



Business Analytics

IBM
Software
Solutions
Group

Cognos Dynamic Cubes



2/11/2014



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Agenda

- **What is Dynamic Cube?**
- **Difference between Dynamic cube and Transformer/TM1 Cube**
- **Dynamic cube in Cognos BI environment**
- **Cognos Cube Designer**
- **Dynamic Cube Management**
- **Overview of Aggregate Advisor**
- **Reference**

What is Dynamic Cube?

- Introduced as new feature from IBM Cognos BI 10.2
- Dynamic Cubes are in-memory OLAP cubes that load data directly from relational data sources that is structured in a star or snowflake schema.
- The Cognos Dynamic Cubes technology is part of the IBM Cognos BI query stack
- The goal of IBM Cognos Dynamic Cubes is to provide quick response to reports and analyses on large volumes of data.
- Enabling high-performance interactive analysis over terabytes of data

What is Dynamic Cube?

- Cognos Dynamic Cube solution consists of :-
 - IBM Cognos Cube Designer
 - IBM Cognos Dynamic Cubes Server
 - Aggregate Advisor (part of IBM Cognos Dynamic Query Analyzer)

- When to use Cognos Dynamic Cubes?
 - Data warehouse with star or snowflake schema
 - A server with adequate memory
 - A database with approximately 25 million or more fact table rows

System Requirement for Cognos Dynamic Cube

- Memory – Because Dynamic Cube stores data in-memory, sufficient server RAM is essential to support the application.
- 64 bit Report Server enabled – Even on a 64 bit OS, the default setting for the report server is 32 bit. Change this to 64 bit.
- Cognos 10.2 or newer
- Supported Databases (in the current 10.2 release) include: IBM DB2, IBM Netezza, Microsoft SQL Server, Oracle, Teradata

System Requirement for Cognos Dynamic Cube

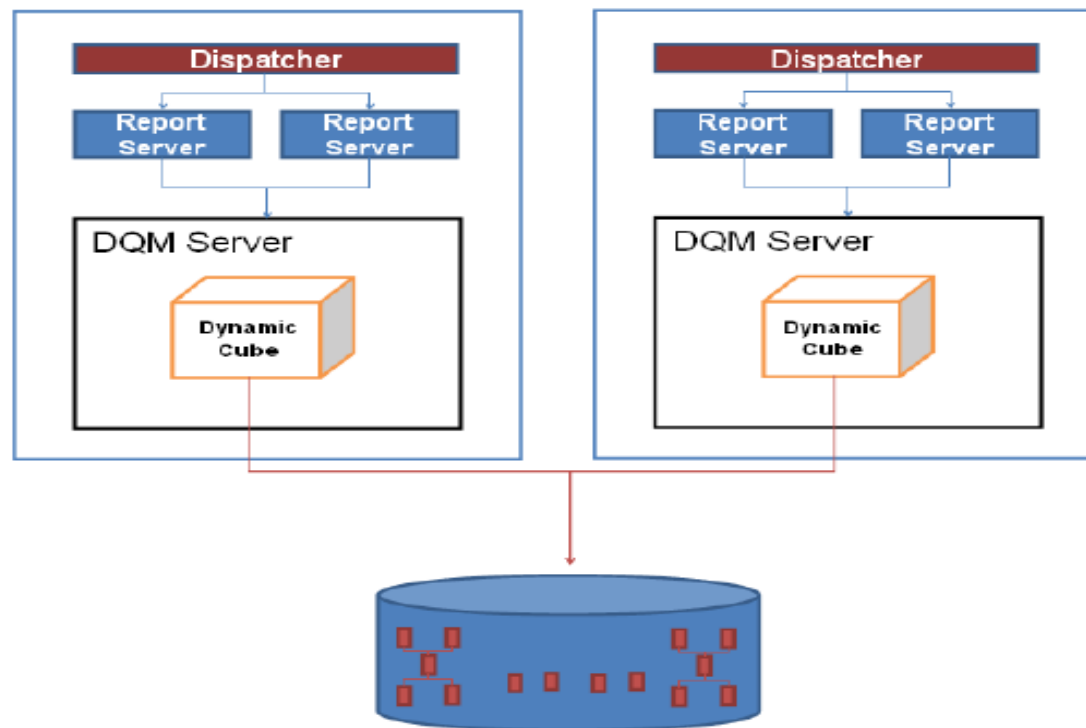
- Hardware specification which need to be sized for Dynamic Cubes are CPU cores, memory, and hard disk space.
- Understanding Hardware Requirements for Dynamic Cubes
 - http://www.ibm.com/developerworks/library/ba-pp-infrastructure-cognos_specific-page659/

Difference between Cognos Dynamic cube and Transformer/TM1 cube

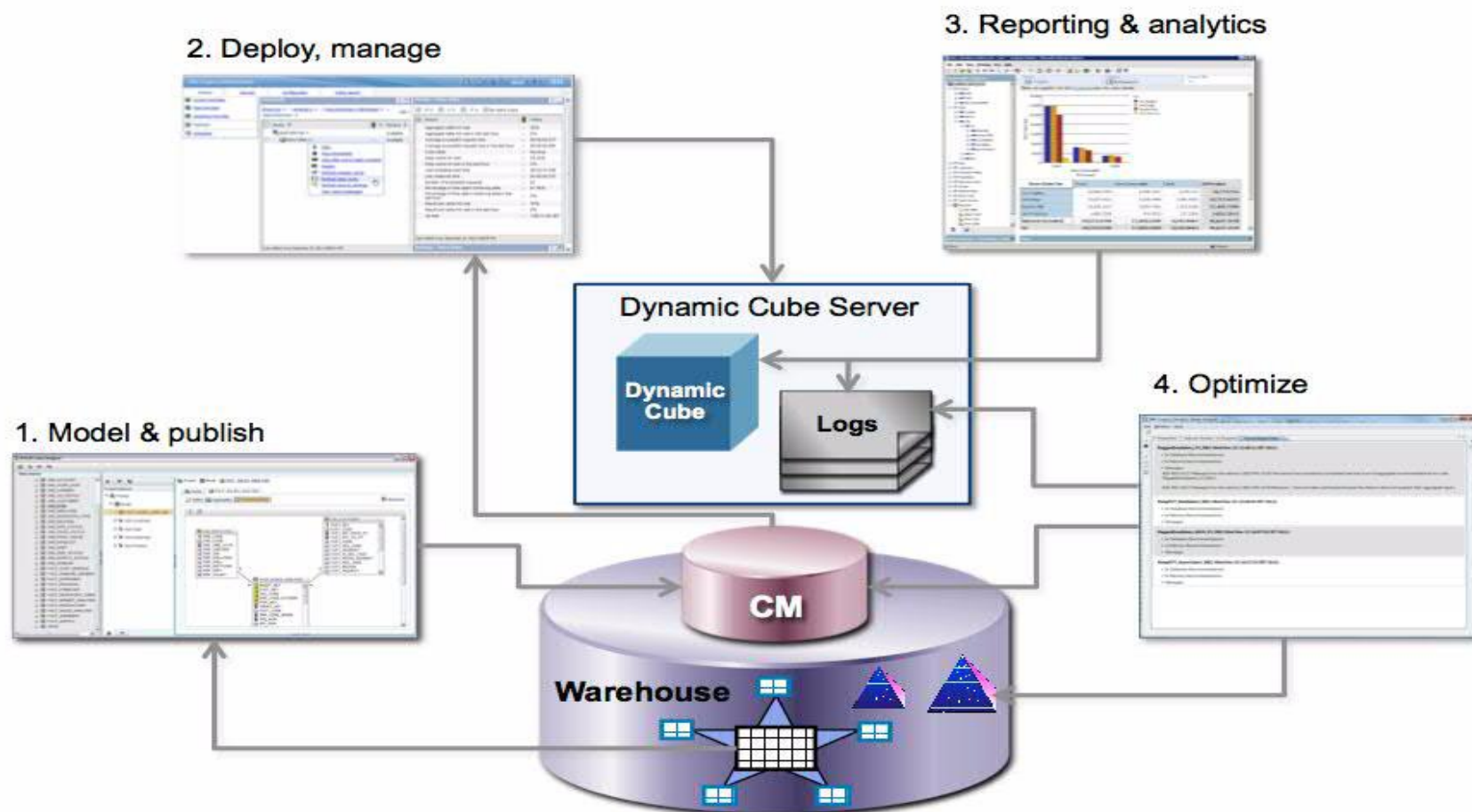
TM1 Cube	PowerPlay Cube	Dynamic Cube
In-memory cube technology with write-back support	File based cube technology	Provides extensive in-memory caching for performance
Is optimal for write-back, what-if analysis, planning and budgeting, or other specialized applications.	Interactive analysis experience to large number of users	Is optimal for read-only reporting and analytics
Star or snowflake data structure is not required	Data source is an operational or transactional system. Do not require star or snowflake data structure	Star or snowflake schema is required
Aggregation occurs on demand	File-based cube with pre-aggregation	Supports in-memory aggregation

Dynamic Cube in Cognos BI Environment

- Dynamic cube are in-memory OLAP containers that resides within DQM server



Dynamic Cube Lifecycle

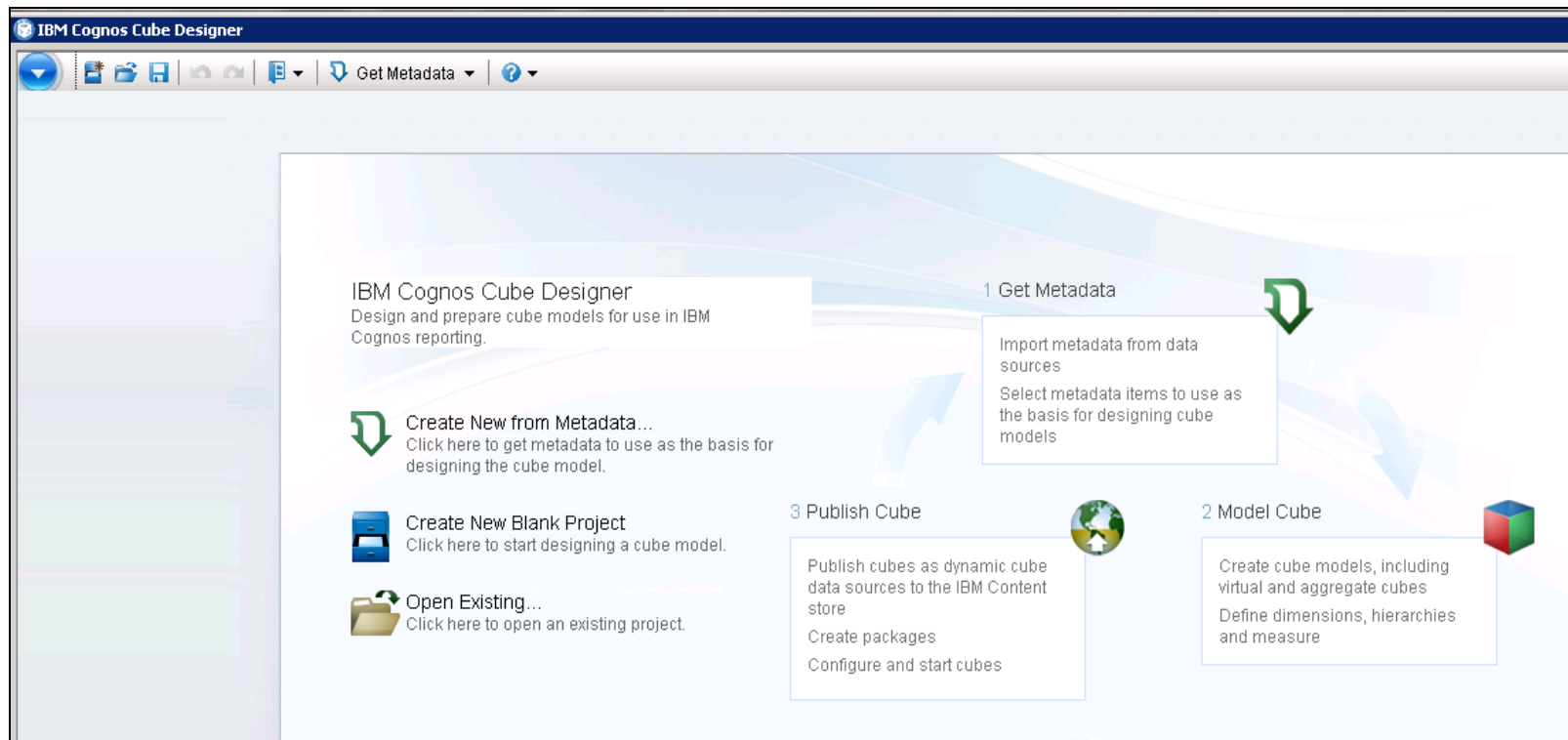


Dynamic Cube Lifecycle

- Modeled in IBM Cognos Cube Designer
- Cube model are then published to Cognos Content Manager as Cognos Dynamic cubes data source.
- From Cognos Administration console, administrator can assign dynamic cube to one or more dispatcher and configure its properties on dispatcher
- When cube is started, DQM server loads the cube model from CM and loads all dimensional members into its member cache.
- It is then made available for processing of reports and analyses.

Cognos Cube Designer

- Cognos Cube Designer is used to model Dynamic Cubes
- Install IBM Cognos Cube Designer in the same location as IBM Cognos Framework Manager



Cognos Cube Designer

- We need a JDBC datasource connection created in Cognos Administration

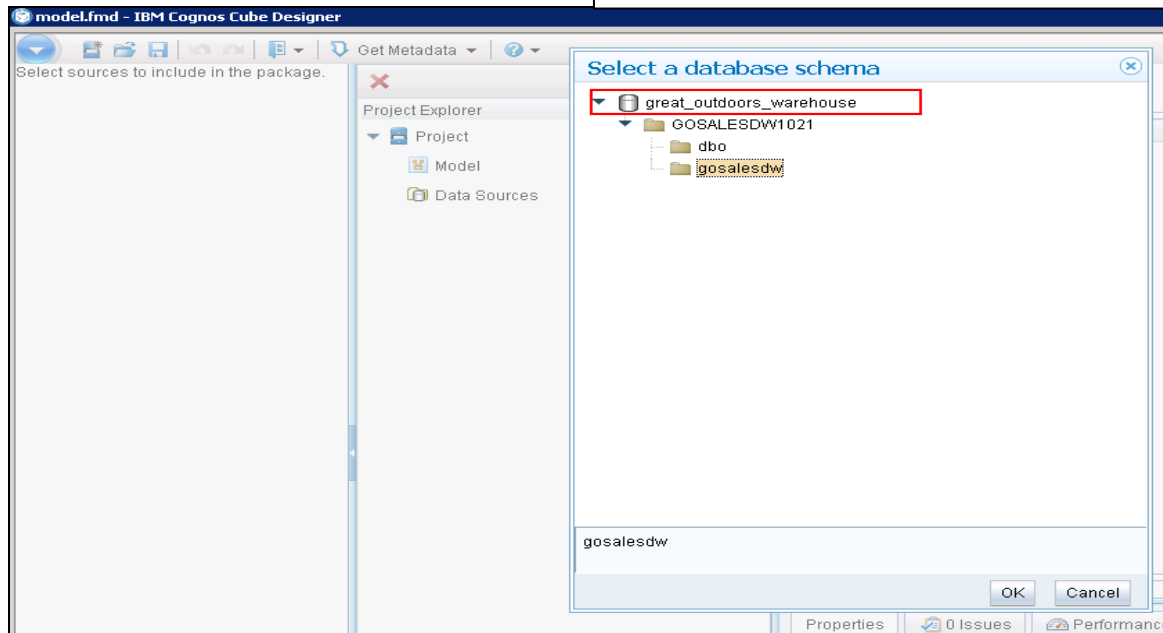
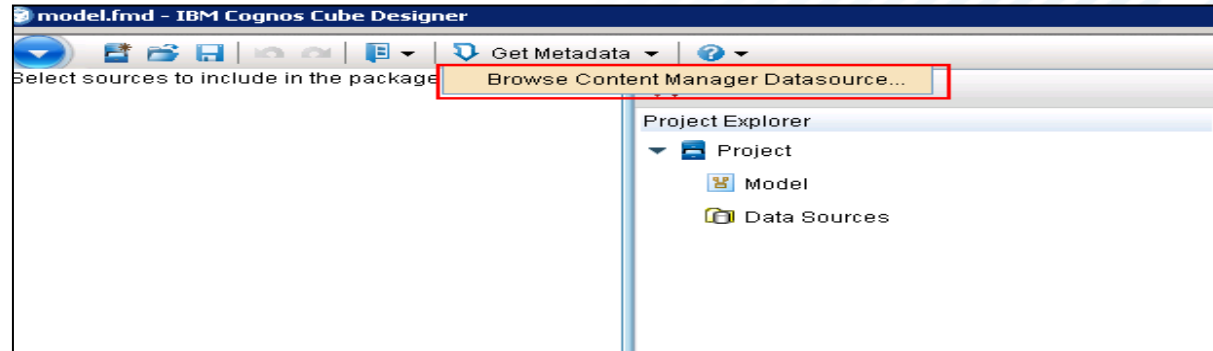
The screenshot displays the Cognos Administration console interface. The left-hand navigation pane shows a tree structure with 'Data Source Connections' selected. The main content area is titled 'Edit the connection string - Microsoft SQL Server 2008'. It features two tabs: 'Native' and 'JDBC', with 'JDBC' being the active tab. Below the tabs, a text prompt reads: 'Edit the parameters to build a Microsoft SQL Server (driver: com.microsoft.sqlserver.jdbc.SQLServerDriver) connection string.' A red rectangular box highlights the 'Enable JDBC connection' checkbox, which is checked. Below this, several configuration fields are visible: 'Server name' (COGL2IND9\COGL2IND9), 'Port number' (empty), 'Instance Name' (COGL2IND9), 'Database name' (GOSALESDW1021), and 'Login Time Out' (0). At the bottom, there is a section for 'JDBC Connection Parameters' with a text area and a 'Local Sort Options' section.

Cognos Cube Designer modeling workflow

- First model your cube definition in Cognos Cube Designer
 - select the database schema
 - import the required metadata
 - define the dimensions and measures
- Creating Dynamic cube
 - Auto-generate cube
 - Use primary-foreign key relationship to populate dimensions
 - Manually model the cube
- Deploy your dynamic cube to BI server
 - Quick-deploy options in Cognos Cube Designer with **Publish** Option
 - Option that is deselected here must be accomplished manually in FM or in Cognos Connection.

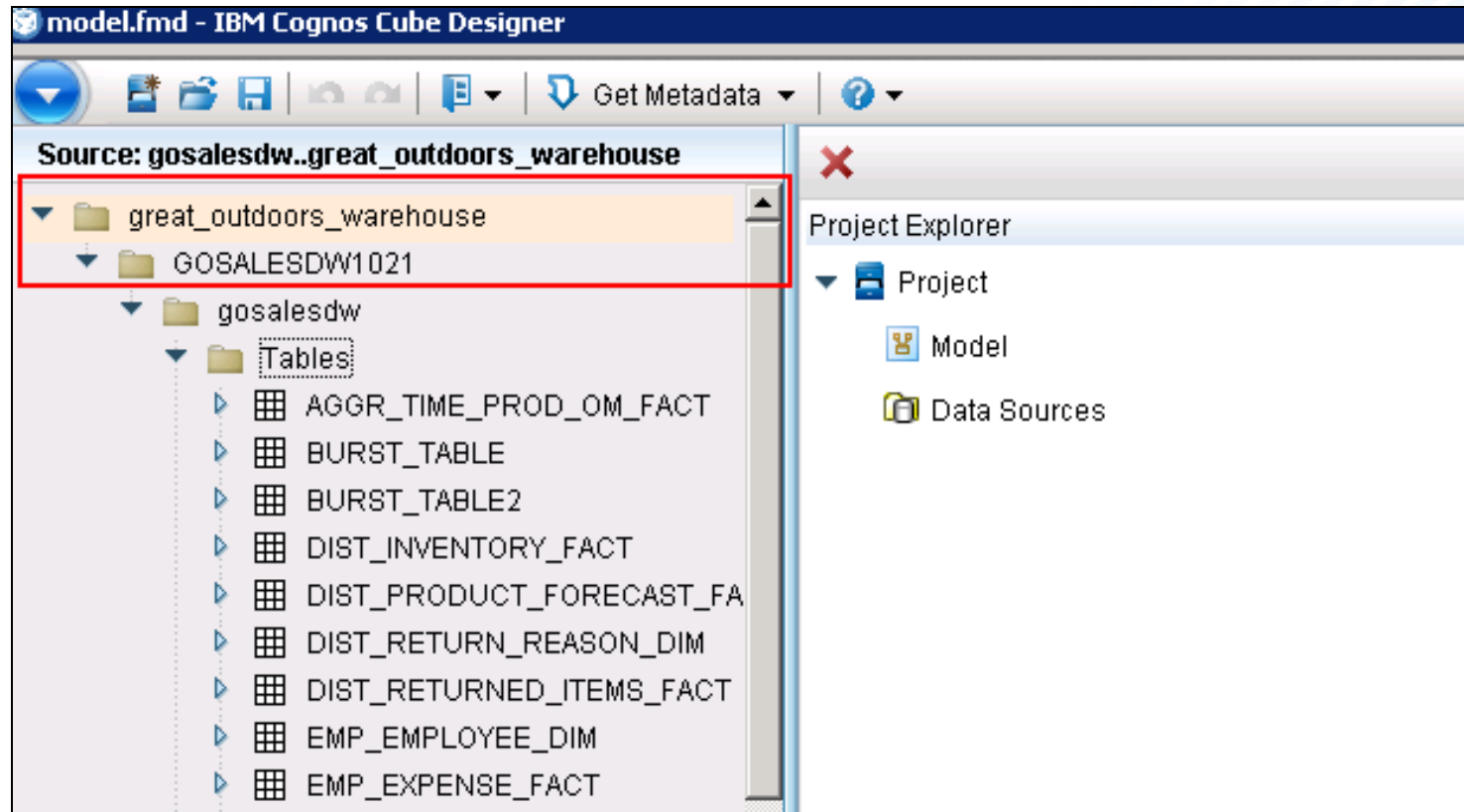
Cognos Cube Designer modeling workflow

- Select the database schema and it will import the metadata



Cognos Cube Designer modeling workflow

- Matadata is imported in Cube Designer



■ Create Cube – Auto generate method

- It creates the cube along with basic Dimensions and Measures

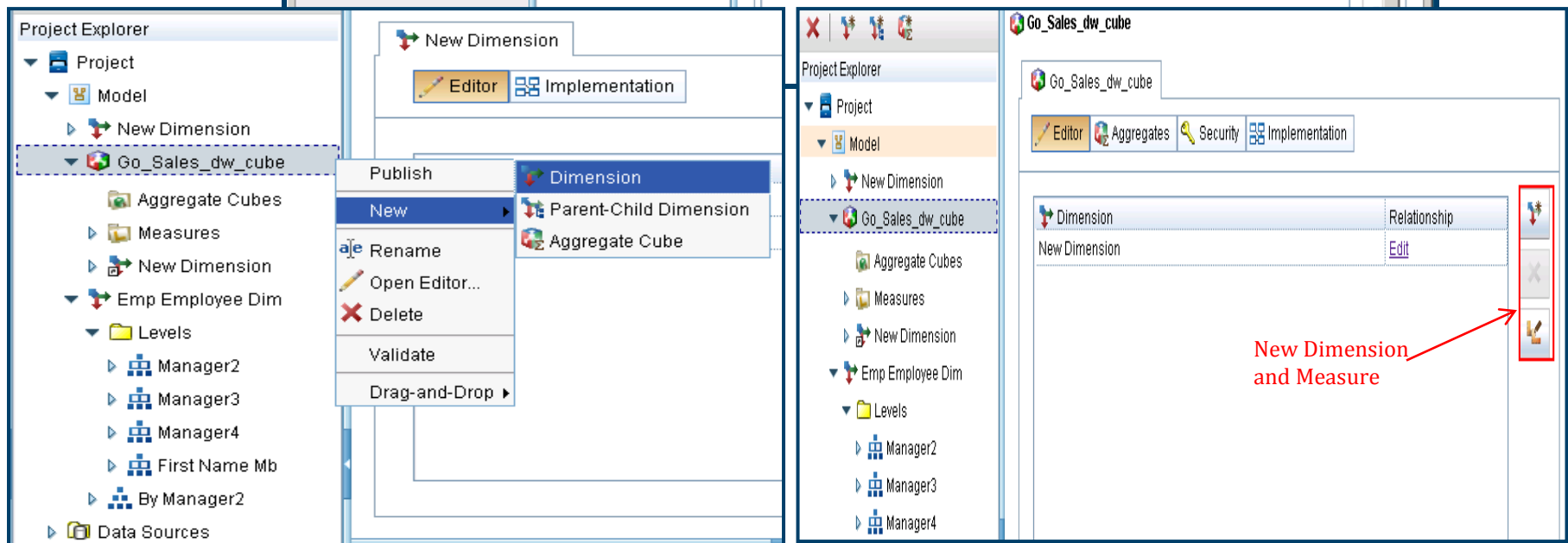
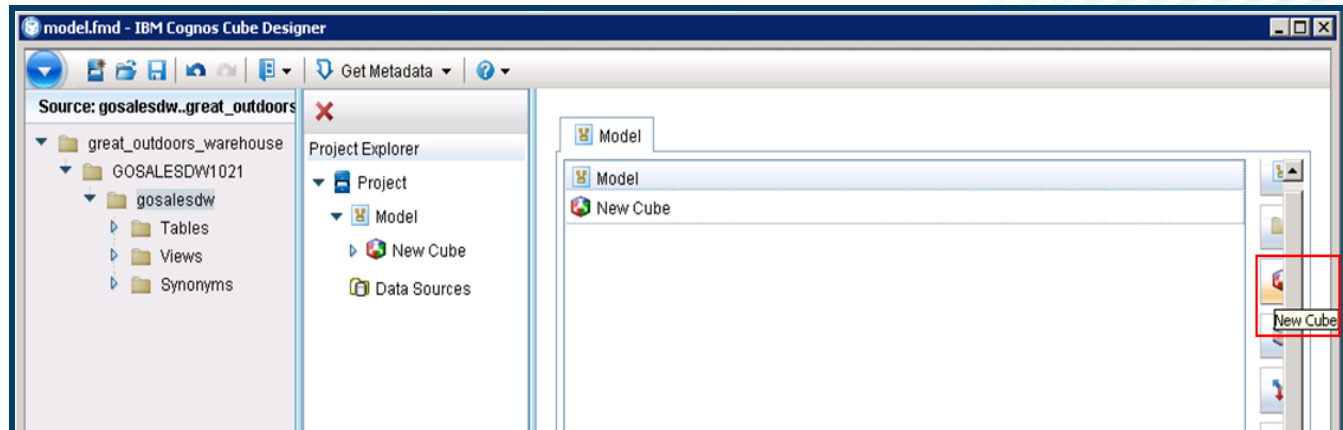
The top screenshot shows the IBM Cognos Cube Designer interface with the 'Generate' menu open, highlighting the 'Cubes with basic dimensions' option. The source is 'gosalesdw..great_outdoors_warehouse'.

The bottom screenshot shows the 'Dist Inventory Fact' cube configuration. The 'Project Explorer' on the left lists the cube and its dimensions. The main pane shows the 'Dist Inventory Fact' cube with tabs for Editor, Aggregates, Security, and Implementation. The 'Editor' tab is active, showing a table of dimensions and their relationships.

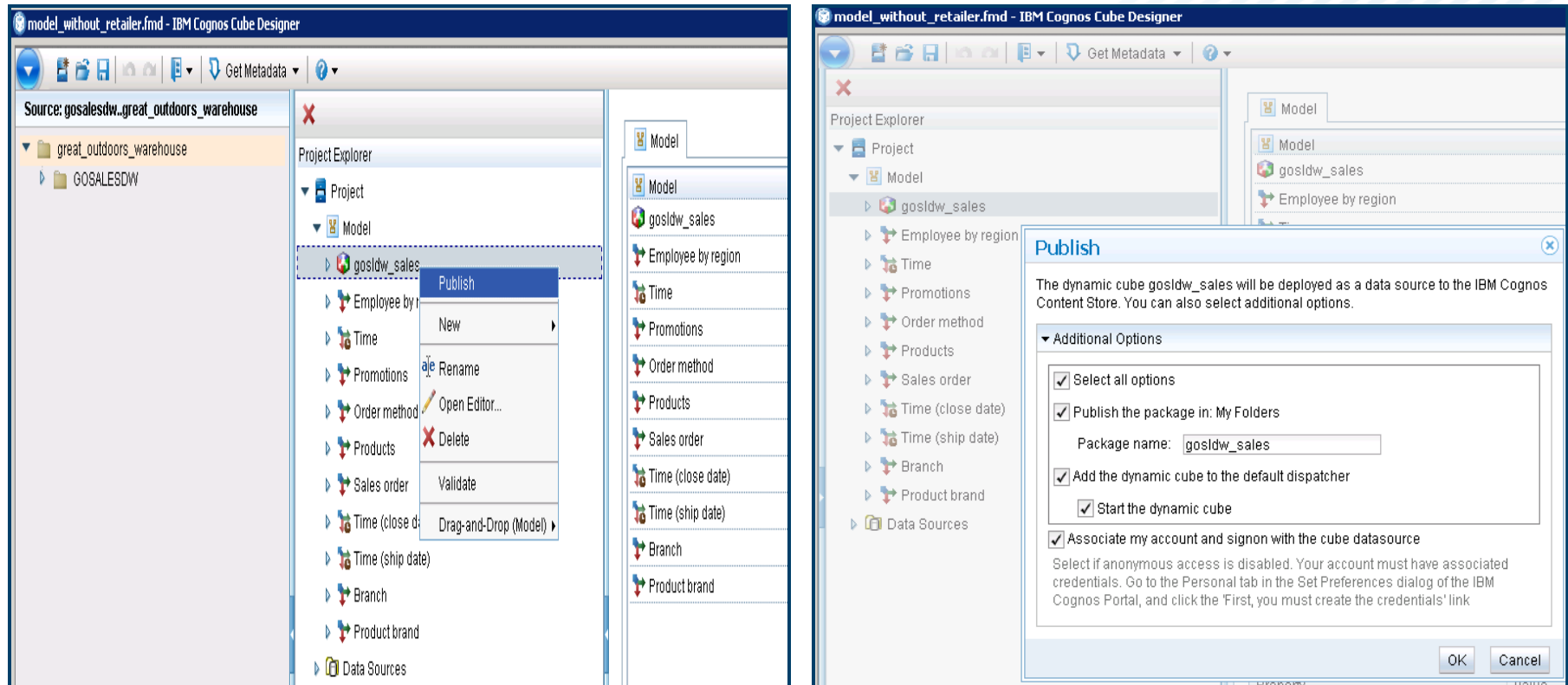
Dimension	Relationship
Go Branch Dim	Edit
Go Org Dim	Edit
SIs Product Dim	Edit

Create Cube – Manual method

- Modeler defines the required Dimensions and Measures and creates the cube

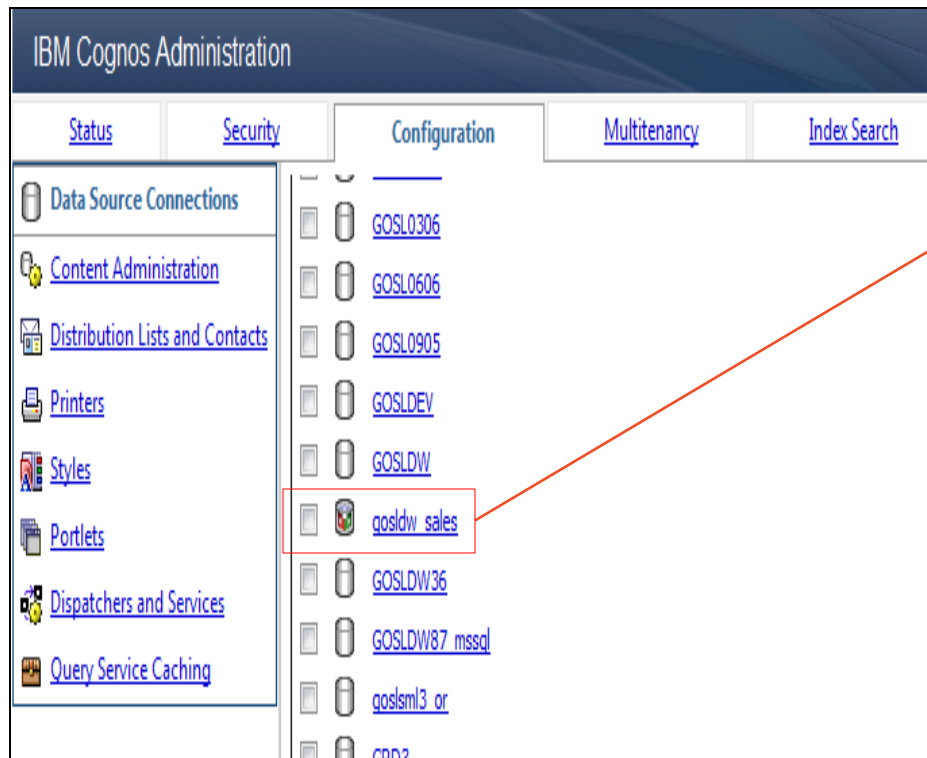


Publish the cube



- Cube model are then published to Cognos Content Manager as Cognos Dynamic cubes data source.

- When a dynamic cube is published to Content Manager from Cognos Cube Designer it appears in the list of data sources



Dynamic cube data source connection

- Access account:
 - single account that is used to access the underlying relational database of the cube.

Set properties - gosldw_sales

General Permissions

Specify the properties for this entry.

Type: Dynamic cube data source Location: Directory > Cognos [View the search path, ID and URL](#)

Owner: Anonymous

Contact: None [Set the contact](#) Created: July 11, 2012 7:30:32 PM

☐ Disable this entry Modified: August 10, 2012 4:11:10 PM

☐ Hide this entry Icon: Standard [Edit...](#)

The name, screen tip and description are shown for the selected language.

Language: English [Remove values for this language](#)

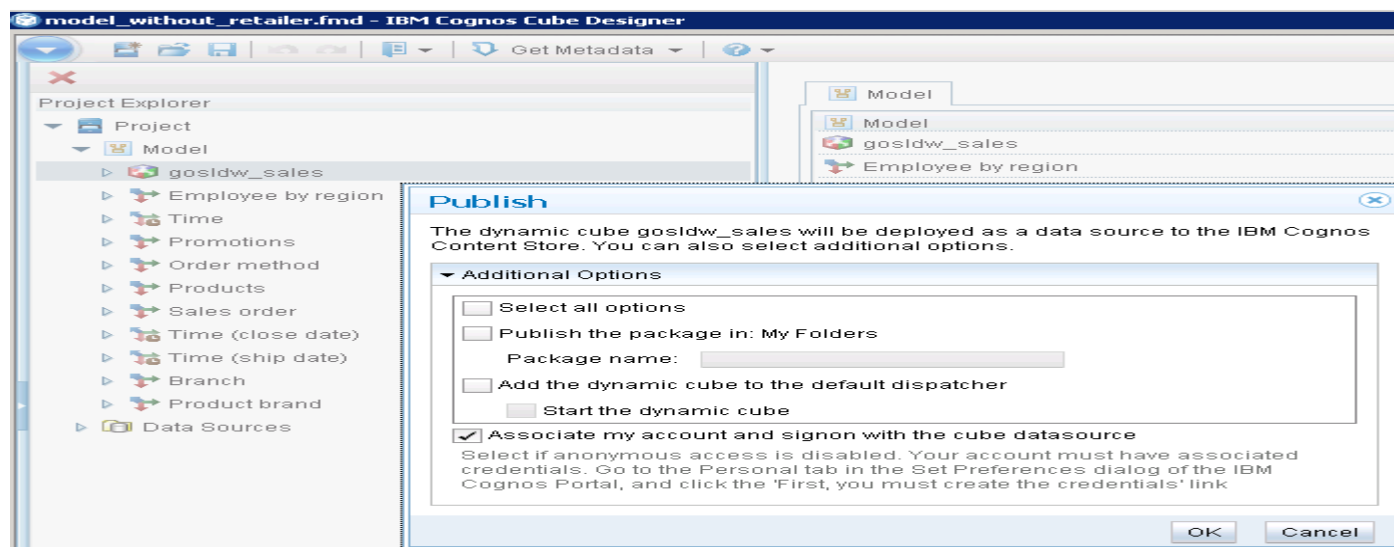
Name: gosldw_sales Description:

Screen tip:

Access Account: Anonymous [Select the access account...](#)

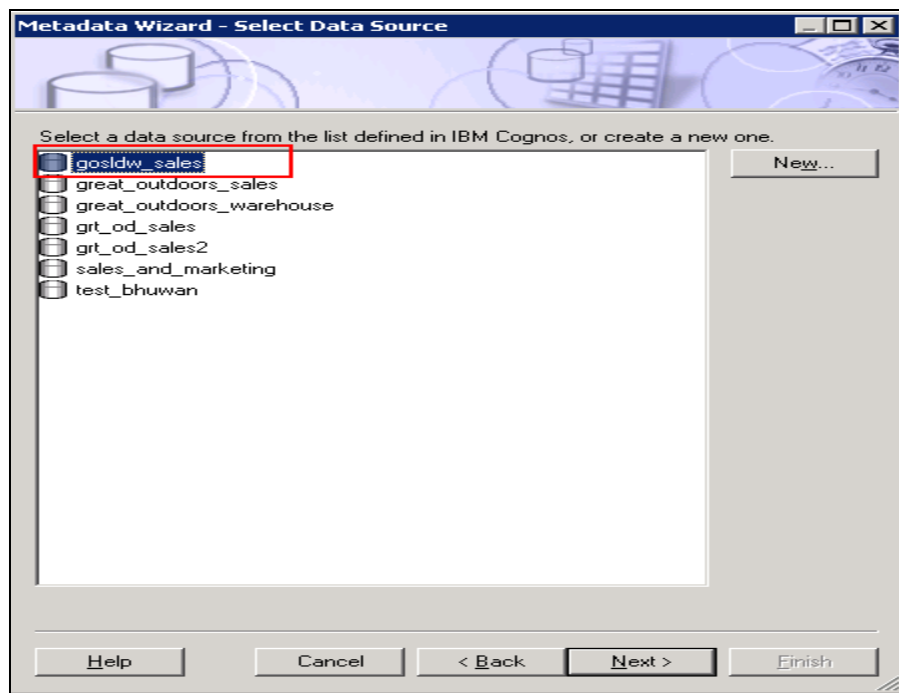
Manually Deploying a Dynamic Cube

- This is the approach while publishing to Production environment
- First required step is to publish the cube from Cognos Cube Designer without the additional options selected.
 - creates a cube data source in Cognos Connection and publishes the cube model to the Cognos content store
 - Associate my account and signon with the cube datasource



Manually Deploying a Dynamic Cube

- Create a Package in FM
 - create a package in IBM Cognos Framework Manager to publish to the content store to make the cube available for reporting and analysis.
 - This process is identical to creating a Framework Manager package using any other supported OLAP source such as IBM Cognos TM1 or IBM Cognos Transformer PowerCubes.



Configuring Dynamic Cube

- Publishing a dynamic cube to Content Manager as a data source does not make a cube accessible to users as at this point only metadata definition of a cube was published.
- Configuring a dynamic cube for a dispatcher requires two steps:
 - Identify a specific dispatcher on which a cube can be active.
 - Define the operational characteristics of a cube on that dispatcher.
Properties such as- data and aggregate cache sizes, must be assigned non-default values
- Assign dynamic cube on dispatcher machine with high CPU and memory capacity in excess of what is required for DQM server.

Configuring Dynamic Cube

Adding a cube to the QueryService

IBM Cognos Administration

Status Security Configuration Library Multitenancy Index Search

Scorecard

Services - Query

Name Status

System Available

QueryService Available

Last refresh time: January 29, 2013

Set properties

Start

Stop immediately

Stop after running and queue processed

Set properties - QueryService

General Settings Permissions

Specify the configuration settings for this entry. By default, an entry acquires its configuration settings from a parent. You can override those settings with the settings set explicitly for this entry.

Category: All

Entries: 1 - 19

Category	Name	Value
Environment	Advanced settings	Edit...
Environment	Dynamic cube configurations	Edit...
Logging	Audit logging level for query service	Minimal
Logging	Enable query execution trace	<input type="checkbox"/>
Logging	Enable query planning trace	<input type="checkbox"/>
Logging	Generate comments in native SQL	<input type="checkbox"/>

Set dynamic cube configurations - QueryService

Specify the dynamic cube configurations.

Data source	Properties
No entries.	

New configuration... Delete

OK Cancel

Select dynamic cube data sources - QueryService

Select the entries you want and click the Add button to update the Selected entries list.

Search

Available entries

Cognos

Entries: 1 - 1

Name
gosldw_sales

Selected entries

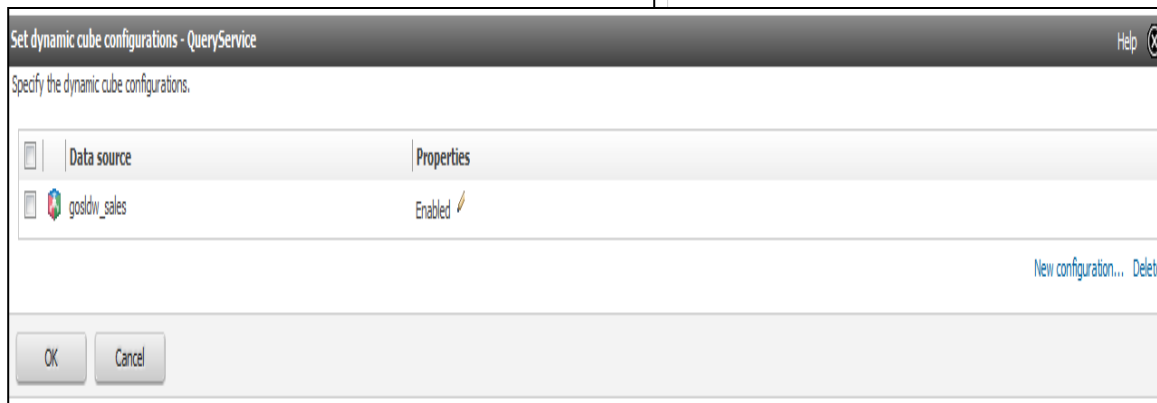
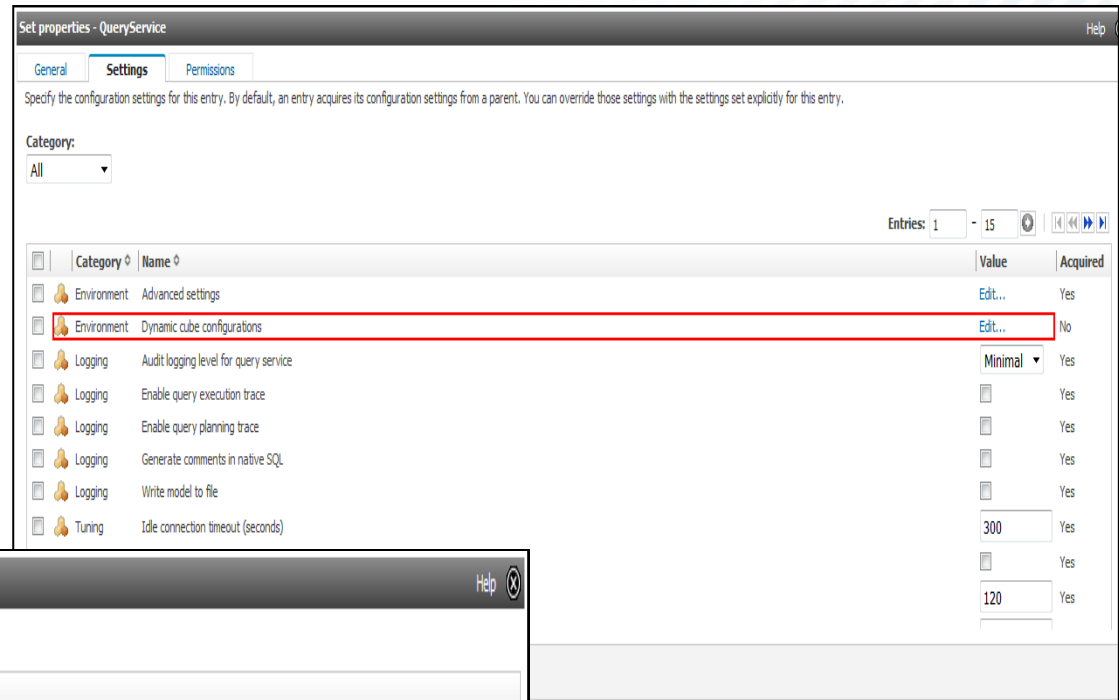
Entries: 1 - 1

Name
gosldw_sales

Remove

Configuring Dynamic Cube

- From QueryService properties select Edit Dynamic Cube Configuration



Configuring Dynamic Cube

- Specify the properties of the Dynamic Cube

Set properties - gosldw_sales Help

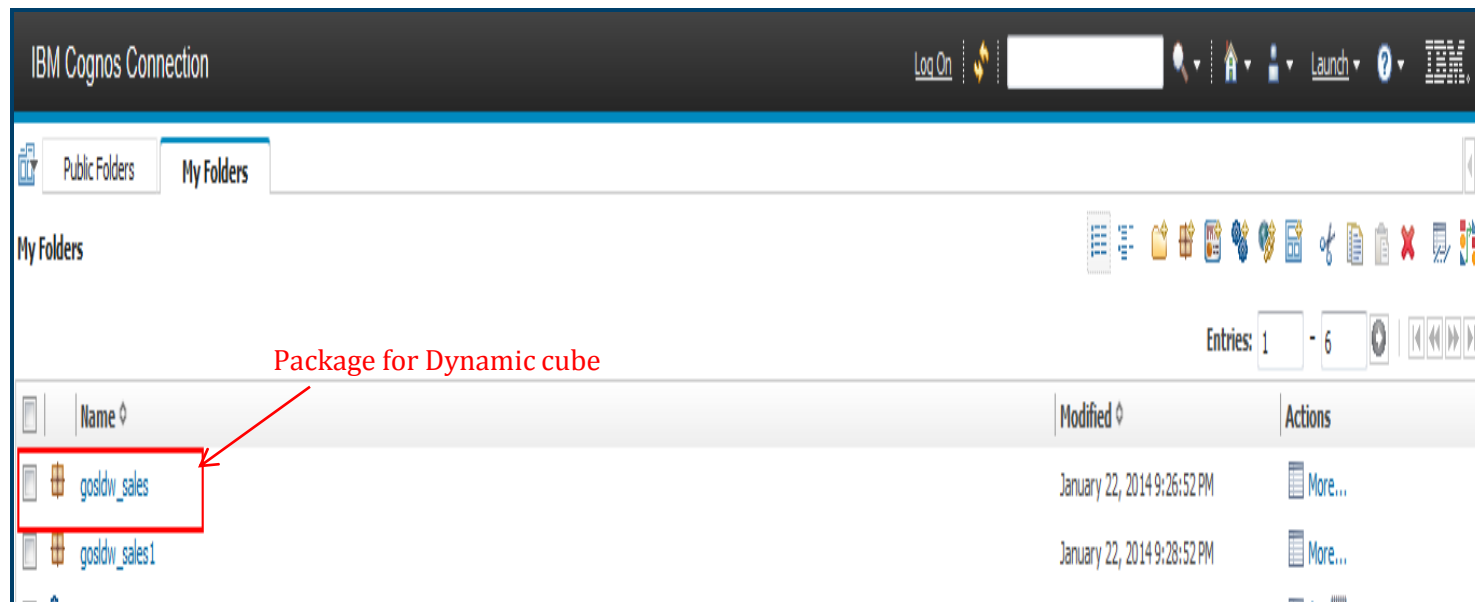
Specify the properties for this entry.

Name	Value
<input type="checkbox"/> Disabled	<input type="checkbox"/>
<input type="checkbox"/> Startup trigger name	<input type="text"/>
<input type="checkbox"/> Disable result set cache	<input type="checkbox"/>
<input type="checkbox"/> Data cache size limit (MB)	<input type="text" value="1024"/>
<input type="checkbox"/> Maximum amount of disk space to use for result set cache (MB)	<input type="text" value="1024"/>
<input type="checkbox"/> Enable workload logging	<input type="checkbox"/>
<input type="checkbox"/> Maximum space for in-memory aggregates (MB)	<input type="text" value="0"/>
<input type="checkbox"/> Disable in-database aggregates	<input type="checkbox"/>
<input type="checkbox"/> Percentage of members in a level that will be referenced in a filter predicate	<input type="text" value="90"/>

[Reset to default](#)

Configuring Dynamic Cube

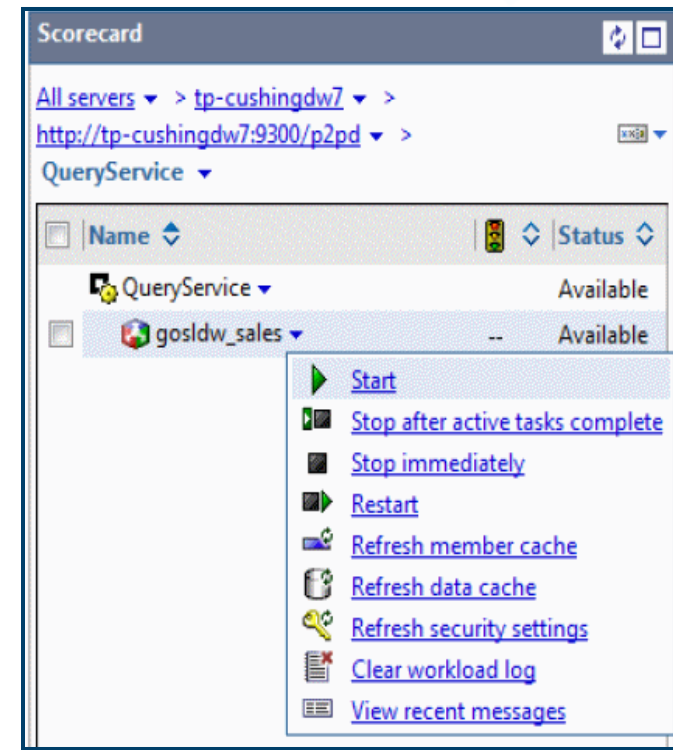
- Dynamic cubes must be either explicitly or implicitly started before they can be accessible to users
- There must also be at least one package available to users to access a cube



Dynamic Cube Management

Now the Cube can be Started

- It can be started in either of four ways:
 - Starting the QueryService
 - Starting the cube from IBM Cognos Administration
 - Creating and scheduling a ROLAP administrative task.
 - Creating an SDK application that starts a cube.



- Start the cube by creating Query Service Administration Task and select Operation as **Start**

IBM Cognos Administration

Status Security **Configuration** Library Multitenancy Index Search

Data Source Connections
Content Administration
Distribution Lists and Contacts
Printers
Styles
Portlets
Dispatchers and Services
Query Service Caching

Specify a name and description - New Query Service Administration Task wizard
Specify a name and location for this entry. You can also specify a description and screen tip.

Name:
Start_dcube

Description:

Screen tip:

Location:
Administration
Select another location...

Cancel < Back Next >

IBM Cognos Administration

Status Security **Configuration** Library Multitenancy Index Search

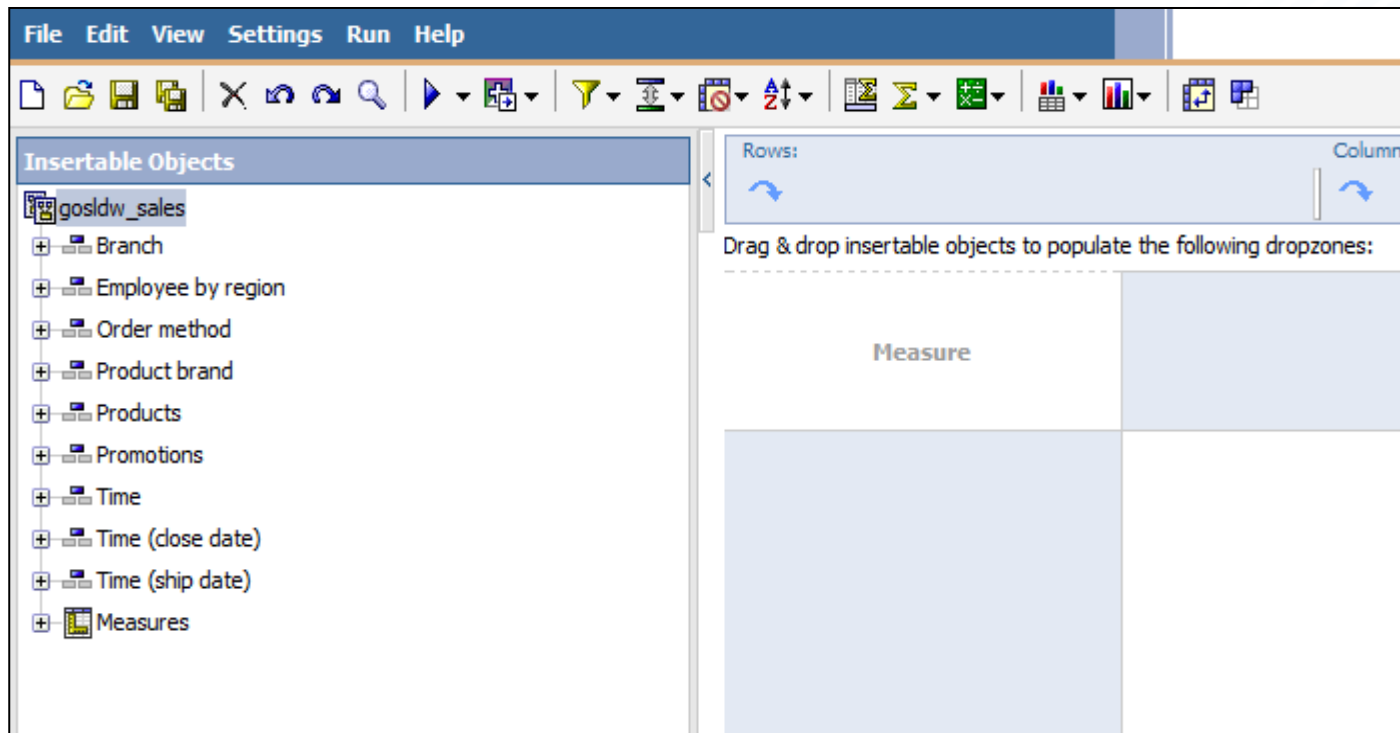
Data Source Connections
Content Administration
Distribution Lists and Contacts
Printers
Styles
Portlets
Dispatchers and Services
Query Service Caching

Select the options - New Query Service Administration Task wizard
Specify the options to use for this entry. To have the Dynamic Cubes query service administration task applied cubes for which the operation is to be performed.

Operation:
Clear workload log
Clear workload log
Refresh data cache
Refresh member cache
Refresh security settings
Restart
Start
Start cube and source cubes
Stop after active tasks complete
Stop immediately

Cancel < Back Next > Finish

- After the cube is started successfully it can be accessed in Cognos Studios for Reporting and Analysis



Administering Dynamic Cube

- Administration tasks include assigning the cube to the QueryService instance, starting it, monitoring its health, and refreshing its contents.
 - Start/Stop the Cube
 - Monitoring Cube
 - Managing the cache
 - Scheduling a refresh of the cache

Administering Dynamic Cube

Start the Dynamic Cube

- When the cube starts successfully, its status changes to **Available**
- Select **View recent messages** if the cube status shows Unavailable

IBM Cognos Administration

Scorecard

Services - Query > QueryService

Name	Status
QueryService	Available
gosldw_sales	Unavailable

Context menu options:

- Start
- Stop after active tasks complete
- Stop immediately
- Restart
- Refresh member cache
- Refresh data cache
- Refresh security settings
- Clear workload log
- View recent messages**

Metrics - gosldw_sales

Name	Value
Aggregate table hit rate	0%
Aggregate table hit rate in last hour	0%
Average successful request time	00:00:00.000
Average successful request time in last hour	00:00:00.000
Cube state	Stopped
Data cache hit rate	0%
Refresh time: July 22, 2012 3:23:29 AM	

View recent messages - gosldw_sales

The list contains the most recently generated cube messages. To see all of the cube messages, view the log files.

Time	Message
July 22, 2012 3:26:07 AM	Cube start succeeded
July 22, 2012 3:25:52 AM	Cube start executing

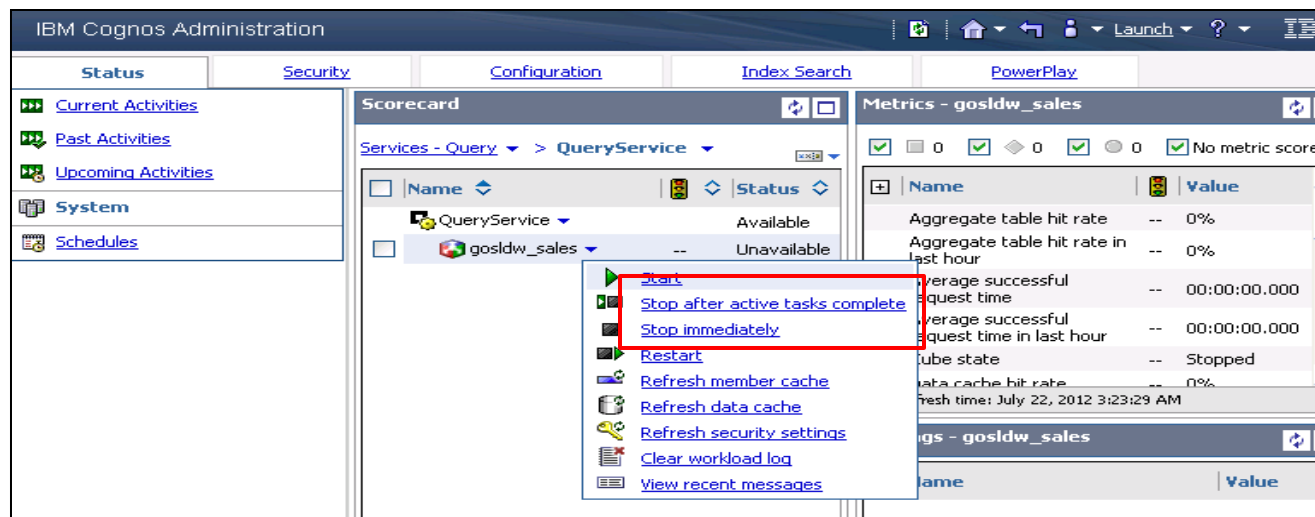
OK

Administrating Dynamic Cube

Stopping the Dynamic Cube

There are two methods :-

- Stop after active tasks complete
 - the cube will stop after currently executing queries are finished.
- Stop immediately
 - The cube will stop immediately, without waiting for the active queries and commands to complete. Some user queries can fail as a result.



Administering Dynamic Cube

Monitoring cube state through metrics

- When managing dynamic cubes, a good practice is to monitor metrics displayed for each cube in the Metrics window

The screenshot displays the IBM Cognos Administration console. The left sidebar contains navigation links: Current Activities, Past Activities, Upcoming Activities, System, and Schedules. The main area is divided into two panes. The left pane, titled 'Scorecard', shows a hierarchy: Services - Query > QueryService. It lists two items: 'QueryService' with a status of 'Available' and 'gosldw_sales' with a status of 'Available'. The right pane, titled 'Metrics - gosldw_sales', displays a table of performance metrics. The table has columns for 'Name' and 'Value'. The metrics include hit rates, request times, cube state, and processing times. The 'Cube state' is 'Running'. The 'Last refresh time' is 'August 9, 2012 8:38:28 PM'.

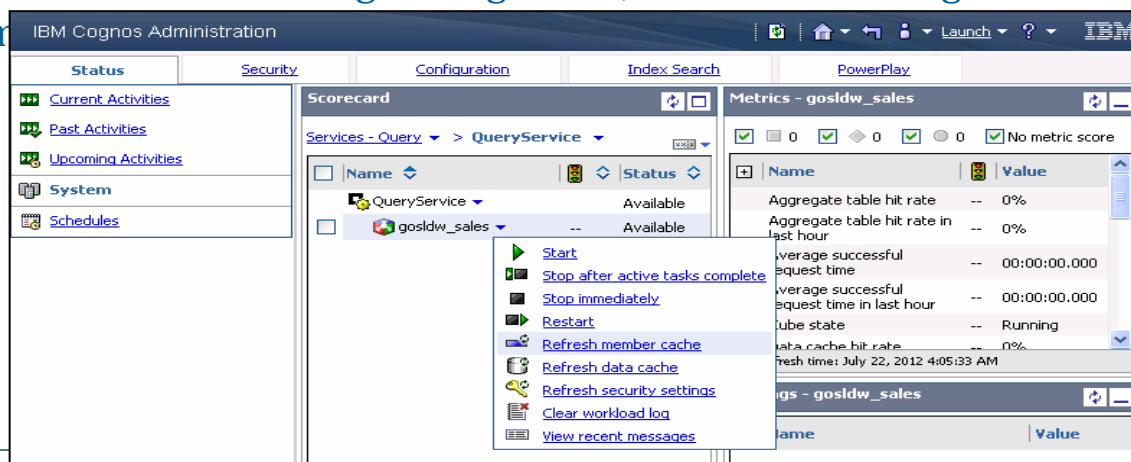
Name	Value
Aggregate table hit rate	100%
Aggregate table hit rate in last hour	100%
Average successful request time	00:00:12.704
Average successful request time in last hour	00:00:12.704
Cube state	Running
Data cache hit rate	0%
Data cache hit rate in last hour	0%
Dependent cubes	--
In-memory aggregate cache hit rate	0%
In-memory aggregate cache hit rate in last hour	0%
Last metadata load time	00:00:11.007
Last response time	00:00:12.704
Loaded/defined in-memory aggregates	0/0
Number of processed requests	5
Percentage of time spent retrieving data	99.64%
Percentage of time spent retrieving data in last hour	99.64%
Result set cache hit rate	0%
Result set cache hit rate in last hour	0%
Time spent loading in-memory aggregates	00:00:00.000
Up time	00:03:29.056

Last refresh time: August 9, 2012 8:38:28 PM

Administering Dynamic Cube

Managing Cache

- Dynamic Cubes support below caches that can be managed by the administrator.
 - Member Cache
 - This cache contains cube members that are loaded from the source relational data source. The member cache can be refreshed when appropriate, such as when the source data is changed, to update the cube with the latest metadata.
 - Data cache
 - This cache contains data values that correspond to the current set of cache metadata. This cache can be refreshed when the data values in the source relational data source are changed. In general, data values change more frequently than cube m



Administering Dynamic Cube

Managing Cache

- Result set cache
 - The result set of each MDX query executed by the engine is stored within the on-disk result set cache

Set properties - gosldw_sales

Specify the properties for this entry.

Name	Value
<input type="checkbox"/> Disabled	<input type="checkbox"/>
<input type="checkbox"/> Startup trigger name	<input type="text"/>
<input type="checkbox"/> Disable result set cache	<input type="checkbox"/>
<input type="checkbox"/> Data cache size limit (MB)	1024
<input type="checkbox"/> Maximum amount of disk space to use for result set cache (MB)	1024
<input type="checkbox"/> Enable workload logging	<input type="checkbox"/>
<input type="checkbox"/> Maximum space for in-memory aggregates (MB)	0
<input type="checkbox"/> Disable in-database aggregates	<input type="checkbox"/>
<input type="checkbox"/> Percentage of members in a level that will be referenced in a filter predicate	90

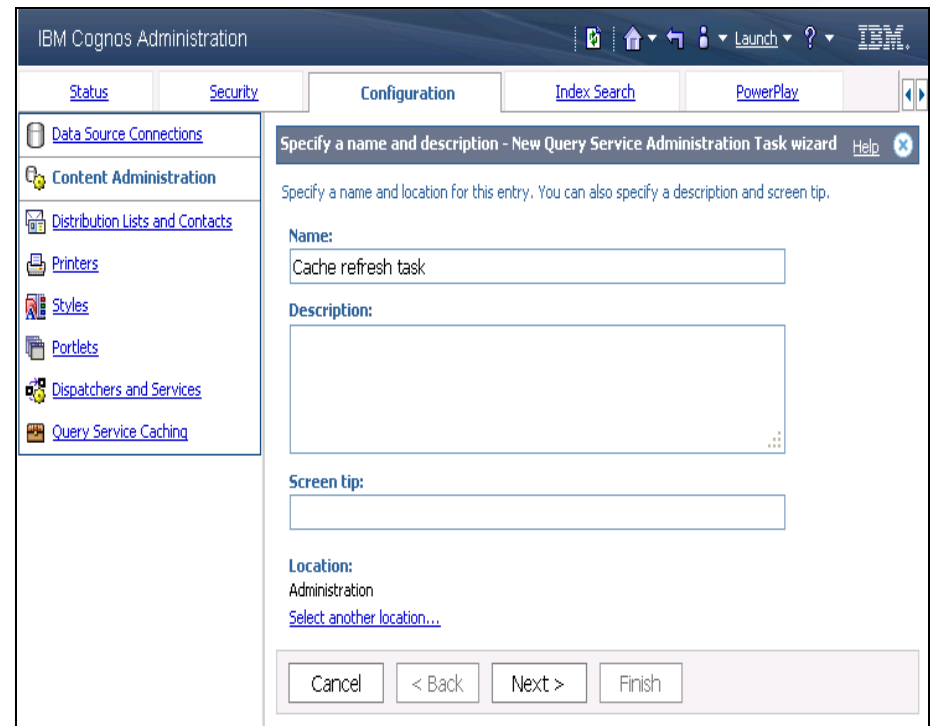
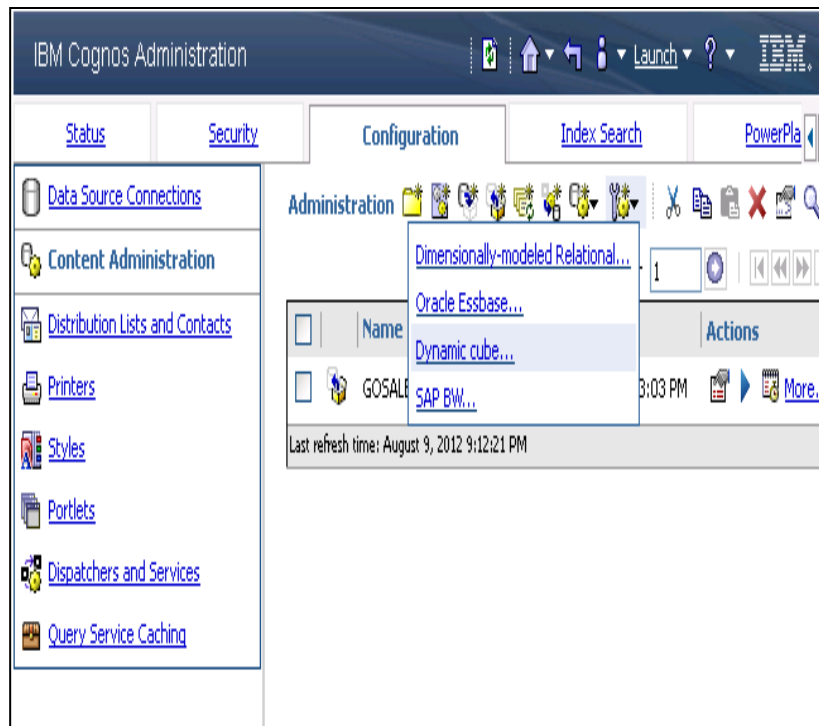
Reset to default

OK Cancel

- Aggregate Cache
 - Pre-computed aggregate values are stored in Aggregate cache.
 - *(Discussed in detail along with Aggregate Advisor)

Scheduling a refresh of the cache

- Cube member and data caches must be updated
- Schedule a refresh of a cube metadata to run once a day



Administering Dynamic Cube

Scheduling a refresh of the cache

IBM Cognos Administration

Status Security **Configuration** Index Search PowerPlay

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Query Service Caching

Select the options - New Query Service Administration Task wizard Help

Specify the options to use for this entry. To have the Dynamic Cubes query service administration task applied to cubes on a dispatcher instance, specify the operation, server group, and dispatcher from the list, and select the cubes for which the operation is to be performed.

Operation:
Refresh member cache

Server Group:
Default Server Group

Dispatcher:
http://dt-beryozad:9300/p2pd

Cubes:

<input checked="" type="checkbox"/>	Name:
<input checked="" type="checkbox"/>	gosldw_sales

Cancel < Back Next > Finish

In the next window, select **Save and schedule** and click **Finish** to create the task

IBM Cognos Administration

Status Security Configuration Index Search PowerPlay

Data Source Connections

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Dispatchers and Services

Query Service Caching

Select an action - New Query Service Administration Task wizard [Help](#)

Select whether you want to run, schedule, or save only, when the wizard closes.

Action:

☐ Save and run once

☒ Save and schedule

☐ Save only

Cancel < Back Next > Finish

IBM Cognos Administration

Status Security Configuration Index Search PowerPlay

Data Source Connections

Content Administration

Distribution Lists and Contacts

Printers

Styles

Portlets

Dispatchers and Services

Query Service Caching

Schedule - Cache refresh task [Help](#)

Schedule the entry to run at a recurring date and time. You can disable the schedule without losing any of its details.

☐ Disable the schedule

Priority: 3

Frequency: Select the frequency by clicking on a link.

By Day By Week By Month By Year By Trigger

☐ Every 1 minute(s)

☐ Every 1 hour(s)

☒ Every 1 day(s)

Daily Frequency: ☒ Every 1 Hour(s) between 3 : 00 AM and 3 : 30 AM

Credentials: Anonymous

Start: Aug 11, 2012 3 : 00 AM

End: ☒ No end date ☐ End by: Aug 11, 20: 3 : 02 A

OK Cancel

Overview of Aggregate Advisor

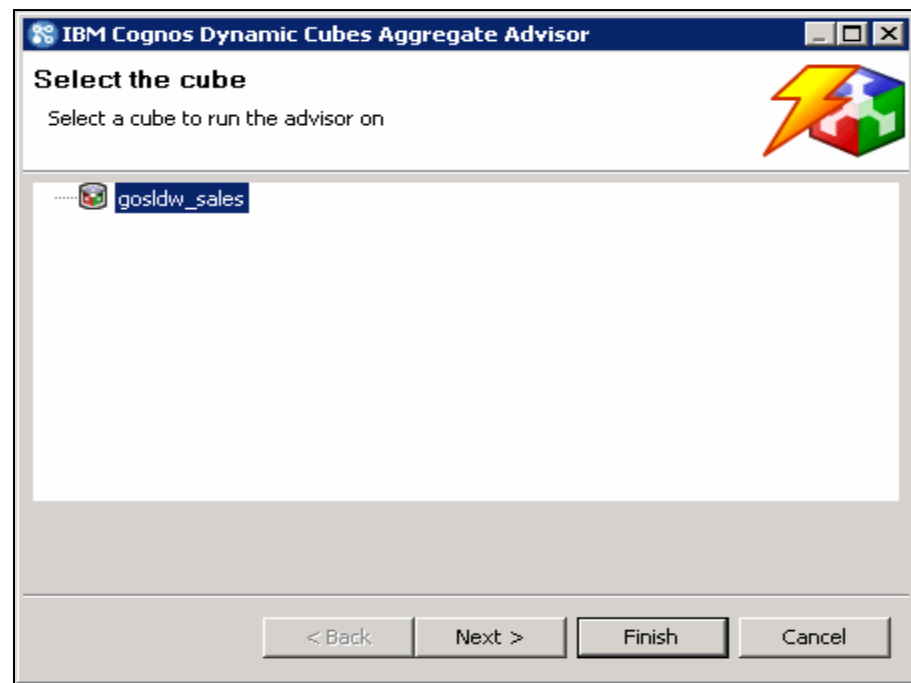
- Aggregate Advisor is a performance optimization utility
- Part of the Dynamic Query Analyzer
- Suggest database aggregate tables, in-memory aggregate, or both.
- Makes use of a cube's model and statistics
- Make use of workload log files that are generated from execution of reports
- Expectation is that the dynamic cube is published in the Content Store, can be started successfully, and that reports and analysis run and return correct results.

Overview of Aggregate Advisor

- After a cube is restarted, the aggregates execute the necessary SQL statements to retrieve the summarized values and place the values in its aggregate cache for subsequent use during query processing.
- Run during off-peak, non-critical business hours

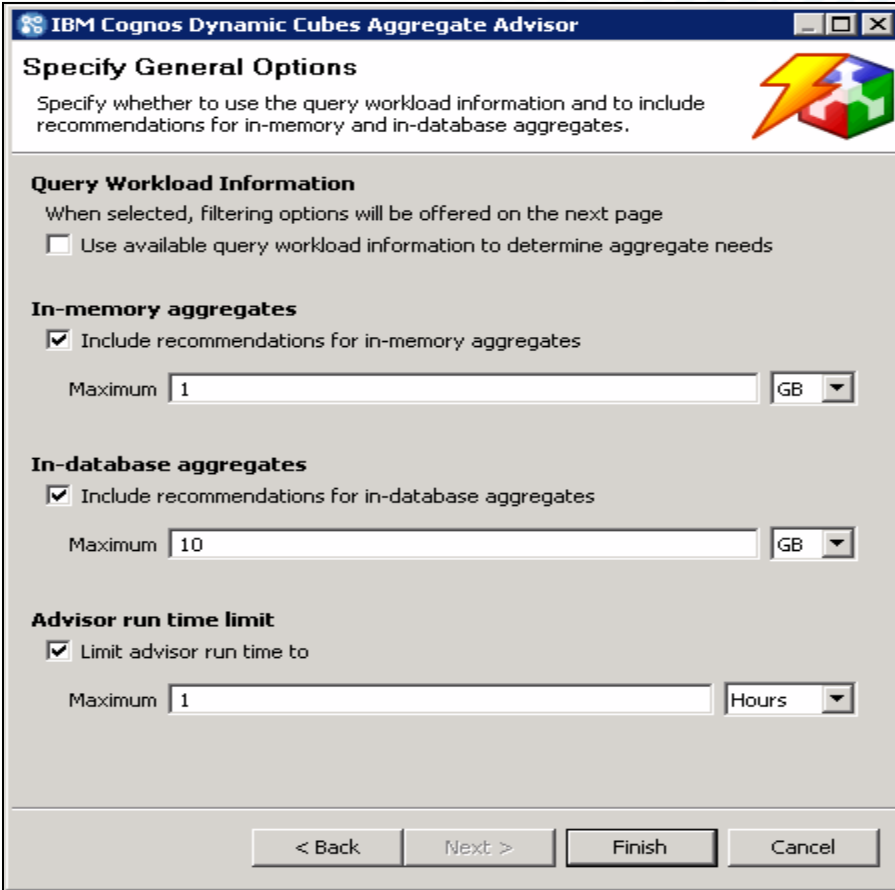
Running Aggregate Advisor

- **Launch Dynamic Query Analyzer**
 - it is the client tool to run and manage Aggregate Advisor recommendations
- To initiate a run of the Aggregate Advisor, select **File -> Run Aggregate Advisor**
 - Select the Cube



Running Aggregate Advisor

- Specify general options
 - Query Workload Information
 - In-memory aggregates
 - In-database aggregates
 - Advisor runtime limit
- Finish the wizard and run the Aggregate Advisor



The screenshot shows the 'IBM Cognos Dynamic Cubes Aggregate Advisor' dialog box. It has a title bar with the IBM logo and window controls. The main area is titled 'Specify General Options' and contains three sections: 'Query Workload Information', 'In-memory aggregates', and 'Advisor run time limit'. Each section has a checkbox and a text input field with a unit dropdown. At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

IBM Cognos Dynamic Cubes Aggregate Advisor

Specify General Options

Specify whether to use the query workload information and to include recommendations for in-memory and in-database aggregates.

Query Workload Information

When selected, filtering options will be offered on the next page

☐ Use available query workload information to determine aggregate needs

In-memory aggregates

☒ Include recommendations for in-memory aggregates

Maximum GB

In-database aggregates

☒ Include recommendations for in-database aggregates

Maximum GB

Advisor run time limit

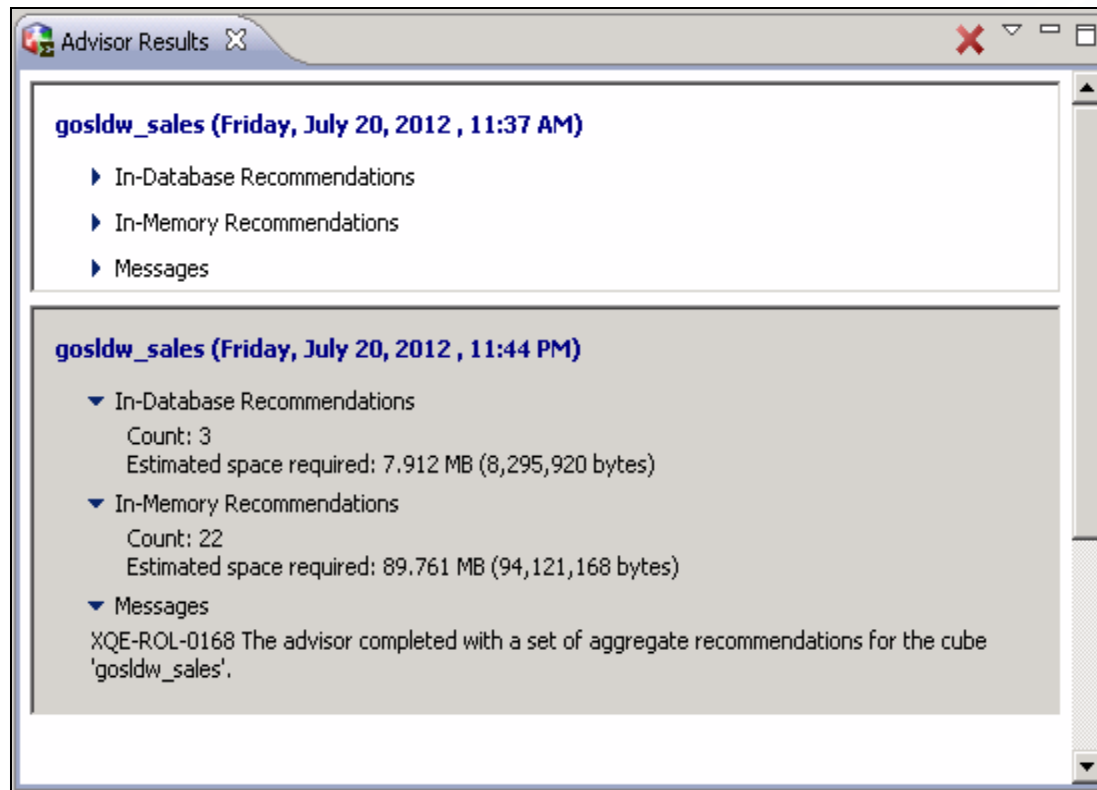
☒ Limit advisor run time to

Maximum Hours

< Back Next > Finish Cancel

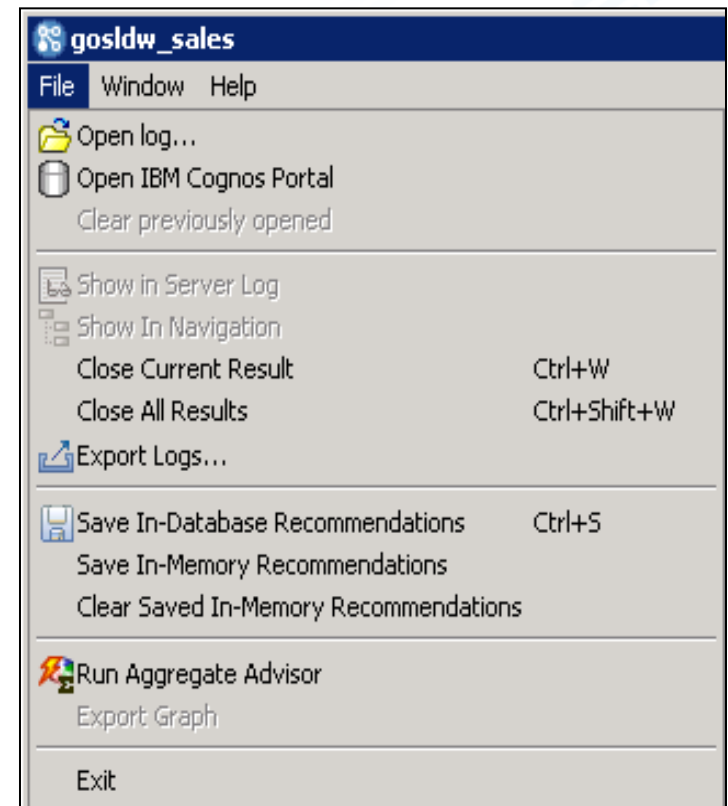
Running Aggregate Advisor

- Results is populated in the Advisor Results view



Running Aggregate Advisor

- Take action to save aggregate recommendations
 - Save In-Database Recommendations
 - Save In-Memory Recommendations
 - Clear Saved In-Memory Recommendations



Aggregate Cache

- Cognos Dynamic Cube supports two type of pre-computed aggregate values:
 - Stored in in-database tables (in-database aggregate)
 - Stored in in-memory aggregate cache
- Aggregate Advisor can suggest collection of in-memory aggregate
- In-memory aggregate do not require involvement of DBA
- Recommendations are stored in Content Manager and take effect next time a cube is started.
- The size of the aggregate cache is specified in the properties of a dynamic cube - Maximum amount of memory to use for the aggregate cache (MB).

Aggregate Cache

- Specify a value greater than the advisor estimated size
- An aggregate cache size of zero disables the aggregate cache.
- loaded on a first-come basis
- Loading of in-memory aggregate to aggregate cache
 - Cube start or cube restart
 - Refresh data cache
 - Refresh member cache
- The DBA should be aware of the aggregate cache-load activities
- Cube metrics available in Cognos Administration can be used to monitor loading of Aggregate
- Aggregate cannot be used and query performance will not be optimal until in-memory aggregate completes its loading

In-memory aggregate tips

- **Aggregate cache size**

- Only enough memory that is required to hold the defined aggregates is used.
 - Example: 90 MB can hold the aggregates for gosldw_sales, and the aggregate cache size is set to 1 GB, only 90 MB of memory is used. Over time, if the underlying fact tables grow, the aggregates are allowed to grow to the specified maximum of 1 GB.
- Should not use more than 30 GB for the aggregate cache.
- Hardware sizing and guidelines for the amount of memory to use for a cube's in-memory aggregate cache - *Understanding Hardware Requirements for Cognos Dynamic*

Reference

- IBM Cognos Dynamic Cubes Redbook -
<http://www.redbooks.ibm.com/redbooks/pdfs/sg248064.pdf>
- Dynamic Cubes User Guide 10.2.0
http://pic.dhe.ibm.com/infocenter/cbi/v10r2m0/nav/5_6
- IBM Business Analytics Proven Practices: Dynamic Cubes Hardware Sizing Recommendations
http://www.ibm.com/developerworks/library/ba-pp-infrastructure-cognos_specific-page659/

Thank you