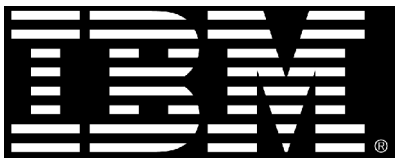


Guideline

IBM Cookbook for IBM Cognos® 8.4 for use with SAP NetWeaver Business Warehouse™

Product(s): IBM Cognos 8.4

Area of Interest: Infrastructure

Copyright and Trademarks

Contents

1 Introduction

1.1 Purpose

This document is intended to provide a single point of reference for techniques and product behaviours when dealing with SAP NetWeaver Business Warehouse® (SAP BW) as a data source.

1.2 Applicability

The techniques and product behaviours outlined in this document apply to:

- IBM Cognos 8® version 8.4 27.28
- The SAP NetWeaver Business Warehouse BEx Designer® version 7.0
- IBM Cognos Virtual View Manager® 8.4 27.23-0 using the 2.1.8 SAP SAP Java Connector (JCo) adaptor.
- IBM Cognos TM1® 9.5.1 Package Connector for IBM Cognos 8.4®

1.3 Exclusions and Exceptions

The techniques and product behaviours outlined in this document may not be applicable to future releases.

The IBM Cognos 8 Virtual View Manager R/3 add on referenced in Section 7 of this document can only be installed on a 32 bit operating system.

2 SAP NetWeaver Business Warehouse Objects and BEx Queries

IBM Cognos 8 leverages the SAP NetWeaver Business Warehouse investment within your organization by providing access to the Business Warehouse metadata and business content. The integration with SAP NetWeaver Business Warehouse provides access to existing SAP NetWeaver Business Warehouse structures within the SAP BW environment:

- InfoQueries
- InfoCubes
- MultiProviders
- Virtual Cubes
- Remote Cubes
- DSO or ODS
- InfoSets
- InfoObjects
- Master data and attributes

The following section further outlines the SAP NetWeaver Business Warehouse objects that can be leveraged by IBM Cognos 8, and illustrates proven methods within SAP NetWeaver Business Warehouse that will help to ensure a successful implementation of IBM Cognos 8 to embrace, enhance and extend your investment in the SAP NetWeaver Business Warehouse.

2.1 Overall Guideline

When modelling against SAP NetWeaver Business Warehouse, there are some general guidelines that you should follow to ensure optimal performance within your IBM Cognos 8 environment with SAP NetWeaver Business Warehouse.

1. It is strongly recommended to use an InfoQuery as the source for the IBM Cognos Framework Manager metadata model. The InfoQuery acts as a database view which can help reduce the volume of data for better performance. The use of the InfoQuery will provide additional access to query objects such as:

- SAP NetWeaver Business Warehouse Variables
- Filters, Restrictions
- Calculated Key Figures
- Restricted Key Figures
- Characteristic and Key Figure Structures
- Currency Conversions
- Global Filters
- Navigational Attributes

2. When using a SAP NetWeaver Business Warehouse InfoQuery, utilize SAP NetWeaver Business Warehouse variables, filters, and restrictions where appropriate. This will force data processing to be performed by the SAP NetWeaver Business Warehouse server database and will often provide better performance. It will also be beneficial to use Calculated Key Figures and Restricted Key Figures where possible to leverage the processing power of the SAP NetWeaver Business Warehouse server.

3. Carefully consider how many IBM Cognos 8 reports you decide to build from a SAP NetWeaver Business Warehouse InfoQuery. There should not be a 1-to-1, IBM Cognos 8 report-to-SAP NetWeaver Business Warehouse query ratio.
   - Consider having a SAP NetWeaver Business Warehouse query that sources several IBM Cognos 8 reports.
   - But do not create one master SAP NetWeaver Business Warehouse query that sources all of your IBM Cognos 8 reports.
   - Start by addressing a particular subject area, and then extend what you have learned in your environment to other subject areas. Apply this approach rather than starting big by implementing several SAP NetWeaver Business Warehouse queries (or one master SAP NetWeaver Business Warehouse

query) for all subject areas, and potentially having to pull back due to poor performance.

4. Review the overall design of SAP NetWeaver Business Warehouse structures and data volumes to identify potential bottlenecks. A SAP NetWeaver Business Warehouse design that is inefficient in SAP NetWeaver Business Warehouse will filter up and deliver unsatisfactory performance to IBM Cognos 8 users. For example, it is commonly known that an InfoCube typically performs faster than a Data Store Object (DSO). In that case, it is suggested to use a SAP NetWeaver Business Warehouse query against a cube rather than against objects such as DSO's or InfoSets.

5. Use of a BEx InfoQuery is required to gain access to Data Store Objects (DSO), InfoSets, and Master Data as an InfoProvider within SAP NetWeaver Business Warehouse. Use this method sparingly if you are dealing with large data sets as you are likely to experience data latency from SAP NetWeaver Business Warehouse. Reading data from these providers is typically slower than reading data from an InfoCube, and is considered normal SAP NetWeaver Business Warehouse performance amongst SAP NetWeaver Business Warehouse administrators. The same rule holds true when referencing these providers indirectly via a MultiProvider.

6. Furthermore, when utilizing a SAP NetWeaver Business Warehouse query against a MultiProvider, consider carefully the underlying InfoProviders in which data is read. Data that is read from a DSO, InfoSet, or InfoCube via a MultiProvider, with high volumes of data may inhibit SAP NetWeaver Business Warehouse performance, thereby passing this slow performance to IBM Cognos 8. Ensure that proper filters, variables, restrictions, and calculations are used within the SAP NetWeaver Business Warehouse query to force SAP NetWeaver Business Warehouse to pass only a subset of the data, instead of passing much more data with no filters and restrictions.

7. The use of the SAP NetWeaver Business Warehouse Accelerator® appliance, BWA (formerly BIA), may be used in conjunction with IBM Cognos 8 for improved SAP NetWeaver Business Warehouse performance. These performance benefits can be realized from within the IBM Cognos 8 environment as the hardware appliance is completely transparent to IBM Cognos 8 and the user. However it is strongly advised to follow all the proven practices as noted within this document to ensure optimal performance for the overall IBM Cognos 8 and SAP NetWeaver Business Warehouse solution.

8. In some instances, you may find that you are creating an IBM Cognos 8 report that is reading high volumes of data from SAP NetWeaver Business Warehouse, which may overstep the limitations of the SAP NetWeaver Business Warehouse temp space. In the event SAP NetWeaver Business Warehouse cannot handle a data request from IBM Cognos 8, and all of these SAP NetWeaver Business Warehouse

guidelines have already been applied, then consider adding more temp space to the SAP NetWeaver Business Warehouse server.

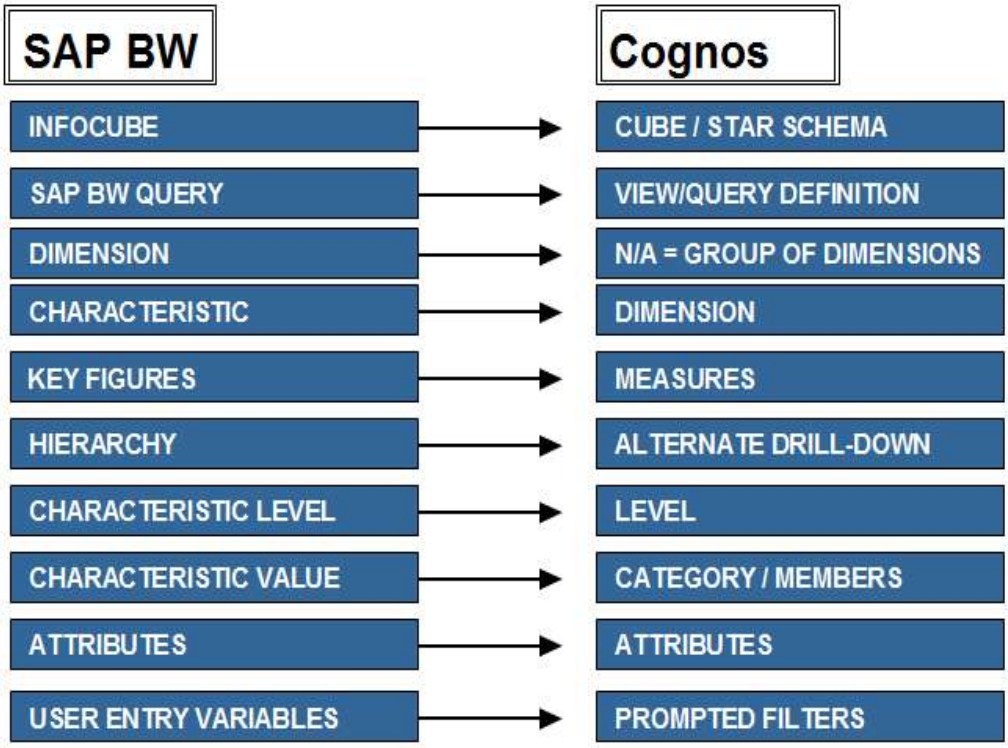
2.2 Definition of SAP NetWeaver Business Warehouse & BEx Terminology

The following table defines common SAP NetWeaver Business Warehouse objects that can be leveraged through IBM Cognos 8.

SAP NetWeaver Business Warehouse Object	Definition
InfoProvider	Analysis-relevant view of a SAP NetWeaver Business Warehouse object for which queries in SAP NetWeaver Business Warehouse can be created or executed. There are two types of InfoProviders. One type includes objects that contain physical data. These are known as data targets, such as InfoCubes, ODS objects, and InfoObjects (characteristics with attributes, texts, or hierarchies). The other type includes objects that display no physical data storage, such as InfoSets, RemoteCubes, and MultiProviders.
InfoCube	An InfoCube is an InfoProvider that describes a self-contained dataset. An InfoCube is a collection of relational tables that are created according to the star schema: a large fact table in the center, with several dimension tables surrounding it.
MultiProviders	Type of InfoProvider that combines data from several InfoProviders and makes it available for reporting. The MultiProvider itself contains no data as its data comes exclusively from the InfoProviders on which it is based (collated using a union operation). A MultiProvider is assembled from different combinations of InfoProviders.
Virtual Cubes	InfoProvider with transaction data that is not stored in the object itself, but which is read directly for analysis and reporting purposes. The relevant data can be from the BI system or from other SAP® or non - SAP® systems. VirtualProviders only allow read access to data.
Remote Cubes	Infocube that is managed in a remote system, but can be accessed in SAP NetWeaver Business Warehouse.
DSO or ODS	Data Store Objects or Operational Data Stores are objects that stores consolidated and cleansed transaction data on a detail level.
InfoSets	A semantic view of ODS objects and InfoObjects (characteristics with master data) that allows you to create reports on these objects, particularly on the joins between these objects.
InfoObjects	Business evaluation objects (for example, customers or sales) are called InfoObjects in SAP NetWeaver Business Warehouse. InfoObjects are subdivided into characteristics, key figures,

	units, time characteristics, and technical characteristics (such as request numbers).
Master Data	Static data (data that rarely changes) describing characteristics. An example may be an employee's birth date, home address, social security number, etc.
Aggregates	Subsets of data from an InfoCube. Aggregates make it possible to access InfoCube data quickly in Reporting. Aggregates serve to improve performance much like data base indexes.
InfoQuery	A reporting structure in SAP NetWeaver Business Warehouse that serves as a request for information from SAP NetWeaver Business Warehouse InfoProviders.
Key Figures	Type of InfoObject. Numeric fields; like number of items on hand, account credit amount & account debit amount.
Characteristic	A type of InfoObject that is a non-numeric field such as company code, account number, course, birth date, etc.
Dimension	The grouping of characteristics whose content is logically connected, under a single generic term, such as Organization, Region, Customers, Products, etc. Dimensions are defined to enable characteristics to be stored in a star schema table (dimension table).
Hierarchy	The organization of the values of a characteristic into a tree structure.
Characteristic Level	A characteristic that acts as a level within a hierarchy.
Attributes	Data which is not stored in an InfoCube, but in master data tables.
Navigational Attributes	InfoObjects that are logically assigned attributes which you can filter or drill on in the query.
Display Attributes	Used for display only as this kind of attribute is subordinated to a characteristic and cannot be filtered or drilled on in a query.
Filter	A filter has a limiting effect on the data selected. When defining the filter, you select characteristic values from one or more characteristics or from a key figure. All of the InfoProvider data is restricted using the filter selection of the query.
Free Characteristic	Characteristics not displayed on the initial report, but available to be included in the report. Free Characteristics have drill-down or drill-across capabilities.
Calculated Key Figure	Consist of formula definitions containing basic key figures, restricted key figures or pre calculated key figures.
Restricted Key Figure	You can restrict the key figures of an InfoProvider by selecting one or more characteristics. The key figures that are restricted by one or more characteristic selections by selecting a basic key figure, calculated key figure or by other restricted key figures.

The following outlines some of these common SAP NetWeaver Business Warehouse and BEx terms, and maps them to common IBM Cognos 8 terms.



2.3 InfoQuery Naming Convention

For easy maintenance it is recommended that InfoQueries which are to be used with IBM Cognos 8 adhere to the following naming convention. Note that this is only a suggested approach, and may be superseded by your existing naming conventions where differences exist.

1. Initial letter Z followed by the InfoProvider name. For example, ZCPA_M04 denotes custom InfoQuery for the InfoProvider CPA_M04

2. Following the InfoProvider Name should be Q and a sequence of numbers:
   ZCPA_M04_Q0001 , where the Q denotes Query, and 0001 is the query number

3. All InfoQueries developed for use with IBM Cognos 8 should then be followed with the letters COG:
   ZCPA_M04_Q0001_COG

4. Finally, all InfoQueries should end with the version number:
   ZCPA_M04_Q0001_COG_001

2.4 When Creating an InfoQuery for IBM Cognos 8

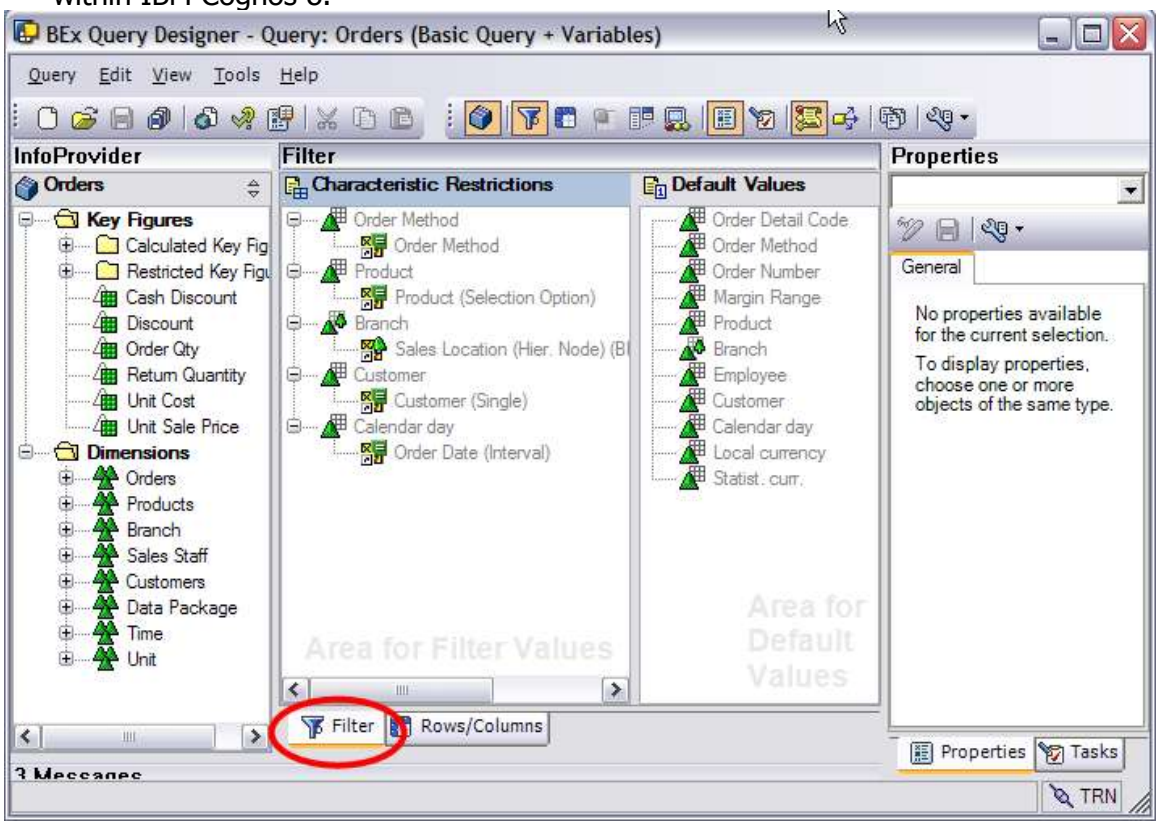
The following points are general guidelines, tips & techniques which should first be considered before developing an InfoQuery in the BEx Query Designer that is built specifically for IBM Cognos 8 use.

1. Start small. Do not create a 'master query' that brings in all data from a cube or multiple cubes.

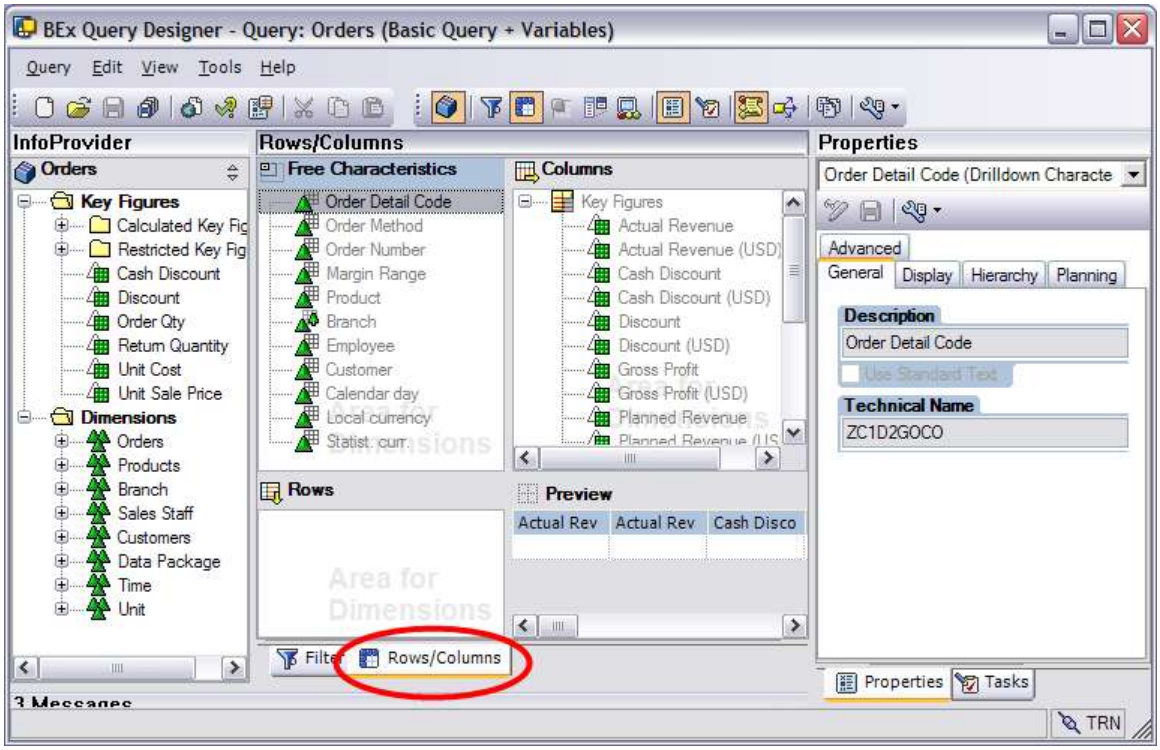
2. Instead restrict the data set to a certain subject area, and apply filters, restrictions, and variables which make sense for the users. Use of calculate or restricted key figures is encouraged as well. This approach will enable you to develop many IBM Cognos 8 reports from one InfoQuery, but will ensure much of the data processing will be performed by the SAP NetWeaver Business Warehouse server.

3. Use of existing or new SAP NetWeaver Business Warehouse variables is highly encouraged. To help ease the management of the variables in IBM Cognos 8, try to keep the technical name of the variable to a maximum of eight characters. This will ensure the proper technical name is referenced in IBM Cognos 8 each time the variable is re-imported.

4. For the 'filter' tab in Query Designer, place the filters, restrictions, or variables in the 'Characteristic Restrictions' window rather than the 'Default Values' window. This will ensure all restrictions are captured within IBM Cognos 8.



5. Note that all objects placed into the 'Rows & Columns' tab will be read into IBM Cognos 8, even Free Characteristics. You will notice from the screenshot below that rows are not included in this query, which is perfectly fine. All of the metadata is captured by IBM Cognos 8 from the Key Figures columns and the Free Characteristics.



2.4.1 Releasing an InfoQuery for IBM Cognos 8

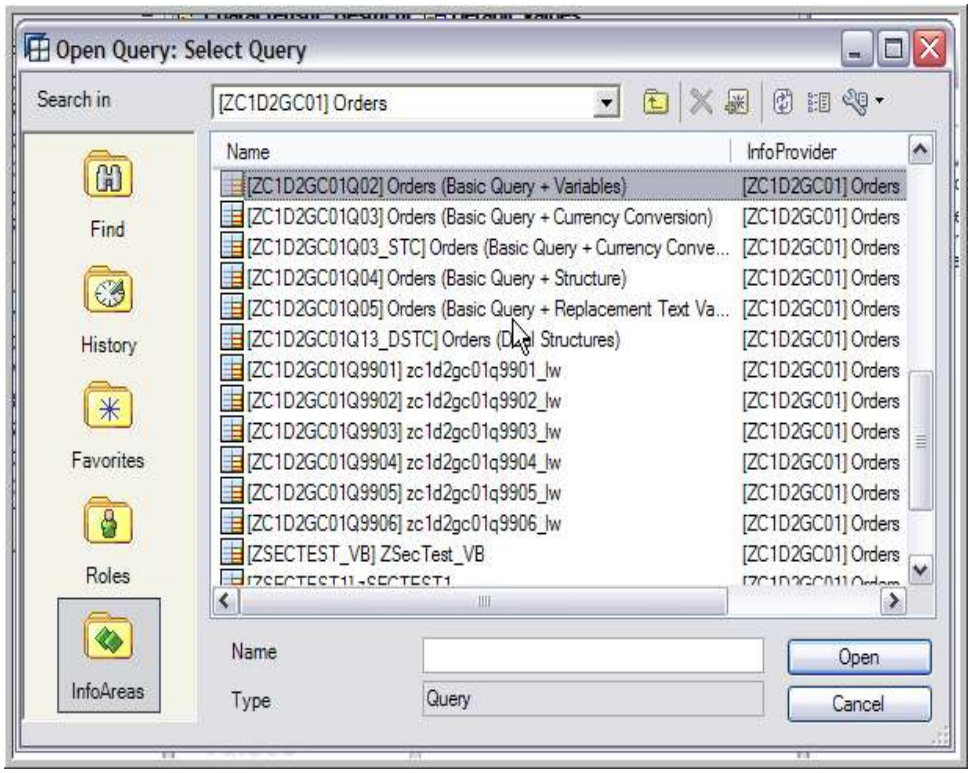
In order for an InfoQuery to be visible to IBM Cognos 8 Framework Manager for import, it should be released for third party applications. This is done within the Business Explorer Query Designer.

1. Launch the Query Designer from the All Programs\Business Explorer \Query Designer.

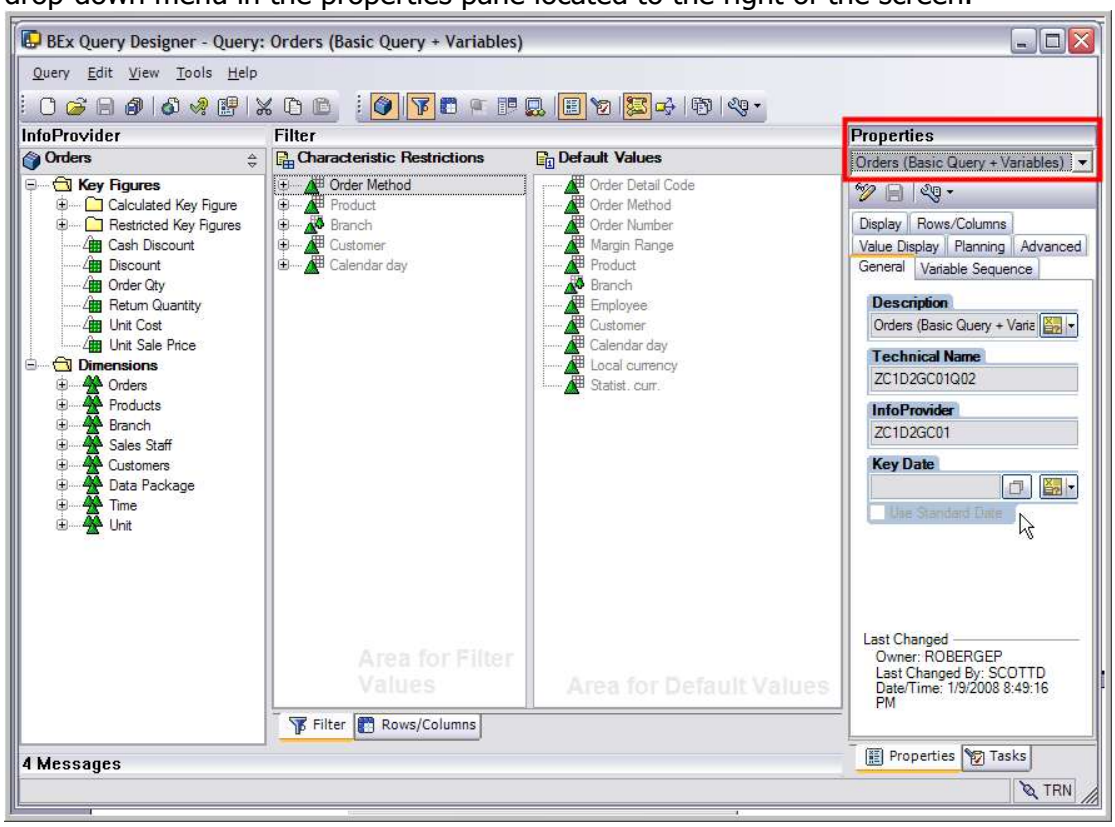
2. Choose the SAP NetWeaver Business Warehouse system which contains the InfoQuery that needs to be released.

3. Logon providing a valid user ID, password and client number.

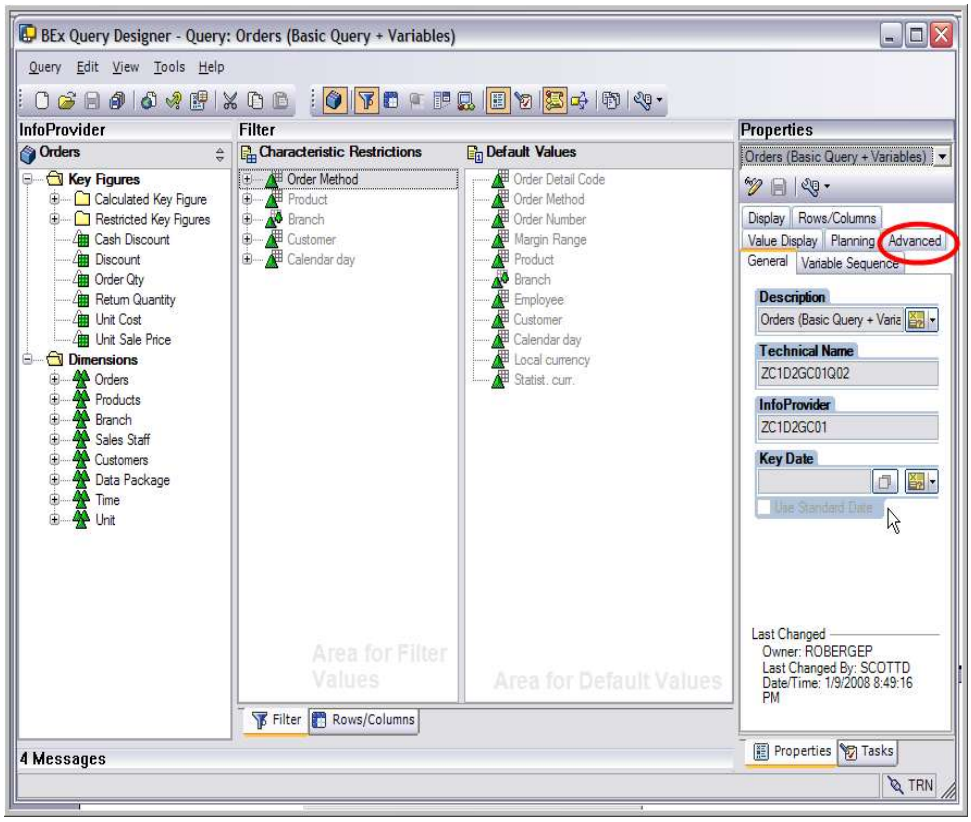
4. Locate the desired InfoQuery that needs to be released and press OK.



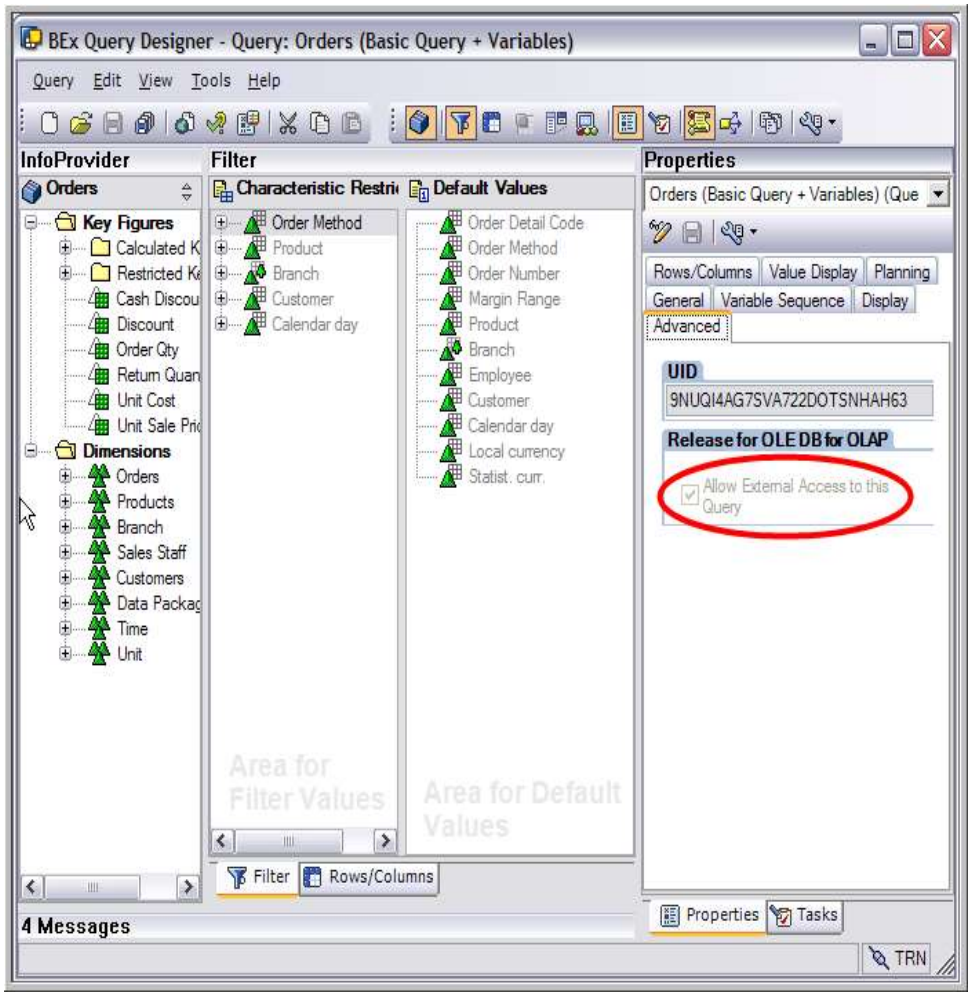
5. Once the query opens, select the Properties of the InfoQuery from the drop-down menu in the properties pane located to the right of the screen.



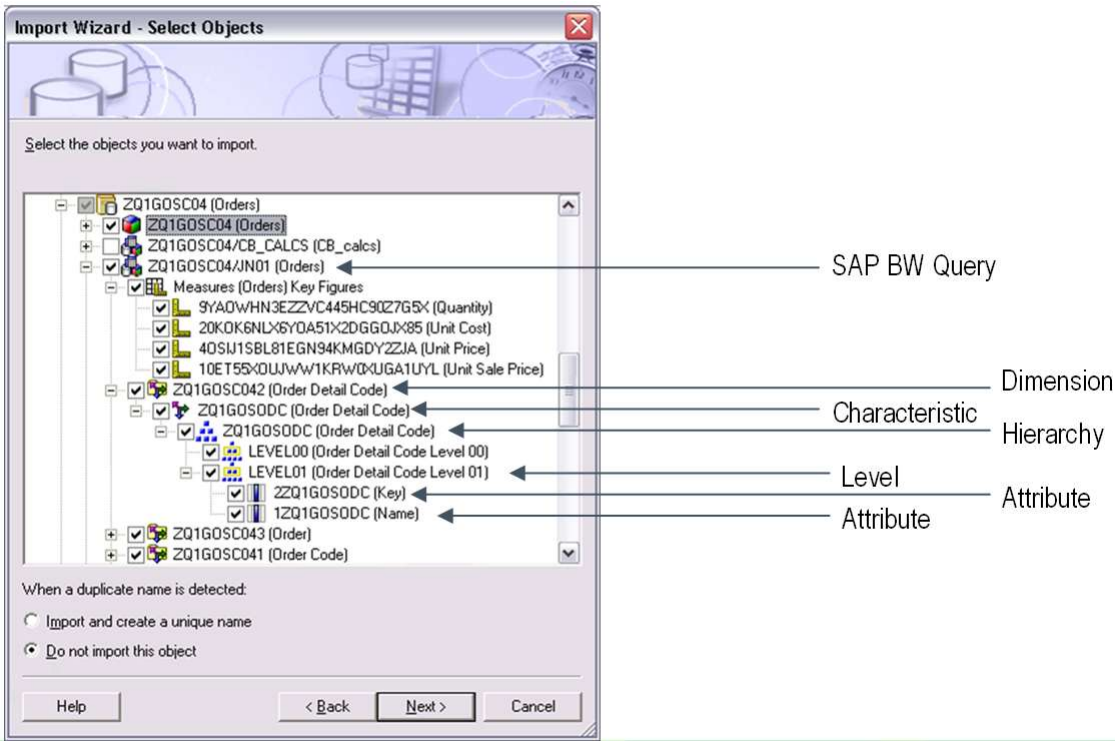
6. Within the Query Properties, select the Advanced Tab



7. Check the "Allow External Access to this Query" check box and select OK



8. The InfoQuery should now be visible to IBM Cognos 8 Framework Manager (FM) for import. The screenshot below shows the FM Import Wizard, and the individual elements within a SAP NetWeaver Business Warehouse query.



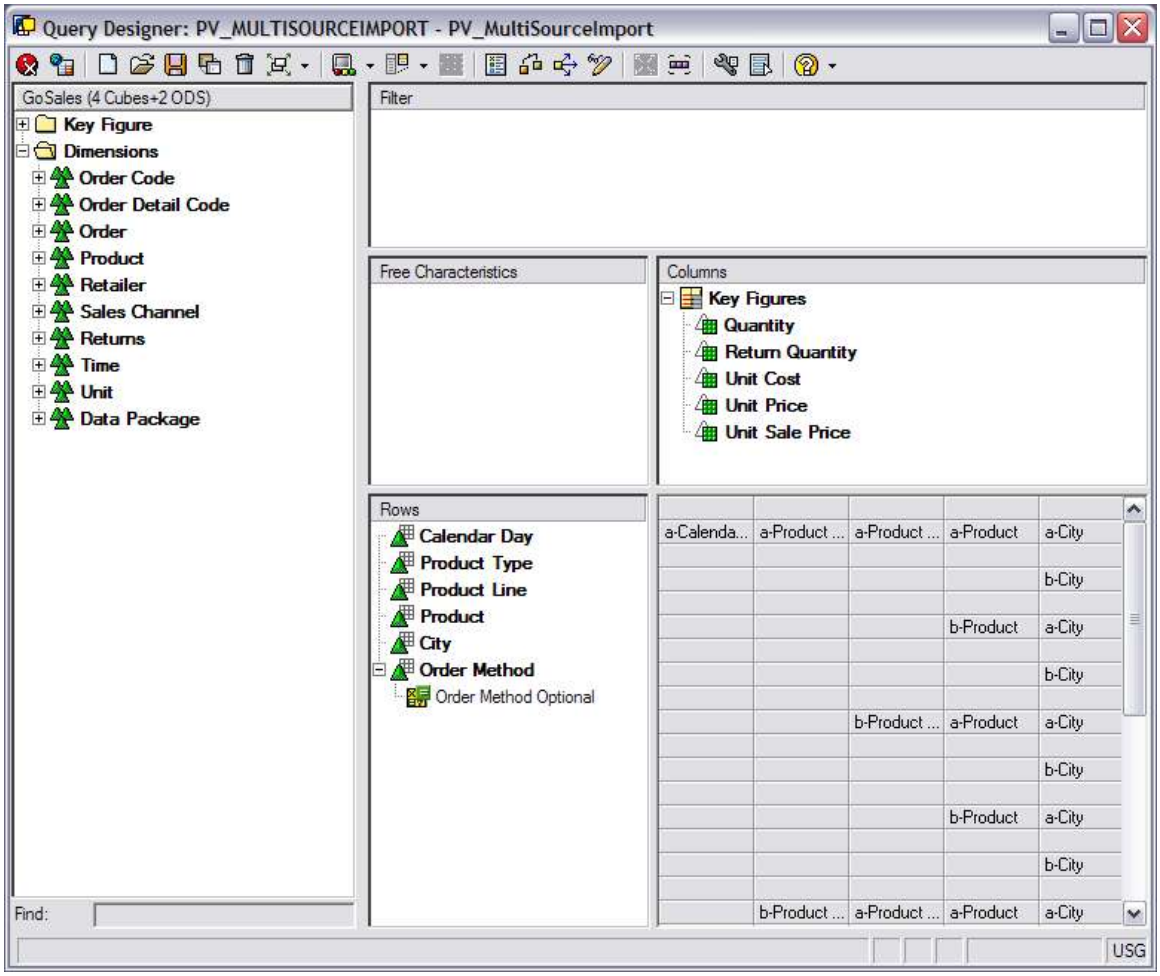
Due to the way that metadata is extracted and stored in the IBM Cognos 8 Framework Manager model, it will be necessary to include IBM Cognos 8 Framework Manager in your SAP NetWeaver Business Warehouse change management plans. The following are common scenarios where changes in SAP NetWeaver Business Warehouse do not usually alter the metadata and do not require an update of the IBM Cognos 8 Framework Manager model:

- **Filter**: You may change an existing filter inside the InfoQuery, or create a new static filter and the data will be filtered based on the filter criteria. Note this does not apply to creation of a new user entry variable.
- **Restrictions**: You can apply a new restriction on the filter tab, and the restriction will be applied without a re-import so long as the characteristic was already part of the InfoQuery.
- **Calculated & Restricted Key Figures**: You can change the formula/restriction inside an existing Calculated or Restricted Key figures, and the new formula will show up inside of IBM Cognos 8. Note that you cannot delete the Calculated Key Figure and re-create using the same name and expect the reports to run. The Key Figures are referenced by a system-generated ID (GUID).

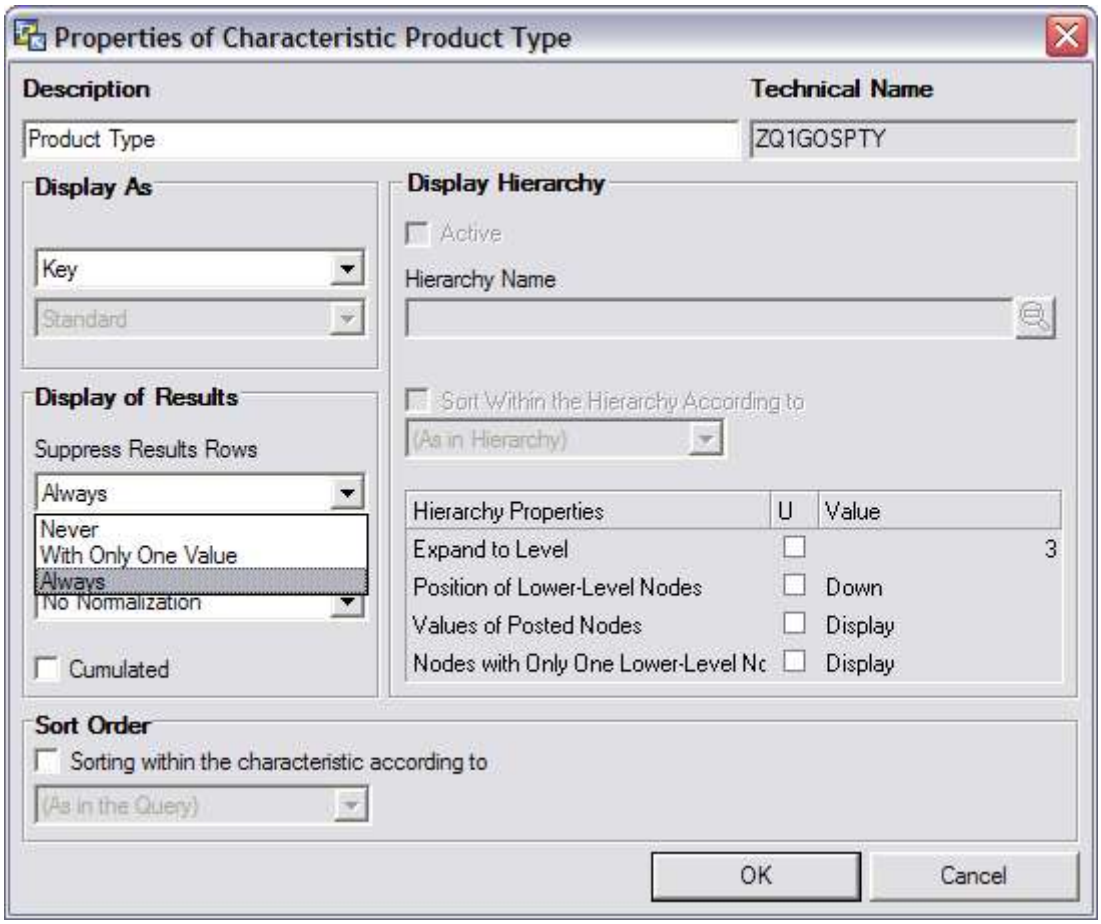
2.5 Considerations for BEx queries intended for IBM Cognos 8 PowerPlay Transformer

In the event you intend to read data from SAP NetWeaver Business Warehouse into an IBM Cognos 8 PowerPlay cube, you may utilize IBM Cognos 8 Transformer with SAP NetWeaver Business Warehouse InfoQueries. The following provides the proven methods to build a SAP NetWeaver Business Warehouse InfoQuery within SAP's Query Designer.

1. Create a SAP NetWeaver Business Warehouse InfoQuery with only the dimensions you wish to import. The more dimensions you include the more detail records you will get back. When IBM Cognos 8 extracts factual data from the INFOQUERY, a "select * from cube\INFOQUERY" approach is used for performance considerations. Therefore only include the dimensions you wish to utilize in transformer. Each dimensions added will grow the number of detailed records being returned – so if you do not need a particular dimension, do not include it.



2. With SAP's Query Designer, remember to set "Suppress Results Rows" to "Always" and "Display As" to "Key" for each characteristic as per the documentation.



3. Make sure to create an **optional** variable on one characteristic. The optimal characteristic to use is one that slices the data evenly across all its unique members. Otherwise, in the absence of an optional variable, IBM Cognos 8 will attempt to extract all the data with one query utilizing the regular reporting approach to SAP NetWeaver Business Warehouse. While very flexible approach for reporting, for extractions it will not allow you to retrieve more then 1 million cells due to SAP NetWeaver Business Warehouse limitations, and will perform poorly.

For performance considerations, the IBM Cognos 8 process to extract fact data will initially make a function call to retrieve all possible values for this created variable. It will then send one MDX in the following format:

Select * from [CUBE/INFOQUERY]
SAP VARIABLES [VAR_NAME] INCLUDING [CHARAC].[VALUE]

For each variable value received, IBM Cognos 8 will send down an MDX statement passing the variable values.

For example, if an optional variable was defined on [PROFIT_CTR] and 100 distinct profit centers exist are returned through a function call, IBM Cognos 8 will sequentially send 100 MDX statements, one for each profit center.

This approach both greatly improves performance as well as allowing the IBM Cognos 8 engine to retrieve detailed records beyond the 1 million cell limit imposed by SAP NetWeaver Business Warehouse in most environments.

To learn more about reading data from SAP NetWeaver Business Warehouse into a IBM Cognos 8 PowerPlay cube, you may reference the IBM Cognos 8 Framework Manager and IBM Cognos 8 Transformer sections within this document.

The IBM Cognos 8 Transformer User Guide also contains useful information regarding the extraction of data from SAP NetWeaver Business Warehouse using Transformer. These details can be found within section Appendix E of the help document entitled Guidelines for Working with SAP BW Data for Use in Transformer. This guide can be found within the IBM Cognos 8 home directory, c8\webcontent \documentation\.

2.6 Variables within BEx queries

When developing a SAP NetWeaver Business Warehouse InfoQuery for IBM Cognos 8, SAP NetWeaver Business Warehouse optional or mandatory variables can be used to restrict data where necessary. The following outlines the SAP NetWeaver Business Warehouse variable types, processing types, and variable functions which can be leveraged in IBM Cognos 8.

SAP NetWeaver Business Warehouse Variable Types, Processing Types & Variable Functions	
Characteristic Value	Characteristic value variables represent characteristic values and can be used wherever characteristic values are used. These can be utilized to filter data based on individual, multiple, or a range of characteristic values
Text	Text represent a text and can be used in descriptions of queries, calculated key figures and structural components
Hierarchy Node	Hierarchy node variables represent a node in a hierarchy and can be used wherever hierarchy nodes are used. Use these to prompt users to select a node within a SAP NetWeaver Business Warehouse hierarchy.
Formula	Formula variables represent numerical values and can be used in formulas. These may be used to perform calculations within the query for key figures, or as an example could be used to perform unit conversions, currency translations, etc.
SAP User Exits	Gives you the option of setting up a processing type for variables, tailor-made to your specific needs. These exits are preconceived enhancement (routines) from SAP that you can configure with customer-specific logic without affecting the standard SAP programs.
Replacement Path	Characteristic value variables, hierarchy variables, text variables, and formula variables with the *Replacement Path* processing type can be replaced by the value from a different variable. The value is either determined from the key, the external attribute of the key, the description, or the attribute value. You can also

	define an offset start and offset length.
Authorization	If within characteristic or hierarchy node variables you choose Process with Authorization, the variable is automatically filled with the values of the user's authorization. When the user opens a query, the data is selected automatically according to the user's authorizations.
Single Value	A variable that represents one value only.
Multiple Single Values	Variable represents a number of single values. This setting is useful in hierarchy nodes, for example, to allow you to select multiple single nodes.
Intervals	Variable represents a specific 'from' value and a specific 'to' value, thus an interval.
Optional	The variable does not have to be filled with a value at runtime.
Mandatory	At least one value has to be specified for the variable at runtime. The initial value (#) is permitted explicitly. The initial value # means "unassigned", that is, you can use it to explicitly select all data records in which this characteristic has no instances.
Variable Offsets	Provide the ability to dynamically show data for a time interval by specifying only a single input value within a variable.

Although most SAP NetWeaver Business Warehouse variables integrate with IBM Cognos 8 out of the box, there are some exceptions to the rule. The following describes the exceptions accompanied with alternate solutions you may deploy within IBM Cognos 8 to meet the functionality desired.

Hierarchy Selection Variable: Hierarchy selection variables represent a set of hierarchies and are used in SAP NetWeaver Business Warehouse wherever hierarchies should be selected. These are used to prompt the user to select a hierarchy from a list of multiple hierarchies.

Alternate Solution: Rather than utilizing a hierarchy selection variable within the SAP NetWeaver Business Warehouse InfoQuery, build an IBM Cognos 8 prompt in Report Studio that will enable a user to select from a list of SAP NetWeaver Business Warehouse hierarchies.

Selection Option: This SAP NetWeaver Business Warehouse variable represents any combination of single values and intervals. In addition, when you select values for variables, you can use operators (>,<,=, and so on), use the contains pattern option (for example, search for all values that begin with A: A*) and exclude certain values (by specifying the values for which you do not want to search).

Alternate Solution: This SAP NetWeaver Business Warehouse variable is read into IBM Cognos 8 as a single select drop-down prompt. If you desire similar functionality in IBM Cognos 8 as a Selection Option variable, consider using a Search & Select prompt or a combination of IBM Cognos 8 prompts in Report Studio which will provide the appropriate prompt functions desired for the user. Further information regarding this method can be found within Section 5-IBM Cognos 8 Report Studio.

2.7 Considerations for BEx Queries that Draw Large Volumes of Data

There are several SAP NetWeaver Business Warehouse design and query concepts you should consider when using BEx queries that read large volumes of data from the Business Warehouse. The following statements identify many of those SAP NetWeaver Business Warehouse concepts. Many of these recommendations are basic SAP NetWeaver Business Warehouse and data warehousing concepts which will ensure the SAP NetWeaver Business Warehouse system works for you and not against you. In the end, following these steps will provide a more stable and better performing Business Intelligence solution.

1. Adhere to SAP NetWeaver Business Warehouse proven practices for InfoProvider design. A solid design of an InfoProvider will provide for much more consistent query and report performance.

2. If you have a choice of building a query from an InfoCube or MultiProvider, consider choosing the InfoCube. Building a query from a MultiProvider could result in SAP NetWeaver Business Warehouse creating unions in order to satisfy the query, and could result in higher record volumes which may not be required.

3. Similarly, if you have a choice of building a query from an InfoCube or an ODS/DSO and/or InfoSet, always choose the InfoCube. Typical ODS or DSOs have detailed levels of data, and are not optimized for reporting purposes. And building a query from an InfoSet will require additional table joins from DSOs and InfoObjects in order to satisfy the query.

4. If using a query from a MultiProvider, limit as much as possible the number of InfoProviders from which data is read. So for example, if the MultiProvider consists of 5 InfoCubes, attempt to restrict data-reading to one cube rather than reading data from all or most of those cubes. This can be accomplished by applying filters and restrictions on the query within the SAP Query Designer

5. Avoid using remote InfoCubes except in the case where there is a small amount of data and a limited number of users. These generally do not perform as well as your basic cube.

6. Minimize the amount of information returned by the query. The less information returned from the query, generally the faster it can be transferred to the end user.

7. Design queries to prevent a large number of rows from being returned. This may be accomplished by using mandatory (required) variables to filter data or create exception reports to return only the data of interest.

8. Avoid complex queries that offer everything for every user. Create multiple queries to meet the requirements and/or use the IBM Cognos 8 drill-through capabilities to link reports together at different levels of detail.

9. If hierarchies are to be used, limit the number of nodes in the query results by using filters and variables for the hierarchy. The objective should be to make the entry hierarchy level as deep as possible upon executing the report. This limits the levels of the hierarchy that must be processed at execution time.

10. Use filters & variables as much as possible, especially for large characteristics, to reduce the size of the query result.

11. Apply the zero suppression property within the SAP NetWeaver Business Warehouse InfoQuery. This method can reduce the number of records which are sent from SAP NetWeaver Business Warehouse to the IBM Cognos 8 environment in the event many zero values exist within the SAP NetWeaver Business Warehouse InfoProvider for the combination of dimensions and key figures requested.

12. Apply general system performance techniques where applicable such as enabling SAP NetWeaver Business Warehouse caching, implementing database indexes, build InfoCube aggregates, or load data to a SAP NetWeaver Business Warehouse Accelerator appliance. These are all performance techniques that will be leveraged by the IBM Cognos 8 engine.

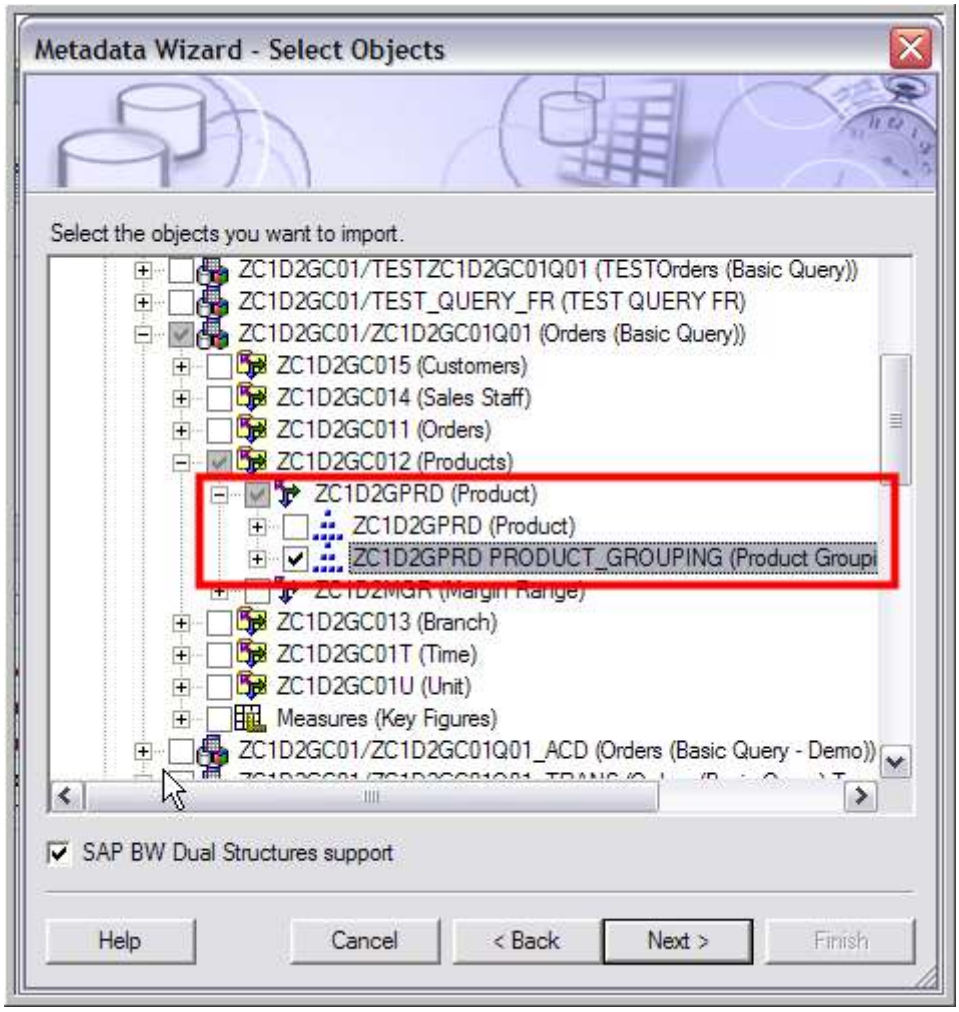
13. In the event all of these concepts are applied and better performance is desired, other options may include reading SAP NetWeaver Business Warehouse data into a high-performance caching IBM Cognos 8PowerPlay cube via IBM Cognos 8 Transformer, or load data to a IBM Cognos 8 TM1 cube which uses in-memory technology.

2.8 BEx Queries using Hierarchies

SAP NetWeaver Business Warehouse hierarchies are the organization of the characteristic values of a characteristic into a tree structure. They are typically created in SAP's transactional R/3 or ECC system and then loaded into SAP NetWeaver Business Warehouse, or built directly within SAP NetWeaver Business Warehouse for a characteristic. Hierarchies can be used across InfoProviders, and are used to provide an organized view for reporting needs.

2.8.1 SAP NetWeaver Business Warehouse Hierarchies in IBM Cognos 8

All hierarchies that are loaded to, or built in SAP NetWeaver Business Warehouse for an individual characteristic are easily made available in your IBM Cognos 8 environment by importing metadata from SAP NetWeaver Business Warehouse via IBM Cognos 8 Framework Manager. You have the ability include all alternate hierarchies for a characteristic, whether there is only one hierarchy or several. Finally, you have the ability to omit specific hierarchies of a characteristic within the Metadata Wizard via IBM Cognos 8 Framework Manager.



2.8.2 Considerations when Using SAP Netweaver Business Warehouse Hierarchies

1. If the level structure of a hierarchy changes in the Business Warehouse, you will need to re-import the hierarchy into the metadata model to acquire the latest version. However you do not need to re-import the hierarchy in the event characteristic values are assigned to different tree nodes so long as the tree structure & levels stay intact.

2. Two or more hierarchies may be used within a IBM Cognos 8 query so long as they are assigned to different Business Warehouse characteristics.

3. As is true within SAP NetWeaver Business Warehouse InfoQueries, only one hierarchy can be used per characteristic per IBM Cognos 8 query. But you can use more than one hierarchy of a characteristic in an IBM Cognos 8 report if multiple IBM Cognos 8 queries are used in the report. In short, the rule is one hierarchy per characteristic per query.

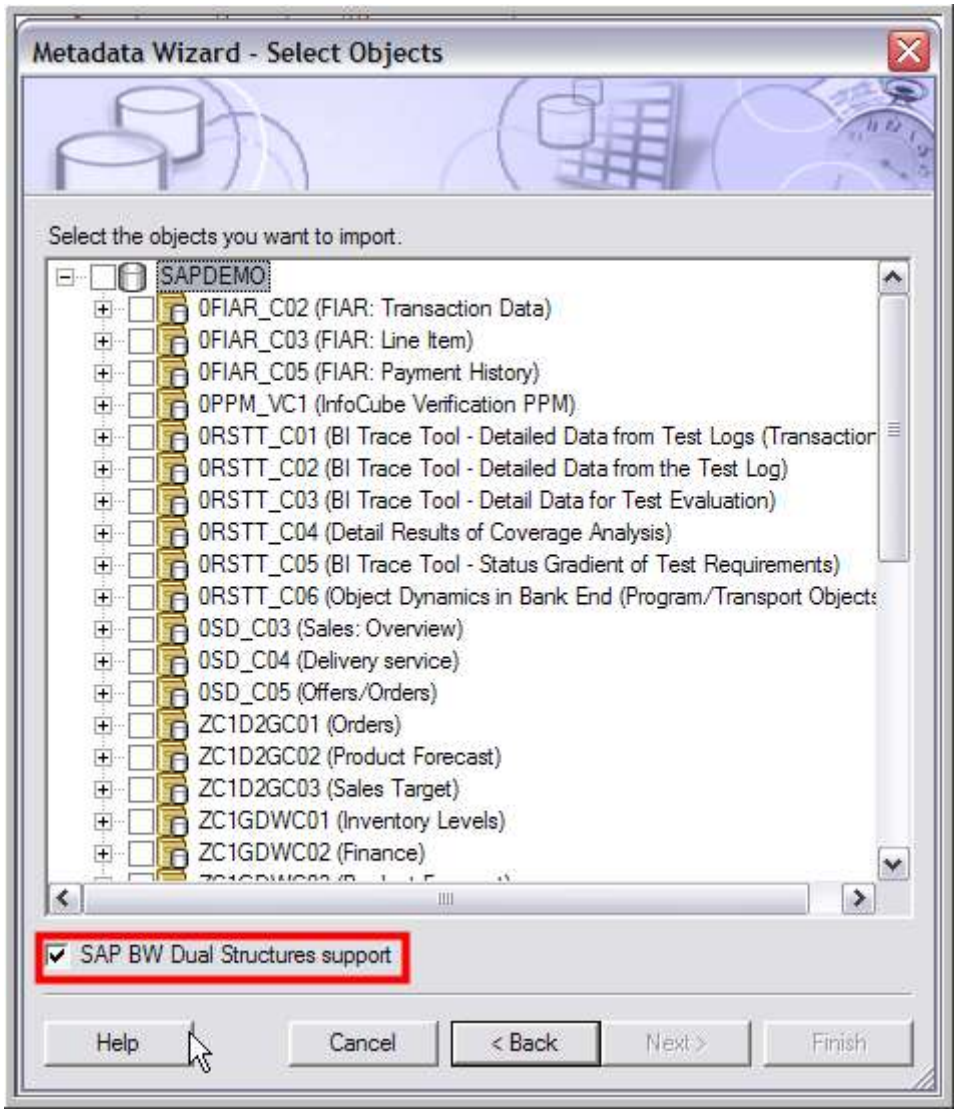
2.9 BEx Queries using Structures

Structures within a BEx query are groupings of characteristics and key figures in an InfoProvider, and are typically used to group and restrict data. There are two types of structures you may encounter within your SAP NetWeaver Business Warehouse environment: Local or Reusable structures.

Local structures are structures built within the SAP NetWeaver Business Warehouse query and can only be used in one query whereas a reusable structure is saved at the InfoProvider level and can be used in several queries for the same InfoProvider.

2.9.1 Structures in IBM Cognos 8

The structures (local or reusable) which are referenced within the SAP NetWeaver Business Warehouse InfoQuery can be leveraged and used by IBM Cognos 8. In the event the SAP NetWeaver Business Warehouse query contains two structures (one in rows & one in columns), IBM Cognos 8 will leverage dual structures as well. You just have to ensure the dual structures support box is checked at time of the metadata import via IBM Cognos 8 Framework Manager.


Metadata Wizard - Select Objects
Select the objects you want to import.
SAPDEMO
0FIAR_C02 (FIAR: Transaction Data)
0FIAR_C03 (FIAR: Line Item)
0FIAR_C05 (FIAR: Payment History)
0PPM_VC1 (InfoCube Verification PPM)
0RSTT_C01 (BI Trace Tool - Detailed Data from Test Logs (Transactior
0RSTT_C02 (BI Trace Tool - Detailed Data from the Test Log)
0RSTT_C03 (BI Trace Tool - Detail Data for Test Evaluation)
0RSTT_C04 (Detail Results of Coverage Analysis)
0RSTT_C05 (BI Trace Tool - Status Gradient of Test Requirements)
0RSTT_C06 (Object Dynamics in Bank End (Program/Transport Objects
0SD_C03 (Sales: Overview)
0SD_C04 (Delivery service)
0SD_C05 (Offers/Orders)
ZC1D2GC01 (Orders)
ZC1D2GC02 (Product Forecast)
ZC1D2GC03 (Sales Target)
ZC1GDWC01 (Inventory Levels)
ZC1GDWC02 (Finance)
SAP BW Dual Structures support
Help
Cancel
< Back
Next >
Finish

2.9.2 Considerations When Deciding Whether to Use Structures

- **When to Use:**

If you have reports with existing structures, you may use these rather than rebuilding within IBM Cognos 8 Report Studio reports. Structures can be helpful within your IBM Cognos 8 reports as they will push data processing back to the SAP NetWeaver Business Warehouse server, much like SAP NetWeaver Business Warehouse filters, restrictions, and variables. Hence when you encounter a SAP NetWeaver Business Warehouse InfoProvider with large volumes of data, you may consider the use of structures to perform certain business rules, manipulations, and restrictions which are desired. This will ensure the data processing is performed at the SAP NetWeaver Business Warehouse server and encourages better overall performance of your Business Intelligence & Performance Management solution.

- **When Not to Use:**

Structures may limit the audience in that they are typically specific to a business purpose or focused report, which may not be relevant to many IBM Cognos 8 on SAP NetWeaver Business Warehouse users. Carefully consider the application of these structures as they could become a maintenance issue within SAP NetWeaver Business Warehouse if they are used too often. Note that some changes to these structures in SAP NetWeaver Business Warehouse may affect every IBM Cognos 8 report that is using them. A regression test of the IBM Cognos 8 reports will be necessary if changes occur within the structures. In the event you find that structures are getting in the way of the SAP NetWeaver Business Warehouse and IBM Cognos 8 development, consider utilizing more SAP NetWeaver Business Warehouse variables, filters, and restrictions within the InfoQuery rather than using structures.

2.10 SAP NetWeaver Business Warehouse Performance Measures that Compliment IBM Cognos 8

There are several SAP NetWeaver Business Warehouse Reporting Performance factors that you can implement within SAP NetWeaver Business Warehouse which will positively influence the overall performance of your IBM Cognos 8 on SAP NetWeaver Business Warehouse solution. The most common of these SAP NetWeaver Business Warehouse performance measures are noted below, and work seamlessly with IBM Cognos 8 out of the box and are completely transparent to users. You should also refer to your Business Warehouse performance and tuning documentation for SAP performance-tuning recommendations for SAP NetWeaver Business Warehouse.

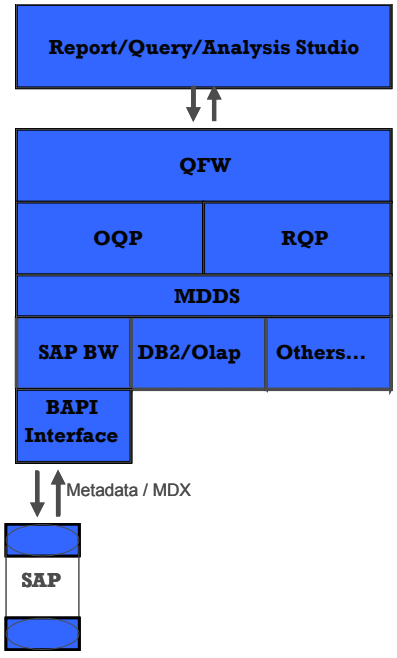
1. **SAP NetWeaver Business Warehouse OLAP Cache:** Accelerates response for similar queries by caching query result sets, and reading from cache instead of the SAP NetWeaver Business Warehouse database. Although this method is the simplest to implement, this is the least flexible of the performance measures and requires exact matching of data subsets.

2. **Cube Aggregates:** Summarized (or subset) materialized views of InfoCube data which are built to enhance data read performance from SAP NetWeaver Business Warehouse cubes. Aggregates are more flexible than OLAP cache, but time to build delays the users' ability to access data.

3. **Database Optimizations:** The application of database indexes, custom statistics, etc, which requires DBA analysis and administration.

4. **SAP NetWeaver Business Warehouse Accelerator:** Installation of a hardware appliance that utilizes in-memory technology to optimize query performance and flexibility when analyzing large amounts of data from SAP NetWeaver Business Warehouse cubes. BWA provides the ability to perform aggregation of the results on the fly and merge results for display.

2.11 Overview of How IBM Cognos 8 Interoperates with the SAP NetWeaver Business Warehouse



The IBM Cognos 8 BI component stack contains multiple layers tasked with processing a request from the studios (Report/Query/Analysis Studio) and returning the result to the end user. The layers start with generalized data source agnostic components (the studios) to refine themselves to very specific components (data source specific providers). In the diagram provided, we can identify the main components related to SAP NetWeaver Business Warehouse (some components have been removed for simplicity).

The Query Framework Coordination Planner (QFW) receives a request from the studios and dissects it into either a relational or an OLAP request. From there QFW then prepares the V5 request following a set of rules for further processing. Some of these rules can be controlled through configuration changes using the qfs_config.xml file.

For SAP NetWeaver Business Warehouse specific requests, the requests are then sent to the OLAP Query Planner (OQP). OQP is tasked with breaking

down the OLAP query and constructing data source agnostic MDX statements – also known as "Incoming MDX".

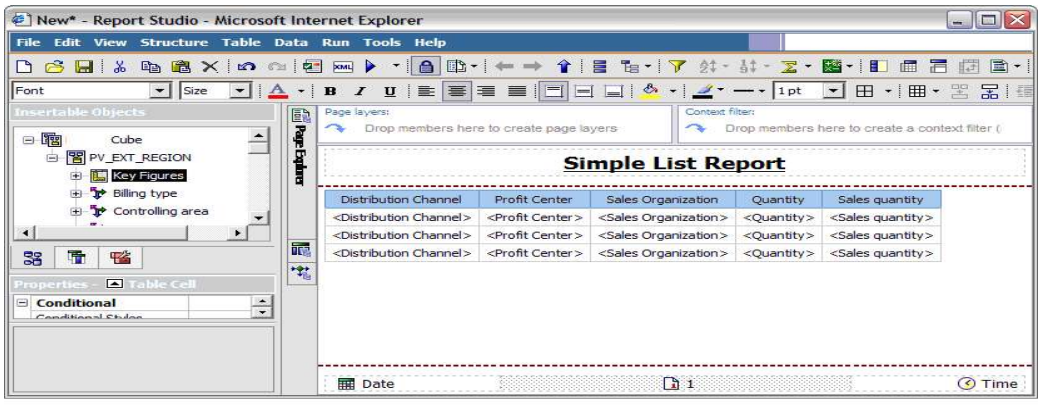
OQP then forwards the "Incoming MDX" to the Multi Dimensional Database Services component (MDDS). It is then recognized as an SAP NetWeaver Business Warehouse query at which time multiple transformations occur to break down the generic MDX and send a series of SAP NetWeaver Business Warehouse BAPI function or MDX statements to SAP NetWeaver Business Warehouse. Configuration changes within the sapbw_config.xml file can alter how and which calls are made by MDDS to SAP NetWeaver Business Warehouse. Once the results are received from Business Warehouse, they are sent back up the component stack for report rendering.

IBM Cognos 8 BI Reporting

Generally speaking the methodology used by IBM Cognos 8 follows a process of decomposing a request to its basic form. All reports eventually resolve themselves to the following steps through a combination of MDX and BAPI_MDPROVIDER_* function calls:

1. Identify the projected dimensions/members/hierarchies.
2. Metadata request to gather all members of the projected dimensions/ member/hierarchies.
3. Data Request to retrieve the factual data.

As an example, take the following simple report.



The report above is comprised of
Three dimensions:

- Distribution Channel
- Profit Center
- Sales Organization

Two Key Figures:

- Quantity (QTY)
- Sales Quantity (Sales QTY)

This simple report will be translated into:

- Metadata Request to gather the enumerated set of members of dimension Distribution Channel
- Metadata Request to gather the enumerated set of members of dimension Profit Center.
- Metadata Request to gather the enumerated set of members of dimension Sales Organization.
- Using the collected enumerated members, an MDX data request is sent to gather factual data using the key figures projected (QTY and Sales QTY)

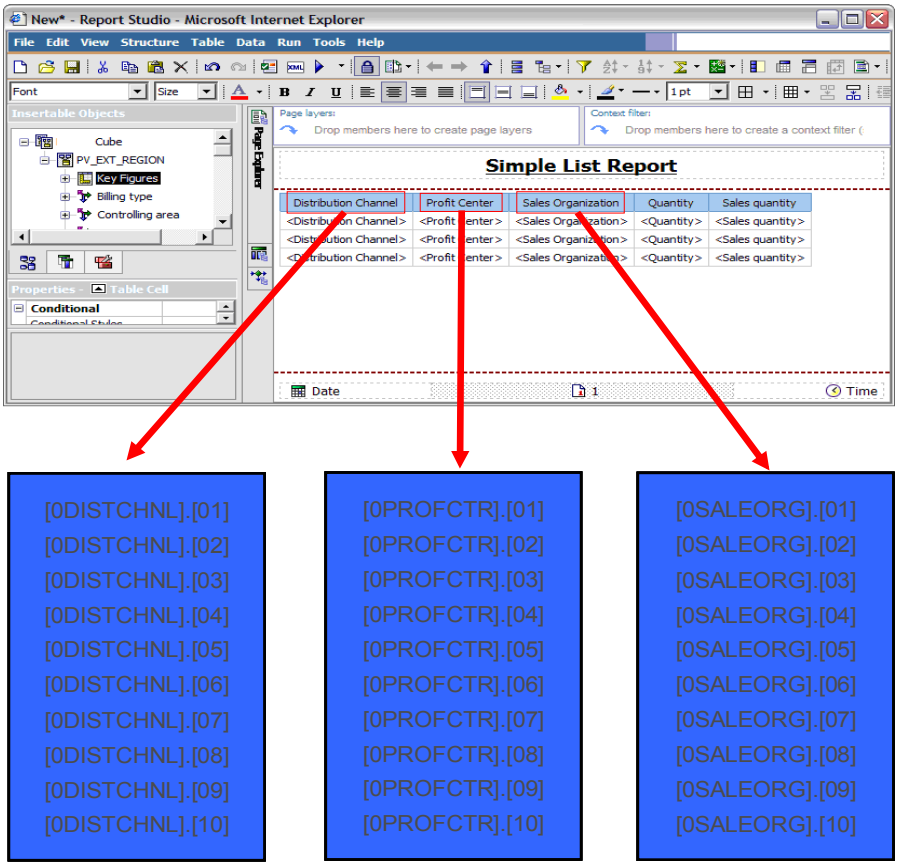
While greatly simplified, with any reports, metadata requests are performed to gather the enumerated set of members, and then followed by data requests to retrieve the factual data.

If we were to demonstrate this graphically, it would follow this process:

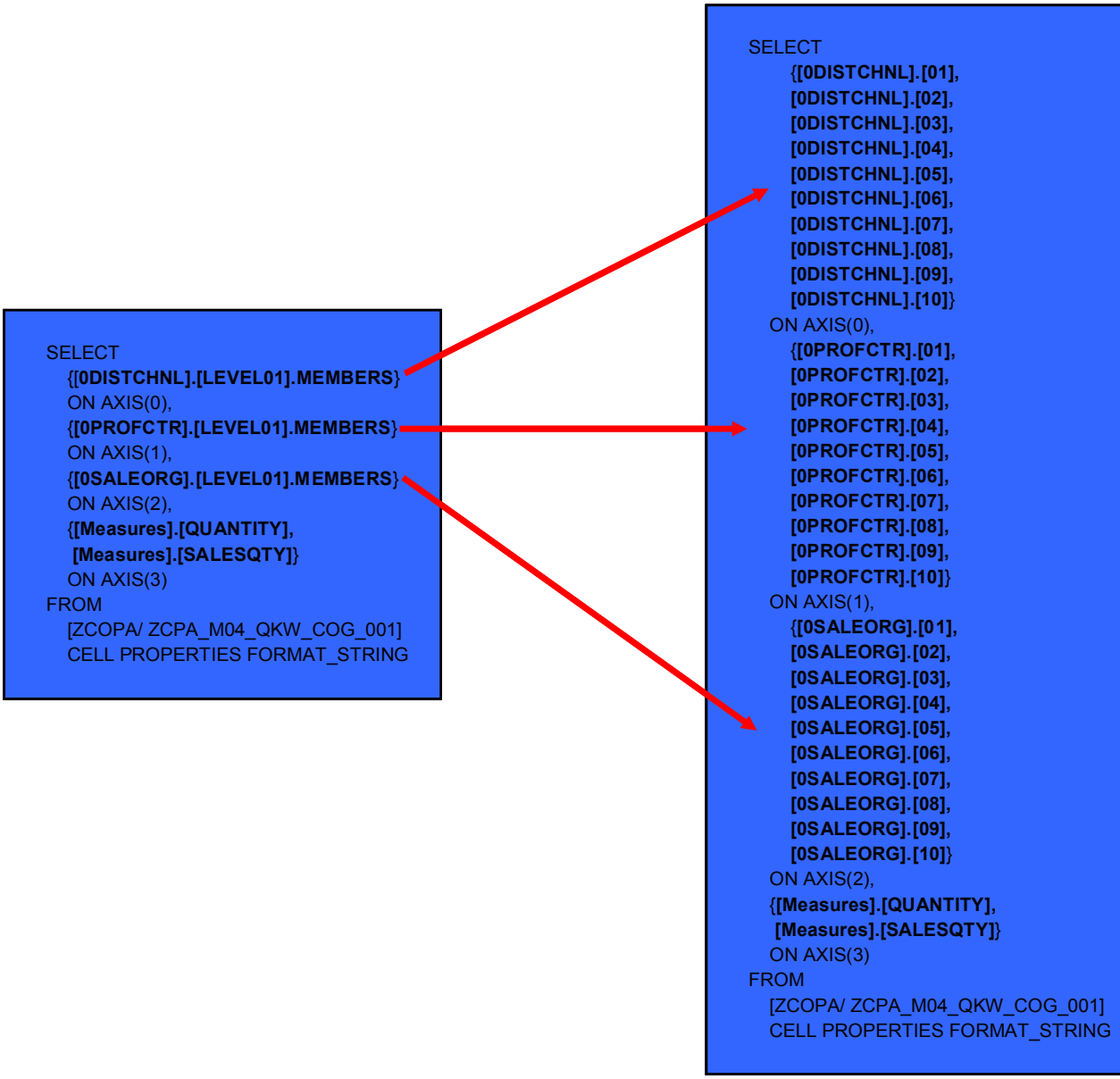
Once the "Incoming MDX" is processed, IBM Cognos 8 begins to construct the MDX to send to SAP NetWeaver Business Warehouse to retrieve the results. It takes the following skeleton MDX:

```
SELECT
   {[0DISTCHNL].[LEVEL01].MEMBERS}
   ON AXIS(0),
   {[0PROFCTR].[LEVEL01].MEMBERS}
   ON AXIS(1),
   {[0SALEORG].[LEVEL01].MEMBERS}
   ON AXIS(2),
   {[Measures].[QUANTITY],
    [Measures].[SALESQTY]}
   ON AXIS(3)
FROM
   [ZCOPA/ ZCPA_M04_QKW_COG_001]
   CELL PROPERTIES FORMAT_STRING
```

IBM Cognos 8 BI then proceeds to fetch all enumerated set of members for each represented dimension.



Once retrieved, the final MDX is constructed:



2.11.1 Performance Considerations: Metadata Requests

There are two different methods used to retrieve metadata while constructing the final MDX.

1. Through a BAPI function call - BAPI_MDPROVIDER_GET_MEMBERS. This function call returns all members for the requested dimension from the Master Data tables, regardless of whether these members have posted data values recorded or whether they meet the filtered criteria as per defined in variables.

2. Through a MDX statement. This MDX statement is issued with a NON EMPTY clause and as such only records with posted data values are returned. As well, any variable selection will be included therefore also potentially reducing the number of members returned.

BAPI_MDPROVIDER_GET_MEMBERS return more/all members and in most cases returns the members quicker then MDX statements as no fact tables are involved. The adverse effect of using this approach is the potential to bloat the final MDX data request which can have an adverse effect on performance.

The results of the MDX statement restrict the members returned to only those members with fact data associated for the variables defined, meaning the potential exists for fewer members to be included in the final MDX. The adverse effect of using this approach is the possibility that the MDX sent to retrieve the members will take a much longer time than a BAPI_MDPROVIDER_GET_MEMBERS. The advantage being a reduction in the size of the final MDX statement, and therefore, superior performance for the final MDX data request.

There are two distinct configuration settings used to dictate and control which one of the two methods (BAPI vs. MDX) will be utilized to retrieve metadata. This is something IBM Cognos 8 administrators will work with to balance performance (metadata fetch performance vs. data fetch performance). The specifics of these settings will be discussed later in this document.

2.12 The qfs_config.xml Configuration File

The Query Framework component behaviour can be affected by the provider specific files located in the <c8_install>/configuration directory. These are:

- qfs_config.xml This is the file that is read by the Query Framework component to obtain any configuration settings.
- qfs_config.xsd This file is the schema file for the qfs_config.xml file.

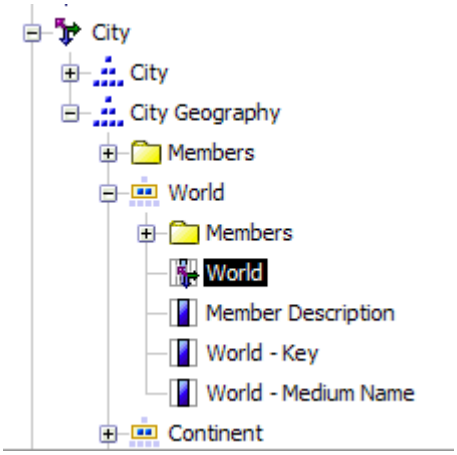
2.12.1 The qfs_config.xml Configuration Settings

The following section is a list of the most commonly used settings available for the qfs_config.xml file.

UseSAPMUNAsBusinessKey

Under very rare circumstances, issues may be encountered when drilling down/through using member unique names. The IBM Cognos reporting engine will utilize the business key when performing these operations and perform the translation from business key to member unique name (MUN) internally. This can cause problems when the business key is not unique and/or when the business key is extremely long. In such cases, changing this parameter to true will in turn cause the IBM Cognos engine to utilize the member unique name instead, and avoid performing the internal translation. The side effect of having this setting set to true will now show the MUNs instead of the business key when the key is projected in the report.

The key in this case does not refer to the business key attribute but the following field (see highlighted field in screen cap):



The following parameter may be added and set to true should you encounter such an issue.

```
 <provider name="OlapQueryProvider" libraryName="oqp">
…
<parameter name="UseSAPMUNAsBusinessKey" value="true"/>
```

DetectSAPVariableUniqueness

When importing multiple queries within one package which have identically named variables from multiple InfoQueries – and especially when including multiple InfoQueries within one report, this setting will uniquely identify each variable by prefixing them with the InfoQuery name. Applying this setting will affect all SAP NetWeaver Business Warehouse content.

```
<provider name="OlapQueryProvider" libraryName="oqp">
…
<parameter name="DetectSAPVariableUniqueness" value="true"/>
```

Note this setting is set to 'true' by default in IBM Cognos 8.4. In versions prior to IBM Cognos 8.4, the default setting for DetectSAPVariableUniqueness is set to 'false'. As a result, when upgrading to IBM Cognos 8.4 from a previous version, reports containing SAP variables may fail. This issue can be resolved by taking one of the two actions below:

1. Fully qualify all of the variables in the IBM Cognos report by changing the [var_name] to [infoquery].[var_name].
2. Change the setting for DetectSAPVariableUniqueness to 'false'. Note that doing so may cause a problem if more than one SAP variable with the same name exists in the package.

2.13 The sapbw_config.xml Configuration File

As mentioned in the architectural overview. The IBM Cognos 8 SAP provider behaviour can be affected by the provider specific files located in the <c8_install>/configuration directory. These are:

- Sapbw_config.xml: This is the file that is read by the Cognos 8 SAP provider to obtain any configuration settings.
- Sapbw_config.xml.sample: This is a sample file which contains examples of the most used provider configurations.
- Sapbw_config.xsd: This file is the schema file for the Sapbw_config.xml: This file will contain a list of all the currently available settings.

2.13.1 The sapbw_config.xml Configuration Settings

The following section is a list of the mostly used settings available for the sapbw_config.xml file.

DisplayProperty

Impacts: Member metadata fetches for reports, IBM Cognos 8 Report Studio authored prompts.

Usage: This parameter allows a user to change the text display from the default behaviour of caption to other attributes such as medium name, name or key. This configuration applies system wide and will affect all reports.

Interoperability with other parameters: None.

OutputDebugMDX

Impacts: Debugging.

Usage: This parameter controls whether to log/display internal MDX statements. The MDX statements produced by this setting are only interim statements later decomposed prior to sending final MDX statements to the underlying data sources. This parameter is used exclusively for debugging purposes and should be set to false in any other circumstances.

Interoperability with other parameters: While BAPI tracing is activated, the output is created within the BAPI trace.

useMDXToRetrieveMembersLimit

Impacts: Member metadata fetches for reports, IBM Cognos 8 Report Studio authored prompts.

Usage: This parameter controls the decision of when to use MDX or to use the BAPI_MDPROVIDER_GET_MEMBERS BAPI call to retrieve member metadata. MDX will be used if the size of the Hierarchy being queried exceeds the value of this parameter. The default value is 100,000. This parameter affects the queries used to load the Global Cache (if active) as well as regular queries from the provider. Setting the value to 500 as a starting point would be recommended.

Interoperability with other parameters: The parameter UseMDXToRetrieveMembersFor also affects whether MDX or BAPI calls will be used to retrieve Member data.

Side effect: When using MDX to retrieve metadata from the SAP NetWeaver Business Warehouse InfoQuery/Cube, IBM Cognos 8 will retrieve only the members which have corresponding fact data. When using BAPI_MDPROVIDER_GET_MEMBERS, IBM Cognos 8 will retrieve all members from the master data table regardless of whether the members have corresponding fact data.

UseMDXToRetrieveMembersFor

Impacts: Member metadata fetches for reports, IBM Cognos 8 Report Studio authored prompts.

Usage: In some cases, it can be more efficient to use MDX queries instead of SAP BAPI Remote Function Calls to retrieve Member Information from a Cube on an SAP Server. This setting contains a list of the Unique Names of Dimensions, Hierarchies and/or Members for whom MDX, rather than BAPI Remote Function Calls, should be used to retrieve Member information. This allows customers fine-grained control over when this optimization is used. If this setting contains an empty list or is missing, it has no effect. The default value is an empty list. The parameter useMDXToRetrieveMembersLimit also affects whether MDX or BAPI calls are used to retrieve Member data. This parameter also affects the queries used to load the Global Cache and Cache Server (if either is configured) as well as regular queries from the provider. With crosstabs, in order for this parameter to take effect, the query property "Suppress" MUST be set to something other than "default". If set to default, IBM Cognos 8 will revert to using BAPI_MDPROVIDER_GET_MEMBERS for all metadata fetches.

When using MDX to retrieve metadata from the SAP NetWeaver Business Warehouse InfoQuery/Cube, IBM Cognos 8 will retrieve only the members which have corresponding fact data.

When using BAPI_MDPROVIDER_GET_MEMBERS, IBM Cognos 8 will retrieve all members from the master data table regardless of whether the members have corresponding fact data. Determining which dimensions to include in this section requires a close examination of the dimensions included in the InfoQuery. As a general rule, the dimensions which have a large delta between the number of all members existing in the dimension and the members with fact data associated to them are good candidates. For example, the [0MATERIAL] dimension may contain a total of 10,000 members of which maybe only 100 of them with actual fact data associated – this would be a good candidate for UseMDXToRetrieveMembersFor.

Interoperability with other parameters: The parameter useMDXToRetrieveMembersLimit also affects whether MDX or BAPI calls are used to retrieve Member data.

UseXJoinForLargeSet

Impacts: MDX data fetch approach during reporting.

Usage: Controls the use of Provider Cross Join for large sets - Provider Cross Join will be used whenever the size of the set exceeds the value of this parameter. The default value is 1,000,000. This parameter applies to the SAPBWODP2 (sbwodp) adapter only.

By default, the Business Warehouse cannot return more then 1,000,000 cells, and we need to ensure we do not exceed this limit. In order to do so, when the potential output exceeds this limit, we will be using a provider cross join in order to retrieve the data. This is a system-wide setting and should not be modified unless specifically instructed by IBM Cognos Support. Some benefits could potentially be seen by reducing this number; however it is applied to the entire environment and may not have a positive effect on all reports.

Interoperability with other parameters: None. However, we will hit this 1M threshold quicker if the number of members included in the MDX isn't reduced by the UseMDXToRetrieveMembersFor setting.

UseSAPOrdinalsForMembers

Impacts: Metadata fetch while slicing/filtering on single members.

Usage: When performing filtering/slicing on single members, in order to get the parentage of the specific member, two approaches can be taken: top-down or bottom-up. By this we refer to how metadata is fetched in order to find the lineage (parent to children, or start with specific member and find its parent). By default, IBM Cognos 8.2 uses the top-down approach (false) while IBM Cognos 8.4 uses the bottom-up approach (true). The bottom up approach has proven to provide some performance benefits as fewer metadata calls are performed to obtain the lineage.

Interoperability with other parameters: None.

EnableModelMetadataLookups

Impacts: General metadata queries during connection initialization.

Usage: When establishing a connection to an SAP NetWeaver Business Warehouse environment, releases prior to IBM Cognos 8.4 would perform various function calls to the underlying cube/InfoQuery to obtain some information such as dimensions, hierarchies etc. IBM Cognos 8 now performs these requests against the runtime model, greatly reducing initial connection time. By default this is set to true in IBM Cognos 8.4 and should only be set to false for troubleshooting purposes.

Interoperability with other parameters: None.

UseGetHierarchiesForRootMembers

Impacts: Root member metadata queries during connection initialization.

Usage: Upon establishing a connection to a cube/InfoQuery, in order to improve performance we can retrieve root members for single root hierarchies using information from the GET HIERARCHIES BAPI instead of making a separate GET_MEMBERS call to SAP. This works since the single root member for single root hierarchies is the "All" member and the information required to load it is already available via the GET_HIERARCHIES. By default this is set to false (all releases) causing the application to make BAPI_MDPROVIDER_GET_MEMBERS in order to fetch root members. Alternatively, we can fetch this from the model by setting this parameter to true. Setting the value to true can greatly improve performance should the query contain many dimensions.

Interoperability with other parameters: None.

UseFastGetMembers

Impacts: Metadata queries performed to populate members for SAP NetWeaver Business Warehouse variables for prompts.

Usage: There are two methods of fetching members to satisfy SAP NetWeaver Business Warehouse variables for prompt usage, FastGetMember and BAPI_MDPROVIDER_GET_MEMBERS. Values returned with FastGetMember will only include members with fact data associated to them while BAPI_MDPROVIDER_GET_MEMBERS will return all members. The FastGetMember approach can be quick in most environments while sometimes proving slower when querying SAP NetWeaver Business Warehouse Multiproviders. By default, this parameter is set to true.

Interoperability with other parameters: Can be used in conjunction with UseFastGetMembersFor when set to true.

UseFastGetMembersFor

Impacts: Metadata queries performed to populate members for SAP NetWeaver Business Warehouse variables for prompts.

Usage: In order to offer more flexibility in the use of FastGetMember or GetMember while retrieving members to satisfy SAP NetWeaver Business Warehouse variables for prompt usage, the "UseFastGetMembersFor" allow customers to specify which dimensions they wish to perform FastGetMembers for. In order for this setting to take effect, "UseFastGetMembers" must be set to true. If any dimensions are specified for this parameter, then IBM Cognos 8 will only apply FastGetMember for the specified dimensions.

Interoperability with other parameters: Can be used in conjunction with UseFastGetMembers when UseFastGetMembers is set to true.

LoadMeasuresFromMDQuery

Impacts: Key figure metadata query approach.

Usage: Some reports were designed to use a large number of key figures (600) – more often going against SAP NetWeaver Business Warehouse dual structures. IBM Cognos 8 can either load all measure metadata at once through a BAPI call or load them individually. Earlier releases of the product will load all measures at once and is not configurable through this setting. IBM Cognos 8.4, by default, will load the measures one at a time (default value of false). The cost benefits of switching this setting to true would only apply for environments where we encounter reports with very large number of key figures included.

Interoperability with other parameters: None.

UseReplacementVariablesFor

Impacts: Exposes Replacement Text Variables when used with IBM Cognos 8 Report Studio Crosstabs.

Usage: When making use of Replacement Text Variables, administrators are required to include the Cube/InfoQuery name and dimension name of the targeted dimension within this configuration setting.

For example, if a replacement text variable is defined on a key figure, the following configuration setting would be required:

```
<provider name="SAPBWODP2">
                <parameter name="UseReplacementVariablesFor" value="[CUBE_NAME/INFOQUERY_NAME].
[Measures]"/>
        </provider>
```

Many entries can be included; they must be separated with commas.

Interoperability with other parameters: None.

UseStgDTypes

Impacts: Expose SAP user-defined date dimensions as dates.

Usage: User-defined date dimensions are passed through the SAP NetWeaver Business Warehouse OLAP BAPI interface to IBM Cognos 8 Framework Manager as string characteristics and not date characteristics. In order to expose those date dimensions as dates, the IBM Cognos administrator needs to alter this configuration setting which will further query the metadata objects at import time with IBM Cognos 8 Framework Manager.

In order to accomplish this, the following configuration setting must be set to 'true' in sapbw_config.xml.

```
<provider name="SAPBWODP2">
        <!-- Must be activated for getting staging datatypes -->
                <parameter name="UseStgDTypes" value="true"/>
        </provider>
```

Note that activating this setting could slow the import process of metadata into IBM Cognos 8 Framework Manager.

Interoperability with other parameters: None.

2.14 Step by Step Example for Setting an Entry within the SAPBW_CONFIG.xml

The following section will step a user through setting the "UseMDXToRetrieveMembersLimit" feature within the sapbw_config.xml file. The "UseMDXToRetrieveMembersLimit" feature of the IBM Cognos 8 SAP NetWeaver Business Warehouse provider is a performance enhancement that uses MDX queries to replace BAPI calls to retrieve Member data. By default, this feature is turned on for SAP NetWeaver Business Warehouse Dimensions where the number of members exceeds a user-defined threshold. The default user-defined threshold is set to 1,000,00. Member data that is retrieved via MDX will only includes data that has facts. When the BAPI calls are used to retrieve member data, all members are returned whether they have facts or not.

1. Locate the <c8_install>\configuration\sapbw_config.xml file and make a backup copy.

2. Open the original file using a text editor.

3. Locate the string "'"SAPBWODP2"'".

4. Add the following line under the <parameters> tag to activate the UseMDXToRetrieveMemberLimit configuration

5. Locate the UseMDXToRetrieveMembersLimit parameter. The completed entry should read as follows:

```
<provider name="SAPBWODP2">
        <parameters>
            <!-- Output processing MDX statements into debug window - set to "true" if
            required -->
            <parameter name="useMDXToRetrieveMembersLimit"
            value="100000"/>
            …
```

6. The value can be changed from 100000 to the desired number of members.

Save the changes and close the file. This configuration setting will be picked up by any new BiBusTKServerMain process that is launched

3 IBM Cognos 8 Framework Manager

IBM Cognos 8 Framework manager provides the metadata model development environment in IBM Cognos 8 and is the starting point for IBM Cognos 8 and SAP NetWeaver Business Warehouse integration. It is important to note that you cannot add or edit SAP NetWeaver Business Warehouse relationships. The Star layout is fact table centric and is the appropriate choice when viewing SAP NetWeaver Business Warehouse metadata. You can use any kind of InfoCube directly (InfoCube, VirtualCube, RemoteCube, MultiProvider) or any SAP NetWeaver Business Warehouse Query on top of them or other Business Warehouse InfoProviders (including ODS/DSO Data, Master Data, and InfoSets). Although options are available to you to use InfoProviders directly, it is highly recommended to use a SAP NetWeaver Business Warehouse query which acts as a database view and provides flexibility to restrict data from the SAP NetWeaver Business Warehouse.

As the general guidelines encourage users to leverage the SAP NetWeaver Business Warehouse query flexibility, the following should also be taken into consideration:

1. Perform as few changes as possible within the IBM Cognos 8 Framework Manager project to avoid re-work in the event a query needs to be re-imported. Note that creating short-cuts, query subjects, calculations and creating expressions including filters within the Framework Manager model is not supported when importing metadata from the SAP NetWeaver Business Warehouse data source.
2. If new calculations are necessary, build them in SAP NetWeaver Business Warehouse Query Designer or in the IBM Cognos 8 Studios.

It is worth noting for faster metadata import you should only import hierarchies that will be used for reporting. This usually cuts down on the objects to import dramatically. In order to improve studios performance, it is recommended to leverage the modelling performed in each SAP NetWeaver Business Warehouse query. If importing metadata for a Query/InfoCube is taking too long or an SAP NetWeaver Business Warehouse memory limitation is hit, use the recommendation above to try to streamline the import, or split the query in smaller chunks by using the option enhance and IBM Cognos Framework Manager will perform even faster.

3.1 Mapping SAP NetWeaver Business Warehouse Objects to IBM Cognos 8 Framework Manager

SAP NetWeaver Business Warehouse objects are mapped to the following IBM Cognos 8 Framework Manager objects.

SAP NetWeaver Business Warehouse Object	IBM Cognos 8 Framework Manager Object
Query, InfoCube, RemoteCube, MultiCube	Namespace.
Dimension	A folder that contains characteristics. You must select the Enhance model for SAP BW organization of objects option when importing metadata to have a folder for each dimension.
Characteristic	The characteristic may contain hierarchies representing each presentation hierarchy. The default hierarchy contains two levels representing the aggregation of all characteristic values, also known as the All value aggregating across all characteristic values. Note: By default, IBM Cognos Framework Manager imports SAP NetWeaver Business Warehouse Currency and Unit of Measure characteristics. You can remove these characteristics if you do not need them.
Key figure	Query item that is part of a measure dimension called Key Figures.
Presentation hierarchy level	Level. Note: Level names must be defined in the Administrator Workbench to be meaningful.
Attribute	Query item associated with a level whose Usage property value is set to Attribute.
SAP NetWeaver Business Warehouse variable	Data source property. For information about the SAP NetWeaver Business Warehouse variables that IBM Cognos Framework Manager supports, see SAP NetWeaver Business Warehouse Variables.

3.1.1 SAP NetWeaver Business Warehouse Variables

SAP NetWeaver Business Warehouse® (SAP BW) variables are parameters of an SAP NetWeaver Business Warehouse Query that are set up during query definition. When queries run, the SAP NetWeaver Business Warehouse variables are filled with values. These function as placeholders and can be processed in different ways. These are automatically exposed as prompts at run time.

SAP NetWeaver Business Warehouse variable information is included in a composite custom property named "**SAP BW Variables"** that exists only if a data source has one or more variables associated with it. The "**SAP BW Variables"** property contains one or more composite properties, each of which must be assigned a unique name. Each property represents a description of a single Business Warehouse variable. Because the variable information is specified in a custom property, IBM Cognos Framework Manager does not validate these properties.

The SAP NetWeaver Business Warehouse variable information is obtained using the SAP BW BAPI MDDataProviderBW::GetVariables. IBM Cognos 8 Framework Manager supports the following types of SAP NetWeaver Business Warehouse variables:

characteristic

There are two kinds of characteristic variables, characteristic value and hierarchy node. Characteristic values variables select characteristic values. Hierarchy node variables select values from any position in a presentation hierarchy.

hierarchy

The user is not prompted for a value because IBM Cognos 8 automatically populates it at run time based on the selected hierarchy. Variables for hierarchies function act as placeholders for the hierarchy of a characteristic. All the values for hierarchy variables are read-only.

formula

The user types a numeric value at run time. Use formula variables if a formula component should be entered only when a query is run. For example, you can use a formula variable for a value-added tax rate to process the current rate at run time.

authorization

Authorization variables are like other variables, but IBM Cognos 8 automatically populates the variable values with the user's credentials. The Business Warehouse uses these credentials to supply the information needed by an SAP NetWeaver Business Warehouse Query that has security applied to it.

3.1.2 Name Property

This property is a string value.

SAP NetWeaver Business Warehouse equivalent: VARIABLE_NAME

Restrictions: Read-only.

3.1.3 Caption Property

The string value for this property is a composite and locale-dependent. Each locale in the model should be represented by a custom property whose value is the locale name. For example, if the locales en-ca and fr-fr exist in the model, define two custom properties named en-ca and fr-fr.

The default value is obtained from SAP NetWeaver Business Warehouse.

3.1.4 Default Low Caption and Default High Caption Properties

The value for each of these properties is a composite, locale-dependent string value. Each locale in the model should be represented by a custom property whose value is the locale name. For example, if the locales en-ca and fr-fr exist in the model, define two custom properties named en-ca and fr-fr.

The default value is obtained from SAP NetWeaver Business Warehouse.

Restrictions: The Default High Caption properties are applicable only for variables with a Selection Type of interval.

3.1.5 Selection Type Property

The possible values are value, interval, complex, multiValued.

Value	SAP NetWeaver Business Warehouse Equivalent
value	SAP_VAR_SEL_TYPE_VALUE
interval	SAP_VAR_SEL_TYPE_INTERVAL
complex	SAP_VAR_SEL_TYPE_COMPLEX
multiValued	SAP_VAR_SEL_TYPE_COMPLEX

Restrictions: Read-only.

3.1.6 Entry Type Property

The default value is obtained from the SAP NetWeaver Business Warehouse.

Value	SAP NetWeaver Business Warehouse Equivalent
optional	SAP_VAR_INPUT_TYPE_OPTIONAL
mandatory	SAP_VAR_INPUT_TYPE_MANDATORY
mandatoryNotInitial	SAP_VAR_INPUT_TYPE_MANDATORY_NOT_INITIAL

Restrictions: Read-only.

3.1.7 Default Low Value and Default High Value Properties

Each of these properties specifies a range of values.

The default value is obtained from SAP NetWeaver Business Warehouse.

Restrictions: The Default High Value property is applicable only for variables with a Selection Type of interval.

3.1.8 Description Property

This property is a string value.

3.1.9 SAP NetWeaver Business Warehouse Variable Type Property

The possible values are numeric, characteristic, hierarchy, or hierarchicalNode.

The default is obtained from SAP NetWeaver Business Warehouse.

Restrictions: Read-only.

3.1.10 Prompt Type Property

The default value depends on the type of the variable. If the value of this property is not one of the predefined values, it is assumed to be hierarchyPickList.

Value	Restrictions
typeIn	Required for numeric variables and optional for characteristic values
pickList	Optional for characteristic variables
calendar	Only for characteristic variables based on 0CALDAY
hierarchyPickList	Optional for all presentation hierarchies
notApplicable	Required for hierarchy variables

Restrictions: Read-only for some types of variables such as characteristic and formula. typeIn can be changed to pickList as well as pickList to typeIn and apply to characteristic variables.

3.1.11 Level Restriction Property

This property is a numeric value.

The default value is 1.

Restrictions: Applicable only for hierarchical node variables with a Prompt Type of hierarchyPickList.

3.1.12 Trim Levels Property

This property is a string value that reduces the number of members in a hierarchical picklist. If the property is set to zero (0), members from all levels of a hierarchy are included in the prompt. You can also specify a range such as 2:4 to include only the members from certain levels. If the starting and ending ranges are the same, such as 3:3, only members from that level will be included.

The default value is zero (0).

Restrictions: Applicable only for characteristic variables with a Prompt Type of hierarchyPickList.

3.1.13 Use Default Values Property

This property is a Boolean property that determines whether the default values will be used. If this property is set to true, your users are not prompted for the associated variable, and the default value is always applied.

The default value is false.

3.1.14 Show Key and Caption Property

To show keys and captions for the SAP NetWeaver Business Warehouse variables, set this property to true. This property is applicable only for pick list prompts and hierarchy node prompts.

The default value is false.

3.1.15 Initial Number of Pick List Values Property

A numeric value that specifies the initial number of values used to populate a picklist, hierarchical picklist, or prompt.

The default value is zero (0), which means all.

3.1.16 Numeric Variable Property Values

The following variable properties are applicable to numeric variables:

Property	Default Value
Type	Numeric
Caption	
Selection Type	Value
Entry Type	obtained from the SAP NetWeaver Business Warehouse
Default Low Value	
Default High Value	
Prompt Type	typeIn
Use Default Value	False

You can change the default values for a numeric variable except for the Prompt Type property, which is read-only.

3.1.17 Characteristic Variable Property Values

There are two kinds of characteristic variables, characteristic value and hierarchy node. Characteristic values variables select characteristic values. Hierarchy node variables select values from any position in a presentation hierarchy.

3.1.18 Characteristic Value Variable Property Values

The following variable properties are applicable to characteristic value variables:

Property	Default Value
Type	Characteristic
Caption	
Selection Type	obtained from the SAP NetWeaver Business Warehouse
Entry Type	obtained from the SAP NetWeaver Business Warehouse
Default Low Value	If the entry type is value or complex, the default property is shown. If the entry type is interval, the default low property is shown. This value is obtained from the SAP NetWeaver Business Warehouse.
Default High Value	If the entry type is value or complex, the default property is shown. If the entry type is interval, the default high property is shown. This value is obtained from the SAP NetWeaver Business Warehouse.
Prompt Type	typeIn or pickList This depends on the number of members in the referenced dimension. If the value is invalid, typeIn is used.
Use Default Value	False
Show Key and Caption	False
Initial Number of Pick List Values	zero (0)

A characteristic value variable for the 0CALDAY dimension is shown in the model as a date. The Data Type property is set to xsdDate and the Prompt Type property is set to calendar. The Prompt Type property is read-only for the 0CALDAY dimension.

3.1.19 Hierarchy Node Variable Property Values

The following variable properties are applicable to hierarchy node variables:

Property	Default Value
Type	characteristic
Caption	
Selection Type	obtained from the SAP NetWeaver Business Warehouse
Entry Type	obtained from the SAP NetWeaver Business Warehouse
Default Low Value	
Default High Value	
Prompt Type	hierarchy PickList You can change the Prompt Type property to typeIn or pickList.
Level Restriction	zero (0)
Use Default Value	False

3.2 Picklist Prompts

Each picklist prompt contains a pre-defined number of values. These values are determined by the Maximum Number of Values property.

If the number of actual values is less than or equal to the default number of values, the prompt is generated as a single picklist prompt. If the number of actual values exceeds the default number, two prompts are generated in this order:

- a bound range parameter with a starting value of 1 and an ending value determined by the Maximum Number of Values property. This parameter is of the type xsdUnsignedLong and is optional. The name of the parameter is the name of the original prompt followed by _range_prompt. The caption is locale-specific. If this is a multilingual model, you must store the template for the caption in a message file.
- a picklist prompt containing the default number of values

3.3 Dimensions

A dimension is a broad grouping of data about a major aspect of a business, such as products, dates, or markets.

The types of dimensions that you can work with in IBM Cognos 8 Framework Manager are regular dimensions and measure dimensions. In the SAP NetWeaver Business Warehouse, measure dimensions are called key figures.

For example, in a project for sales analysis, you include these dimensions:

Name	Type	Description
Time	Regular dimension	Dates of sales organized into years, quarters, months, weeks, and days when sales were made
Region	Regular dimension	Locations of sales grouped into sales regions, countries, and cities
Product	Regular dimension	Product details organized by product type, brand, model, color, and packaging
Customer	Regular dimension	Customer information
Sales	Key Figures dimension	Purchase details such as units sold, revenue, and profit

3.3.1 Modify a Regular Dimension

A regular dimension contains descriptive and business key information and organizes the information in a hierarchy, from the highest level of granularity to the lowest. It usually has multiple levels and each level requires a key and a caption. If you do not have a single key for your level, it is recommended that you create one in a calculation.

Model regular dimensions are based on data source or model query subjects that are already defined in the model. You must define a business key and a string type caption for each level. When you verify the model, the absence of business keys and caption information is detected. Instead of joining model regular dimensions to measure dimensions, create joins on the underlying query subjects and create a scope relationship between the regular dimension and the measure dimension.

When dimensions are based on SAP NetWeaver Business Warehouse metadata, you cannot edit the underlying query.

1. Click the regular dimension you want to modify.
2. From the Actions menu, click Edit Definition.
3. Choose the action that you want:

4. Embed calculations by selecting the level, clicking Add, and then defining the expression
5. Embed filters
6. Test the dimension
7. Click OK.

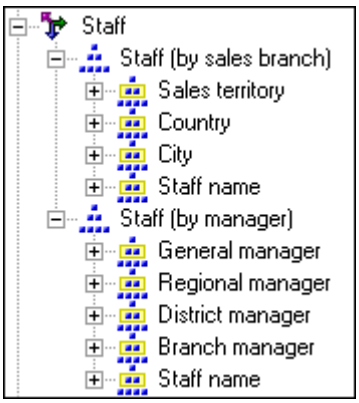
3.3.2 Hierarchies for a Regular Dimension

A hierarchy is an ordered list of levels or a collection of items. Each query item in a hierarchy must have a unique name.

You can specify multiple hierarchies on regular dimensions in IBM Cognos Framework Manager. Multiple hierarchies for a regular dimension behave as views of the same query. The first hierarchy is the primary or default hierarchy.

You can use only one hierarchy at a time in a query. For example, you cannot use one hierarchy in the rows of a crosstab report and another hierarchy from the same dimension in the columns. If you need both hierarchies in the same report, you must create two dimensions, one for each hierarchy. For more information, see Modeling Dimensions with Multiple Hierarchies in the IBM Cognos 8 Framework Manager User Guide

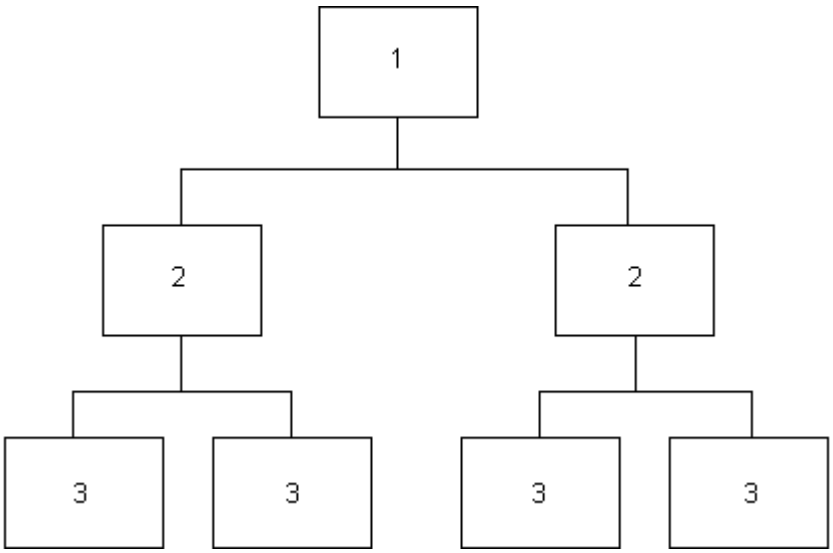
For example, sales staff can be viewed by manager or by geography and can be modeled as a single dimension with two hierarchies.



3.3.3 Balanced Hierarchy

Each path in a balanced hierarchy descends to the same depth.

For example, in the following diagram, the highest level is Product Line. Level 2 is Product Type. Level 3 is Products.



In SAP NetWeaver Business Warehouse, all leaf nodes of a hierarchy are values of the characteristic, but each path does not have to descend to the lowest level of the hierarchy.

3.3.4 Levels for a Regular Dimension

A level is a collection of attributes, typically of a common granularity. Each level needs an item that is defined as a key and another item that is defined as a caption. For the SAP NetWeaver Business Warehouse data sources, levels contain members.

The first level of the hierarchy is automatically defined as the All level. It contains a single root member, which represents the top level of the hierarchy. For example, the All level for the Time dimension is named Time (All). You cannot delete or move the All level. You can change its name, description, and screen tip.

If you do not specify the levels of the hierarchy correctly, incorrect aggregation could occur.

3.4 Member Unique Names

The member unique name (MUN) is how the member is found in the data source, much like using business keys to find records in a table.

The member unique name is used in the expression for a member data item that is used in a report, a reference to members in filters and expressions, and used in drill-through between OLAP data sources. The member keys in the MUN for the different OLAP data sources must match.

3.5 Roles

Roles define what appears in the member tree in the IBM Cognos 8 studios. Use roles to organize and manage metadata and to determine how to present data to your users.

You can also create expressions that refer to roles instead of query items. You must use the `roleValue` function to refer to a particular role. For example, you want to query against a specific role in a hierarchy but the query item playing that role is different at each level of the hierarchy. A single query can span the different query items at each level. You can also use the `roleValue` function when you know the role but not the underlying query item.

You can assign multiple roles to one query item, but the same role cannot be assigned to different query items in the same level.

Default roles are pre-defined for all parent-child hierarchies and for all levels in level-based hierarchies. Most of these roles are not visible in the IBM Cognos 8 studios.

The roles that are reserved by IBM Cognos 8 start with an underscore. The name for a custom role cannot start with an underscore.

3.6 SAP NetWeaver Business Warehouse Hierarchies

When importing metadata, IBM Cognos 8 Framework Manager generates a dimension in each SAP NetWeaver Business Warehouse characteristic.

Only one hierarchy associated with a given characteristic can be used in a report. Therefore, you should group dimensions that represent the hierarchies of a single characteristic into a folder or model query subject to make reporting easier for your users.

If there are multiple hierarchies in an SAP NetWeaver Business Warehouse data source, the first hierarchy that is imported becomes the default hierarchy.

IBM Cognos 8 Framework Manager supports the following types of hierarchies:

characteristic

This is a list of all the characteristic values.

text node

Non-leaf nodes contain only text and do not reference any other data source object.

characteristic value

The nodes of each level of a presentation hierarchy are values from another characteristic.

recursive

The nodes of the entire presentation hierarchy are from the characteristic itself.

If a characteristic is not in a time dimension but it is a date and is treated as a date in the SAP NetWeaver Business Warehouse, the characteristic is imported with the date data type.

IBM Cognos 8 Framework Manager does not support hierarchies that contain two or more types of nodes. These hierarchies are imported but are hidden in the IBM Cognos Framework Manager model.

Because hierarchical metadata is automatically generated for the SAP NetWeaver Business Warehouse, you cannot change it within the IBM Cognos 8 Framework Manager.

3.6.1 Versioned Hierarchies

You can import the following types of versioned hierarchies from an SAP NetWeaver Business Warehouse data source:

Version dependent hierarchy

A hierarchy can have multiple versions. Each version of a hierarchy can have a different structure, such as Sales by Region and Sales by Manager. During metadata import, IBM Cognos Framework Manager identifies each version as a separate hierarchy and creates a dimension for each.

Entire hierarchy time dependent

Each version has an associated time period that does not overlap with any other version of the same hierarchy. The structure of each version can be different. During metadata import, IBM Cognos 8 Framework Manager identifies each version as a hierarchy and includes the applicable time period as part of the dimension name.

3.7 Importing SAP Metadata into IBM Cognos 8 Framework Manager

IBM Cognos 8 Framework Manager is a Windows-based client application as opposed to the IBM Cognos 8 Studios in IBM Cognos 8 Connection which are web-based applications. When you work in IBM Cognos 8 Framework Manager you work in a project. At the highest level objects in a project include a model, namespaces or folders to organize and provide uniqueness to objects with the same name, data sources to define your connection to the underlying data sources, parameter maps to allow for the substitution of parameter values at runtime to match items found in your data, and packages to define the presentation of reporting objects made available to authors.

The IBM Cognos 8 Framework Manager workflow is an iterative process where the model is typically revisited to make adjustment for performance, security or business requirements. Initially modellers create a project. This phase requires diligence in gathering reporting requirements and understanding your data and its structure, and ensuring that you have the appropriate data access plan. In other words, is the data source you intend to use the best structure for your reporting and analysis needs? Once you are ready to import metadata, ensure you have an appropriate project structure and import only the required metadata to keep your modelling environment manageable.

To enable IBM Cognos 8 Framework Manager to retrieve metadata from SAP NetWeaver Business Warehouse, access privileges must be set up within the SAP system. The appropriate authorization objects that should be configured are noted with the **IBM Cognos 8 Framework Manager User Guide**.

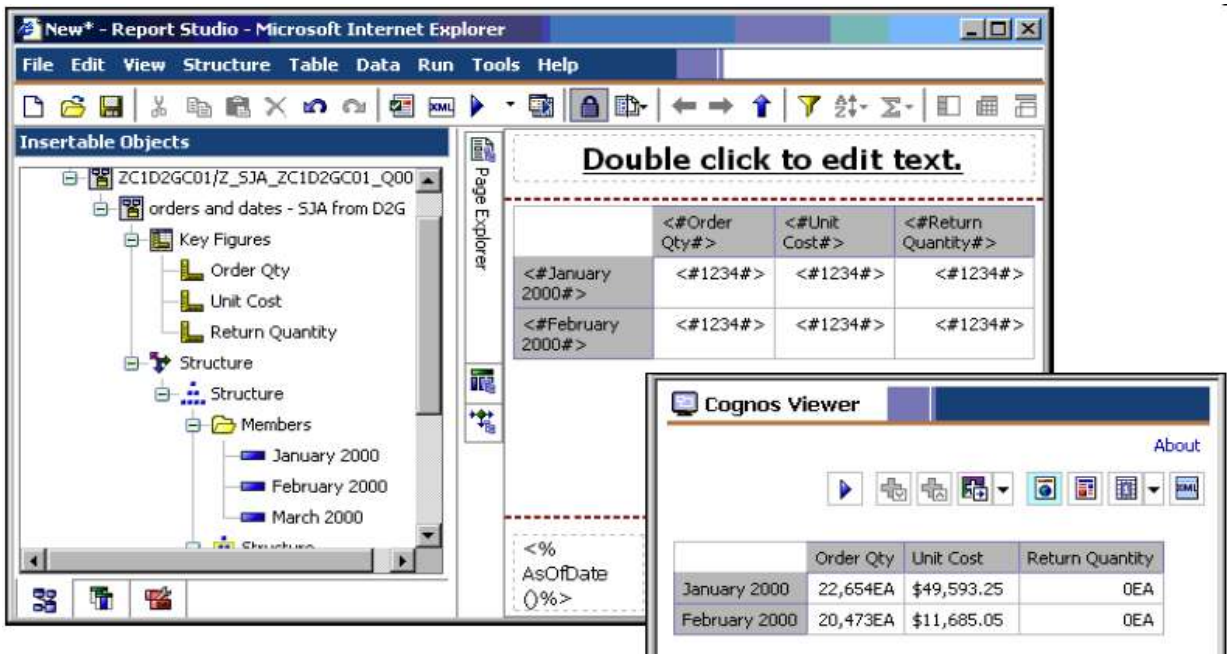
3.8 SAP NetWeaver Business Warehouse Structures

Many existing SAP NetWeaver Business Warehouse queries that will be used in an IBM Cognos 8 application contain structures, and you may plan to use them in queries prepared for an IBM Cognos 8 application to control the amount and the order of information that your report users see.

The SAP Query Designer automatically creates a key figure structure when you add key figures to a query. Although the SAP NetWeaver Business Warehouse does not require key figures in a query, you must have at least one key figure to import the query metadata into IBM Cognos Framework Manager. This is true even when you do not use the key figure in the IBM Cognos 8 reports. Therefore, you will always have a key figure structure.

A characteristic structure is a collection of characteristic values (members) from one or more dimensions. You create a characteristic structure within the Business Warehouse by adding a structure to the query, and then adding the required members to the structure. In IBM Cognos 8.4, the structure appears as an additional dimension that has only one, multi-root level. If you use a characteristic structure as well as a key figure structure (dual structures) in your SAP NetWeaver Business Warehouse query, then you create a table with fixed cell definitions for reporting. You can set filters and so on as you would for any other SAP NetWeaver Business Warehouse query.

When you import an SAP NetWeaver Business Warehouse query into IBM Cognos 8 Framework Manager and publish a package to the reporting studios, the key figure structure appears in the measures dimension, and the characteristic structure appears as any other dimension. That is, you can drag it onto a report, and select individual and multiple members.



3.9 Step by Step Data Source Connection and Import for SAP NetWeaver Business Warehouse

3.9.1 Creating a Data Source Connection

A data source defines the physical connection to a database and requires the data source client to be installed on the connecting system. For the purposes of this section, the connecting system is the system with IBM Cognos 8 Framework Manager installed, and the data source client is the SAP GUI. Hence the SAP GUI should be installed on the server where IBM Cognos 8 Framework Manager is installed before a data source connection from IBM Cognos to SAP NetWeaver Business Warehouse can be established. A data source connection specifies the parameters needed to connect to a database, such as the location of the database and the timeout duration. These parameters form a connection string for the data source.

You can create data sources in the portal or in IBM Cognos 8 Framework Manager. Although they are stored on the server and appear in both places, both the IBM Cognos 8 server and the IBM Cognos 8 Framework Manager systems will require a local data source client install.

If you are an administrator, you can set up all required data sources before models are created in IBM Cognos Framework Manager so that all connections are available in the IBM Cognos Framework Manager Metadata wizard.

Data sources are stored in the IBM Cognos 8 namespace and must have unique names. For example, you cannot use the same name for a data source and a group.

You can include authentication information for the database in the data source connection by creating a signon. Users need not enter database authentication information each time the connection is used because the authentication information is encrypted and stored on the server. The signon produced when you create a data source is available to the Everyone group. Later, you can modify who can use the signon or create more signons. For more information about data source security, see the Administration and Security Guide.

Before creating data sources, you must have write permissions to the folder where you want to save the data source and to the IBM Cognos 8 namespace. You must also have execute permissions for the Data Source Connections secured feature. To create a data source connection within IBM Cognos 8 Framework Manager, perform the following steps.

1. If you are not already using Run Metadata Import Wizard, click the namespace folder, or segment you want to import into, and from the **Actions** menu, click **Run Metadata Wizard.**
2. In the Select Metadata Source window, click Data Sources.
3. Click Next.
4. In the Select Data Source window, click New.

5. In the name and description page, type a unique name for the connection and, if desired, a description and screen tip, and then click **Next.**
6. In the New data source page, enter the Application server name (SAP NetWeaver Business Warehouse server), System number, Client number and also select the type of Authentication (Provide User ID and Password).

   Note the default option for **SAP logon type** is Application server, but the SAP logon type may be changed to Message server or Destination.

   IBM Cognos 8 provides compatibility with SAP message servers which utilize a load-balancing architecture in the SAP landscape. Consider using **Message server** for the SAP logon type if this load-balancing architecture is available within the SAP NetWeaver Business Warehouse landscape, i.e. there is more than one application server installed within the SAP NetWeaver Business Warehouse environment and a message server is configured within the SAP landscape. Accessing the SAP message server from IBM Cognos 8 will leverage the load balancing architecture managed by the SAP basis layer or SAP NetWeaver layer. When Message server is invoked within the SAP landscape and users logon to the message server, they will be routed to the active application server with the most available resources. This approach can ensure SAP server availability, optimize server resources, and improve SAP NetWeaver Business Warehouse access performance.

   Note that IBM Cognos 8 consumes dialog processes, and Message server should be used only if the group of application servers has dialog processes defined. For this option, enter the message server name (SAP NetWeaver Business Warehouse server), System ID, Logon group, Client number and also select the type of Authentication (Provide User ID and Password). These logon settings can be found in the SAP Logon Pad, corresponding to the connection type 'Group/ Server Selection'.

3.9.2 Steps to Import from a SAP NetWeaver Business Warehouse Data Source

1. Ensure there is a connection to the data source
2. Click the namespace, folder, or segment you want to import into and from the Actions menu, click Run Metadata Wizard.
3. Select a data source connection and click Next.
4. Select the objects you want to import.
5. If you are re-importing, the existing object gets updated.
6. If you are importing new objects and an object with the same name exists, the new object is imported and a number is appended to the original name. For example, you see QuerySubject and QuerySubject1 in your project.
7. After they are imported, query items cannot be deleted without deleting the entire query subject.
8. If you want to import a characteristic structure and a key figure structure, select the "SAP BW Dual Structures Support" check box.
9. The content of the Select Objects page is updated to reflect the dual structures in your data source.

   If you are re-importing the same SAP NetWeaver Business Warehouse query (for example, because the underlying data source has changed), you must use the same setting for this check box. IBM Cognos 8 Framework Manager does not allow you to select a different setting for the same query because different objects are then generated in the model and this leads to errors.
10. Select the languages you want to import.

    These languages must exist in the SAP NetWeaver Business Warehouse data source.

    You can add languages to your project later, but you cannot go back and import the language-specific metadata from the data source. After the import is complete, the language-specific metadata must be added manually.
11. Indicate whether you want IBM Cognos 8 Framework Manager to show the short name, long name or the technical name for the dimensions.
12. If you select short name and the field is empty, the long name is shown. If you select the long name and the field is empty, the short name is shown. If you select either short name or long name and both fields are empty, the technical name is shown.

13. To have objects in the model organized the same way that they are organized in Business Explorer Query Designer, select the "Enhance model for SAP BW organization of objects" option. You will then have a folder for each dimension. Note this selection is purely optional for visual purposes only, and is a matter of personal preference. You may choose this option to accommodate those users who are familiar with the SAP Business Explorer tools.
14. Click Next.

    A list of objects that could not be imported appears along with counts of objects that were imported.
15. Click **Finish**.

If you are re-importing the same SAP NetWeaver Business Warehouse query because the underlying data source has changed, there are two primary options to refresh the existing IBM Cognos 8 Framework Manager project.

The first option is to delete and re-import the query. This is particularly appropriate if the general guideline above has been followed, which recommends performing as few changes as possible within the IBM Cognos 8 Framework Manager project to avoid re-work in the event a query needs to be re-imported. To safely delete and re-import the query, and ensure all changes are captured, follow these steps in IBM Cognos 8 Framework Manager:

1. Perform an impact analysis within IBM Cognos 8 Framework Manager to understand if changes to reports are required as a result of SAP NetWeaver Business Warehouse changes. Select the query that will be re-imported, then go to **Tools** -> **Find Report Dependencies**.
2. Upon documenting the results of the impact analysis, delete the query from the IBM Cognos 8 Framework Manager project.
3. Delete the data source within IBM Cognos 8 Framework Manager.
4. Re-import the SAP NetWeaver Business Warehouse query into the project. The data source will be recreated within the project and any changes in the underlying SAP NetWeaver Business Warehouse data source will be captured.
5. Publish the revised package, and update the IBM Cognos 8 reports where necessary as identified by the impact analysis.

The second option is to use the synchronize method in IBM Cognos 8 Framework Manager. This method is more suited for those projects where changes have been made to the metadata layer such as changing variable types or creating a presentation layer for more business-friendly names. This approach can be used instead of the manual delete & query re-import procedure(first option), and can reduce the re-work that would be necessary to manually change the metadata layer back to its state before the re-import. To apply this method, go to **Project** and choose **Synchronize.** Before synchronizing, perform an impact analysis to **Determine Report Dependencies.** Document the analysis accordingly so changes to reports can be made post-synchronization if required.

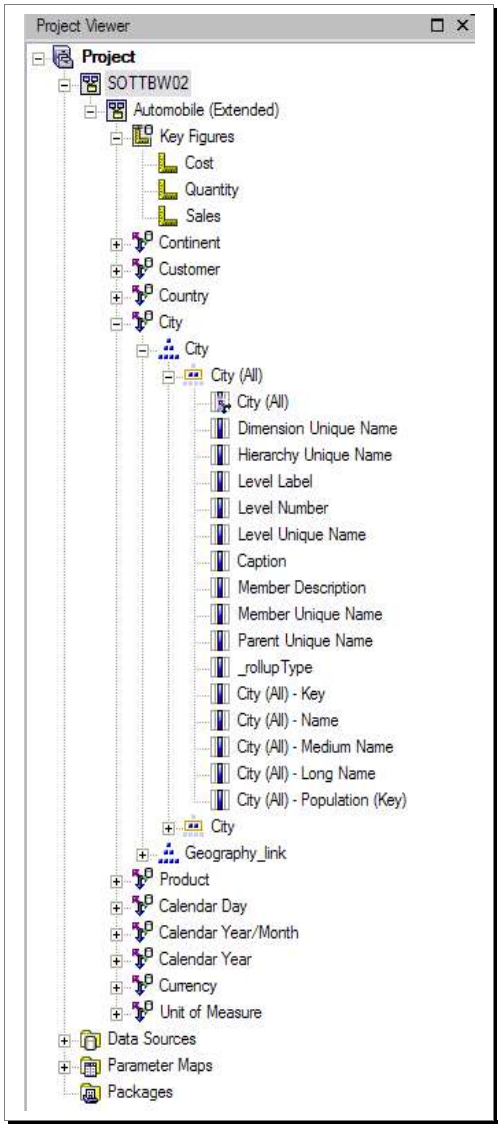
Note the choice of refresh method is a matter of personal preference as the administrator of the IBM Cognos 8 Framework Manager project will need to evaluate the specific environment and its complexities to determine risk and best course of action.

3.9.3 Examining the SAP NetWeaver Business Warehouse Metadata after an Import

To explore the SAP NetWeaver Business Warehouse metadata within IBM Cognos 8 Framework Manager:

In the Project Viewer pane, expand the SAP NetWeaver Business Warehouse namespace. The namespace now contains a list of children namespaces, which represent each of the SAP NetWeaver Business Warehouse Queries that were imported from the SAP NetWeaver Business Warehouse data source.

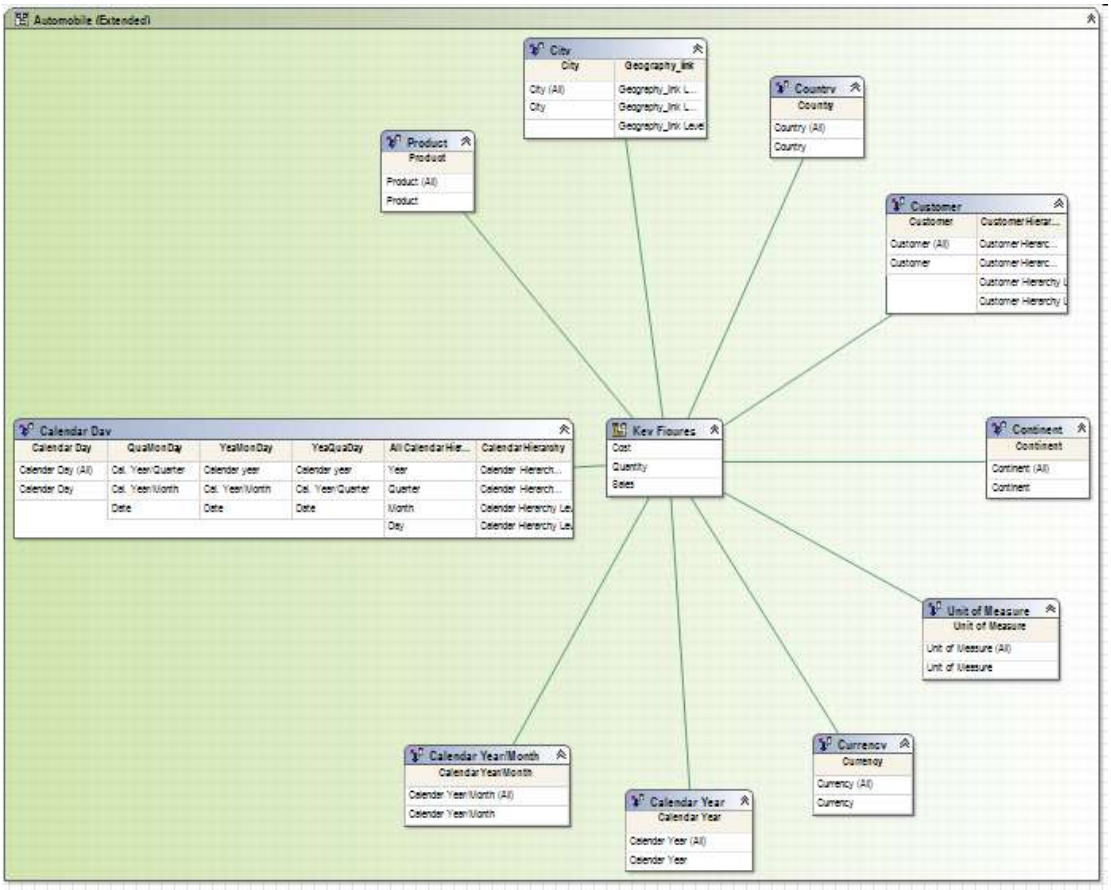
The graphic below depicts the appropriate Basic Query, Key Figures, Levels and Attributes of the Automobile Query example. These contain the appropriate query subjects that were generated, during the import, representing key figures and dimensions.



3.9.4 Configure and Explore the Object Diagram

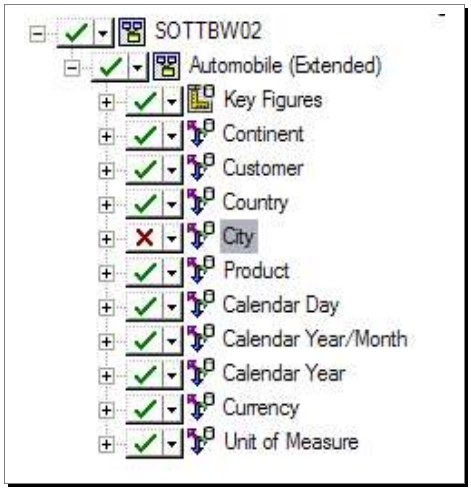
1. In the Project Info View, click the Diagram link.
2. The various namespaces that were created during the import appear.
3. Expand the Query namespace.
4. Notice the layout of the objects. We would like to represent a Star Schema where the fact table (key figures) is at the center of all its related dimensions.
5. On the toolbar, click the Auto Layout button.
6. In the Layout Style drop down box, select Star.
7. Slide the Sibling Distance slider all the way to the left to make the diagram more manageable to read, click Apply, and then and then click Close.
8. Go to Diagram – Zoom and select Fit All to automatically resize the view

9. The layout has changed to a Star layout and appears as shown below.



3.9.5 Create and Publish a Package for Power Users.

1. In the Project Viewer pane, right-click Packages, point to Create, and then click Package.
2. The Create Package Wizard appears.
3. In the Name box, type (Your Package Name), and then click Next.
4. If required, change the default selections to exclude any of the items in your package (the image below depicts City as an example), and then click Finish.



5. A dialog box appears indicating that the package was created successfully, and prompts to open the Publish Package wizard.
6. Click Yes.
7. If necessary, clear the Enable model versioning check box, then accept the remaining defaults, and then click Publish.
8. A message appears within the wizard indicating that the package was successfully published.
9. Click Finish to close the Publish Package wizard.
10. From the File menu, click Save to save the Framework Manager model.

3.10 Modelling SAP NetWeaver Business Warehouse Metadata and Naming Conventions

When modelling a SAP NetWeaver Business Warehouse data source within IBM Cognos 8 Framework Manager it may be beneficial to consider the following approaches.

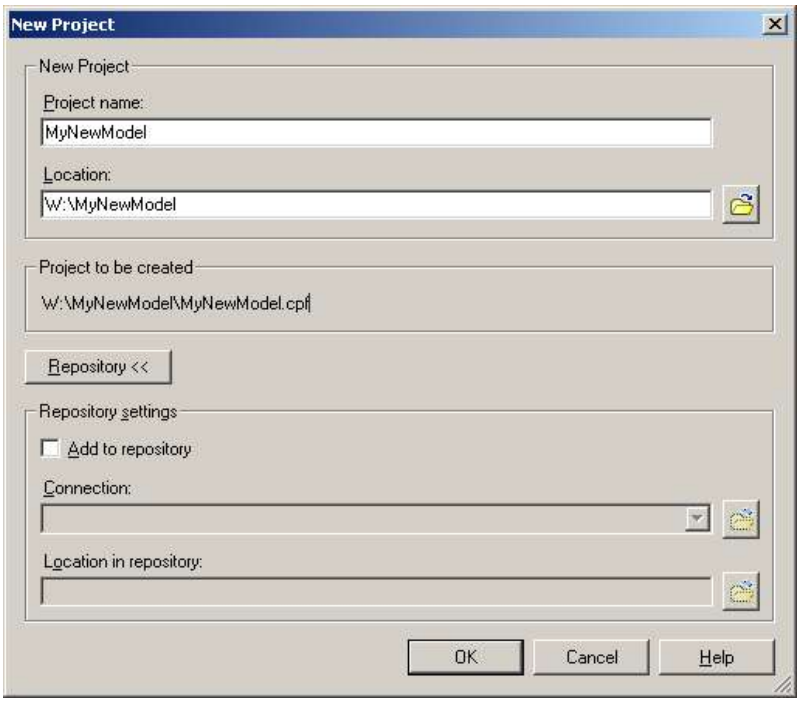
- **IBM Cognos Framework Manager Directory Structure**
  To help you manage, share, and secure different versions of your metadata, you can configure IBM Cognos 8 Framework Manager to use a source control system. You must already have one of the following source control system clients set up on the same computer as IBM Cognos 8 Framework Manager:
  - Component Software Concurrent Versions System
  - Visual Source Safe

  For more information about installing and setting up source control systems, see Repository Control in the IBM Cognos 8 Framework Manager User Guide.

  If you do not have the source control system you may be able to take advantage of existing infrastructure backup procedures. Generally LAN locations are backed up at regular intervals. Therefore any projects saved there would be backed up as well. In order to implement this:

1. Create a folder on a LAN location available to the model developers.
2. Secure the folder using the NTLM folder security
3. On the IBM Cognos Framework Manager system map a network drive to LAN share

4. When creating a new IBM Cognos 8 Framework Manager model specify the mapped drive location created in the previous step.



In the example above the project name is MyNewModel saved out to the network drive W:\

- **Project Name**
  All Project names should be representative of the high-level subject area that's being modelled.

- **Data Source Name**
  The system administrator will have created the SAP NetWeaver Business Warehouse data source for the developers prior to the start of the project. The naming convention for SAP NetWeaver Business Warehouse data will be kept generic in order to lower the risk of confusion when migrating from Test to Production.

  For example, if a SAP NetWeaver Business Warehouse data source was named after the source system SAPBWDEV, this name would be associated to all the IBM Cognos 8 objects right through the application stack. Once the development reports are moved to production, it would

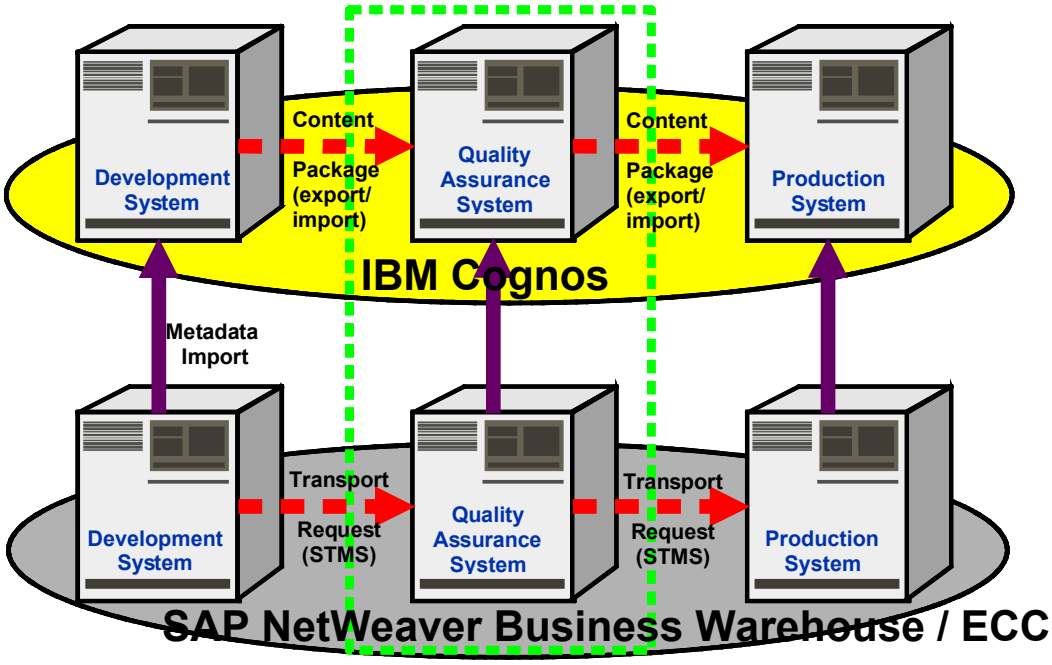
appear as if the production server is still running against the development data source. By keeping a generic name of "**SAPBW**", the confusion is kept to a minimum.

- **Parent Namespace**

The Parent Namespace should follow a convention that is representative of the entire subject matter. For example, if the data being modeled is Automobile data the Parent Namespace should be named Automobile or something easily identifiable as related to the subject matter of the Metadata model.

3.11 Managing the IBM Cognos 8 Model across the SAP NetWeaver Business Warehouse Landscape

The typical SAP NetWeaver Business Warehouse landscape consists of at least three SAP environments composed of development, quality assurance, and production servers. Therefore to replicate like-for-like test scenarios and avoid unforeseen problems in Production, it is recommended to have one IBM Cognos 8 environment for each of the SAP NetWeaver Business Warehouse environments to accommodate IBM Cognos development, quality assurance, and production activities.



If such an IBM Cognos landscape is established with SAP NetWeaver Business Warehouse as a data source, then consider these general guidelines when developing and testing IBM Cognos content across the SAP NetWeaver Business Warehouse landscape.

1. To safeguard against problems during development, testing, and migration of IBM Cognos content across the SAP landscape, ensure the SAP NetWeaver Business Warehouse data sources are synchronized routinely via SAP Transport Management System (STMS). This will reduce errors or complexities that could arise when working with IBM Cognos in development to quality assurance, and ultimately to production. SAP NetWeaver Business Warehouse objects should look the same structurally when comparing different environments in the same SAP landscape.

2. Generally, SAP NetWeaver Business Warehouse changes that would likely affect an existing IBM Cognos metadata model include modifications to infoObjects, infoProviders, infoQueries, and hierarchy structure/levels. Such changes could affect cardinality definitions, and depending on the type of change, could introduce new technical names. This is important because at import time, IBM Cognos reads the cardinality of relevant SAP NetWeaver Business Warehouse tables and relies on this cardinality to make appropriate calls (mdx vs. bapi calls) with its query engine. Hence SAP NetWeaver Business Warehouse changes of such magnitude would require a re-import of the IBM Cognos metadata layer.

3. When changes are needed in the SAP NetWeaver Business Warehouse Development environment, identify and test relevant IBM Cognos dependencies before moving changes to the quality assurance and/or production environments.

4. In the event the SAP development updates require modifications to IBM Cognos 8 content and changes have been made to IBM Cognos in Development, first move the SAP NetWeaver Business Warehouse changes to the SAP target system with SAP transport requests. And then move the IBM Cognos content to the relevant IBM Cognos target environment via content packages for further regression testing.

5. Note that SAP data sources within IBM Cognos 8 could be over-written when carrying out a content package deployment to an IBM Cognos target environment. If this result is not desired during the import/export process, it is important to ensure data sources and connections are not captured via the New Export wizard before moving to the IBM Cognos 8 target environment to avoid potential problems.

6. There are options to help save on server costs as it is not absolutely necessary to run different servers to host different instances of IBM Cognos. VMware images can be used to host an IBM Cognos environment, or multiple IBM Cognos 8 environments could run from a single server. For example, IBM Cognos Development and Quality instances can be hosted from one server, with Production on a dedicated server.

4 IBM Cognos 8 Report Studio

The following section outlines how to leverage the SAP NetWeaver Business Warehouse objects for reporting in IBM Cognos 8 Report Studio, and illustrates proven methods within IBM Cognos 8 Report Studio that will help to ensure a successful implementation of IBM Cognos 8 with the SAP NetWeaver Business Warehouse.

The following sections will provide general rules to remember when building all IBM Cognos 8 with the SAP NetWeaver Business Warehouse reports, and then move into details for functionality and performance for prompt and report building.

4.1 General Overview

Before moving into specific details for building IBM Cognos 8 Report Studio Reports, the following are rules of thumb to apply to all IBM Cognos 8 for use with the SAP NetWeaver Business Warehouse reports.

1. SAP NetWeaver Business Warehouse is an OLAP source which is fundamentally different than a relational source and even other OLAP data sources, ie, IBM Cognos 8 PowerPlay and MSSQL Analysis Services. This means OLAP data sources have multiple axis (ie many dimensions) whereas relational data sources are two dimensional. SQL language is used to select data from a relational source whereas MDX is used to read data from an OLAP source. Hence when building crosstab reports on an OLAP source, MDX language is passed to the source which delivers all possible combinations of data intersections.

2. Leverage the BEx Queries. In the relational world, these equate to a database view where additional business value is built in, such as calculations, filtering, etc.

3. Push filtering to the SAP NetWeaver Business Warehouse server as much as possible to deliver a focused result back to the IBM Cognos 8 server. This includes using BEx variables and filtering in the BEx Query.

4. It is recommended to use the level object  to populate the field in a report, except in those cases where the key is a better match for formatting (no leading zeroes, slash characters, etc).

5. For comparison purposes, it is important to note that SAP BEx tools behave differently than IBM Cognos 8. SAP uses RFC calls (which are more SQL like) not MDX calls and therefore are not subject necessarily to the same OLAP constraints that IBM Cognos 8 faces using MDX.

4.2 Overview of Configuration settings that apply to this studio.

Improving performance for reporting from SAP NetWeaver Business Warehouse can be achieved by modifying configuration settings as outlined in other sections of this document. There are several configuration changes which can positively impact the performance of IBM Cognos 8 data reports, however the parameters noted below are key ones specific to SAP NetWeaver Business Warehouse and Report Studio.

Configuration settings for overall report performance tuning:

- UseMDXToRetrieveMembersLimit
- UseMDXToRetrieveMembersFor

Configuration settings for prompt performance tuning:

- UseFastGetMembers
- UseFastGetMembersFor
- UseSAPOrdinalsForMembers

The parameters noted in this section are defined more explicitly in the configuration settings that were outlined in the previous section.

4.3 Prompt Overview

4.3.1 General Guidelines

When developing reports against SAP NetWeaver Business Warehouse, there are some general guidelines that you should remember when considering the use of prompts in your IBM Cognos 8 reports.

- BEx variables are well supported and allow the SAP NetWeaver Business Warehouse data source to pre-filter the result set. Use of these variables is recommended as they can generate prompts which will either require optional or mandatory input from the IBM Cognos 8 user.
- IBM Cognos 8 will automatically attempt to generate an appropriate prompt based on the metadata captured from SAP NetWeaver Business Warehouse. However if a different prompt style is required, then it is possible to customize the prompt page.

- For positional and layout changes, you can use the "generated prompt" prompt type, or you may use a different prompt type and have that populate the BEx variable. In this way you can utilize BEx variables without sacrificing the flexibility of a custom IBM Cognos 8 prompt page.
- Report authors can build and use a IBM Cognos 8 prompt to get answers in the event the BEx variable does not exist, instead of waiting until a new variable is available in SAP NetWeaver Business Warehouse/BEx.
- IBM Cognos 8 prompts can also be used for hierarchy selection and to emulate BEx selection option variables.

The sections below will illustrate prompt techniques for the following scenarios which are pertinent to SAP NetWeaver Business Warehouse:

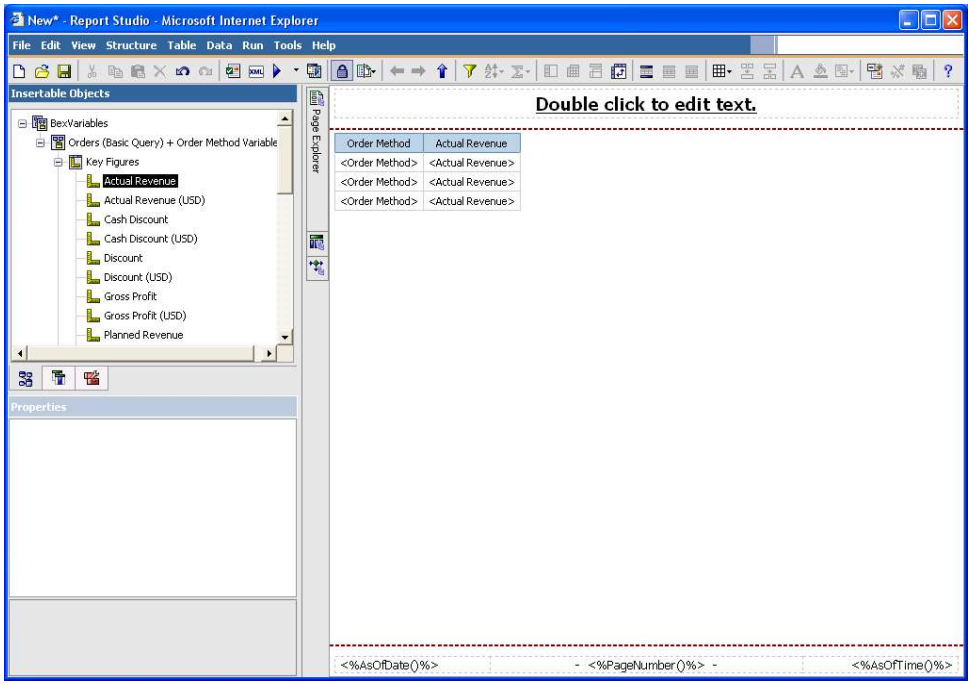
- Using BEx Variables without associating them with a Cognos 8 prompt
- Creating a Cognos 8 prompt page to format BEx variables
- IBM Cognos 8 search and select prompt
- Preselected values to Populate a Prompt Query
- Detect BEx variable Uniqueness

4.3.2 Using BEx Variables without associating them with an IBM Cognos 8 Prompt

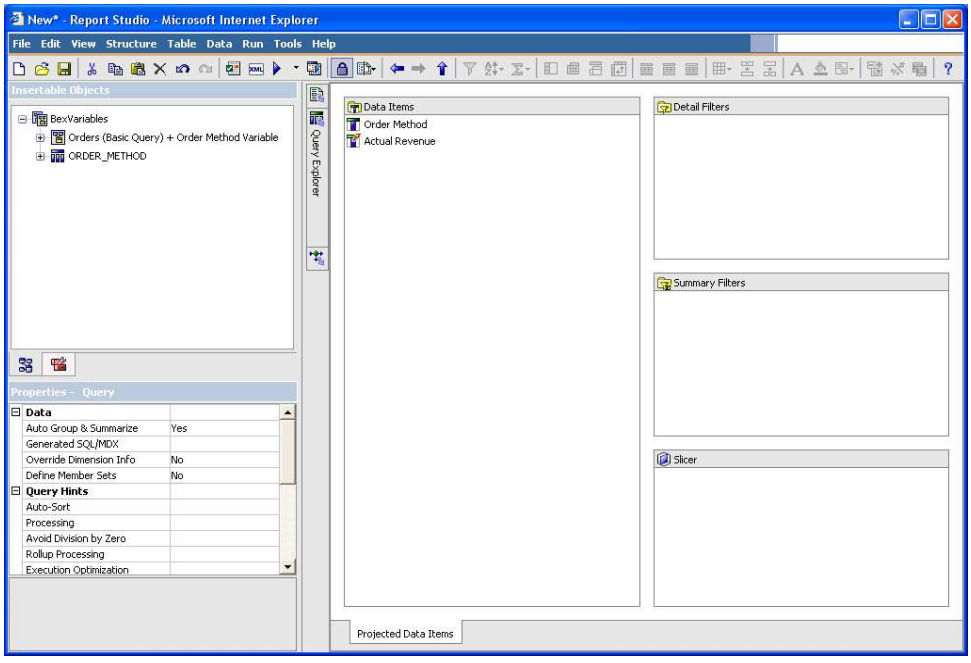
When a mandatory BEx variable is defined in the SAP NetWeaver Business Warehouse query, you do not always have to include the variable within an IBM Cognos 8 prompt. This is because IBM Cognos 8 will automatically attempt to generate an appropriate prompt based on the metadata captured from SAP NetWeaver Business Warehouse.

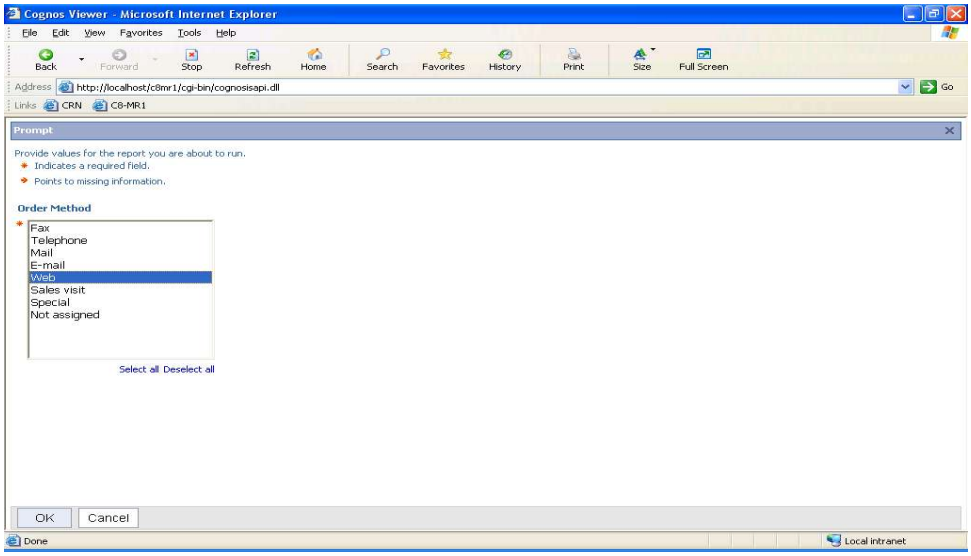
The steps below illustrate how an IBM Cognos 8 report will behave if the BEx mandatory variable is not explicitly defined within an IBM Cognos 8 prompt.

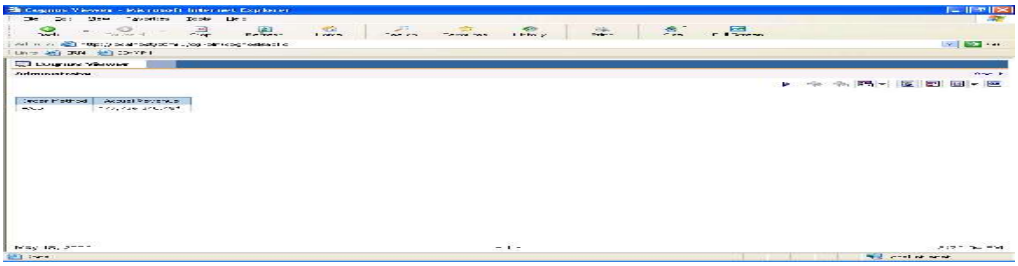
1. Create the report normally as you would any Report Studio report.



2. Notice that the report query does not contain a filter. However, when running the query, the user is still prompted for a value and the report result contains only the information which satisfies the BEx variable condition. This is because the SAP NetWeaver Business Warehouse mandatory variable was included within the SAP NetWeaver Business Warehouse query, and in turn is defined in the IBM Cognos 8 metadata model that was used in this IBM Cognos 8 package.




Cognos Viewer - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Print Size Full Screen
Address http://localhost/c8mr1/cgi-bin/cognosisapi.dll
Go
Links CRN C8-MR1
Prompt
Provide values for the report you are about to run.
Indicates a required field.
Points to missing information.
Order Method
Fax
Telephone
Mail
E-mail
Web
Sales visit
Special
Not assigned
Select all Deselect all
OK
Cancel
Done
Local intranet

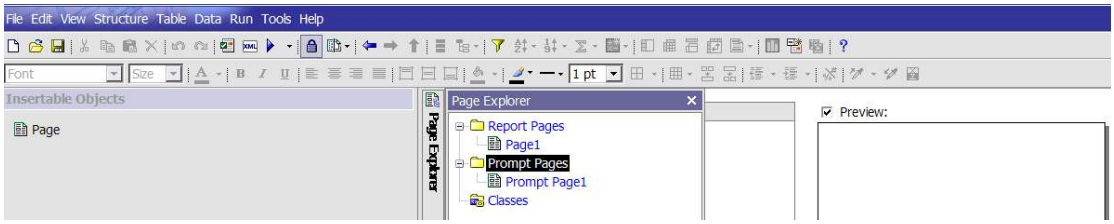


4.3.3 Creating the Prompt Page to format BEx variables

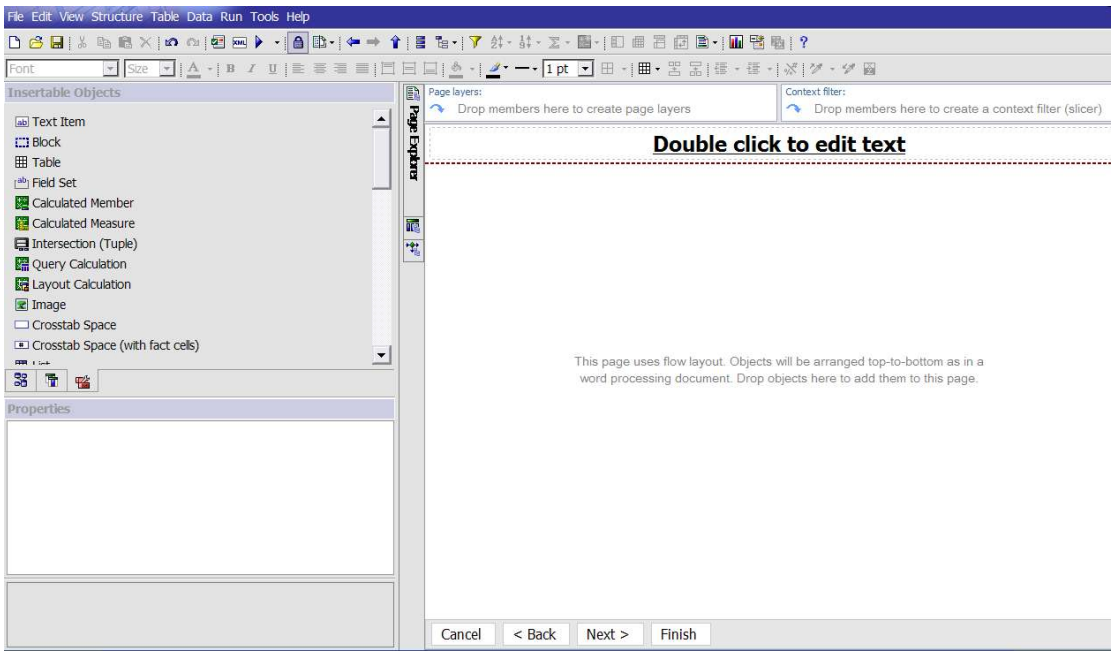
Although IBM Cognos 8 has the ability to automatically generate appropriate prompts based on the SAP BEx variable, a report builder does have the ability to customize the prompt for additional formatting.

The following steps enable additional formatting of BEx variables in IBM Cognos 8 reports.

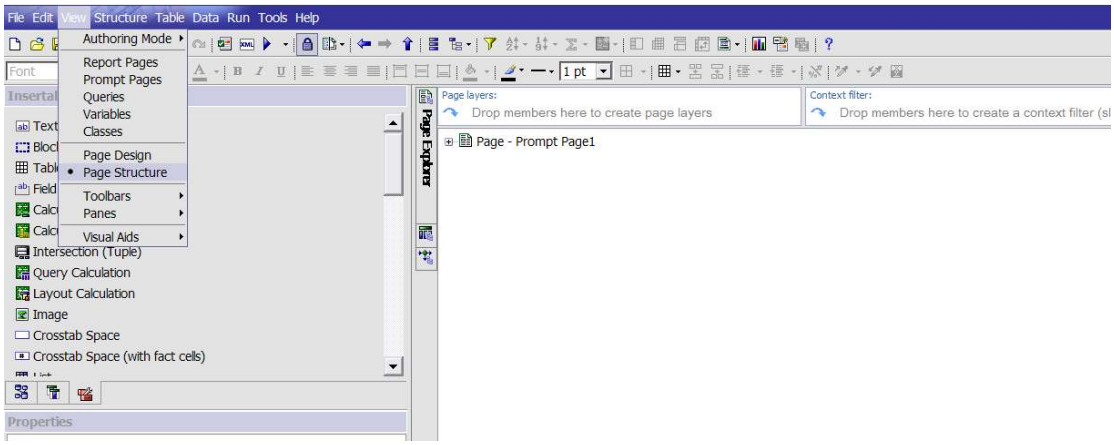
1. Using the Page explorer, create a new prompt page.



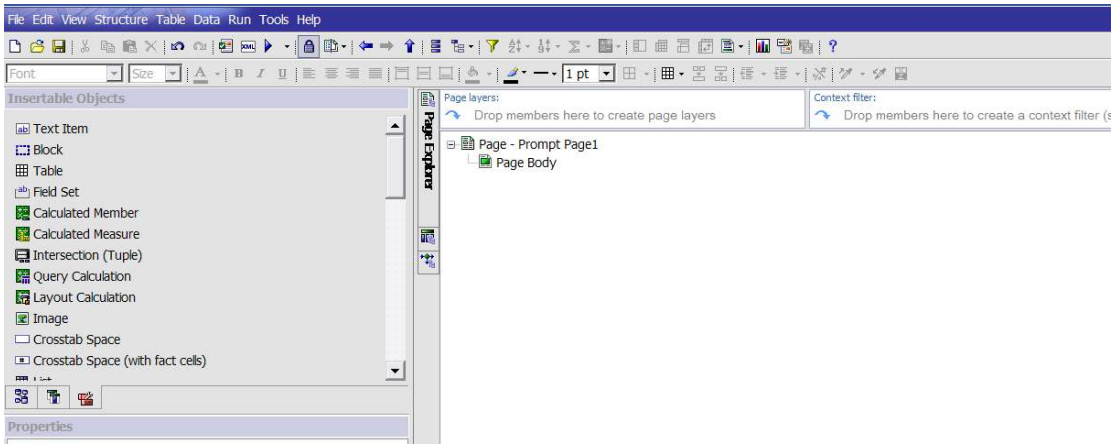
2. Within the Page Explorer, double click on Prompt Page1. The following view should be displayed.



3. Using the View menu command, switch from Page Design to Page Structure.



4. Delete all the objects, except for the Page Body. Once the objects have been removed, the screen should display as follows.

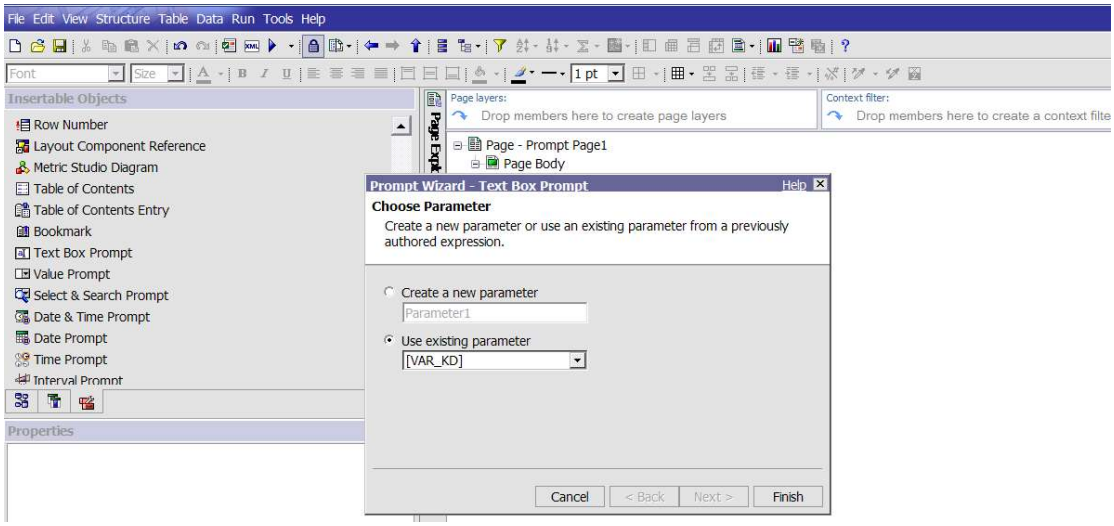


5. From the Insertable Objects pane, locate the Block object. Then drag this object under the Page Body.

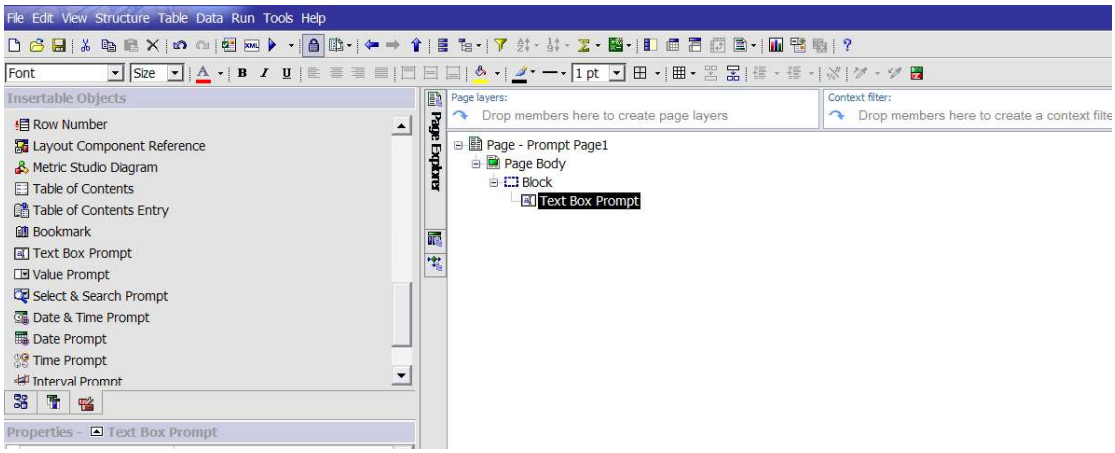
6. From the Insertable Objects pane, locate the Text Box Prompt and drag it on top of the Block object.

7. When presented with the Prompt Wizard dialog box. Select the "Use existing parameter" radio button.

8. From the list of available parameters, select the SAP BEx variable desired. For this example, the parameter will be [VAR_KD].



9. Once completed, select Finish. The Page Structure view should look like the following.



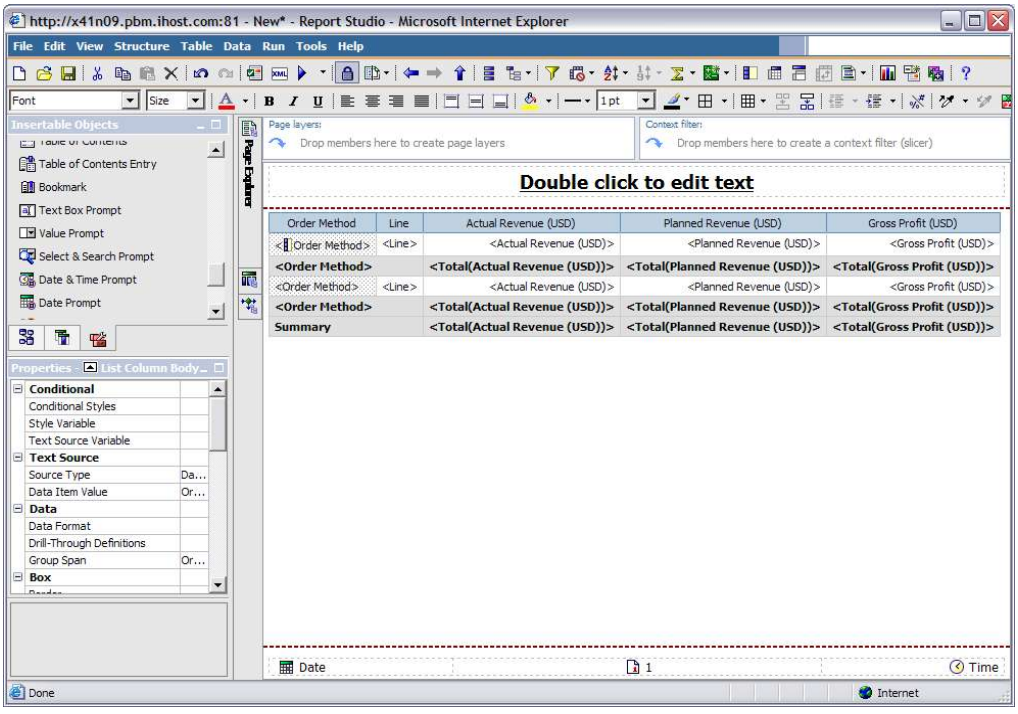
10. If the report is executed now, the prompt page will appear with the appropriate SAP NetWeaver Business Warehouse variable prompt in the prompt page. Text boxes, etc, may be added to the prompt page for more formatting.

4.3.4 IBM Cognos 8 Search and Select Prompt

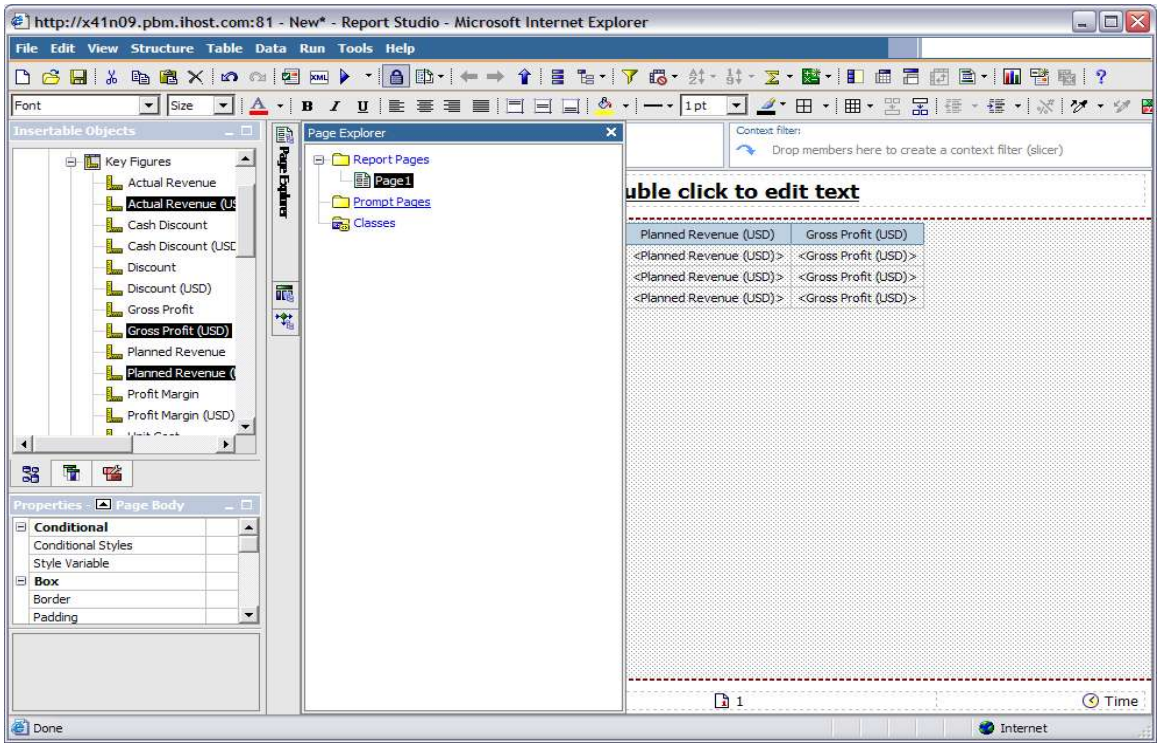
The Selection Option BEx variable allows interval, single select, multi select, and search/select prompting scenarios. The Selection Option BEx variable is imported as a type of complex in IBM Cognos 8 Framework Manager. When displayed in an IBM Cognos 8 report, it appears as a single select picklist.

To emulate the Selection Option BEx variable in IBM Cognos 8, multiple optional BEx variables can be used for the characteristic for the required prompt types, ie, interval, single select, and multi select options on an IBM Cognos 8 prompt page.

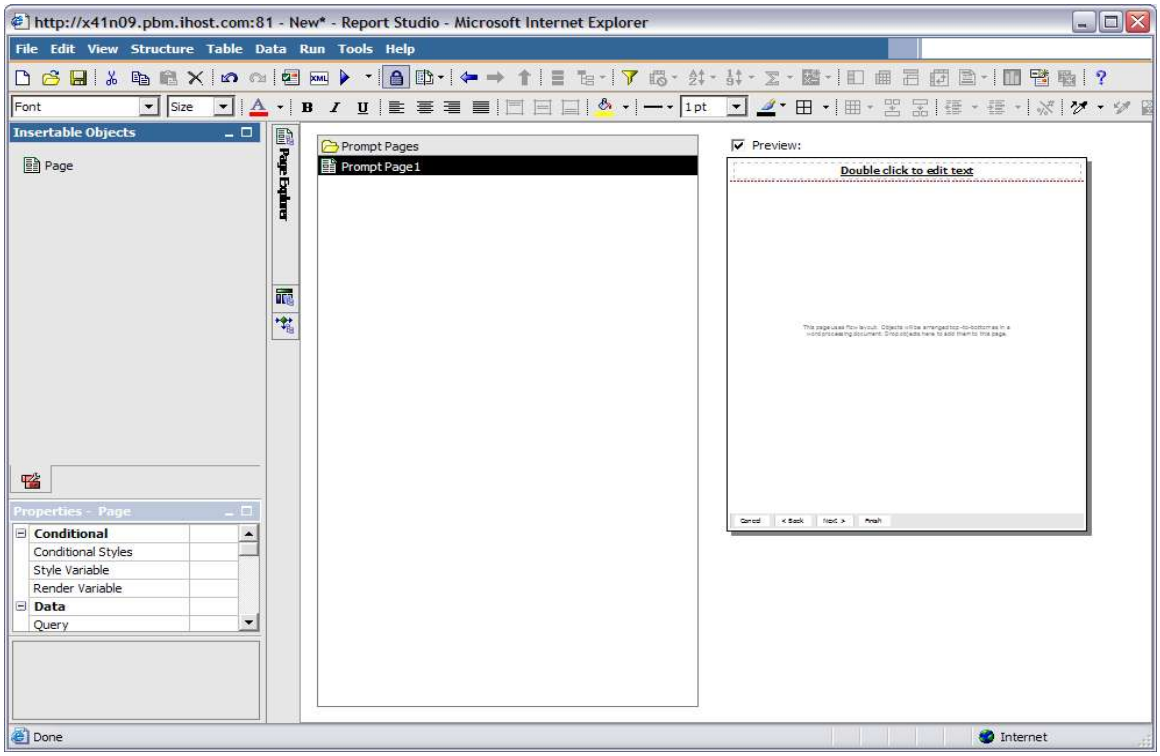
The following example of a Search & Select Prompt leverages a multi-value BEx variable. The report has been built, and now we need to build the prompt for the report below.



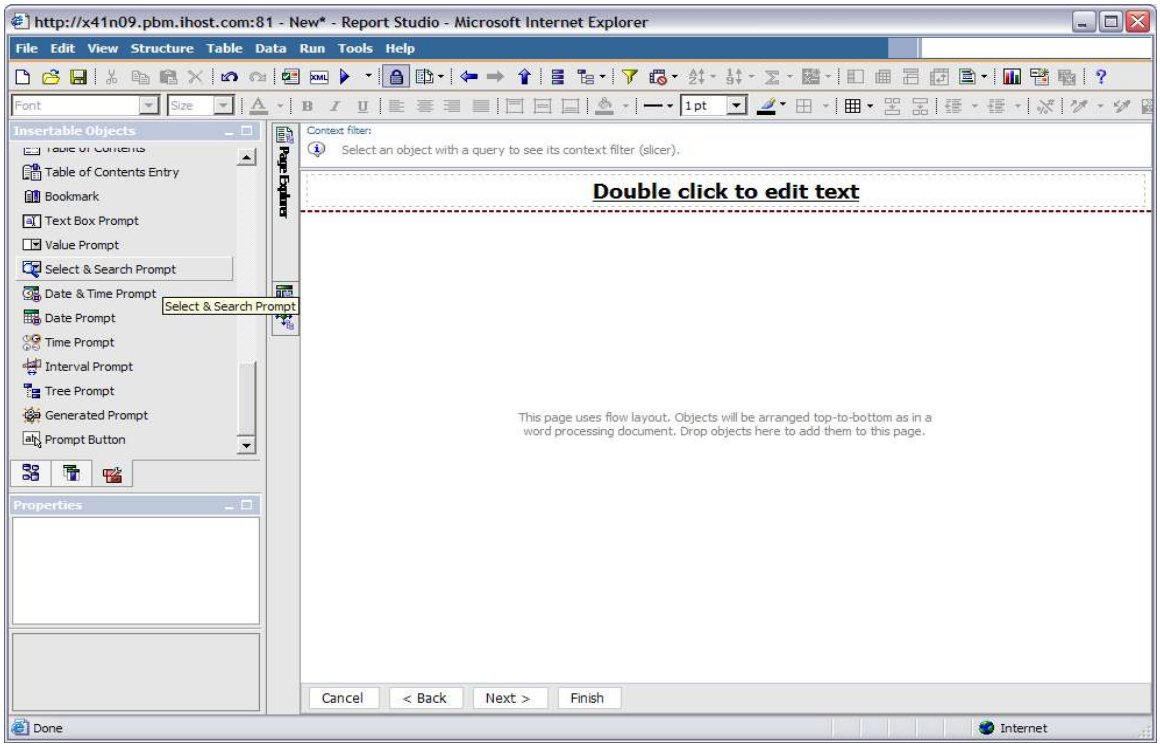
1. From Page Explorer select Prompt Pages.



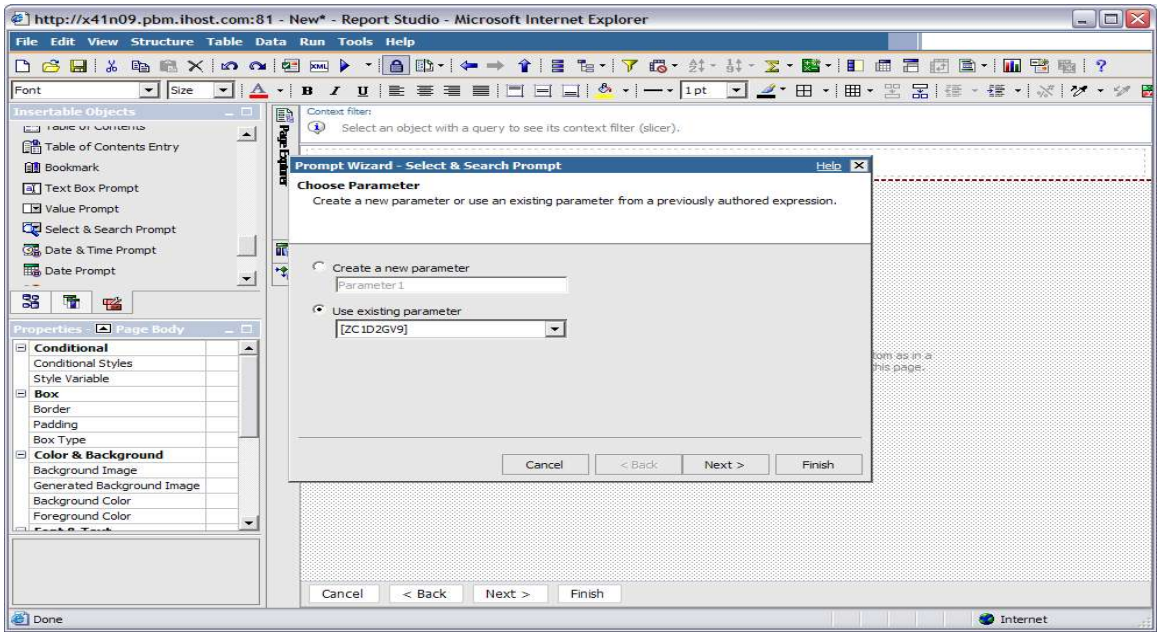
2. Drag a Page to the Prompt Pages window. Double click to open the prompt page.



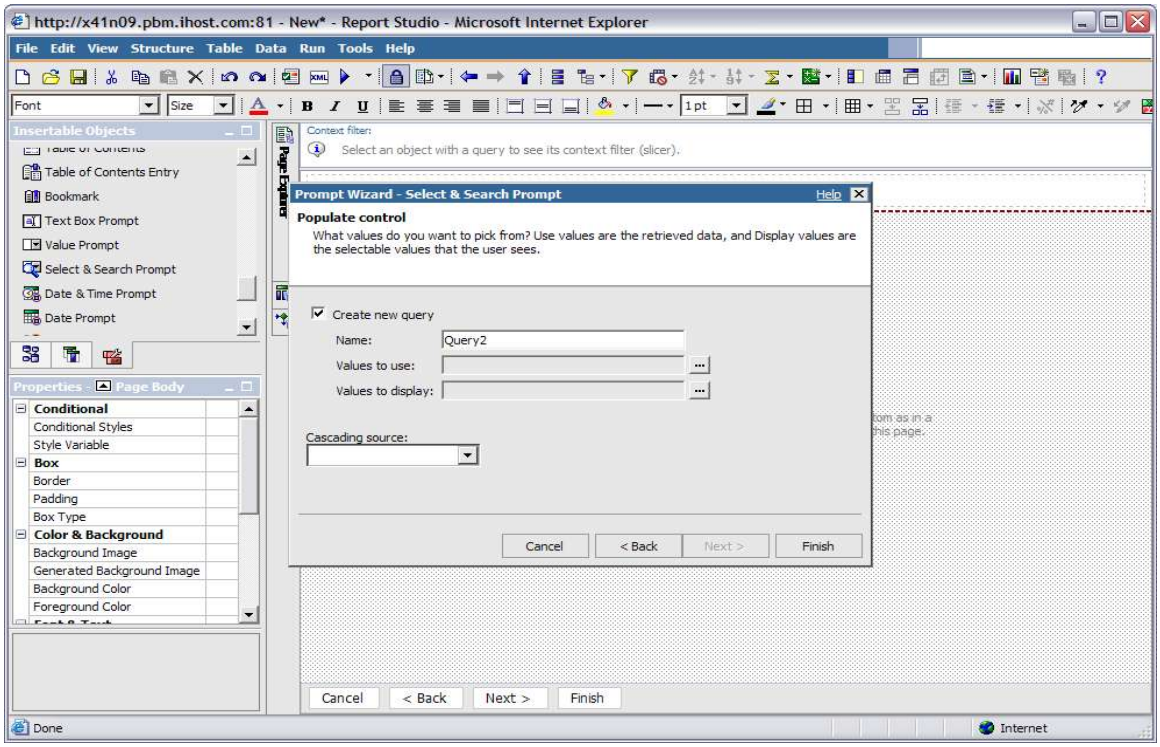
3. From the Tool Box find and drag a Search & Select Prompt onto the Prompt Page.



4. The Prompt Wizard first asks for the parameter/BEx variable to use. Click Next.



5. Next, create a query to populate values to search against then to be passed to the multi-value BEx variable.

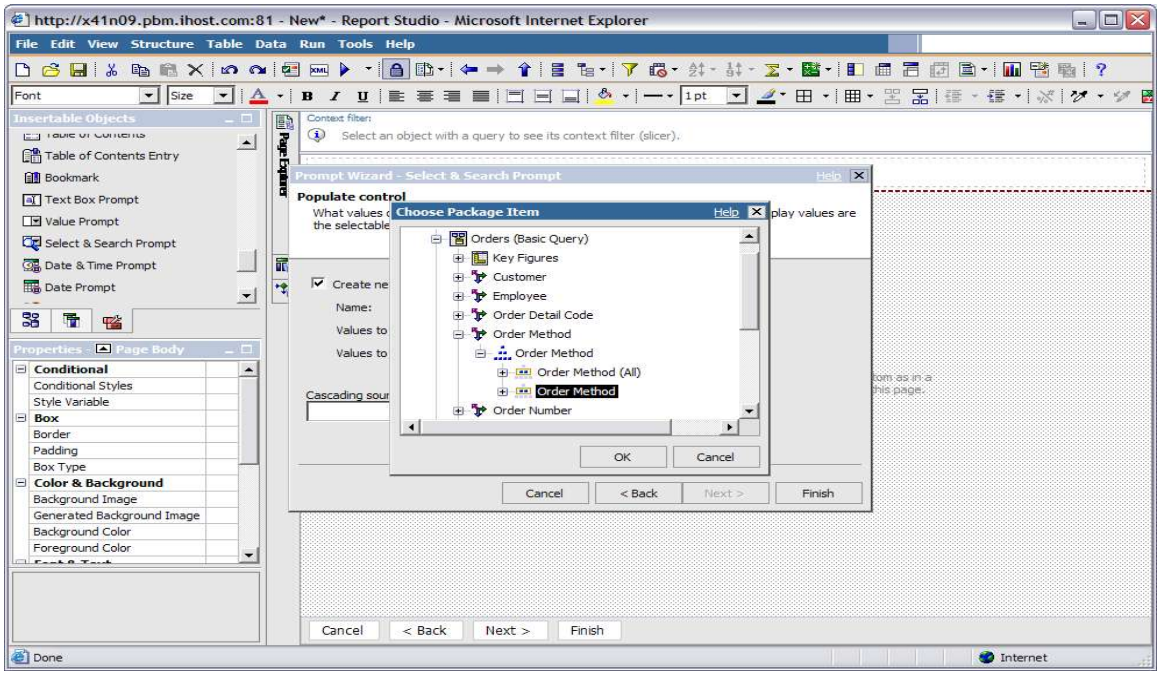


6. Use a BEx query that contains no BEx variables for the new query. In this case, the BEx variable is for Order Method.

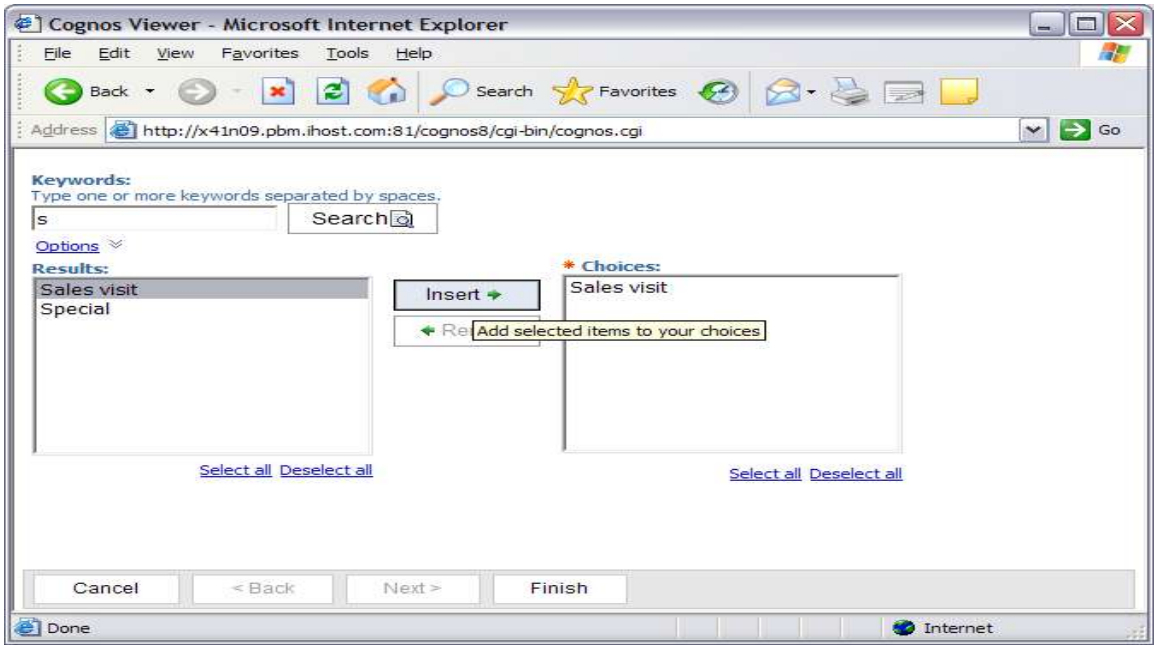
7. For the Value to Use property, expand the BEx query with no BEx variables and select Order Method. Then click OK.

8. For Values to Display property, click Order Method again. Note: Depending on how the BEx variable was created, if it only uses key values and you need to search on descriptions then the use value would be the business key and the description would be the level.

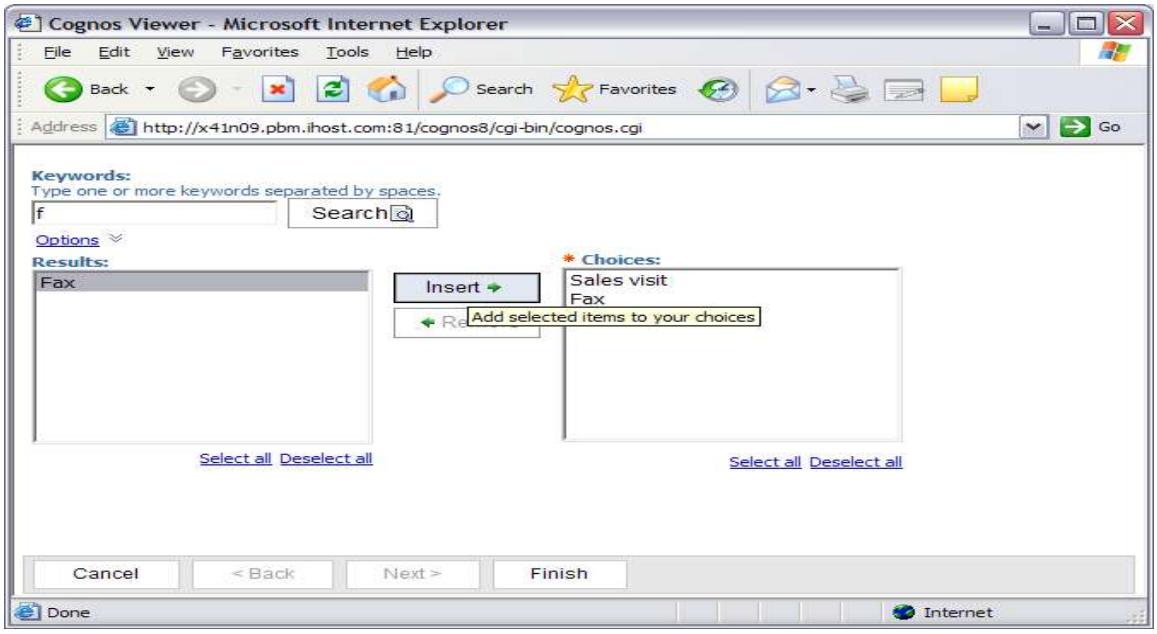
9. Click OK, then click Finish.



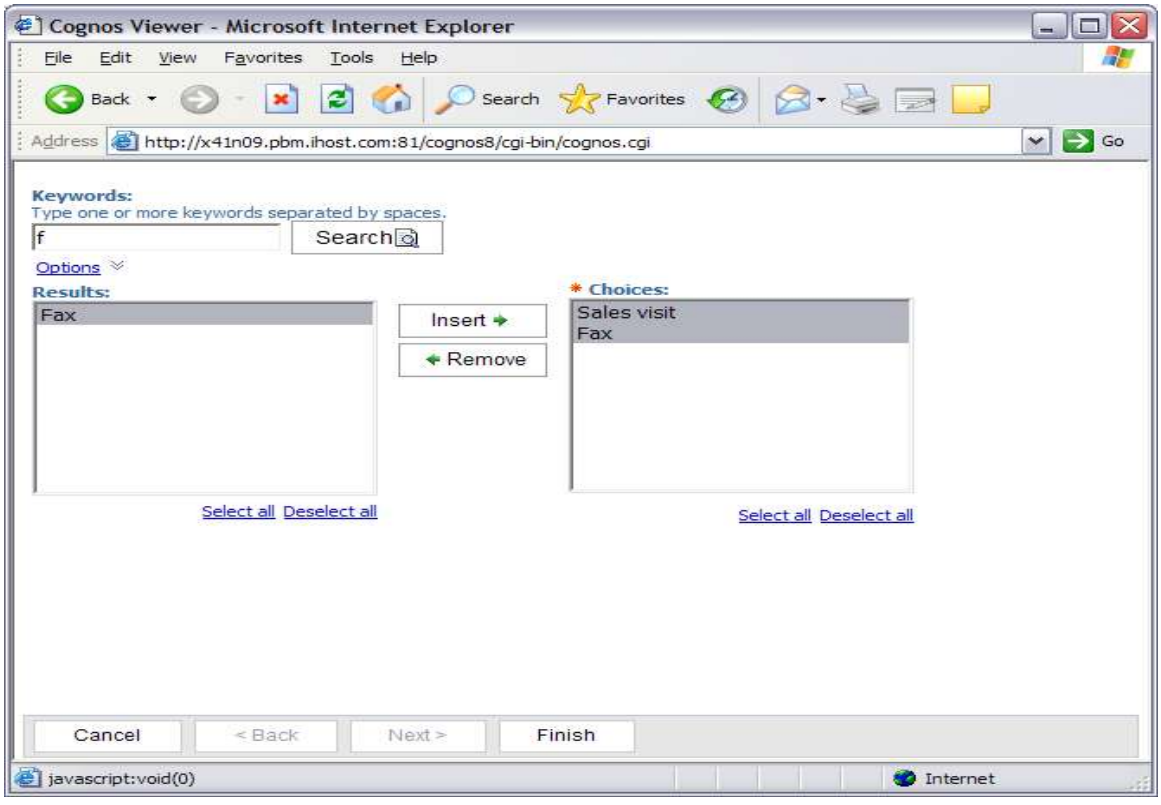
10. Execute report and the prompt page displays with the Search & Select Prompt using a multi-value BEx variable. First, searching on strings containing "s", Sales visit is selected and inserted into the Choices box.



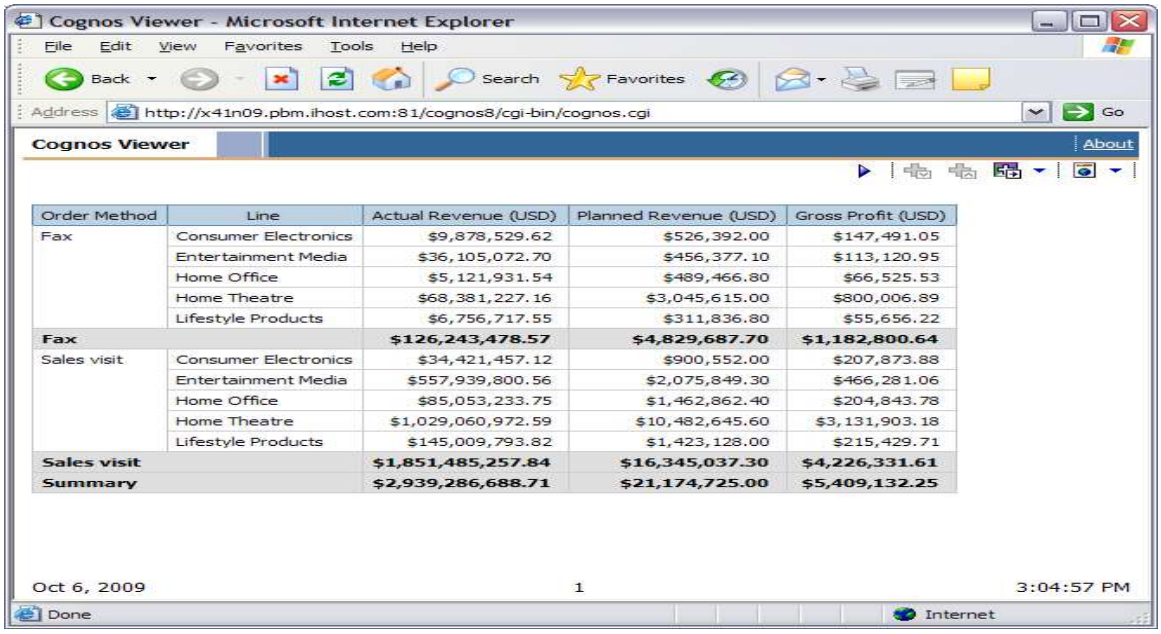
11. Next searching on "f", Fax is returned, selected and added to Choice box.



12. Select all items in the Choices box to filter on then click on Finish.



13. The following is report filtered on the selected values:



Order Method	Line	Actual Revenue (USD)	Planned Revenue (USD)	Gross Profit (USD)
Fax	Consumer Electronics	$9,878,529.62	$526,392.00	$147,491.05
	Entertainment Media	$36,105,072.70	$456,377.10	$113,120.95
	Home Office	$5,121,931.54	$489,466.80	$66,525.53
	Home Theatre	$68,381,227.16	$3,045,615.00	$800,006.89
	Lifestyle Products	$6,756,717.55	$311,836.80	$55,656.22
Fax		**$126,243,478.57**	**$4,829,687.70**	**$1,182,800.64**
Sales visit	Consumer Electronics	$34,421,457.12	$900,552.00	$207,873.88
	Entertainment Media	$557,939,800.56	$2,075,849.30	$466,281.06
	Home Office	$85,053,233.75	$1,462,862.40	$204,843.78
	Home Theatre	$1,029,060,972.59	$10,482,645.60	$3,131,903.18
	Lifestyle Products	$145,009,793.82	$1,423,128.00	$215,429.71
Sales visit		**$1,851,485,257.84**	**$16,345,037.30**	**$4,226,331.61**
Summary		**$2,939,286,688.71**	**$21,174,725.00**	**$5,409,132.25**

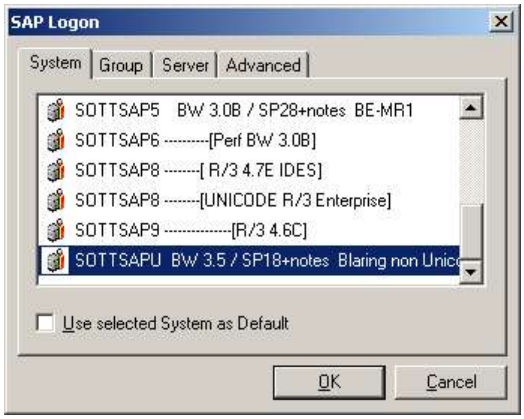
4.3.5 Pre-selected values to Populate a Prompt Query

An InfoQuery can be created and used to populate a prompt with restricted pre-selected values. These selected values will not need to be suppressed. This method could be extended to use in a cascading prompt scenario.

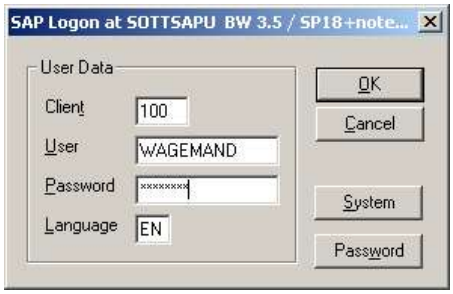
This restructure method can be applied to most IBM Cognos 8 Report Studio problematic prompting scenarios.

Steps to implement:

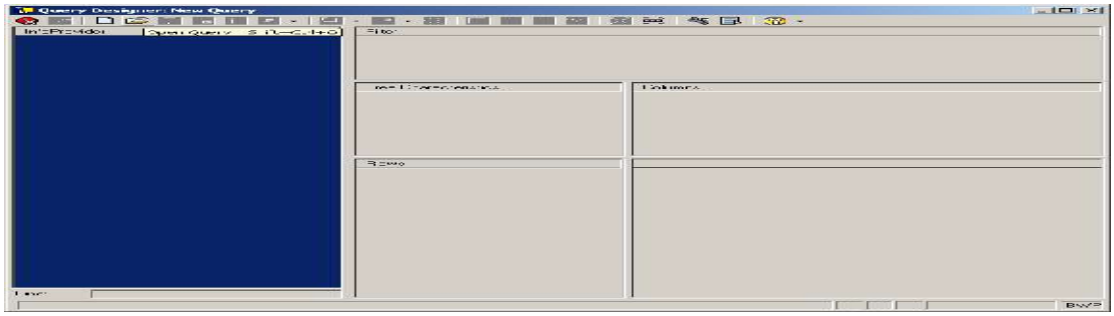
1. In IBM Cognos 8 Report Studio, identify the queries that are used to populate prompts.
2. For each of these queries, make a list of the query item being used.
3. Each of the items from the list above will be replaced by a new query item which is based on an InfoQuery whose values have been restricted.
4. To begin creating an InfoQuery with restricted values, launch the Query Designer from a computer that has BEx installed.
5. When the "SAP Logon" dialog box appears, select the appropriate "SAP server" and click the OK.



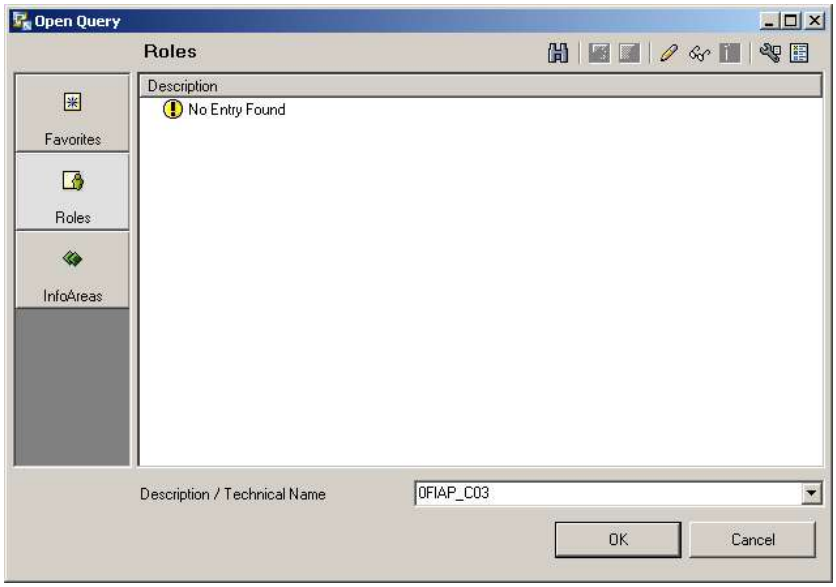
6. Enter the correct Client, User, Password and Language setting. Once completed select OK.



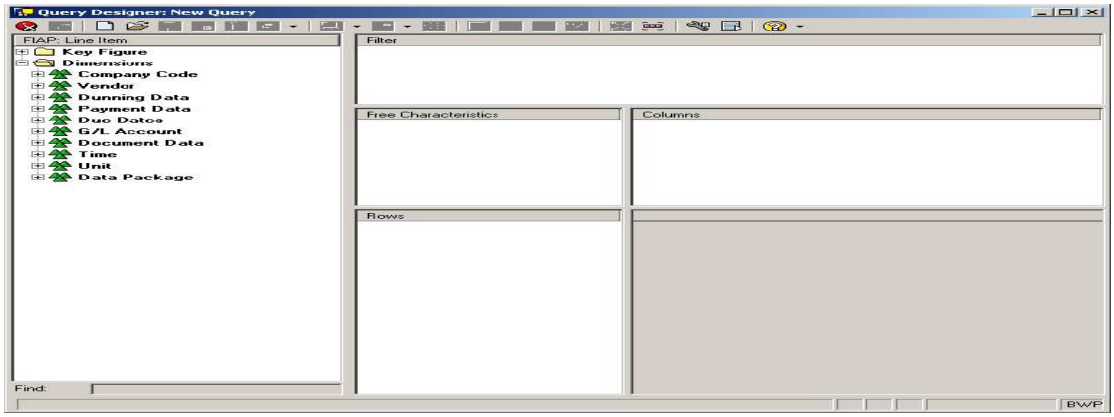
7. When the Query Designer application loads, click the folder icon located on the top toolbar.



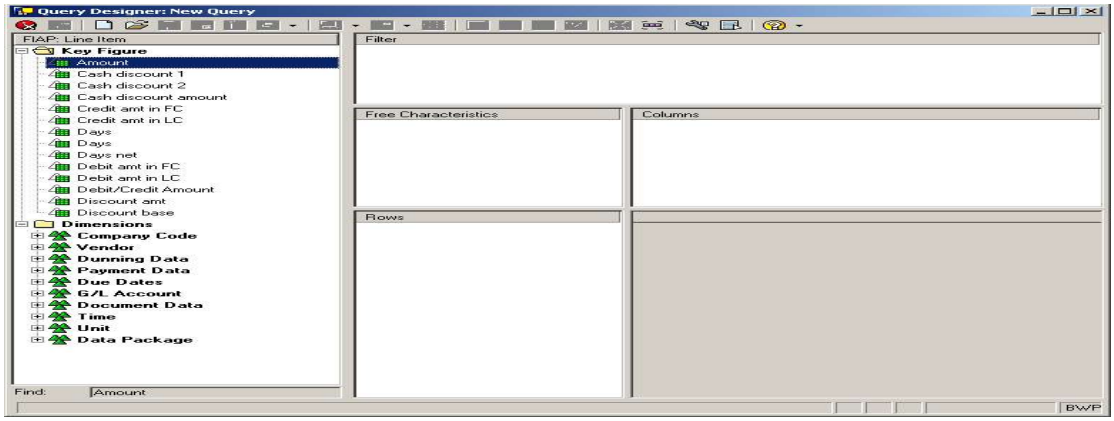
8. Enter the Description/ Technical Name of the SAP NetWeaver Business Warehouse object that the original query items were based on. This can be obtained from the Namespace screen tip of the original model namespace within IBM Cognos 8 Framework Manager.



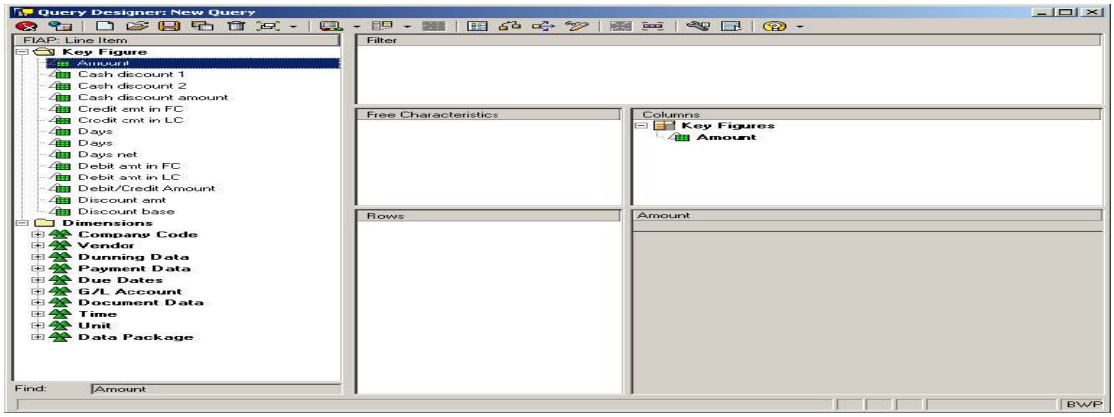
9. Press OK to display the following screen.



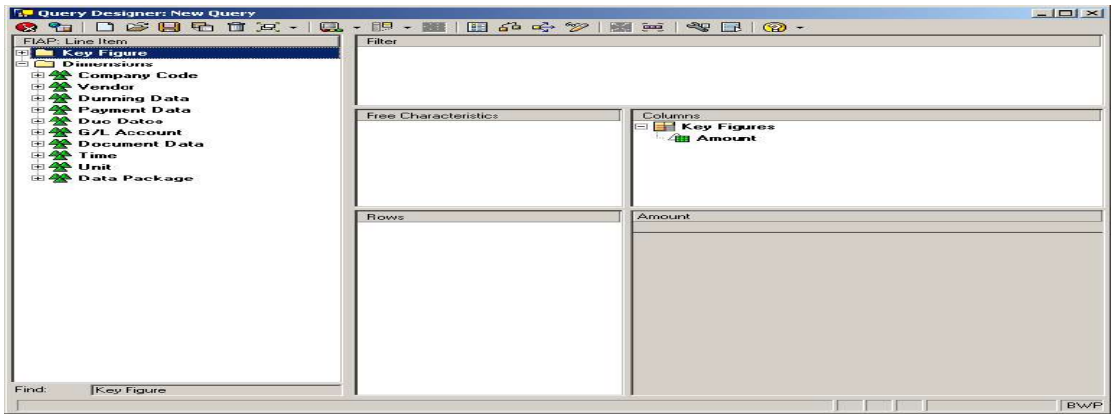
10. Expand the Key Figure folder, and select a Key Figure by clicking on it.



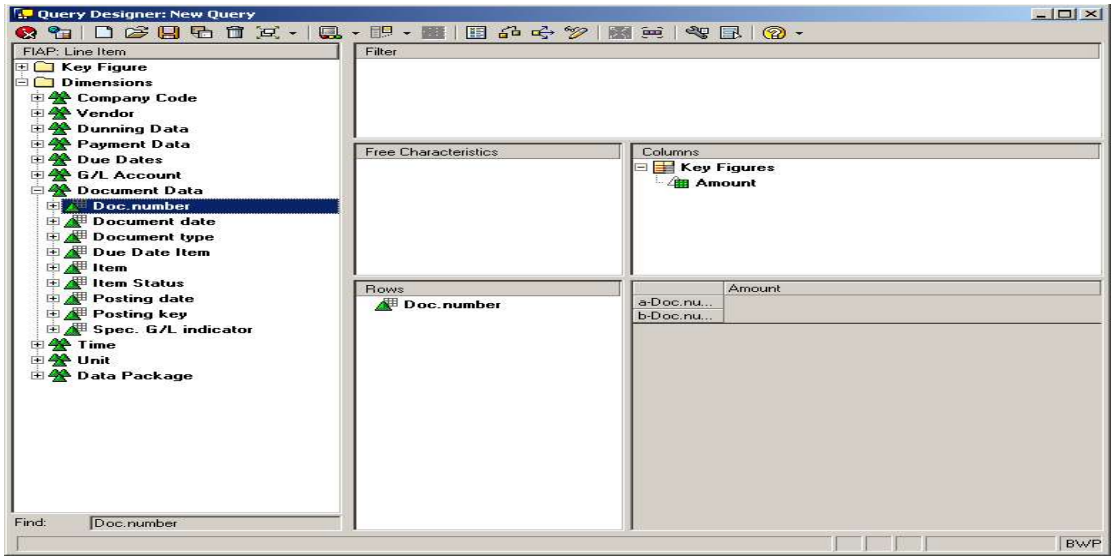
11. Drag the selected Key Figure into the Columns window.



12. Close the Key Figure folder and expand the Dimension folder.

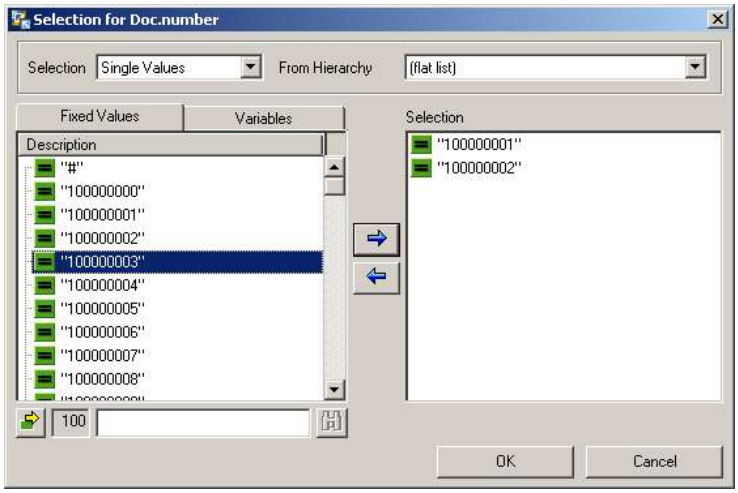


13. Locate the characteristics objects identified by the list of query items in step 2 and drag these items into the Rows window.

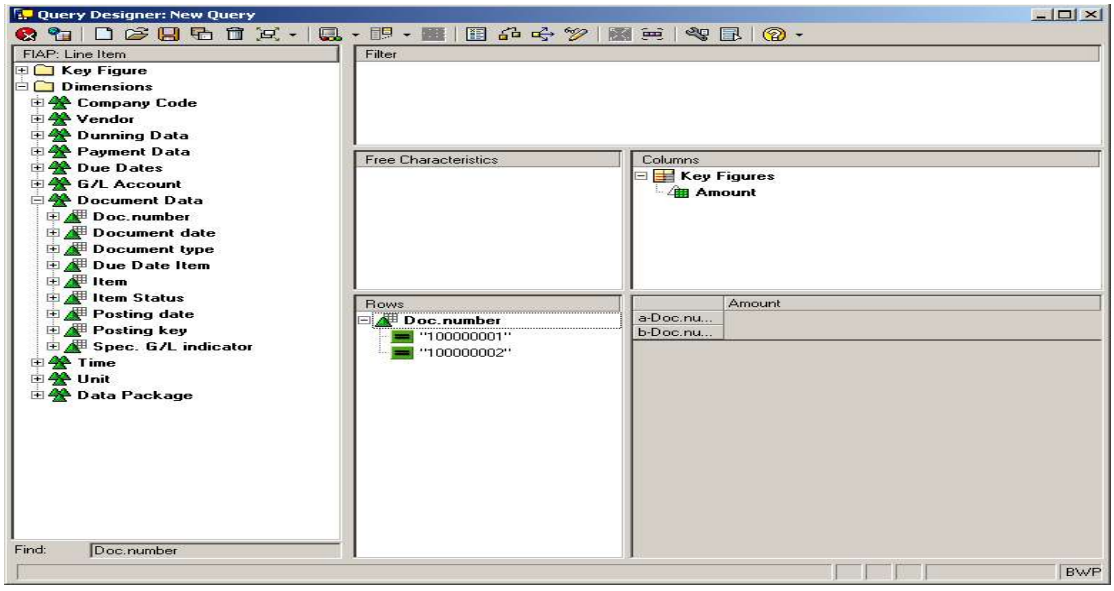


14. Right click the first item in the Rows window and select Restrict.

15. Select the values required to satisfy the IBM Cognos 8 Report Studio query prompt. The selected values can be moved between the left and right window by pressing the arrow buttons.

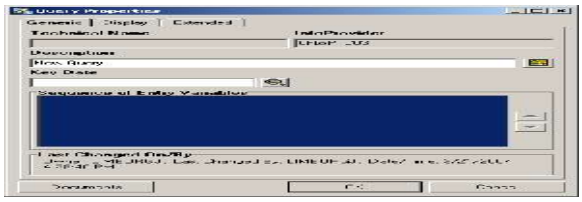


16. Once the desired selections have been made, click the OK button.

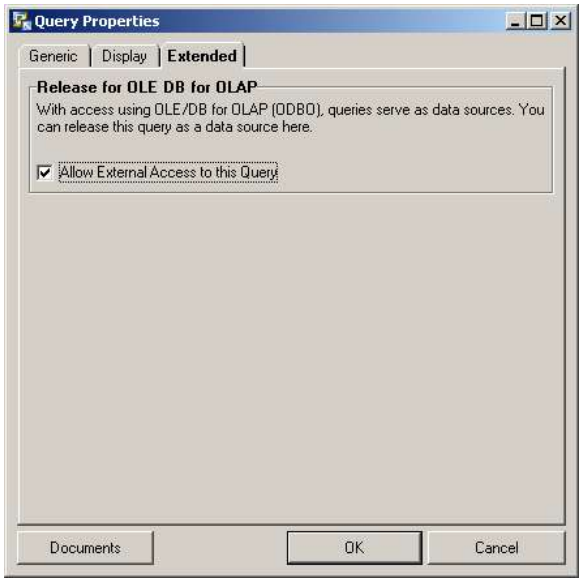


17. Select the Query Properties on the top toolbar.

18. Click on the Extended tab



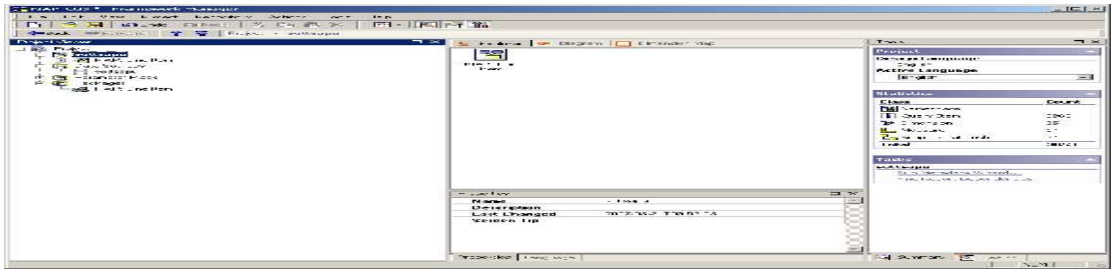
19. Click the select box to "Allow External Access to this Query" and click the OK button.



20. Select the save icon on the top toolbar to save this query. When prompted give the query an appropriate technical name and description.

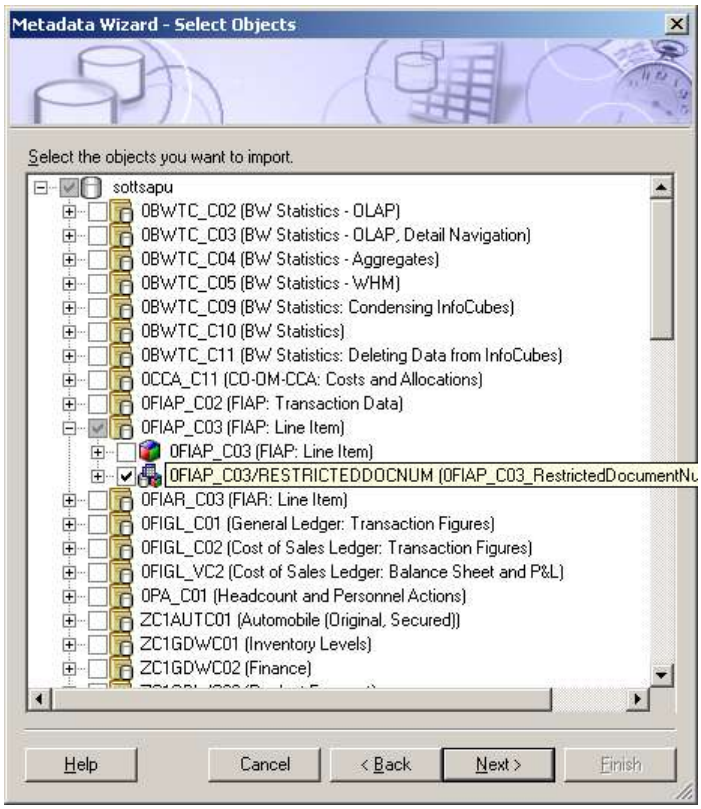
21. Exit the query from the top toolbar.

22. Launch IBM Cognos 8 Framework Manager and open the original model used for the existing reports.

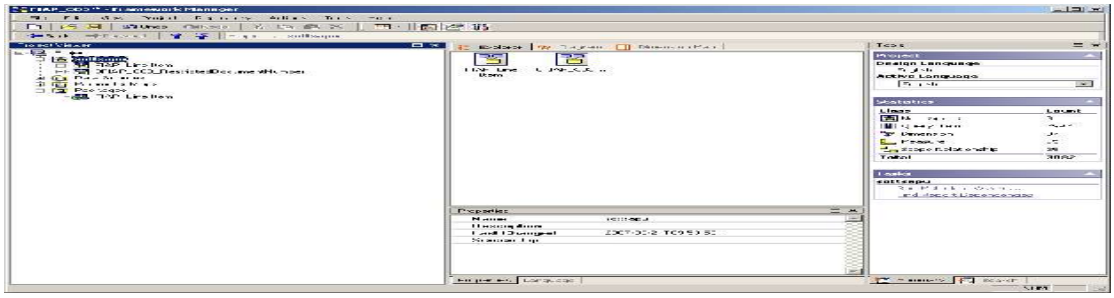


23. Right click on the top level namespace and select 'Run Metadata Wizard". Traverse the screens, selecting the correct data source.

24. The previously created InfoQuery should be visible in the Select Objects Import window.



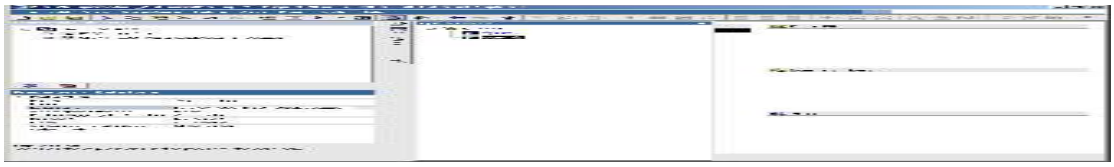
25. Ensure that the checkbox for the newly created InfoQuery has been selected. Traverse the remainder of the screens to complete the import. When completed the object should now appear under a new namespace in the IBM Cognos 8 Framework Manager model.



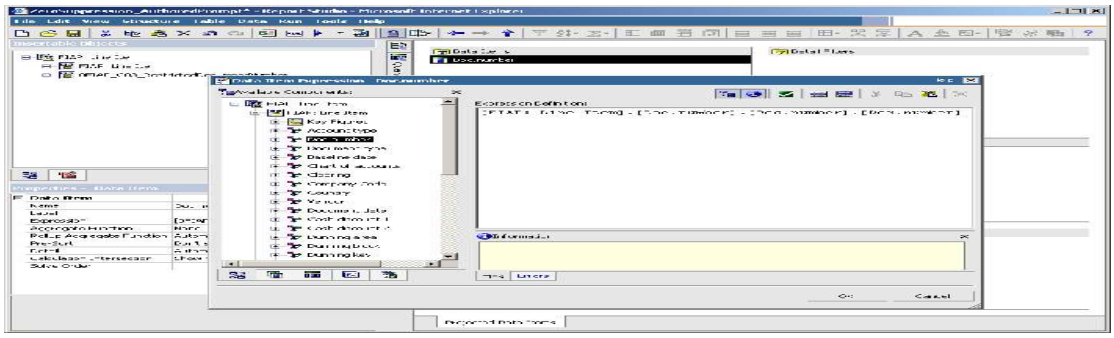
26. Save the changes and publish the package.

27. Once published, open the existing report in IBM Cognos 8 Report Studio.

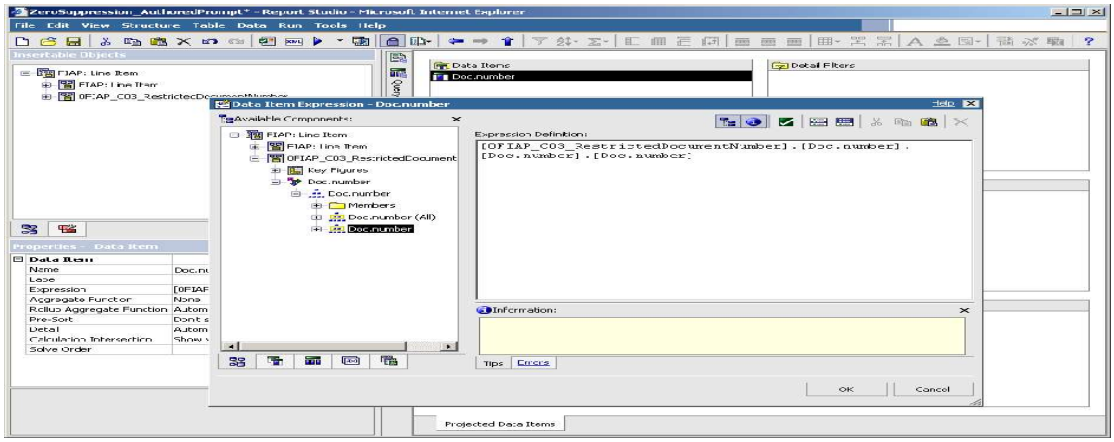
28. Via the Query Explorer, select one of the prompt queries.



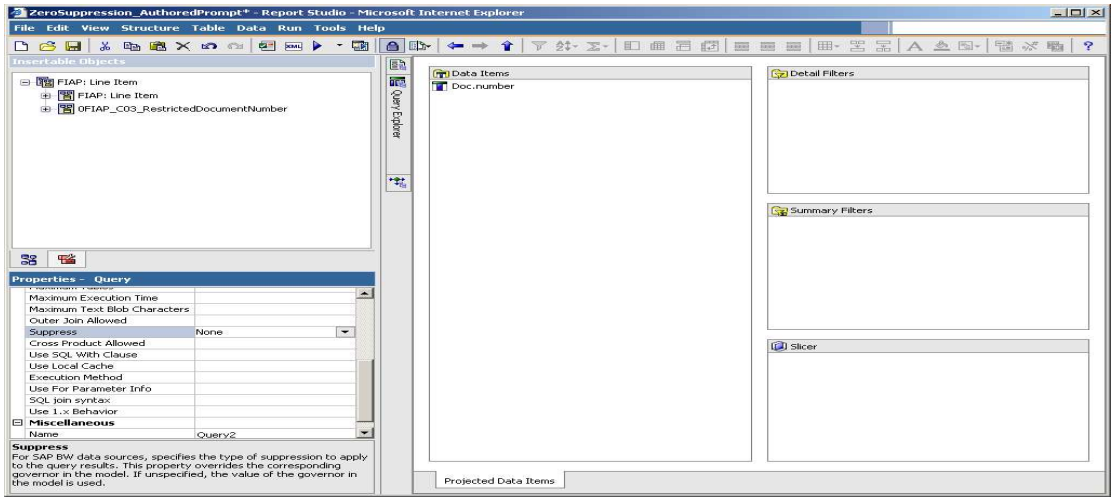
29. Double click on the QueryItem in the prompt query.



30. Delete the expression, and select the same element from within the newly imported InfoQuery.



31. Click OK. Then ensure that the Suppress has been set to "None" on the properties of the prompt query.



32. Run the query, and you will notice the only prompt values displayed will be the selected values in the InfoQuery restriction.

4.3.6 Detect BEx Variable Uniqueness

In the event a BEx variable with the same technical name is used in two different BEx queries and is used in the same Report Studio report, the BEx variable will be displayed once and the value(s) entered will filter both BEx queries. To force the BEx variable to be displayed once for each BEx query and to allow different values to be selected for filtering, the DetectSAPVariableUniqueness parameter in qfs_config.xml can be set to true.

This is a global setting and will impact ALL Report Studio reports. More information on parameter settings are provided in Section 3 - IBM Cognos 8 SAP Provider. Below you will see which file & setting to modify to invoke the SAP variable uniqueness.

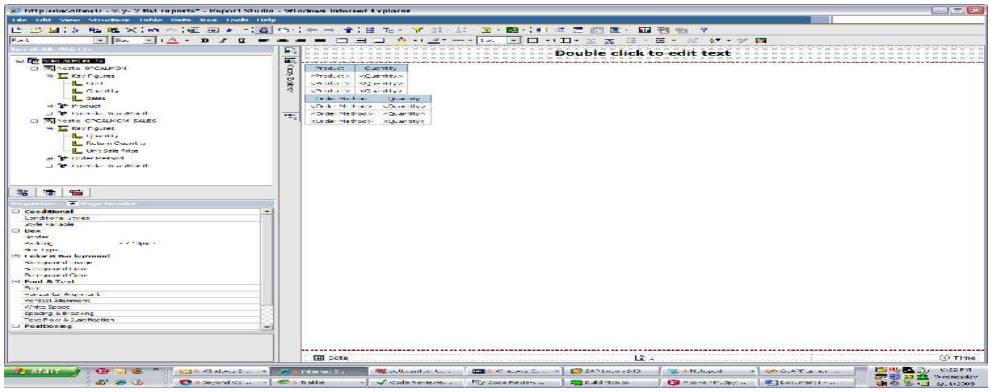
1. To turn on the setting, open <c8_install>/configuration/qfs_config.xml and browse to the following location.

   <provider name="OlapQueryProvider" libraryName="oqp">

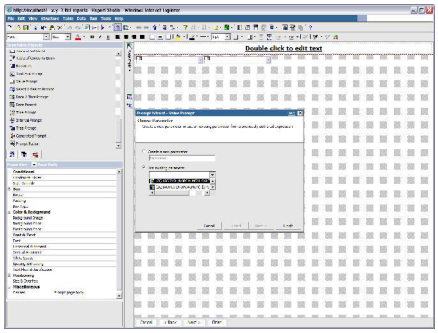
   And ensure it has a child element which exists and is set to true.

   <parameter name="DetectSAPVariableUniqueness" value="true"/>

2. Open the IBM Cognos 8 package with duplicate variables and create a report with elements from each.

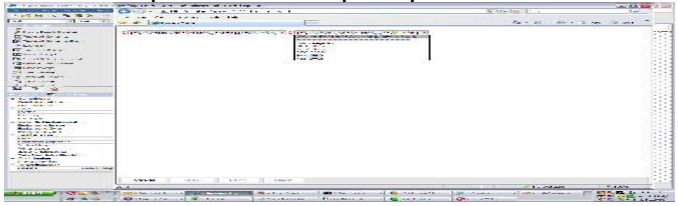


3. Create a prompt page and add prompts for each duplicate variable. This step is required for the functionality to work.



4. Note each duplicate variable has been prefixed by its cube name while non-duplicate variables remain non-prefixed.

5. Run the Report and fill in prompt values. Then click Finish.



4.4 Prompt Performance Tuning

4.4.1 General Guidelines

There are multiple approaches which can positively impact the performance of prompts used in IBM Cognos 8 Report Studio. These approaches include:

- Using the configuration settings covered in the configuration section of this document:
  - UseFastGetMembers
  - UseFastGetMembersFor
  - UseSAPOrdinalsForMembers
- Using Suppression to manipulate the product behaviour discussed below
- 'Use for parameter info' query setting discussed below
- Creating an InfoQuery with pre selected values to populate the prompt query.

4.4.2 Using Suppression

This is a technique used to improve the efficiency of prompt queries by reducing the number of members returned instead of returning all dimension members.

The suppression property on a query forces a non empty clause to be added after the select component of an MDX statement. This not only suppresses the resulting query data set but it also forces IBM Cognos 8 to fully deconstruct the prompt query as it would a data query.

Since prompt queries are usually simple and consist of several dimension columns, treating them as a full data query may result in some additional overhead which impacts performance.

By turning the suppression property off on the IBM Cognos 8 Report Studio prompt query, the IBM Cognos 8 query planner is no longer forced to generate an MDX statement. The data can now be retrieved using the BAPI_MDPROVIDER_GET_MEMBERS metadata call saving the query deconstruction overhead. It is important to note that the BAPI_MDPROVIDER_GET_MEMBERS call will return all members regardless of whether or not they have populated key figures in the InfoCube.

4.4.3 'Use for parameter info' query setting

When the 'Use for parameter info' setting is used, queries created in Report Studio to reconcile the prompts are executed before the queries to populate the report.

In SAP NetWeaver Business Warehouse environments where there are non-hierarchical data source (BEx) variables, the number of BEx variables along with the number of possible values for these BEx variables could have a significant negative impact. The use of the 'Use for parameter info' query hint could offer performance benefits.

4.5 Reporting Overview

4.5.1 General Guidelines

When creating list reports and bringing in multiple dimensions from SAP NetWeaver Business Warehouse, you should remember this is an OLAP source. You are returning individual cell values. This is referred to as a cross join. As an example, if 1 million materials and 1 million customers are requested, the result set contains 1 trillion cell intersections.

The following are additional guidelines for improved functionality and performance.

For performance:

- Use of Display and Navigational Attributes

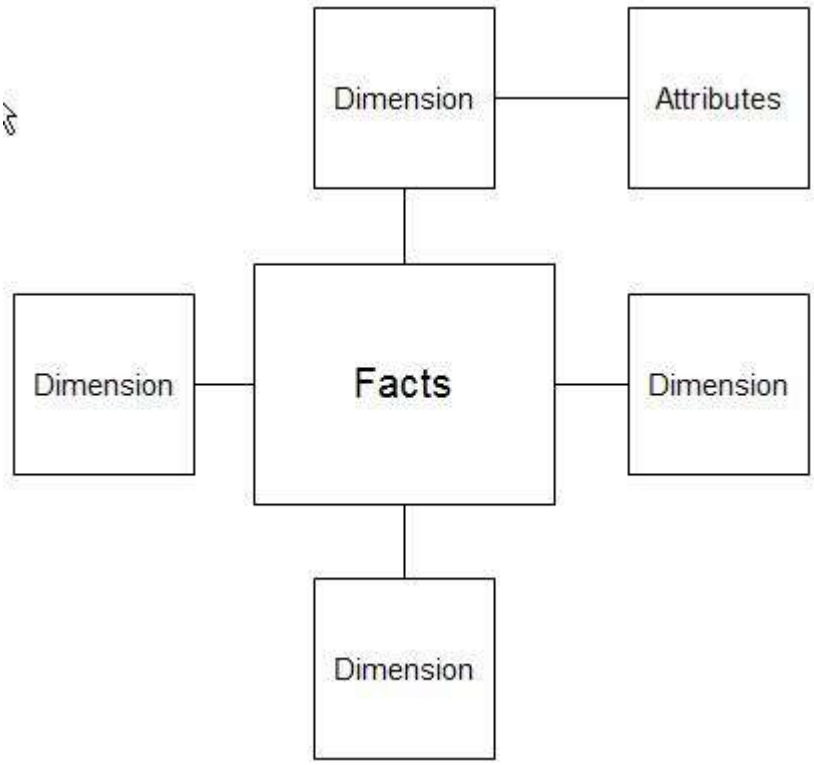
To report from SAP NetWeaver Business Warehouse and other heterogeneous data in one report:

- Union Between SAP NetWeaver Business Warehouse and Relational Data
- Master Detail Queries

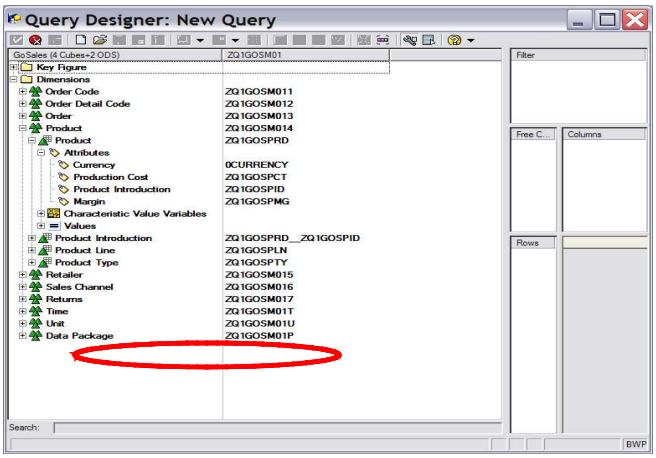
4.5.2 Use of Display and Navigational Attributes

Using a display attribute instead of an available navigational attribute will impact report performance.

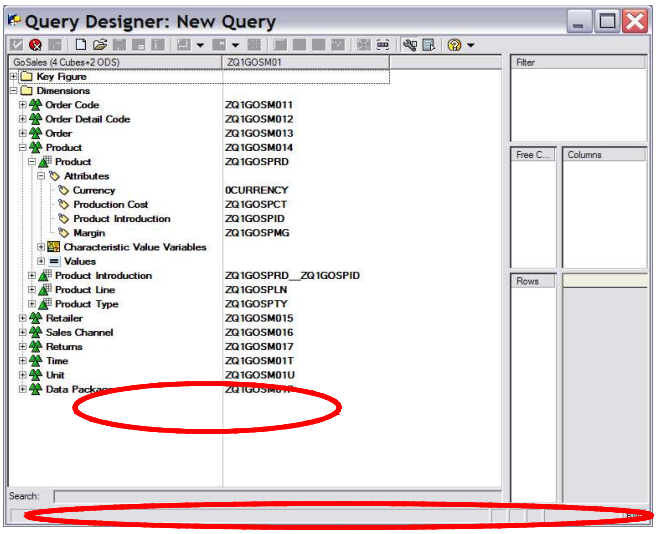
Display attributes: Use the dimension levels and avoid use of display attributes for reporting AND filtering reports because they are not part of the dimension table.



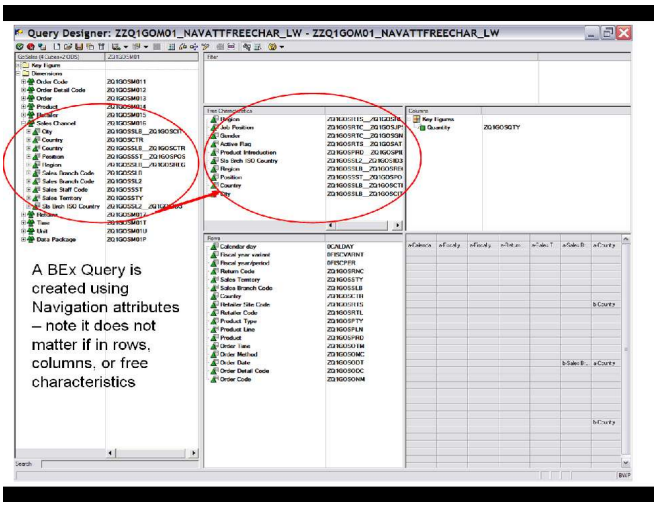
Display attributes can be defined as characteristic details which are intended for display only. These attributes cannot be grouped or sorted within Business Explorer (BEx). While they can be grouped and sorted in IBM Cognos 8, the processing takes place on the IBM Cognos 8 server instead of the SAP NetWeaver Business Warehouse. A display attribute is identified within BEx Query Designer by the yellow tag icon, as illustrated below.



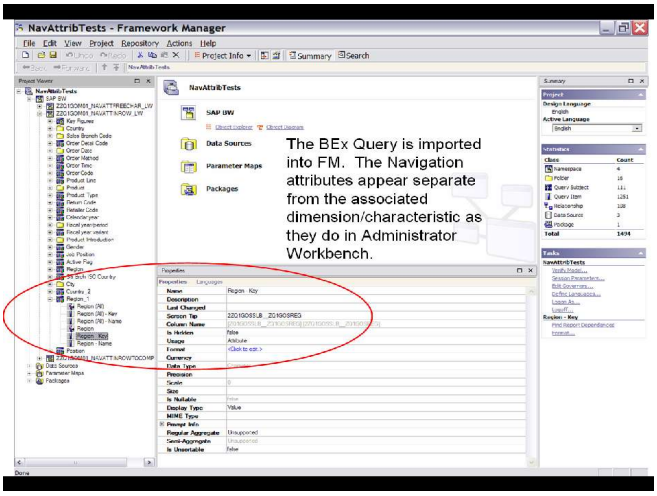
If a navigational attribute has been created, it will appear as a characteristic of the dimension in the BEx query and as a dimension in IBM Cognos 8. Navigational attributes can be grouped and sorted within BEx and IBM Cognos 8. An example of a navigational attribute is illustrated below. Please note that the Product Introduction shows up as a display attribute and a characteristic of Product. Navigational attributes will adhere to the two part name joined by a double underscore (CharacteristicTechName__AttributeTechName).



Navigation Attributes must be part of a SAP NetWeaver Business Warehouse Query, and cannot be accessed directly from the InfoCube/ODS structure via IBM Cognos 8.



After import of BEx Query into IBM Cognos 8 Framework Manager, navigation attributes will appear as dimensions as Region_1 does below. Note its technical name in the properties pain which identifies it as navigational attribute. It will appear as a display attribute as well.



Once a package is created and published, select the navigation attribute as opposed to the display attribute when building reports in Report Studio. IBM Cognos 8 creates MDX that is translated to SQL to pass to the underlying database. If the display attribute is used, the generated SQL will read the fact table sequentially to pull the data referenced by the display attribute. The navigation attribute generates SQL that leverages the join defined in the navigational attribute definition.

4.6 Union between SAP NetWeaver Business Warehouse and Relational data

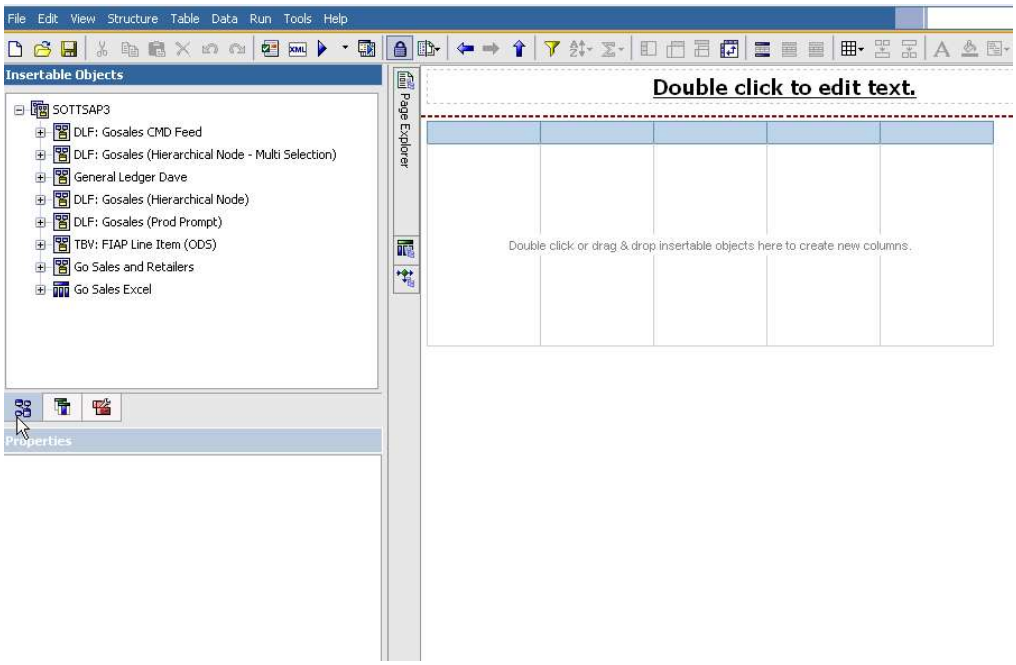
To bring in data from SAP NetWeaver Business Warehouse and a relational source, or two different SAP NetWeaver Business Warehouse data sources, and have the ability to create calculations across the two data sources, a union report can be created in report studio.

This requires a key or text field to match between the two data sources. In the Report Studio Query Explorer, two queries should be built, one against each data source, with the matching columns that are defined appropriately for data types. Then a union query is created to union the data from each data source to build the report.

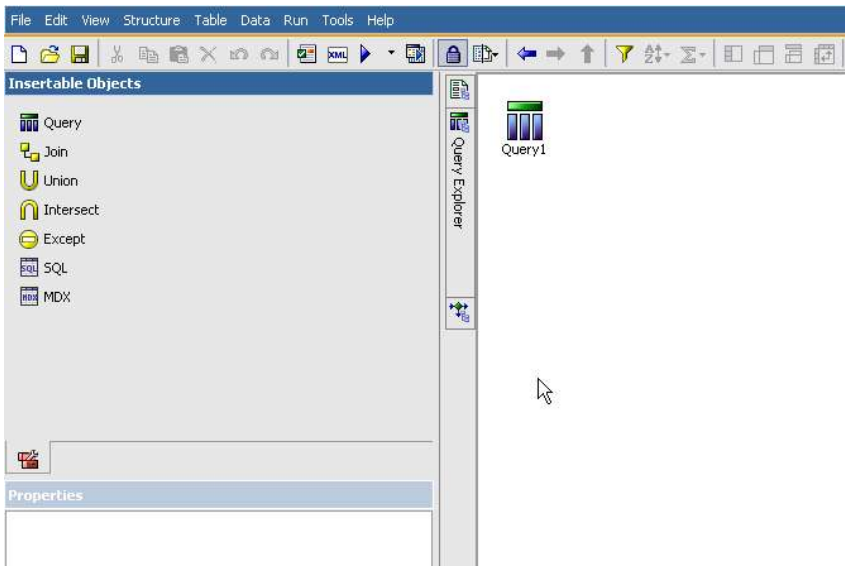
This method brings the result set back from each data source and 'unions' the data on the IBM Cognos 8 server.

4.6.1 Creating the Report and Adding a Union

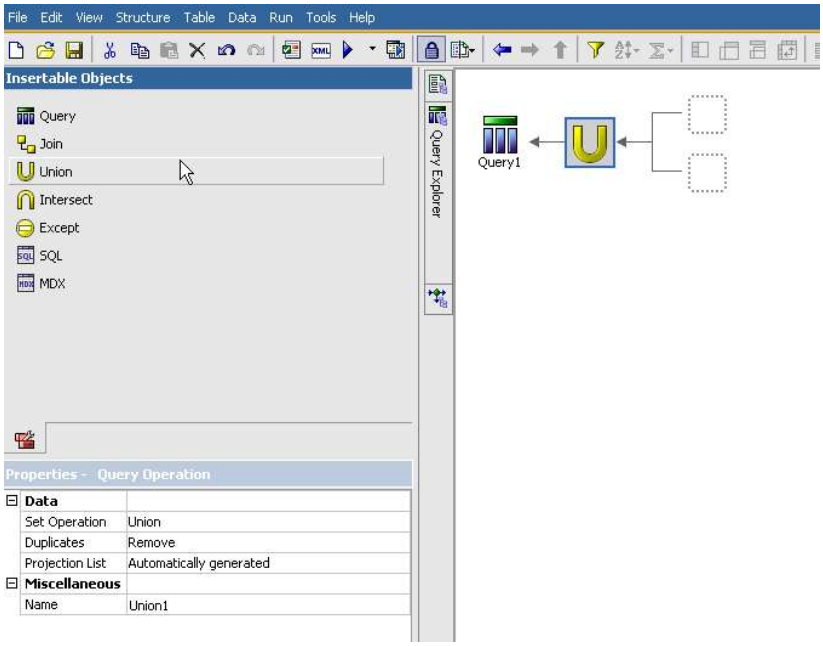
1. Start in Report Studio with a package that has both the SAP NetWeaver Business Warehouse and Relational data source, choose a list frame.



2. Go to Query Explorer.

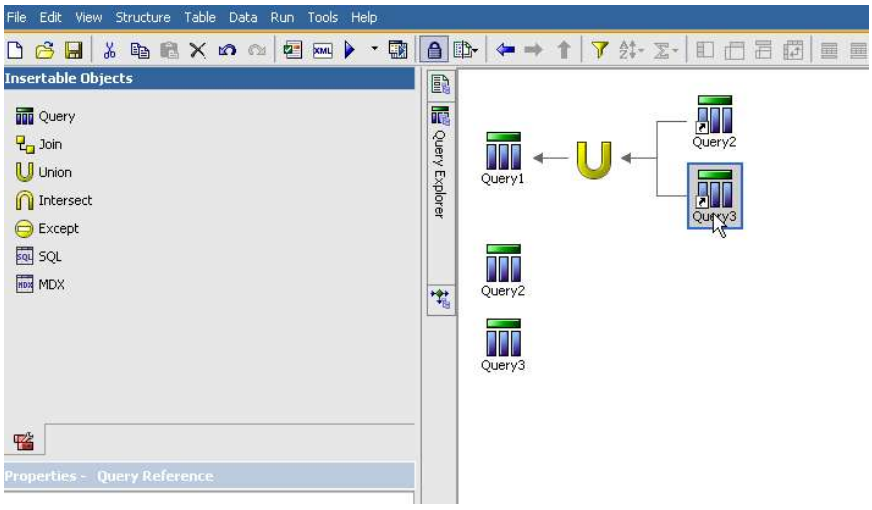


3. Add a Union from the Insertable Objects Window.

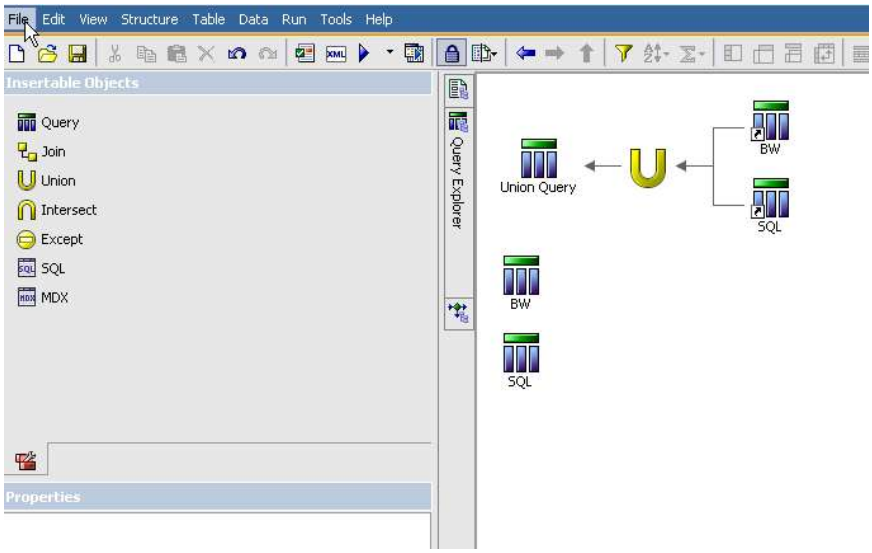


4.6.2 Creating the Queries

1. Add two new queries.

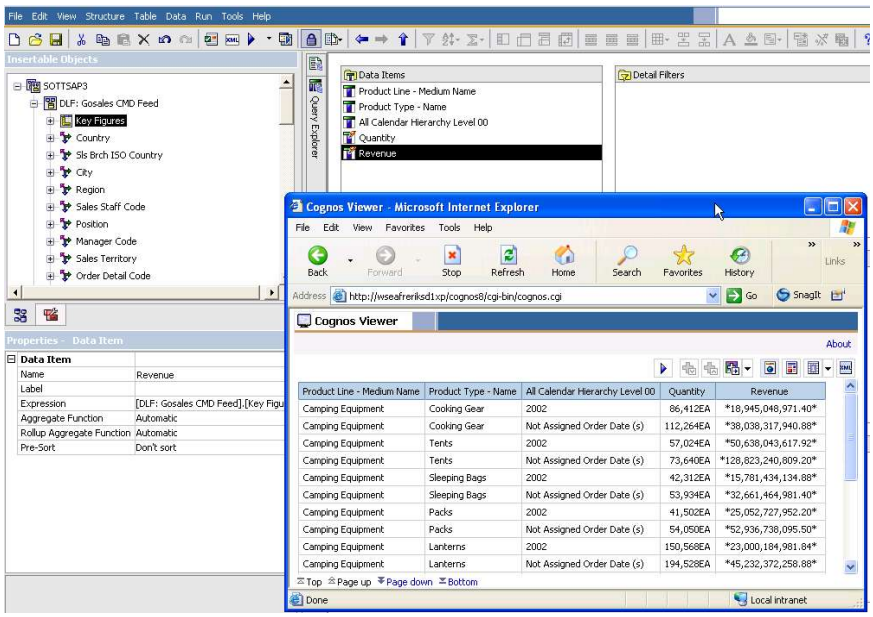


2. Change Names to Query Origin.

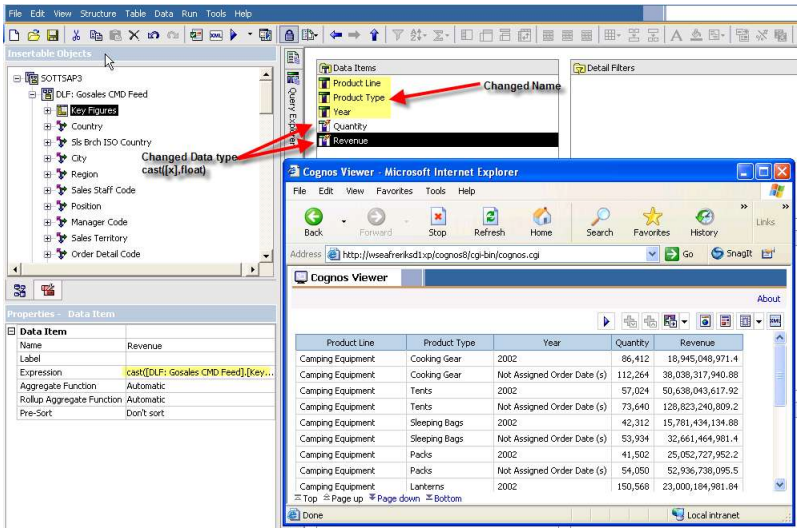


4.6.3 Adding Data Items to the SAP NetWeaver Business Warehouse Query

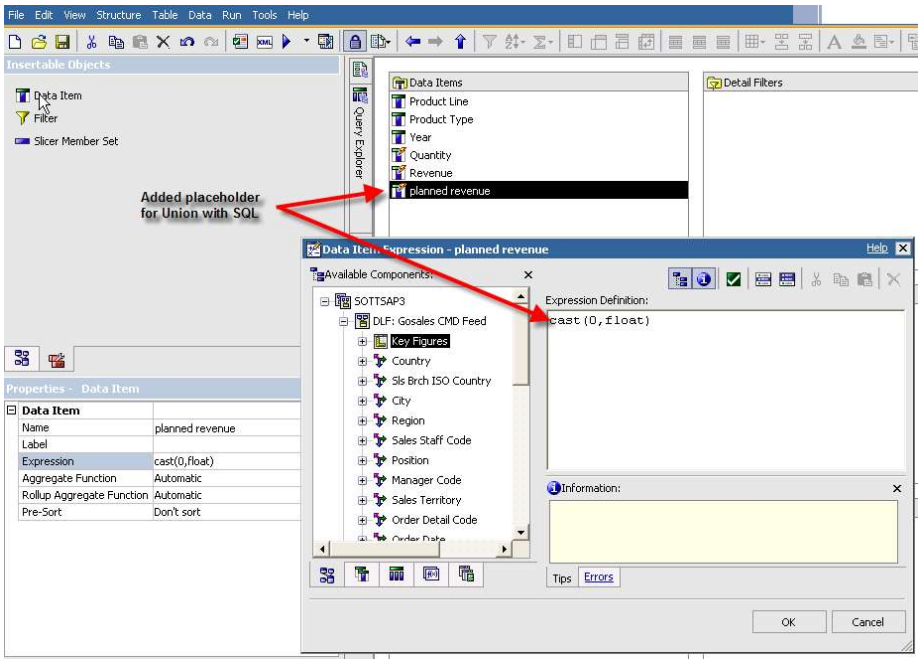
1. Add SAP NetWeaver Business Warehouse Data Items to query.



2. Change names to simplify, and cast key figures as FLOAT data types (this is not necessarily required with IBM Cognos 8.4, but can be used if data type incompatibilities are encountered).

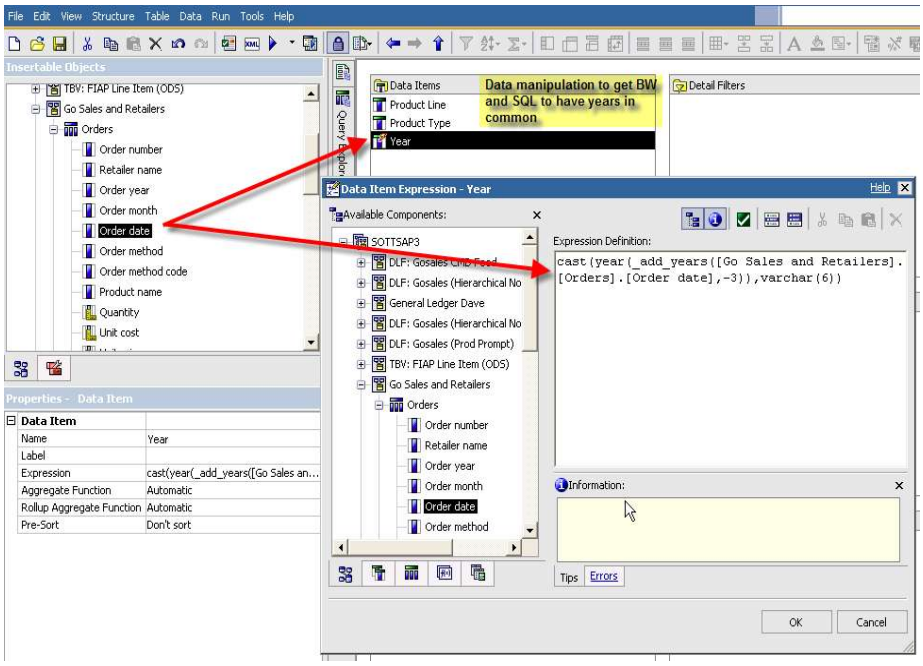


3. Add a placeholder data item for Union.

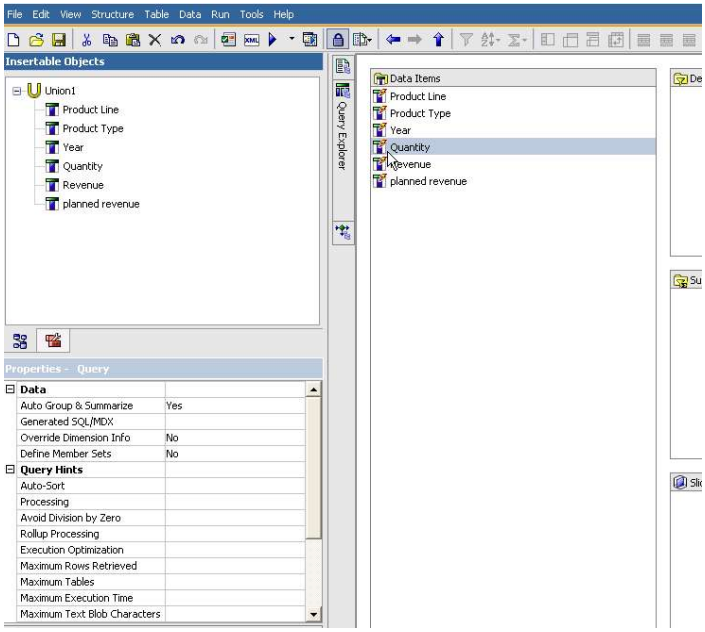


4.6.4 Adding Data Items to the SQL Query

1. Switch to the SQL query for adding data items. With the SAP NetWeaver Business Warehouse dates in mind for the case below, Order Date may be cast as varchar.

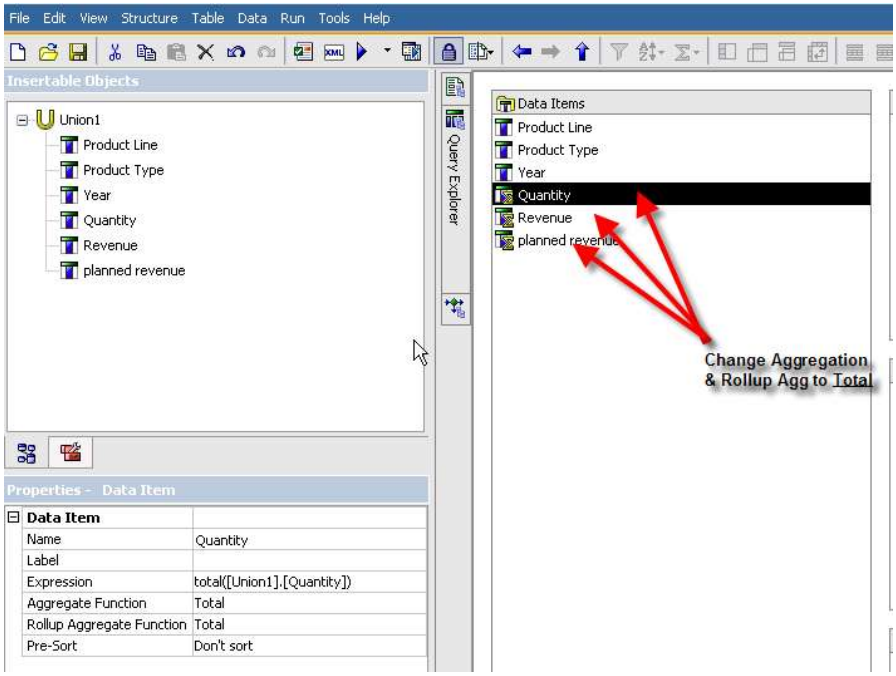


2. Add rest of Measures, two place holders for Quantity and Revenue [cast(0,float)] along with the real measure - Planned Revenue cast as a float. (if needed)



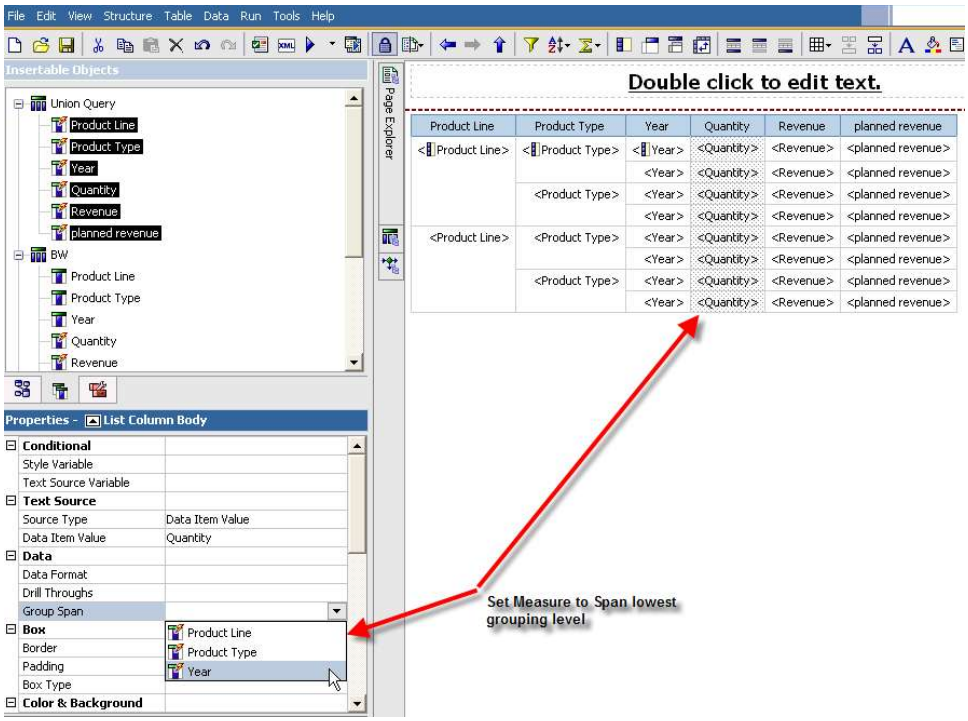
4.6.5 Changing the Aggregation and Rollup for the Union

1. Go to the Union Query in Query Explorer, and change aggregation & rollup to total. It is also necessary to surround each query item definition with the total(…) function to ensure correct aggregation.

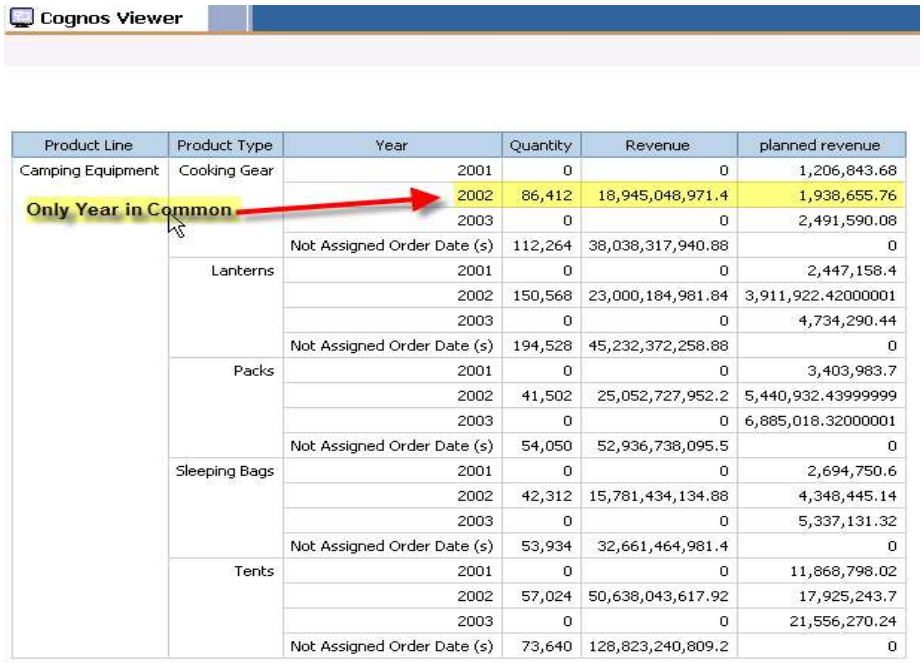


4.6.6 Adding Data to the List Frame

1. From the page explorer, add the column from the Union Query to the list, and group on Product Line, Product Type, and Year. For each measure, make sure the Group Span is set to the lowest level of the Grouping (Year in our case).

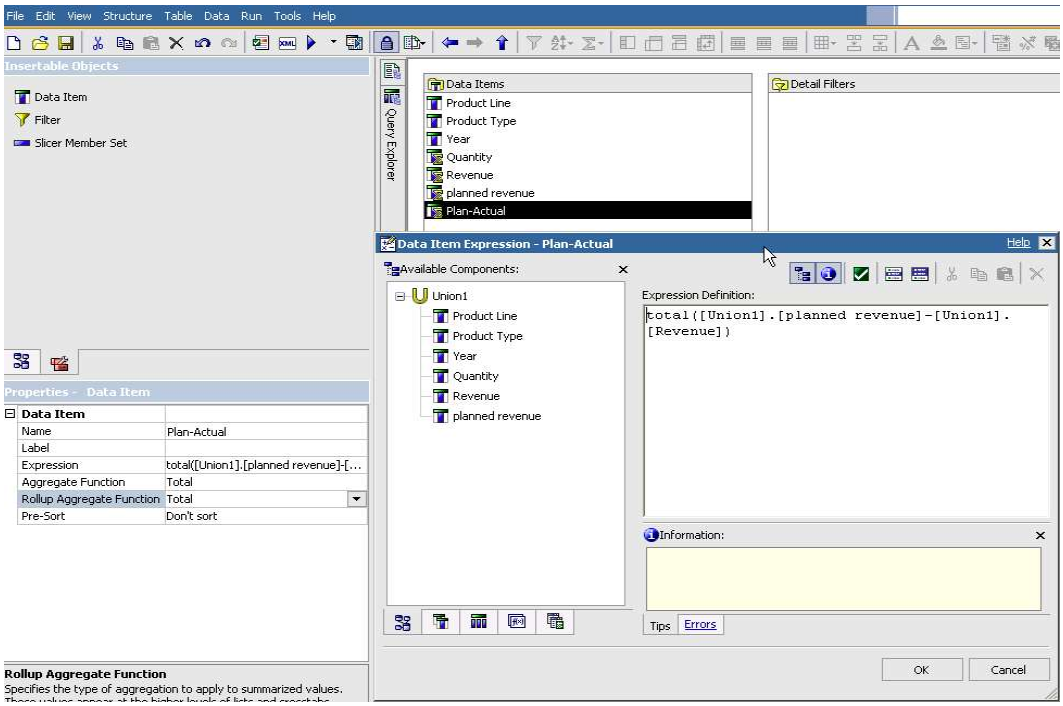


2. The report can then be run and the unioned data is displayed.



Product Line	Product Type	Year	Quantity	Revenue	planned revenue
Camping Equipment	Cooking Gear	2001	0	0	1,206,843.68
		2002	86,412	18,945,048,971.4	1,938,655.76
		2003	0	0	2,491,590.08
		Not Assigned Order Date (s)	112,264	38,038,317,940.88	0
	Lanterns	2001	0	0	2,447,158.4
		2002	150,568	23,000,184,981.84	3,911,922.42000001
		2003	0	0	4,734,290.44
		Not Assigned Order Date (s)	194,528	45,232,372,258.88	0
	Packs	2001	0	0	3,403,983.7
		2002	41,502	25,052,727,952.2	5,440,932.43999999
		2003	0	0	6,885,018.32000001
		Not Assigned Order Date (s)	54,050	52,936,738,095.5	0
	Sleeping Bags	2001	0	0	2,694,750.6
		2002	42,312	15,781,434,134.88	4,348,445.14
		2003	0	0	5,337,131.32
		Not Assigned Order Date (s)	53,934	32,661,464,981.4	0
	Tents	2001	0	0	11,868,798.02
		2002	57,024	50,638,043,617.92	17,925,243.7
		2003	0	0	21,556,270.24
		Not Assigned Order Date (s)	73,640	128,823,240,809.2	0

3. To add a calculation - Go back to Query Explorer, add a new data element (Planned Revenue vs. Revenue), and set the rollup and aggregation types and add total(xxxx) to the new calculation. Add to the list frame in Page Explorer and run.



4. The end result appears as follows.

Product Line	Product Type	Year	Quantity	Revenue	planned revenue	Plan-Actual
Camping Equipment	Cooking Gear	2001	0	0	1,206,843.68	1,206,843.68
		2002	86,412	18,945,048,971.4	1,938,655.76	-18,943,110,315.64
		2003	0	0	2,491,590.08	2,491,590.08
		Not Assigned Order Date (s)	112,264	38,038,317,940.88	0	-38,038,317,940.88
	Lanterns	2001	0	0	2,447,158.4	2,447,158.4
		2002	150,568	23,000,184,981.84	3,911,922.42000001	-22,996,273,059.42
		2003	0	0	4,734,290.44	4,734,290.44
		Not Assigned Order Date (s)	194,528	45,232,372,258.88	0	-45,232,372,258.88
	Packs	2001	0	0	3,403,983.7	3,403,983.7
		2002	41,502	25,052,727,952.2	5,440,932.43999999	-25,047,287,019.76
		2003	0	0	6,885,018.32000001	6,885,018.32000001
		Not Assigned Order Date (s)	54,050	52,936,738,095.5	0	-52,936,738,095.5
	Sleeping Bags	2001	0	0	2,694,750.6	2,694,750.6
		2002	42,312	15,781,434,134.88	4,348,445.14	-15,777,085,689.74
		2003	0	0	5,337,131.32	5,337,131.32
		Not Assigned Order Date (s)	53,934	32,661,464,981.4	0	-32,661,464,981.4
	Tents	2001	0	0	11,868,798.02	11,868,798.02
		2002	57,024	50,638,043,617.92	17,925,243.7	-50,620,118,374.22
		2003	0	0	21,556,270.24	21,556,270.24
		Not Assigned Order Date (s)	73,640	128,823,240,809.2	0	-128,823,240,809.2

4.6.7 Master Detail Queries

Data from different data sources can also be brought into a report leveraging the Master Detail relationship in Report Studio. In particular, it is useful for two data sources with a one-to-many relationship. This could be two different Infocubes, one at a summary level and the second at a detail level.

If the SAP NetWeaver Business Warehouse is one data source and the second is a relational data source, use the SAP NetWeaver Business Warehouse data source as the master query in the relationship. Note the master detail relationship will not allow calculations across the data sources.

Note that steps to build a master detail relationship are provided within the Report Studio user guide.

4.7 Report Performance Tuning

4.7.1 General Performance Tuning Guidelines

The following outline some general rules of thumb to apply when building a Report Studio report using the SAP NetWeaver Business Warehouse:

1. Leverage filtering on the SAP NetWeaver Business Warehouse server to limit result sets returned to IBM Cognos 8.

2. Do not filter on display attributes, but preferably on the level object which will pass a mdx filter to SAP NetWeaver Business Warehouse.

3. When possible in Report Studio, suppress nulls triggered by a filter statement or in query properties within Query Explorer.

4. Remember the cross joins! As stated in the Report Studio overview section, for each characteristic brought in, the result set delivered from the SAP NetWeaver Business Warehouse will contain the multiple of each characteristic's members. 1000 Products * 1000 Customers returns 1,000,000 rows in the result set.

5. If practices outlined in this document are applied and better performance is desired, log a call with support and/or review configuration settings for UseMDXToRetrieveMembersFor and UseMDXToRetrieveMembersLimit which are outlined in configuration section of this document.

6. Remember IBM Cognos 8 works with the Business Warehouse Accelerator (BWA) out of the box with no additional configuration. Although BWA improves the SAP NetWeaver Business Warehouse query performance, continue to use practices as outlined within the SAP NetWeaver Business Warehouse performance tuning guide.

4.7.2 Summary Filters, Detail Filters and Slicers

Filtering in a crosstab: In a crosstab report, filtering columns on the outermost edge will have better performance than filtering columns which are nested. Below, the report is filtered on Product Line, ie, Consumer Electronics and Home Office and not Product Type, ie Computer Accessories, etc.

		Actual Revenue (USD)	Planned Revenue (USD)
Consumer Electronics	Computer Accessories	$638,164.05	$638,160.00
	Computers	$959,994.70	$958,447.20
	PDA	$2,786,832.25	$2,780,184.00
	MP3	$1,121,541.13	$1,109,776.80
Home Office	Chairs	$3,163,002.94	$3,162,330.00
	Desks	$3,985,390.04	$3,980,253.60
	Office Accessories	$909,004.30	$908,515.20

Summary Filter: Data is filtered after it is received from SAP NetWeaver Business Warehouse, then processed and aggregated on the IBM Cognos 8 server.

Detail Filter: This is a filter which is pushed down as part of the query (filtering before aggregation). IBM Cognos 8 filters (on members) are usually sent down, assuming no calculation is performed on the filter operation, unless it is an attribute filter. It should be noted that the IBM Cognos 8 filters get sent down as an extra edge on an axis and not in a WHERE clause. You MAY see a filter sent to the SAP NetWeaver Business Warehouse in a WHERE clause of a data fetch but that is rare. It should also be noted that NO IBM COGNOS 8 FILTERS will be sent down on an axis on MDX metadata fetches - only on the fact data fetches.

Slicer Filter: When you filter data, members that do not meet the filter criteria are removed from the report. Slicer filters are different from other filters. A slicer does not remove members from a report. Instead, their values are removed, and you see blank cells. For example, if you have a crosstab with Years and Quarters as rows, and Revenue as columns and you define a slicer member set that consists of the first two quarters in 2006, you get the following result:

		Revenue
2004	Q1	
	Q2	
	Q3	
	Q4	
2005	Q1	
	Q2	
	Q3	
	Q4	
2006	Q1	344,124,267.07
	Q2	391,874,462.51
	Q3	
	Q4	
2007	Q1	
	Q2	
	Q3	

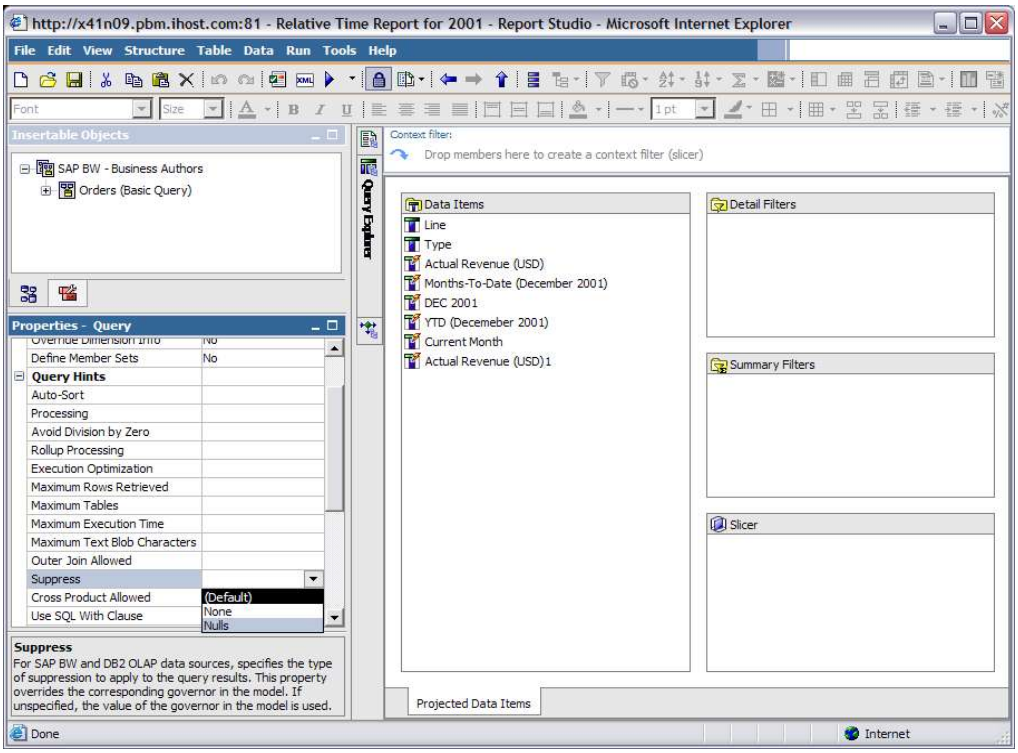
In addition, any summary values in the report are recomputed to reflect the results returned by the slicer. Slicers offer good performance, but they are not the same as filters.

4.7.3 Null suppression

The following two options are provided to you as potential methods to suppress null values from within Report Studio, which may filter nulls from the data set passed from the SAP NetWeaver Business Warehouse.

Option 1 - Use suppress nulls within the Query Explorer of Report Studio rather than building a filter since it is only sent down on an axis where suppress nulls inserts a "select non-empty" clause.

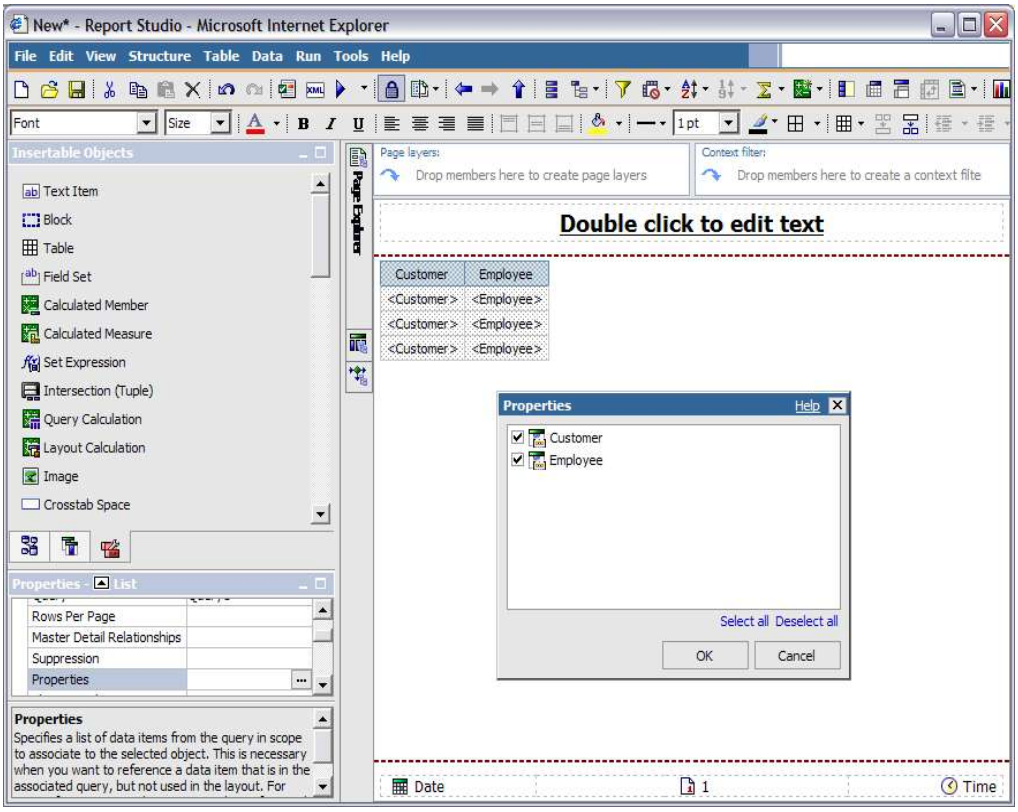
To set up, select the "suppress nulls" option in the query explorer as seen below:



Option 2 - Null suppression is leveraged in Report Studio. Setting query suppression pushes suppression back to the SAP NetWeaver Business Warehouse server for processing.

To set within the Report Studio Report View, select the list or crosstab. From the properties pane, find the properties property and click the ellipses to display a window with characteristics of the report as displayed in screenshot below. Select one or all to invoke this suppression.

This allows dimensional data suppression based on the default key figure (first key figure listed in the IBM Cognos 8 Framework Manager model after import) containing non-zero values for all selected characteristics.



Other options to suppress nulls are:

- Filtering the dimensions directly, ie, typing in the filter expression editor 'filter ([0customer], [revenue] is not NULL)'.
- There is also a "suppress nulls" setting in the query explorer properties section.

5 IBM Cognos 8 Query Studio

5.1 Report Do's and Don'ts

The following statements provide general guidance which can be applied within the Query Studio environment when working with SAP NetWeaver Business Warehouse.

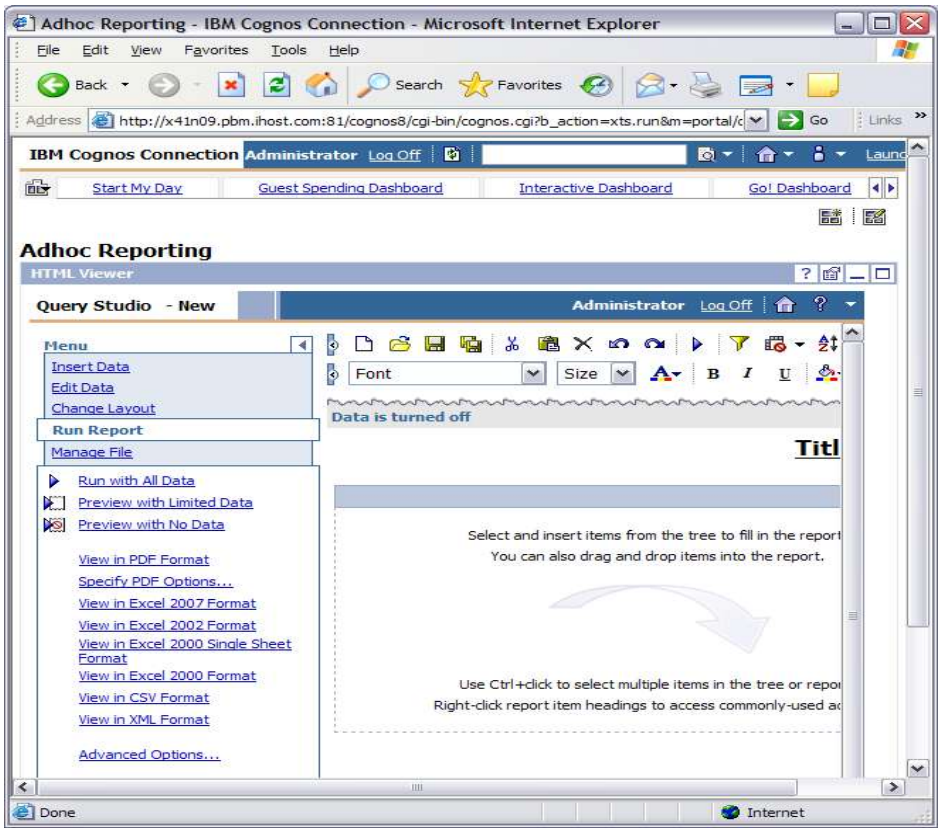
1. Use BEx queries with variables and filters to restrict the data set from BW.

2. To simplify reporting for end users, build a FM package 'fit for purpose' with only one data source. For example, deliver a package that delivers only what the users need from a data source, rather than allowing them to see all available content. And consider hiding or omitting elements, such as several alternate hierarchies, which they do not need. This approach will help to alleviate user-confusion and mitigate the probability that users will attempt to view high volumes of data which may provide poor performance. Details and suggestions are reviewed in FM section for designing FM package.

3. All grouping and filtering performed within Query Studio will invoke processing on the IBM Cognos 8 server after the result set has been delivered from the SAP NetWeaver Business Warehouse server, which could impact report performance.

4. As discussed in the Report Studio section, bring dimension levels into the report as opposed to attributes.

5. If users work from interactive mode, keep queries simple. If building a report and you do not want data to refresh as each column is brought in, create the reports in 'Preview with No Data' mode found in the Run Report menu.



5.2 Overview of configuration settings which apply to Query Studio

Note that some settings recommended for Report Studio will also help Query Studio report performance. Refer to the configuration section in this document for more details.

However the parameter that is of most use with Query Studio is UseMDXtoretrievemembers. In general, setting this parameter to 500 will help, however you may need to adjust this setting to a value that best suits your situation.

In the event you have applied all the practices specified in this document, you should log a call with IBM Cognos support to help assess the situation.

5.3 Prompt Overview

The following are guidelines and statements regarding SAP BEx variables which can generate prompts within Query Studio.

- Leverage BEx query optional variables as opposed to filtering within Query Studio. This approach will leverage the processing power of the SAP NetWeaver Business Warehouse server, and push filtering of the data to the SAP NetWeaver Business Warehouse data source.
- The format of the BEx variables will be determined by the definition of the variable within the BEx query, and changes made to the variable definition in IBM Cognos Framework Manager.
- No formatting of the variable display format is done within Query Studio.

6 SAP NetWeaver Business Warehouse Authentication in IBM Cognos 8

The following section outlines how IBM Cognos 8 can leverage security that is built within SAP NetWeaver Business Warehouse.

6.1 IBM Cognos 8 Security Overview

The IBM Cognos 8 security model is designed to meet the need for security in various situations. IBM Cognos 8 can be easily integrated with the existing security infrastructure in your organization, as it can be configured to leverage one or more external, third-party authentication providers (ex. LDAP, NTLM, Active Directory, SAP NetWeaver Business Warehouse, etc). The external providers are used to define and maintain users, groups, and roles, and to control the authentication process. Each

authentication provider known to IBM Cognos 8 is referred to as a namespace.

IBM Cognos 8 does not authenticate users itself, but rather relies on these third-party authentication sources to do so. This concept implies that IBM Cognos 8 presents logon data (essentially credentials) entered by the user or obtained through single sign-on (SSO) mechanisms to the third-party authentication sources on behalf of the user. Then once authenticated, IBM Cognos 8 needs to read the user's groups and roles from the authentication source and make them available to the authorization functionality. This concept is effectively known as user pass-through.

User authentication in IBM Cognos 8 is managed by these authentication providers. The authentication providers define users, groups, and roles used for authentication. User names, IDs, passwords, regional settings, and personal preferences are some examples of information stored in the providers. To set up authentication for IBM Cognos 8, users must provide valid credentials, such as user ID and password, at logon time. In the IBM Cognos 8 environment, authentication providers are also referred to as namespaces, and they are represented by namespace entries in the user interface. IBM Cognos 8 does not replicate the users, groups, and roles defined in your authentication provider.

An IBM Cognos 8 administrator can configure IBM Cognos 8 to connect to external authentication providers, such as SAP NetWeaver Business Warehouse, using IBM Cognos 8 Configuration. This section assumes the reader understands the general security concepts employed by IBM Cognos 8. For more information on the IBM Cognos 8 security model, reference the **IBM Cognos 8 Administration and Security Guide**, or browse IBM developerWorks® which is a resource for developers and IT professionals.

The remainder of this section will describe the steps required to leverage SAP NetWeaver Business Warehouse as an authentication provider, and to enforce data security and authorizations defined within the SAP NetWeaver Business Warehouse when executing IBM Cognos 8 reports, i.e. user pass-through.

6.2 Configure a SAP NetWeaver Business Warehouse Authentication Provider in IBM Cognos 8 Configuration

To enable access to the IBM Cognos 8 environment for SAP NetWeaver Business Warehouse users and leverage their SAP security roles & authentications, a SAP namespace should be configured in IBM Cognos 8 Configuration.

The following describes the steps necessary to configure the SAP namespace resource, and disable anonymous access to ensure an IBM Cognos 8 user must use their SAP NetWeaver Business Warehouse credentials to authenticate to IBM Cognos 8, and have Cognos pass those credentials to SAP NetWeaver Business Warehouse upon report execution.

1. Navigate to Start\Programs\Cognos 8 and then choose IBM Cognos Configuration.

2. In the Explorer pane of IBM Cognos Configuration, under Security, right-click **Authentication**, point to **New resource**, and then click **Namespace**.

3. In the New resource - Namespace dialog box, under Name, type in the name of your choice (ex. SAP BW),

4. From the drop-down list, under Type, click **SAP**, and click OK.

5. In the Namespace ID row, enter a unique namespace identifier which can be distinguished between multiple namespaces in the event more than one is needed. (ex. SAP BW ID1). Note that each namespace must have a unique identifier, as when a namespace is selected for authentication in the run-time environment, the IBM Cognos 8 uses the identifier.

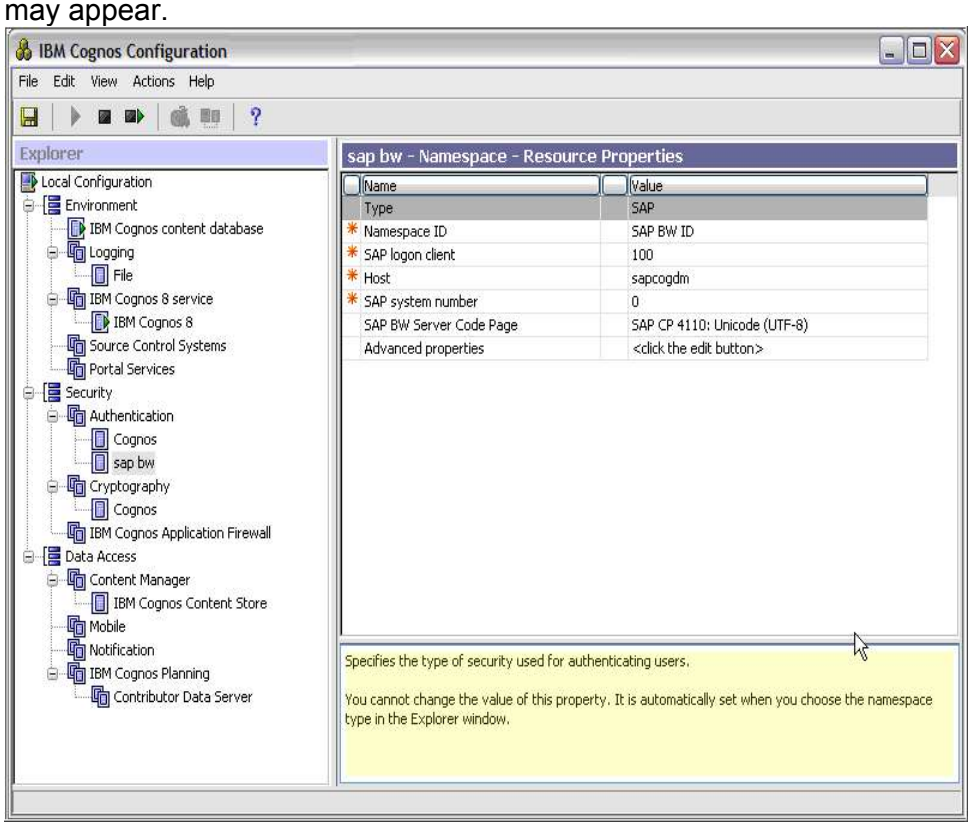
6. Enter the appropriate SAP logon client.

7. Specify the host name of the SAP server. This can be the fully qualified host name or the static IP address. Use of the host name is recommended. Note that use of a message server(s) is not supported for this use case.

8. Enter the SAP system number.

9. The default for SAP BW Server Code Page is Unicode. It may be necessary to change this parameter to an encoding which is used by the SAP server. Consult the SAP Business Administrator for the appropriate encoding.

The following screenshot shows an example of how a SAP namespace may appear.



10. To disable anonymous access and ensure an IBM Cognos 8 user must supply authentication credentials when logging into IBM Cognos 8, within the Explorer pane under Authentication, click **Cognos**. To the right of Allow anonymous access, change the value to **False**.

11. You can test the configuration by right-clicking the SAP namespace, and select **Test**. You should have green check marks beside each entry. If you see a red X, your configuration is not set correctly. If a red X appears, examine the last few entries again. Press **OK** when done.

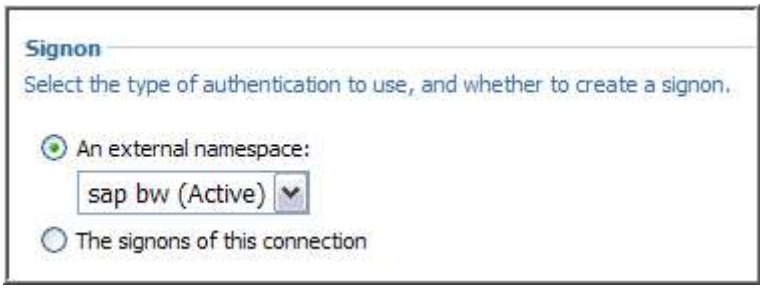
12. Choose **Save configuration** to capture the changes in IBM Cognos 8 Configuration.

13. Stop and re-start IBM Cognos services to make changes go into effect.

14. To test the SAP namespace configuration, open Internet Explorer and go to the IBM Cognos Gateway URL. You will be prompted to logon to the SAP namespace.

15. In the User ID and Password boxes, type the user ID and password of an active SAP NetWeaver Business Warehouse user, and press OK. The user should now have access to IBM Cognos 8 using their SAP NetWeaver Business Warehouse credentials.

16. To achieve user pass-through authentication to SAP NetWeaver Business Warehouse and ensure the user's provided SAP credentials are used to authenticate to SAP, the SAP data source must use the external SAP namespace just created. From IBM Cognos Administration, modify the SAP NetWeaver Business Warehouse data source to use the external SAP Namespace within the Sign-on section.



17. IBM Cognos 8 can now leverage the data security and authorizations built within the SAP NetWeaver Business Warehouse by passing through the SAP user credentials to the SAP security provider.

6.3 Leveraging the SAP NetWeaver Business Warehouse Security Model

When attempting to leverage the SAP NetWeaver Business Warehouse security model within IBM Cognos 8, it is important to understand what SAP version and security model is used for authentication. This answer will drive the proper deployment within IBM Cognos 8 and ensure SAP NetWeaver Business Warehouse data is filtered appropriately according to the SAP security model.

In each case, the SAP authentication provider will have an infoObject(s) defined as 'authorization relevant' for the characteristic(s) that need to be secured. But depending upon the version of the SAP NetWeaver Business Warehouse, there are fundamental differences in the technologies and concepts used by SAP for authentication. To summarize, 3.x versions utilize Standard and Report Authorization concepts, whereas the 7.x version can leverage the same OR upgrade/implement to the new security concepts introduced in SAP NetWeaver Business Warehouse 7.x, described as Analysis Authorizations.

The two sections below summarize the general guidelines recommended for IBM Cognos 8 to leverage these SAP security models as they are built within the SAP NetWeaver Business Warehouse. Note that in addition to restricting the users to the appropriate data sets based on their SAP security authorizations, these methods will also ensure the IBM Cognos 8 solution will leverage the processing power of the SAP NetWeaver Business Warehouse server as the data may be filtered or reduced before it is passed to IBM Cognos 8, which may result in better performance.

6.3.1 When using SAP NetWeaver Business Warehouse 7.x Security Model (Analysis Authorizations)

1. As long as the SAP namespace is enabled within IBM Cognos 8, no additional actions are necessary to begin leveraging Analysis Authorizations from the SAP NetWeaver Business Warehouse 7.x security model.

2. Use of authorization variables in a SAP infoQuery, and IBM Cognos 8 reports is not necessary. Data will be restricted according to the SAP security authorizations if the user is logged into the IBM Cognos 8 environment using their SAP NetWeaver Business Warehouse credentials.

6.3.2 When using SAP NetWeaver Business Warehouse 3.5 Security Model (Standard & Report Authorizations)

1. Since this SAP security model is based on Report Authorizations, IBM Cognos 8 requires use of an InfoQuery as the source for the IBM Cognos Framework Manager metadata model.

2. The InfoQuery should contain an authorization variable(s) for the relevant authorization object(s) in SAP NetWeaver Business Warehouse.

3. Ensure the SAP authorization variable is classified as 'ready for input' within SAP Query Designer.

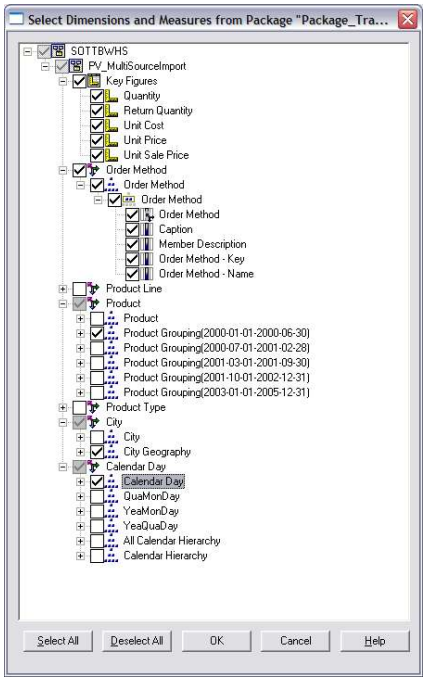
For reports created in IBM Cognos 8 Report Studio, reference the SAP authorization variable(s) accordingly within the IBM Cognos 8 reports as outlined in Section 4: IBM Cognos 8 Report Studio.

7 IBM Cognos 8 Transformer

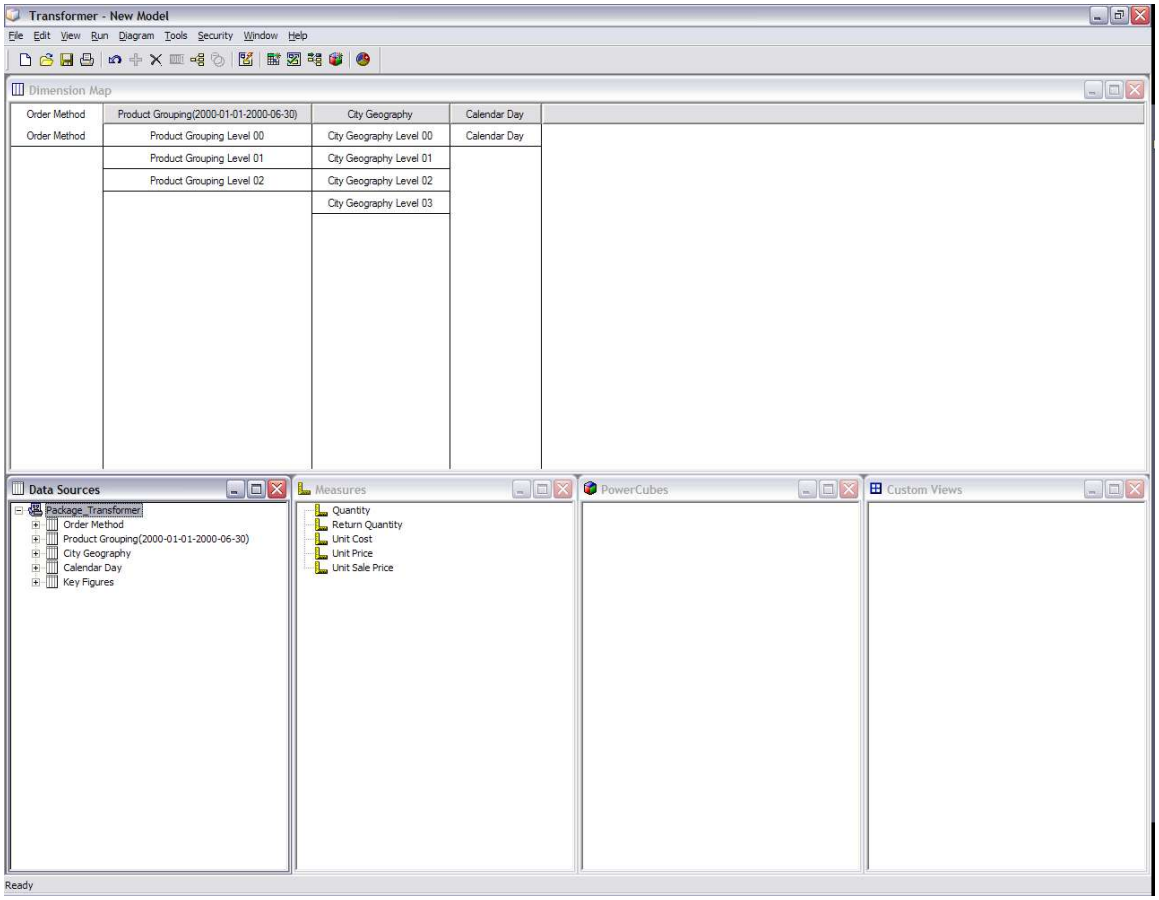
7.1 Building a IBM Cognos 8 Transformer Model using a IBM Cognos 8 Package

When using a package as a data source, we will have transformer build all the dimensions automatically. While this approach is simple, performance against large cubes may suffer - especially against large hierarchies. To create the model:

1. Open transformer and create a new model.
2. Cancel the "New Model" dialog.
3. Right-click on "Dimension Map" window and select "Insert Dimension from Package".
4. Select the recently published package.
5. Select the dimensions required (only one hierarchy per dimension for the purpose of this exercise).
6. Select the key figures required.
7. Select the objects as per following diagram and select OK.



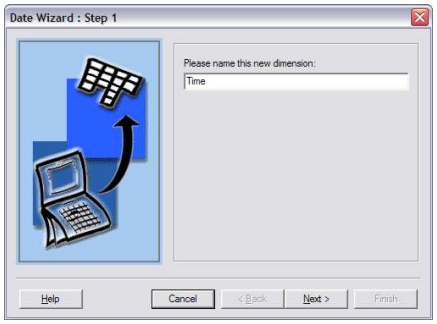
This should create the following model.



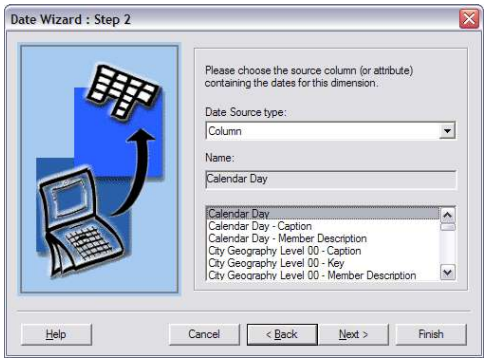
There is some minor housekeeping to be performed at this point. "Calendar Day" was imported during the "Insert Dimension…" step. However, it would be best to populate the dimension using the "Date Wizard" utilizing fact data values instead to populate it given the date column is returned whole in the fact data results. We needed to include "Calendar Day" in the initial import in order to make sure it is included in the "Key Figures" query utilized to extract fact data.

To do this:

8. Delete the "Calendar Day" query from the "Data Source" window and invoke the "Date Wizard" by right-clicking the Dimension dialog box.

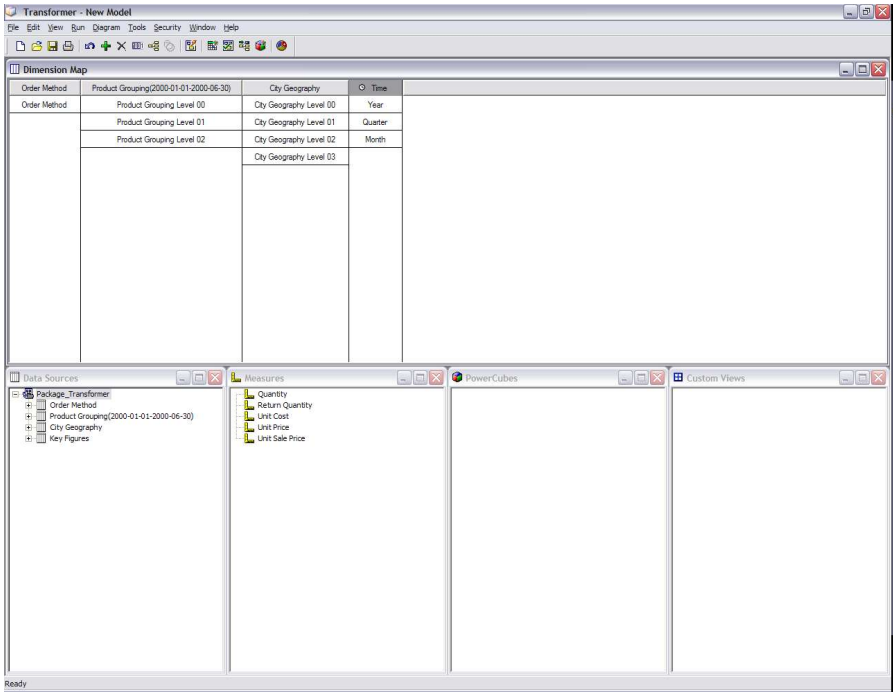


9. Type a name and click next.



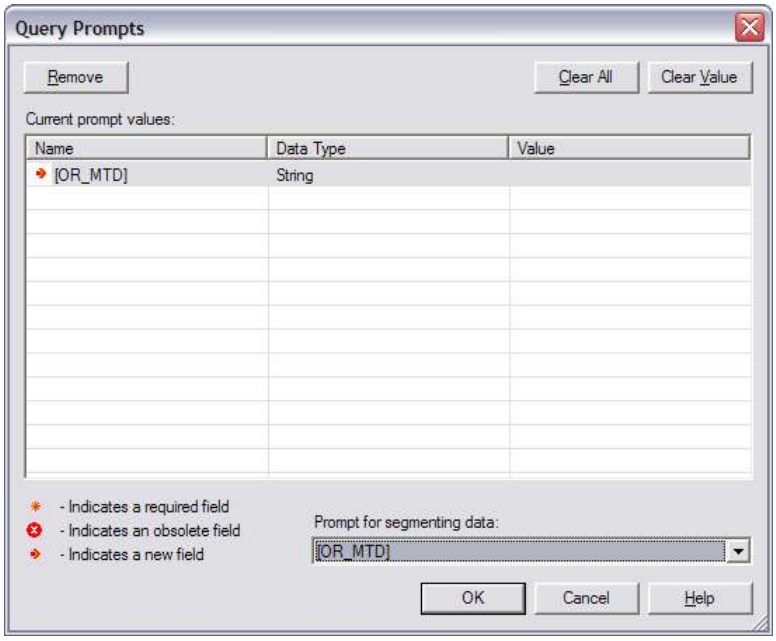
10. Select "Calendar Day" from the columns and click next.

11. Select what you like included in the date dimension. The final window should look like the following.



The final step required is to make sure the fact extract utilizes the defined optional variable. In order to accomplish this:

12. Right-click on "Key Figures" query within the "Data Source" window and select "Edit Prompts".
13. Change "Prompt for Segmenting data" to the optional prompt used for slicing the data.



14. At this point, click OK to generate the cube.

This approach to Transformer cube builds is simple and fairly quick to develop. There is a clear advantage of utilizing the optional variable approach (referred to as StreamBAPI) which is the single most important step to improve performance and exceed the 1 million cell SAP NetWeaver Business Warehouse limitation. However, there are other areas which can potentially be improved - most notably the extraction of hierarchies.

By default, given the approach taken above, we have left our engine perform all the work to build the hierarchies and dimensions. While this is simple and quick from the surface, this will require the engine to build the entire hierarchy tree utilizing one MDX statement. This one MDX statement will be constructed by fetching all the members of each level, finding all their children and perform this process for all levels in order to build the entire hierarchical tree. This step will also utilize fact tables in order to populate it.

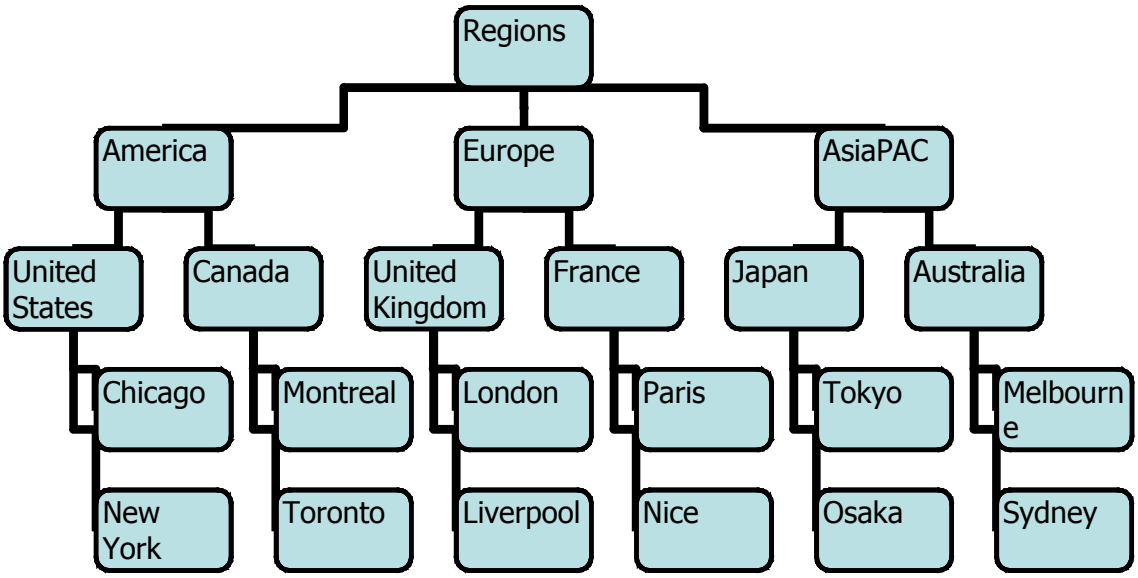
Consider a "Region" hierarchy containing three levels.

- Level_00 is Continent (America, Europe, AsiaPAC)
- Level_01 is Country (United States, Canada, UK, France, Australia, Japan)
- Level_02 is City (Chicago, New York, Montreal, Toronto, London, Liverpool, Paris, Nice, Melbourne, Sydney, Osaka, Tokyo)

When transformer is left to build the hierarchy, the general process will flow as such:

- Get members for Level_00 which returns "America, Europe, AsiaPAC"
- Get children (level_01) of America which returns "United States, Canada"
- Get children (level_02) of United States which returns "Chicago, New York"
- Get children (level_02) of Canada which returns "Montreal, Toronto"
- Get children (level_01) of Europe….

This process would be continued until the entire tree is built creating the following diagram:



Once created, we would build a final MDX statement to fetch all the members which have fact data. While easy and effective, this process may not perform adequately in some environment. What it gains in ease of creation may be lost in performance. While the bulk of the processing is usually consumed by the fact data extraction, it may be useful to gain some performance in other areas such as this one.

7.2 Using IBM Cognos 8 Framework Manager to Externalize Data for Consumption within IBM Cognos 8 Transformer

Another way to populate the hierarchy would be to export (CSV) the dimensions/hierarchies/levels from Framework Manager which would later be imported in Transformer. While extra steps are required, it's important to remember that you only need to create the model once. Careful planning only needs to be considered at the beginning.

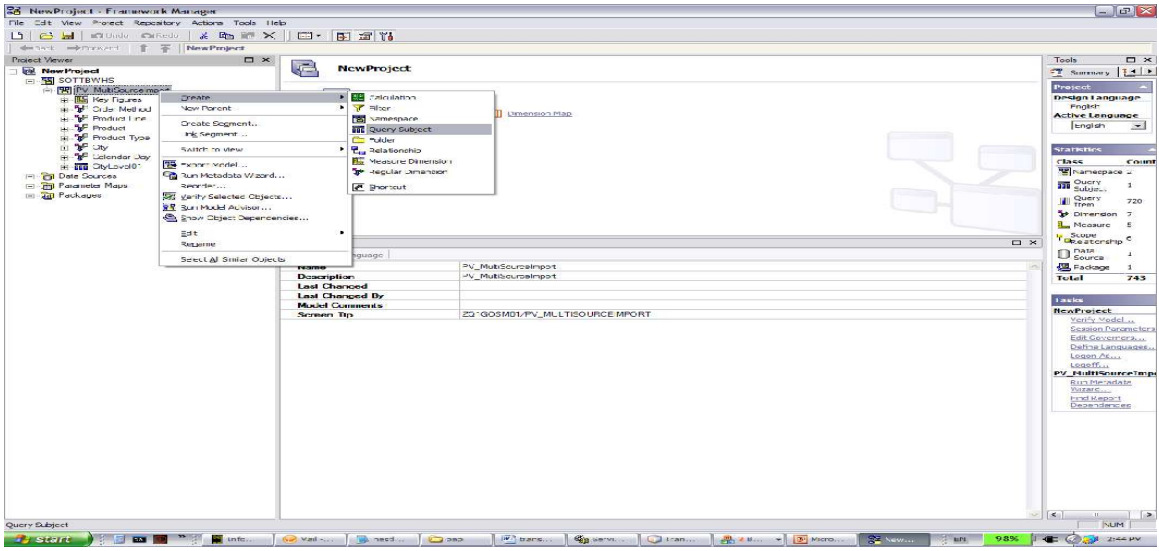
The advantage of extracting hierarchies directly from FM allows the execution of MDX which avoids the inclusion of fact tables (it should be noted that various BW systems may cause different internal processing based on patch levels etc…). The MDX takes the following form:

```
WITH MEMBER [Measures].[COG_OQP_USR_COG_OQP_INT_m1noFact] AS '1'
SELECT [ZQ1GOSSLB__ZQ1GOSCIT          CITY_GEOGRAPHY].
[LEVEL00].MEMBERS

DIMENSION PROPERTIES PARENT_LEVEL,

CHILDREN_CARDINALITY,
```

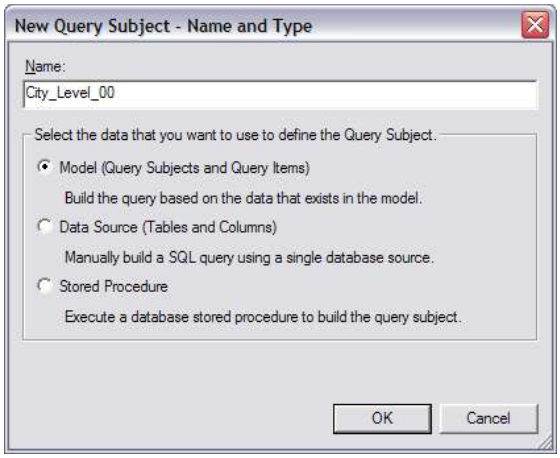
```
MEMBER_UNIQUE_NAME,
[ZQ1GOSSLB__ZQ1GOSCIT].[5ZQ1GOSSLB__ZQ1GOSCIT],
[ZQ1GOSSLB__ZQ1GOSCIT].[2ZQ1GOSSLB__ZQ1GOSCIT],
DESCRIPTION,
PARENT_UNIQUE_NAME
ON AXIS(0)
FROM [ZQ1GOSM01/PV_MULTISOURCEIMPORT] WHERE [Measures].
[COG_OQP_USR_COG_OQP_INT_m1noFact] CELL PROPERTIES FORMAT_STRING
```

To extract a hierarchy manually within IBM Cognos 8 Framework Manager:

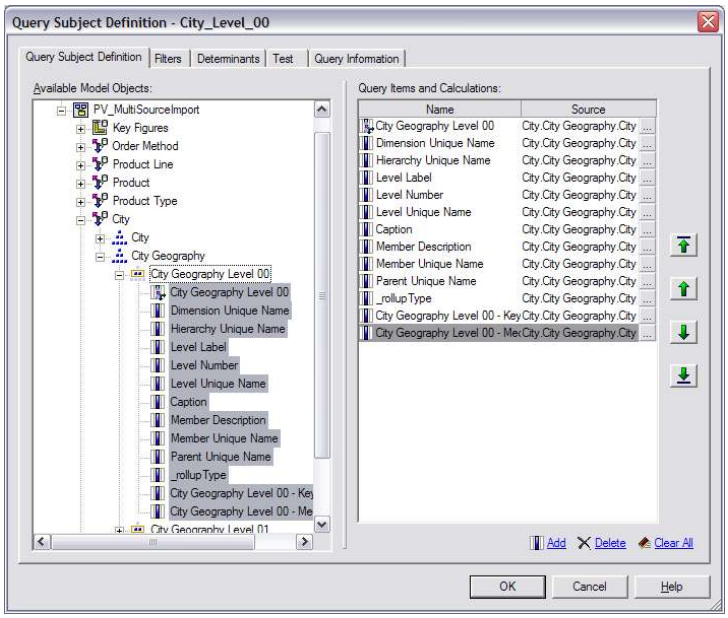
1. Create a new query subject



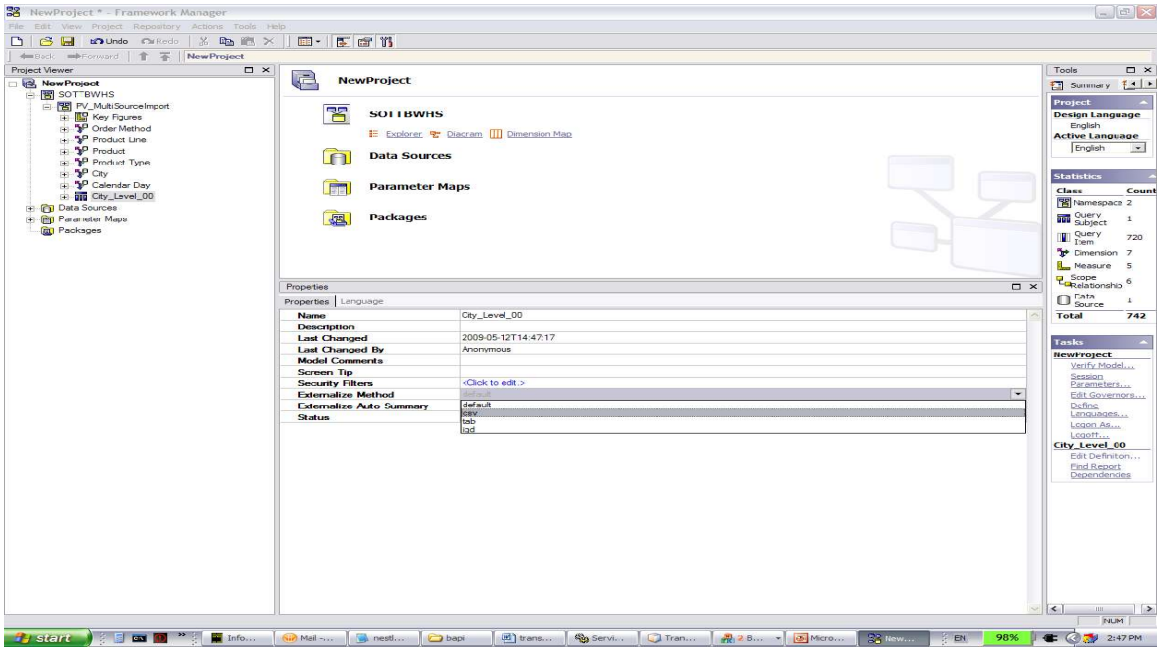
2. Name it accordingly then click OK:



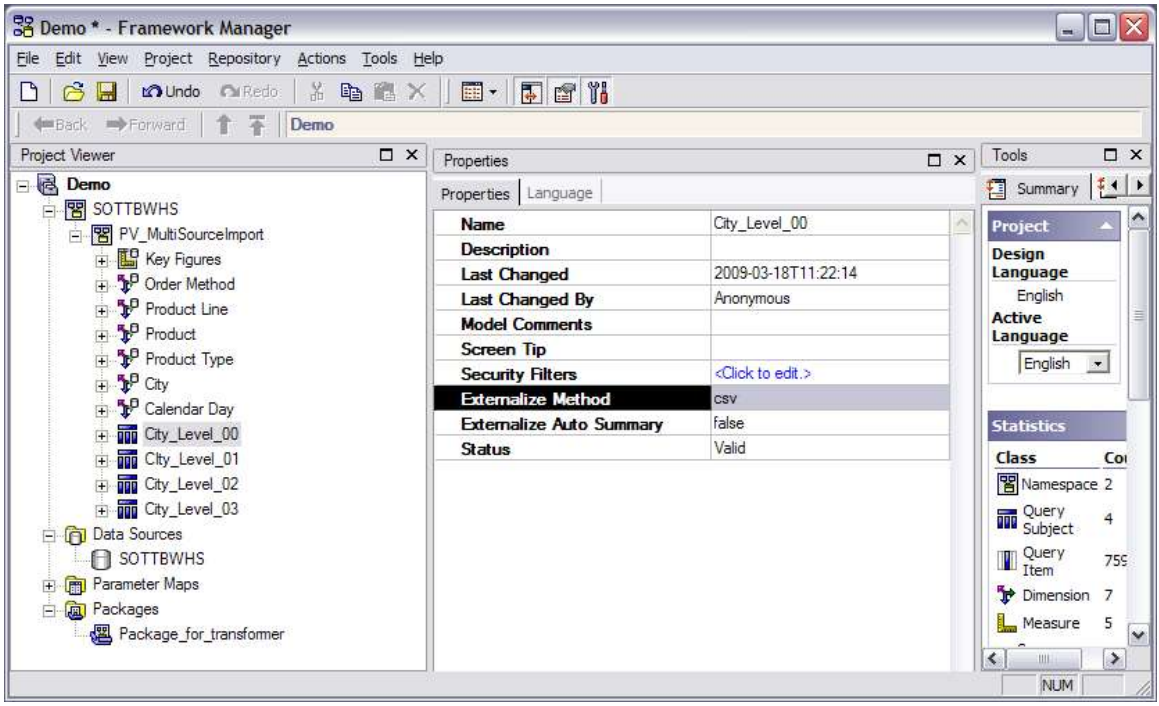
3. Drag the concerned Level – in our case City Geography Level 00:



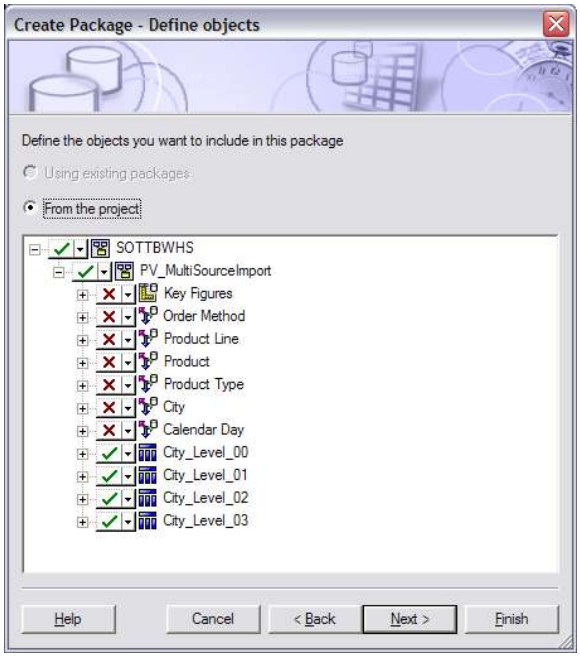
4. Once created, select the newly created query subject in the "Project Viewer" area and change the externalize method to CSV.



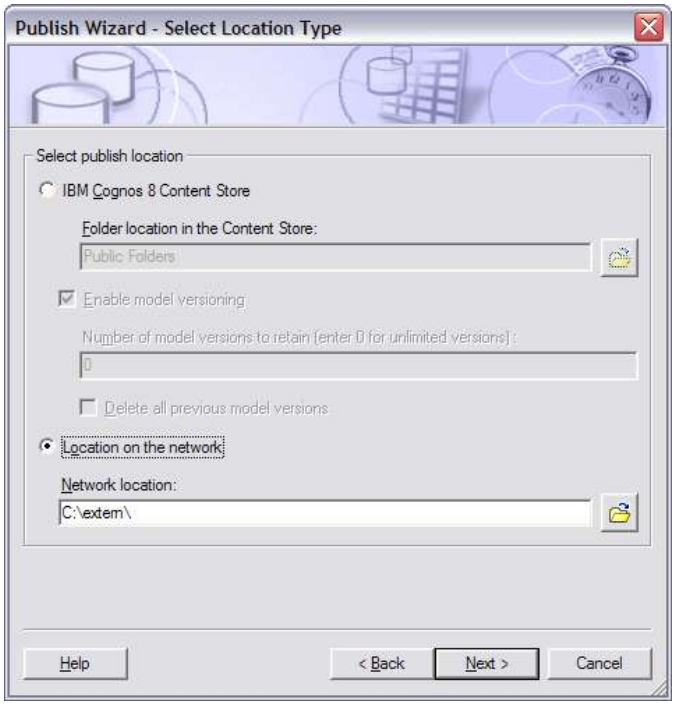
5. Perform this task for all levels in the given hierarchy.



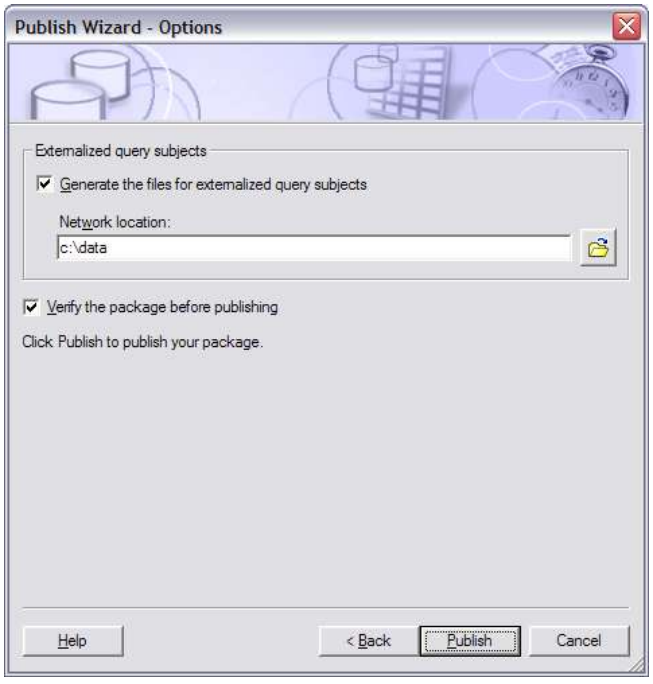
6. Create a package including only the created four (4) query subjects.



7. Given you will not need to publish this to the portal, you can publish the package to a location on the network.

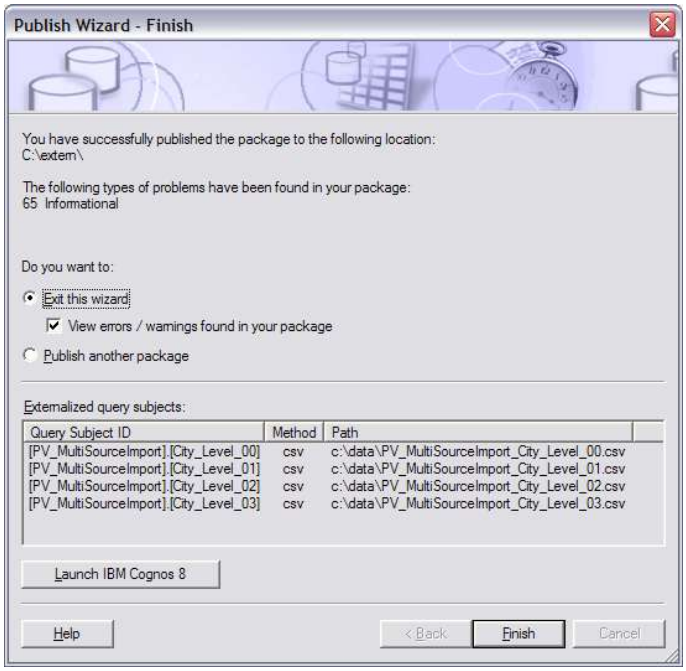


8. Accept all defaults until you get to the following screen:

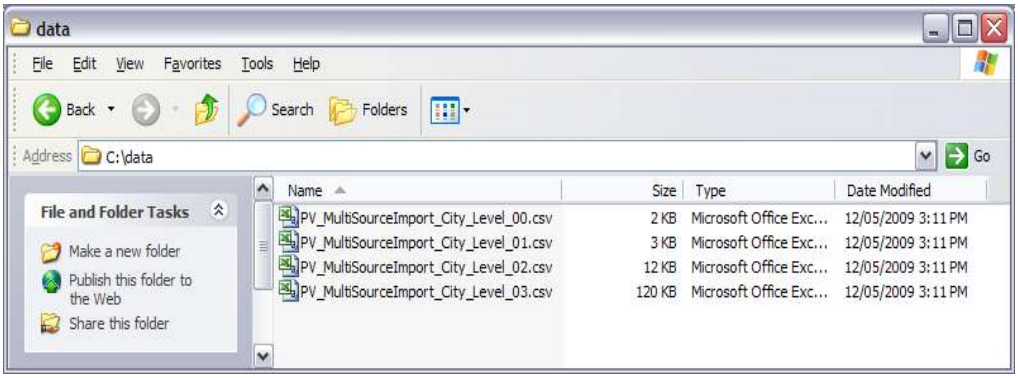


9. Select a location on the network\computer where you wish to create the CSV files. Now click Publish…

   You will eventually see the following screen once done:



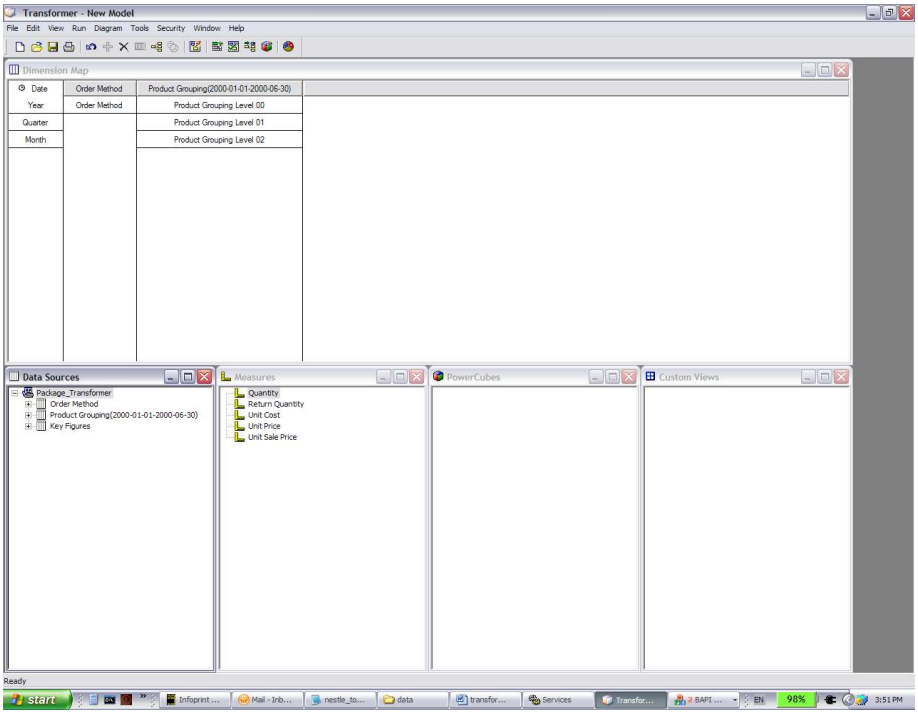
Navigating to the chosen location, you should now see the CSV files created. One should be created for each level:



7.3 Building a IBM Cognos 8 Transformer Hierarchy Using Externalized IBM Cognos 8 Framework Manager Data

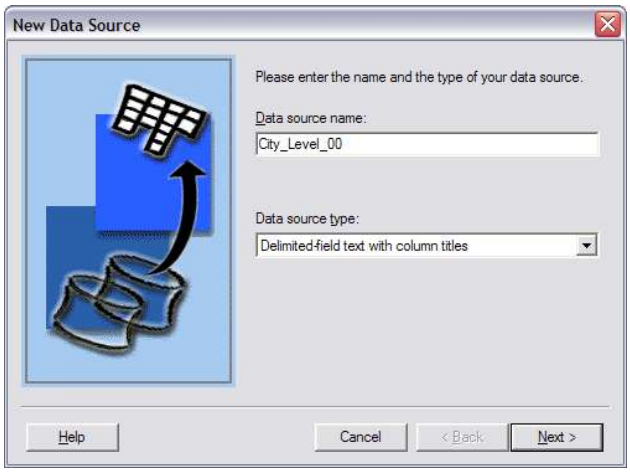
This section uses the CSV files extracted in the above Externalization section of this document to replace the automatically created City Geography Dimension obtained when creating the model from a package. Taking a close look at the CSV files created, you will notice that for each record retrieved both the "Member Unique Name" is included as well as the "Parent Unique Name". This allows us to have a parent/child relationship we can rely on to create our hierarchy within Transformer.

Again using the model created by the package approach, we now need to open transformer and remove the City Geography Dimension and the City Geography query. Once completed your model should now look like this:

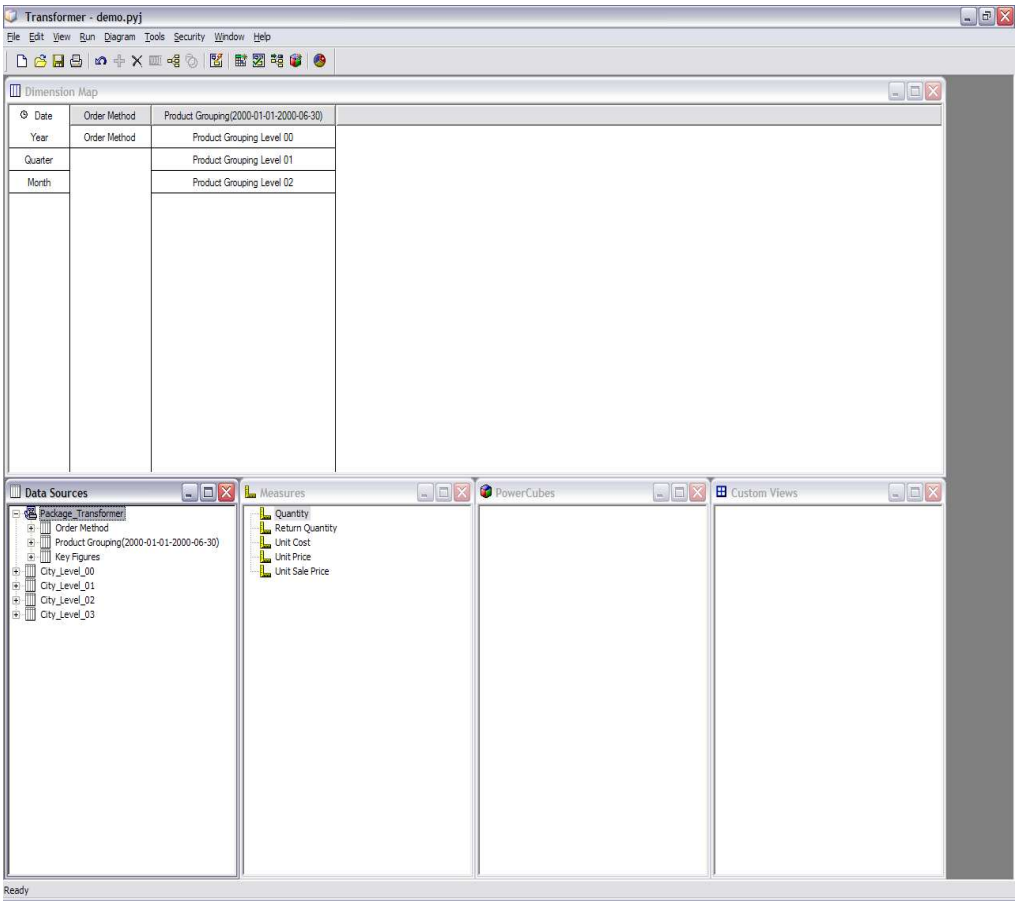


We now need to include the four CSV files as data sources for our model. To do this:

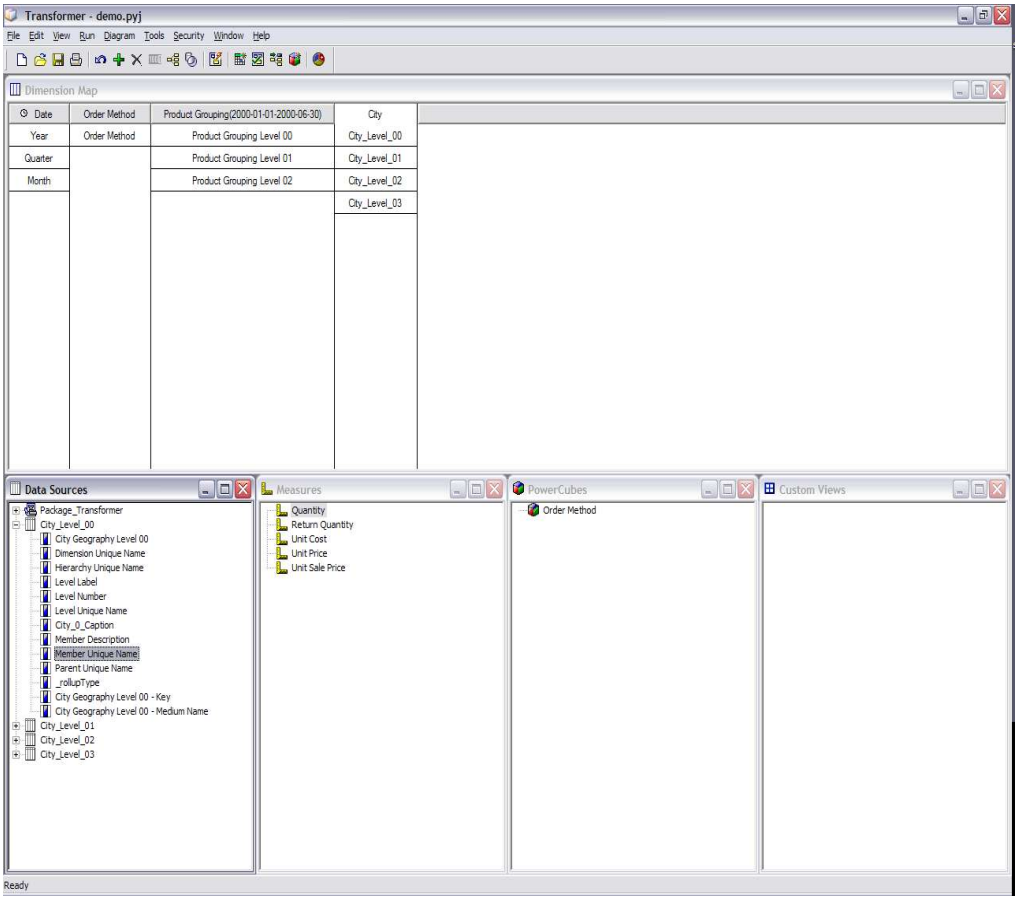
10. Right-click within the "Data Sources" window and select "insert data source".
11. Choose "Delimited-field text with column titles" and give it any name:



12. Click on next, browse to the file location.
13. Click next and do not run auto-design.
14. Perform this task for every level. Once completed you should now have the following:

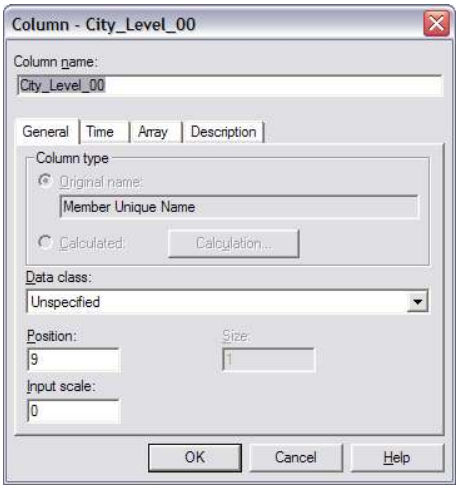


You will need to define how each query relates to each other. By expanding each newly added query, you'll notice that each query contains the parent unique name along with the member unique name.



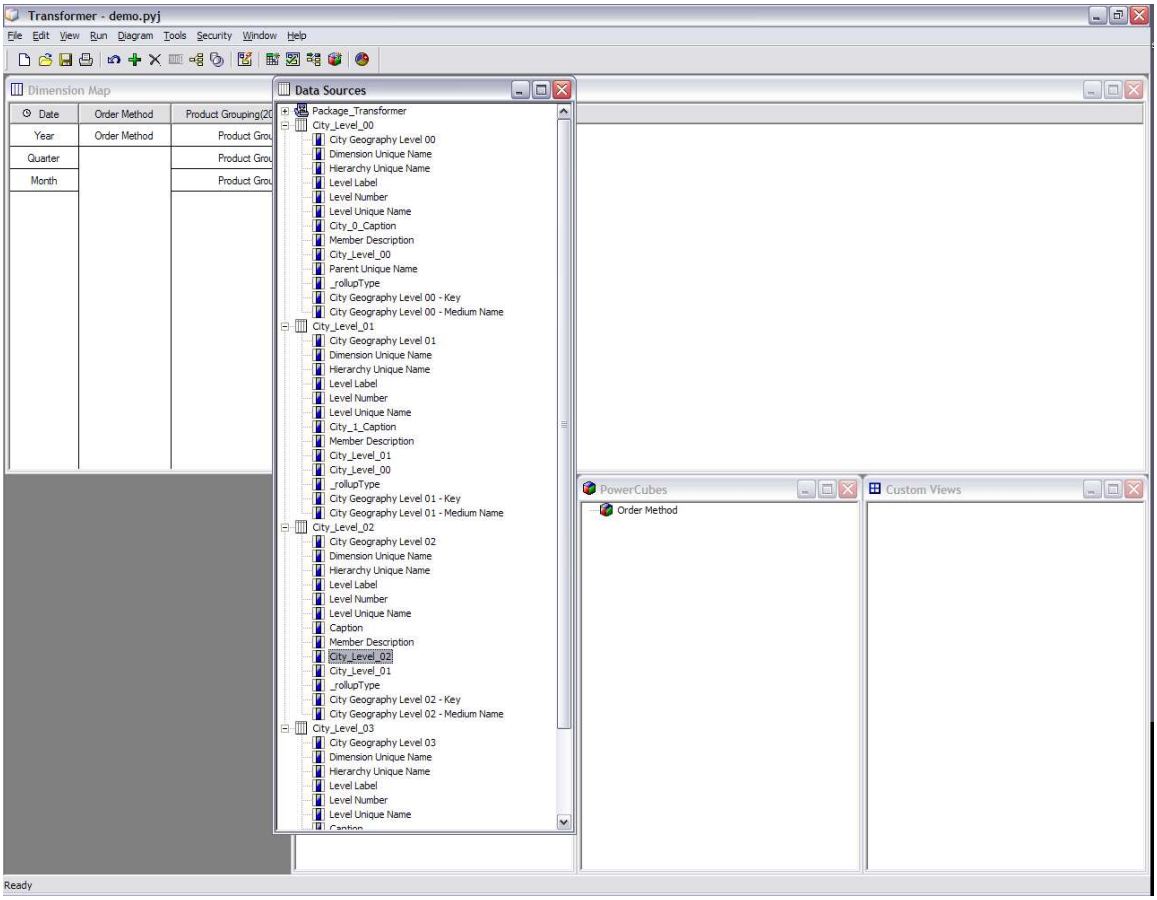
In order to establish a relationship between each level, we can rename the "Member Unique Name" column for each query to represent the actual level. For example, for query "City_Level_00", rename "Member Unique Name" to "City_Level_00". We do this by:

- Right-clicking on the "Member Unique Name" column.
- Select "Properties" and change the column name at the top:



1. Now we expand query "City_Level_01" query, rename "Member Unique Name" first, and then also rename "Parent Unique Name" to "City_Level_00".

This last step will create the relationship required between the two first queries which correspond to the top two levels. Perform these steps for each CSV query. Once done, you should end up with the following:



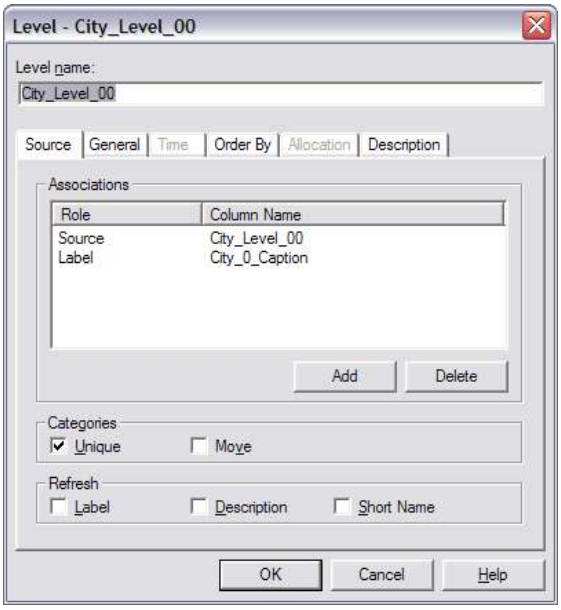
At this time, we can further prepare the queries prior to defining the dimension.

As each query contains the same column names (other then the ones we just modified), for each query you will need to find a column which contains the label you wish to use for reporting display purposes. The key may display "01" for the Country, however the "Medium Name" may contain "United States" which you may find more adequate for your reports. In many cases the caption can be utilized – however this depends on the design of your cube. A quick look through the CSV files should suffice to let you know which column is best suited. Once you've identified the appropriate column, simply rename the appropriate column as we did before for the unique names. In my case, the "Caption" column could be used for the two first levels, I needed to rename "Caption" of query "City_Level_00" to "City_0_Caption" and "Caption" of query "City_Level_01" to "City_1_Caption". This step allowed me to differentiate one caption from the other. I did not need to perform this step for the bottom two queries, as I could use "City Geography Level 02 - Medium Name" and " City Geography Level 03 - Medium Name" given they were named differently.

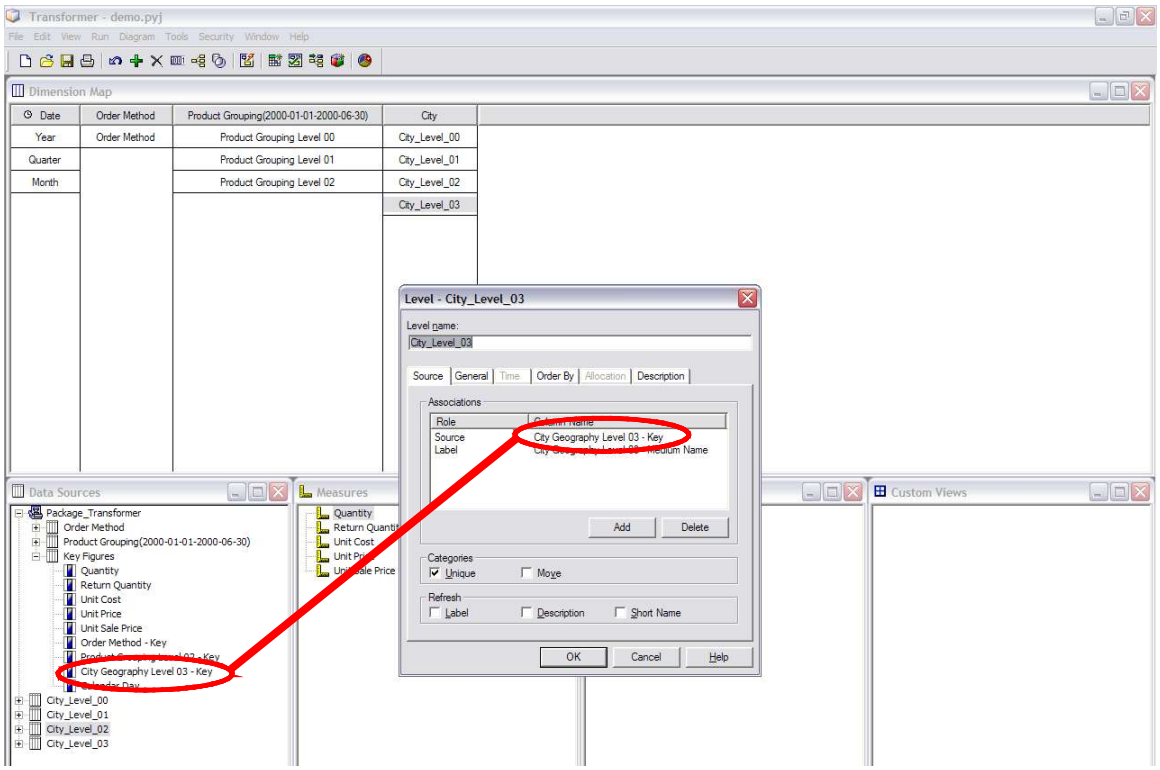
The last step is creating the actual dimensions. To do this:

2. Right-click on the dimension window and select "Insert Dimension". Give it a name and select OK.

3. Now need to drag column "City_Level_00" underneath the newly created dimension. Double-click it, the following window will be shown:



4. Under associations, notice the Source points to "City_Level_00" column.
5. You now need to add your label, in my case I added "City_0_Caption".
6. You also need to check the "Unique" check box.
7. Perform the same task for the top three levels.
8. The bottom level is a little different. We need to ensure that the column utilized in the fact query for this dimension is what is utilized as the source as illustrated below.



At this time, select ok and you should be able to build the cube.

8 Access SAP Data Sources Using IBM Cognos TM1 Package Connector

8.1 IBM Cognos TM1 Package Connector Overview

With IBM Cognos TM1 version 9.5.1, IBM® Cognos® supports connectivity to IBM Cognos 8 BI packages using the TM1® Package Connector.

IBM Cognos 8 leverages the SAP NetWeaver Business Warehouse certified Business API (BAPI) for professional, interactive, and ad-hoc reporting as well as data fetching to populate IBM Cognos 8 PowerPlay cubes. With the introduction of the IBM Cognos TM1 Package Connector, the same SAP-certified BAPI interface is utilized to access data from SAP NetWeaver Business Warehouse to load data to in-memory IBM Cognos TM1 cubes. This is possible as the IBM Cognos TM1 Package Connector utilizes the same engine as the IBM Cognos 8 Transformer application. Similar to the way a PowerPlay cube is loaded via IBM Cognos 8 Transformer, the TM1 Package Connector leverages packages that are published by IBM Cognos 8 Framework Manager.

By using the IBM Cognos TM1 Package Connector, data is fetched from SAP NetWeaver Business Warehouse via the metadata package models created by IBM Cognos 8 Framework Manager. The data calls will be performed by the SAP MDX functionality. MDX represents the multi-dimensional version of SQL with a more complex grammar. Utilizing MDX calls to SAP NetWeaver Business Warehouse allows

fetching of data independent from the InfoProvider type, which means it is possible to load data from all SAP NetWeaver Business Warehouse infoProviders such as a infoCubes, Data Store Objects (DSO), multiProviders, and infoSets.

There are three proven stages to importing an SAP NetWeaver Business Warehouse-based package using the TM1 Package Connector:

1. Create the SAP NetWeaver Business Warehouse query.
2. Create a Package in Framework Manager based upon the SAP NetWeaver Business Warehouse query.
3. Create a TurboIntegrator process that uses the TM1 Package Connector.

Within these three primary stages, there are some general guidelines that you should follow to ensure optimal performance within your IBM Cognos TM1 environment with SAP NetWeaver Business Warehouse.

8.1.1 General Principles when Building a SAP NetWeaver Business Warehouse Query

1. Rather than attempting to access a SAP NetWeaver Business Warehouse cube directly, create a SAP NetWeaver Business Warehouse query which is dedicated for the IBM Cognos TM1 Package Connector and the target TM1 cube and dimensions. This provides access to the query restrictions, variables, navigational & display attributes, and calculated & restricted key figures. This method will also enable data access to other infoProviders such as data store objects (DSO), master data infoObjects, and infoSets.

2. For the SAP query definition, include only what is needed to load into the IBM Cognos TM1 cube. Anything extra could unnecessarily extend the time to fetch data from the source.

3. In the SAP query definition, all characteristics should be placed within the **Rows** section of the query in SAP Query Designer. And their **Display Values** defined as **Key** and **Results Rows** set to **Always Suppress**.

4. All SAP key figures required to be loaded to a TM1 cube should be placed within the **Columns** section of the query in SAP Query Designer.

5. Do not include any characteristics into the Free Characteristics section of SAP Query Designer.

6. To enable use of the streamBAPI interface, which is the most efficient way to extract detail data from SAP NetWeaver Business Warehouse, an optional SAP variable should be used within the SAP query to restrict a characteristic. The optimal characteristic to use is one that slices the data evenly across all its unique members. StreamBAPI is the single most important step to improve performance and exceed the 1 million cell limitation within SAP NetWeaver Business Warehouse.

Note use of the SAP variable, combined with the IBM Cognos 8 Tansformer setting mentioned below, is also required to help trigger concurrent processing on the SAP NetWeaver Business Warehouse server.

For more information on how to induce concurrent processing on the SAP NetWeaver Business Warehouse server, see the section below entitled Performing Parallel Queries with a Segmenter Prompt.

8.1.2 General Principles when Creating a Package in IBM Cognos Framework Manager

1. Limit the number of SAP NetWeaver Business Warehouse queries to one per IBM Cognos Framework Manager package. This method will simplify the load process, and eliminate the need to use the **Show Namespace** option within TurboIntegrator processes.

2. Import only one language from the SAP NetWeaver Business Warehouse in which the target TM1 cube should reflect.

3. Keep the model simple. IBM Cognos Framework Manager is utilized as an import and package-publishing solution in this process. Do not introduce new calculations, restrictions, mappings, etc in Framework Manager when importing metadata from SAP NetWeaver Business Warehouse.

8.1.3 General Principles when Creating a TurboIntegrator Process

1. When defining a fact data load for a TM1 cube from SAP NetWeaver Business Warehouse, and when streamBAPI is enabled via the optional SAP variable, select the **Accumulate Values** Data Action. This is because the fetched fact data may have more than one value for a given intersection of data elements, so the values should be aggregated rather than over-written.

2. De-select **Show Namespace** before selecting key figures on the **Dimension** tab to limit the length of the dimension and key figure names shown in TM1. De-selecting the option will allow for better viewing when browsing the TM1 cube.

3. When selecting hierarchies from SAP NetWeaver Business Warehouse, for most cases, load one hierarchy at a time for each dimension to ensure optimal run time and to avoid inflation of the fact records. If more than one hierarchy is required for a particular dimension, separate dimension **update processes** can be created.

4. When loading attributes from a SAP characteristic to be used as a TM1 dimension alias, remember that aliases must be unique within TM1. Note it is possible to have the same descriptions within the SAP NetWeaver Business Warehouse data source, and could cause an error when loading to the dimension alias. Custom scripts can be used if the aliases are not unique within the data source.

5. After constructing and loading the TM1 cube and dimensions based on a SAP query and IBM Cognos Framework Manager package, utilize the **Cube Optimizer** to better organize the order of dimensions based on data sparsity and density. This action can reduce the amount of memory required and improve performance of the TM1 cube.

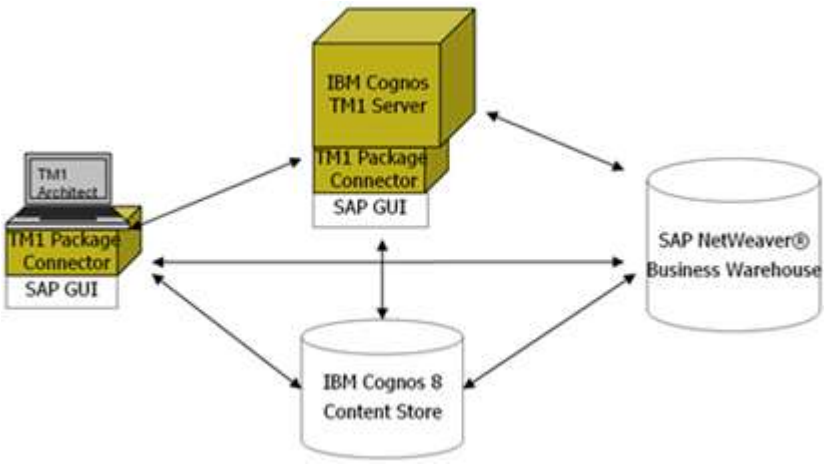
The remainder of this section is a resource to describe more detailed recommendations for working with SAP NetWeaver Business Warehouse data, creating a package in IBM Cognos 8 Framework Manager, and using the TM1 Package Connector.

8.2 IBM Cognos TM1 Package Connector Installation & Configuration

The IBM Cognos Package Connector is an optional component stored on a CD separate from the main TM1 installation disk. See Installing the IBM Cognos TM1 Package Connector in the **IBM Cognos TM1 Installation Guide** for requirements and details on installing and configuring the IBM Cognos Package Connector on Windows and Unix platforms. And consider the following when planning your installation.

1. The TM1 Package Connector must be installed on both the TM1 server and the administrative client machines where TurboIntegrator processes are being created against a SAP NetWeaver Business Warehouse package.

2. The communication between IBM Cognos and SAP NetWeaver Business Warehouse is based on remote function calls. To enable connectivity to the SAP server, 32-bit SAP RFCSDK library files and DLLs are required on both the TM1 Admin Client and the TM1 server. To obtain these files on Windows where TM1 is installed, install the SAP GUI. The illustration below is an example of such an architecture.



3. When installing with IBM Cognos BI 8.4.0, you must use a separate folder for the package connector installation and ensure the TM1_PACKAGE_CONNECTOR and TM1InterFacePath variables are pointed to the IBM Cognos 8 install location.

4. When installing with IBM Cognos BI 8.4.1, there are two install location options. The package connector can be installed in the same directory as the IBM Cognos 8 install directory. Or it may be installed in a separate folder, and ensure the variables TM1_PACKAGE_CONNECTOR and TM1InterFacePath are set appropriately.

5. Note the communication between IBM Cognos BI 8.4.0/8.4.1 and TM1 Package Connector will be performed by the Gateway URI specified in IBM Cognos Configuration. If the TM1 Package Connector is installed in a separate folder, the Gateway URI in the Package Connector configuration should match the IBM Cognos 8 configuration.

6. To invoke the ability to send multiple queries, and allow concurrent processing on the SAP NetWeaver Business Warehouse server, update the IBM Cognos 8 Transformer settings. The Transformer engine can be configured to include a new parameter called **SegmenterParallelQueryCount**.

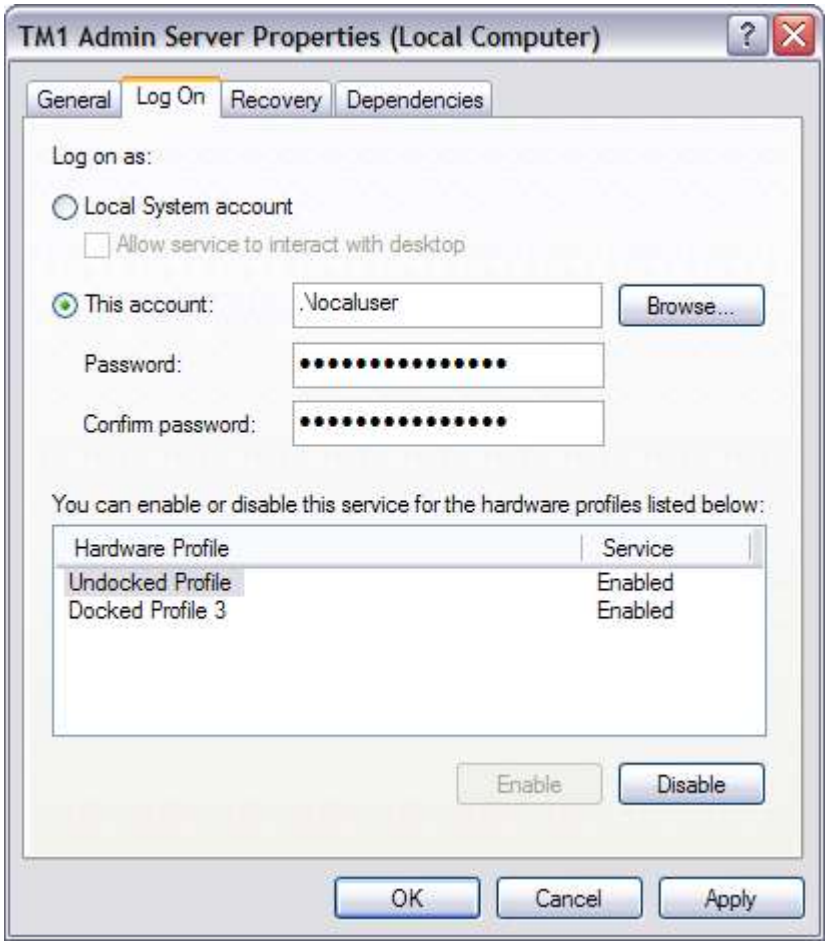
   In <C8 Install Directory>/configuration/, rename the file cogtr.xml.sample to **cogtr.xml**, and add the noted parameter. Further information can be found below in Performing Parallel Queries with a Segmenter Prompt.

7. In addition to updates to the **cogtr.xml** file for concurrent processing, it is necessary to use an optional SAP query variable. See steps to **Create a SAP Variable for Data Segmentation** for more information.

8.2.1 TM1 User Variable

Upon installation of the TM1 Package Connector, a user variable **TM1_PACKAGE_CONNECTOR** is created, and is only available to the logged in user.

Note it is possible to run the TM1 server either with the **User account** or a **Local System account**.



Because **TM1_PACKAGE_CONNECTOR** is a user variable, it is only available to the logged in user. In the example above, the variable is only available to the user named **localuser**, and the TM1 server is configured to run with this user account. Note this means that the server will not run for another named user, and the user variable is not available for another named user.

If the user variable is defined as above and in the event the TM1 server is configured to run with the Local System account, the TM1 server will not recognize the variable TM1_PACKAGE_CONNECTOR, and in turn will not run the TM1 Package Connector. In this case, the following error may be generated:

> Error Message (in English = that the TM1 server can not find the package connector .exe):
> "CCognosProxy::Connect C8Error: Spawn: could not find executable
> Error: Prolog procedure line (0): Unable to open data source
> "".CCognosProxy::Connect C8Error: Spawn: could not find executable"

In the event the TM1 server cannot recognize the user variable when the TM1 server is configured to run with a Local System Account, a system administrator can create a new **system variable** called TM1_PACKAGE_CONNECTOR to point to the appropriate install directory. Reboot the server where the system variable is defined so it will take effect. The system variable will then be available to all logged in users, and can be recognized by the TM1 server.

Note that a variable may also be added to the configuration file **tm1s.cfg** to indicate where the TM1 Package Connector is installed. To do so, add the following line to the tm1s.cfg file:

CognosTM1InterFacePath=<C8 Install Location>/bin>

8.3 Access SAP NetWeaver Business Warehouse Data with a Package in IBM Cognos 8 Framework Manager

You can leverage SAP NetWeaver Business Warehouse data in the IBM Cognos TM1 Package Connector using an SAP-based package created in Framework Manager and published to Content Manager. This is the recommended method to leverage your SAP NetWeaver Business Warehouse data. There are special considerations when using SAP-based packages created in Framework Manager.

You can use the TM1 Package Connector to import both dimensional and fact data from an SAP NetWeaver Business Warehouse query source. The following instructions describe how to rebuild an SAP NetWeaver Business Warehouse cube as an IBM® Cognos® TM1® cube. To do so, the SAP NetWeaver Business Warehouse query package must be in a specific format.

As stated before, there are three primary stages to importing a SAP NetWeaver Business Warehouse query to access both dimensions and facts using IBM Cognos TM1 Package Connector:

1. Create a BW Query in SAP Business Explorer Query Designer
2. Create a Package in IBM Cognos Framework Manager.
3. Create a TI process that uses the TM1 Package Connector.

For general information about creating packages, see "Create or Modify a Package" in the IBM Cognos 8 Framework Manager User Guide.

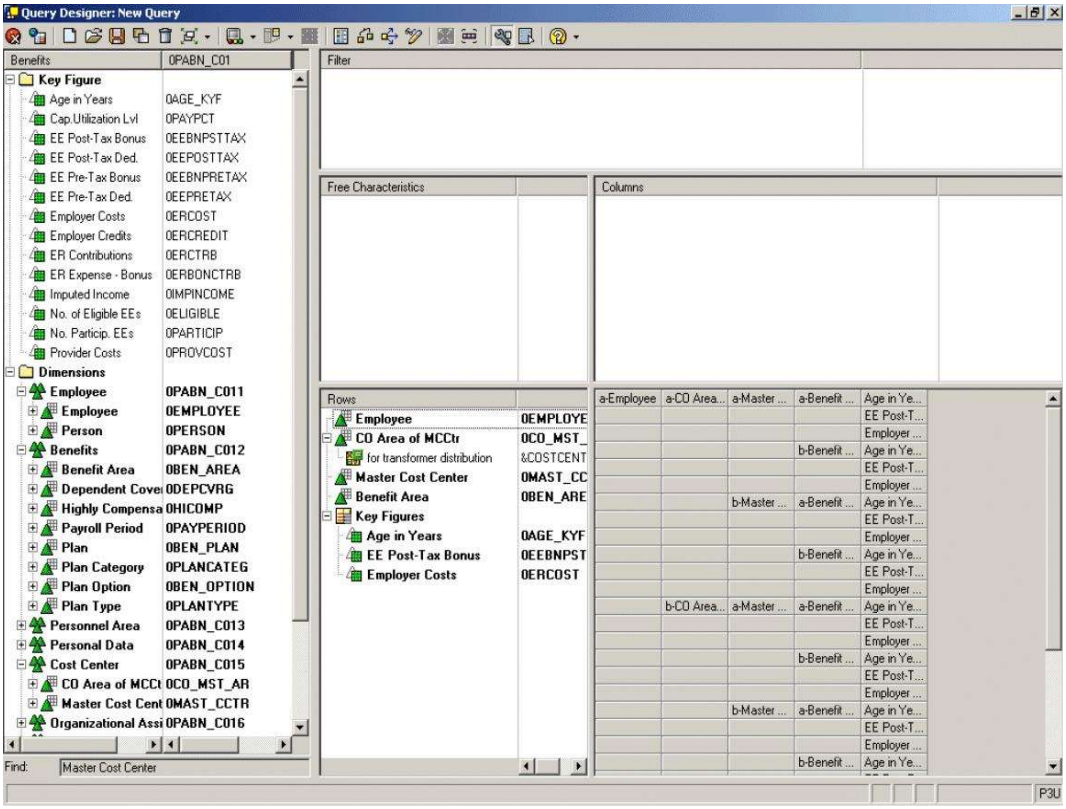
8.4 Creating a SAP NetWeaver Business Warehouse Query in SAP Query Designer

You must create a query that includes the cube that you wish to import. We recommend that you base the query on a single InfoCube in the database. A query based on multiple sources may result in SAP NetWeaver Business Warehouse errors during data retrieval.

The steps you use may vary depending on the version of Query Designer you use.

1. In **Query Designer**, click **New Query**.
2. In the **New Query** dialog box, select the information provider that contains the cube that you want to import.
3. Click the **Tools** icon  to view the technical name of the **InfoObject**.

4. Drag a characteristic that you wish to import from the **InfoObject** catalog on the left column to one of the fields on the right-hand side of the page. For example, **Columns** or **Rows**.



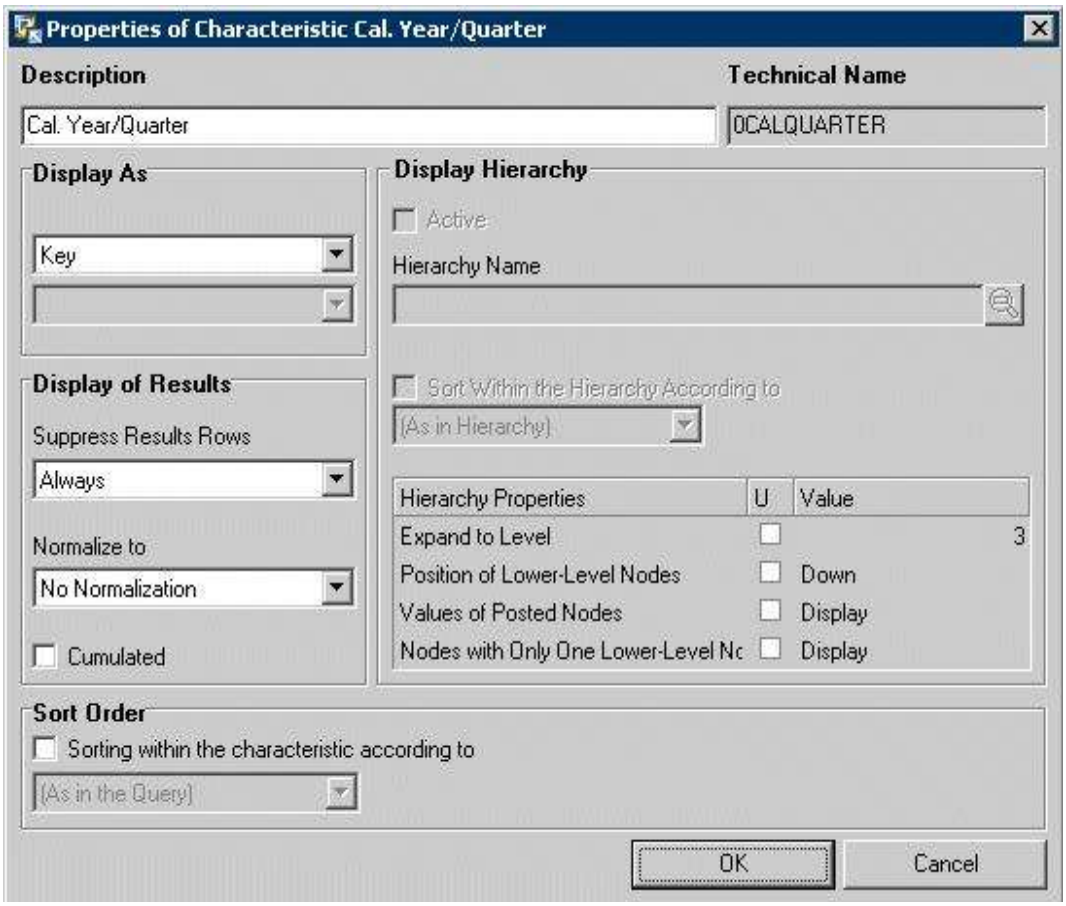
The characteristics you select will define the metadata in the cube. The characteristics must adhere to the following restrictions:

- You must have at least a single optional variable to segment data extraction requests. This may result in substantially higher throughput than regular requests.
- Select a characteristic that is representative of the data source. The characteristics can be either key figures, which will become measures in the cube, or dimensions, which will become the cube dimensions.
- Do not assign any of the characteristics a display hierarchy, either explicitly or by a variable.
- All key figures in the SAP NetWeaver Business Warehouse query must be numeric.
- Only include characteristics in the SAP NetWeaver Business Warehouse query that you wish to extract using the TM1® Package Connector. Including unnecessary characteristics increases data volume, thereby adversely affecting performance.
- Characteristics must be copied to the **Columns** or **Rows** fields of the query definition. If copied to the **Free Characteristics** or the **Filter** fields, the characteristics show as dimensions when importing from

the package but the stream extract processing used when segmented data extraction occurs is not able to fetch the values.

- If you have filters defined, they must reference only dimensions that have been included elsewhere in the query definition.
- If you include a free characteristic, no values will appear for that characteristic in the key figures extract. A filter on a free characteristic acts as a filter on the returned SAP NetWeaver Business Warehouse data. You can use this as a filter to define a subset of an InfoCube.
- Use a picklist prompt, rather than a type-in prompt for the query. A picklist prompt provides values for segmenting the data.

5. To define the metadata that will populate the cube, you must change the properties of each characteristic that you have selected for inclusion. Right-click a characteristic, and select **Properties**.
6. In the **Properties of Characteristic** dialog box, change the **Display As** value to **Key**, and the **Suppress Results Rows** value to **Always**. Note that any restriction or filter applied here will be carried forward.



7. Repeat steps 5 and 6 for each characteristic that you selected in step 4.

Note: You should only select the characteristics that you require. To avoid excessive memory consumption, and decreased system performance or failure, carefully consider what characteristics you want to include in the query. We recommend that you consult an SAP NetWeaver Business Warehouse administrator to ensure that the data volumes are not exceeded.

8. Click the **Queries Properties** icon  , and in the **Extended** tab select the **Allow External Access to this Query** check box. This exposes the query to Framework Manager.
9. Click **Save**, and provide the new query with a **Description** and a **Technical Name**. We recommend that you use the SAP NetWeaver Business Warehouse naming convention in the **Technical Name** field. That is, begin the entry with the letter 'Z' followed by an intuitive name or your standard naming convention. It is important to write down this technical name, as you will need it to find the query in Framework Manager.

You are now ready to create a variable. For more information on using the **SAP Query Designer**, see your SAP NetWeaver Business Warehouse documentation.

You may now create an optional prompt parameter for the query so the TM1® Package Connector can issue smaller queries to SAP NetWeaver Business Warehouse, and thereby retrieve the entire data set in smaller chunks. This technique must be used where the volume of data would otherwise cause errors on the SAP NetWeaver Business Warehouse server.

8.4.1 Specifying a Segmenting Prompt for a SAP NetWeaver Business Warehouse Query

A segmenting prompt is used when querying a SAP NetWeaver Business Warehouse data source for fact data. Also known as a SAP BEx variable, a segmenting prompt ensures that the query retrieves a representative sampling of the fact data.

A segmenting prompt can be single value, multiple value, or a range. If you specify a range, it must be inclusive, including a value for both the beginning and end of the range. A segmenting prompt must be optional and have no default value specified.

Multiple prompts, or SAP BEx variables, are allowed. If you have multiple prompts, you can select one as the segmenting prompt. The segmenting prompt should not have values specified in any query. Mandatory prompts that are not specified as the segmenting prompt must have a value specified. Optional prompts that are not specified as the segmenting prompt may or may not have a value, as necessary.

8.4.2 Guidelines for Extracting SAP NetWeaver Business Warehouse Fact Data

There are no set rules for variable usage when extracting SAP NetWeaver Business Warehouse data for use in the TM1® Package Connector. However, you must be careful not to request too much data that could potentially perform poorly or error out with out-of-memory messages within your SAP NetWeaver Business Warehouse environment.

A basic guideline to follow is that when a variable is utilized to segment the data extraction, the TM1 Package Connector will first fetch all members that exist for the dimension against which the variable is defined. After this, the TM1 Package Connector will perform individual data fetches to extract the fact data for each of the individual members within the dimension in order to satisfy the variable.

This allows the TM1 Package Connector to break down your data extraction into manageable chunks that the SAP NetWeaver Business Warehouse server can handle. There are no set standards as to which dimension to apply it to. To achieve optimal performance, you must understand your SAP NetWeaver Business Warehouse data and determine which dimension evenly breaks up the factual data.

You must choose carefully which dimension to define the variable on. It may require some experimentation to achieve optimal performance. For example, you may have a [COUNTRY] dimension that contains three countries as members, United States (US), Canada (CA), and Mexico (MX). If most of the business is performed in the US (90%) and the remaining business (10%) is recorded against Canada and Mexico evenly, this dimension would not evenly split up the data. The resulting queries would have one very large request (US) and two small ones (CA and MX). Therefore, this dimension would not be a good candidate.

You do not want to apply a variable on a dimension that would cause too many very small requests. For example, [0MATERIAL], a dimension often utilized in SAP NetWeaver Business Warehouse environments would probably not be a good candidate because it would cause too many small requests to be performed.

You may have a dimension defined for [COSTCENTER] that evenly divides up the data for 10 distinct cost centers that may serve to segment the data evenly. Another good alternative may be calendar year or calendar month because it may divide your data into sections that perform adequately.

Note it may not be necessary to apply any variables to queries for data extraction. Some extractions will perform perfectly well when no variables are applied.

No formula can be applied as no two environments are alike. However, a cautious approach is recommended to avoid disrupting your SAP NetWeaver Business Warehouse environment.

8.4.3 Steps to Create a SAP Variable for Data Segmentation

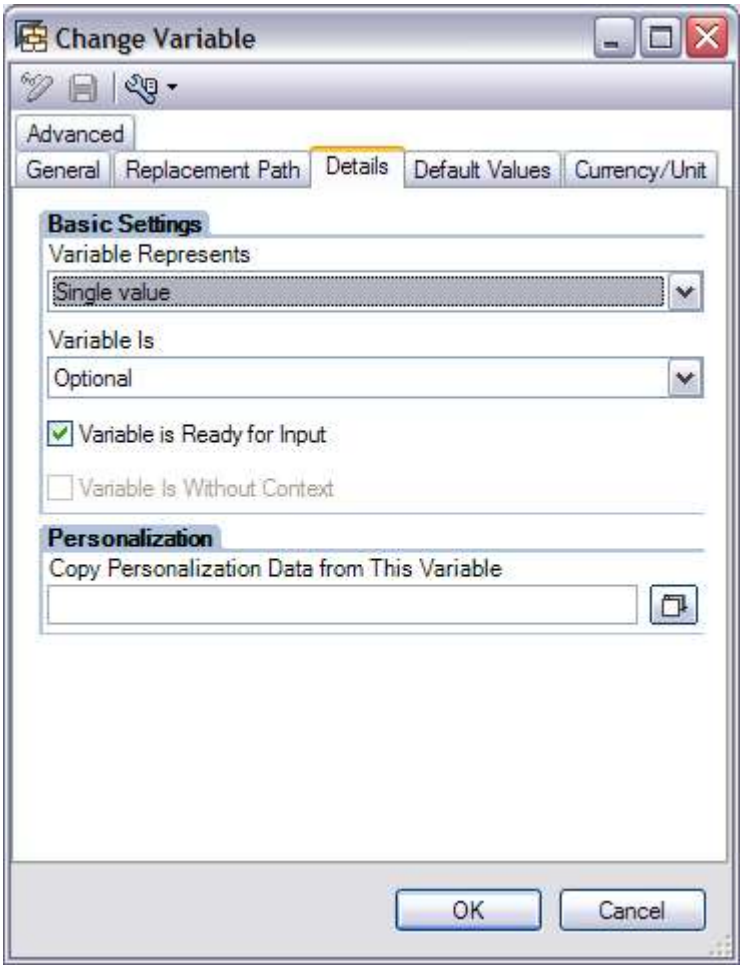
1. In **Query Designer**, right-click a characteristic that you have selected in the previous procedure and select **Restrict**.

To ensure that data is distributed evenly, select a characteristic that is representative of the cube and will not result in a large number of values. You want a resulting variable where the number of rows for each value of the variable is similar; you do not want a resulting variable that is too fine-grained (for example, not many rows per value resulting in an excessive number of queries), nor do you want a variable that is too coarse-grained (for example, more than one million rows per value).

2. In the **Selection Values for ...** dialog box, choose show **Variables** in the drop-down list. Then select **Create New Variable**.

Note: If one of the characteristics that you have chosen already has a variable, you can avoid creating a new variable and skip to step 7 of this procedure.

3. In the **Change Variable** page, type a **Variable Technical Name** and **Description**, and leave the defaults for the **General** tab. Click the **Details** tab.
4. In the **Details** page, select **Single Value**, **Multiple Single Values**, or **Interval** in the **Variable Represents** field, **Optional** in the **Variable Is** field, and ensure the checkbox for **Ready for Input** is selected.



5. In the **Default Values** page, ensure that the **Default Value** field is empty. Click **OK**.
6. Confirm the variable **Description** and **Technical Name**, and click **OK**.
7. Select the variable and click the right arrow  to move the selected variable over to the **Chosen Selection** window, click **OK**, and save the query. You are now ready to import the query in Framework Manager.

8.5 Creating a Package in IBM Cognos 8 Framework Manager

To create a package in Framework Manager you must:

- Import the SAP NetWeaver Business Warehouse metadata using the MetaData Wizard described here.

  Framework Manager imports the SAP NetWeaver Business Warehouse query into a model, and defines a package that it exports to Content Manager.

  When importing, note the following:

- The dimensions selected in the SAP NetWeaver Business Warehouse query are available in the **Dimension Folders** in the **Import** dialog box.
- Each dimension will contain at least one default hierarchy.
- Always select the primary hierarchy whose name matches the hierarchy.
- If other hierarchies are available, select one that gives the desired set of levels within the hierarchy.
- Framework Manager imports time dimensions into the model from the SAP NetWeaver Business Warehouse data source only if a configuration parameter is turned on. See Importing Metadata from SAP NetWeaver Business Warehouse for details. Setting the configuration as a time dimension is a global entry; every imported dimension will then be treated as time strings.

- Create a package.

  When creating the package for publishing to Content Manager, hide the primary hierarchy in those dimensions where you imported two hierarchies. The primary hierarchy is necessary, and must be in the package for querying to work correctly. You can hide the hierarchy if you don't want it visible.

8.5.1 Importing Metadata from SAP NetWeaver Business Warehouse

Whether or not a Dimension is a Time Dimension is determined when the metadata from the SAP NetWeaver Business Warehouse Cube is imported into a model definition in Framework Manager.

For this to be done correctly, a configuration setting must set. By default, the value is not set.

In the "configuration" directory under the location where Framework Manager was installed, there is a configuration file for controlling SAP NetWeaver Business Warehouse access. It is named "sapbw_config.xml". The installer does not directly install this file. Instead it installs a file named "sapbw_config.xml-sample". If "sapbw_config.xml" does not exist, create it by either copying "sapbw_config.xml-sample" or renaming "sapbw_config.xml-sample".

In "sapbw_config.xml", there are the following lines:

```
<provider name="SAPBWODP">
    <!-- Must be activated for getting staging datatypes -->
        <parameter name="UseStgDTypes" value="true"/>
    <!-- Controls the use of a faster version of GetMembers.
```

```
 Default is "true".-->
        <parameter name="UseFastGetMembers" value="true"/>
</provider>
```

Ensure that "UseStgDTypes" has value = "true". By default, the value is "false".

This must be done before FrameWork Manager is started and before you import the metadata from SAP NetWeaver Business Warehouse to create the model.

What this change does is allow the metadata import to recognize that a Dimension in the SAP NetWeaver Business Warehouse Cube is a "Time" Dimension. That is a Dimension where the members of the lowest Levels in the Dimension have key values that are dates.

8.5.2 Steps for Importing Using the Metadata Wizard

1. In Framework Manager, click **Create a new project**.
2. Complete the fields in the **New Project** dialog box. Click **OK**.
3. Complete the steps in the **Metadata Wizard**. When prompted to select a data source, if you need to create a new data source, click **New...**
4. In the **Select Objects** page, locate and select the query that you defined in SAP NetWeaver Business Warehouse Query Designer in the previous stage.
5. Complete the remaining screens in the **Metadata Wizard**, accepting the default values, and click **Next**. This will generate dimensions and import the metadata.
6. At the final wizard screen, verify the results, and click **Finish**.

8.5.3 Steps for Creating a Package

1. Click the **Packages** folder, and from the **Actions** menu, click **Create**, **Package**.
2. In the **Provide Name** page, type the name for the package and, if you want, a description and screen tip. Click **Next**.
3. Select the query that you imported in the previous section.
4. In the **Define objects** page, when hiding or excluding child objects from the package, you must select each of them individually. Excluding parent objects also exclude all of its children. Note that excluding (or unselecting) many objects from larger cubes will require a significant amount of time.

   Note: Framework Manager supports ctrl+shift and alt+shift functionality. Use these keystrokes to select multiple objects that you wish to include or hide in the cube. For example, if you wish to only include two items in a large branch, select the entire branch, then use ctrl+shift to de-select the items you wish to include, and hide the remaining selected items.

For more information about including, excluding and hiding objects, see "Create or Modify a Package" in the Framework Manager User Guide.

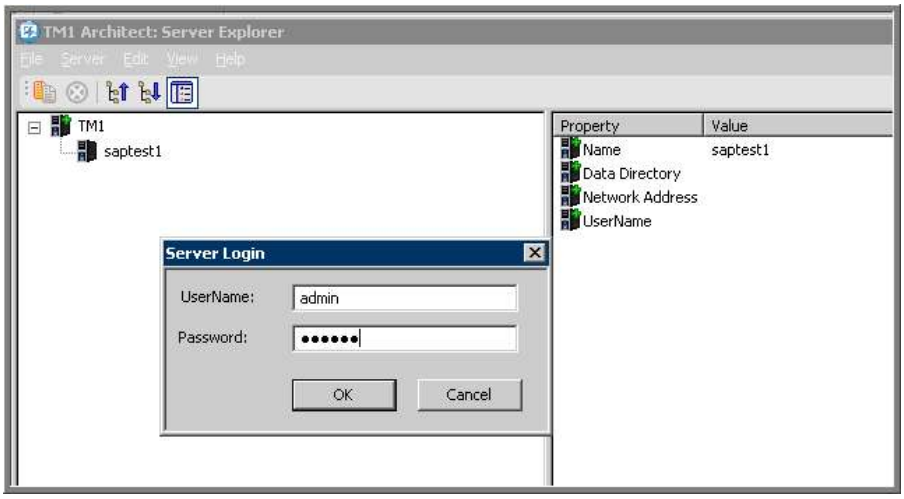
5. Choose whether to use the default access permissions for the package:
   - To accept the default access permissions, click **Finish**.
   - To set the access permissions, click **Next**.
6. When you are prompted to open the **Publish Package Wizard**, click **Yes**.
7. Select the default values, and click **Publish**. This will publish the package to the content store, and will allow you to access the package in TM1®.
8. At the final screen verify the results, and click **Finish**.

You are now ready to create a model in IBM Cognos TM1.

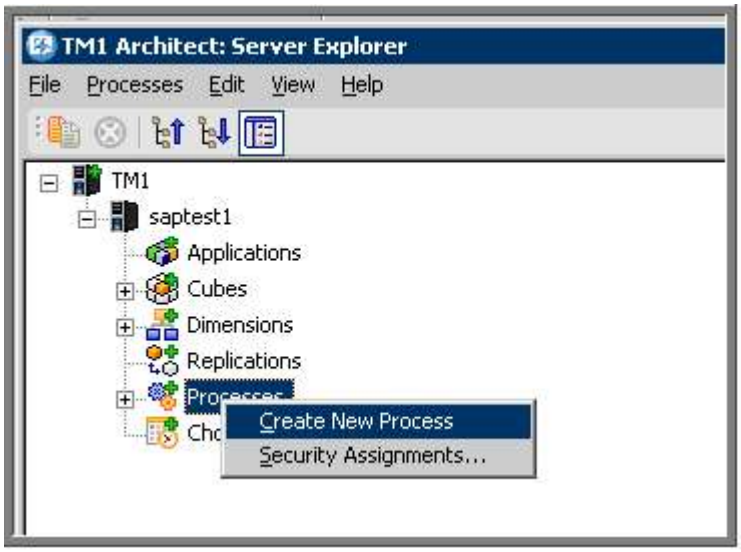
8.6 Import SAP NetWeaver Business Warehouse Data into a IBM Cognos TM1 Cube

Upon a successful publish of the SAP-based package, perform the following steps which are necessary within IBM Cognos TM1 Architect to load data into a IBM Cognos TM1 cube.

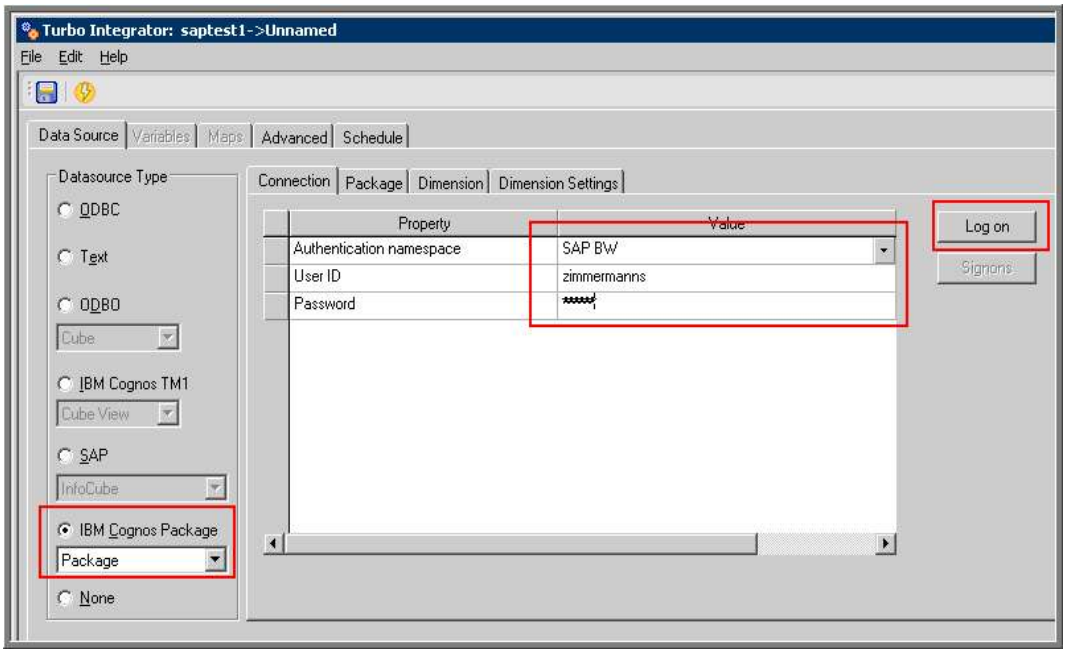
1. Start TM1 Architect and logon to TM1 Server.



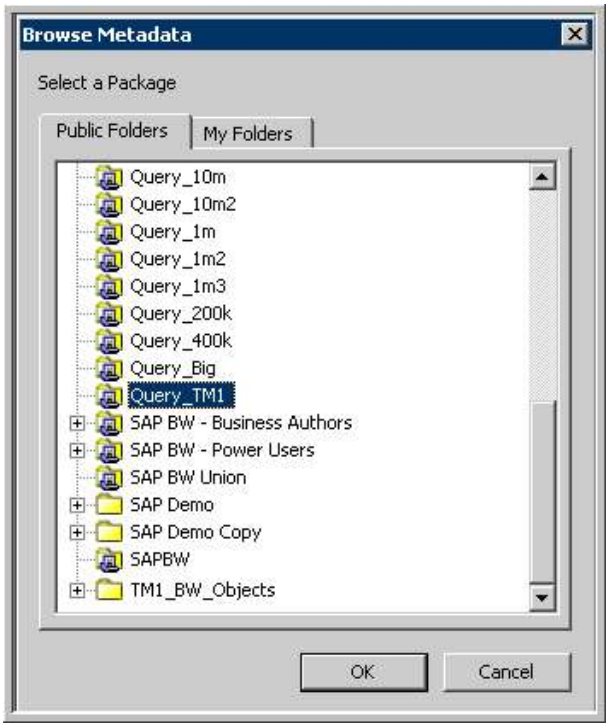
2. After connecting to the TM1 server, create a new TurboIntegrator processes. Right-click **Processes** -> **Create New Process**.


TM1 Architect: Server Explorer
File Processes Edit View Help
TM1
saptest1
Applications
Cubes
Dimensions
Replications
Create New Process
Security Assignments...

3. In the TurboIntegrator window, select **IBM Cognos Package**. Depending on the namespace configured in IBM Cognos 8, you can find the package within the appropriate authentication namespace. In this case the package has been published within the namespace "SAP BW" which requires authentication. To login, enter the appropriate user credentials, and click **Log on**.

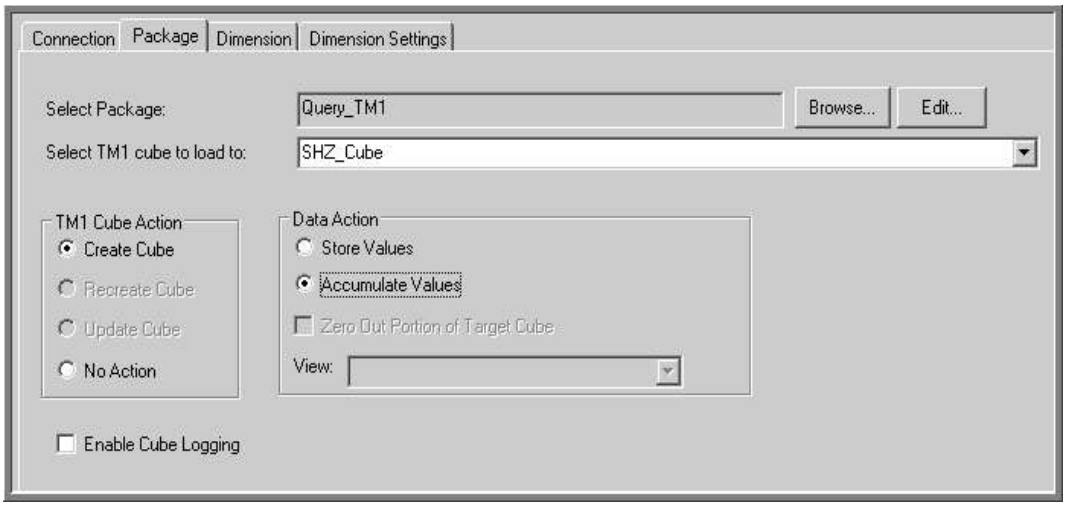


4. After establishing the connection successfully, go to the **Package** tab and press the "Browse" button to select the Cognos package we want to use. If the logon button is not pressed, the login happens while switching tabs.



5. Depending on whether there is a need to update or recreate an existing cube or to create a new cube, select an existing cube from the combo box or type in a new name. In this instance, we are about to create a new cube and chose "SHZ_Cube" as a new name.

6. When defining a fact data load for a TM1 cube from SAP NetWeaver Business Warehouse, and when streamBAPI is enabled via the optional SAP variable, select the **Accumulate Values** Data Action. This is because the fetched fact data may have more than one value for a given intersection of data elements, so the values should be aggregated rather than over-written.



7. On the dimension tab, since we only have one SAP query with the Framework Manager package, **deselect** the option for **Show Namespace**. This will shorten the name of the dimension by removing the namespace prefix.

Note that once key figures are selected in the following steps, this option cannot be changed within the same TurboIntegrator process.

8. Specify a name for each characteristic we want to import, including the measures. Note that navigational attributes will show up as a dimension on the dimensions tab. For each dimension where an action is defined as **create** or **update**, a new TurboIntegrator process is created which will build the dimension.

Note you may encounter an error in the event you attempt to select the measures as stated in the next step before providing a dimension name for the measures. To avoid this error, be sure to name and select the measures in the recommended sequence.

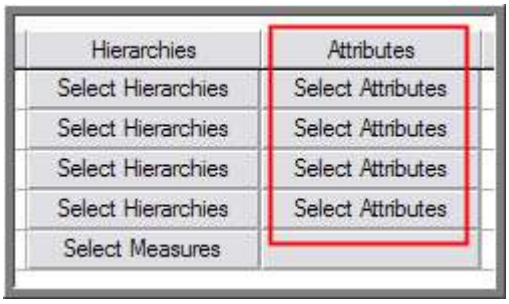
9. Click the Select Measures button to ensure the SAP NetWeaver Business Warehouse key figures are imported. 

Then choose **Select All** since the SAP query should contain only what we need.

10. Choose the appropriate hierarchies for each dimension with the **Select Hierarchies** button. When selecting hierarchies from SAP NetWeaver Business Warehouse, load one hierarchy at a time per dimension to ensure optimal run time and to avoid inflation of the fact records. For a particular fact data load, if multiple hierarchies are selected for a single dimension, multiple measure queries will be spawned to fetch all combinations of the hierarchies of each dimension. If the hierarchies contain the same leaf-level elements, this process can result in the inaccurate inflation of the fact results within the TM1 cube. However, if the alternate hierarchies of a characteristic contain distinct sets of leaf elements, multiple hierarchies could be loaded in the fact data load.

    If more than one hierarchy is required for a particular dimension and they contain similar leaf elements, separate dimension **update processes** should be created.

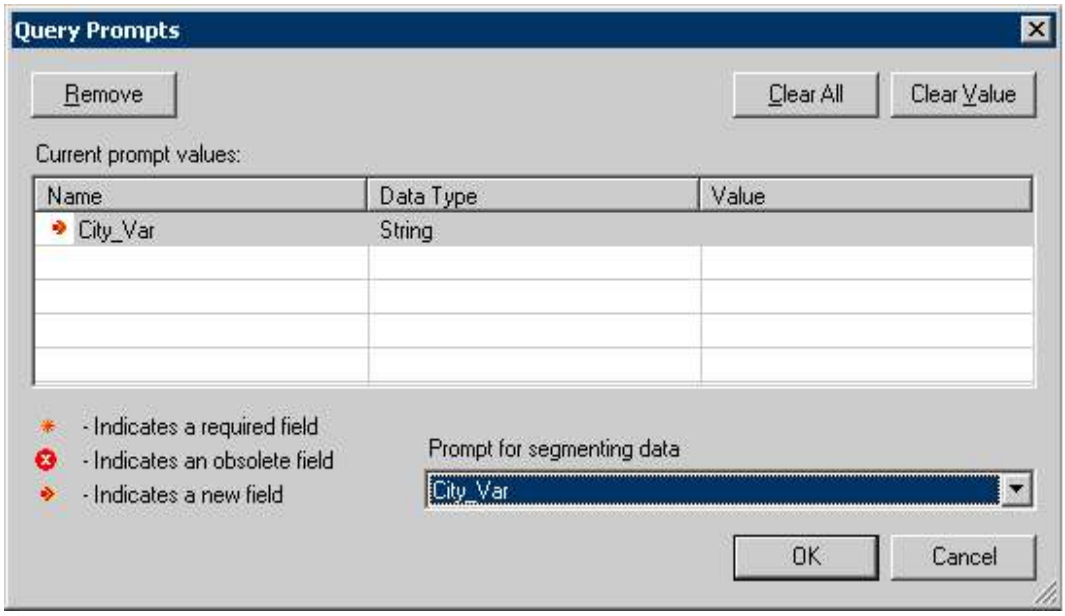
11. Select additional attributes of a dimension to load for more texts or alias names by clicking the **Select Attributes** button for the relevant dimension.



12. Now we can choose the appropriate variable to perform the data segmentation. To do this, select the **Prompts** button. We need to choose the variable that was defined during the definition of the SAP NetWeaver Business Warehouse query. It is this variable which can be used to reduce the amount of data to download as well as to take advantage of multithreaded download as mentioned above.

    By pressing the **Prompts** button at the bottom of the grid, a selection dialog opens.

13. In the **Prompt for segmenting data** list, select the prompt for segmenting the fact data. Only valid variables are listed which were defined within the SAP infoQuery.



14. Ensure that the segmenting prompt does not have a default value specified.

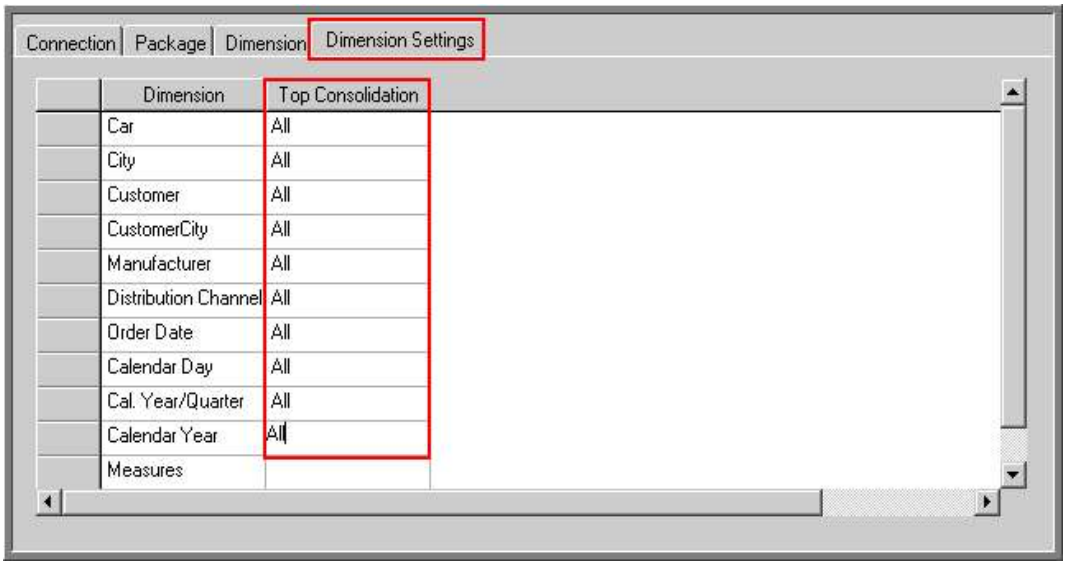
    Tip: To clear the values for a prompt, click the prompt in the **Current prompt values** list, and click **Clear Value**.

15. Ensure that any mandatory prompts listed in the **Current prompt values** list have a value specified. Click **OK**.

16. It is useful to specify a top consolidation node for each imported dimension, which helps to aggregate all data along the dimension. This can be done on the **Dimension Settings** tab.

    If you want to create a top-level consolidation for the dimension, enter the name of the top-level consolidation here.

    The resulting dimension will include a consolidation with the name you entered. For example, if you enter All in **Top Consolidation**, the dimension includes a top level consolidation named All with all imported elements as children of the consolidation. This is useful when wanting to validate data back to SAP NetWeaver Business Warehouse.



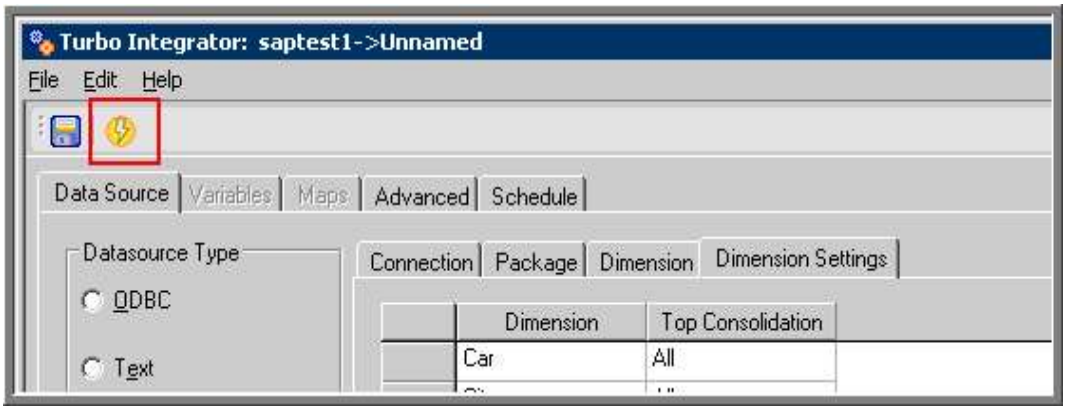
17. When there are mapped dimensions, hierarchies and measures, you can test the query by clicking **Test Queries**.

    Test Queries triggers a query execution before the TurboIntegrator run. It can be used to pre-test if the queries run successfully and to supply missing prompt values or sign-on information.

18. **Save** the TurboIntegrator process and you will be prompted to name the process. Enter a name, and click **OK**.

19. Depending on the "action" the dimensions are set up to perform, saving the process creates one process per dimension, plus one process for downloading the facts. Each new process for characteristic and measure dimensions will follow the naming convention of **<ProcessName>_<Dimension Name>.** It is not necessary to execute the children processes separately as the 'master' process will execute all of them.

20. The process can be run by pressing the **Execute** button.



8.6.1 Importing a Single Dimension or Hierarchy

You can use the Dimension pull-down option on the Data Source tab in the TM1 TurboIntegrator process as a quick way to define a single dimension or load a separate hierarchy.

1. Right-click **Processes** -> **Create New Process**.

2. Choose **Dimension** from the IBM Cognos Package option pull-down, then authenticate to the appropriate namespace. Then open the **Dimension** tab.

3. Locate the appropriate package. Click the **Browse** button to select from available packages.

4. Identify the **Dimension to load from:**.

   The pull-down lists the dimensions available in the selected package.

5. Identify the **TM1 Dimension to load into:**

   The pull-down lists the dimensions available if you are updating an existing dimension.

6. Select a **TM1 Dimension Action** just as you would for any other data source.

7. Identify the **Top Consolidation**:

8. If needed, select a hierarchy with the **Select Hierarchies** button.

9. Define attributes, if necessary with the **Select Attributes** button.

10. If desired, you can test the query by clicking **Test Queries**.

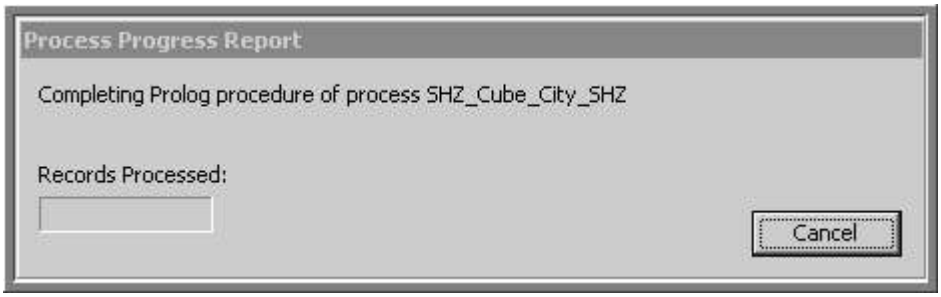
11. **Save** the process, and name the process as you wish, and **Run.**

8.7 Running TM1 processes to Fetch SAP NetWeaver Business Warehouse Data

While running the TM1 process to load a TM1 cube, the prolog section of the main TurboIntegrator process calls each dimension process first. After the dimension builds are finished successfully, TM1 TurboIntegrator starts sending measure queries

to SAP NetWeaver Business Warehouse to fetch fact data, and begins processing the data section of TurboIntegrator process.

It may not appear that any progress is done in the "Records processed" window during the import of a dimension as the screenshot below shows. And only the fact download may show progress on the counter.



Although it may appear as though no records are loading for a particular dimension, this is typically not the case. By calling of transactions SM04 and SM50 using the SAPGUI, it is possible to monitor the activity on the SAP NetWeaver Business Warehouse server. The following screenshot shows the required memory for a larger dimension. In this case, the extract needed 2.752 MB of memory.

Clie...	User	Terminal	Transaction	Time	Sess.	Type	Megabyte
800	DEMO_MS	boed51n3.boebling		11.21.08	1	RFC	2.752
800	DEMO_MS	boed51n3.boebling		11.21.06	1	RFC	6
800	TM1ADMIN	boed51n3.boebling		10.32.40	1	RFC	2
800	ZIMMERMANNS	boed51n3.boebling		11.21.03	1	RFC	2
800	ZIMMERMANNS	L3L0830-6457A26	SM04	11.25.29	1	GUI	7

Note that when extracting data for TM1 dimensions, a large amount of memory consumption on the SAP NetWeaver Business Warehouse server could result. In this case, SAP NetWeaver Business Warehouse reads the **default measure** and performs an aggregation on it, which can cause a high allocation of server resources on the SAP NetWeaver Business Warehouse.

An option to reduce the amount of needed server resources during the dimension load is to analyze the requested aggregates, and to build them for the cube in SAP NetWeaver Business Warehouse. In this way, SAP NetWeaver Business Warehouse should be able to deliver the requested data much faster.

8.8 Improving Load Performance

When looking to improve the speed of data loads from SAP NetWeaver Business Warehouse into a TM1 cube when using the TM1 Package Connector, consider the following:

8.8.1 Performing Parallel Queries with a Segmenter Prompt

If you have defined a variable within the SAP query to segment the SAP NetWeaver Business Warehouse fact data extraction, you can set a preference for the IBM Cognos TM1 Package Connector to send multiple queries to the SAP NetWeaver Business Warehouse server. This will allow the SAP server to process the queries concurrently and improve performance of the fact data load.

Note the following steps will only work if you have defined the appropriate variable within the SAP query for data segmentation, and referenced it correctly within the TM1 TurboIntegrator load process. For more information on proven methods to build the SAP variable for data segmentation, see the section entitled **Creating a SAP NetWeaver Business Warehouse Query in SAP Query Designer**. For more information on how to correctly reference the SAP variable within the TM1 TurboIntegrator process, see the section entitled **Import SAP NetWeaver Business Warehouse Data into a IBM Cognos TM1 Cube**.

1. Locate the installation folder for TM1 Package Connector, navigate to the Configuration folder and open the **cogtr.xml** file in a text editor (preferably in an XML-aware editor).
2. Add the following entry to the "Transformer" section of the file:

```
<Preference Name="SegmenterParallelQueryCount" Value="6"/>
```

3. Set the value to the number of parallel queries you want the TM1 Package Connector to issue. By default, it issues them one at a time.
4. Save the file.

TM1 Package Connector will now execute measure queries in parallel based on the value you specify. For example, you define an InfoQuery optional variable on month and there are 48 months in the characteristic. You specify this variable as the segmenter prompt for the measure dimension. The TM1 Package Connector will execute up to 6 queries in parallel (one for each month), which may greatly increase the rate of fact data extraction.

To confirm multiple queries are sent from the TM1 Package Connector, you can view the Windows Task Manager where it is installed and look for the process **TM1Interface.exe**, and notice the number of threads it is using. The number of threads will increase substantially during the fact data load. To confirm the queries are processed concurrently on the SAP server, you can look at the number of SAP dialog processes spawned by the fact data load with SAP transaction SM50.

Consult with your SAP administrator to ensure that your data extraction queries do not negatively affect the SAP NetWeaver Business Warehouse environment for other users.

8.8.2 Other Options to Improve Load Performance

Since this IBM Cognos TM1 connection to SAP NetWeaver Business Warehouse is based on existing IBM Cognos 8 BI technology to retrieve data and metadata to build and populate dimensions and cubes, we can apply some of the performance practices as described in the sections contained in this cookbook to speed the access to data. Options may include:

1. Update parameter settings within the configuration file sapbw_config.xml.

   In particular, consider the values for these four parameters:
   - UseMDXToRetrieveMembersLimit
   - UseMDXToRetrieveMembersFor
   - UseFastGetMembers
   - UseFastGetMembersFor

   See section **2.13 The sapbw_config.xml Configuration File** for more details.

2. Application of SAP NetWeaver Business Warehouse performance measures, for example SAP cache or cube aggregates. Refer to section **2.10 SAP NetWeaver Business Warehouse Performance Measures that Compliment IBM Cognos 8.**

3. Include filters and restrictions in the SAP infoQuery from within the 'filter' tab in SAP Query Designer.

8.9 Tracing, Monitoring, and Trouble-Shooting

8.9.1 Enable SAP Logging in IBM Cognos TM1

To log SAP specific imports on the TM1 side, the log4c logging mechanism of TM1 can be used. To enable logging, the appropriate logger needs to be set to debug. The logger can be set in the tm1s-log.properties files of TM1.

```
log4j.logger.TM1.Sap=DEBUG
log4j.logger.TM1.Cognos=DEBUG
```

After the changes have been made to the properties file, the server does not need a restart. The changes are picked up 60 seconds after the changes have been written to the file.

NOTE:
The tm1s-log.properties files need to reside in the same folder as the tm1s.cfg file. Also note the logger names are case sensitive.

The **Sap logger** logs all data related issues. This includes source data and column descriptions for each line which is retrieved from the data source. The logging is very detailed and may produce huge logging files. Use this only when absolutely necessary and all other trouble-shooting options have been exhausted.

The **Cognos logger** logs any type of connection related information. If something fails or any exception is raised during data download a record is logged as well.

8.9.2 BAPI Tracing

Besides the logging at the query level, it is also possible to trace at the API level responsible for the communication with SAP NetWeaver Business Warehouse. The communication between the SAP NetWeaver Business Warehouse server and IBM Cognos is performed by the BAPI Interface. Like for IBM Cognos Transformer, there is a special configuration to activate tracing and log runtime measurements. By default, BAPI tracing should be switched off, except when it is necessary to investigate performance or SAP-related issues.

To invoke BAPI tracing, you will need to perform the following changes:

1. Temporarily quiet the IBM Cognos 8 environment to keep users off the system until tracing is complete. This will ensure only the appropriate runtime measurements are captured within the generated log file.

2. Turn BAPI tracing on.

    a. For IBM Cognos 8.4.0:

    Copy the file bapiint_config.xml to a backup, located at <IBM Cognos installation directory>/configuration/.

    Change parameter settings in <IBM Cognos 8 install directory>/configuration/**bapiint_config.xml**.

    <bapiTraceLevel value="200"/>
    <bapiTraceTabDmp value="true"/>
    <bapiTimeKeeperLevel value="3"/>
    <bapiTraceCtrlFile value="false"/>

    b. For IBM Cognos 8.4.1:
    To activate tracing, create a new file named **bapitrace.on** with notepad, etc, and place the file in <IBM Cognos install directory>/configuration/.

3. Run the appropriate TM1 Package Connector tests that will make data requests from SAP NetWeaver Business Warehouse via the OLAP BAPI interface.

4. When the tests are complete, turn off the BAPI tracing by either modifying the file bapiinit_config.xml back to its original state (8.4.0) or removing the bapitrace.on file (8.4.1).

5. The log results will be written into newly created files;

ex. <IBM Cognos 8 install directory>/logs/bapi_#####_######.trc

Note it is not necessary to stop the IBM Cognos 8 services. Rather than stopping the services, it is possible to manually end the process(es) called BIBusTKServerMain.exe via the Windows Task Manager. A new process will be spawned once IBM Cognos 8 is called from a browser, and the BAPI tracing will begin upon the next data request from SAP NetWeaver Business Warehouse.

8.9.3 SAP Monitoring

For optimal extraction performance, it is necessary to consider the typical workload of the SAP NetWeaver Business Warehouse server and its available resources. In particular, the extraction of hierarchies can cause a huge memory consumption. SAP NetWeaver Business Warehouse applications server provides many ways to trace and analyze the workload. For most cases, it should be enough to verify the workload on the fly and not necessary to activate tracing. The following information can be retrieved by using the SAPGUI and the corresponding transactions.

8.9.3.1 Tune Summary (Transaction ST02)

This dialog is very helpful to get an overview of the memory parameters of a SAP NetWeaver Business Warehouse server. It is very easy to see the memory usage, the number of swaps or database accesses. The following screenshot shows a situation right after a restart. So no swaps (will be red marked) are displayed.

Tune Summary (boed51n4_BW1_00)

Current parameters | Detail analysis menu

System: boed51n4_BW1_00 Tune summary
Date + Time of Snapshot: 02.07.2010 10:27:00 Startup: 02.07.2010 10:00:44

Buffer	HitRatio %	Alloc. KB	Freesp. KB	% Free Sp.	Dir. Size	FreeDirEnt	% Free Dir	Swaps	DB Accs
Nametab (NTAB)								0	
Table definition	71,03	11.896	9.455	94,74	35.000	33.157	94,73	0	1.901
Field definition	71,06	42.734	37.638	94,10	35.000	34.150	97,57	0	1.251
Short NTAB	82,56	4.094	2.934	97,80	8.750	8.504	97,19	0	246
Initial records	1,97	8.094	6.536	93,37	8.750	8.106	92,64	0	644
								0	
program	91,34	500.000	344.397	73,89	125.000	123.121	98,50	0	5.637
CUA	96,88	5.000	3.800	94,53	2.500	2.489	99,56	0	11
Screen	96,65	4.297	4.021	98,24	2.000	1.979	98,95	0	24
Calendar	100,00	488	352	73,64	200	110	55,00	0	90
OTR	100,00	4.096	3.313	100,00	2.000	2.000	100,00	0	
								0	
Tables								0	
Generic Key	98,96	87.891	56.290	68,86	20.000	19.172	95,86	0	880
Single record	65,63	10.000	5.686	57,86	500	460	92,00	0	4.353
								0	
Export/import	12,00	10.240	6.329	99,97	10.000	9.997	99,97	0	
Exp./ Imp. SHM	100,00	10.240	6.331	100,00	10.000	10.000	100,00	0	

SAP Memory	Curr.Use %	CurUse[KB]	MaxUse[KB]	In Mem[KB]	OnDisk[KB]	SAPCurCach	HitRatio %
Roll area		0	552	995.200	53.376	IDs	93,33
Page area		0	448	406.080	642.496	Statement	95,00
Extended memory	1,91	126.976	180.224	6.635.520	0		0,00
Heap memory		0	0	0	0		0,00

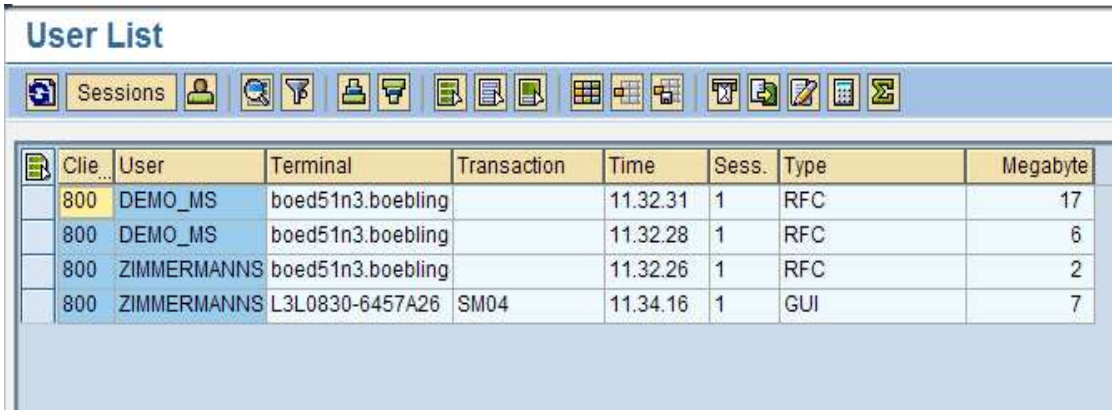
Call Stati	HitRatio %	ABAP/4 Req	ABAP Fails	DBTotCalls	AvTime[ms]	DBRowsAff.
Select single	96,67	12.832	5.444	29	0	7.388
Select	92,61	13.606	0	5.959	0	9.523
Insert	0,00	3.627	1.680	3.640	0	3.569
Update	0,00	18	0	19	0	18
Delete	0,00	1.637	15	1.645	0	3.244
Total	94,64	31.720	7.139	11.292	0	23.742

Further details about a buffer will be provided by double-clicking on the name. For instance, by double-clicking on the buffer "program", we do get the detailed analysis of the ABAP program buffer, which represents one of the most interesting parameters. This way, we do get an exact overview of the buffer efficiency and possible swaps.

Note if there are many swaps in a buffer area, then this can cause direct influence to the extraction performance. So verification of the SAP NetWeaver Business Warehouse server conditions should represent a mandatory step in preparation of a extracting data using the IBM Cognos TM1 Package-Connector.

8.9.3.2 User List with Memory Consumption (Transaction SM04)

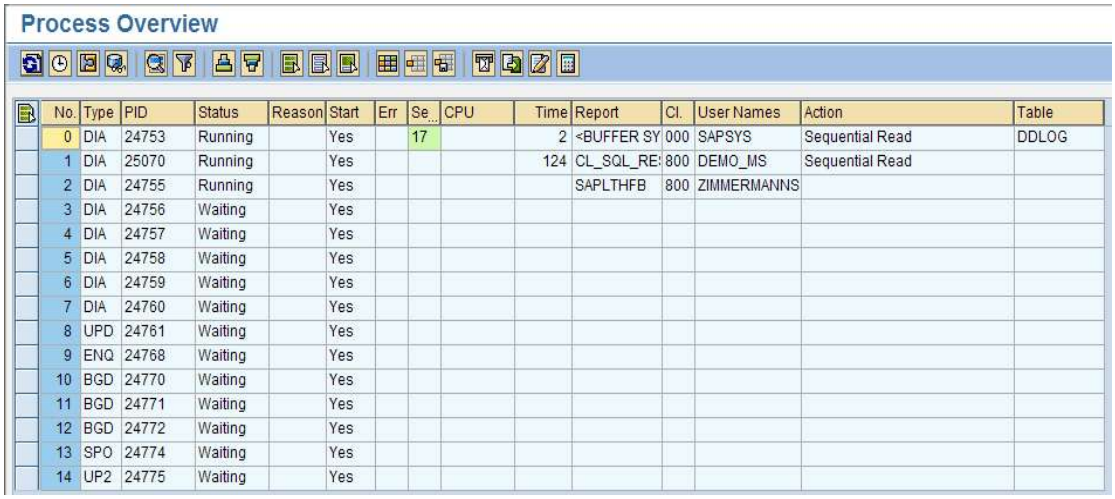
The verification of SAP users that are logged onto the SAP NetWeaver Business Warehouse server and their corresponding memory consumption is also very helpful to get a quick overview of the current workload.



Clie...	User	Terminal	Transaction	Time	Sess.	Type	Megabyte
800	DEMO_MS	boed51n3.boebling		11.32.31	1	RFC	17
800	DEMO_MS	boed51n3.boebling		11.32.28	1	RFC	6
800	ZIMMERMANNS	boed51n3.boebling		11.32.26	1	RFC	2
800	ZIMMERMANNS	L3L0830-6457A26	SM04	11.34.16	1	GUI	7

8.9.3.3 Workload on SAP processes (Transaction SM50)

With the two previously mentioned transactions, we access mainly static information. For verification of the current activity on the SAP NetWeaver Business Warehouse instance, it is helpful to use transaction SM50 which calls the process overview.



No.	Type	PID	Status	Reason	Start	Err	Se...	CPU	Time	Report	Cl.	User Names	Action	Table
0	DIA	24753	Running		Yes		17		2	<BUFFER SY	000	SAPSYS	Sequential Read	DDLOG
1	DIA	25070	Running		Yes				124	CL_SQL_RE	800	DEMO_MS	Sequential Read	
2	DIA	24755	Running		Yes					SAPLTHFB	800	ZIMMERMANNS		
3	DIA	24756	Waiting		Yes									
4	DIA	24757	Waiting		Yes									
5	DIA	24758	Waiting		Yes									
6	DIA	24759	Waiting		Yes									
7	DIA	24760	Waiting		Yes									
8	UPD	24761	Waiting		Yes									
9	ENQ	24768	Waiting		Yes									
10	BGD	24770	Waiting		Yes									
11	BGD	24771	Waiting		Yes									
12	BGD	24772	Waiting		Yes									
13	SPO	24774	Waiting		Yes									
14	UP2	24775	Waiting		Yes									

Besides the verification of the running processes, this transaction gives us the number of available dialog work processes. This kind of process is indicated by the entry **DIA** in the **Type** column.

In the example case here, there are seven dialog work processes. With this information and verification on the current number of active reports, we can decide what number of extraction threads we want to define in the IBM Cognos TM1 Package-Connector configuration. For instance, it does not make sense to use the value setting of "8" for parameter **SegmenterParallelQueryCount** because this SAP NetWeaver Business Warehouse can handle only seven dialog work processes at the same time. Furthermore, the SAP NetWeaver Business Warehouse should have at least one free process to work on other requests. Hence it is recommended to

define the value setting to at most an algorithm of **the number of available dialog work processes - 1**.

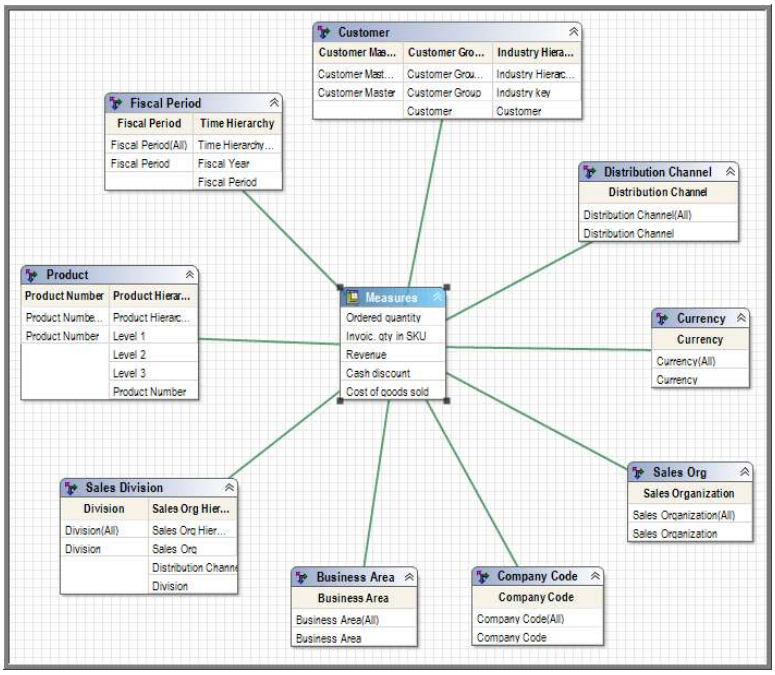
In productive environments, it is necessary to investigate the typical workload by standard SAP NetWeaver Business Warehouse users before IBM Cognos TM1 extraction will be performed. Too many dialog work processes for extraction can slow down the entire SAP NetWeaver Business Warehouse server. Monitor these closely and plan accordingly the data extraction schedules from SAP NetWeaver Business Warehouse to IBM Cognos TM1.

8.10 Access SAP ECC Data Using IBM Cognos TM1 Package Connector

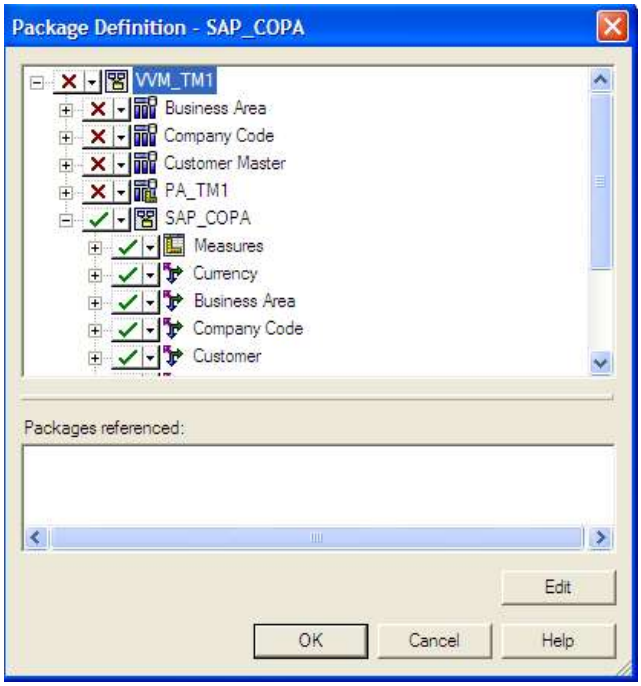
There are six general steps which are necessary when accessing data from SAP®R/3® Enterprise Central Component (SAP ECC) with the IBM Cognos TM1 Package Connector.

1. Identify the appropriate tables within SAP ECC where the required data resides, and import the SAP objects into IBM Cognos Virtual View Manager. For more information on how to use IBM Cognos Virtual View Manager to query SAP R/3 or ECC data, see Chapter 9: Using IBM Cognos Virtual View Manager to Query SAP R/3 or ECC Data.

2. Define a Dimensionally Modeled-Relational (DMR) model within IBM Cognos 8 Framework Manager that references the SAP objects identified above. Note the SAP ECC source must be modeled as a DMR source in IBM Cognos Framework Manager to access SAP ECC data with the IBM Cognos TM1 Package Connector. This includes the definitions of the hierarchies you wish to create within IBM Cognos TM1. See the **IBM Cognos 8 Framework Manager User Guide** for information on how to create a DMR model.



3. Create and publish a package via IBM Cognos 8 Framework Manager to the IBM Cognos 8 content store.



4. Access the newly created package with the IBM Cognos TM1 Package Connector and a TurboIntegrator process. Note the steps to access the package are noted in the above section Import SAP NetWeaver Business Warehouse Data into a IBM Cognos TM1 Cube.

5. Create and run a IBM Cognos TM1 TurboIntegrator process to load dimensional and fact data to new or existing dimensions and cubes. When selecting hierarchies from SAP ECC and the DMR model within the data load process, select one hierarchy per dimension to ensure optimal run time and to avoid inflation of the fact records.

6. Create a IBM Cognos TM1 TurboIntegrator **update process** to load additional hierarchies where multiple hierarchies exist for a particular dimension.

9 Using IBM Cognos Virtual View Manager to Query SAP R/3 or ECC Data

This section outlines the steps required to query a SAP BAPI and R/3 table within IBM Cognos 8 through IBM Cognos Virtual View Manager.

9.1 Installing the SAP R/3 Connectivity Add-On

Although the SAP data service is part of the IBM Virtual View Manager install media download, it is not installed by default. In order for the SAP data source to appear in the available data sources, an additional add on will need to be installed.

To install Data Services for SAP on Windows:

1. Install the Microsoft .NET Framework SDK Version 1.1. Microsoft .NET Framework SDK is available from the Microsoft Developer Network (MSDN) download site.
2. Shut down the IBM Virtual View Manager service, if it's running.
3. Within the IBM Virtual View Manager installation package. Locate and double-click the installer, CADS_460_sap_windows_install32.exe to begin the installation process.

This installation must be performed on the computer that has the IBM Virtual View Manager server component installed.

4. The installer window should appear. Click the Next button to display the license agreement page. If the license agreement is acceptable click the Accept radio button.
5. Click Next to continue the install.
6. Select the appropriate IBM Cognos Virtual View Manager installation directory and click the Next button.
7. Click the Next button to create the shortcuts.
8. Click the Install button to begin the installation.
9. Click the Next button, then the Done button to quit the installer.

9.2 Installing the SAP Java Connector Library

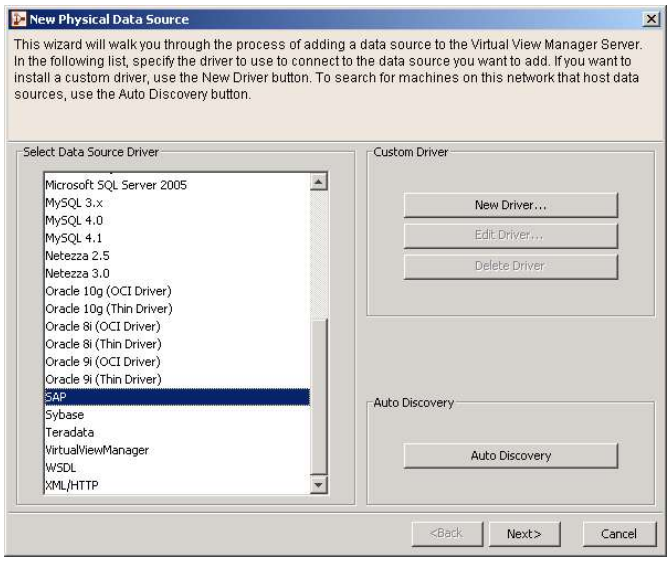
In order for the SAP Java Connector (JCo) 2.1.8 to function properly, it requires a Java Runtime Environment of 1.3 or higher. It also requires a RFC runtime library of version 6.40 or higher. To install JCo for windows:

1. Unzip the appropriate distribution package into an arbitrary folder.
2. If an older `librfc32.dll` in the `system32` directory, back it up and replace it with the one that comes with JCo.
3. Copy the sapjcorfc.dll to the `system32` directory. If an older one exists back it up and replace it with the one that comes with JCo.
4. Copy the sapjco.jar to the IBM Virtual View Manager Server install directory under the ..\ vvm\apps\dlm\app_ds_sap\lib directory.
5. Start the IBM Virtual View Manager service. Once the IBM Virtual View Manager service is restarted, the jar file should be loaded by the application.

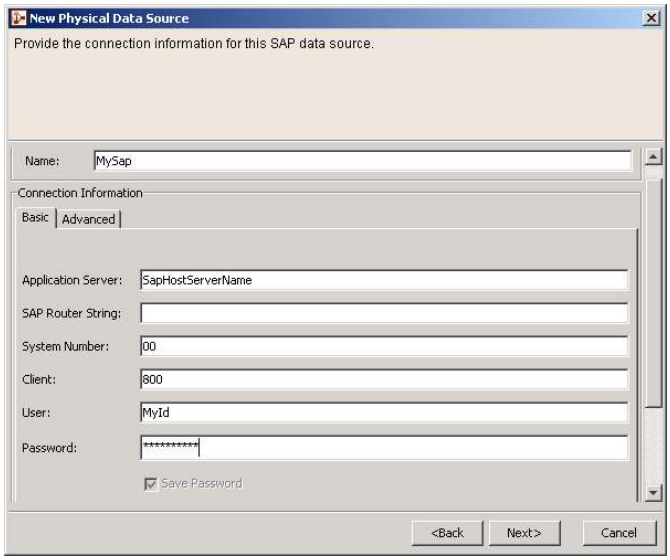
9.3 Creating a Data Source and Importing a BAPI

The IBM Cognos Virtual View Manager is now configured to connect to SAP R/3. The following section will step a user through the creation of a SAP data source within IBM Cognos Virtual View Manager Studio. I will also outline the steps required to import a SAP BAPI.

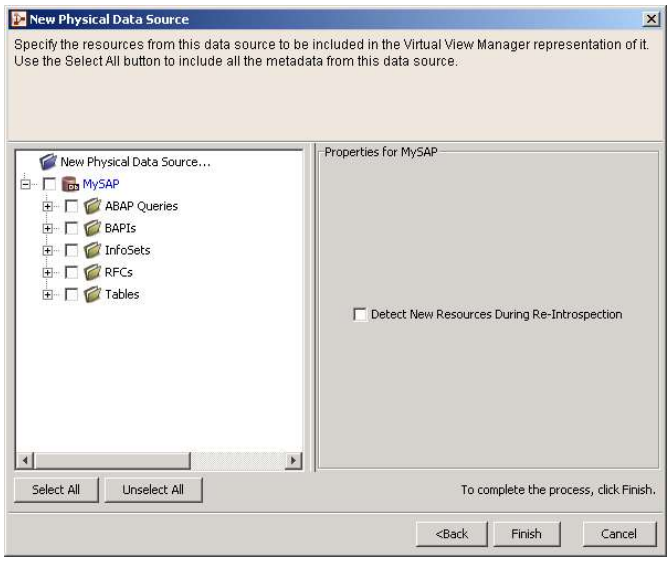
1. After signing into IBM Virtual View Manager, right click on the Shared folder and select the "New Data Source"
2. Within the Add Physical Data Source dialog box, Select SAP from the list and click the Next button.



3. Within the New Physical Data Source dialog box, enter the information below and click the Next button.
    - Name: This is the name of the data source as it will be displayed within the IBM Cognos Virtual View Manager Studio.
    - Application Server: This is the host name of SAP system
    - System Number:
    - Client:
    - User: This is the user id that is going to be used to connect to the SAP system.
    - Password: This is the SAP password for the user identified in the User field.



4. The New Physical Data Source dialog box should now display the metadata available from the SAP system as illustrated below.

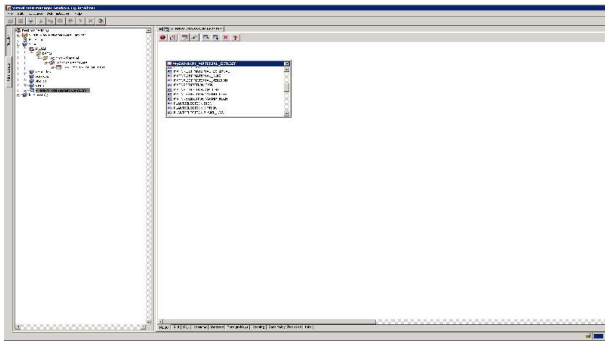


5. For this particular example, the BAPI will be /SAPERP7/BAPIs/Logistics - General/Logistics Basic Data/BAPI_MATERIAL_GETLIST
6. Click Finish to complete the import.

9.4 Creating a View and providing static BAPI Import Parameters

For the purpose of this document, the BAPI_MATERIAL_GETLIST BAPI will be used to return 10 rows of actual Material data and its associated description. This particular BAPI requires several input parameters in order to return data. The following section will provide the steps required to create a view against this BAPI. It would also outline how to pass static values to the BAPI import parameters using filter criteria.

1. Right mouse click on the Shared folder and select New View.
2. Give the view a name and click OK. For the purpose of this example the name will be v_BAPI_MATERIAL_GETLIST.
3. Select the previously imported BAPI_MATERIAL_GETLIST BAPI and drag it into the right hand pane. Once complete, the screen should represent the following image.



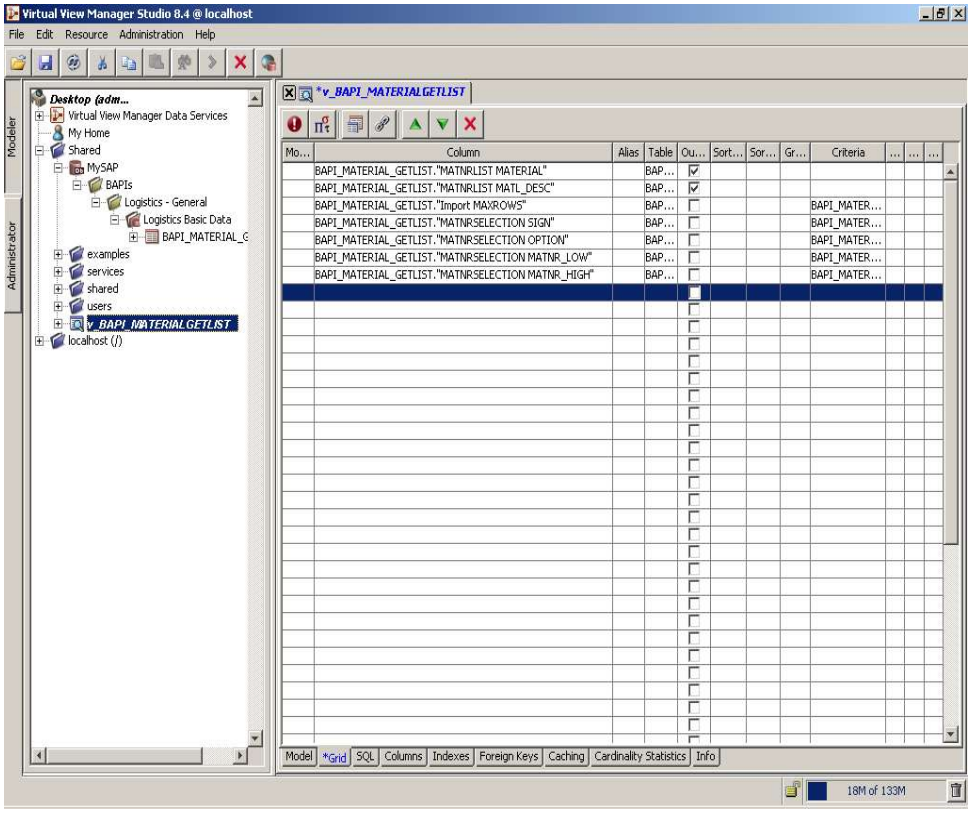
4. On the bottom of the screen, click on the Grid tab to switch to the grid view.
5. On the first line, within the Column area, select MATNRLIST MATERIAL form the available list.
6. On the second line, within the Column area, select the MATL_DESC from the available list.
7. On the next five lines, select the following items.
    - MAXROWS
    - MATNRSELECTION MATNR_LOW
    - MATNRSELECTION MATNR_HIGH
    - MATNRSELECTION SIGN
    - MATNRSELECTION OPTION

The five items chosen above are the input parameters required by the BAPI in order to return the material data and description.

8. For each of the 5 items chosen in the previous step, uncheck the output checkbox.
9. For each of the 5 items, type in the following values into the criteria column for the appropriate row.

Import Parameter	Criteria
MAXROWS	10
MATNRSELECTION MATNR_LOW	'000000000000000000'
MATNRSELECTION MATNR_HIGH	'ZZZZZZZZZZZZZZZZZZ'
MATNRSELECTION SIGN	'I'
MATNRSELECTION OPTION	'BT'

When completed the Grid user interface for this BAPI view should represent the following image.



10. Press the F9 key to sample the data. To view the generated SQL, click on the SQL tab. The following code is the SQL generated for this particular view.

```
SELECT
    BAPI_MATERIAL_GETLIST."MATNRLIST MATERIAL",
    BAPI_MATERIAL_GETLIST."MATNRLIST MATL_DESC"
```

```
FROM

    /shared/MySAP/BAPIs/"Logistics - General"/"Logistics Basic
Data"/BAPI_MATERIAL_GETLIST BAPI_MATERIAL_GETLIST

WHERE

    (((BAPI_MATERIAL_GETLIST."Import MAXROWS" = 10 AND

    BAPI_MATERIAL_GETLIST."MATNRSELECTION SIGN" = 'I') AND

    BAPI_MATERIAL_GETLIST."MATNRSELECTION OPTION" = 'BT') AND

    BAPI_MATERIAL_GETLIST."MATNRSELECTION MATNR_LOW" =
'000000000000000000') AND

    BAPI_MATERIAL_GETLIST."MATNRSELECTION MATNR_HIGH" =
'ZZZZZZZZZZZZZZZZZZ'
```

9.5 Creating a Parameterized Query and Providing Dynamic BAPI Import Parameters

The following section will provide the steps required to create a parameterized query against the BAPI_MATERIAL_GETLIST BAPI. It would also outline how to pass dynamic, user entered values, to the BAPI import parameters using filter criteria.

1. Right mouse click on the Shared folder and select New Parameterized Query.
2. Give the parameterized query a name and click OK. For the purpose of this example the name will be pq_BAPI_MATERIAL_GETLIST.
3. Select the previously imported BAPI_MATERIAL_GETLIST BAPI and drag it into the right hand pane.
4. On the bottom of the screen, click on the Grid tab to switch to the grid view.
5. On the first line, within the Column area, select MATNRLIST MATERIAL form the available list.
6. On the second line, within the Column area, select the MATL_DESC from the available list.
7. On the next five lines, select the following items.
    - MAXROWS
    - MATNRSELECTION MATNR_LOW
    - MATNRSELECTION MATNR_HIGH
    - MATNRSELECTION SIGN
    - MATNRSELECTION OPTION

The five items chosen above are the input parameters required by the BAPI in order to return the material data and description.

8. For each of the 5 items chosen in the previous step, uncheck the output checkbox.

9. For each of the 5 items, type in the following values into the criteria column for the appropriate row.

Input Parameter	Criteria
MAXROWS	{ param MAXROWS BIGINT }
MATNRSELECTION MATNR_LOW	{ param MAT_LOW VARCHAR(18) }
MATNRSELECTION MATNR_HIGH	{ param MAT_HIGH VARCHAR(18) }
MATNRSELECTION SIGN	{ param MAT_SIGN VARCHAR(1) }
MATNRSELECTION OPTION	{ param MAT_OPTION VARCHAR(2) }

10. As before, execute the parameterized query by pressing the F9 key.
11. When prompted, enter the following values.

Input Parameter	Criteria
MAXROWS	10
MAT_LOW	000000000000000000
MAT_HIGH	ZZZZZZZZZZZZZZZZZZ
MAT_SIGN	I
MAT_OPTION	BT

12. Click the OK button to run the parameterized query, the results will be displayed in the results pane at the bottom of the screen.
13. To view the generated SQL, click on the SQL tab. The following code is the SQL generated for this particular parameterized query.

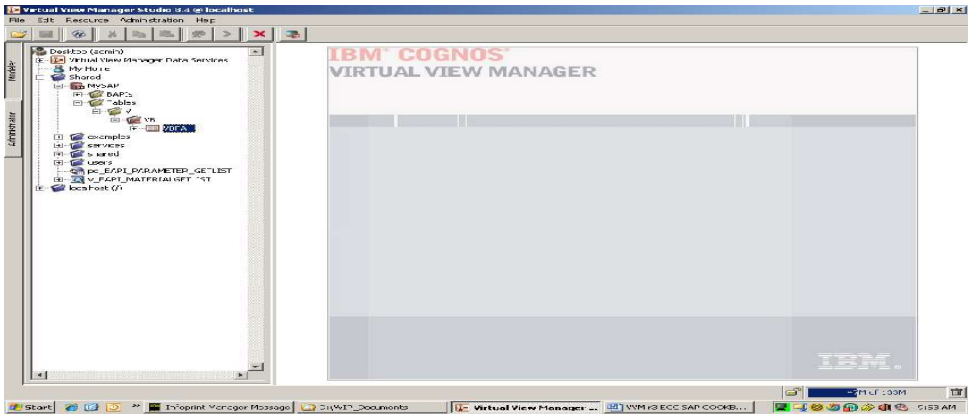
```
PROCEDURE pq_BAPI_PARAMETER_GETLIST(
    IN MAXROWS BIGINT,
    IN MAT_SIGN VARCHAR(1),
    IN MAT_OPTION VARCHAR(2),
    IN MAT_LOW VARCHAR(18),
    IN MAT_HIGH VARCHAR(18),
    OUT result CURSOR (
        "MATNRLIST MATERIAL" VARCHAR(18),
        "MATNRLIST MATL_DESC" VARCHAR(40)
        )
    )
    BEGIN
        OPEN result FOR
            SELECT
                BAPI_MATERIAL_GETLIST."MATNRLIST MATERIAL",
                BAPI_MATERIAL_GETLIST."MATNRLIST MATL_DESC"
```

```
            FROM

                /shared/MySAP/BAPIs/"Logistics -
General"/"Logistics Basic Data"/BAPI_MATERIAL_GETLIST
BAPI_MATERIAL_GETLIST

            WHERE

                (((BAPI_MATERIAL_GETLIST."Import MAXROWS" =
MAXROWS AND

                BAPI_MATERIAL_GETLIST."MATNRSELECTION SIGN" =
MAT_SIGN) AND

                BAPI_MATERIAL_GETLIST."MATNRSELECTION OPTION" =
MAT_OPTION) AND

                BAPI_MATERIAL_GETLIST."MATNRSELECTION MATNR_LOW" =
MAT_LOW) AND

                BAPI_MATERIAL_GETLIST."MATNRSELECTION MATNR_HIGH"
= MAT_HIGH;

    END
```

9.6 Importing and Sampling a R/3 Table

IBM Virtual View Manager also has the ability to import and sample raw SAP R/3 tables. The following section will provide the steps required to import and sample an R/3 table.

1. Within the left hand tree view of the studio, right click on the MySAP SAP data source defined earlier.
2. From the available menu items, select Add/Remove Resources.
3. Within the Add/Remove resources dialog box, traverse the tree to the VBFA table within the Tables\V\VB\ structure.
4. Click the Finish button to complete the import. Once the import completes, the VBFA table should now be visible within the right hand tree pane.



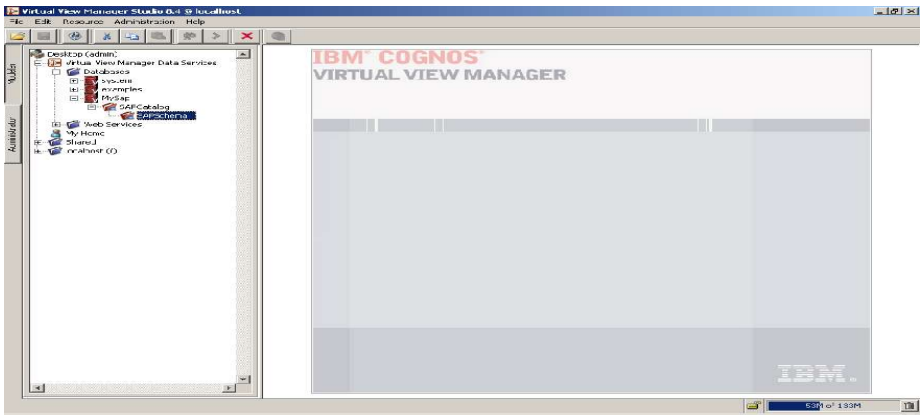
5. To sample the data contained within the VBFA table, right-click on the table name and select Show Contents from the available menu. Once the query executes the results will be displayed within the results pane at the bottom of the screen. In certain scenarios the Show Contents may present the user with an error message. This occurs when a columns length within the R/3 table exceeds the value set for RFC_READ_TABLE. For more information on how to rectify this issue, please see SAP Note 758278.

9.7 Publishing the R/3 Table and the Parameterized Query to the IBM Cognos 8 Virtual View Manager Data Services Database

IBM Virtual View Manager uses a publish process to add objects to a Data Services Database. Only items published to this database under a catalog and schema will be useable within IBM Cognos 8. The following section will provide the steps required to create a services database with a catalog and schema. This section will also cover the publishing process.

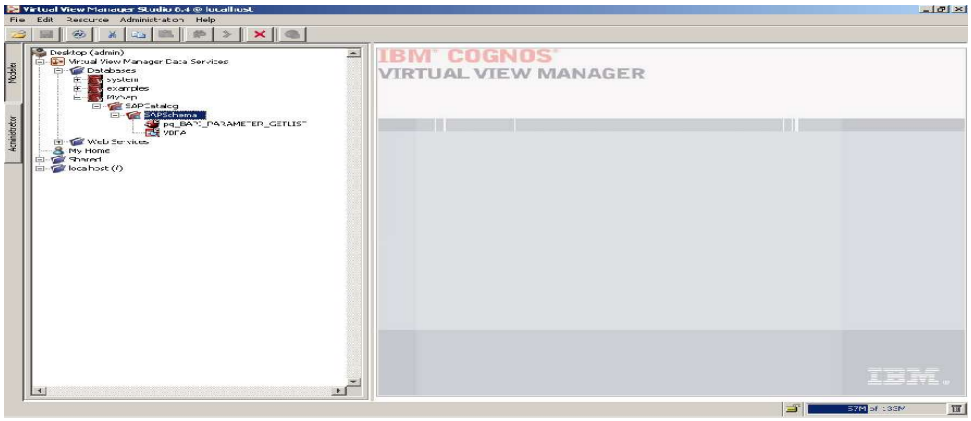
9.7.1 Creating a Services Database with a Catalog and Schema

1. Within the left hand navigation pane, traverse the tree to Virtual View Manager Data Service\Databases.
2. Right click on the Databases folder, and select New Virtual View Manager Data Service from the available menu.
3. When prompted, provide a name and click the OK button. For the purpose of this section, the data service name will by "MySAP"
4. Right-Click on the "MySAP" database, from the available menu, select New Catalog.
5. When prompted, provide a catalog name and press the OK button. For the purpose of this section the catalog name will be "SAPCatalog".
6. Right-Click on the "SAPCatalog" and from the available menu, select New Schema.
7. When prompted, provide a schema name and press the OK button. For the purpose of this section the schema name will be "SAPSchema". When completed the UI should now represent the following.



9.7.2 Publishing Content to the Data Services Database

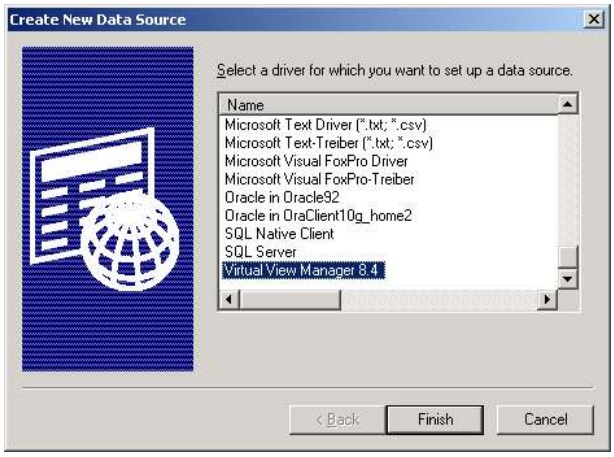
1. Within the left hand navigation pane, CTRL click the /shared/ pq_BAPI_PARAMETER_GETLIST and /shared/MySAP/Tables/V/VB/ VBFA objects.
2. With both objects highlighted, right click and select Publish from the available menu options.
3. Within the Publish dialog box, traverse the tree structure and select the SAPSchema schema object.
4. Click the OK button to complete the publish process. Once completed the R/3 table and the parameterized query should now be visible under the data service database.



9.8 Creating and Configuring a Virtual View Manager Data Source Name (DSN)

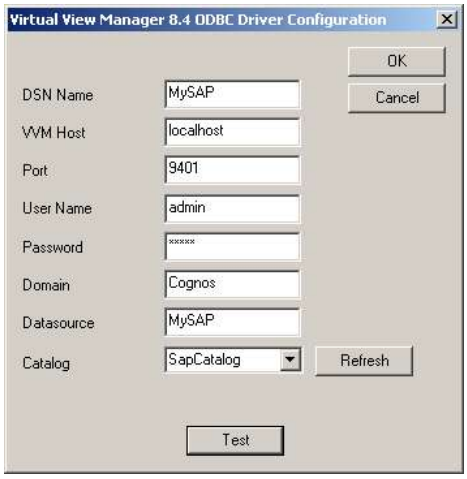
IBM Cognos 8 uses the IBM Cognos Virtual View Manager ODBC driver to retrieve data from Virtual View Manager. The Virtual View Manager ODBC connection can be created and configured using the following steps.

1. Within the ODBC Data Source Administrator, select the system DSN tab.
2. Click the Add button, located at the top right hand side.
3. From the available list of drivers, select Virtual View Manager 8.4 and click the Finish button.



4. Provide the required information to the Virtual View Manager 8.4 ODBC Driver Configuration dialog box.
    - DSN can be any name.
    - VVM Host is the hostname of the Virtual View Manager Server.
    - Port is the port on which Virtual View Manager listens for ODBC connections. This can be configured within the Administration portion of Virtual View Manager Studio. The default is 9401.
    - UserName and Password is the same credentials as logging into the Virtual View Manager Studio.
    - Domain is the security domain, unless an external security provider has been configured for Virtual View Manager this value will be Cognos.
    - Datasource is the name of the DataServices Database created in the studio.
    - Catalog is the name of the catalog created withing the DataServices Database.

Below is an example of a completed configuration.



5. Click the OK button to create the ODBC data source.

9.9 Creating and IBM Cognos 8 Data Source and Package

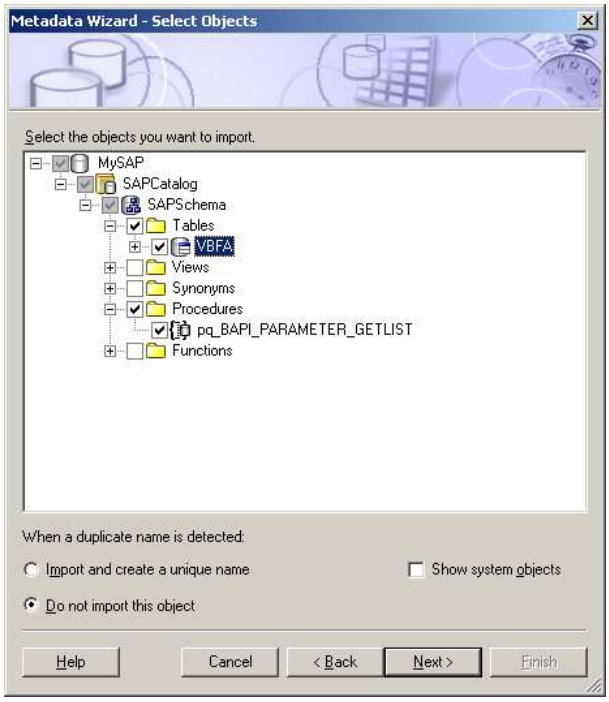
With the ODBC data source successfully defined, the Virtual View Manager data is ready to be consumed by the IBM Cognos 8 environment.

9.9.1 Creating and IBM Cognos 8 Virtual View Manager Data Source

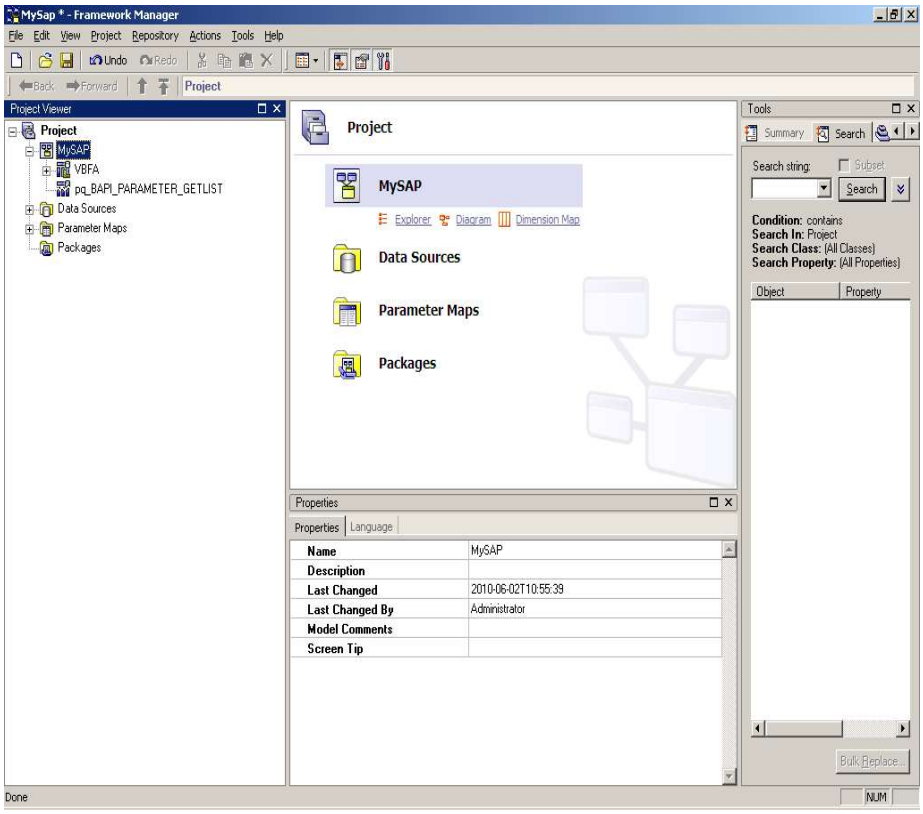
1. Launch IBM Cognos 8 Framework Manager, and click the Create a new project link.
2. Work through the new project wizard until the Select a Data Source dialog appears.
3. Within this dialog box click the New button.
4. Click Next.
5. Provide a name to the data source. For this example the data source name will by MySAP
6. Click Next
7. From the Type drop down menu, select IBM Cognos Virtual View Manager (ODBC) and click the Next button.
8. Provide the ODBC data source name. This is the same name that was given to the DSN in the previous section.
9. The credentials will be the same user and password used to access the Virtual View Manager Studio.
10. Click the Finish button to create the IBM Cognos 8 data source.

9.9.2 Importing the Metadata and Creating a Query Subject

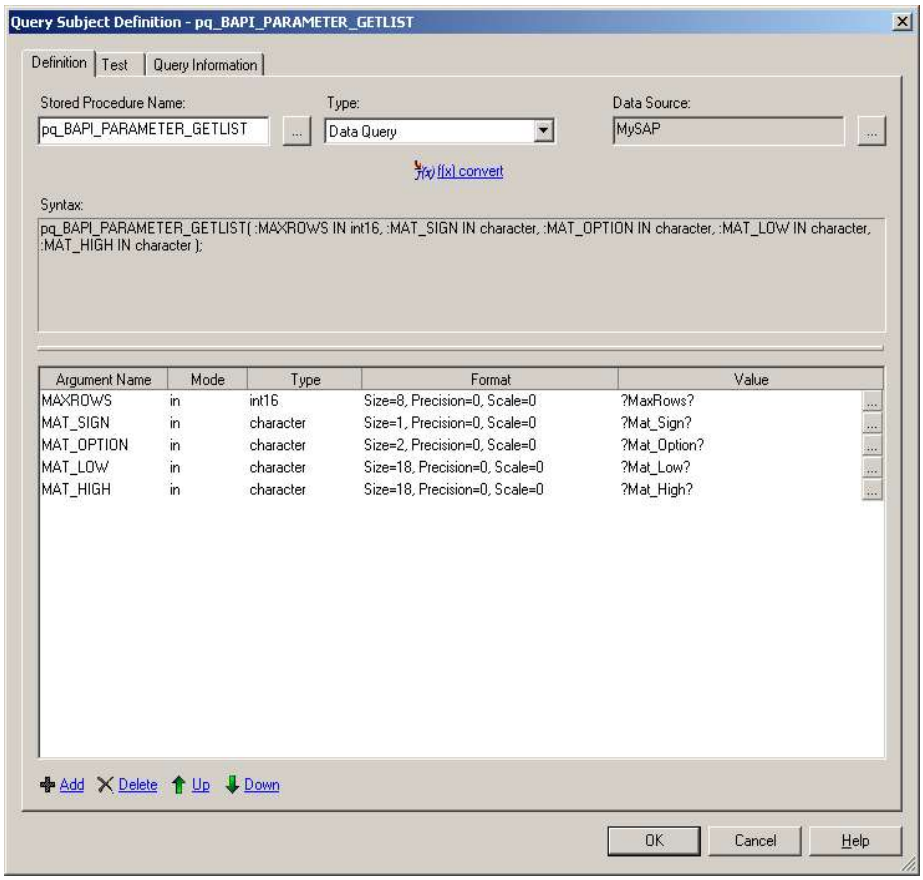
1. Within the Select a Data Source dialog box, locate and select the MySAP data source.
2. Click the next button.
3. Within the Metadata Wizard Select Object dialog box, select the R/3 table under the tables folder and the pq_BAPI_MATERIAL_GETLIST located within the procedures folder.



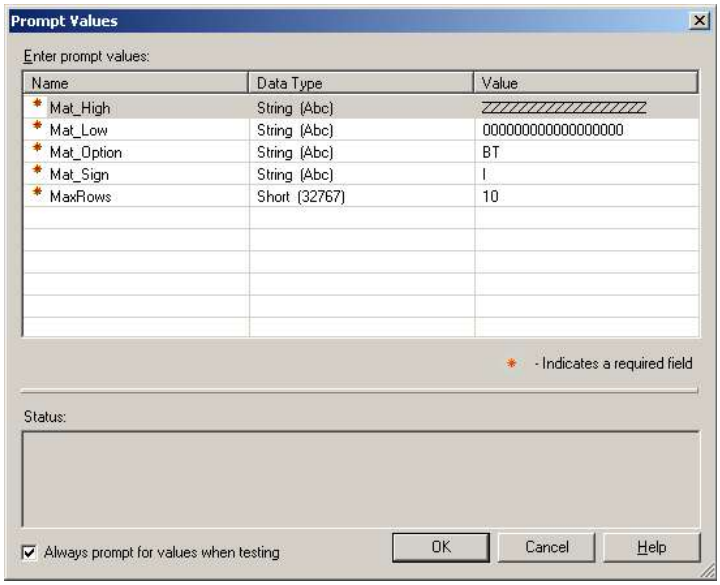
4. Click the Next button.
5. Click the Import button.
6. Click the Finish button to complete the import. IBM Cognos 8 Framework Manager should display the imported objects within the left hand Project Viewer pane.



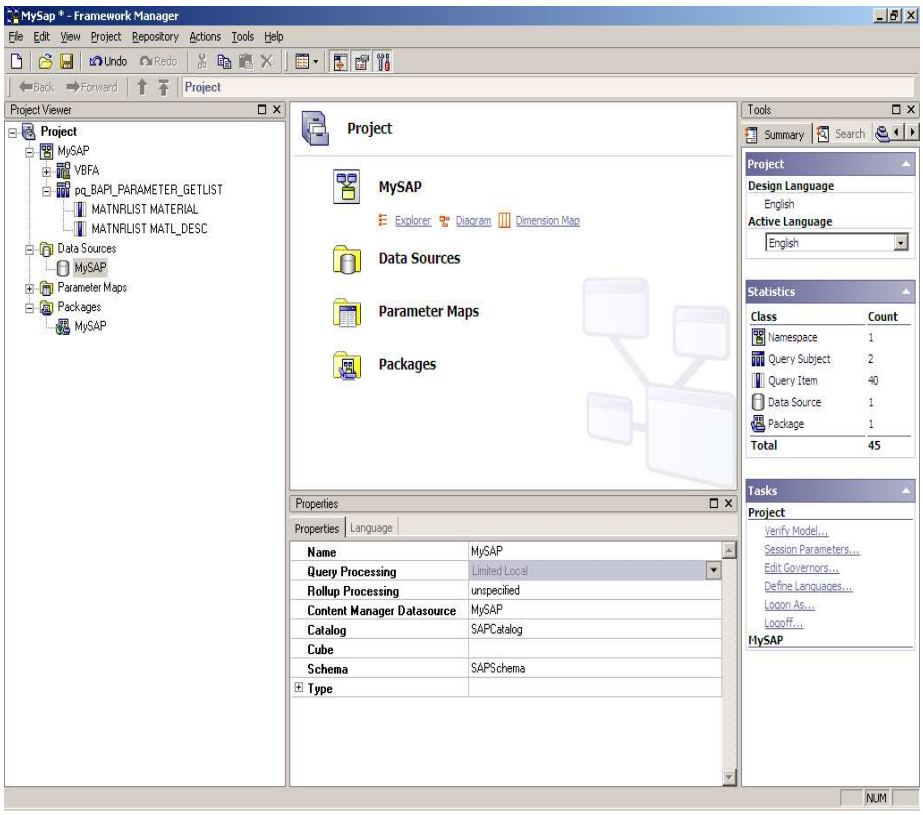
7. Within the left hand Project Viewer pane, double click the pq_BAPI_PARAMETER_GETLIST query subject.
8. For each of the required BAPI import parameters, click on the ellipses and assign a IBM Cognos 8 prompt with the correct data type. For the BAPI_MATERIAL_GETLIST, the following values were used.



9. Click the OK button twice.
10. When prompted provide the following prompt values.



11. Click the OK button to return back to the IBM Cognos 8 Framework Manager project view.



12. Within the left hand Project Viewer, select the MySAP data source under the Data Sources folder.
13. Within the Properties pane at the bottom middle of the screen, switch the Query Processing from Database Only to Limited Local.
14. At this point, once the content has been published as an IBM Cognos 8 package, the R/3 table and the BAPI are ready for consumption within the IBM Cognos 8 Report Studio and Query Studio.

10 Appendix A: Performance Case Studies

In order to achieve better performance when accessing the SAP NetWeaver Business Warehouse, a basic understanding of our reporting approach to this data source is recommended. The following case study will walk you through a simple example.

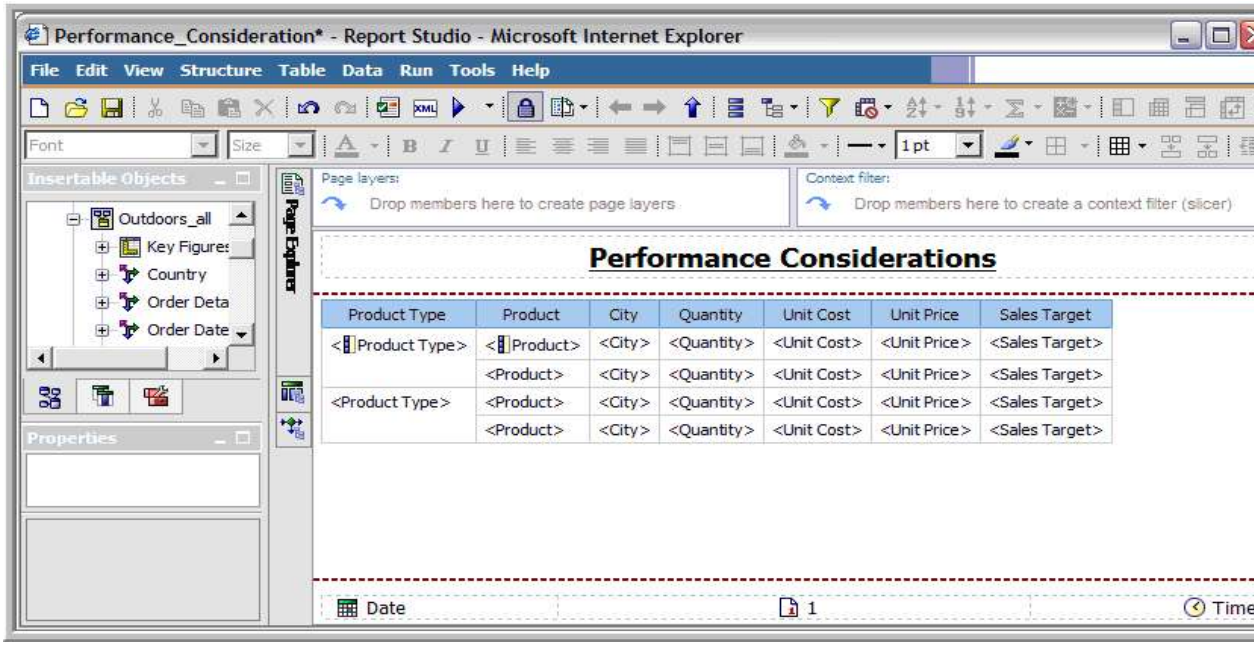
First and foremost, as highlighted in section 3 of this document, the basic methodology utilized by IBM Cognos 8 when querying the Business Warehouse is to decompose each query down to its simplest form. This method allows the creation of simple MDX sent to the SAP NetWeaver Business Warehouse thereby avoiding some of the pitfalls and performance degradations encountered when trying to maximize MDX performance for complicated queries.

We will tackle three basic concepts: usage of MDX for metadata retrieval, variable usage for filtering purposes, and finally reusability of metadata cache.

As a starting point, the screen capture below displays the basic report we wish to execute. The report consists of three (3) dimensions and 4 key figures. A filter was applied to restrict "Country" to United States. Taking the default configuration, let's also assume the following pre-conditions:

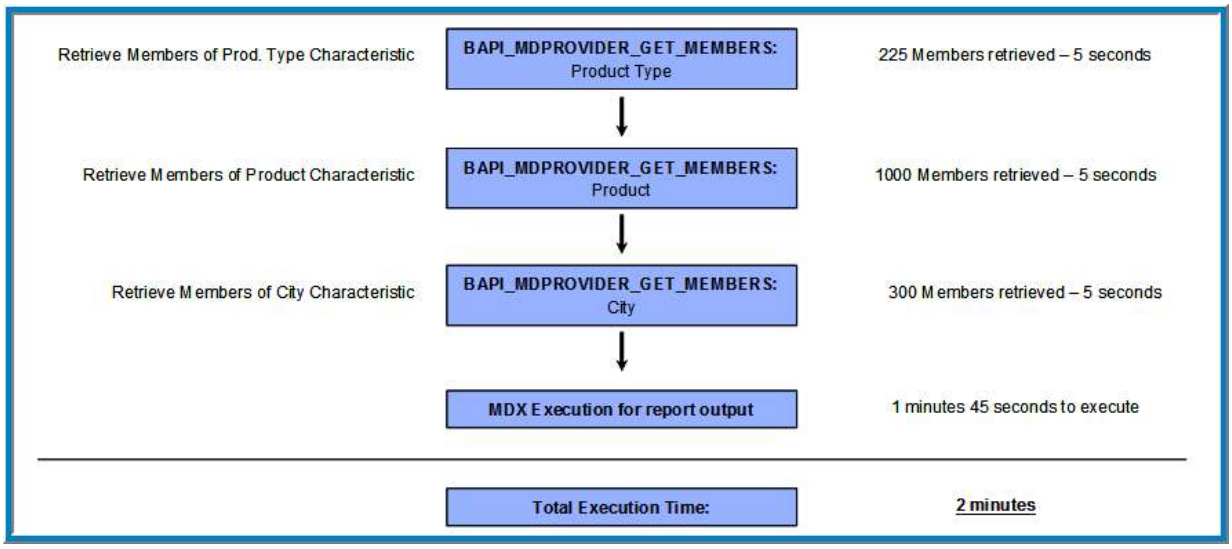
Within the SAP NetWeaver Business Warehouse environment:

- Product Type Characteristic contains 225 distinct members (150 with associated fact values)
- Product Characteristic: 1000 distinct members (500 with associated facts)
- City Characteristic: 300 Distinct members (250 with associated facts)

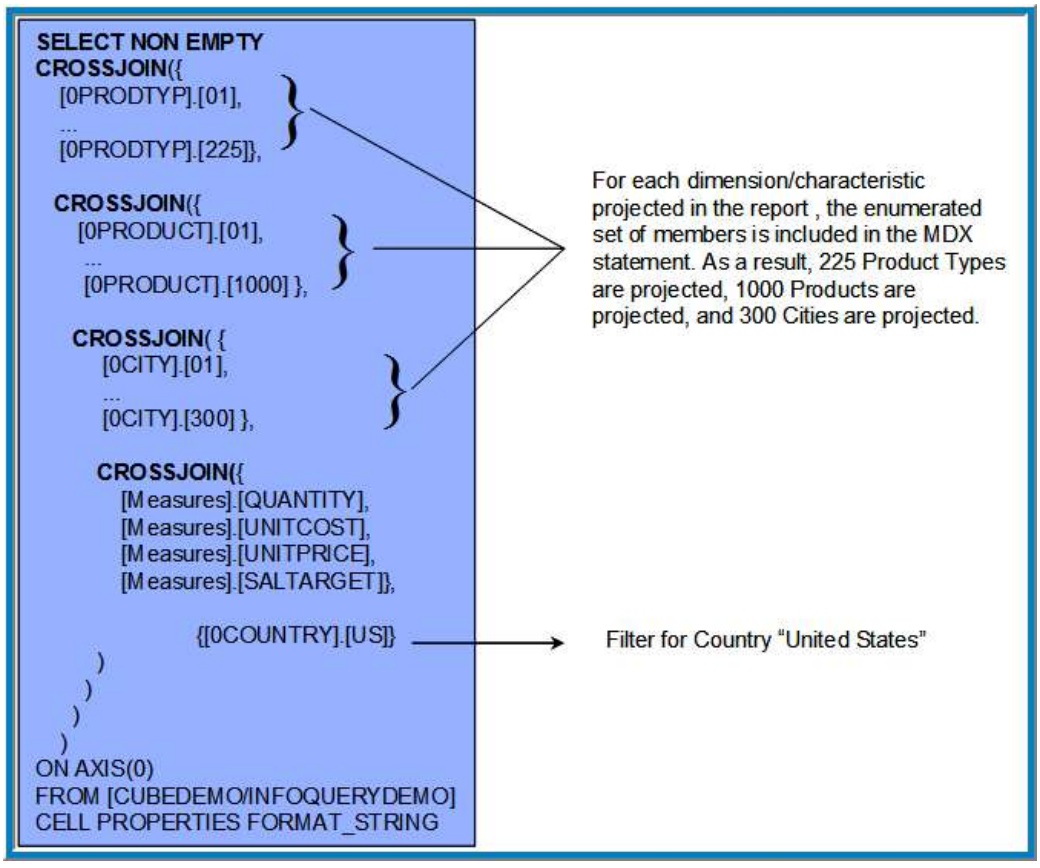

Performance_Consideration* - Report Studio - Microsoft Internet Explorer
File Edit View Structure Table Data Run Tools Help
Insertable Objects
Outdoors_all
Key Figures
Country
Order Deta
Order Date
Properties
Page Explorer
Page layers:
Drop members here to create page layers
Context filter:
Drop members here to create a context filter (slicer)
Performance Considerations
Product Type
Product
City
Quantity
Unit Cost
Unit Price
Sales Target
<Product Type>
<Product>
<City>
<Quantity>
<Unit Cost>
<Unit Price>
<Sales Target>
Date
1
Time

10.1 Scenario 1 - Base Query with no Optimization (Runtime 2 min)

As a starting point, we executed the report and its execution completed in 2 minutes. Graphically the execution of this report can be represented as such:



The final MDX sent to Business Warehouse would have the following form:



We now see that the bulk of the execution of the report is taken by the execution of the final MDX (1 minute 45 seconds). Each metadata BAPI calls executed using BAPI_MDPROVIDER_GET_MEMBERS is relatively fast (5 seconds in our example).

10.2 Scenario 2 - Query with UseMDX Optimization (Runtime 1min 30 sec)

The first step required to maximize this report would be to attempt to reduce the size of the final MDX sent. We can accomplish this by retrieving the members using MDX instead of BAPI_MDPROVIDER_GET_MEMBERS. This will ensure that only members with associated facts are included in the final MDX. There are two methods to accomplish this task.

The first method is more general in nature. A configuration setting exists which evaluates the cardinality of the projected dimension. If the cardinality exceeds a threshold, then MDX will be utilized to fetch the members. The cardinality for each dimension is extracted by IBM Cognos Framework Manager during import. This setting exists in the sapbw_config.xml file and can be modified by changing the value for:

<parameter name="useMDXToRetrieveMembersLimit" value="500"/>

Please note that by default this parameter is set to 100,000 which should be reduced to a value between 200 to 5000. While this range is high, all SAP NetWeaver Business Warehouse environments differ and some testing may be required in order to find the correct limit which suits your environment. Setting the value to 500 as a starting point would be recommended.

The second method is more targeted and requires administrators to identify specific dimensions (characteristics), hierarchies, or even members against which you may want to make use of MDX to retrieve members. Given most large dimensions are taken care of using the first method, this would target dimensions where cardinality falls below the above threshold however have a large differences between all existing members and members actually containing posted values in various circumstances (variables for example). This setting exists in the sapbw_config.xml file and can be modified by changing the value for:

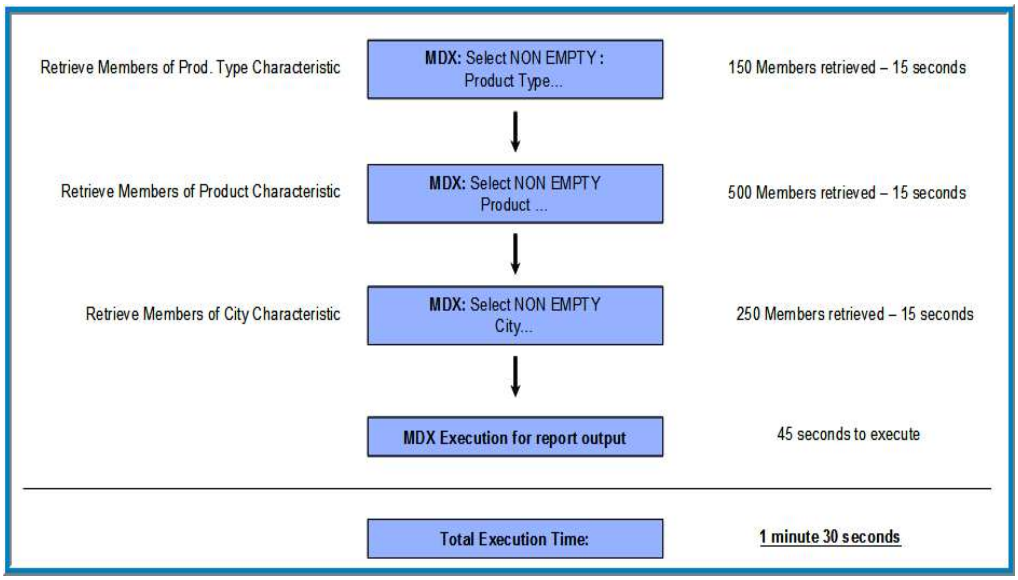
<parameter name="UseMDXToRetrieveMembersFor" value="[0DIMX]”/>

Why shouldn’t we make all metadata calls using MDX then? In most environments, MDX metadata statements tend to be more expensive and take more time to execute. A good balance between the two usually offers the best performance.

Given what we’ve learned from the parameters above, we have decided to add the following configuration setting:

<parameter name="useMDXToRetrieveMembersLimit" value="200"/>

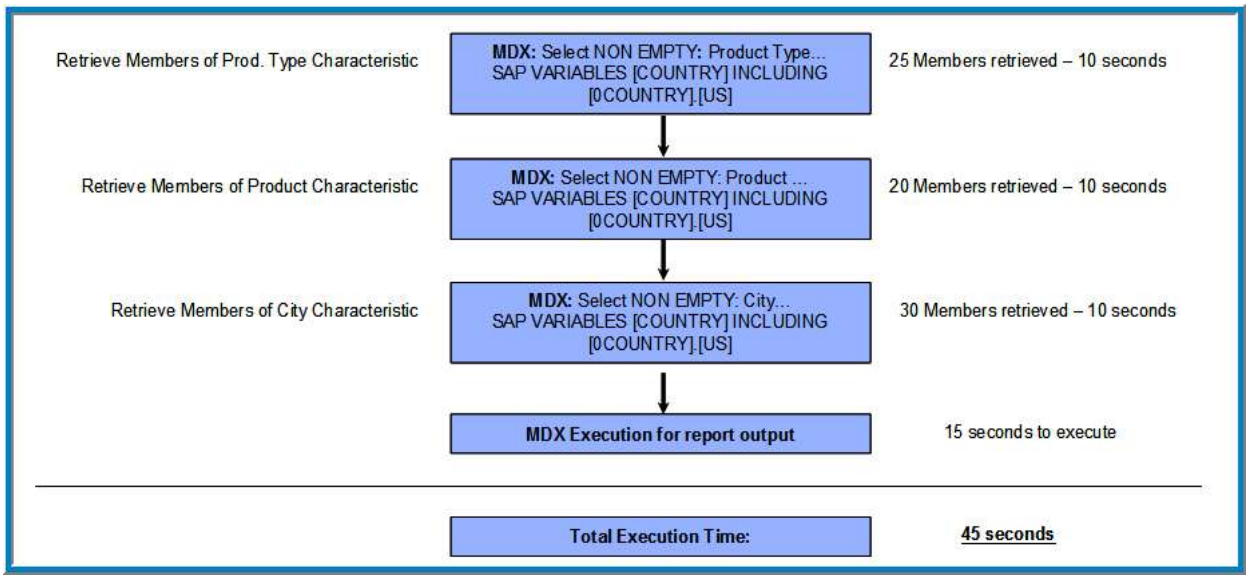
This will force the query engine to fetch the members with MDX thereby returning only members with posted data values. Find below the graphical representation of this change.



While this has increased performance by 30 seconds, there is still room for improvement.

10.3 Scenario 3 - Query with UseMDX Optimization and Business Warehouse Variable (Runtime 45 sec)

This report currently uses a local filter was defined for Country. While this filter is sent to SAP NetWeaver Business Warehouse in the final MDX as an extra axis, it is not considered hen retrieving members during the metadata phase. Alternatively, one can make use of BW variables instead. When combined with MDX metadata fetches, this will have the added benefit of further filtering the members returned for each characteristic. The impact on the final data MDX sent is often greatly improved.



10.4 Important Note on Metadata Reuse:

While MDX metadata fetch can greatly improve performance, another aspect needs to be considered - reusability. The IBM Cognos 8 query engine will attempt to reuse some of the members retrieved through metadata calls as much as possible for subsequent execution. If the cube or query is the same, if the user is the same, if the BiBus process is the same and if the subsequent execution request is performed within 5 minutes (connection timeout) then the IBM Cognos 8 engine will reuse the members in memory – however the following two rules apply:

- Member retrieved using BAPI_MDPROVIDER_GET_MEMBERS can be reused
- Member retrieved using MDX can be reused ONLY when NO variables are used

Reusability has greatly improved performance of some reports, especially with many reports targeting identical hierarchies.

While this simple example simply scratches the surface of performance considerations, a good understanding of the concept discussed here will serve as a solid foundation of all subsequent design approaches.