

IBM Cognos TM1
Version 10.2.0

TurboIntegrator Guide



Note

Before using this information and the product it supports, read the information in "Notices" on page 97.

Product Information

This document applies to IBM Cognos TM1 Version 10.2.0 and may also apply to subsequent releases.

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Contents

Introduction	vii
Chapter 1. TurboIntegrator Basics	1
Data Sources Available with TurboIntegrator.	1
String Length Limit in TurboIntegrator	1
Importing Options	1
TurboIntegrator Functions	2
Processes and Chores	2
Order of Operations within a TurboIntegrator Process	2
Notes on TurboIntegrator Processes.	3
Simultaneous Connections to the Same TM1 Server	4
Aliases in TurboIntegrator Functions	4
Using Personal Workspaces and Sandboxes with TurboIntegrator Processes	4
Manually Running a TurboIntegrator Process with a Personal Workspace or Sandbox	4
Using TurboIntegrator Functions with Sandboxes	5
Chapter 2. Importing a Text File	7
Creating a Dimension from a Text File.	7
Defining a Data Source	7
Identifying Variables in the Data Source	9
Mapping Variables	11
Saving and Executing the TurboIntegrator Process	13
Creating a Cube from a Text File	13
Defining the Cube Data Source.	13
Defining Cube Variables	14
Mapping Cube Variables	14
Mapping Cube Element Variables to Dimensions.	15
Mapping Cube Data Variables	15
Mapping Consolidation Variables	15
Saving and Executing the Cube Process	15
Chapter 3. Importing from an ODBC Source.	17
Unicode and DNS	17
Defining an ODBC Data Source.	17
Generating a TurboIntegrator Process from an MDX Statement	18
Building the MDX TurboIntegrator Process.	18
Chapter 4. Importing from a TM1 View or Subset	19
Using a TM1 Cube View as a Data Source	19
Create a Cube Process.	19
Using the TM1 Subset as a Data Source	19
Define Dimension Subset as Data Source	20
Define Dimension Variables	20
Mapping Dimension Variables	20
Saving and Executing the Dimension.	21
Chapter 5. Importing from MSAS	23
OLE DB for OLAP Data Sources	23
ODBO Provider Name.	23
ODBO Location	23
ODBO Datasource	23
ODBC Catalog	23
Connection Strings: MSAS vs. TM1	23
Connecting to an OLE DB for OLAP Data Source When Using CAM Authentication	24

Importing a MAS Cube	25
Connecting to Analysis Services with TurboIntegrator	25
Specifying the Cube with the Load ODBC Cube Tab.	26
Using the Cube Dimensions Tab	27
Saving and Executing the MAS Process	27
Importing a MAS Dimension	28
Define MAS Connection Parameters	28
Using the Load ODBO Dimension Tab	29
Save and Run the Dimension MAS Process.	30
TM1 Message Log	30
Chapter 6. Importing Data Using the IBM Cognos TM1 Package Connector	31
Establishing a Connection to the Cognos BI Server	31
Connecting to Published Packages - Package and Dimension option	32
Importing a Single Dimension	36
Connecting to Published Packages - Custom Query option	36
Saving and Executing the TurboIntegrator Process	38
Seeing the Results	38
Guidelines for Working with SAP BW Data.	38
Working with SAP BW Data Using a Package in Framework Manager.	38
Specifying a Segmenting Prompt for an SAP BW Query	44
Performing parallel queries with a segmenter prompt	45
Invalid key errors when executing measure query	45
Chapter 7. Editing Advanced Procedures	47
Using Bulk Load Mode	47
Considerations for Using Bulk Load Mode	47
TurboIntegrator Process Commands for Bulk Load Mode	48
TM1 C API Functions for Bulk Load Mode	48
Editing Procedures	48
Executing a Process on Demand	49
Using TM1RunTI	50
TM1RunTI syntax	50
TM1RunTI configuration file.	54
TM1RunTI return codes and error messages	56
TM1RunTI other considerations	57
Serializing TurboIntegrator processes using synchronized()	58
synchronized()	58
TurboIntegrator security is assigned by administrator	60
Chapter 8. Scheduling a Process for Automatic Execution with Chores	63
Important Note on Chore Start Times.	64
Editing a Chore	64
Activating a Chore	64
Deactivating a Chore	64
Deleting a Chore	64
Executing a Chore on Demand	65
Using Chore Commit	65
Running a chore at server startup	65
Appendix A. TurboIntegrator Tutorial	67
Setting the Tutorial Data Directory.	67
TurboIntegrator Overview	67
Creating a TurboIntegrator Process	68
Creating Dimensions Using TurboIntegrator	68
Creating a Cube and Processing Data.	75
Advanced Scripting.	79
Editing the Prolog, Metadata, Data, and Epilog Procedures	79
Creating Subsets.	86
Creating Attributes	87

Appendix B. TurboIntegrator Reserved Words	89
Rule Function Names	89
Process Function Names	91
Implicit Variable Names	94
TurboIntegrator Keywords	95
Notices	97
Index	101

Introduction

This document is intended for use with IBM® Cognos® TM1®.

This manual describes how to use IBM Cognos TM1 TurboIntegrator to import data and metadata from a variety of Business Analytics sources.

Business Analytics provides software solutions for the continuous management and monitoring of Financial, Operational, Customer and Organizational performance across the enterprise.

Finding information

To find IBM Cognos product documentation on the web, including all translated documentation, access one of the IBM Cognos Information Centers (<http://pic.dhe.ibm.com/infocenter/cogic/v1r0m0/index.jsp>). Release Notes are published directly to Information Centers, and include links to the latest technotes and APARs.

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Chapter 1. TurboIntegrator Basics

This section describes basic information about how to import data into an IBM Cognos TM1 cube using TurboIntegrator.

TurboIntegrator lets you design a process that recognizes the data structure of the source and transforms it into the appropriate structure TM1 needs. Once the TI process is designed, you can re-run it or schedule it to be used when importing data from a dynamic source. Subsequent sections describe the steps used to import data from specific types of sources.

Before you begin using TurboIntegrator, be sure you understand the information that applies to all kinds of sources described in this chapter.

Data Sources Available with TurboIntegrator

Using TM1 TurboIntegrator, you can import data from these data sources:

- Comma-delimited text files including ASCII files.
- Relational database tables that are accessible through an ODBC data source.
- Other cubes and views.
- Microsoft Analysis Services.
- SAP via RFC.
- IBM Cognos packages

See the other sections in this manual for details about each of these source types.

String Length Limit in TurboIntegrator

TurboIntegrator is capable of handling string data in sizes of up to 8000 single-byte characters at a time. This limit applies when your TI process is performing actions such as assigning a value to a variable or importing individual records of data. Any value or record longer than 8000 single-byte characters is truncated.

This limit applies when your TI process is performing actions such as assigning a value to a variable or importing individual records of data. Any value or record longer than 8000 single-byte characters is truncated.

For example, if you are importing lines of data from a text file, each line of text can be no more than 8000 characters long. If you are importing data from a comma delimited file, each record in the file can be no more than 8000 characters long.

Importing Options

When you import data using TurboIntegrator, you have the following options:

- Create a cube and populate it with data imported from the source.
- Re-create a cube. This destroys a currently-existing cube and recreates it, allowing you to change both data and metadata during the import.
- Update an existing cube, maintaining the cube's structure. This enables you to import data into an existing cube structure.
- Create a dimension from data imported from a source.

- Update a dimension from imported data.

You can use TurboIntegrator to perform any combination of these actions.

TurboIntegrator Functions

TurboIntegrator includes a series of functions that let you manipulate cubes, views, dimensions, elements, and other TM1 objects while importing data.

In addition to these TurboIntegrator functions, you can also incorporate all standard TM1 rules functions in a TurboIntegrator process, with the exception of the STET function.

TurboIntegrator functions are described in "TM1 TurboIntegrator Functions" in the IBM Cognos TM1 *Reference Guide*.

Processes and Chores

You import data with TurboIntegrator by defining a *process*. A process is the TM1 object that consists of:

- A description of a data source.
- A set of variables corresponding to each column in the data source.
- A set of maps that define relationships between variables and data structures in the TM1 database.
- A Prolog procedure, consisting of a series of actions to be executed before the data source is processed.
- A Metadata procedure, consisting of a series of actions that update or create cubes, dimensions, and other metadata structures.
- A Data procedure, consisting of a series of actions that update or transform data in your TM1 database.
- An Epilog procedure to be executed after the data source is processed.
- A set of parameters that can be used to generalize a process so it can be used in multiple situations.

Chores are a container object for a set of TM1 processes. Chores allow you to run processes in a certain order and schedule processes to be run at a certain time. For details, see Chapter 8, "Scheduling a Process for Automatic Execution with Chores," on page 63.

Order of Operations within a TurboIntegrator Process

A TurboIntegrator process includes several procedures: Prolog, Metadata, Data, and Epilog. These procedures can be viewed as sub-tabs of the Advanced tab in the TurboIntegrator editor.

When you define a data source, set variables, and specify data actions for a process, TM1 generates scripts that are executed when you run the TurboIntegrator process. These scripts are placed in the appropriate procedure sub-tab of the TurboIntegrator editor. You can also create your own scripts in any of the procedure sub-tabs using TurboIntegrator functions and rules functions.

When you run a TurboIntegrator process, the procedures are executed in the following sequence:

1. The Prolog procedure is executed *before* the data source for the TurboIntegrator process is opened.
2. If the data source for the process is None, TurboIntegrator immediately executes the Epilog procedure after the Prolog finishes processing.
Note: When the data source for a process is None, the Metadata and Data procedures are ignored. In this case, all scripts for the process must be created in either the Prolog or Epilog procedures.
3. If the data source is anything other than None, TurboIntegrator opens the data source for the process.
4. All lines in the Metadata procedure are sequentially executed against the first record in the data source. All lines are then sequentially executed against the second record in the data source, and so on until all records are processed.
5. All lines in the Data procedure are sequentially executed against the first record in the data source. All lines are then sequentially executed against the second record in the data source, and so on until all records are processed.
6. TurboIntegrator closes the data source after the Data procedure is completed.
7. The Epilog procedure is executed.
8. TM1 closes the TurboIntegrator process.

Notes on TurboIntegrator Processes

Keep in mind the following items when creating and editing TurboIntegrator processes.

- TurboIntegrator compiles a new or altered dimension only at the conclusion of the procedure in which the dimension is created or altered.
 In the case of a new dimension, this means that you cannot access the new dimension (through TurboIntegrator or otherwise) until the procedure in which the dimension is created has finished processing all records in the data source. In the case of an altered dimension, this means that you cannot access any new elements in the dimension until the procedure in which the dimension is altered has finished processing.
- TurboIntegrator and rules functions (with the exception of STET) can be used in any procedure of a process. Further, there are no restrictions regarding which functions can be used in a given procedure; all functions are valid in any TurboIntegrator procedure.
- See "Formulas" in the Introduction to Rules chapter of the IBM Cognos TM1 *Rules Guide* for information on using different kinds of operators, such as logical and arithmetic operators in TI processes and rules.
- In the TurboIntegrator process, null values are converted into zeroes for Numeric values and NULL values are converted into empty strings for String Values.
- If you try to put a Consolidated element under an existing N-level element, the N-level element changes to a Consolidated element and any data in the original N-level element will be lost.

You must, however, create a logical sequence of functions to ensure that a process accomplishes your goal. For example, if you want to build a process that adds new elements to a dimension and updates data values for the new elements, you must be sure that the process adds the new elements and compiles the dimension *before* attempting to update data values for the new elements. In most circumstances, you

would add the new elements in the Metadata procedure using the DimensionElementInsert function, then update values in the Data procedure using the CellPutN function.

Using the above example, if you attempt to build a process in which both new elements are added *and* corresponding data values are updated in the Data procedure, the process will fail. The failure occurs because, as noted above, altered dimensions are compiled only at the conclusion of a procedure. Until the dimension is compiled, the new elements do not exist. TurboIntegrator cannot update data values for elements that do not exist, so the process fails.

Simultaneous Connections to the Same TM1 Server

Do not perform any operation within a TurboIntegrator process that creates a new connection (logs in) to the *same* TM1 server where the process is already running. This type of scenario could cause a deadlock situation between the two logins or threads causing the server to hang or possibly crash.

For example, avoid the following scenarios:

- Do not use a TI process to launch an ODBO MDX query (via the TM1 OLE DB MD Provider) into the *same* server. This scenario can result in both the process and the query waiting on each other to finish.
- Do not use the TI function, ExecuteCommand, to call out of a TI process to run *and wait* (Wait argument set to 1) for an external program that logs back into the *same* server. This includes any custom application or any IBM Cognos application, such as the TM1 ETL DAP utility, that could possibly connect back to the same server.

Be aware that using the ExecuteCommand function with its Wait argument set to 1 risks hanging the server *even if* the external program *doesn't* log back into the same server. If the external program encounters its own problem and becomes hung, the TI process essentially hangs waiting for the external program to finish executing.

Aliases in TurboIntegrator Functions

An alias name can be used in place of the corresponding element principal name in rules or in TurboIntegrator functions.

Using Personal Workspaces and Sandboxes with TurboIntegrator Processes

This section describes how to use Personal Workspaces sandboxes with TurboIntegrator processes and functions.

Manually Running a TurboIntegrator Process with a Personal Workspace or Sandbox

You can manually run a process with the currently active sandbox in Server Explorer by selecting the **Use Active Sandbox** property for that process.

The active sandbox is determined by which sandbox is currently selected in the Cube Viewer. For Personal Workspaces the only available sandbox is the [Default].

Note: Chores, and the processes they contain, cannot run against a Personal Workspace or sandbox. When a process runs as part of chore, it can only run against base data.

Procedure

1. In Server Explorer, open a view in the Cube Viewer.
2. Click the sandbox in the list of available sandboxes to select the sandbox you want to use with the process.
3. In the Tree pane, right-click the process and click **Use Active Sandbox** to enable the option.
4. Right-click the process and click **Run**.

Results

The process runs using the current active sandbox.

Using TurboIntegrator Functions with Sandboxes

The following TurboIntegrator functions allow a TurboIntegrator process to interact with Personal Workspaces and sandboxes.

- `GetUseActiveSandboxProperty`
- `SetUseActiveSandboxProperty`
- `ServerActiveSandboxGet`
- `ServerActiveSandboxSet`

These functions are similar to the **Use Active Sandbox** property available in the Server Explorer interface.

For more information, see the section about TurboIntegrator sandbox functions in the IBM Cognos TM1 *Reference Guide*.

Chapter 2. Importing a Text File

This section describes how to import comma-delimited text data, such as ASCII, with IBM Cognos TM1 TurboIntegrator. Though each TM1 process is unique, and importing from other types of data sources varies slightly, this section describes the steps common to most processes. The procedures and examples use the file `NewEngland.cma`, which is installed as part of the sample data that is included with TM1 .

Creating a Dimension from a Text File

You can use TurboIntegrator to create a dimension from a list of element names in a data source. This is the fastest way to create a dimension containing hundreds or thousands of elements.

When you create a dimension with TurboIntegrator, you define a process that is saved as an object on your TM1 server. This process can be accessed by other users, and can be executed on demand or at a scheduled interval.

To create a dimension with TurboIntegrator:

1. Define the data source to TM1 . See “Defining a Data Source.”
2. Identify the variables TM1 will encounter. See “Identifying Variables in the Data Source” on page 9.
3. Map the variables to their data types. See “Mapping Variables” on page 11.
4. Save the process and run it. See “Saving and Executing the TurboIntegrator Process” on page 13.

Defining a Data Source

Whenever you use TurboIntegrator, the first step requires you to define the data source from which you will be reading data. This example defines the ASCII file called `NewEngland.cma` as the data source for this TurboIntegrator process.

Procedure

1. Right-click **Processes** in the left pane of the Server Explorer and choose **Processes, Create New Process**.
2. Click **Text** on the Data Source tab.
The TurboIntegrator window opens.
3. Click **Browse**.
The Select Input File dialog box opens.
4. Navigate to `NewEngland.cma`, select it, and click **Open**.
`NewEngland.cma` is available in either the `PData` or `SData` sample data directory. If you accepted the default installation directory for TM1 , the full path to the file is
`C:\Program Files\Cognos\TM1\Custom\TM1Data\SData\NewEngland.cma`
or
`C:\Program Files\Cognos\TM1\Custom\TM1Data\PData\NewEngland.cma`.

You may receive a message indicating that you should use Universal Naming Convention (UNC) to specify the file location. If you are going to consistently run your process against an ASCII file, you should use UNC and ensure the following:

- If running a Microsoft Windows TM1 server, the ASCII file should reside on a shared Windows directory so that the server can access it.
- If running a TM1 server on a UNIX operating system, your file should reside on a shared network directory, one which both the TM1 Windows client and the TM1 UNIX server can see.

Note: If running a TM1 server on a UNIX operating system, the input source filename *cannot* contain any upper-case characters or spaces.

5. Click **OK** on the warning box.
6. Complete the TurboIntegrator dialog box as follows:

NewEngland.cma is a delimited source that uses commas as its delimiter; double quote as a quote character; no title records; a period as a decimal separator; and a comma as a thousands separator.

To define this source enter the following settings:

- At Delimiter Type, select **Delimited**.
- Select **Comma** as the Delimiter.
- Enter " at Quote Char.
- Leave the Number of Title Records field blank.
- Enter . at Decimal Separator.
- Enter , at Thousands Separator.

7. Click **Preview**.

TurboIntegrator shows you a sample of your source data at the bottom of the window.

Using Fixed Length Records

TurboIntegrator can also import data from text files that use fixed width fields. To specify that the data source has fixed width fields, after specifying the location of your data source file select the Delimiter Type of **Fixed Width**, then click **Set Field Width**.

The Data Preview dialog box displays the first three records of your source data. To set the field widths based on the contents of records in your data source:

Procedure

1. Click the **1** column heading.
A break line displays in the column heading and extends through the three records.
2. Click the break line and drag it to a position that separates the first column from the second column.
A new column heading (2) displays.
3. Click column heading **2** and drag the new break line to a position that separates the second column from the third column.
4. Set break lines for all remaining columns in the text source.
5. Click **OK** to return to the TurboIntegrator window.

Identifying Variables in the Data Source

After you define a data source, TurboIntegrator assigns a variable to each column in the source. You must identify these variables by type and content.

To illustrate this process, consider the following text data:

Table 1. sample text data

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
New England	Massachusetts	Boston	Supermart	Feb	2000000
New England	Massachusetts	Springfield	Supermart	Feb	1400000
New England	Massachusetts	Worcester	Supermart	Feb	2200000
New England	Connecticut	Hartford	Supermart	Feb	1240000
New England	Connecticut	New Haven	Supermart	Feb	2700000
New England	Connecticut	Greenwich	Supermart	Feb	1700000

The first 3 columns form a hierarchy for a Location dimension that you will build from the source text file:

- The New England consolidation is at the top of the hierarchy.
- The states Massachusetts and Connecticut are one level below New England.
- The third column, containing city names such as Boston and Hartford, supplies simple elements at the lowest level of the hierarchy.
- The remaining columns are not used for the creation of the Location dimension.

Here is the Variables tab on the TurboIntegrator window for this data structure:

Table 2. Variables tab

Variable Name	Variable Type	Sample Value
V1	String	New England
V1	String	New England
Massachusetts	String	Massachusetts
Boston	String	Boston
SuperMart	String	SuperMart
Feb	String	Feb
V6	Numeric	2000000

TurboIntegrator assigns a variable name to each column, and assigns a variable type based on the sample value for each column.

The default variables names, such as V1 and Massachusetts, can be changed. It is good practice to give the variables a meaningful name. Having meaningful names makes the TurboIntegrator scripts easier to read and troubleshoot.

To edit a variable name, click the name in the Variable Name column and type a new name. For this exercise, the names of the first three variables were edited like this:

Sample Value	Variable Name
New England	Region
Massachusetts	State
Boston	City

A variable name must begin with a letter, and can contain only these characters:

Character	Description
Upper-case Letters	A through Z
Lower-Case Letters	a through z
Digits	0 through 9
Period	.
Underscore	_
Dollar Sign	\$

The Variable Type field identifies the contents of the column. For instance, the first column of this data contains the string "New England". TurboIntegrator correctly identifies the variable type as String.

Note: The Variable Type fields are usually set accurately for ASCII data, but not for data extracted from an ODBC data source.

The Contents field can be defined with one of these settings:

Option	Description
Ignore	Ignore the contents of the column when processing the data source.
Element	The column contains simple elements for the dimension you want to create.
Consolidation	The column contains consolidated elements for the dimension you want to create.
Data	The column contains data values. For this example, you should ignore the column containing the data values. Columns containing data values are not imported when you are creating a dimension.

Option	Description
Attribute	The column contains element attributes for the dimension you want to create.
Other	The column contains data that does not fall into any of the previous four categories. Typically, this setting is used for columns containing data that will be processed through custom variables and formulas.

The text data in this example contains elements and consolidations for a Location dimension:

- It does not contain any attributes.
- It does contain data values, but those values are irrelevant to the creation of the Location dimension, as are the elements from other dimensions.

To define the variables for the Location dimension:

Procedure

1. Click the **Variables** tab on the TurboIntegrator window.
2. Set the **Contents** field for variables Region, State, and City as specified here:

Variable	Content
Region	Consolidation
State	Consolidation
City	Element

- The variable Region is now identified as a consolidation
- The variable State is also identified as a consolidation
- The variable City is identified as a leaf level (non-consolidated) element.

Mapping Variables

After you identify the variables in your data source, you must map those variables to elements and consolidations.

To begin mapping variables, click the **Maps** tab on the TurboIntegrator window.

The Maps tab contains several additional tabs. The Cube tab is always available. All other tabs become available based upon the column contents you set on the Variables tab. For example, if you identify a column as containing elements, the Dimension tab becomes available. If you identify a column as containing consolidations, the Consolidations tab becomes available, and so on.

Disable Cube Mapping

You should not perform any cube actions when creating a dimension. To prevent cube mapping:

Procedure

1. Click the **Cube** tab.
2. Select **No Action** in the Cube Action box.

Mapping Dimensions

If you identify any columns in your data source as containing elements, you must map those elements to the dimension you are creating:

Procedure

1. Click the **Dimensions** tab.
2. Type **Location** in the Dimension field.
If multiple elements map to the same dimension, type the dimension name for each element.

When you type a new dimension name in the Dimension column, the Action column defaults to Create.

If you type the name of an existing dimension, you have the option of recreating or updating the dimension. If you choose the Recreate action, the elements in the existing dimension are deleted and replaced by the data in the data source. If you choose the Update action, the dimension is updated with any new elements contained in the data source.

3. Select a type for each element from the appropriate Element Type menu. The element type indicates the type of data identified by the element variable. In TM1, this setting is almost always Numeric.
4. Select an **Element Order** option. The element order determines how elements are added to the dimension during processing.
The data in this example contains a single numeric element that maps to a new Location dimension. The completed Dimensions tab displays as follows.

Disable Data Mapping

You should not perform any data mapping when creating a dimension.

Example

Since you specified No Action on the Cube Mapping tab “Disable Cube Mapping” on page 11, this Data tab becomes unavailable.

Mapping Consolidations

If you identify any columns in your data source as containing consolidations, you must map consolidation paths for the dimension you are creating:

Procedure

1. Click the **Consolidations** tab.
The tab displays the variables that are defined as consolidations, Region and State.
You can define the consolidation hierarchy of the dimension by specifying the child variable of each consolidation variable.
2. The immediate child of the Region consolidation variable is State. Click the right angle bracket button in the Child Variable field for the Region consolidation, select **State**, and click **OK**.
3. The immediate child of the State consolidation variable is City. Click the right angle bracket button in the Child variable field for the State consolidation, select **City**, and click **OK**.
4. For each consolidation, click the **Component Order** button. The Component Element Ordering dialog box opens.
5. Click **Automatic**, **Name**, and **Ascending**.

Note: When you are setting up multiple consolidations within the same dimension, all the consolidations must be set to the same Component Element Ordering settings. If you set two consolidations in the same dimension to different Component Element Ordering settings, TurboIntegrator produces a Sorting Information Mismatch error when you try to save and execute the process.

Saving and Executing the TurboIntegrator Process

After you define a data source and set up variables, the TurboIntegrator process is compiled and saved. To create the dimension, you execute the completed process.

Procedure

1. Click **File, Save** from the TurboIntegrator menu bar.

The Save Process As dialog box opens.

2. Enter a name for the process and click **Save**.

If TM1 encounters an error during compilation and saving, an error message indicates the nature of the error. The TurboIntegrator window remains active, so you can immediately correct any errors.

TM1 saves the process as a server object under Processes in the Server Explorer. The process is now available for execution or modification.

To execute the process and create the dimension, click **File, Execute** from the TurboIntegrator menu bar. You can also execute a process directly from the Server Explorer by selecting the process and clicking **Process, Execute Process**.

If the process executes successfully, TM1 issues a confirmation message.

If TM1 is unable to execute the process, a dialog box details the errors encountered during execution.

When NewEngland.cma is processed, a new Location dimension is created.

Creating a Cube from a Text File

TurboIntegrator can also create an entire cube from a text file. This procedure also builds some dimensions and elements, and performs some data manipulation.

The procedure for building a cube is similar to the process for building a dimension:

1. Define the data source to TM1. See “Defining the Cube Data Source.”
2. Identify the variables TM1 will encounter. See “Defining Cube Variables” on page 14.
3. Map the different variables to their different data types in the resulting cube. See “Mapping Cube Element Variables to Dimensions” on page 15, “Mapping Cube Data Variables” on page 15, “Mapping Cube Variables” on page 14, and “Mapping Consolidation Variables” on page 15.
4. Save the process and run it. See “Saving and Executing the Cube Process” on page 15.

TM1 includes a sample data directory called TI_data. TI_data contains a file called import_cube.csv. This example describes how to build a cube from import_cube.csv.

Defining the Cube Data Source

The first step in creating a cube from a text file is to define the data source.

Procedure

1. In the left pane of the Server Explorer, right-click the **Processes** icon and select **Create New Process**.
2. Click the **Data Source** tab on the TurboIntegrator window.
3. Choose **Text** as the Data Source Type.
4. Click the **Browse** button next to the Data Source Name field and select the **import_cube.csv** file in your TI_data directory. If you accepted the default installation directory, the full path to the TI_data directory is
C:\Program Files\Cognos\TM1\Custom\TM1Data\TI_Data
5. Set the Delimiter Type to **Delimited**, and choose **Comma** as the Delimiter. Ignore the Quote Char and Number of Title Records fields for this example.
6. Make sure the Decimal Separator is period (.) and the Thousand Separator is comma (,).
7. Click **Preview** to view the first few records of the data source.
Each record in import_cube.csv contains 6 fields. The first five fields contain information that will be imported into TM1 as element names. The sixth column contains cube data.

Variable Name	Variable Type	Sample Value	Contents
V1	String	Actual	Ignore
Massachusetts	String	Argentina	Ignore
V3	String	S Series 1.8 L Sedan	Ignore
Units	String	Units	Ignore
Jan	String	Jan	Ignore
V6	Numeric	313.00	Ignore

Defining Cube Variables

After identifying the source data to TurboIntegrator, you must identify the contents of each field in the source.

Procedure

1. Click the **Variables** tab. TurboIntegrator sets default values for each variable.
2. For each variable, select a type from the associated Variable Type menu.
In this example, no changes to the Variable Type fields are required. TM1 correctly identifies the type for each variable.
3. For each variable, select a content type from the associated Contents menu.
In this example, all variables with the exception of V6 should be identified as Element. V6 should be identified as Data.

Mapping Cube Variables

You've identified variables for data, elements, and consolidations. Now you have to map the variables and provide instructions for creating a new cube.

Procedure

1. Click the **Maps** tab.
2. Click the **Cube** tab.
3. Select **Create** for the Cube Action.
4. Type **import_cube** in the Cube Name field.
5. Select **Store Values** for the Data Action.
6. Do not turn on the Enable Cube Logging option. When you enable cube logging, TM1 logs changes to cube data during processing. You are creating a new cube, so there is no need to log changes.

Mapping Cube Element Variables to Dimensions

Map all variables you identified as having an Element type to appropriate dimensions.

Procedure

1. Click the **Dimensions** tab.
2. Set values in the Dimensions tab according to the following table.

Element Variable	Sample value	Dimension	Order in Cube
Actual	Actual	actvsbud2	1
Argentina	Argentina	region2	2
V3	S Series 1.8 L Sedan	model2	3
Units	Units	measures	4
Jan	Jan	month2	5

3. For all element variables, set the Action to **Create**, and the Element Type to **Numeric**.

Mapping Cube Data Variables

For this example, there is only one data variable - V6. You do not need to map this data variable. TurboIntegrator does it for you. The data tab is not even enabled in this example.

TurboIntegrator adds the data to the cube at the intersection of the created dimensions. If there were 2 or more variables defined as data on the Variables tab, you would have to specify information about where the data should be added to the cube.

For an in-depth example of mapping data values into a cube, see "TurboIntegrator Tutorial."

Mapping Consolidation Variables

No variables in this example are defined as consolidations on the Variables tab. The Consolidations tab is not enabled in this example.

For an in-depth example of mapping consolidations into a cube, see "TurboIntegrator Tutorial."

Saving and Executing the Cube Process

You must save and name the process before you can execute it.

Procedure

1. Click the **Execute** button.
To save and execute the process:
TM1 prompts you to name and save the process.
2. Save the process as create_newcube.
After a few seconds, you should see confirmation that the process executed successfully.
3. Open the Server Explorer. You should see that the cube import_cube has been created and populated, and that all required dimensions have been created.

Chapter 3. Importing from an ODBC Source

Using TurboIntegrator, you can create cubes and dimensions from data in relational database tables. To do this, you must have the following software on your machine:

- The client software for your relational database installed on the same machine on which you are running TurboIntegrator.
- An ODBC data source established for your relational database. You build data sources through the Windows Data Sources control panel.

Once you have defined the ODBC data source, the steps for creating a cube or dimension from relational data are identical to creating a cube or dimension from a text file. For a complete step-by-step tutorial of creating objects in TurboIntegrator using an ODBC source, see "TurboIntegrator Tutorial."

Note: TM1 requires DataDirect drivers to access an Oracle ODBC source on Solaris or AIX®. These drivers are not supplied with TM1 and must be acquired separately.

Unicode and DNS


When configuring the DSN to import Unicode data from an Oracle database using the version 11g client/ODBC driver, be sure to specify the Enable Closing Cursors option on the Application tab. TI processes can fail if this option is not specified.

The Oracle 11g ODBC driver does not adequately support the SQL_CLOSE option of the SqlFreeStmt.

Defining an ODBC Data Source

To define an ODBC data source:

Procedure

1. Open the Server Explorer.
2. Right-click the **Processes** icon  beneath the server on which you want to create the process and choose **Create New Process**.
The TurboIntegrator window opens.
3. Choose the top **ODBC** in the Data Source Type box. TurboIntegrator displays the fields required to define an ODBC source.
4. Click **Browse** and choose an ODBC data source name. Only data sources that have been defined on the computer on which the TM1 server runs are accessible.
5. If they are required to use this source, enter a valid username and password for the target database in the **UserName** and **Password** fields.
6. In the **Query** box, enter an SQL query to extract data from the source. The syntax and format of the SQL query depends on the type of database you are using. For example, if you are using an Microsoft Access Database, you can run Microsoft Access, open the database, use the SQL view, then copy the SQL statement into this Query window.

Note: If the query references a table name that contains spaces, you must enclose the name in double quotes.

7. Click **Preview**.

If the query was valid, and the connection was properly defined, the first ten records of the target database table appear in the TurboIntegrator window.

See "Identifying Variables in the Data Source" for the steps used to define ODBC variables.

See " Mapping Variables" for instructions on how to define ODBC map instructions.

See "Saving and Executing the TurboIntegrator Process" for details on saving and executing a TurboIntegrator process.

Generating a TurboIntegrator Process from an MDX Statement

This section describes how to extract data from an ODBO data source using an MDX statement, and import that data into TM1 .

It is best to generate an MDX statement using another utility, then use the working MDX statement as the basis for your data import into TM1 .

When you import data, it is important to start with an MDX statement that has a limited number of columns. Some MDX statements generate large numbers of columns. Such queries are impractical as a starting point for an import.

One method of limiting the number of columns is to place only the measures you are interested in on the columns.

Building the MDX TurboIntegrator Process

Once you have an MDX statement that returns useful data, you can build your TurboIntegrator process.

To get started, follow these steps:

Procedure

1. In the Server Explorer, right-click **Processes** and choose **Create New Process**. The TurboIntegrator window opens.
2. In the Data Source Type box, click **ODBO** and select **MDX Query**.
3. Enter required connection parameters in the Connection tab of the TurboIntegrator window. The connection parameters are vendor-specific.
4. Click **Connect**. If you connect successfully, the Connect button becomes greyed out and you are able to proceed to the MDX Query tab.
5. Click the **MDX Query** tab.
6. Type your MDX query into this tab. You can also cut a working MDX query from another application and paste it into this tab.
7. Click the **Variables** tab. For each column generated by the MDX statement, one variable is generated by TurboIntegrator.
Columns containing row headers are typically mapped as dimension elements. Columns containing data elements are mapped as data.
8. See "Mapping Variables" to map the variables into TM1 structures. Once you have connected to the ODBO data source and defined the MDX statement, the process for completing the TurboIntegrator process is identical to that of an ODBC data import.

Chapter 4. Importing from a TM1 View or Subset

IBM Cognos TM1 TurboIntegrator allows you to extract data from a cube view and create new objects with that data. The steps for building a process to use a TM1 view are similar to those used to define any other data source, except that you first build a view of your data that is specifically designed for import.

Not all TM1 cube views can be successfully imported. By building a view with certain parameters from inside TurboIntegrator, your import will work successfully every time.

Using a TM1 Cube View as a Data Source

You can define a cube view as a data source.

To do so, see “Create a Cube Process” to define the data source, then follow the procedures described in “Importing a Text File”.

Create a Cube Process

You can create a process that uses a cube view as a data source.

Procedure

1. Right-click **Processes** in the Server Explorer and choose **Create New Process**.
2. Click **TM1** and select **Cube View** in the Data Source Type box. TurboIntegrator displays the Data Source Name field.
3. Click **Browse** to select from a list of available views. The Browse Server Cube Views dialog box opens.
4. Select the cube that holds the data you want to import.
5. If a view that you want to use as a data source already exists, select that view. If such a view does not exist, click **Create View** to open the View Extract window and create the view. After creating the view, select it in the Browse Server Cube Views dialog box.
6. Click **OK**.

The selected view now displays as the data source for your TurboIntegrator process.

Continue with the steps described in “Importing a Text File” to complete the import of your TM1 view.

Using the TM1 Subset as a Data Source

TurboIntegrator allows you to extract data from the TM1 dimension subset and move that information to another TM1 object. In the following example, the Europe consolidation in the Region dimension is extracted and used to form a new dimension called Region_Europe.

When you are extracting information from a dimension subset, the target object is typically another dimension. You cannot build a cube from information extracted from a dimension subset.

The procedure for extracting data using the TM1 Subset is similar to other TurboIntegrator process. See "Define Dimension Subset as Data Source" to get started.

Define Dimension Subset as Data Source

Follow these steps to create a process that uses a dimension subset as a data source:

Procedure

1. Right-click **Processes** in the Server Explorer and choose **Create New Process**.
2. Click **TM1** and select **Dimension Subset** in the Data Source Type box. TurboIntegrator displays the single field required to define a cube view source.
3. Click **Browse** to select from a list of available subsets.
The Browse Server Subsets dialog box opens.
4. Select the dimension that contains the elements you want to import.
5. Select the subset that you want to use as a data source and click **OK**.
6. Click **Preview**.

The elements of the selected dimension subset appear in the preview panel.

Define Dimension Variables

In this example, the elements extracted from the subset data source will be added as children of a top-level consolidation called All Europe.

To build a new consolidation follow these steps:

Before you begin

See "Defining Cube Variables" for details on identifying and defining variables in TurboIntegrator.

Procedure

1. Click **New Variable**.
The variable V2 displays in the Variables tab.
2. Click **Formula**.
The Process Variable Formula dialog box opens.
3. Modify the formula as follows:
V2='All Europe';
4. Click **OK**.
5. Change the Variable Type for V2 to **String**.
6. Change the Contents setting for V2 to **Consolidation**.

In the next section, the elements imported from the subset data source are added to the All Europe consolidation.

Mapping Dimension Variables

In this example, you must set the Cube, Dimensions and Consolidations tabs to create a new dimension called Europe. Europe has a single consolidation called All Europe.

See "Mapping Variables" for details on the procedure for mapping imported data to TM1 objects.

Setting the Cube Tab

Set the following options on the Cube tab:

Action Type	Setting
Cube Action	No Action
Data Action	Store Values

Setting the Dimensions Tab

The Dimensions tab allows you to map incoming data into TM1 dimensions. In this example, only one dimension is created, named Europe. Set the following options on the Dimension tab:

Option Name	Setting
Element Variable	Europe
Dimension	Region
Action	Create
Element Type	Numeric

Setting the Consolidations Tab

The All Europe variable you added earlier should appear on the Consolidations tab. Notice that the Sample Value is set to the value you established in the formula. Because the process contains only two variables, TM1 correctly identifies the region variable as the child of the V2 variable. There is no need to modify the setting on the Consolidations tab.

Saving and Executing the Dimension

After saving and executing the process, TM1 creates a new dimension named Europe with a single consolidation named All Europe, which contains leaf elements for all European regions.

See "Saving and Executing the TurboIntegrator Process" for details on how to save and execute a TurboIntegrator process.

Chapter 5. Importing from MSAS

IBM Cognos TM1 TurboIntegrator allows you to import data from any OLE DB for OLAP (ODBO) data source, including Microsoft Analysis Services. This section shows how to use TurboIntegrator to import cubes and dimensions from Microsoft Analysis Services.

OLE DB for OLAP Data Sources

An OLE DB For OLAP data source is identified by the following parameters:

- ODBO Provider Name
- ODBO Location
- ODBO Data Source
- ODBO Catalog

ODBO Provider Name

This is the name assigned by the ODBO provider that identifies their multidimensional database server. For example, TM1 uses "TM1 OLE DB MD Provider" and Microsoft Analysis Services uses "Microsoft OLE DB Provider for OLAP Services 8.0".

TurboIntegrator lists only the ODBO providers that you have installed on your server.

ODBO Location

The location field is the name of the location where an administrator assigns a particular instance of the ODBO provider service.

The exact interpretation of this field is vendor-specific.

ODBO Datasource

This is the name your administrator assigns to a set of catalogs at a particular location. In Microsoft Analysis Services, this is the name of a registered server.

ODBC Catalog

This is the name assigned by your administrator to a particular collection of databases (Cubes, Dimensions and other objects). For Microsoft Analysis Services, this is the name of the database.

Connection Strings: MSAS vs. TM1

The TM1 OLE DB for OLAP Provider has been modified to provide more flexibility to programmers building connection strings. This was done to make TM1 connection strings compatible with MSAS connection strings.

In earlier versions of TM1 , logging in through the TM1 OLE DB Provider required the following fields:

Field	Example Setting
Location The machine name of the TM1 Admin Server host.	MyServer
Datasource The name of the TM1 server.	Sdata
userID The TM1 user name.	Admin
password The password for the TM1 user.	Apple

You can use the parameters described above, or you can log in to TM1 using the parameters in the following table. These parameters are also used to connect to Microsoft Analysis Services from TurboIntegrator.

Field	Example Setting
Datasource The machine name of the TM1 Admin Server host.	MyServer
Catalog The name of the TM1 server.	Sdata
userID The TM1 user name.	Admin
password The password for the TM1 user.	Apple

Connecting to an OLE DB for OLAP Data Source When Using CAM Authentication

If your TM1 server is configured to use Cognos Access Manager (CAM) authentication, you must specify the CAM namespace ID used by the server when establishing a connection to an ODBO data source.

If you are running a 32-bit version of the server, you can specify the CAM namespace in the Additional Connection Parameters section of the Connection tab in TurboIntegrator. The CAM namespace ID must be specified using the following format:

```
Provider String="CAMNamespace=<CAM Namespace ID"
```


<CAM namespace ID> must be the internal CAM namespace ID, not the descriptive name of the namespace.

If you are running a 64-bit version of the server, you must specify the CAM namespace ID through a connection string, using the same format noted above. For example the following connection string specifies a CAM namespace ID named NTLM_NAMESPACE:

```
Provider=TM1OLAP.1;Location=localhost;Data  
Source=empty;UserID=tm1user;Password="abc123";  
Provider String="CAMNamespace=NTLM_NAMESPACE";InitialCatalog=empty
```

You cannot use the TurboIntegrator user interface to specify the CAM namespace when running a 64-bit server; you *must* use a connection string.

Importing a MAS Cube

This procedure describes how to import a simple cube from Microsoft Analysis Services into TM1 .

To import a cube into TM1 from Microsoft Analysis Services:

- 1. Establish the connection to the MAS data source.**
See "Connecting to Analysis Services with TurboIntegrator."
- 2. Specify which cube you are importing.**
See "Specifying the Cube with the Load ODBC Cube Tab" on page 26.
- 3. Define the dimensions.**
See "Using the Cube Dimensions Tab" on page 27.
- 4. Save the process and run it.**
See "Saving and Executing the MAS Process" on page 27.

Connecting to Analysis Services with TurboIntegrator

Use TurboIntegrator to create a process that connects to Microsoft Analysis Services.

Procedure

1. Run Architect, and log in using a valid user name and password.
2. Right-click **Processes** and choose **Create New Process**.
The TurboIntegrator dialog box opens.
3. Click the **ODBO** option and then select **Cube**.
The dialog box displays the options that allow you create to an ODBO connection string.
4. Enter connection parameters into the dialog box as follows:

Field	Value
ODBO Provider	Choose Microsoft OLE DB Provider for OLAP Services .
ODBO Location	Leave this parameter blank.
ODBO Datasource	Enter the machine name of the server that hosts Analysis Services.

Field	Value
ODBO Catalog	Enter an Analysis Services database name. For example, to import data from the Microsoft sample database, enter FoodMart 2000 in this field.
ODBO UserID	Enter a valid user name for the Analysis Services database.
ODBO Password	Enter a valid password for this username for the Analysis Services database.
Additional Connection Parameters	Some ODBO servers may require additional parameters in order to successfully connect. Enter those parameters in this field, delimited by semi-colons.

5. Click **Connect**. If you connect successfully, the Connect button becomes greyed out, and you are able to proceed to the Load ODBO Cube tab.

Specifying the Cube with the Load ODBC Cube Tab

The Load ODBO Cube tab allows you to specify which cube you are importing from Analysis Services, along with other information. Follow these steps to fill out this tab.

Procedure

1. Click the **Load ODBO Cube** tab.
2. Choose a cube action. The choices are described in the following table:

Option	Description
Create Cube	Copies data and metadata from the ODBO data source, and create a new cube in TM1 . Use this option only when none of the cubes and dimensions you are importing exist on the server.
Recreate Cube	Destroys a currently existing cube, and rebuilds it using data and metadata from the ODBO data source. Use this option only when the cubes and dimensions exist, and you want to replace them with new structures and data.
Update Cube	Copies data from an existing ODBO cube, and inserts it into an existing cube. This option does not change the structure of cubes and dimensions on the server.
No Action	The default value for the screen. Processes that specify No Action do not affect the cube's data or metadata. Use this to test and debug processes or to define your own custom operations.

For this example, choose **Create Cube**.

3. Click **Select ODBO Cube From** and choose an Analysis Services cube to import into TM1 .
4. Click in the **Select TM1 Cube to Load To** field. Enter a unique name for your cube.

- In the Data Action panel, choose **Store Values**. This option writes cell values in the ODBO cube to the cube. The Accumulate Values option allows you to aggregate values as they are being imported.

Using the Cube Dimensions Tab

The Cube Dimensions tab allows you to manipulate imported dimensions as they are imported into TM1 .


By default, all of the dimensions in the ODBO cube are imported. They are created in TM1 as *name_*. For example, when the [customer] dimension in Analysis Services is imported, the corresponding dimension in TM1 is called Customer_.

This dialog box presents the following options:

- You can choose to map an ODBO dimension to an existing dimension. To do this, click any dimension in the **TM1 Dimension** column, and choose another dimension.
- You can also import the ODBO dimension's elements into an entirely new dimension. Click in the corresponding cell underneath the TM1 Dimension column, then type the name of the new dimension. For example, replace the customer_ dimension with a dimension called MyCustomerDim.
- For each imported dimension, you must choose the TM1 Dimension Action. Choose one of the following options:

Option	Description
Create	Imports dimension data from the ODBO cube, and creates a new dimension with the entire set of element from the dimension. This is the default action.
Filter Only - MDX	Imports dimension data from the ODBO cube, and creates a new dimension in with a limited set of elements.
No Action	Do not import this dimension from the ODBO data source.

Saving and Executing the MAS Process

Once you have completed your changes to the Cube Dimensions tab, click  to save and execute the process.

The Save Process As dialog box opens.

Enter the name of the new process. Give the process a name related to the data you are importing. For this example, enter **ODBO_Sales_Import**.

TM1 should import your data and create the new cube. A dialog box will appear to show the progress of the import.

Importing a MAS Dimension

This section describes how to import a dimension from Microsoft Analysis Services into TM1 . The following table is a representation of the dimension as displayed in Analysis Services.

```
Dimension Members
· All store2
+ · Canada
- · Mexico
  + · DF
  + · Guerrero
  + · Jalisco
  + · Veracruz
  + · Yucatan
  + · Zacatecas
· USA
+ · CA
+ · OR
+ · WA
```

TM1 requires that all elements in a dimension have unique names. TM1 also requires that all aliases for the elements have unique names. In order to ensure that the element names are unique, TM1 names each consolidation and element in an imported dimension with the names of all its parents in square brackets, delimited by periods.

After being imported into TM1 , the subset aliases are populated with the element names from Analysis Services.

The procedure to import MAS data is similar to other import processes.

Define MAS Connection Parameters

The first step in importing an Analysis Services dimension into TM1 is connecting to Analysis Services and choosing the ODBO Dimension option. Follow these steps:

Procedure

1. Run Architect, and log in using a valid user name and password.
2. Right-click **Processes** and choose **Create New Process**.
The TurboIntegrator dialog box opens.
3. Click the **ODBO** option and then select **Dimension**.
4. Enter connection parameters into the dialog box as follows:

Field	Value
ODBO Provider	Choose Microsoft OLE DB Provider for OLAP Services .
ODBO Location	Leave this parameter blank.

Field	Value
ODBO Datasource	Enter the machine name of the server that hosts Analysis Services.
ODBO Catalog	Enter an Analysis Services database name. For example, to import data from the Microsoft sample database, enter FoodMart 2000 .
ODBO UserID	Enter a valid user name for the Analysis Services database.
ODBO Password	Enter a valid password for this user for the Analysis Services database.
Additional Connection Parameters	Leave this field blank.

5. Click **Connect**. The Connect button should grey out, indicating that you connected successfully.

Using the Load ODBO Dimension Tab

Once you are successfully connected to Analysis Services, you must specify information about the source and destination dimensions for your dimension load process. Follow these steps:

Procedure

1. Click the **Load ODBO Dimension** tab.
2. Choose the TM1 Dimension Action. Choose one of the following options:

Option	Description
Create Dimension	Copies a dimension from the ODBO data source, and creates a new dimension.
Recreate Dimension	Destroys a currently existing dimension, and rebuilds it using data from the ODBO data source.
Update Dimension	Update Dimension assumes that TM1 already has a dimension into which you want to insert or delete elements. <ul style="list-style-type: none"> • If elements exist in the ODBO data source but not in TM1 . The elements are added to the dimension. • If elements exist in TM1 , but not in the ODBO data source, those elements are unaffected by the import. No changes are made to the elements in the local dimension. • If elements exist in the ODBO data source and the local dimension, the elements from the ODBO data source are imported, and they are created in the local dimension as <element_name>_1. Note that this will increase the size of your dimension.
No Action	The default value for the screen. This process has no effect on the dimension.

3. Click the **ODBO Cube Containing Dimension** list and choose the cube that contains the dimension that you want to import from Analysis Services.
4. Click the **Cube Dimensions** list and choose the dimension you want to import.
5. If you are updating or recreating a dimension, click the **TM1 Dimension to Load** list and select a dimension from the list.

If you are creating a new dimension, type in the name of your new dimension in the TM1 Dimension to Load field.

Save and Run the Dimension MAS Process

Once you have completed your changes to the Load ODBO Dimension tab, click

 to save and execute the process.

The Save Process As dialog box opens.

Enter the name of the new process, then click **Save**. The import begins, and TM1 displays a dialog box showing the status of the import.

TM1 Message Log

When the process completes, minor errors may be written to the TM1 message log. If so, TM1 displays a message box to inform you.

To check the server message log, right-click the TM1 Server in the Server Explorer, and choose **View Message Log**. To see details about an error, double-click the error in the message log.

Chapter 6. Importing Data Using the IBM Cognos TM1 Package Connector

The IBM Cognos TM1 Package Connector is currently supported for use with IBM Cognos Business Intelligence packages against SAP Business Warehouse and other relational and ODBC data sources.

See the Supported Hardware and Software link on the Cognos TM1 10.1.0 Information Center (<http://publib.boulder.ibm.com/infocenter/cogic/v1r0m0/index.jsp>) for specifics on supported software.

When importing packages using the TM1 Package Connector, do the following tasks:

- For SAP BW Datasources: create the SAP BW infoquery. Infoqueries are an important step when importing from SAP BW datasources.
- Create a Package in Framework Manager.
- Create a TurboIntegrator process that uses the TM1 Package Connector.

This topic describes using the TM1 Package Connector and also provides information on Guidelines for Working with SAP BW Data and Creating a Package in Framework Manager. More details on these topics can be found in the SAP documentation and the IBM Cognos Framework Manager documentation.

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 details on installing and configuring the IBM Cognos TM1 Package Connector.

Establishing a Connection to the Cognos BI Server

After the components have been installed and configured, follow these instructions to establish the connection:

Procedure

1. Run TM1 .
2. In the left pane of the TM1 Server Explorer, right-click the **Processes** group and select **Create New Process**.
The TurboIntegrator window opens.
3. Select the **IBM Cognos Package** option in the Data Source Type dialog box.
4. **Package** is selected by default.

Remember:

Package and Dimension

The Package and Dimension option provides a simplified way to import data from dimensionally modeled sources, (for example, SAP Business Warehouse or Dimensionally modeled relational sources) and is not easily customized.

You can instead select **Dimension** if you only want to import hierarchies from a single dimension in a package.

Custom Query

The Custom Query option works with DMR or non-DMR sources and provides more flexibility in selecting the items to query and provides more open access to the standard TurboIntegrator programming capabilities.

See Connecting to Published Packages for more details.

5. Enter the connection details:

If your IBM Cognos BI server permits anonymous logon, you can click "Log on." Otherwise, enter your logon credentials here:

- **Authentication Namespace**

The pull-down list shows all available authentication namespaces.

- **User ID and Password**

Supply a user ID and password for a user in the selected authentication namespace.

- **Sign-ons**

Allows you to manage sign-on information associated with the TurboIntegrator process. The button is enabled once you have successfully logged into the BI Server.

A sign-on called "BI Server Logon" is automatically created for you the first time you authenticate to the BI Server. If you update the credentials in the Connection tab after the initial login, those changes do not update this sign-on. You must use the Manage Sign-ons dialog box to make changes to the sign-on. You can Add, Modify, and Remove sign-ons. Also, if you enter credentials on the Connection tab, then click on logon and modify the sign-on in the sign-on window, the credentials on the Connection tab are not updated.

Removing a sign-on can make the TurboIntegrator process unable to run when anonymous logon is turned off.

As you work with dimensions and measures, data source sign-ons may be created. These can also be managed through the Sign-ons window.

- **Log on/Log off**

Click **Log on** to log in to the BI server. Once you are logged in, Log off becomes available to let you log out of the BI server.

Connecting to Published Packages - Package and Dimension option

Once you have connected to the BI server, move to the Package tab and select the package that you want to work with.

If you are not importing measures, after selecting a Package, proceed to the Dimension tab.

Procedure

1. Click the **Browse** button to select from available packages. Only packages containing dimensions are available for selection.

When you select a package from the Browse Metadata window, the **Select Package** field is automatically filled in for you. The Edit button becomes available after a package is selected.

2. Select the **TM1 cube to load to** option. If you are creating a cube, enter the cube name. If you are recreating or updating an existing cube, select it from the list.

3. Specify the import actions to take.

Complete the Cube Action and Data Actions options as needed for this import, just as you would for any other type of datasource. See Mapping Variables for details on these options.

For SAP BW-based packages, you may have to select Accumulate Values if the result set may contain more than one row for the selected key values you are importing. Verify your results.

4. To define the dimensions in the package, click the **Dimension** tab.

5. Define the Hierarchy and Attribute structure using the dialog boxes offered when you click **Select Hierarchies** or **Select Attributes**.

Keep in mind the following details about Hierarchies and Attributes:

- **Default Hierarchy**

If you specify the TM1 Dimension without pre-selecting any hierarchies, TM1 will automatically select the first one as the Default Hierarchy. You can change the selection by unchecking or checking the check boxes.

- **Selecting before mapping**

You can also select hierarchies and all sub items such as filters *before* mapping to a dimension. When you fill in the dimension on the pre-selected hierarchies dimension, all the selections are applied automatically. If you unselect any mapped dimension by clearing the dimension name in the field, all the pre-selected hierarchies under the corresponding dimensions are automatically cleared.

- **Name versus Reference**

Hierarchy displays Hierarchy Name and Hierarchy Reference to clearly identify the specified hierarchy. Hierarchy name can be repeated but hierarchy reference is unique.

- **Filters**

If a filter is defined in the package, and a hierarchy is selected, the Select Filters button becomes available so you can choose filters to apply.

Ensure the filter makes sense for the selected hierarchy or your query may fail to execute.

- **Multiple Levels in a Hierarchy**

IBM Cognos allows users to define multiple levels in a hierarchy. When a hierarchy defines multiple levels, attribute names may be repeated across different levels.

For example, in a dimension called City, it could contain City, Geography, Geography_link, etc. Each hierarchy can define multiple levels.

You can have, for example, dimensions such as Level Label, Level Number, Hierarchy Unique Name, etc. that are the same across different levels under different hierarchies. TM1 performs the consolidation of the attributes based on the two factors: attribute external name and attribute roles.

The precedence order is attribute external name and then attribute roles. If any attribute contains the same Attribute External Name values, those attributes are consolidated.

If an attribute does not contain the external name, its roles signature (where all the roles compound to a role signature) will be evaluated as the factor of the consolidation. In this context, "compound" refers to items with identical roles being grouped together in a single TM1 attribute

When specifying the attribute mapping, all the attributes whose external name or role signature matches with the mapped attributes are selected during importing. More than one attribute may be mapped.

6. Select Attributes

Map a dimension attribute to a TM1 attribute by doing one of the following:

- To map an attribute to a new attribute, enter a name for the new attribute in the corresponding TM1 Attribute field, then select an Attribute Type. The new attribute will be created when you execute the TurboIntegrator process.
- To map an attribute to an existing attribute, click the corresponding **TM1 Attribute** field, select an attribute, then select an **Attribute Type**.

Attribute Type	Description
Text	Identifies attributes with a string value.
Numeric	Identifies attributes with a numeric value.
Alias	Identifies attributes that are alternative names for the dimensions with which they are associated. You can use this attribute to display dimensions by their alternative names in the TM1 user interface. A dimension alias must be unique from all other dimension aliases or actual dimension names.

You must now map the measures to a dimension.

The measures appear as the last row in the Dimensions tab.

Measures have to be selected by clicking on Select Measures. TurboIntegrator does not pre-select the measures as there are no default ones.

7. Click Select Measures.

The Select Measures dialog box opens.

Note: A package may have multiple measure dimensions. The name of the measure includes the measure dimension name from the package.

8. Select each measure you want to import into TM1 .
9. Click **Filters** to select filters to apply to the measure query. Ensure the filter makes sense for the selected hierarchy or your query may fail to execute.
10. Click **OK**.

11. Map the measures to a dimension.

If the measures map to an existing dimension, click the **TM1 Dimension** column and select the dimension that corresponds to the measure.

If you want to create a new dimension from the measure, enter a name for the dimension in the TM1 Dimension column.

12. Select a TM1 Dimension Action for the measures.

13. Dimension Settings

Use the Dimension settings tab to define the Top Consolidation for any specified dimensions.

14. Prompt Editing

You can click the Prompts button to open a Cognos Prompt editing window to set and change the prompt values. SAP BW variables appear as prompts in IBM Cognos packages. If mandatory prompts exist in the package, prompt values must be provided before the query is run by TurboIntegrator process. Otherwise the process will fail. If you are extracting data from SAP BW,

specify a prompt for segmenting data. When a segmenting data prompt is specified, the query sent to SAP BW is optimized for extraction and provides the ability to further speed extraction by utilizing parallel queries. See “Guidelines for Working with SAP BW Data” on page 38.

You can use the Prompts button to use the UserInterface to allow setting values or ranges. Click in the cell under the **Value** column to set the prompt value.

Or you can use the following TurboIntegrator processes/APIs.

If you know the prompt names, you can directly call CGAddPromptValues by passing the prompt name and values. These functions must be entered in the Prolog of the Parent TurboIntegrator process.

These functions allow you to retrieve prompts that are defined in the TurboIntegrator process. To define them in the underlying TurboIntegrator process, you must have launched the Prompts window in your TurboIntegrator process. Click **Prompts**, pull the prompts from all defined queries, and click **OK** to make them available. Anytime you make changes to the prompts you must click **OK** to make the prompts available.

TurboIntegrator process API	Description
CGPromptSize()	returns the total number of prompts that need to be set
CGPromptGetNextMember(int index)	returns the prompt by index (0-(CGPromptSize()-1))
CGAddPromptValues(promptName, value 1, value 2...)	sets the prompt values by specified prompt name
Example	<pre>count=CGPromptSize(); while(i<count); prmptname=CGPromptGetNextMember(i); CGAddPromptValues(prmptname, '1999-01-01','2009-01-01'); i=i+1; end;</pre>

15. 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 process run. It can be used to pre-test if the queries run successfully and to supply missing prompt values or sign-on information.
16. Click the **Show Namespace** checkbox to include the namespace in the Dimension listing.
17. Complete the Advanced and Schedule tabs if needed. See Editing Advanced Procedures and Chores for details. The Package Connector also generates the TurboIntegrator process for each dimension. This gives you the flexibility to add your own TurboIntegrator process scripting statements if needed.
18. Save and execute the TurboIntegrator process. See Saving and Executing the TurboIntegrator Process.

Multiple hierarchies

The IBM Cognos TM1 Package Connector includes only one hierarchy per dimension when issuing a measure query.

If you select more than one hierarchy for a dimension and include measures in your TurboIntegrator process, the TM1 Package Connector will issue multiple measure queries, substituting each hierarchy in turn. This behavior is appropriate where the leaf-level members of each hierarchy are distinct from each other.

If the leaf level members are the same in the hierarchies, you should create a TurboIntegrator process selecting only one hierarchy per dimension along with the desired measures. Create a separate process to merge multiple hierarchy structures into the same dimension.

Importing a Single Dimension

You can use the Dimension pull-down option on the Data Source tab as a quick way to define a single dimension.

Choose **Dimension** from the IBM Cognos Package option pull-down to directly open the Dimension tab and specify the actions to take and to define the hierarchies.

Procedure

1. Locate the package.
Click the **Browse** button to select from available packages.
2. Identify the **Dimension to load from:**
The pull-down lists the dimensions available in the selected package.
3. Identify the **TM1 Dimension to load into:**
The pull-down lists the dimensions available if you are updating an existing dimension.
4. Select a **TM1 Dimension Action** just as you would for any other datasource. See Mapping Dimensions for details.
5. Identify the **Top Consolidation:**
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 *Total* in **Top Consolidation**, the dimension includes a top level consolidation named Total with all imported elements as children of the consolidation.
6. See “Specifying a Segmenting Prompt for an SAP BW Query” on page 44 for details on specifying prompts.
7. 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 process run. It can be used to pre-test if the queries run successfully and to supply missing prompt values or sign-on information.

Connecting to Published Packages - Custom Query option

You can use the Custom Query option of the IBM Cognos TM1 Package Connector to connect to any kind of dimensionally modeled source to create a customized query. The Custom Query is the only way to connect to a non-dimensionally modeled source.

About this task

After connecting to the IBM Cognos Business Intelligence (BI) server, specify the source package you want to work with and the fields in that source package that you want to import to IBM Cognos TM1 in this process.

Procedure

1. Click the **Browse** button to select from available packages.

When you select a package from the Browse Metadata window, the **Select Package** field is automatically filled in. The **Edit** and **Edit Query** buttons become available after a package is selected.

The **Edit** button shows information about the data source and allows you to create a custom sign-on if the content store sign-on requires a password.

2. Click on the **Edit Query** button. The fields available in the source package are shown.
3. Select the each field required for extraction and select **Add**.
4. Choose the **Query Options**:

Preview

Shows a columnar lists. MDX displays the code used for the transformation.

Match links a query item from the source package or report to a column in the query. It is only needed if the source has been modified and a query item has been moved or renamed. The Match option allows you to match the columns and query items back up again after moving or renaming an item.

Auto Summarize

Selected by default. The query generates SQL to aggregate duplicate rows. For queries based on relational packages, enabling the Auto Summarize feature also helps reduce the number of rows that Cognos TM1 Package Connector retrieves from the source data, further improving cube build performance. If the source data is being used at the same granularity as the underlying table this should remain unchecked. If the source data is not consolidated then this should be checked. Ensure that the query has appropriate identifier and fact usage attributes set for this setting to be effective. These settings need to be set in the source; either Cognos Framework Manager or the report. Review the SQL to ensure appropriate grouping and summary functions are being applied. Do not use Auto Summarize to compute an average, but normally using Auto Summarize is desirable.

Supress Null values

By default this option is set to use the governor setting in the defined package. To override this setting, select either **Yes** (Suppress Null values) or **No** (do not suppress).

Parallel query count when segmenting (1-64)

This option is only applicable if extracting data from SAP BW and you have selected a variable for segmenting the data. When this option is set and data is being segmented, *n* number of queries are sent to the source system at a time, which may improve extraction time.

5. Select the **Validate** button to verify that a valid query can be generated from the information selected.
6. Click **OK** to enable the **Prompts** and **Preview** button.

Prompts

Click **Prompts** if any prompt values need to be set and to select a prompt for segmenting data (SAP BW only).

Preview

Click **Preview** to see the MDX that will be generated and to preview the data if desired.

7. Click on the **variables** tab. From this point forward, the procedure is the same as for any other TurboIntegrator process. See "Identifying Variables in the Data Source" on page 9.

Tip: When working with SAP BW data, the segmenting prompt for data is only available if you have selected only data and key values from the source system. If you want to pull additional metadata, define these items in a separate query in order to be able to segment the data when doing an extraction.

Saving and Executing the TurboIntegrator Process

To save and execute the process:

Procedure

1. Click the **Execute** button.
TM1 prompts you to name and save the process.
2. Save the process.
You should then see confirmation that the process executed successfully.
3. Open the Server Explorer. You should see that the cube you specified has been created and populated, and that all required dimensions have been created.

Seeing the Results

When you define a process to import a package into TM1 and create a new cube, the following actions occur:

- For each dimension you choose to include in your cube, TM1 generates a process to import the dimension and create a corresponding dimension.
- TM1 generates a master process that executes the above described dimension-creating processes, builds the cube, and imports data values.
- The query item defined as the key for the level in the hierarchy is used as the element name.

Guidelines for Working with SAP BW Data

There are special considerations when using SAP-based packages created in Framework Manager.

For detailed information about creating your SAP queries, creating the SAP-based packages in Framework Manager and using them in TM1, see *Working with SAP BW Data Using a Package in Framework Manager*. For general information about creating packages in Framework Manager, see "Create or Modify a Package" in the *Framework Manager User Guide*.

Working with SAP BW Data Using a Package in Framework Manager

There are special considerations when using SAP-based packages created in IBM Cognos BI Framework Manager.

You can leverage SAP BW 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 BW data.

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

There are three stages to importing a SAP BW query to access both dimensions and facts using IBM Cognos:

- Creating a BW Query in SAP Business Explorer Query Designer
- Creating a Package in Framework Manager.
- Creating a TurboIntegrator process that uses the TM1 Package Connector.

This extract process is limited to SAP BW data sources only.

The data source must be a specifically constructed query defined in the SAP BW data source.


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

Creating a BW Query in SAP Business Explorer Query Designer

You must create a query that includes the cube that you wish to import. Base the query on a single InfoCube in the database. A query based on multiple sources may result in SAP BW errors during data retrieval.

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

Procedure


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 BW query must be numeric.
- Do not select the **Currency/Unit** characteristic.
- Ensure that all selected key figures use the same currency.

- Only include characteristics in the SAP BW 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 BW 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 BW 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 BW 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.

Results

You are now ready to Create a Variable. For more information on using the **SAP Query Designer**, see your SAP BW documentation.

Create a Variable:

You may now create an optional prompt parameter for the query so the TM1 Package Connector can issue smaller queries to SAP, and thereby retrieve the entire data set in smaller chunks.

Before you begin

This technique must be used where the volume of data would otherwise cause errors on the SAP BW server.

There are no set rules for variable usage when extracting SAP BW 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 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 BW 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 BW 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 [REGION] dimension that contains three regions 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 BW 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.

It is not 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 BW environment.

Procedure

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 for ...** dialog box, click the **Variables** tab, right-click anywhere inside the **Description** window and select **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 **New Variable Wizard General Information** page, type a **Variable Name** and **Description**, and select a dimension as the characteristic. Click **Next**.
4. In the **Details** page, select **Single Value**, **Multiple Single Values**, or **Interval** in the **Variable Represents** field, **Optional** in the **Variable entry is** field, and select the **Ready for Input** check box. Click **Next**.
5. In the **Default Values** page, ensure that the **Default Value** field is empty.
6. Click **Next** until you are returned to **Selection for ...** dialog box. The new variable appears in the **Description** window.
7. Select the variable and click the right arrow to move the selected variable over to the **Selection** window, and save the query. You are now ready to import the query in Framework Manager.

Creating a Package in Framework Manager

To create a package in IBM Cognos Framework Manager you must

- Import the SAP BW metadata using the MetaData Wizard Steps for Importing Using the Metadata Wizard

Framework Manager imports the SAP BW 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 BW query are available in the **Dimension Folders** in the **Import** dialog box.
 - Each dimension will contain at least one 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 BW data source only if a configuration parameter is turned on. Setting the configuration as a time dimension is a global entry; every imported dimension will then be treated as time strings.
- Create a package Steps for Creating 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.

Importing Metadata from SAP BW

Whether or not a Dimension is a Time Dimension is determined when the metadata from the SAP BW 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 BW 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 BW to create the model.

What this change does is allow the metadata import to recognize that a Dimension in the SAP BW 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.

Procedure

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 the query that you defined in SAP BW query Designer in the previous stage. Scroll the list for the technical name that you provided when you created the variable. The folder structure is as follows: Hierarchies > Level definitions > Query Item definitions.
5. Select the main query items that directly relate to the level. That is, those labeled **(Key)**, **(Name)**, and so on.
6. Complete the remaining screens in the **Metadata Wizard**, accepting the default values, and click **Next**. This will generate dimensions and import the metadata.
7. At the final wizard screen, verify the results, and click **Finish**.

Creating 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.

Procedure

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**.

Results

You are now ready to create a model in TM1 . For more information on creating a package, see "Create or Modify a Package" in the *Framework Manager User Guide*.

Specifying a Segmenting Prompt for an SAP BW Query

Use a segmenting prompt when querying a SAP BW data source for fact data.

When a prompt is specified a more optimal query for extraction is executed by the IBM Cognos Package Connector to retrieve data. Also known as a 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 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.

Remember: Segmenting prompts must appear in Cognos Framework Manager as type pickList. The type is case sensitive and should use a lowercase p and uppercase L.

Procedure

1. After selecting hierarchies and measures, click **Prompts**.
2. In the **Prompt for segmenting data** list, select the prompt for segmenting the fact data. Only valid prompts are listed.
3. 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**.

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

Performing parallel queries with a segmenter prompt

If you have defined a prompt to segment SAP BW fact extraction, you can set a preference for the TM1 Package Connector to improve performance.

Procedure

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="16"/>`
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 16 queries in parallel (one for each month), which may greatly increase the rate of fact data extraction.

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

Invalid key errors when executing measure query

If you get "Invalid key" errors when executing a measure query using a segmenter prompt, ensure that each characteristic in your SAP BW Info Query has its **Display As** setting set to **Key**. Otherwise there may be a key mismatch between elements in the dimension and key values returned in the measure query.

Chapter 7. Editing Advanced Procedures

This section describes managing IBM Cognos TM1 TurboIntegrator processes.

Using Bulk Load Mode

Bulk Load mode enables TM1 to run in a special optimized single-user or single chore/process mode. This mode can maximize performance for dedicated tasks during times when little or no other activity is expected.

Some examples of using Bulk Load mode include:

- An administrator that needs to manually perform maintenance operations.
- A night-time window to load large amounts of data.

TM1 typically runs in a multi-user mode where multiple users, chores and processes can all run concurrently accessing data. In Bulk Load mode, the TM1 server prevents concurrent activity by temporarily suspending other users, chores and processes and eliminates the overhead required by a multi-user environment.

Bulk Load mode doesn't actually log out users, but only suspends their interaction with TM1. As soon as Bulk Load mode is done, any users that were previously logged in are reactivated and user-interaction with TM1 resumes.

You can enable Bulk Load mode directly within a TI process or with the TM1 API. In either case, you use commands to *enter* and *leave* Bulk Load mode.

Considerations for Using Bulk Load Mode

You should consider the following when using Bulk Load mode:

- Bulk Load mode does not display a message to end-users to alert them. You will need to plan and coordinate your usage of Bulk Load mode accordingly.
- Only a single user or process may be active during Bulk Load mode. No new connections can be established to the server while it is operating in Bulk Load mode.
- A TI process can not use the ExecuteCommand to launch a command line program that attempts to log back into the same TM1 server. The login attempt will fail.
- Any scheduled chores that are scheduled to execute during the time Bulk Load mode is enabled are deactivated and not run.

Starting Bulk Load Mode

When the server enters Bulk Load mode, all processing by other threads is paused. Any existing user threads and running chores will be suspended. Only the thread that initiated Bulk Load mode will remain active. All scheduled chores will be deactivated, except the chore that initiates Bulk Load mode. All system-specific threads and TM1 Top connections will also be suspended.

Ending Bulk Load Mode

When Bulk Load mode is disabled, all system and user threads will be resumed and user logins will be allowed.

Custom applications that use the TM1 API to enable Bulk Load mode should also call the necessary TM1 API function to *exit* Bulk Load mode. However, if the client

connection is severed (the network fails or the client logs out, crashes or disconnects), the server will automatically exit Bulk Load mode.

Similarly, if a TI process/chore is running in Bulk Load mode and the process exits, whether successfully or with errors, the server will automatically exit Bulk Load mode.

When the server returns to normal multi-user mode, any chores that were deactivated get reactivated and return to their normal schedule. If the chores were scheduled to run, but were prevented by Bulk Load mode, they will not get executed immediately, but will execute according to the schedule. You may have to adjust the launch time of your scheduled chores to prevent them from getting locked out during the times you enable Bulk Load mode.

TurboIntegrator Process Commands for Bulk Load Mode

You can enable Bulk Load mode in either the Prolog or Epilog section of a TI process. For efficiency, we recommend enabling Bulk Load mode in the first, or very close to the first, statement in the Prolog section of your process.

After enabling Bulk Load mode in a process, it can only be disabled on the last line in the Epilog section. If you attempt to disable Bulk Load mode anywhere else in the process, the process will not compile.

If the mode is enabled in one TI process, it remains enabled until explicitly disabled or until the chore completes. This means you can enable the mode in a process within a chore and then run a series of TI processes before disabling it. You can also enter and exit Bulk Load mode repeatedly, using the mode only for certain critical parts of a chore.

Use the following TI commands to enable and disable Bulk Load mode in a TI process.

`EnableBulkLoadMode()`

`DisableBulkLoadMode()` - This function can only be used on the last line in the Epilog section of your TI process when using Bulk Load mode.

TM1 C API Functions for Bulk Load Mode

The following TM1 C API functions are available for enabling and disabling Bulk Load mode.

- `TM1ServerEnableBulkLoadMode`
- `TM1ServerDisableBulkLoadMode`

For details, see the IBM Cognos TM1 *API Guide*.

Editing Procedures

After you specify a data source, identify all variables, and define all mapping instructions, TurboIntegrator generates four procedures that are based on the options you selected in the TurboIntegrator tabs. These procedures are identified as sub-tabs of the Advanced tab.

The procedures are:

Tab	Description
Prolog	A series of statements to be executed before the data source is processed.
Metadata	A series of statements that update or create cube, dimensions, and other metadata structures during processing.
Data	A series of statements that manipulate values for each record in the data source.
Epilog	A series of statements to be executed after the data source is processed.

You can edit these procedures to include TurboIntegrator functions and TM1 rules functions that extend the capabilities of TurboIntegrator. For example, you can edit the Data procedure to include statements that instruct the process to skip records containing zero values, or to write imported records to an external file.

For a complete list of all available TurboIntegrator and TM1 rules functions, see the *IBM Cognos TM1 Reference Guide*.

When editing procedures, keep in mind that each procedure is intended to execute certain types of actions at specific times in a process. Accordingly, you should create actions or statements that are appropriate for a given procedure.

Note: When the data source for a process is NONE, the Data and Metadata procedures are ignored when the process is executed. Any functions or statements on the Data or Metadata sub-tabs are not executed, but TM1 does not issue an error or warn you that part of the process was not executed.

To edit a procedure:

Procedure

1. Click the **Advanced** tab.
2. Click the sub-tab for the procedure you want to edit.
3. Enter your statements in the text box either *before* this line:

```
*****GENERATED STATEMENTS START*****
```


or *after* this line:

```
*****GENERATED STATEMENTS FINISH*****
```

Important: User-created statements can be inserted either before or after the generated statements, but cannot be inserted within the statements generated by TurboIntegrator.

Executing a Process on Demand

To execute a process on demand, select the process in the Server Explorer and choose **Process, Execute Process**.

You can also execute a process from within TurboIntegrator by choosing **File, Execute**  .

Using TM1RunTI

TM1RunTI is a command line interface tool that can initiate an IBM Cognos TM1 TurboIntegrator (TI) process from within any application capable of issuing operating system commands.

This utility is of special interest in application situations where TurboIntegrator processes need to be grouped in order to ensure that the processes that can run in parallel do run in parallel. It is also helpful so that those processes which cannot be run in parallel are serialized in the right order. Note that TM1RunTI does not finish (return) before the TurboIntegrator is finished which can be used to serialize calls if the calling process is waiting for TM1RunTI to finish.

The TM1RunTI executable file (tm1runti.exe) can be found in the bin directory of a TM1 server install.

If you accepted the default installation location for tm1runti.exe is in C:\Program Files\IBM\cognos\tm1\bin.

Asynchronous calls and TM1

The Execute command takes two parameters; the second one describes whether to have a synchronous call or an asynchronous call. Cognos TM1 tools should only be called asynchronously (Parameter 0) to avoid server deadlocks if the system is waiting for a lock held by the TurboIntegrator process and the process is waiting for the utility. The same advice applies to any executables called by ExecuteCommand if they login to Cognos TM1 .

Note: Never use a synchronous call if the tool logs into Cognos TM1 .

TM1RunTI syntax

The TM1RunTI syntax is described here.

```
tm1runti -?  
or tm1runti -help  
or tm1runti1 [<cmd_parm>...] [<ti_parm>...]
```

where <cmd_parm> is one of:

```
-i <filespec>  
-process <string>  
-connect <string>  
<connect_parm>...
```

where <ti_parm> is:

```
<parm_name> '=' <parm_value>
```

where <connect_parm> is one of:

```
-adminhost <string>  
-server <string>  
-user <string>  
<password_parm>  
-AdminSvrSSLCertAuthority <filespec>  
-AdminSvrSSLCertID <id>  
-AdminSvrSSLCertRevList <filespec>  
-AdminSvrSSLExportKeyId <id>  
-ExportAdminSvrSSLCert <T>  
-CAMNamespace <string>
```

where <password_parm> is one of:

```
-pwd <string>  
-passwordfile <filespec> -passwordkeyfile <filespec>
```

Parameters

Parameters can be either in a configuration file or passed on the command line. Command line parameters take precedence over parameters that are in the configuration file. This makes it possible to have persistent default parameters for relatively static parameters (such as adminhost and server) and to supply just the few parameters needed to either override the defaults or to provide values that are not easily defaulted, such as the user name or the TurboIntegrator process name.

The parameters have a different format when passed on the command line. While all parameters are passed in a "-parameter_name value" fashion, everything that is passed as "parameter_name=value" is treated as a TurboIntegrator process parameter.

There are four types of parameters:

- Command parameters
Used to specify the config file to use, which group of connection parameters to use, or which TurboIntegrator process to run.
- Connection parameters
Used to specify the servername, username and other information needed to connect to the Cognos TM1 server.
- Password parameters
Can either be a username and plaintext password or can be a filename containing an encrypted password and associated keyfile used for decryption.
- TurboIntegrator parameters
Passed to the named TurboIntegrator.

Parameters specified on the command line must begin with dash (-) or slash (/). The parameter value is separated from the parameter name by a space, and the value can be specified as is or in quotes (if there are embedded spaces).

For example:

```
tm1runTI -server MyTM1Server -username John -pwd "my secret"  
ti_parm1=yes ti_parm2="my value"
```

TM1RunTI Parameters

Parameter	Description Value/Required/Default
i	Path to configuration files String/No/None
connect	This parameter can be used to specify a section in the configuration file containing parameters used to make server connections, such as user, pwd, CAMnamespace, etc. String/No/None
Process	Name of the TurboIntegrator process to call String/No/None
Help	Display help text to the command window (stdout). not applicable/No/not application

Parameter	Description
	Value/Required/Default
?	Display a synopsis of command line parameters to the command window (stdout). not applicable/No/not application

Connect Parameters

Connect parameters are common among Cognos TM1 tools, and can be defined in their own section to enhance reuse and avoid the effort and risks associated with maintaining multiple copies.

Parameter	Value/Required/Default	Description
adminhost	String/No/None	Cognos TM1 admin host
sever	String/No/None	Cognos TM1 server name
user	String/No/None	Cognos TM1 or CAM name
AdminSvrSSLCertAuthority	String/No/none	The full path of the certificate authority file that issued the Cognos TM1 Admin Server's certificate
AdminSvrSSLCertID	String/No/none: API Default is : tmladminserver	The name of the principal to whom the Cognos TM1 Admin Server's certificate is issued. Note: The value of this parameter should be identical to the SSLCertificateID parameter in the Tmladmsrv.ini file.
AdminSvrSSLCertRevList	String/No/None	The full path of the certificate revocation file issued by the certificate authority that originally issued the Cognos TM1 Admin Server's certificate. A certificate revocation file will only exist in the event a certificate had been revoked.
ExportAdminSvrSSLCert	Boolean/No/F	Specifies whether you want the certificate authority certificate which originally issued the Cognos TM1 Admin Server's certificate to be exported from the Microsoft Windows certificate store at runtime. When this option is selected, you must also set a value for AdminSvrSSLExportKeyID as described here. Refer to <i>IBM Cognos TM1 Installation and Configuration Guide</i> for appropriate TM1Server configuration.

Parameter	Value/Required/Default	Description
AdminSvrSSLExportKeyId	String/No/None	The identity key used to export the certificate authority certificate, which originally issued the Cognos TM1 Admin Server's certificate, from the certificate store. This parameter is required only if you choose to use the certificate store by setting ExportAdminSvrSSLCert=T. Refer to <i>IBM Cognos TM1 Installation and Configuration Guide</i> for appropriate TM1Server configuration.
CAMNamespace	String/No/none	CAM namespace id. Note: This not the CAM namespace name. This value is needed only if the Cognos TM1 Server authenticates using CAM.

TurboIntegrator Parameters

These parameters are defined by the TurboIntegrator process and must be of the correct type (number or string).

Parameter	Description
<ti_parm>	Provide the string or number value <value> to the parameter named <ti_parm> which must be a valid parameter name accepted by the TurboIntegrator being run. <value>/No/None

Password Parameters

Passwords are either provided in cleartext (not recommended) using the pwd parameter, or using an encrypted file provided by the passwordfile parameter.

Parameter	Value/Required/Default	Description
pwd	String/No/None	Cognos TM1 or CAM password
passwordfile	String/No/None	The full path of the file containing the encrypted password for the specified user. If no path is specified, the Cognos TM1 server directory is assumed. When this option is used, you cannot use -pwd.
passwordkeyfile	String/No/None	If passwordfile is set, the full path to the key file is also required in order to decrypt the password. The password file and key file can be created using TM1Crypt tool. Refer to <i>IBM Cognos TM1 Installation and Configuration Guide</i> .

TM1RunTI configuration file

TM1RunTI can function with or without a configuration file.

If a configuration file is specified, its parameters are read first.

Parameters specified on the command line are then used to override those obtained from the configuration file. When a configuration file is read, TM1RunTI first obtains parameters from the [TM1RunTI] section of the configuration file.

If a connect parameter is present, then parameter values are obtained from the associated [Connect <name>] section and used to override anything read from [TM1RunTI].

A -connect parameter can also be provided on the command line, and overrides any connect parameters found in the configuration file.

The configuration file contains:

1. A single TM1RunTI section.
2. One or more sections defining the TurboIntegrator processes that may be run.
3. Zero or more sections defining connection parameters.

All entries must start at column 1. Lines beginning with # are treated as comments.

Section names must be enclosed in square brackets []. If a section name is repeated, only the first one is used.

Parameters within a section:

- cannot have blank lines between them
- can appear in any order
- are specified in keyword=value format.

Parameter values need to be enclosed in quotes (") if they contain whitespace.

Connect sections

To facilitate easy maintenance for different server environments such as development, test and production, connection parameters for each environment can be specified in separate sections. Each section is named using the prefix "Connect -" followed by a user defined name. For example:

```
[Connect - Production]
```

```
[Connect - Test]
```

```
[Connect - Development]
```

Process sections

Multiple process sections are permitted. Each section is named to match a process in the server.

Each TurboIntegrator process section is used to define the parameters of the TurboIntegrator process and their default values.

If there are multiple process sections with the same name, only the first one is used.

Example configuration file

This example shows the [TM1RunTI] section and a section for a single TurboIntegrator process ("my_ti_process"). The parameters and their default values, which may be overridden by parameters provided on the command line, are defined below each section header.

```
[TM1RunTI]
process=my_ti_process
connect=Production

[Process - my_ti_process]
num1="value1"
stringX="value2"
stringY="value3"

[Connect - Production]
adminhost=
server=MyTM1server
user="MyTM1AdminServer"
pwdfile="c:\tm1_admin_area\passwords\tm1_password.txt"
AdminSvrSSLCertAuthority=.\ssl\applixca.pem
AdminSvrSSLCertID=tm1adminserver
AdminSvrSSLCertRevList=
CAMNamespace=LOCAL_NTLM
```

Processing logic

Configuration parameters and command line parameters are processed in the following fashion:

1. If specified by `-i`, the configuration file is opened and any connect option specified in [TM1RunTI] is processed first.
2. Any other parameters in [TM1RunTI] are then processed and may override those specified by the connect parameter.
3. The command line parameter `-connect` is processed next, if present. It loads values from the associated [Connect - <connection_name>] section of the config file, overriding any values loaded by the preceding steps.
4. The remaining command line parameters are processed.

For example, if you save the configuration file in the preceding example with the name `tm1tools.config` and then you execute the following:

```
tm1runTI -i ".\tm1tools.config" -passwordkeyfile c:\keystore\prodkey.dat -connect prodssystem
```

Since the `-i` parameter was provided, the tool would do the following:

1. Open the config file and load the [tm1runTI] section
2. Upon seeing the connect parameter in [tm1runTI], load the parameter values from [Connect - testssystem]
3. Process the command line parameters:
 - a. Upon seeing the connect parameter, load the parameters from [Connect - prodssystem]
 - b. Replace the value for passwordkeyfile.

Configuration filename and location

The command line parameter `-i` can be used to specify a configuration filename. This is particularly useful if several Cognos TM1 servers are supported in the environment, as a different configuration file can be used for each server and like-named processes in different servers can be defined with different parameters.

TM1RunTI return codes and error messages

The following error messages are used by TM1RunTI.

Return codes and error messages

Return Code

Message: Description

- | | |
|----|---|
| 0 | None: The program completed successfully. |
| 1 | Password not specified: Password not specified as an argument or as a password file.

Short Help text: Necessary parameters not provided (user, server, process). The short help is sent to stdout. Equivalent to <code>-?</code>

Invalid number of parameters at <n>: More parameters were detected than are actually supported by the program, beginning at the <n> parameter. |
| 2 | Server connection failed: The program was unable to make a connection to a Cognos TM1 server. |
| 3 | Calling process<TI_name> completed with minor errors: The TurboIntegrator process completed but with minor errors. |
| 4 | Calling process <TI_name> completed with messages:: The TurboIntegrator process completed but returned messages. |
| 5 | Error retrieving password: The program was unable to get the password from the password file. One of the other error messages listed may appear in stderr before this one, indicating more precisely the nature of the problem. <ul style="list-style-type: none">• NULL key returned from reading <filename> key path.• NULL password returned from reading <filename> password file.• Error obtaining file status of <filename>.• Error opening <filename>.• Unable to allocate data for key.• Error reading <filename> key file. |
| 6 | TI process: <TI_name> not found on server: <server_name>: The TI process was not found on the specified server. |
| 7 | TI process: <TI_name> parameter cannot be read: Cannot read parameter information from the TurboIntegrator process. |
| 8 | TI process: <TI_name> no read access: Specified user does not have read access to the TurboIntegrator process. |
| 9 | calling process: <TI_name> called ProcessQuit.: The TurboIntegrator process called ProcessQuit. |
| 10 | calling process: <TI_name> aborted.: The TurboIntegrator process was aborted. |

- 11 **TI process: <TI_name> reading numeric parameter <param_name>=<param_value> failed:** A non-numeric value was passed into a numeric TurboIntegrator parameter.
- 99 **Other TI error:** The TurboIntegrator process completed with an unspecified error.

Errors are also returned from the TM1API. They are displayed as (TM1 API Error) <xxx> where <xxx> is the value defined in the TM1API.

Modes of execution and error handling limitations

TM1RunTI can be run as a standalone executable, from within an operating system batch script, or from within a Cognos TM1 TurboIntegrator process.

The most straightforward way to run TM1RunTI from within TurboIntegrator is to use the ExecuteCommand() call to directly execute it. For example:

```
ExecuteCommand("tm1runTI -i myconfig.config -connect prodserver -process update")
```

The ability to define connection and other relatively static parameters in a configuration file makes it possible to simplify the parameter list passed to TM1RunTI from a calling TurboIntegrator process, and to reduce maintenance effort by centralizing connection information.

Executing TM1RunTI directly from within a TurboIntegrator process using ExecuteCommand() has an important limitation. TM1RunTI returns an error code if it fails, but the ExecuteCommand() does not return the error code and there is no other mechanism in TurboIntegrator to access the return code after the call.

Another limitation to consider is that the process will have the same current drive and directory as the calling process (the server) which will be the database directory. This is documented in "TurboIntegrator Functions" on page 2.

To deal with errors, execute TM1RunTI from a batch script called by ExecuteCommand so that the error return code can be obtained in CMD.EXE through the ERRORLEVEL variable and so that error messages can be logged or intercepted by redirecting stderr. Various options are then available to the application designer for handling the error, such as:

- Write the error information to database.
- Write the error information to a file and then, in a subsequent TurboIntegrator process, load the information into a Cognos TM1 Cube. The cube can then be used for reporting, alerts, etc.

Note: In versions 9.5.1 and earlier, this could create additional lock contentions.

- Write the error information to a file or files and then, within the calling TurboIntegrator process, use the FileExists() TurboIntegrator process function to test for the existence of that file or files. The process can then take conditional actions based on the existence of the files generated by the batch script.

TM1RunTI other considerations

These are some additional considerations when using TM1RunTI.

Password Security

The use of passwords on the command line for this utility is not recommended for production deployments. Instead of using passwords on the command line, the password should be passed to the program using the `passwordfile` parameter to specify a file that contains the encrypted password. A keyfile is also needed, to decrypt the password, and this is provided through the `passwordkeyfile` parameter. These files can be stored in a location accessible to the username running the tool, but under operating system protection so that other users cannot access them.

A combination of password and key can be generated by using `TM1Crypt` tool which comes with the standard Cognos TM1 installation. See the *IBM Cognos TM1 Installation and Configuration Guide* for details.

Platform Portability

The tool is available as a 32-bit and 64-bit Microsoft Window utility, as well as an AIX utility. The executable name is all lowercase for platform portability and for consistency with `tm1top` and other Cognos TM1 server tools.

Serializing TurboIntegrator processes using `synchronized()`

IBM Cognos TM1 TurboIntegrator (TI) function called `synchronized()` can be used in a TurboIntegrator script to force serial execution of a designated set of TurboIntegrator processes.

Cognos TM1 application developers can define TurboIntegrator (TI) processes that execute in response to user actions or run as batch processes. Unless explicitly prevented from doing so, TurboIntegrator processes may execute in parallel. In some applications, TurboIntegrator processes should be serialized in order to improve performance efficiency. Prior to the introduction of this new function, application designers used various techniques to ensure that TurboIntegrator processes were serialized.

One technique is to rely on object locks to force serialization of the processes. Typically, a status value is written to a cube to invoke the cube's lock as it prepares for exclusive access mode. However, the introduction of Parallel Interaction (PI) may cause this method to fail. Normally, data writers conflict with other data writers. In this way, an executing TurboIntegrator process in a cube is either able to acquire the lock and run to completion, or it must wait until the lock is available. In PI mode, multi-version concurrency control allows multiple writers to perform their writes immediately.

Since this technique is no longer valid with PI enabled, `synchronized()` is available to explicitly invoke serialization in TurboIntegrator process code.

See the "Process Control TurboIntegrator Functions" section of the TurboIntegrator Functions chapter of the *IBM Cognos TM1 Reference Guide* for details on using this function.

`synchronized()`

IBM Cognos TM1 TurboIntegrator (TI) function called `synchronized()` can be used in a TurboIntegrator script to force serial execution of a designated set of TurboIntegrator processes. The `synchronized()` function uses the following syntax.

```
synchronized(string)
```

Parameters

synchronized() takes a single required parameter that is a user-defined name for a lock object. This lock object name can be used in multiple TurboIntegrator processes in order to serialize their execution as a group.

LockName

Value=String

Required?=Yes

Default=none

The user-defined name of a lock object on which to synchronize. Names are case-insensitive and embedded spaces are ignored. Names may not exceed 1023 characters in length.

Semantics

A TurboIntegrator process may make any number of calls to synchronized(), with any number of lock objects. Serializing is effective from the time synchronized() is called, until the containing transaction completes.

For example, if synchronized() is called from a subprocess (Ps) of master process (Pm) or master chore (Cm), the Lock Object is "released" when Pm or Cm completes. The exception is that a SaveDataAll (SDA) prematurely "ends" a transaction mid-process execution; this applies to Lock Objects as well.

The synchronized() call may be placed anywhere within a TurboIntegrator script, but serialization applies to the entire TurboIntegrator process when it is encountered.

Consider a TurboIntegrator process with a synchronized() call somewhere in the "middle" of its script, and an operation O1 preceding that call. Two instances of this TurboIntegrator process may start at the same time. It is possible for one instance to run to completion, including its call to synchronized(), before the second instance reaches its synchronized() call. In this case, the two processes appear to the user to have run concurrently. If, instead, the second process does reach its synchronized() call before the first completes, it will undo any work it had done (O1) and wait for the first to complete. In this case, the two processes appear to the user to have serialized.

To avoid such confusion, and to optimize the use of synchronized(), it is recommended (but not enforced) that synchronized() calls be the first statements of a TurboIntegrator process.

Example

Consider that TurboIntegrator process P needs to update two cubes, Cube_1 and Cube_2.

Other TurboIntegrator processes may also need to update Cube_1 or Cube_2.

To cause all TurboIntegrator processes that will update Cube_1 or Cube_2, to run one at a time, P could call synchronized() in the following way:

```
sCube_1='Cube_1';  
sCube_2='Cube_2';  
sE1='E1m1';
```

```

sE2='Elm2';
sE4='Units';
sE5='Price';

Synchronized( sCube_1 );
Synchronized( sCube_2 );

CellPutn( 111, sCube_1, sE1, sE2 );
CellPutn( 9.99, sCube_2, sE4, sE5 );

# ...

```

Other TurboIntegrator processes that will update Cube_1 or Cube_2 must also call `synchronized(sCube_1)` and/or `synchronized(sCube_2)` in a similar way.

In this example, the two lock objects' names were chosen to be the same as the cubes' names. But a lock object's name does not have to be the same as other Cognos TM1 objects (cubes, dimensions, subsets, etc.).

Lock object maintenance and naming

Lock objects are managed internally by Cognos TM1 . No explicit creation or deletion is required of the user. Simply specify a lock object by name in a `synchronized()` call.

Lock object names are insensitive to case or embedded blanks. For example, if there is a lock object with the name 'Abc Def', that lock object can be referred to using the names 'ABCDEF', 'ab cd ef' etc. In other words, the execution of a TurboIntegrator process with a call to `synchronized('Abc Def')` will serialize with the execution of a process with a call to `synchronized('ABCDEF')`. Lock object names may not exceed 1023 characters in length.

Order of execution

A group of TurboIntegrator processes containing `synchronized()` calls to the same lock object are prevented from concurrently executing. However, their actual order of execution is unaffected. As long as they do not execute concurrently, the order in which they execute is determined by many other factors, including application design and operating system level scheduling. If order of execution is important, for example, if one TurboIntegrator process is dependent on updates made by another process, then it is up to the application designer to use other methods to ensure the desired order of execution.

MaximumTIObjectLocks configuration parameter

The `MaximumTILockObjects` parameter restricts the size of the object locked list. See the *IBM Cognos TM1 Installation and Configuration Guide*.

TurboIntegrator security is assigned by administrator

The admin who creates a TurboIntegrator process assigns the security privileges to the TurboIntegrator process.

A TurboIntegrator process can be created only by an administrator, who has the Admin privileges required to create a process. The administrator can assign rights to the process. The TurboIntegrator process has those rights regardless of the rights assigned to any user running the process.

Non-admin users need to have Read access to a TurboIntegrator processes in order to see the process in the interface and to execute the process. But the TurboIntegrator process itself retains the rights assigned by the administrator.

For example, consider a user and an administrator where:

- User U1 has only Read access to cube_1.
- The administrator creates a TurboIntegrator process that does a CellPutN into cube_1, which requires Write access to the cube.
- The administrator gives U1 Read access to the TurboIntegrator process.
- U1 can run this TurboIntegrator process and it will do the CellPutN even though the user only has Read access to cube_1. The same result is obtained if U1 has None access to cube_1.
- A user with only Read access to a TurboIntegrator process can only view and execute the process. The user can't edit the process to change the value being sent or the location where data is being put.
- The conditions described above are also true when a user executes a TurboIntegrator process from within a chore.

To prevent U1 from being able to access this TurboIntegrator process, the IBM Cognos TM1 administrator should not give U1 Read access to the TurboIntegrator process.

Chapter 8. Scheduling a Process for Automatic Execution with Chores

You can execute processes on demand and you can create a *chore* to execute processes at defined intervals. These two methods of execution are not mutually exclusive. You can execute any process on demand at any time, even if the process is scheduled for automatic execution as a chore.

A chore is the TM1 object that executes one or more processes at a user-defined frequency. A chore is comprised of:

- A list of processes to be executed.
- A start date and time for the initial execution of the chore.
- A frequency at which the chore is subsequently executed.

Once defined, chores can be activated and deactivated as required.

Access to chores functionality is controlled by user group security privileges. You must be a member of the ADMIN or DataAdmin group to create chores on a server. Users must have Read privilege to a chore to be able to view the chore in the Server Explorer and to manually execute the chore.

You can schedule a process for automatic execution as a chore from within TurboIntegrator.

Procedure

1. Click the **Schedule** tab in the TurboIntegrator window.
2. Select the **Schedule this Process as a Chore Named** option.
3. Enter a name for the process in the adjacent field. By default TurboIntegrator assigns the name of the process to the chore.
4. Click a date on the calendar to specify a start date for the initial execution of the chore.
5. Enter a Time to specify the start time for the initial execution of the chore.
6. Set the fields in the Chore Execution Frequency box to define the interval at which the chore is executed.
7. Choose **File, Save** to save the process with the scheduling information.
When you schedule a process from within TurboIntegrator, the chore is automatically activated and will be executed at the specified start time.
You can also create a chore for a process (or a collection of processes) directly from the Server Explorer.
8. In the Server Explorer, select the **Chores** icon beneath the server on which you want to create the chore.
9. Choose **Chores, Create New Chore**.
The Chore Setup Wizard opens.
10. In the Available list, select the process for which you want to create a chore.
11. Click the right arrow icon.
12. Click **Next**.
13. Click a date on the calendar to specify a start date for the initial execution of the chore.

14. Enter a time to specify the start time for the initial execution of the chore.
15. Set the fields in the Chore Execution Frequency box to define the interval at which the chore is executed.
16. Fill the **Chore Schedule is Active** box.
17. Click **Finish**.
The Save Chore As dialog box opens.
18. Enter a name for the chore and click **Save**.

Important Note on Chore Start Times

Chore start date/time is stored in Greenwich Mean Time (GMT) format and chore execution is based on GMT. TM1 provides no automatic accommodation for Daylight Saving Time/Summer Time. If the system clock on the server is set to use local Daylight Saving Time/Summer Time, you must edit the chore start date/time at the beginning and end of Daylight Saving Time/Summer Time to maintain a consistent local chore execution schedule.

On the day that Daylight Saving Time/Summer Time begins, edit the chore to use the current date and desired start time.

On the day the Daylight Saving Time/Summer Time ends, again edit the chore to use the current date and desired start time.

Editing a Chore

To open a chore for editing in the Chore Setup Wizard:

Procedure

1. Select the chore in the left pane of the Server Explorer.
2. Choose **Chore, Edit Chore**.

Activating a Chore

To activate a chore that is currently deactivated:

Procedure

1. Select the chore in the left pane of the Server Explorer.
2. Toggle the **Chore, Activate** option on.

Deactivating a Chore

To suspend the regularly scheduled execution of a chore:

Procedure

1. Select the chore in the left pane of the Server Explorer.
2. Toggle the **Chore, Activate** option off.

Deleting a Chore

To delete a chore:

Procedure

1. Select the chore in the left pane of the Server Explorer.
2. Choose **Chore, Delete**.

Note: You cannot delete an active chore. You must deactivate a chore before you can successfully delete it.

Executing a Chore on Demand

To execute a chore on demand:

Procedure

1. Select the chore in the left pane of the Server Explorer.
2. Choose **Chore, Execute**.

Using Chore Commit

ChoreCommit is a property of a chore that allows you to specify if the processes in a chore will be committed as a single transaction or if the processes in the chore are committed as multiple transactions.

A Chore executes a sequence of TurboIntegrator processes as a single Commit transaction. Any locks acquired by the first process are kept until the last process is complete. This means locks can be held for very long periods of time. ChoreCommit enables a Chore to optionally execute such that each TurboIntegrator process is committed as a transaction when the process is complete. Locks are then held only for the duration of a single process instead of for the length of the chore.

Chore Property

When setting up a chore, Chores can be identified as:

- Single Commit Mode
All processes are committed as a single transaction. This is legacy and default behavior.
- Multiple Commit Mode
Any processes that need to be committed do so as they are processed.

This property can be modified only when a Chore is inactive.

Running a chore at server startup

You can designate a chore as a "startup" chore that is processed when the server starts up.

To indicate that a chore should be run when the server starts up, use the configuration parameter StartupChores to identify a list of chores to be run before the server starts up. A chore is a set of tasks that can be executed in sequence that are typically TurboIntegrator processes. See the *IBM Cognos TM1 Installation and Configuration Guide* for information on this parameter.

Startup chores can be used as a way to set up the server before processing. Startup chores run before users login and before other chores begin processing.

Since Startup chores are run before logins are allowed, the user can not monitor the Startup chores with TM1Top and therefore there is no way to cancel a Startup chore with the exception of killing the server process.

Appendix A. TurboIntegrator Tutorial

This tutorial guides you through advanced IBM Cognos TM1 TurboIntegrator features.

This tutorial is designed for users responsible for implementing TM1 and developing utilization strategies within their organization. The advanced user, or developer, will typically be responsible for creating, maintaining, and developing cubes and dimensions as well as data import processes. Before working through this tutorial, you should have a good understanding of TM1 concepts and a working knowledge of TM1 functionality.

The tutorial teaches you how to use TurboIntegrator to create dimensions and cubes, import flat files and ODBC data sources. It will also show you how to expand the power of TurboIntegrator using advanced scripting features. This tutorial also includes hints and tips on how to approach a TurboIntegrator problem.

Setting the Tutorial Data Directory

This tutorial relies on sample data shipped with TM1 . Before beginning this tutorial, you must set your local server data directory to reference the sample data.

To set your data directory:

Procedure

1. Click **TM1** in the left pane of the Server Explorer and select **File, Options**.
The Options dialog box opens.
2. Click the **Browse** button for the Local Server Data Directory to navigate to the TurboIntegrator sample data directory.
The sample data directory is named `TI_data`, and it is located in your `<install_dir>\Custom\TM1Data\` directory. If you installed to the default installation directory the full path to this sample data directory is `C:\Program Files\Cognos\TM1\Custom\TM1Data\TI_Data`.
3. Click **OK** on the Options dialog box to set the data directory and restart the local server.

TurboIntegrator Overview

TM1 TurboIntegrator lets you create processes that automate data importation, metadata management, and other tasks.

A process is an object that consists of:

- A description of a data source
- A set of variables corresponding to each column in the data source
- A set of maps that define relationships between variables and data structures in the TM1 database.
- A prolog procedure, consisting of a series of actions to be executed before the data source is processed.

- A metadata procedure, consisting of a series of actions that update or create cubes, dimensions, and other metadata structures.
- A data procedure, consisting of a series of actions to be executed for each record in the data source.
- An epilog procedure to be executed after the data source is processed.
- A set of parameters that can be used to generalize a process so it can be used in multiple situations.

You can use TurboIntegrator to import data from ODBC sources, ASCII files, SAP-based data, OLAP multi-dimensional sources, TM1 cube views, and TM1 dimension subsets.

TurboIntegrator includes a complete set of functions that you can use to enhance process capabilities. You can use these functions to create scripts that export data to ASCII files and ODBC sources, or that use conditional expressions to control processing. In addition to these TurboIntegrator functions, you can also incorporate all standard TM1 rules functions in a process definition, with the exception of the STET and UNDEFVALS functions.

Access to TurboIntegrator is controlled user groups. You must be a member of the ADMIN group to gain access to all TurboIntegrator features and define processes on a networked TM1 server.

There is no interface to assist in the creation of TurboIntegrator functions. You must enter functions by hand directly in the appropriate sub-tab within the Advanced tab. String arguments to TurboIntegrator functions must be enclosed in single quotation marks. A semi-colon (;) must be included to indicate the end of each function in the TurboIntegrator window.

Creating a TurboIntegrator Process

There are five steps to creating a process. Each step is completed by setting options or editing values in an individual tab of the TurboIntegrator window.

The steps required to create a process include:

Procedure

1. Defining a data source
2. Setting variables
3. Mapping data
4. Editing advanced scripting
5. Scheduling the completed process

You must complete each tab of the TurboIntegrator window in sequential order to create a process. TurboIntegrator does not let you proceed to a new tab until you supply all required information in the current tab.

Creating Dimensions Using TurboIntegrator

You can use TM1 TurboIntegrator to create a list of elements for a dimension from one of several possible data sources, including ODBC and ASCII files. This is the fast approach to creating a long list of elements, such as a thousand names along a customer dimension.

Sample ASCII File

Here is the delimited ASCII file (example.cma) that you will use to build a dimension and import data.

```
"New England", "Massachusetts", "Boston", "SuperMart",  
"Feb" , 2000000 "New England", "Massachusetts", "Springfield", "SuperMart",  
"Feb" , 1400000 "New England", "Massachusetts", "Worcester", "SuperMart",  
"Feb" , 2200000
```

Each record in this source file has six fields, three of which will be used to create the Example dimension. The first two fields will become consolidated elements. The third field will become a numeric element. The remainder of the fields will be ignored.

In the Dimension Editor, the Example dimension will have the following structure:

New England

- Massachusetts
 - Boston
 - Springfield
 - Worcester

The numeric values from Boston, Springfield, and Worcester will consolidate into Massachusetts totals, which will consolidate into New England totals.

Creating a Dimension from an ASCII File

To create a dimension using the example.cma sample file:

Procedure

1. In the left pane of the Server Explorer, select **Processes** beneath the local server.
2. Choose **Process, Create New Process**.
The TurboIntegrator window opens.
3. Select **Text** as the Data Source Type.
4. Click the **Browse** button for the Data Source Name and select **example.cma** in your TI_data directory.
5. Leave the Data Source Name on Server field empty.
6. Set the Delimiter Type to **Delimited** and the Delimiter to **Comma**.
7. Disregard the Quote Character and the Number of Title Records fields, as there are no quotes and no title records in the input file.
The Decimal Separator should be period (.) and the Thousand Separator should be comma (,).
8. Click the **Preview** button to view records from the example.cma source file.
These records let you examine the structure of records in the data source.

Identifying Variables:

After loading the source data into TurboIntegrator, you must identify the contents of each field in the source. TM1 assigns a variable to each field in the source.

Procedure

1. Click the **Variables** tab to reveal the following information, which displays a row for each variable in the data source.

Variable Name	Variable Type	Sample Value	Contents
V1	String	New England	Ignore
Massachusetts	String	Massachusetts	Ignore
Boston	String	Boston	Ignore
Supermart	String	Supermart	Ignore
Feb	String	Feb	Ignore
V6	Numeric	2000000	Ignore

The first column of the grid assigns a Variable Name to each data source field. To assign your own variables, click the appropriate cell and enter a new variable name.

The second column assigns a Variable Type for each variable. This identifies the type of data in the source field. You can change the type by selecting one from the drop-down list.

The third column, Sample Value, lists the contents of the first record of the data source. In the above image, New England is the contents of the first field in the first record of example.cma.

The Contents column determines the data type (Element, Consolidation, Data, Attribute, Other, or Ignore) each variable identifies. In the example, the first three variables identify consolidations and elements of a regional hierarchy.

2. In the Contents column for variable V1, select **Consolidation** from the drop-down list.
3. Do the same for the Massachusetts variable.
4. For the Boston variable, select **Element**.
5. Select **Ignore** for all other variables, as they will not be used to create the dimension.

Variable Name	Variable Type	Sample Value	Contents
V1	String	New England	Consolidation
Massachusetts	String	Massachusetts	Consolidation
Boston	String	Boston	Element
Supermart	String	Supermart	Ignore
Feb	String	Feb	Ignore
V6	Numeric	2000000	Ignore

Mapping Variables:

After identifying variables in the data source, you must map them to TM1 objects.

Procedure

1. Click the **Maps** tab, then the **Cube** sub-tab.
2. You are not creating a cube, so select **No Action** in the Cube Action box.
3. The Data Action is irrelevant, as you are not creating or updating a cube. You can disregard this box.
4. The Cube Logging option is not relevant, as you are not processing data values. Leave this option unselected.
5. Click the **Dimensions** sub-tab.
This grid has a row for each variable that you identified as an Element content type. You must specify an element type and identify the dimension to which the element belongs.
6. You are creating a new dimension, so type **Example** in the Dimension column for the Boston variable.
7. Select **Create** from the Action drop-down list.
8. Select **Numeric** from the Element Type drop-down list.
The Boston variable is now mapped as a numeric element of a new dimension named Example.
You can now map the variables identified as consolidations.
9. Click the **Consolidations** sub-tab.
TM1 correctly identifies both consolidation variables as members of the new Example dimension. All you have to do is identify the child variable for each consolidation.
10. For the **V1Consolidation Variable**, select **Massachusetts** as the Child Variable.
11. For the **Massachusetts Consolidation Variable**, select **Boston** as the Child Variable.
12. Do not edit the Weight of either consolidation variable.
When you are done, the Consolidations sub-tab should appear as follows.


Consolidated Variable	Dimension	Child Variable	Weight	Sample Value	Component Order
V1	Example	Mass.	1.000000	New England	By Input
Mass.	Example	Boston	1.000000	Massachusetts	By Input

All mapping is complete. If you want, you can click the Advanced tab and then click through the various sub-tabs to view the scripts generated by TurboIntegrator that create the new Example dimension and insert consolidations and elements. We will take a closer look at TurboIntegrator scripts later in this tutorial.


Saving and Executing the Process:

To save and execute the process:

Procedure

1. Click the **Run** button .
TM1 prompts you to save the process.
2. Save the process as create_Example_dimension.
It is a good idea to save processes with descriptive names.

After a few seconds, you should see a message box displaying a confirmation that the process executed successfully.

3. Close the TurboIntegrator window.
4. Open the Server Explorer.
5. Right-click the new Example dimension and select **Edit Dimension Structure**. The Example dimension opens in the Dimension Editor.
6. Click  to sort the dimension members by hierarchy level. The Example dimension was successfully created. New England is a consolidated element containing Massachusetts (consolidated element), which in turn contains Boston, Springfield, and Worcester (numeric elements).

Creating a Dimension from an ODBC Source

This part of the tutorial guides you through the creation of a dimension from an ODBC data source. The procedure is very similar to creating a dimension from an ASCII file.

Defining the Data Source:

Before continuing with the tutorial, you must add a Microsoft Access database as an ODBC data source to make it available to TurboIntegrator.

Procedure

1. Open the Windows ODBC Data Source Administrator dialog box. The procedure required to access this dialog box varies according to the version of Windows you are running. See the Windows online help for details.
2. On the User DSN tab, click the **Add** button. The Create New Data Source dialog box opens.
3. Select **Microsoft Access Driver** and click **Finish**. The ODBC Access Setup dialog box opens.
4. Type **NewDB** in the Data Source Name field.
5. Click the **Select** button. The Select Database dialog box opens.
6. Navigate to you TI_Data directory and select **NewDB.mdb**.
7. Click **OK** to exit the Select Database dialog box.
8. Click **OK** to exit the ODBC Administrator dialog box. The NewDB Access database is now available as an ODBC source.

Querying the Data Source:

To query the data source:

Procedure

1. From the Server Explorer, right-click the Processes icon and select **Create New Process**. The TurboIntegrator window opens.
2. Select **ODBC** as the Data Source Type.
3. Click the **Browse** button next to the Data Source Name field.
4. The ODBC Data Sources dialog box opens.
5. Select **NewDB** and click **OK**.

NewDB.mdb has one table, ACCOUNT, which has 27 fields. You will write an SQL query to select information from six of them. All ODBC queries *must* use the SQL dialect of the underlying DBMS. The syntax of an MS Access query will be different from that of an Informix® query, an SQL Server query, and so on.

To guarantee the correct syntax, you can first create the query using the querying facility of the underlying DBMS, then copy the query and paste it into the TurboIntegrator Query field.

6. In the Query field, type the following statement exactly as it opens:

```
SELECT [ACCOUNT_ID], [PARENT_ID], [NAME], [TYPE], [SALESREP],  
[SALESTEAM] FROM ACCOUNT;
```

7. Click **Preview** to view the first ten records returned by the query.

Using a parameter in the SQL:

You can create a parameter to use in the Datasource field, then call that parameter as part of a query.

For example in the following SQL statement,

```
SELECT * FROM customer WHERE last_name = 'Smith'
```

you can replace the value of Smith with the parameter 'pLastName' so the SQL statement becomes:

```
SELECT * FROM customer WHERE last_name = '?pLastName?'
```

When creating a parameter, consider the following:

- You must initially create the TI process using an ODBC source. This will populate the Variables tab. At that point, you can use the variable DATASOURCEQUERY to overwrite the query text box value in the Datasource tab.
- The number of columns from the returned set must match the number when the TI process was developed.
- The data type of columns must also match.
- It is important to enclose the parameter with single quotes when it is a string parameter. For a numeric parameter, do not use the single quotes, for example the query using a numeric could be

```
SELECT  
* FROM customer WHERE last_name = ?pQuantity?
```

To create the parameter, use the Advanced Tab in the TurboIntegrator process dialog box to replace the default PO parameter with the parameter you want to use, for example: **pLastName**.

Identifying Variables:

After querying the source data, you must identify the contents of each field in the query results.

Procedure

1. Click the **Variables** tab.

Note that the Variable Name column has been filled with the correct column names from the database.

2. Change the selections in the Contents column to these selections.

Variable Name	Contents
ACCOUNT_ID	Ignore
PARENT_ID	Ignore
NAME	Element
TYPE	Consolidation
SALESREP	Consolidation
SALESTEAM	Consolidation

You are now ready to map variables.

Mapping Variables:

Map variables by mapping elements to dimensions then mapping consolidation variables.

Procedure


1. Map elements to dimensions.
 - a. Click the **Maps** tab, then click the **Dimensions** sub-tab.
The single variable you identified as an element displays in the grid.
 - b. In the Dimension column, type **DB**.
 - c. Select **Create** from the Action drop-down menu.
 - d. Select **Numeric** from the Element Type drop-down menu.
2. Map consolidation variables.
 - a. Click the **Consolidations** sub-tab.
TM1 correctly identifies each consolidation variable as mapping to the DB dimension.
 - b. Set the Child Variable for each consolidation variable.

Cons. Variable	Child Variable
TYPE	SALESREP
SALESREP	NAME
SALESTEAM	TYPE

Saving and Executing the Process:

To save and execute the process:

Procedure

1. Click the **Run** button  .
TM1 prompts you to save the process.
2. Save the process as create_DB_dimension.
After a few seconds, you should see confirmation that the process executed successfully.
3. Close the TurboIntegrator window.
4. Open the Server Explorer.

5. Double-click the new **DB** dimension.
The DB dimension opens in the Subset Editor.
6. Select **Edit, Sort, Hierarchy** from the Subset Editor menu bar to display the dimension elements and consolidations.
The DB dimension contains over 40 elements and has four hierarchy levels.

Creating a Cube and Processing Data

The next example shows how to use TM1 TurboIntegrator to create a cube, dimensions, and elements and process data at the same time.

Defining the Data Source

Perform the following steps to define a data source.

Procedure

1. In the left pane of the Server Explorer, right-click the **Processes** icon and select **Create New Process**.
The TurboIntegrator window opens.
2. Click the **Data Source** tab on the TurboIntegrator window.
3. Set the Data Source Type as **Text**; the Delimiter Type as **Delimited**; and the Delimiter as **Comma**.
Ignore the Quote Char and Number of Title Records fields.
4. Make sure the Decimal Separator is period (.) and the Thousand Separator is comma (,).
5. Click the **Browse** button next to the Data Source Name field and select the file **newcube.csv** in your TI_data directory.
6. Click **Preview** to view the first ten records of the data source.
Each record in newcube.csv contains 20 fields. You can scroll across the display grid to view all fields.

Identifying Variables

After loading the source data into TurboIntegrator, you must identify the contents of each field in the source.

Procedure

1. Click the **Variables** tab.
Some variables will use the Vn naming convention while others will use names corresponding to the first record in the source file.
2. To simplify the editing process, rename all variables using the Vn convention. The first variable should be named $V1$, the second variable $V2$, and so on.
When you are done, the Variables tab should appear as follows:

Data Source Variables Maps Advanced Schedule			
	Variable Name	Variable Type	Sample Value
1	V1	Numeric	-1
2	V2	Numeric	-760.8
3	V3	Numeric	-1
4	V4	String	26.03.97
5	V5	String	Total A
6	V6	String	CC
7	V7	String	CC_3707
8	V8	String	CC_3707_3001000
9	V9	String	CC_3707_30010000
10	V10	String	CC_3707_30010000_L
11	V11	String	All
12	V12	String	Branch 900
13	V13	String	Finsterwalder
14	V14	String	6091400
15	V15	String	Total B
16	V16	String	E
17	V17	String	E 453326000000000
18	v18	String	D
19	V19	String	8
20	v20	String	lst

- For each variable, select a type from the associated Variable Type drop-down list.

For variables V1, V2, V3, V14, and V19, the type is **Numeric**. For all other variables, the type is **String**.

- For each variable, select a content type from the associated Contents drop-down list. Refer to the following table to identify the content type for each variable.

Variable Name	Contents	Variable Name	Contents
V1	Data	V11	Consolidation
V2	Data	V12	Consolidation
V3	Data	V13	Consolidation
V4	Element	V14	Element
V5	Consolidation	V15	Consolidation
V6	Consolidation	V16	Consolidation
V7	Consolidation	V17	Element
V8	Consolidation	V18	Element
V9	Consolidation	V19	Element

Variable Name	Contents	Variable Name	Contents
V10	Element	V20	Element

Mapping Variables

You have identified variables for data, elements, and consolidations. Now you have to map the variables and provide instructions for creating a new cube.

Mapping the Cube:

To provide cube mapping instructions:

Procedure

1. Click the **Maps** tab.
2. Click the **Cube** sub-tab.
3. Select **Create** for the Cube Action.
4. Type **NewCube** in the Cube Name field.
5. Select **Store Values** for the Data Action.
6. Do not turn on the Enable Cube Logging option.

When you enable cube logging, TM1 logs changes to cube data during processing. You are creating a new cube, so there is no need to log changes.

Mapping Element Variables to Dimensions:

You can now map all variables you identified as having an Element type to appropriate dimensions.

Procedure

1. Click the **Dimensions** sub-tab.
2. Using the following table as a guide, specify a Dimension, Action, and Element Type for each element variable.

Element Variable	Dimension	Action	Element Type
V4	date	Create	Numeric
V10	item	Create	Numeric
V14	customer	Create	Numeric
V17	job	Create	Numeric
V18	region	Create	Numeric
V19	agent	Create	Numeric
V20	book	Create	Numeric
Data variables	measure	Create	Numeric

You can accept the default **Order in Cube** values for each variable.

Mapping Data Variables:

You must now map variables you identified as having a Data type to individual elements.

Procedure

1. Click the **Data** sub-tab.
2. For data variable V1, enter **weight** as the element to which the variable will map.
3. For V2, enter **conversion**.
4. For V3, enter **pieces**.
5. In the Element Type column, select **Numeric** for all three elements.

Mapping Consolidation Variables:

You must now map consolidation paths for all variables you identified as having a Consolidation content.

Procedure

1. Click the **Consolidations** sub-tab.
2. Using the following table as a guide, specify a Dimension and Child Variable for each consolidation variable.

Consolidation Variable	Dimension	Child Variable
V5	item	V6
V6	item	V7
V7	item	V8
V8	item	V9
V9	item	V10
V11	customer	V12
V12	customer	V13
V13	customer	V14
V15	job	V16
V16	job	V17


3. You can accept the default Weight and Component Order for all consolidation variables.

You have now completed mapping to create new dimensions, insert elements and consolidations into the dimensions, create a new cube, and populate the cube with data.

Saving and Executing the Process:

To save and execute the process:

Procedure

1. Click the **Run** button  .
TM1 prompts you to save the process.
2. Save the process as create_newcube.

After a few seconds, you should see confirmation that the process executed successfully.

3. Open the Server Explorer and note that the cube NewCube has been created and populated, and that all required dimensions have been created.

Browse the new cube (it is very sparsely populated) and examine the newly created dimensions.

Advanced Scripting

Use the **Advanced** tab of TurboIntegrator to create parameters that can be passed to a process at runtime or to edit process procedures, thereby enhancing the capabilities of TurboIntegrator. Procedures are edited by creating scripts that incorporate both TurboIntegrator functions and TM1 rules functions.

Editing the Prolog, Metadata, Data, and Epilog Procedures

You can enhance the capabilities of TurboIntegrator by editing the procedures that define the actions of a process. A procedure is a group of statements that manipulates TM1 data or metadata.

A process includes four procedures that are executed in sequence. Each procedure contains generated statements that are created based on the options you select elsewhere in the TurboIntegrator window. You can edit these procedures by adding your own statements that incorporate TurboIntegrator functions and Rules functions.

The procedures contained within a process are:

Tab	Description
Prolog	A series of actions to be executed before the data source is processed
Metadata	A series of actions that update or create cube, dimensions, and other metadata structures during processing.
Data	A series of data actions to be executed for each record in the data source.
Epilog	A series of actions to be executed after the data source is processed.

When editing procedures, keep in mind that each procedure is intended to execute certain types of actions at specific times in a process. Accordingly, you should create actions or statements that are appropriate for a given procedure.

For example, to export processed data to an ASCII file, you would add an ASCIIOutput function to the Data procedure. ASCIIOutput is a function that manipulates data, and it should be executed during processing. Therefore, the Data procedure is the correct location for the function.

Editing a Procedure

To edit a procedure:

Procedure

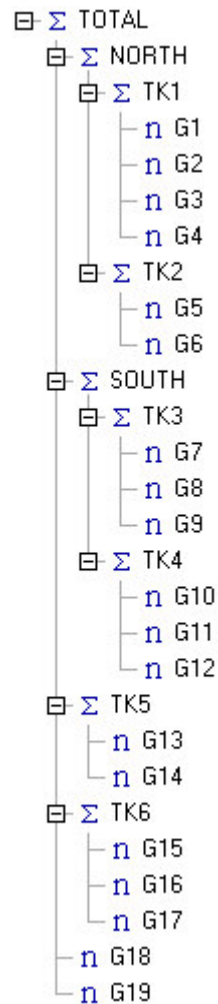
1. Click the **Advanced** tab on the TurboIntegrator window.
2. Click the sub-tab for the procedure you want to edit.
3. Enter your statements in the text box *before* the
#***GENERATED STATEMENTS START*** line
or *after* the
#***GENERATED STATEMENTS FINISH*** line.
You should not edit generated statements between these two lines.

Creating a Dimension with Unbalanced Hierarchies

In this exercise, you will use the following input file to create a dimension with unbalanced hierarchies.

```
TOTAL,NORTH,TK1,G1
TOTAL,NORTH,TK1,G2
TOTAL,NORTH,TK1,G3
TOTAL,NORTH,TK1,G4
TOTAL,NORTH,TK2,G5
TOTAL,NORTH,TK2,G6
TOTAL,SOUTH,TK3,G7
TOTAL,SOUTH,TK3,G8
TOTAL,SOUTH,TK3,G9
TOTAL,SOUTH,TK4,G10
TOTAL,SOUTH,TK4,G11
TOTAL,SOUTH,TK4,G12
TOTAL,TK5,G13
TOTAL,TK5,G14
TOTAL,TK6,G15
TOTAL,TK6,G16
TOTAL,TK6,G17
TOTAL,G18
TOTAL,G19
```

The final result will look like this:



To begin creating the dimension:

Procedure

1. In the left pane of the Server Explorer, right-click the **Processes** icon and select **Create New Process**.
The TurboIntegrator window opens.
2. Select the **Text** Data Source Type.
3. Click **Browse** next to the Data Source Name field and select **unbalanced.csv** in your TI_data directory.
4. Leave all other options on the Data Source tab at their default settings.
5. Click **Preview** to view the first ten records in the data source.

Identifying Variables

After loading the source data into TurboIntegrator, you must identify the contents of each field in the source.

Procedure

1. Click the **Variables** tab.
2. In the Contents column, select **Consolidation** for variables Total, North, and TK1.
3. Select **Element** for variable G1.

Mapping Variables

You have identified variables elements and consolidations. Now you have to map the variables to a dimension and define consolidation paths.

Procedure

1. Click the **Maps** tab.
2. Click the **Dimensions** sub-tab.
3. For element variable G1, enter **unbalanced** as the Dimension; **Create** for the Action; and **Numeric** for the Element Type.
4. Click the **Consolidations** sub-tab.
5. In the **Dimension** column, select **unbalanced** from the drop-down list for the three variables.
6. For the Cons. VariableTotal, select **North** as the Child Variable.
7. For the Cons. VariableNorth, select **TK1** as the Child Variable.
8. For the Cons. VariableTK1, select **G1** as the Child Variable.

Copying Generated Statements

TM1 generates statements dynamically as you change options in the TurboIntegrator window.

You are going to edit the generated statements on the Prolog and Metadata subtabs of the Advanced tab to accommodate an unbalanced dimension hierarchy. To make things a little easier, you will copy and paste the generated statements so that they will be available after you change options in the TurboIntegrator window.

Procedure

1. Click the **Advanced** tab, then the **Prolog** sub-tab.
2. Copy the DimensionDestroy and DimensionCreate functions from between the comment lines

```
*****GENERATED STATEMENTS START*****  
*****GENERATED STATEMENTS FINISH*****
```

and paste them below the comment lines.

```
*****GENERATED STATEMENTS START*****  
DIMENSIONDESTROY('unbalanced');  
DIMENSIONCREATE('unbalanced');  
DIMENSIONSORTORDER('unbalanced', 'ByInput', 'ASCENDING', 'ByInput', 'ASCENDING');  
*****GENERATED STATEMENTS FINISH*****  
DIMENSIONDESTROY('unbalanced');  
DIMENSIONCREATE('unbalanced');
```

3. Click the **Metadata** sub-tab.

There are two functions:

The DimensionElementInsert function adds a simple (leaf) element to a dimension. You can use this function to add both numeric and string elements.

The DimensionElementComponentAdd function adds a component (child) to a consolidated element.

4. Copy all the generated statements and paste them below the last comment line.

```
*****GENERATED STATEMENTS START*****  
DIMENSIONELEMENTINSERT('unbalanced',",G1,'n');  
DIMENSIONELEMENTINSERT('unbalanced',",TOTAL,'c');  
DIMENSIONELEMENTINSERT('unbalanced',",NORTH,'c');
```

```

DIMENSIONELEMENTINSERT('unbalanced',",TK1,'c');
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TK1,G1,1.000000);
****GENERATED STATEMENTS FINISH****
DIMENSIONELEMENTINSERT('unbalanced',",G1,'n');
DIMENSIONELEMENTINSERT('unbalanced',",TOTAL,'c');
DIMENSIONELEMENTINSERT('unbalanced',",NORTH,'c');
DIMENSIONELEMENTINSERT('unbalanced',",TK1,'c');
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TK1,G1,1.000000);

```

Removing the Generated Statements Permanently

To permanently remove generated statements:

Procedure

1. Click the **Variables** tab and change the selections in the Contents column to **Other**.

When a variable is identified as Other, the variable is available to be used in advanced scripts. If a variable is identified as Ignore, it is not processed by TurboIntegrator and thus cannot be referenced in advanced scripts.

2. To verify that the statements have been removed, click on the **Advanced** tab, then the **Prolog** and **Metadata** sub-tabs.

The statements should appear as follows:

Prolog>

```

****GENERATED STATEMENTS START****
****GENERATED STATEMENTS FINISH****
DIMENSIONDESTROY('unbalanced');
DIMENSIONCREATE('unbalanced');

```

Metadata>

```

****GENERATED STATEMENTS START****
****GENERATED STATEMENTS FINISH****
DIMENSIONELEMENTINSERT('unbalanced',' ',G1,'n');
DIMENSIONELEMENTINSERT('unbalanced',' ',TOTAL,'c');
DIMENSIONELEMENTINSERT('unbalanced',' ',NORTH,'c');
DIMENSIONELEMENTINSERT('unbalanced',' ',TK1,'c');
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TK1,G1,1.000000);

```

Editing the TurboIntegrator Statements

Examine the script that currently exists on the Metadata sub-tab, which appear as follows.

```

DIMENSIONELEMENTINSERT('unbalanced',' ',G1,'n');
DIMENSIONELEMENTINSERT('unbalanced',' ',TOTAL,'c');
DIMENSIONELEMENTINSERT('unbalanced',' ',NORTH,'c');
DIMENSIONELEMENTINSERT('unbalanced',' ',TK1,'c');
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);

```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TK1,G1,1.000000);
```

This script, which was generated based on the first record in unbalanced.csv, is valid for records that contain four fields. The script creates dimension elements from each field in the source, then creates a hierarchy. The script, however, is not valid for records containing less than four fields.

Because the source file unbalanced.csv contains records of varying length, you must modify the script to evaluate each record in the source. The script should determine the correct level of consolidation and specify an appropriate consolidation path for each possible level of consolidation. This can be accomplished by editing the script to include an IF function, which allows you to execute other TurboIntegrator statements based on defined conditions.

Procedure

1. Click the **Advanced** tab, then the **Metadata** sub-tab.
2. Insert the line

```
IF (G1@<>');
```

before the first DIMENSIONELEMENTINSERT statement. This IF statement indicates that if the string variable *G1* is *not* empty, the statements that follow should be executed. If *V4* is empty, processing should skip to the next conditional statement.

The Metadata sub-tab now appear as follows.

```
*****GENERATED STATEMENTS START*****  
*****GENERATED STATEMENTS FINISH*****  
IF (G1@<>);  
DIMENSIONELEMENTINSERT('unbalanced','',G1,'n');  
DIMENSIONELEMENTINSERT('unbalanced','',TOTAL,'c');  
DIMENSIONELEMENTINSERT('unbalanced','',NORTH,'c');  
DIMENSIONELEMENTINSERT('unbalanced','',TK1,'c');  
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);  
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);  
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TK1,G1,1.000000);
```

When IF (G1@<>) is true, TurboIntegrator inserts three consolidated elements (Total, North, TK1) and a single numeric element (G1) into the unbalanced dimension. TurboIntegrator also creates a four-level hierarchy where Total is the parent of North, North is the parent of TK1, and TK1 is the parent of G1.

3. Insert the line

```
ELSEIF (TK1@<>');
```

after the last DIMENSIONELEMENTCOMPONENTADD statement.

This conditional ELSEIF statement indicates that if the string variable *V3* is *not* empty, the statements that follow should be executed. If *V3* is empty, processing should skip to the next conditional statement.

4. You must now insert statements to be executed when ELSEIF (TK1@<>) is true.

When ELSEIF (TK1@<>) is true, the source record contains three fields. Accordingly, the statements should create a dimension element from each field, then create a hierarchy of three levels.

5. Insert the following statements immediately after ELSEIF (TK1@<>);

```
DIMENSIONELEMENTINSERT('unbalanced','',TOTAL,'c');  
DIMENSIONELEMENTINSERT('unbalanced','',NORTH,'c');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',TK1,'n');
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);
```

When IF (TK1@<>) is true, TurboIntegrator inserts two consolidated elements (TOTAL, NORTH) and a single numeric element (TK1) into the unbalanced dimension. TurboIntegrator also creates a three-level hierarchy where TOTAL is the parent of NORTH and NORTH is the parent of TK1.

6. Insert the line

```
ELSE;
```

after the last DIMENSIONELEMENTCOMPONENTADD statement.

7. You must now insert statements to be executed when processing reaches the ELSE statement. (This occurs when both IF (G1@<>) and ELSEIF (TK1@<>) are false.)

When processing reaches the ELSE statement, the source record contains two fields. The statements you insert should create a dimension element from each field, then create a hierarchy of two levels.

8. Insert the following statements immediately after ELSE;

```
DIMENSIONELEMENTINSERT('unbalanced','',TOTAL,'c');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',NORTH,'n');
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
```

These statements instruct TurboIntegrator to insert the consolidated element TOTAL and the numeric element NORTH into the unbalanced dimension, and to create a hierarchy where TOTAL is the parent of NORTH.

9. Insert the line

```
ENDIF;
```

after the final DIMENSIONELEMENTCOMPONENTADD statement. ENDIF indicates the end of the IF statement.

When you are done, the completed Metadata sub-tab should appear as follows:

```
*****GENERATED STATEMENTS START*****
```

```
*****GENERATED STATEMENTS FINISH*****
```

```
IF (G1@<>');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',G1,'n');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',TOTAL,'c');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',NORTH,'c');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',TK1,'c');
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TK1,G1,1.000000);
```

```
ELSEIF (TK1@<>');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',TOTAL,'c');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',NORTH,'c');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',TK1,'n');
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',NORTH,TK1,1.000000);
```

```
ELSE;
```

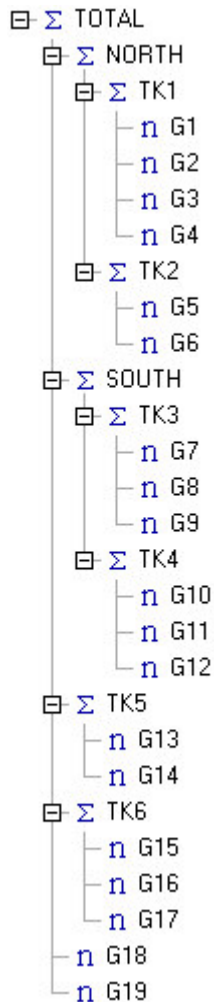
```
DIMENSIONELEMENTINSERT('unbalanced','',TOTAL,'c');
```

```
DIMENSIONELEMENTINSERT('unbalanced','',NORTH,'n');
```

```
DIMENSIONELEMENTCOMPONENTADD('unbalanced',TOTAL,NORTH,1.000000);
```

ENDIF;

10. Choose **File, Save** and name the process create_unbalanced_dim.
11. Choose **File, Run** to execute the process.
12. To verify that the dimension was built correctly, open the unbalanced dimension in the Dimension Editor. It should look like the following image.



Creating Subsets

In this exercise you create subsets for the dimension newdim, which is created by the dimension process.

Procedure

1. Open the process **subsets** in the TurboIntegrator window.

You might have to edit the data source to point to region.csv in your TI_data directory. If you change the data source, you will be prompted to specify how process variables should be handled. Select **Keep All Variables**.

This example uses the TM1 TurboIntegrator functions SubsetCreate() and SubsetElementInsert() to create and populate dimension subsets.

The preview of the source file looks like this:

V0	V1	V2	V3	V4
Sweden	Scandania	Europe	International	Europe
Norway	Scandania	Europe	International	Europe
Denmark	Scandania	Europe	International	Europe
France	Europe	International	Worldwide	Europe
Germany	Europe	International	Worldwide	Europe
UK	Europe	International	Worldwide	Europe
Ireland	Europe	International	Worldwide	Europe
Holland	Europe	International	Worldwide	Europe
Spain	Europe	International	Worldwide	Europe
Italy	Europe	International	Worldwide	Europe

Here are the scripts for the process subsets:

Prolog>

```

****GENERATED STATEMENTS START****
****GENERATED STATEMENTS FINISH****
SubsetCreate('NewDim','Europe');
SubsetCreate('NewDim','US');
SubsetCreate('NewDim','ROW');

```

Metadata>

```

****GENERATED STATEMENTS START****
****GENERATED STATEMENTS FINISH****
SubsetElementInsert('NewDim',V4,V0,0);

```

2. Execute the process.
3. In the Server Explorer, expand the newdim dimension and view the newly created subsets.

Creating Attributes

The AttrPutS function assigns a value to a string element attribute. If you want to assign the string Europe to the Continent attribute of the region Sweden in the NewDim dimension, you would write the AttrPutS function this way:

```
AttrPutS('Europe','NewDim','Sweden','Continent');
```

Procedure

1. Open the **Attributes** process in TurboIntegrator.
You might have to edit the data source to point to region.csv in your TI_data directory. If you change the data source, you will be prompted to specify how process variables should be handled. Select **Keep All Variables**.
2. Click the **Variables** tab.
Note that V4 and V5 have been identified as Attribute.

3. Click the **Formula** cell for V5.
It reads V5=V0|V4;
This formula concatenates the values of the V4 and V5 variables.
4. Click the **Maps** tab and the **Attributes** sub-tab.
The attribute type for variable V4 has been defined as Text and the type for V5 as Alias.
5. Click the **Advanced** tab and the **Data** sub-tab to show the generated statements and two additional statements.

```

*****GENERATED STATEMENTS START*****
V5=v0|v4;
AttrPutS(V4,'newdim',V0,'continent');
AttrPutS(V5,'newdim',V0,'cont');
*****GENERATED STATEMENTS FINISH*****
AttrPutS(V4,'newdim',V1,'continent');
AttrPutS(V4,'newdim',V2,'continent');


```

The two statements above were added manually because V1 and V2 were not declared as contents in the Variables tab. They must, however, be assigned the text attribute Continent.
6. Save and execute the Attributes process.

Viewing the Attributes

After assigning an attribute value, you can view the assignment as follows.

Procedure

1. In the Server Explorer, double-click the **newdim** dimension to open the Subset Editor.
2. Click **Subset All** .
3. Choose **Edit, Filter By, Attribute** from the menu to display the Filter by Attribute dialog box.
4. Select an attribute value from the drop-down list on the Filter by Attribute dialog box to display all regions for a specific continent in the Subset Editor.

Appendix B. TurboIntegrator Reserved Words

This appendix lists IBM Cognos TM1 TurboIntegrator reserved words. To prevent errors in your TurboIntegrator scripts, you should avoid creating variables with names that match any of the words listed in the following tables.

There are four categories of reserved words in TurboIntegrator:

- Rule Function Names
- Process Function Names
- Implicit Variable Names
- TurboIntegrator Keywords

Rule Function Names

These are the reserved words for TM1 rule functions:

- ABS
- ACOS
- ASIN
- ATAN
- ATTRN
- ATTRS
- AVG
- BANNR
- BDATE
- BDAYN
- CAPIT
- CENTR
- CHAR
- CNT
- CODE
- COL
- Consolidate Children
- COS
- DATE
- DATES
- DATFM
- DAY
- DAYNO
- DBG16
- DBGEN
- DELET
- DFRST
- DIMIX
- DIMNM

- DIMSIZ
- DISPLY
- DNEXT
- DNLEV
- DTYPE
- DYS
- ELCOMP
- ELCOMPEN
- ELISANC
- ELISCOMP
- ELISPAR
- ELLEV
- ELPAR
- ELPARN
- ELWEIGHT
- EXP
- FILL
- FV
- HEX
- IF
- INSRT
- INT
- IRR
- ISLEAF
- ISUND
- LIN
- LN
- LOG
- LONG
- LOOK
- LOWER
- MAX
- MEM
- MIN
- MOD
- MONTH
- MOS
- NCELL
- NOW
- NPV
- PAYMT
- PV
- RAND
- RIGHT
- ROUND

- ROUNDP
- SCAN
- SCELL
- SIGN
- SIN
- SLEEP
- SQRT
- STDDV
- STR
- SUBSIZ
- SUBST
- SUM
- TABDIM
- TAN
- TIME
- TIMST
- TIMVL
- TODAY
- TRIM
- UNDEF
- UPPER
- VAR
- WHOAMI
- WIDTH
- YEAR
- YRS

Process Function Names

These are the TurboIntegrator process function names:

- AddClient
- AddGroup
- AllowExternalRequests
- ASCIIDelete
- ASCIIOutput
- AssignClientPassword
- AssignClientToGroup
- AttrDelete
- AttrInsert
- AttrPutN
- AttrPutS
- AttrToAlias
- BatchUpdateFinish
- BatchUpdateStart
- CellGetN
- CellGetS

- CellIsUpdateable
- CellPutN
- CellPutProportionalSpread
- CellPutS
- ChoreQuit
- CubeCreate
- CubeDestroy
- CubeExists
- CubeGetLogChanges
- CubeLockOverride
- CubeProcessFeeders
- CubeSetConnParams
- CubeSetIsVirtual
- CubeSetLogChanges
- CubeSetSAPVariablesClause
- CubeSetSlicerMembers
- CubeUnload
- DeleteClient
- DeleteGroup
- DimensionCreate
- DimensionDeleteAllElements
- DimensionDestroy
- DimensionEditingAliasSet
- DimensionElementComponentAdd
- DimensionElementComponentDelete
- DimensionElementDelete
- DimensionElementInsert
- DimensionElementInsertByAlias
- DimensionElementPrincipalName
- DimensionExists
- DimensionSortOrder
- ElementSecurityGet
- ElementSecurityPut
- EncodePassword
- ExecuteCommand
- ExecuteProcess
- Expand
- FileExists
- GetProcessErrorFileDirectory
- GetProcessErrorFilename
- IsNull
- ItemReject
- ItemSkip
- LockOff
- LockOn

- NumberToString
- NumberToStringEx
- NumericGlobalVariable
- NumericSessionVariable
- ODBCConnect
- ODBCOpen
- ODBCOutput
- ProcessBreak
- ProcessError
- ProcessExitByBreak
- ProcessExitByChoreQuit
- ProcessExitByQuit
- ProcessExitMinorError
- ProcessExitNormal
- ProcessExitOnInit
- ProcessExitServerError
- ProcessExitWithMessage
- ProcessQuit
- PublishView
- RemoveClientFromGroup
- ReturnSQLTableHandle
- ReturnViewHandle
- RuleLoadFromFile
- SaveDataAll
- SecurityRefresh
- ServerShutDown
- SetChoreVerboseMessages
- StringGlobalVariable
- StringSessionVariable
- StringToNumber
- StringToNumberEx
- SubsetAliasSet
- SubsetCreate
- SubsetCreateByMDX
- SubsetDeleteAllElements
- SubsetDestroy
- SubsetElementDelete
- SubsetElementInsert
- SubsetExists
- SubsetFormatStyleSet
- SubsetGetElementName
- SubsetGetSize
- SubsetIsAllSet
- SwapAliasWithPrincipalName
- ViewColumnDimensionSet

- ViewColumnSuppressZeroesSet
- ViewConstruct
- ViewCreate
- ViewDestroy
- ViewExists
- ViewExtractSkipRuleValuesSet
- ViewExtractSkipRuleValuesSet
- ViewExtractSkipZeroesSet
- ViewRowDimensionSet
- ViewRowSuppressZeroesSet
- ViewSetSkipCalcs
- ViewSetSkipRuleValues
- ViewSetSkipZeroes
- ViewSubsetAssign
- ViewSuppressZeroesSet
- ViewTitleDimensionSet
- ViewTitleElementSet
- ViewZeroOut
- WildcardFileSearch

Implicit Variable Names

These are the implicit variable names for TurboIntegrator:

- DatasourceASCIIDecimalSeparator
- DatasourceASCIIDelimiter
- DatasourceASCIIHeaderRecords
- DatasourceASCIIQuoteCharacter
- DatasourceASCIIThousandSeparator
- DatasourceCubeview
- DatasourceDimensionSubset
- DatasourceNameForClient
- DatasourceNameForServer
- DatasourceODBOCatalog
- DatasourceODBOConnectionString
- DatasourceODBOCubeName
- DatasourceODBOHierarchyName
- DatasourceODBOLocation
- DatasourceODBOProvider
- DatasourceODBOSAPClientId
- DatasourceODBOSAPClientLanguage
- DatasourcePassword
- DatasourceQuery
- DatasourceType
- DatasourceUseCallerProcessConnection
- DatasourceUsername
- MinorErrorLogMax

- NValue
- OnMinorErrorDoItemSkip
- SValue
- Value_Is_String

TurboIntegrator Keywords

These are the reserved TurboIntegrator keywords.

- break
- else
- elseif
- end
- endif
- if
- while

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Index

A

- alias in TI functions 4
- ASCII
 - files 1
 - flat file 13
 - sample file 69

B

- bulk load mode 47

C

- characteristic
 - mapping 32
- chore 65
 - automatic execution 63
 - definition 2, 63
 - setup wizard 63
- ChoreCommit 65
- configuration 54
- connection
 - MSAS string 23
 - SAP parameters 31
- consolidations
 - mapping 12
 - multiple 12
- cube
 - ASCII flat file 13
 - creating 13
 - data source 14
 - mapping 11, 15
 - variables 14
 - view 19
- Custom query 36

D

- data
 - mapping 12
 - ODBC source 17
 - procedure 2
 - source 2, 7, 11, 14, 19
 - variables 15
- data extraction
 - SAP BW guidelines for variable usage 41
- data source parameter 73
- detailed fact query subject 39
- detailed key figures 39
- dimension
 - ASCII flat file 7
 - mapping 12
 - mapping consolidation variables 15
 - mapping data variables 15
 - mapping element variables 15
 - ODBO 29
 - subset data source 19

E

- elements
 - importing from data sources 7
- Epilog procedure 2
- error messages 56

F

- fixed length records 8
- functions
 - use in TurboIntegrator processes 2

I

- IBM Cognos 8 Planning and SAP BW data 39
- importing data
 - overview 1
- importing options 1

K

- key figures 32

M

- mapping
 - consolidation variables to dimension 15
 - consolidations 12
 - cube 11, 15
 - cube variables 15
 - data 12
 - dimension 12
 - dimension element variables 15
 - variables 11
- MDX 18
- measures
 - for IBM Cognos 8 Planning 39
- message log 30
- metadata procedure 2
- Microsoft Analysis Services 23, 28, 30
 - connecting 25
 - connection string 23
 - importing a cube 25
 - importing a dimension 28
- MSAS
 - connection string 23

N

- non-dimensionally modeled 36
- null values 3

O

- ODBC 1
 - catalog 23
 - data source 17
 - define data source 17

ODBO
 Catalog 23
 cube 26
 cube dimensions 26, 27
 data source 23
 Data Source 23
 dimension 29
 location 23
 Location 23
 Provider Name 23
 saving cube 28
 saving dimension 29
OLAP 23
OLE DB 23
OLE_LINK1 81

P

parallel queries 45
parameter in data source 73
passwords 58
process
 definition 2
 editing 49
 executing 13, 49
 procedures 2
 running ODBO 30
 saving 13, 30
 tips 3
prolog procedure 2
prompts
 specifying segmenting in SAP BW query 44

Q

query
 SQL 17
Querying the data source 72

R

records, fixed length 8
registered server 23
reserved words
 implicit variable names 94
 overview 89
 process functions 91
 rule functions 89
 TurboIntegrator keywords 95

S

sample ASCII file 69
sandbox
 running with a TurboIntegrator process 5
 TurboIntegrator functions 5
 using with TurboIntegrator processes 4
SAP
 BW 31
 characteristics 32

SAP (*continued*)
 connection parameters 31
 establishing a connection to BW 31
 hierarchies 32
 key figures 32
 mapping 32
SAP BW
 guidelines for using fact data 41
SAP BW data
 Cognos Planning 39
SAP BW query
 specifying segmenting prompt 44
serializing TurboIntegrator processes 58
Sign-on 31
SQL query 17
startup 65
STET 3
string length limit 1
strings 3
synchronized 58
synchronized() 58
syntax 50, 58

T

TI processes
 recommendations 4
TM1RunTI 50, 54, 56, 58
TurboIntegrator
 functions 2
 importing data 2
 importing from MDX 18
 ODBC 17
 process 2
 reserved words 89
 tutorial 67
tutorial
 creating 68, 69, 75, 86, 87
 creating dimensions 69
 data directory 67
 editing procedures within a process 79
 overview 67

U

UNC 7
Universal Naming Convention
 data source 7

V

variables
 cube 14
 data source 11
 default names 11
 guidelines for SAP BW fact data 41
 map cube 15
 mapping 11
 mapping consolidation to dimension 15
 mapping to dimension 15