

# Working with Analytical Objects

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intellicus

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For details, visit: <http://www.intellicus.com/acknowledgements.htm>

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# 1 Introduction to Analytical Objects

Intellicus' Analytical Object is a definition of cube comprising of related dimensions and measure groups used to analyze data.

Intellicus cubes are multi-dimensional, pre-aggregated data of your source data. The cubes are persisted in file system under Intellicus folders and are editable by data administrator.

To design and save an Analytical Object in a specific category, you need Read, Write and Execute permissions for Analytical Objects in that category.

This document explains the steps for a designer to design and build cubes using Analytical Object.

## Pre-requisites

### License

Ensure that Intellicus system you are using is licensed for High Speed View feature. This is an add-on feature in professional and enterprise editions of Intellicus.

### Disk Space

Each cube can take from few KBs of disk space to many GBs based on certain factors used to design the cube. We will look at those factors later in this document.

Ensure you have enough disk space for all the cubes you plan to create and build.

### Memory

Cube building is an activity of pre-aggregation. It requires sorting and other data processing activities. Intellicus uses minimum required memory at a given point in time, using streaming-in data and disk swapping.

Ensure that each cube being built in parallel has at least 1 GB of RAM available to it during the build time. This is considering building cube of 2-3 GB size from a 5-10 million transaction rows.

## About Cubes

A cube is a structured multidimensional data-set; it has business dimensions and pre-calculates aggregations ahead of time for querying.

The structure of a cube makes it easy to visualize or conceptualize data along various dimensions of a cube making it easy to query and interact with the cube. Cubes organize data in a hierarchical arrangement, according to dimensions and measures.

*Dimensions* group the data along natural categories and consist of one or more levels. Each level represents a different group within the same dimension. For example, a time dimension can include levels such as years, months, and days.

*Measures* are the cube data values that are summarized and analyzed. A measure is the combination of a numeric input column with a roll-up rule or statistic. *Attributes* represent a single type of information in a dimension. For example, year is an attribute in the time dimension.

The elements of a dimension can be organized as a *hierarchy*—a set of parent-child relationships, where a parent member summarizes its children.

Let's apply this to an example. For example, from your data warehouse you can create a cube which indexes and pre-computes sales data.

In your cube you could have all those pre-computed dimensions: sales by months, by week, by salesman, by client, by geographical region, by product model, etc. Then you can run queries on your cube to have the total, average and maximum sales by (month, salesman, region), or by (product model, region), or by (salesman, month). Since all the data is pre-computed and indexed, the queries are fast.

To design a cube, you can source both Fact Data (Measures) and Dimension Data from Intellicus Query Objects. Query Objects can fetch data from RDBMS or file sources. Refer [WorkingwithQueryObjects.pdf](#) for more details.

You can thereafter browse a cube on High Speed View or view High Speed reports that draws data from a cube.

## 2 Designing Analytical Objects

Let us talk about designing the Analytical Object and further building the cube. You can navigate to the Analytical Object from Navigate > Design > Analytical Object. Following are the main sections on the Analytical Object screen:

1. Editor or design canvas – the area on the left that represents the design of an analytical object
2. Query Object Selector – the right pane from where you can drag required Query Objects to design the analytical object
3. Fields tab – the right-bottom pane to choose fields of the selected query object
4. Button palette – action buttons on the top for CRUD and build operations
5. Build Status tab – that shows status of the build activity

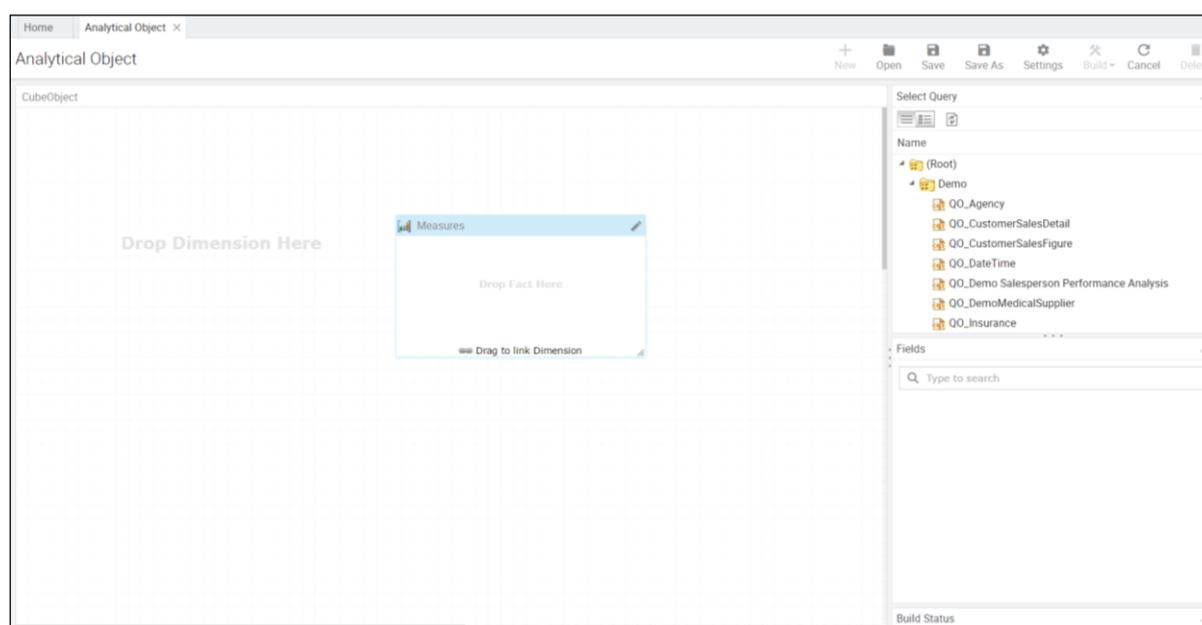


Figure 1: Analytical Object

### Adding Measures and Dimensions to an Analytical object

The Editor section shows two sub sections:

1. A box titled - Measures
2. A canvas area for dropping Dimensions on

Drag the Query Object with quantitative fields from Query Object Selector into the Measures box.

Now it shows that Measures is 'sourced' by the selected Query Object.

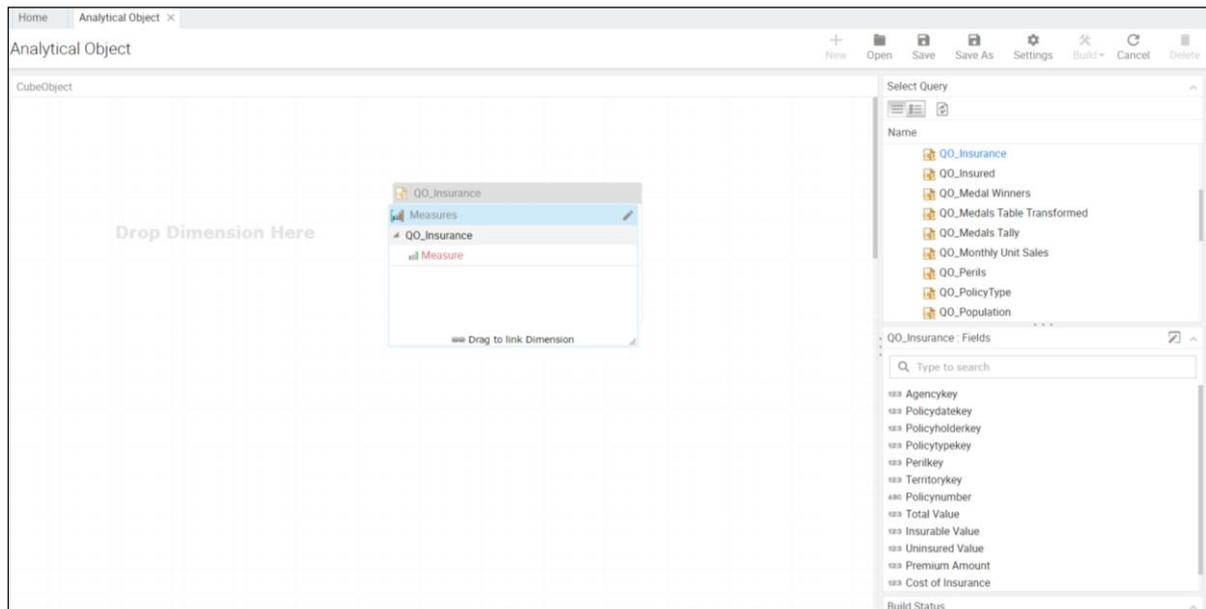


Figure 2: Measures on Editor

Click Measure and select the source field in the property pop-up as shown in Figure 3.

Click  to turn Edit Mode on. You can click + to add measures to the analytical object definition.

You can also click + in front of the query object name to add a Measure Group. A measure group contains measures which belong to the same underlying fact table.

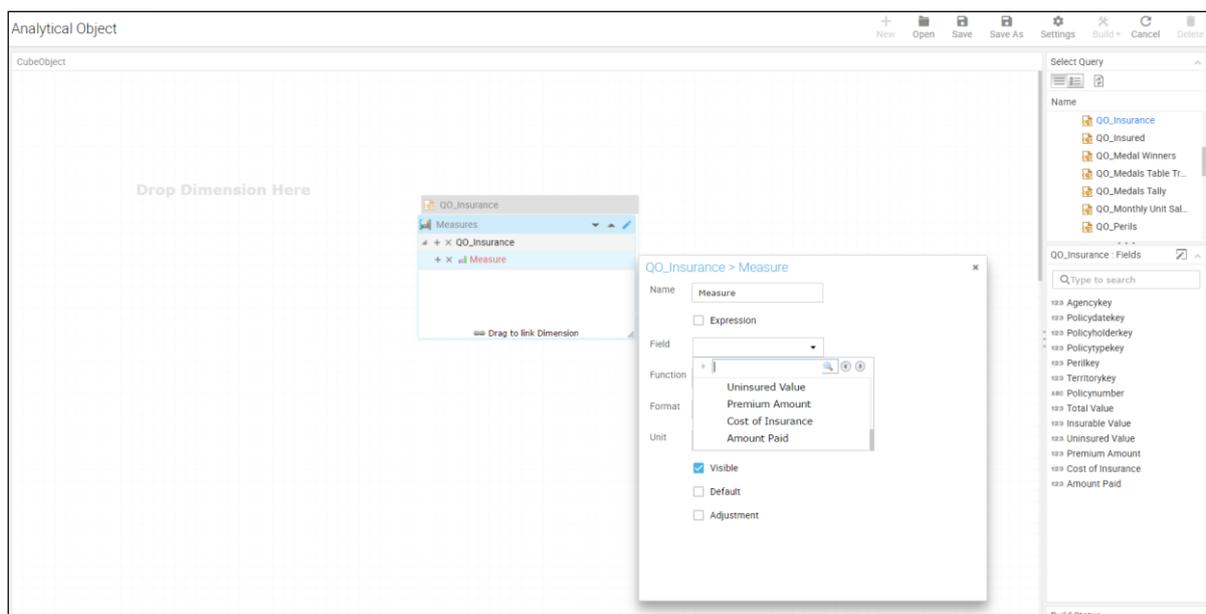


Figure 3: Measure Properties Pop-up

Drag the Query Object with qualitative fields to the Dimension area.

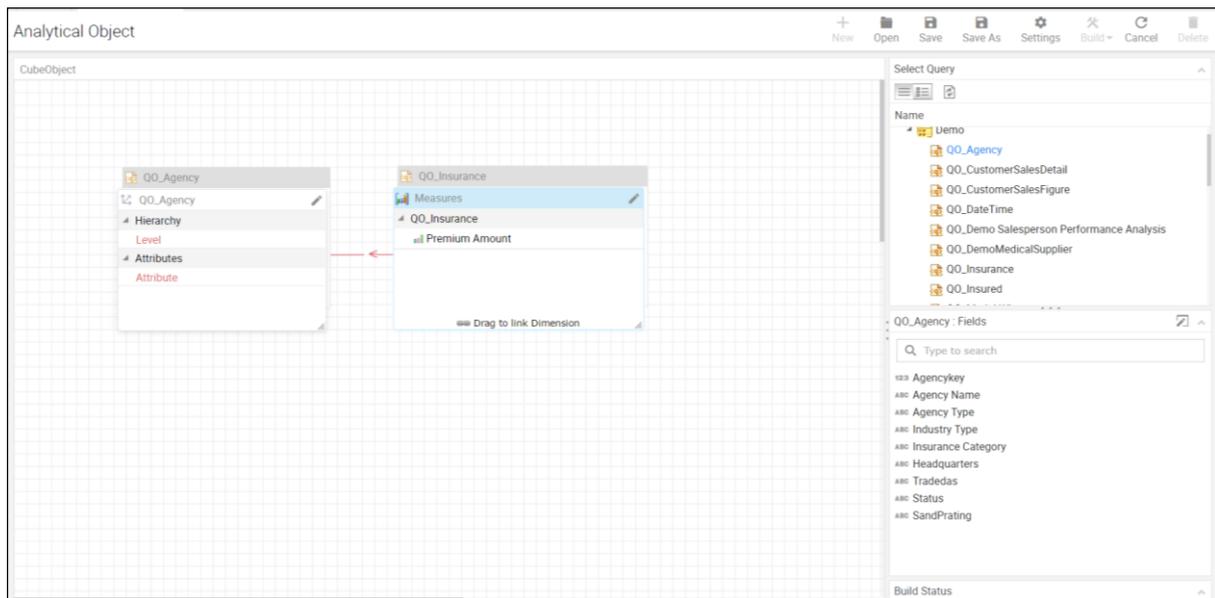


Figure 4: Dimension on Editor

Now a dimension is created with the dragged Query Object as source.

Next you need to select Hierarchy item and set the Hierarchy name in the property tab of dimension.

Click Level under Hierarchy to select Level item. Specify the Level source field from the source Query Object and set the level name.

An integral part of creating aggregations is to create and maintain the appropriate attribute relationships for your hierarchies.

The joining line appears in red color till the time relation between measure and dimension is not set.

Select the line and set the key joining measure to dimension.

As soon as you set the key, the line turns blue.

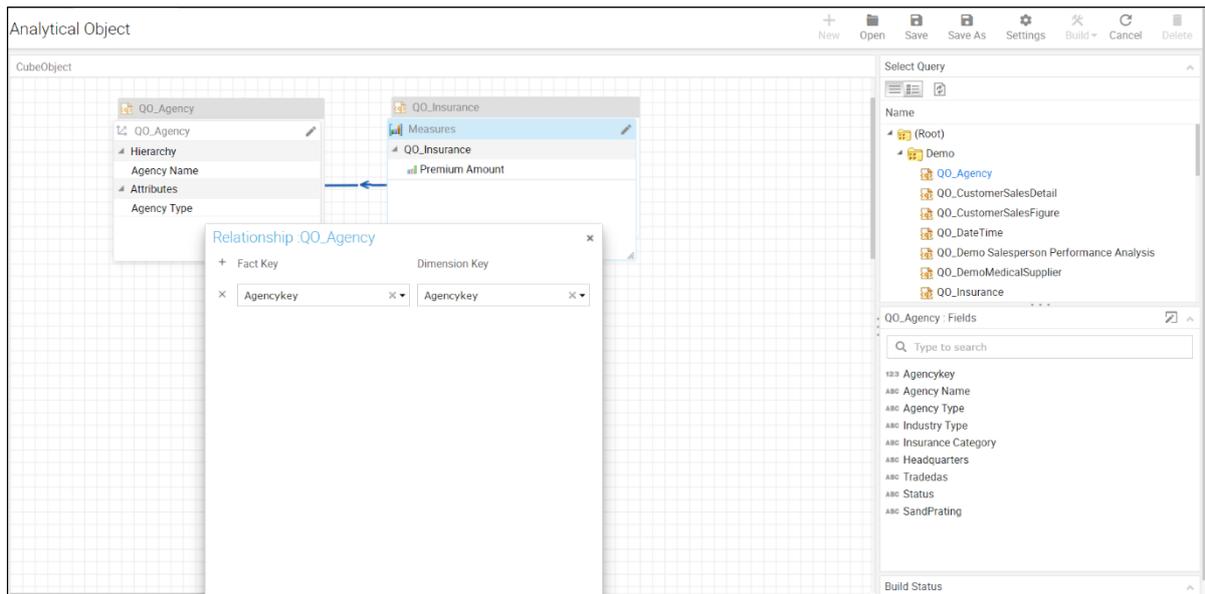


Figure 5: Line showing Relation from Measure to Dimension

You can add multiple measures each sourcing a field from the Query Object.

You can add multiple dimensions by dragging multiple Query Objects on the dimension area. It helps to create levels if you drag the fields inside an existing dimension.

The fields can be added to the Editor by either of the following ways:

- Dragging and dropping a field from under Fields pane as measure/dimension/attribute/hierarchy
- Clicking the + sign under Edit Mode to add measure, level or attribute on the Editor area. You can specify a field on the properties pop-up window on clicking the newly added measure, level or attribute.
- You can click the query object name (for measure or dimension) to list the fields in a pop-up window as shown in Figure 6. Right-clicking the field would add the field as measure, level or attribute

On the same pop-up, click the Edit Query icon  if you want to make any changes to the selected Query Object. The query object can be removed by clicking .

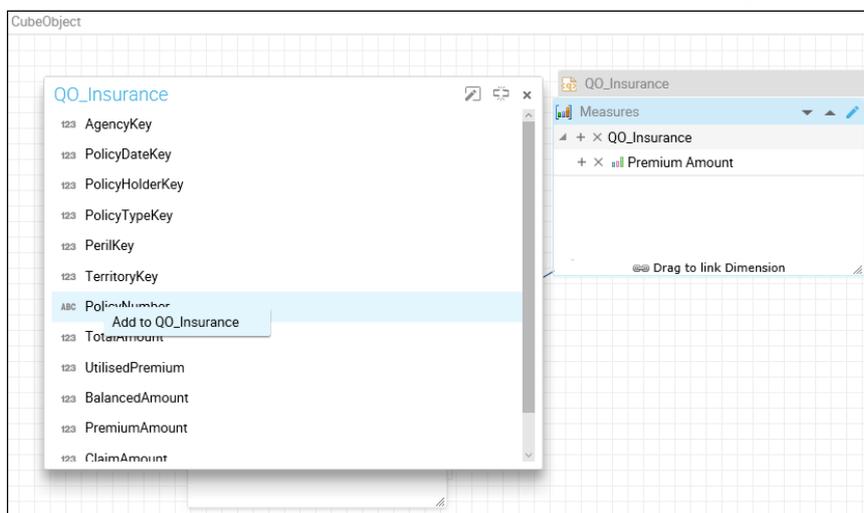


Figure 6: Query Object Properties Pop-up

Click  or  to respectively expand or collapse the measure, level or attribute.

In Edit mode, you can select a field and move them up and down using the arrow keys  

Click the cross icon  in front of the respective field to remove a measure, measure group, hierarchy, level or attribute.

A typical designed Analytical object shall look like below:

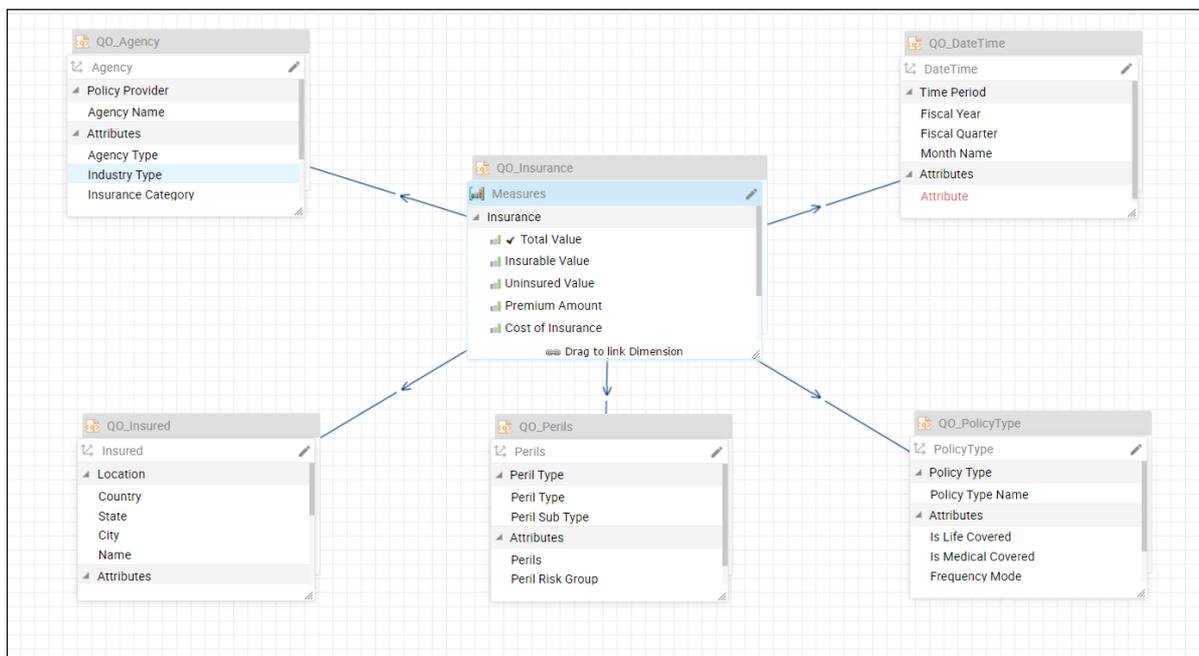


Figure 7: Analytical object

## Query Object Selector

Query Object Selector provides a categorized list of Query Objects accessible to current user. It allows dragging Query Objects from the list to the design area.

The sections in Query Object Selector can be resized by dragging the section borders. Use  $\downarrow$  or  $\uparrow$  respectively to expand or collapse sections in Query Object Selector pane.

You can open the Query Editor by clicking Edit Query icon  in front of the Query Object name on the Query Object Selector pane as shown in Figure 8.

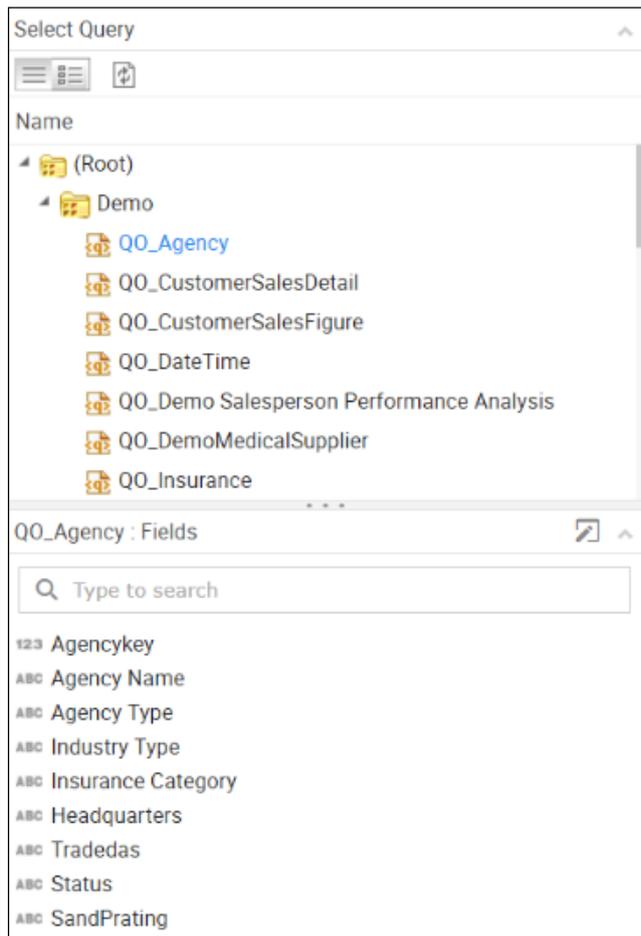


Figure 8: Query Object Selector with Fields

## Specifying Properties of Measures and Dimensions

The properties pop-up window shows and captures properties of selected item on the design area.

The following tables list the properties of measure, dimension and hierarchy/level/attribute.

### Measure Properties

| Item    | Property | Values  | Comments  |
|---------|----------|---|---|
| Measure | Name     | Type yourself                                     | You can see this name for this measure on the High Speed View and reports.  |
|         | Field    | Select from the Query Object Fields               | The list of Query Object Fields appears here.   |
|         | Function | SUM,<br>AVERAGE,<br>COUNT,<br>MINIMUM,<br>MAXIMUM | Select from the list as per need.   |
|         | Format   | Format String<br>#,##0.00                         | This format will be applied on this measure on High Speed View and reports. To know more on Data Formats, please refer Appendix A                   |
|         | Unit     | Type yourself                                     | Used as a suffix for the measure value on High Speed View and reports.  |
|         | Visible  | Check/Uncheck                                     | Check – You can see this measure on viewer<br><br>Uncheck – You cannot see this measure. You can only use it to express another calculated measure. |

|  |   |                       |  |
|--|---|-----------------------|--|
|  | Default                                 | Yes/No                | Specifies if this is the default measure for this cube. You should have at least one default measure to create an analytical object.   |
|  | Adjustment                              | Check/Uncheck         | This is a waterfall type chart related property. If you check this property, then this measure becomes a floating bar on a waterfall type of chart.  |
|  | Adjustment-Yes<br>Negative/<br>Positive | Negative/<br>Positive | <p>If the adjustment property is checked, then you will see this property.</p> <p>If you set as negative adjustment – the floating bar will be Red in color and will be drawn downwards from previous measure’s top.</p> <p>If you set as positive adjustment – the floating bar will be Green in color and will be drawn upwards from previous measure’s top.</p> |
|  | Expression                              | Check/Uncheck         | <p>Check – This is a calculated measure.</p> <p>Uncheck – This is a field sourced measure.</p>   |
|  | Solve Order                             | 0-N                   | <p>You can set any number from 0 to N.</p> <p>The lower Solve Order Calculated Measures will be evaluated prior to higher Solve Order Calculated Measures.</p>   |

## Calculated Measures

Calculated Measures are expressions created on existing field based measures.

Calculated measures are NOT calculated during cube build and they don't consume any disk space.

Calculated Measures are evaluated at the time of slicing and dicing on the result set extracted for current view and analysis.

If you can achieve a measure using an expression, it is always efficient to make it a calculated measure. For example: Field1 + Field2, % of contribution etc.

Calculated measures are evaluated in the increasing order of "Solve Order" value.

## Expression Syntax

The basic syntax supported is MDX linear syntax.

Measure values at the same level are accessed by

**[Measures].[Field1]**

Linear calculation

To Sum field1 and field2 in a calculated measure field3, do the following:

Select Field3 measure -> Check Expression in properties tab.

In the Expression box, type:

**[Measures].[Field1] + [Measures].[Field2]**

Previous Row Value

To calculate Running Total of field1 in a calculated measure field3, do the following:

Select Field3 measure -> Check Expression in properties tab.

In the Expression box, type:

**[Measures].[Field1]**

**+ ( [Measures].[Field3], prevRowMember() )**

Contribution calculation – inner most group

To find Contribution of field1 in field1’s lowest grouped total, in a calculated measure field3, do the following:

Select Field3 measure -> Check Expression in properties tab.

In the Expression box, type:

```
(( [Measures].[Field1] ) /  
( [Measures].[Field1], currRowMember().PARENT ))
```

Contribution calculation – outer most group

To find Contribution of field1 in field1’s lowest grouped total, in a calculated measure field3, do the following:

Select Field3 measure -> Check Expression in properties tab.

In the Expression box, type:

```
(( [Measures].[Field1] ) /  
( [Measures].[Field1], currentDim().defaultMember ))
```

### Dimension Properties

| Item      | Property    | Values          | Comments   |
|-----------|-------------|-----------------|--|
| Dimension | Name        | Type yourself   | You can see this name for this dimension on the High Speed View and reports. |
|           | Type        | Regular<br>Time | Type of the dimension as Regular.<br>Type of the dimension as Time.          |
|           | GIS Enabled | Check/Uncheck   | Check = If this dimension needs to be plotted on a map.                      |

|                      |                 |                                      |  |
|----------------------|-----------------|--------------------------------------|--|
| On Incremental Build | Processing Mode | Options:                             | This governs the action in case of Incremental Build.                |
|                      |                 | Skip Processed Files And folders     | Skips processed files and folders while building.                    |
|                      |                 | Reiterate And Skip Processed Records | Skips only processed records under files and folders while building. |

#### Hierarchy/Level/Attribute Properties

| Item      | Property             | Values           | Comments   |
|-----------|----------------------|------------------|--|
| Hierarchy | Name                 | Type yourself    | You can see the name for this Hierarchy on the High Speed View and reports.  |
|           | 'All' member caption | Type yourself    | Caption to be displayed on High Speed View to show the summarized value.   |
|           | Field                | Select from list | Value of the field in case of a Time type dimension.   |
|           | Calendar             | Select from list | In case of a Time type dimension, for the chosen date field you can select Calendar as 'None' to specify Year-Quarter-Month-Day as YQMD, YQM, YQD, etc. under Levels. In case of 'Standard' Calendar, along with the levels you can specify the Start and End Dates.<br><br>You can also customize the Standard Calendar according to your business needs. For example, an organization may be using |

|       |                        |                            |   |
|-------|------------------------|----------------------------|---|
|       |                        |                            | a twelve-month Gregorian calendar starting on January 1 and ending on December 31st.<br>However, some organizations may want to use a fiscal calendar that defines the fiscal year used by the organization.              |
|       | Levels                 | Select from list           | Choose from YQMD, YQM, YQD, and so on.  |
|       | Date                   | Start Date<br><br>End Date | Specify the first date, month or year in fact table. You can also specify a fixed start date from calendar<br><br>Specify the last date, month or year in fact table. You can also specify a fixed end date from calendar |
| Level | Name                   | Type yourself              | You can see the name for this Level on the High Speed View and reports.   |
|       | Field                  | Select from list           | Value of the field in case of a Regular type dimension.   |
|       | Display Field          | Select from list           | Display name of the field in case of a Regular type dimension.  |
|       | Secure Using Parameter | Select from list           | You can choose from the secured parameters to restrict user to view cube data.  |
|       | Level Format           | Select from list           | If you have specified levels for a TIME type dimension, you can choose a Level Format to display a particular year, month, quarter or day.  |
|       | Sample                 | Type yourself              | Specify an example for the chosen Level Format.   |

|           |                        |                  |  |
|-----------|------------------------|------------------|--|
| Attribute | Name                   | Type yourself    | You can see the name for this Level on the High Speed View and reports.        |
|           | Field                  | Select from list | Value of the field in case of a Regular type dimension.                        |
|           | Data Type              | Read only        | Data type of the selected attribute  |
|           | Secure Using Parameter | Select from list | You can choose from the secured parameters to restrict user to view cube data. |

### Specifying Actions from the Button Palette

The various menu actions that can be performed on the analytical object are described in the below table.

| Item    | Action   |
|---------|--|
| New     | Closes currently opened analytical object and provides a new screen for designing an analytical object.  |
| Open    | <p>Opens a selector dialog to select and open the selected analytical object for editing. To open an analytical object, expand the folder and either double-click or click the analytical object name and click Open.</p> <p>List View shows the list of analytical objects.</p> <p>Detailed View shows the detailed view of analytical objects list. You can see details like the 'Owner' and the 'Last Modified Date' of analytical objects.</p> <p>Refresh List refreshes the shown list of analytical objects fetched from the repository.</p> |
| Save    | Saves any editing work done on the analytical object to the repository. This saves the definition of analytical object only. It doesn't refresh the cube data.   |
| Save As | <p>Saves currently edited analytical object with a new ID (auto-generated) and Name in repository. You can choose a different folder location to save.</p> <p>Build will be required before end user can see and use this cube.</p>  |

|          |   |
|----------|---|
|          | <p>If you are saving an existing analytical object with a new name, check “Copy Access Rights” under Options to copy the same rights to this new analytical object. You can also add Description to the analytical object.</p>  |
| Settings | <p>You can specify the Build Schedule options as:</p> <p>Once: Initiates the Cube Build activity in the background.</p> <p>Cube build activity is a background activity. You can leave this screen after initiating the build, leaving the screen doesn’t cancel Build activity.</p> <p>The Build Status tab shows up when Build starts.</p> <p>You can initiate Build only once concurrently for a given cube.</p> <p>If you Open an analytical object and its Build activity is going on, then you will see a disabled Build button.</p> <p>You may need to wait till build is completed or you can Cancel the Build before you can reinitiate Build activity.</p> <p>Recurring: You can schedule the build activity periodically within the start and end dates.</p> |
| Build    | <p>The options provided under Build include:</p> <p>Full: To be able to schedule a full build on the saved cube either once or in recurring mode.</p> <p>Incremental: To be able to schedule a build picking differential data after the last build was run.</p> <p>Consolidation: Consolidates previous run full or incremental builds.</p>  |
| Cancel   | <p>Cancels current editing action of New or Open and closes currently opened analytical object.</p>   |
| Delete   | <p>After a confirmation prompt dialog, deletes currently opened analytical object from repository. This action is not reversible.</p>   |

## Building a Cube

After saving the analytical object, click the Build button to choose either Full, Incremental or Consolidated build (as explained in the table above). The Build Status tab is shown below the Fields tab.

When the Build activity is going on, then this tab shows:

- Log entries of current data processing details by Report Engine
- Status: Building, Error, Completed
- Size on Disk
- Time elapsed from initiation
- An eraser icon  to clear the logs from this screen
- A Cancel icon  to cancel the background Build activity
- Build History shows the build summary of current and previous builds



Figure 9: Build Status

When No Build activity is going on, then this tab shows:

- Last Build Status
- Size on Disk
- Time elapsed in building last cube

**Note:** Any change made to the analytical object requires re-building of the cube.

### 3 Navigating to Analytical Object from Explorer

You can also navigate to an analytical object from the Explorer tab. Upon clicking the Explorer tab, select the folder that contains the analytical object that you wish to search. Select Object Type as Analytical Object to get a list of analytical objects under the selected folder.

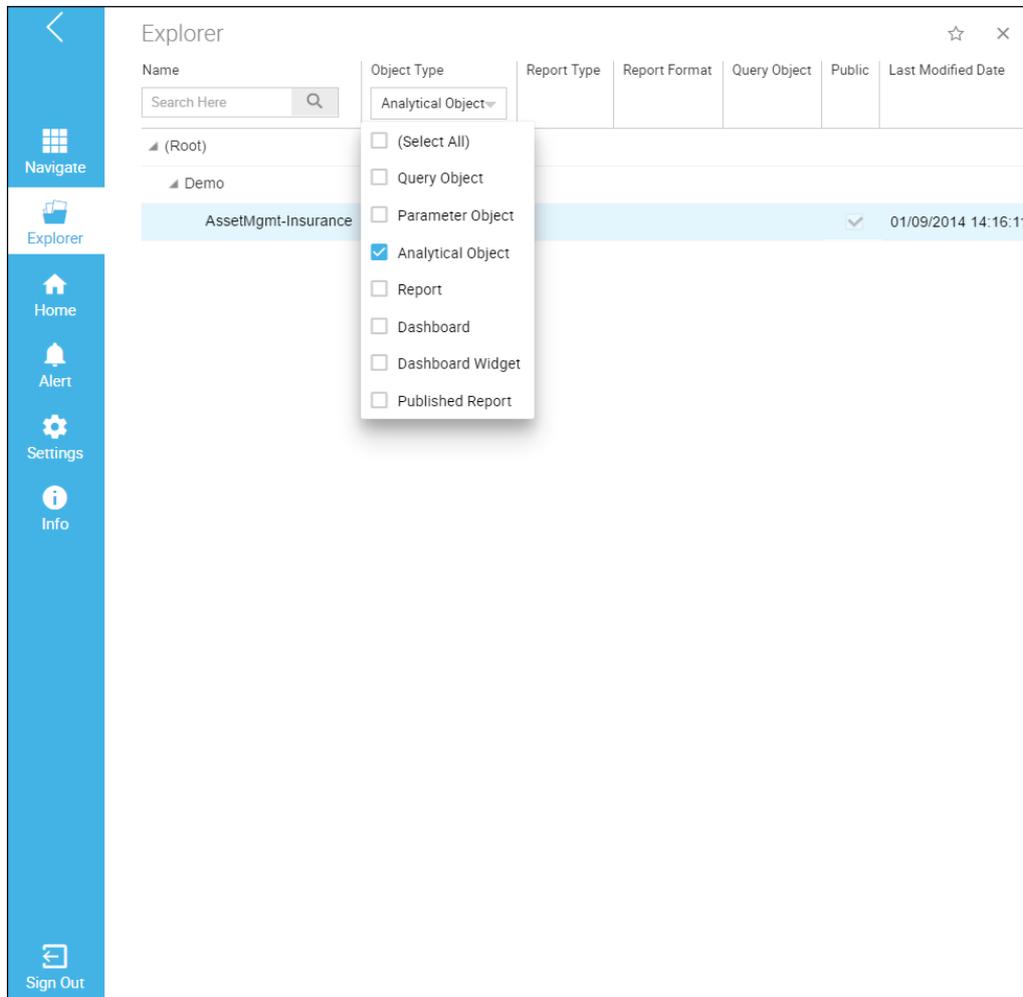


Figure 10: Listing Analytical Objects from Explorer

If you right-click only one Analytical Object, you can do the following operations:

- Edit Analytical Details: Opens up the selected analytical object that you wish to edit
- Browse Analytical Object: Opens up the selected analytical object in High Speed View to let you design and view high speed reports
- Copy or cut the selected Analytical Object and paste in a new or existing folder
- Add the selected Analytical Object to Favorites
- Delete the selected Analytical Object

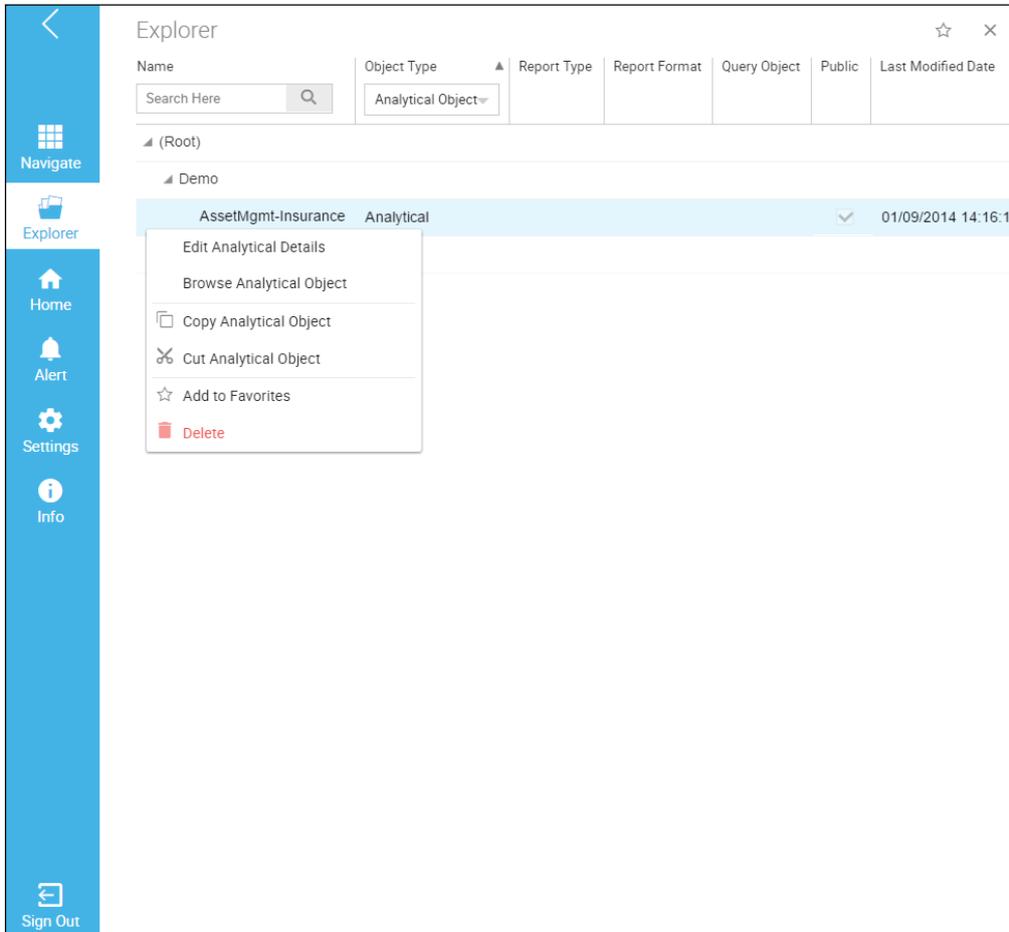


Figure 11: Analytical Objects' Operations from Explorer

You can perform copy, cut and delete operations when you right-click multiple analytical objects at a time.

## 4 Appendix

### A) Data Formats

In business world, data carries a business value associated to name, percent, month, year, profit, etc. Below are the formats used to commonly represent data:

- Title case for cities: New Delhi
- Percent symbol: 56%
- Year represented in 4 digits: 2009
- Date in United States of America: 12/27/2009 (MM/dd/yy)
- Date in India: 27/12/2009 (dd/MM/yy)
- Currency symbol: \$ 89.99

Format is applied to a field during report generation. Format properties for a field is stored in the form of format codes (also known as format string).

Use this dialog box to apply preset format to a field. Selected format will be converted in format code and displayed in Format text box (on Analytical Object page).

#### Preset data formats

Application offers a number of preset formats to choose from. When you specify a format, a sample and the format code it applies is displayed on the dialog.

**Apply Locale Default:** While specifying output format of a Number, Currency, Date and Time type field, check this checkbox to format the output based on the default format as per Locale active at report generation time. Leave the checkbox unchecked to set format that should be applied on the output.

**Note:** Default format to be used for a locale is automatically set by the application. However, this can be customized by specifying in localeconfigurations.xls located on Report Server.

#### General

Select this option when data is not expected in any specific format preferences. When applied as output format, report will be generated using data in the format it is received from database. When applied as input format, user may enter value in any format.

#### Number

The following pre-set format properties are available for numbers:

- Decimal Places: The number of digits on the right side of decimal point. For example, if you select 2, the number 12 will be displayed as 12.00 and the number 12.345 will be displayed as 12.34
- Use 1000 Separator: Check this checkbox to insert a comma after every thousand. For example 1,000,000
- Negative Numbers: Negative number can be enclosed in brackets, e.g. (874.98) or it can have a dash (negative sign) on the right, e.g. -874.98

## **Currency**

If the numeric data is "currency" like sales or salary or profit, you may select a currency symbol from Currency dropdown. This is in addition to the preset properties available for Number format.

When you select a format, dialog displays a sample value and the format code that it will auto-generate for the field.

## **Date**

Application offers a number of preset date formats to choose from. Select a format to view a sample of date in selected format. To know more about date and time format codes, refer to Appendix B.

## **Time**

A number of pre-set time formats are available to select from. Select a format to view a sample of how time will appear in selected format. To know more about date and time format codes, refer to Appendix B.

## **Percentage**

To denote a number as percentage, select this format. You can further choose the Decimal Places in a number after which the percentage symbol (%) be displayed

Decimal places: The number of digits on the right side of decimal point.

## **Scientific**

Select this format to represent a value in scientific notation (also known as exponential notation). In computer applications, exponential part of the number is separated by E. For example, 123.456 in scientific format will be 1.23456 E+2