dialog box.
7. Click **Update** to save your changes.

To deactivate or activate a dimension-type listing field, deactivate or activate the dimension. See the chapter "Defining Dimensions."

# 9.8 Deleting a Listing Field

To delete an independent listing field, do the following:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **List Field Library** tab.
3. In the upper right area, click the listing field.
4. Click **Delete** to save your changes. You are prompted to confirm this action.

To delete a dimension-type listing field, do one of the following:

- Delete the dimension.
- Modify the dimension and clear the **List Field** check box on the **General** tab.

See the chapter "Defining Dimensions."

# 9.9 Next Steps

After you define, modify, or delete any kind of listing field, do the following to make your changes visible in the Analyzer:

1. Recompile and rebuild, as described in "Recompiling and Rebuilding" earlier in this book.
2. If you have not yet done so, define a subject area, as described later in this book.

   When you define the subject area, make sure to give access to it to all suitable roles.
3. If you have added a listing field, add it to a detail listing, as described in the next chapter.
4. If you have deleted a listing field, remove it from all detail listings, as described in the next chapter.
5. If the subject area is already open in the Analyzer, you may need to reopen it.

# 10

# Using Other Tables to Define Dimensions, Measures, and Listing Fields

The preceding chapters describe how to define dimensions, measures, and listing fields that are based on properties that are in the base class or in classes that are related to it by property relationships.

Sometimes, however, it is necessary to access properties in other tables, properties that you cannot access via dot syntax. This chapter describes the techniques for doing so:

- Using complex code and embedded SQL
- Using a class query

## 10.1 Using Complex Code and Embedded SQL

You can use the following technique to define a dimension, measure, or listing field on a property in a table that is external to the base class:

1. Write a class method or a routine that uses embedded SQL to access the external property.
2. Use **Complex Code** to invoke that method or routine.

For example, suppose that the base class is `EPI.Patient`, and suppose that another class `EPI.PatientDetails` contains properties that you want to use as a dimension. There is no direct

relationship between these classes; that is, you cannot access properties of `EPI.PatientDetails` from `EPI.Patient` via dot syntax.

Instead, in both classes, the property `PatientID`, which is not the primary key, identifies the patient.

You could write a method like the following:

```
ClassMethod GetFavoriteColor(patientID As %String) As %String
{
    &sql(SELECT FavoriteColor INTO :FavoriteColor FROM EPI.PatientDetails
         WHERE PatientDetails.PatientID=:patientID)
    If (SQLCODE=0) {
        Quit FavoriteColor
        }
        Else {
            Quit "None"
        }
}
```

Then you could define a dimension as follows:

- **Dimension Name**: `Favorite Color`
- **Property** (first field): `EPI.Patient`
- **Property** (second field): empty
- **Complex Code**:

  ```
  ##class(EPI.UtilsForSubjectArea).GetFavoriteColor(##this.PatientID)
  ```

The method is executed when the indices are generated.

**Tip:** To make this method run more quickly, be sure to add an index to the child table, on the field that you are using in the SELECT statement. In the example here, add an index to `PatientID` in the `PatientDetails` table.

# 10.2 Using a Class Query

You can use the following technique to define a dimension or measure on a property in a table that is external to the base class:

1. Create a class that inherits from %RegisteredObject and %BI.Adaptor.
2. In this class, create a query that selects the desired fields. This query must specify which field is the ID field.

   The class definition should include only one query. DeepSee ignores additional queries.
3. In the Architect, use those fields as dimensions or measures.

**Note:** You cannot use the fields as listing fields.

This technique is also useful if you cannot modify the base class, if you have an existing complex query that you want to use, or if you want to combine multiple classes via an SQL UNION.

For example:

```
Class DeepSee.FilmQuery Extends (%RegisteredObject, %BI.Adaptor)
{

Query Films() As %SQLQuery(CONTAINID = 1)
{
 SELECT Title,Category->CategoryName,Rating,TicketsSold FROM Cinema.Film
}

}
```

In this example, the `Title` field is the ID field, which we indicate in the query by including `CONTAINID = 1`.

When you open this class in the Architect, you see the following:

Each field in the query is available for use as a dimension or (if numeric) a measure. You cannot, however, use these fields as listing fields.

For another example, suppose that `EPI.Patient` contains unique patient records, and that `EPI.PatientSet2` contains an additional set of unique patient records (perhaps that come from a different source). To perform analysis on the combined set of patients, you could create an additional class like the following:

```
Class EPI.PatientClassQuery Extends (%RegisteredObject, %BI.Adaptor)
{

Query Patients() As %SQLQuery(CONTAINID = 1)
{
 SELECT PatientID,Age,Gender,TestScore FROM EPI.Patient
 UNION ALL
 SELECT PatientID,Age,Gender,TestScore FROM EPI.PatientSet2
}

}
```

The class query is executed when the indices are generated.

# 11

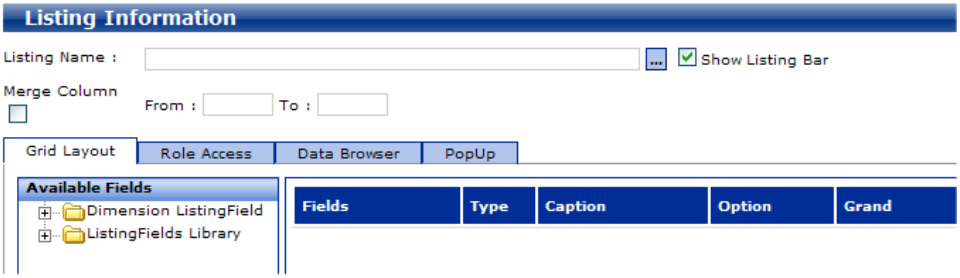
# Defining Detail Listings

This chapter describes how to create detail listings. It discusses the following topics:

- An overview of the Detail List tab
- The basic process to define a detail listing
- How to modify a detail listing in general
- How to modify the layout of a detail listing
- How to add summary lines to a detail listing
- How to specify the roles that have access to a detail listing
- How to add a link from one detail listing to another
- How to add a link from a detail listing to a URL
- How to delete a detail listing
- How to make your changes visible in the Analyzer

## 11.1 Overview of the Detail List Library Tab

You use the **Detail List** tab to define, redefine, and delete detail listings.




The **Listing Name** field shows the name of currently selected detail listing. To select a detail listing, click the browse button (...), click the detail listing, and then click **OK**.

The following table summarizes the other options. Unless otherwise noted, the sections listed here are in this chapter.

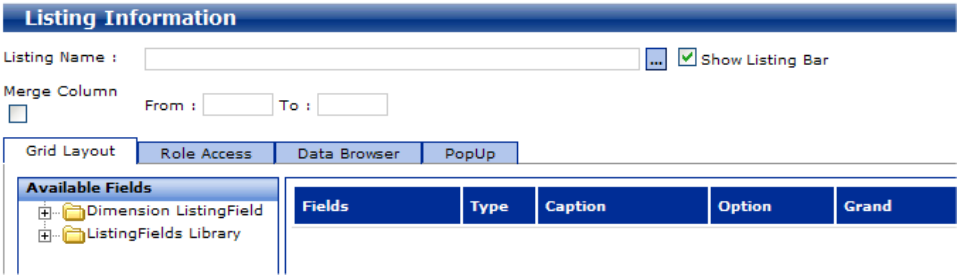
*Options for Detail Listings*

| Option | Purpose |
|---|---|
| **Show Listing Bar** option | Controls whether the title bar is shown within this detail listing. |
| **Grid Layout** tab | Lists the listing fields in this detail listing, in order. See "Modifying the Layout of a Detail Listing" and "Adding Summary Lines to a Detail Listing." |
| **Role Access** tab | Lists the roles that have access to this detail listing. See "Specifying Role Access to a Detail Listing." |
| **Data Browser** tab | Lists the detail listings to which the user can jump, from within this detail listing. See "Adding a Link to Another Detail Listing." |

# 11.2 Defining a Detail Listing: The Basics

You define detail listings on the **Detail List** tab. Although it is useful to become acquainted with all the options on this tab, in many cases you can define detail listings very simply, without knowing these options in detail. This section describes the basic method, which is a suitable start in all cases:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.




3. In **Listing Name**, type the name of this detail listing.
4. Optionally clear **Show Listing Bar** if you do not want to include the title bar within this detail listing.
5. In **Available Fields**, expand the two folders so that you can see all the available listing fields.

   The **Dimension ListingField** folder lists the listing fields that are based directly on dimension definitions. The **ListingFields Library** folder lists the listing fields that you created manually on the **List Field Library** tab.

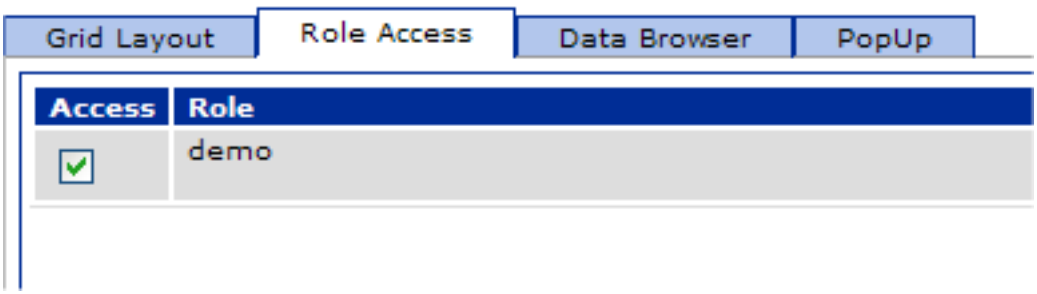
   **Tip:**

   If you do not see all the listing fields you expect to see, click the refresh button ( ) in the menu bar.

6. Double-click each listing field that you want to include.

   **Note:** The listing field is then copied to the detail list. This means that if you later redefine the listing field, the changes are not reflected in this detail list.

7. After you add a listing field, optionally click it in the table and edit the **Caption** field, which is the column header for this listing field.
8. Click the **Role Access** tab.
9. Click the check box next to each role that should have access to this detail listing. By default, no roles are selected.



10. Click **Add**.

# 11.3 Modifying a Detail Listing

In general, to modify the definition of a detail listing:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.
3. Click the browse button (...) next to **Listing Name**.
4. Click the detail listing and then click **OK**.
5. Make the changes.
6. Click **Update** to save your changes.

# 11.4 Modifying the Layout of a Detail Listing

To modify the layout of a detail listing:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.
3. Click the browse button (...) next to **Listing Name**, click the detail listing, and then click **OK**.
4. Now you can do the following on the **Grid Layout** tab:
   - Move a row up. To do so, right-click it and click **Move Up**. This action moves the corresponding listing field to the left within the detail listing.
   - Move a row down. To do so, right-click it and click **Move Down**. This action moves the corresponding listing field to the right within the detail listing.
   - Remove a row. To do so, right-click it and click **DeleteLine**.
   - Add a listing field. To do so, in **Available Fields**, expand the two folders so that you can see all the available listing fields.

     **Tip:**

     If you do not see all the listing fields you expect to see, click the refresh button (  ) in the menu bar.

Double-click each listing field that you want to include. The additions are added at the bottom of the table.

- Edit the column header for any listing field. To do so, click it in the table and edit the **Caption** field.

5. Click **Save**.

# 11.5 Adding Summary Lines to a Detail Listing

A detail listing can include either or both of the following kinds of summary lines:

- A summary line for the current page of the detail listing
- A summary line for the entire detail listing

You define these summary lines separately. Each can include a summary for any or all of the listing fields contained in this detail listing.

To add such summary lines:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.
3. Click the browse button (...) next to **Listing Name**, click the detail listing, and then click **OK**.
4. To add a summary line for the entire detail listing:
   a. Decide which detail listing fields you want to summarize in this line.
   b. Double-click in the first **Option** column, in the row for one of those detail listing fields.
   c. In this column, click an option that specifies the kind of syntax to use. For example, **System** refers to system functions. The options are explained after these steps.
   d. Double-click in the **Grand** column, in the same row.
   e. In this column, either select an appropriate option or type the appropriate syntax. For example, **Total** displays a numeric total; this option is available if you selected **System** in the previous column. The options are explained after these steps.

   Repeat as necessary for all detail listings that you want to summarize in this summary line.
5. To add a page summary line, follow the preceding steps but use the second **Option** column and the **Page** column.
6. Click **Save**.

In either **Option** column, the value you select controls the value to use in the column to its right, as follows:

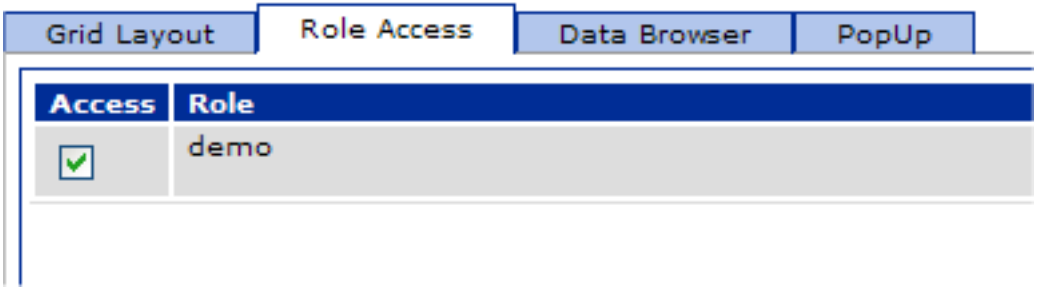
*Options for the Detail Listing Summary Lines*

| Value of Option | Value to Use for Grand or Page |
|---|---|
| **Label** | Type a string to use as a label. |
| **System** | Select one of the following numeric aggregation functions:<br>• **Total**<br>• **Average**<br>• **Max**<br>• **Min**<br>• **Count**<br>• **Std. Dev**<br>• **Variance**<br>• **% Per** (Percentage of the total value)<br>• **Median** |

# 11.6 Specifying Role Access to a Detail Listing

To specify the roles that have access to a detail listing:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.
3. Click the browse button (...) next to **Listing Name**, click the detail listing, and then click **OK**.
4. Click the **Role Access** tab.
5. Click the check box next to each role that should have access to this detail listing. Clear the check box for any roles that should not have access.




6. Click **Save**.

# 11.7 Adding a Link to Another Detail Listing

Within a detail listing, a user can display another detail listing, in any subject area to which the user has access. Specifically, the user can right-click a row and then select the name of another detail listing; DeepSee then displays that other detail listing with details for the selected row.

To add a link to another detail listing:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.
3. Click the browse button (...) next to **Listing Name**, click the detail listing, and then click **OK**.
4. Click the **Data Browser** tab.

   This table displays one row for each detail listing that you can access from within this detail listing.
5. For each detail listing to which you want to link, right-click and then click **Add Line**. This adds a new, empty row. Then enter the following information:

   - **Listing ID** — Specifies the detail listing to display. Double-click this field. DeepSee displays a list of all detail listings available to you, given your role access. Click a detail listing and then click **OK**.
   - **Menu Caption** — Specifies a string to display in the right-click menu. (For example, type the name of the detail listing).
   - **Query** — Specifies the filter expression that indicates which records to select when displaying this associated detail listing.

     If the associated detail listing is in a different subject area, use the following guidelines:

     - The dimension name you use should be the name of the dimension as defined in the other subject area. Use this dimension name on the left side of the filter expression.

- To select members of that dimension, you can use the syntax *##this.propertyname* to refer to a property in the current subject area. Use this syntax on the right side of the filter expression.

For example, suppose that we want to link from detail listing 1 (in the subject Orders) to detail listing 2 (in the subject area Order Details). Also suppose that:

- The Order Details subject area has an `Order ID` dimension.
- The Orders subject area has an `OrderID` property.

We would use the following filter expression:

```
[Order ID = ##this.OrderID]
```

The user right-clicks in detail listing 1, perhaps on order 10366, and selects Order Details. Then DeepSee evaluates `##this.OrderID`. Next, when it retrieves records from the Order Details subject area to display in detail listing 2, DeepSee applies the filter expression `[Order ID = 10366]`.

6. Right-click in the empty area and select **Save Data Browser**.
7. Click **Save**.

On the **Data Browser** tab, you can also do the following:

- Move a line up or down, to control the order of the options in the detail listing. To do so, right-click a line and then click **Move Up** or **Move Down**.
- Remove a line from the table. To do so, right-click it and then click **Delete Line**. The line is immediately removed.
- Remove all lines from the table. To do so, right-click in the empty area and then click **Clear**. DeepSee prompts you for confirmation.

Note that your changes on this tab are not saved unless you right-click in the empty area and select **Save Data Browser**.

# 11.8 Adding a Link to a URL

Within a detail listing, a user can right-click, select an option, and go to a URL in a new browser window. To add a right-click option that opens a URL:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.

3. Click the browse button (...) next to **Listing Name**, click the detail listing, and then click **OK**.
4. Click the **Popup** tab.

   This table displays one row for each URL that you can access from within this detail listing.
5. For each URL to which you want to link, right-click and then click **Add Line**. This adds a new, empty row. Then enter the following information:
   - **Menu Caption** — Specifies the string to display in the right-click menu.
   - **Pre Script** — Specifies a Caché ObjectScript statement to execute before opening the URL.
   - **URL Action** — Specifies the URL to open in a new browser window.
   - **Post Script** — Specifies a Caché ObjectScript statement to execute after opening the URL.
6. Click **Save**.

**Tip:** To remove a line from the table, right-click it and then click **Delete Line**. DeepSee prompts you for confirmation.

# 11.9 Deleting a Detail Listing

To delete a detail listing:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Click the **Detail List** tab.
3. Click the browse button (...), click the detail listing, and then click **OK**.
4. Click **Delete**.

# 11.10 Next Steps

After you define, modify, or delete a detail listing, do the following to make your changes visible in the Analyzer:

1. Recompile, as described in "Recompiling and Rebuilding" earlier in this book.
2. If you defined a new detail listing, make sure to give access to the detail listing to all suitable roles, as described earlier in this chapter.

3. If you have not yet done so, define a subject area, as described later in this book.

   When you define the subject area, make sure to give access to it to all suitable roles.

4. If the subject area is already open in the Analyzer, you may need to reopen it.

# 12

# Using Replacements, Ranges, and Transformations

Replacements, ranges, and transformations allow you to modify the data shown in the Analyzer and in pivot tables, for dimensions and for listing fields. The Architect provides these tools in several contexts. This chapter discusses the following topics:

- An overview
- How to replace null values for a dimension, measure, or listing field
- How to define a set of replacements for a dimension or listing field
- How to define a set of ranges for a dimension or listing field
- How to define a transformation to use in a dimension or a listing field
- How to apply a transformation to a dimension or a listing field

## 12.1 Overview of Replacements, Ranges, and Transformations

Replacements, ranges, and transformations allow you to modify the data shown in the Analyzer and in pivot tables, for dimensions and for listing fields.

A *replacement* substitutes one string for another. If you use a replacement within a dimension, you are effectively renaming a dimension member. If you use a replacement within a listing field, you are replacing any occurrences of the old string in any detail listing that uses this field. The comparison is

case-sensitive and it considers the entire string (there is no partial matching option). With one exception, replacements do not affect measures; that is, DeepSee ignores them if the dimension data type is **Numeric**.

A special case of replacement is the **Null field replacement** option, which replaces null values with the string or number you specify. You can use this option with all dimension data types (including **Numeric**, which is the type used by measures).

*Ranges* examine numeric source data and place it into named buckets. For a dimension, when you define ranges, you are effectively defining the members of that dimension. Each member of the dimension corresponds to a range of values. For a listing field, when you define ranges, then in each row of a detail listing, the name of the appropriate range is displayed instead of the listing field data.

*Transformations* are reusable definitions that include replacements, ranges, and other options such as case conversion and field justification. You define them separately and apply them to dimensions or listing fields where needed.

Transformations have a lower priority than replacements and ranges that are included directly within dimension or listing field definitions; for example, if a dimension includes a set of replacements and has a transformation applied to it, the transformation is ignored.

# 12.2 Replacing Null Values for a Dimension, Measure, or Listing Field

To replace null values for a dimension, measure, or a listing field:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Select the dimension, measure, or a listing field. Either:
   - Click the **Dim** tab and then click the dimension or measure.
   - Click the **Listing Field** tab and then click the listing field.
3. Click the **Translation/Replacement** tab.
4. Type a value into **Null field replacement**. For example: `No region`

   DeepSee ignores this option if you have entered an expression into **Complex Code**, if you are using the **Words** dimension data type, or if you are using the **Manual Child Browse** feature. In such cases, write an expression in **Complex Code** that detects the nulls and replaces them appropriately.
5. Click **Update** to save your changes.

If you edited a dimension or measure, notice that the **Trns/Repl** check box is checked in the table at the top of the page; this happens automatically when you enter information on the **Translation/Replacement** or the **Range** tab.

# 12.3 Defining Replacements for a Dimension or Listing Field

To define a set of text replacements for a dimension or a listing field:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Select the dimension or a listing field. Either:
   - Click the **Dim** tab and then click the dimension.
   - Click the **Listing Field** tab and then click the listing field.
3. Click the **Translation/Replacement** tab.
4. To add a row to the table:
   a. Right-click in the empty area and select **Add Line**.
   b. Click the blank line, beneath the **Original Text** heading.
   c. Type the exact text that you are going to replace. Matching is exact and case-sensitive.
   d. Press **Tab** or click the blank line beneath the **Translate to** heading.
   e. Type the replacement text.

   Repeat as necessary. For example:

| Original Text | Translate To |
|---|---|
| United Package | UP |
| Speedy Express | SE |
| Federal Shipping | FS |

5. Click **Update** to save your changes.

If you edited a dimension, notice that the **Trns/Repl** check box is checked in the table at the top of the page; this happens automatically when you enter information on the **Translation/Replacement** or the **Range** tab.

### 12.3.1 Other Options

You can also do the following on the **Translation/Replacement** tab:

- To delete a single line, right-click it and select **Delete Line**. The line is immediately deleted.
- To delete all lines, right-click and select **Clear**. You are prompted to confirm this action.
- To copy all lines of this table to the system clipboard, right-click and select **Copy to Clipboard**.
- To paste the contents of the system clipboard, right-click and select **Paste from Clipboard**.

  **CAUTION:** If the clipboard does not currently contain lines from a replacement table like this (perhaps from a different dimension or listing field), the current contents of your replacement table are cleared and nothing is pasted.

## 12.4 Defining Ranges for a Dimension or Listing Field

You can define ranges for dimensions and for listing fields that use numeric data:

- If you define ranges for a dimension, you are defining the members of the dimension. Each range creates one dimension member; the name of the range is the name of the member.

  Also see "Creating Hourly Buckets, " earlier in this book.
- If you define ranges for a listing field, then in each row of a detail listing, the name of the appropriate range is displayed instead of the listing field data.

### 12.4.1 Basics

To define a set of ranges for a dimension or a listing field:

1. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
2. Select the dimension or a listing field. Either:
   - Click the **Dim** tab and then click the dimension.
   - Click the **Listing Field** tab and then click the listing field.
3. Click the **Ranges** tab.

   In this tab, you define a set of ranges, each with a name or caption.

4. To add a row to the table:

   a. Right-click in the empty area and select **Add Line**.

      The system then adds a blank line.

   b. Click the blank line, beneath the **Caption** heading.

      Then the cursor blinks to indicate that you can type here.

   c. Type the name of this member.

      To move to other fields in the row, press **Tab** or click the blank line beneath the appropriate heading.

   d. For **From**, type the lower end of the range, if any.

      This can be a Caché ObjectScript expression or a constant. If you use an expression, note that DeepSee evaluates it at compile time.

   e. If this range includes this value, click the check box in the first **inclusive** column.

   f. For **To**, type the upper end of the range, if any.

      This can be a Caché ObjectScript expression or a constant. If you use an expression, note that DeepSee evaluates it at compile time.

   g. If this range includes this value, click the check box in the second **inclusive** column.

   Repeat as necessary. For example:

| Caption | From | inclusive | To | inclusive |
|---|---|---|---|---|
| Less than 10 | | ☐ | 10 | ☐ |
| 10 to 30 | 10 | ☑ | 30 | ☐ |
| 30 to 60 | 30 | ☑ | 60 | ☐ |
| 60 and up | 60 | ☑ | | ☐ |

5. If you are editing a dimension, optionally type a string into **Range Dimension Suffix**. This string is appended to the dimension name.

6. Click **Update** to save your changes.

If you edited a dimension, notice that the **Trns/Repl** check box is checked in the table at the top of the page; this happens automatically when you enter information on the **Translation/Replacement** or the **Range** tab.

## 12.4.2 Other Options

You can also do the following on the **Range** tab:

- To delete a single line, right-click it and select **Delete Line**. The line is immediately deleted.
- To delete all lines, right-click and select **Clear**. You are prompted to confirm this action.
- To copy all lines of this table to the system clipboard, right-click and select **Copy to Clipboard**.
- To paste the contents of the system clipboard, right-click and select **Paste from Clipboard**.

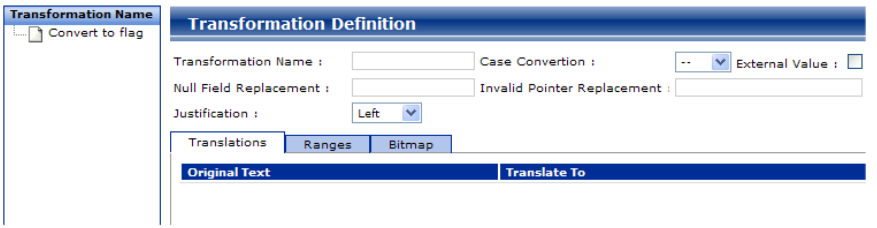
**CAUTION:** If the clipboard does not currently contain lines from a range table like this (perhaps from a different dimension or listing field), the current contents of your range table are cleared and nothing is pasted.

# 12.5 Defining and Modifying Transformations

To define or redefine a transformation:

1. At the top of the Architect page, click **Data Modeler > Transformation**.

   The system then displays a page like the following:




2. Either:
   - Type a new transformation name into **Transformation Name**.
   - Click a transformation name in the list on the left.
3. Make edits as needed. The options are described after these steps.
4. Click **Add** or **Update** in the lower right.

*Options in a Named Transformation*

| Option | Purpose |
|---|---|
| **Transformation Name** | Name of this transformation, as you want to see in the Architect. |

| Option | Purpose |
|---|---|
| **Case Conversion** | Specifies how to convert the case of any strings. Optionally choose **Upper Case** or **Lower Case**. |
| **External Value** | Click this option if you want DeepSee to use the external value for this field, rather than the internal value. This option takes effect only if the field has both internal and external values. |
| **Null Field Replacement** | Optionally specifies a string to use as replacement for any null values. |
| **Invalid Pointer Replacement** | Optionally specifies a string to use as replacement for any invalid pointers. |
| **Justification** | Specifies how to convert the horizontal alignment of any strings. Optionally choose **Left**, **Center**, or **Right**. |
| **Translations** tab | Optionally defines a set of text replacements. Follow the general instructions in "Defining Replacements for a Dimension or a Listing Field," earlier in this chapter. |
| **Ranges** tab | Optionally defines a set of ranges. Follow the general instructions in "Defining Ranges for a Dimension or a Listing Field," earlier in this chapter. |
| **Bitmaps** tab | Optionally defines a set of text-to-image replacements. This affects only independent listing fields. See the following subheading. |

## 12.5.1 Defining Text-to-Image Replacements

Within a transformation, you can define a set of replacements that substitute images in the place of text. You specify the text to replace, and a bitmap image to display in its place. This replacement affects only independent listing fields; dimensions and dimension-type listing fields ignore any text-to-image replacements.

To define text-to-image replacements within a transformation:

1. Make sure the **Translations** tab is empty. Otherwise, the replacements defined there take precedence over the text-to-image replacements that you are adding.
2. Click the **Bitmaps** tab.
3. Right-click and click **Add Line**.
4. In the right column (**Field Value**), type the exact text that you are going to replace. Matching is exact and case-sensitive.

5. Make sure the new row is still selected.
6. Click the **Select Image** button.

   This brings up a dialog box.
7. Click the image that you want to use and click **OK**. The internal ID of this image is automatically written to the **Id** column.
8. In the **Remark**, type an optional remark.
9. Repeat as needed.

   For example:

Bitmap List

| Id | Field Value |
|---|---|
| 92 | Austria |
| 93 | Brazil |
| 94 | Canada |
| 95 | Denmark |
| 96 | Finland |
| 97 | France |
| 98 | Germany |
| 99 | Ireland |
| 100 | Italy |
| 101 | Mexico |
| 102 | Norway |

On this tab, you can also do the following:

- Delete a line. To do so, right-click the line and click **Delete Line**.
- Delete all lines. To do so, right-click and click **Clear**. You are prompted to confirm this action.
- Preview the image used in a given row. To do so, click the line. The image is displayed in the **Bitmap Preview** box.
- Remove an image for a given line. To do so, click the line and click **Clr**.

If you make any change, click **Update** to save this change.

For an example of text-to-image replacement, see "Tutorial Part 3: Adding a Detail Listing to the Model," earlier in this book.

## 12.5.2 Deleting a Transformation

To delete a transformation:

1. At the top of the Architect page, click **Data Modeler > Transformation**.

2. Click a transformation name in the list on the left.
3. Click **Delete** in the lower right. The transformation is immediately deleted.

### 12.5.3 Next Steps

After you add, modify, or delete a transformation, recompile and rebuild, as described in "Recompiling and Rebuilding" earlier in this book.

## 12.6 Applying a Transformation to a Dimension or Listing Field

To apply a transformation to a dimension or a listing field:

1. Define the transformation if it is not yet defined. See the previous section.
2. Open a BI-enabled class as described in "Opening a BI-enabled Class," earlier in this book.
3. Select the dimension or a listing field. Either:
   - Click the **Dim** tab and then click the dimension.
   - Click the **Listing Field** tab and then click the listing field.
4. In the **General** tab, select the transformation from the **Transformation Type** drop-down list.
5. Click **Update** to save your changes.

# 13

# Validating Your DeepSee Data Model

This chapter briefly describes some useful tools and techniques to help you validate your dimensions, measures, and listing fields.

## 13.1 Useful Tools

To assist you during testing, make sure that the **Listing Field** option is selected for each measure.

Also make sure that you have the following tools:

- A listing field based on an identifier or other unique value in the source data (for example, `OrderID` or `PatienID`. This enables you to easily identify the source records when viewing detail listings.
- A detail listing that displays the preceding listing field and all measures. Even if you do not intend to provide this to users, you will find this tool useful during testing.
- Other detail listings that contain all the listing fields that you intend to provide to users.
- A low-level dimension (so that any member uses a small number of records that you can easily look at). For example, if the base class is `Sample.Orders`, you might base a dimension on `OrderID`. Even if you do not intend to provide this dimension to the users, you will find it useful during testing.
- The System Management Portal, especially its SQL tools.
- The DeepSee Analyzer.

Before you test your model, be sure that the DeepSee indices are current.

# 13.2 Validating a Dimension

For a dimension, it is useful to consider the following questions:

- Do the members access the expected records and no others?
- Does the dimension handle nulls in the way that you want it to?

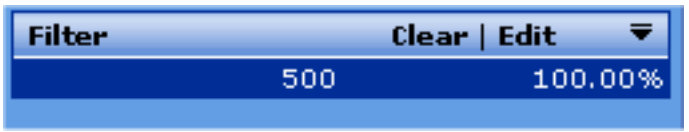
The following procedure is a good starting point:

1. In the Analyzer, place the dimension on the row axis and display a grand total. Use the default measure (Count). The following example shows the home city of the patients as a dimension, using patients as the base class:

| *Home City* | Count |
|---|---|
| Cedar Falls | 47 |
| Centerville | 59 |
| Cypress | 55 |
| Elm Heights | 56 |
| Juniper | 69 |
| Magnolia | 52 |
| Pine | 55 |
| Redwood | 58 |
| Spruce | 49 |
| Grand Total | 500 |

   DeepSee computes the grand total by adding the Count for each member.

2. Compare the grand total to the record count for this subject area. (You can see the record count in the **Filter** area on the left.)



If these numbers are not the same, make sure that you understand why they do not match.

There are two reasons why these numbers can be different:

- In some of the source records, the data used this dimension might contain null values. If you do not convert those null values to a string, this dimension essentially ignores those records. This outcome may or may not be desirable depending on your business needs.

  For example, consider the following dimension, which is based on the industry in which the patients work:

| *Industry* | Count |
|---|---|
| Accommodation and Food Services | 21 |
| Construction | 33 |
| Educational Services | 20 |
| Finance and Insurance | 33 |
| Health Care and Social Assistance | 21 |
| None | 105 |
| Other Services | 16 |
| Professional, Scientific, and Technical Services | 40 |
| Real Estate and Leasing | 9 |
| Retail Trade | 22 |
| Transportation and Warehousing | 16 |
| Grand Total | 336 |

  This dimension includes a member called `None`, which is intended to contain the records with no recorded industry. By comparing the total shown here to the record count, however, we can tell that the dimension probably does not handle nulls correctly.

- If the dimension is based on a collection, any given source record can be included in multiple dimensions. The following example shows a dimension based on patient allergies, using patients as the base class:

| Allergies | Count |
|---|---|
| additive/coloring agent | 88 |
| animal fur | 91 |
| ant bites | 77 |
| avocado | 75 |
| bee stings | 87 |
| cow's milk | 96 |
| dairy products | 91 |
| nil known allergies | 85 |
| Grand Total | 690 |

Because a patient can have multiple allergies, the total here (690) is greater than the number of patients (500), as expected.

3. Double-check that the dimension is accessing the records that you expect.

   Look at the count for a given member. In the System Management Portal, execute a suitable query to determine how many records this particular member should include. Compare that to the count shown in the pivot table.

   For example, consider the `Real Estate and Leasing` member in the following pivot table (in which the Industry dimension now handles nulls correctly):

| Industry | Count |
|---|---|
| Accommodation and Food Services | 21 |
| Construction | 33 |
| Educational Services | 20 |
| Finance and Insurance | 33 |
| Health Care and Social Assistance | 21 |
| None | 269 |
| Other Services | 16 |
| Professional, Scientific, and Technical Services | 40 |
| Real Estate and Leasing | 9 |
| Retail Trade | 22 |
| Transportation and Warehousing | 16 |
| Grand Total | 500 |

In the System Management Portal, you could enter an SQL query like the following:

```
SELECT Count(*) as Count, Profession->Industry FROM EPI.PatientDetails
GROUP BY Profession->Industry
```

The results might be as follows:

| # | COUNT | Industry |
|---|---|---|
| 1 | 164 | |
| 2 | 21 | ACCOMMODATION AND FOOD SERVICES |
| 3 | 33 | CONSTRUCTION |
| 4 | 20 | EDUCATIONAL SERVICES |
| 5 | 33 | FINANCE AND INSURANCE |
| 6 | 21 | HEALTH CARE AND SOCIAL ASSISTANCE |
| 7 | 16 | OTHER SERVICES |
| 8 | 40 | PROFESSIONAL, SCIENTIFIC, AND TECHNICAL SERV |
| 9 | 9 | REAL ESTATE AND LEASING |
| 10 | 22 | RETAIL TRADE |
| 11 | 16 | TRANSPORTATION AND WAREHOUSING |
| *Complete* | | |

There are indeed 9 patients employed in this industry.

If the counts are not the same, display a detail listing in the Analyzer and determine which records DeepSee is using. Compare this to the records in the source table itself.

# 13.3 Validating a Measure

For a measure, particularly a measure based on **Complex Code**, it is useful to consider the following questions:

- Does the measure return the correct value at the lowest level?
- Is the measure aggregated as expected to higher levels?

The following procedure is a good starting point:

1. In the Analyzer, place the lowest-level dimension on the row axis. For **Metrics**, use the measure and the Count measure. For example:
2. Find a member that has a fairly low value for Count.
3. Display the detail listing for this member.
4. For each measure, look at a single record and check that the value shown in the detail listing is as expected.

5. If the lowest-level values for a measure are as expected, aggregate those values for all the records in this detail listing. Use the aggregation type specified in the measure. Compare the resulting number to the number shown for this measure in the pivot table itself.

# 13.4 Validating a Listing Field

For a listing field, it is useful to consider the following questions:

- Does the listing field display the correct value?

  Are the appropriate transformations, ranges, or replacements applied?

- Does the listing field display the correct value when the source data is null?

Because listing fields are directly associated with source records and because they are not aggregated in any way, it is a simpler process to validate them.

1. In the Analyzer, use any dimensions and measures, and display a detail listing.
2. Examine each listing field and consider the preceding questions.

# A

# Expressions and Scripts in DeepSee Architect

The DeepSee Architect uses formulas, expressions, and scripts of varying types. This appendix summarizes the cases and the syntax for your convenience. It discusses the following topics:

- Filter expressions
- Caché ObjectScript expressions

## A.1 Filter Expressions

A *filter expression* is a boolean expression that specifies which records to include.

### A.1.1 Where Used

Filter expressions are used in the following contexts:

- An optional filter applied to a subject area (to restrict the number of rows that can be accessed).
- The definition of a member of a compound dimension.
- An optional filter applied to any pivot table in a subject area when used by a specific role (a rare usage).
- An optional filter applied to any detail listing in a subject area when used by a specific role (a rare usage).

## A.1.2 Syntax

A filter expression has the following syntax:

```
[DimensionName = String]
```

Here:

- *DimensionName* is the name of a dimension, without quotes.
- *String* is an unquoted string that typically equals the name of a member of that dimension, or the start of a name.

Notes:

- The spaces before and after the equals sign (=) are required.
- You can combine filter expressions by using the logical operators NOT, AND, and OR. For example:

  ```
  [Ship Country = Canada] OR [Ship Country = Mexico]
  OR [Ship Country = USA]
  ```

  Use brackets to control the precedence.
- Filter expressions use the internal names of dimensions and members. By default, the external name of a dimension is the same as the internal name; similarly, the external name of a member is the same as the internal name. This means that if you have renamed dimensions or members, the filter editor still shows the original names.

## A.1.3 Filter Expression Using IN

You can also create a filter expression with the following syntax:

```
[DimensionName IN String1,String2,String3,...]
```

For example:

```
[Ship Country IN Canada,Mexico,USA]
```

## A.1.4 Filter Expression with a Full Date

When you create a dimension based on a date, DeepSee creates a set of dimension variants, which you can use separately or in combination. For example, if you create a date dimension called `Order Date`, DeepSee creates the variants `Order Date Year`, `Order Date Quarter`, `Order Date Month`, and so on. The `Order Date Year` variant uses only the year part of the date, `Order Date Quarter` uses only the quarter number, and so on.

You can use these in the same way as any other dimensions, including using them in filters.

However, when you filter by date, you often want the filter to consider a complete date rather than just an isolated segment of it. For example, you might want to filter a subject area to show only the data that falls within a particular ten-year span of time.

To do so, you can use the base date dimension name without any of the automatically generated suffixes. For example:

```
[Birth Date > 01/01/1980] AND [Birth Date < 01/01/1990]
```

The dates must be in the form dd/mm/yyyy or dd/mm/yy.

### A.1.5 Filter Expression with Embedded Caché ObjectScript

A filter expression can include an embedded Caché ObjectScript expression. The syntax is as follows:

```
[DimensionName = {COS expression}]
```

An extremely simple example is as follows:

```
[Ship Country = {"Den"_"mark"}]
```

### A.1.6 Filter Expression That Uses Session Data

In a Caché ObjectScript expression in DeepSee, you can refer to the current DeepSee username or the current DeepSee user role, as follows:

```
%session.Data("CurrUser")
%session.Data("CurrRole")
```

For example, you could use the current DeepSee role to specify the filter on a subject area:

```
[Region Name = {$CASE(%session.Data("CurrRole"),
   "role1":"North Region","role2":"South Region",
   "role3":"West Region",:"East Region") }]
```

## A.2 Caché ObjectScript Expressions

You can use Caché ObjectScript expressions in multiple places in DeepSee Architect:

- Within the name of a member in a filter expression, as described in the previous section.
- As the expression that defines dimension members (the **Complex Code** option).
- As the expression that defines a detail listing field (the **Complex Code** option).

- As the values of **From** and **To**, within a range definition.

# B

# When to Recompile and Rebuild

For your convenience, this appendix summarizes when to recompile and when to rebuild indices, in order to make the changes visible in the Analyzer and in pivot tables.

*When to Recompile and When to Rebuild*

| Item Added, Modified (Including Renaming), or Deleted | Need to Recompile? | Need to Rebuild Indices? |
|---|---|---|
| Dimension | *Yes* | *Yes* |
| Compound dimension or member (if not dynamic) | *Yes* | *Yes* |
| Compound dimension or member (if dynamic) | *Yes* | No |
| Dynamic dimension | *Yes* | No |
| Relationship between dimensions | *Yes* | *Yes* |
| Subject area | No | No |
| Dimension-type listing field | *Yes* | *Yes* |
| Independent listing field | *Yes* | No |
| Detail listing, any change other than role access | *Yes* | No |
| Detail listing, changing role access | No | No |
| Transform used by dimension or dimension-type listing field | *Yes* | *Yes* |
| Transform used by independent listing field | *Yes* | No |

For information on recompiling and rebuilding, see the section "Recompiling and Rebuilding," earlier in this book.

# Index