IBM Cognos TM1 Developer

Instructor Guide

2016

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Module 1 - Introduction

<u>Objectives:</u>

- *Discuss the IBM Cognos TM1 Developer Course Objectives*

1.1 IBM Cognos TM1 Developer Course Objectives

- This is a three day course for power users and administrators, who need to learn to define dimensions, create and populates cubes, create rules, and apply security to your multidimensional data using TM1.
- Throughout the IBM Cognos TM1 Developer course, concepts and exercises are grouped into structured modules.
- The course will contain a mixture of Microsoft PowerPoint slides, and hands on demonstrations, exercises, and workshops, which you will be asked to complete with each module.
- It is recommended that you have Microsoft Excel experience.
- An IBM Cognos TM1 End User Analysis class is a prerequisite for the TM1 Developer course.

Facilitator Tip: With this next module, it is suggested you go through defining OLAP and OLTP with the class. However, defining a cube and dimensions could be used as a review since the attendees should have attended the TM1 End User class. Therefore, ask the participants what is a dimension and to give an example. Once the response is given, ask what is a cube and to give an example.
Before the course is started, you should introduce yourself, give brief background on experience, ask students to give their names, titles, and ask them what their expectations are for the course. You can write this on an easel and then refer back to it at the end of the course. Also, inform students about breaks and class times, in order to set expectations. You can also ask students if they will be utilizing TM1 to convert currencies for their financial reporting. If the client will not be converting currencies, Module 6 can be skipped.

Module 2 - Multi-Dimensional Business Data

Objectives:

- *Discuss OLAP Concepts*
- *List TM1 Components*
- *Define TM1 Objects*
- *Define Concepts of*
    - *Elements*
    - *Dimensions*
    - *Cubes*
- *Navigate the Server Explorer Window*
- *Discuss Model Design*
- *Review Naming Conventions*

Facilitator Tip: In order to prepare, you should come up with a series of questions you would like to ask the students, in order to encourage participation and ensure the appropriate knowledge transfer has occurred.

2.1 What is OLAP?

- On-Line Analytical Processing (OLAP) is a technology used by multidimensional databases.
- OLAP tools are optimized for data analysis such as performing aggregations or roll-ups of data.
- Aggregations are based on individual models adding greater value to your analysis.
- Data is indexed by dimensions such as Accounts, Departments, Versions and Periods.
- A dimension is a collection of like items that can be placed on rows, columns, or titles or pages on a report.
  For example:
  - You can perform analysis on Sales by Products, Regions, or Channel.
  - When working in Microsoft Excel you may have one worksheet for the P&L for the West region, one for the East and one for the South region:
    - However, to compare the regions' P&L side by side is difficult using a spreadsheet. In this case scenario you only have two dimensions, Accounts and Regions
  - As you add more dimensions, the number of worksheets you may have will increase making it difficult to manage your business by making better decisions quickly.

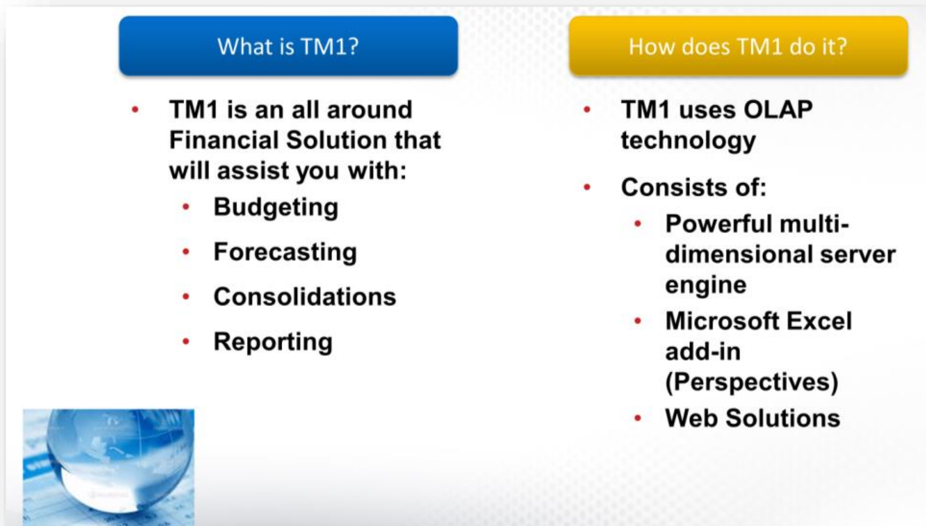
Did you know?

- In relational databases, data is stored in tables with rows or records and columns or fields.
- Relational databases are part of the On Line Transaction Processing (OLTP) standard and are optimized for transaction processing.
- OLTP databases are therefore ideal for systems like general ledger systems, where transactions are being processed.
- However, relational databases are usually not optimized for analysis and reporting.
- On Line Analytical Processing (OLAP) describes a complementary set of technologies that store and present data in a form that is optimized for analysis.
- TM1 is an example of an OLAP database.
- You will often load data into TM1 from a transactional system, like a general ledger, and then use it to produce reports, perform analysis, and create financial modeling.

Facilitator Tip: If you have access to the AdventureWorks SQL database, it may be a good idea to show them at some point during this module how there are three separate tables regarding Product information, and how within TM1 you can combine the tables into one dimension & have a hierarchy built in.

2.2 What is TM1?

- TM1 is an OLAP tool:
  - It contains a powerful multidimensional database engine, TM1 server, as well as a user interface, Perspectives or from a web browser
  - TM1 will allow multiple users read and write access and performs calculations quickly, making it an ideal tool for budgeting, forecasting, and a variety of other business intelligence applications



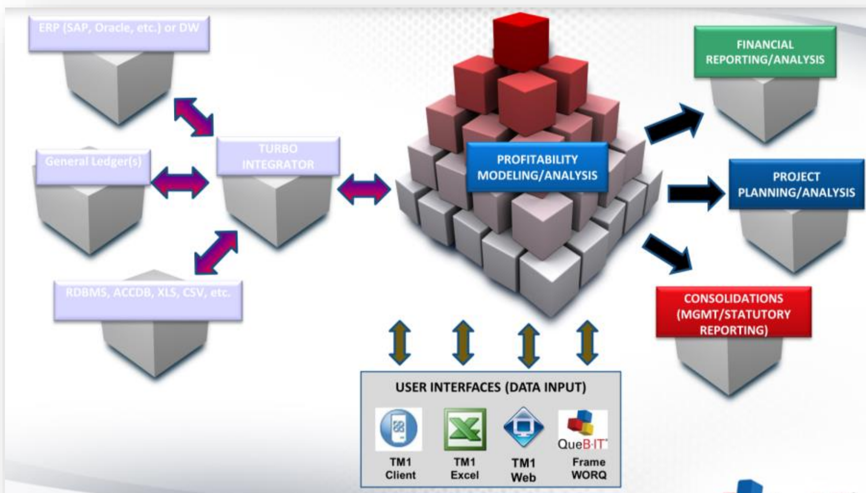
Did you know?

- Multi-Dimensional OLAP data is stored in a specially optimized multi-dimensional format.
- Some OLAP products store data in relational databases organized in interlinked tables called star-schemas:
  - this may be called Relational OLAP (ROLAP)
- Hybrid OLAP or HOLAP marries the two, MOLAP and ROLAP. MOLAP is chosen when you need speed and performance.

Facilitator Tip: If the a decision has been made regarding user interfaces, you may want to find out if the client will be using just perspectives, TM1 Web Interface, FrameWORQ products, or a combination. This may help you guide them to a design discussion regarding their model.

2.3 Why TM1 for Financial Performance Management?

- TM1 stores data in separate TM1 database files called cubes. Each piece of data is stored once in a TM1 cube.
- TM1 is significantly faster than most other OLAP products, due to the TM1 cubes residing in RAM during user access.
- TM1's advanced sparsity features allow quick navigation through hyper-sparse, or lots of zeroed cubes.
- TM1 also contains advanced algorithms for managing data and calculations.
- TM1's highly efficient engine stores data about one-tenth of the size of similar data stored in relational or other OLAP formats.
- TM1 is a real time environment, empowering companies to make intelligent decisions faster.



Facilitator Tip: You can state that a project can be broken out into phases. For example, Phase one may require the company financial reporting to be modeled first. Phase two, can require Project planning and analysis, which may include workforce planning, and so on.

2.4 End User Tools

Below are the TM1 end user tools:

2.4.1 TM1 Perspectives & Microsoft Excel®

- TM1 Perspectives is a client application allowing you to create and manage, access, and edit TM1 databases, which reside on either local or remote TM1 servers.
- Perspectives is an Excel add-in.
- In order to access TM1 from Excel, TM1 must be an active add-in. The add–in is loaded when you have TM1 accessible on the Excel main menu.

NOTE: If you do not see Perspectives, you must load the add-in manually. The Excel add-in uses the tm1p.xla file.

2.4.2 TM1 Server Explorer

- Server Explorer is part of the TM1 Perspectives Excel add-in tool allowing TM1 end-users and developers the ability to navigate the various components of TM1.
- Server Explorer may show one or more TM1 servers and corresponding applications, cubes, dimensions, replications, processes, and chores.
- It may also display local and network servers. You can see the properties of objects with Server Explorer.
- Server Explorer has interoperability with Microsoft Excel and therefore create:
    - Snapshots
    - Slices
    - Active Forms

2.4.3 TM1 Architect: Server Explorer

- Architect essentially is Perspectives without the Microsoft Excel add-in. It is for users or servers who do not have Excel.
- Server Explorer may show one or more TM1 servers and corresponding applications, cubes, dimensions, replications, processes, and chores.
- It may also display local and network servers. You can see the properties of objects with Server Explorer.

NOTE: TurboIntegrator is executed from within TM1 Architect or Perspectives.

2.4.4 Cube Viewer

- The Cube Viewer is a TM1 window allowing the user to open, configure, and save views of TM1 data.
- The Cube Viewer also lets you to open, configure, and create slices and snapshots of views in Excel worksheets.

2.4.5 TM1 Web

The TM1 Web extends the analytical function of TM1 by allowing users to access a URL to:

- Analyze and edit data in formatted Excel reports or cube views
- Drill, pivot, select, and filter data
- Build charts from cube data
- Perform some TM1 server administration tasks

2.4.6 IBM Cognos TM1 Applications

- IBM Cognos TM1 Applications allows modelers to plan and build the data structures on which applications are based. Administrators can determine which of the two clients is made available through Cognos TM1 Applications.
- Offers rich formatting provided by websheets, as well as slices and other detailed navigation cube.
- Applications are viewed as a canvas layout to show a simple multi-tabbed view and use a workflow process to submit plans.

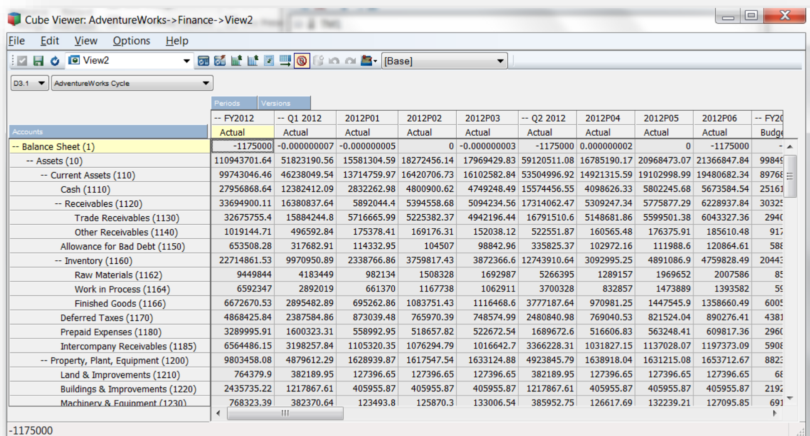
2.4.7 Cognos Insight

- Offers flexible and interactive experience with a choice of distributed or connected modes.
- Can use interactive canvas layout for planning and analysis applications, providing responsive, rapid discovery and navigation of data using distributed mode.

2.5 What is a Cube?

Cubes are comprised of dimensions. Typically there are two types of dimensions:

- those that list the measures or values in your cubes like net revenue, sales, units sold, or expenses
- and those that clarify the measures
    - descriptive dimensions determine how measures are aggregated, for example, reviewing sales by product, region, or departments



Once the measures are determined, you will need to find how those measures are defined.

Not only will this allow you to determine the descriptive dimensions structures, but also their appropriate hierarchies.

Facilitator Tip: Imagine your favorite Excel report. What headings do you have on the rows? What headings are on columns? Are they accounts, products, time periods, customers? Any of these can be dimensions. Dimension elements describe the data. For example, January 2020, may be an element of the Periods dimension and Sales may be an element of the Accounts dimension.

2.5.1 Describing Data

A dimension is an array of data points on an axis.

In other words, a dimension helps define your data and answers questions such as:

- Who
- What
- Where
- When

Dimensions are a list of related items and can have one or multiple hierarchies.
Two or more dimensions build a cube.

Facilitator Tip:
Ask the students to define the difference between metadata and data. Ask the students to give you as much information about the 162,862 piece of data that they can. For example, it is Accessories. You can then define a dimension – a list of like things, such as products.

If you have access to any of the client's reports that they would like to duplicate, it would be ideal for you to ask them to define what is on rows, columns, title sections, worksheet tabs, etc.

2.5.2 Strategies for Designing Cubes

- The objective of this course is to learn how to create dimensions and cubes, as well as determine the best strategy for your organization, by following best practices in order to build your TM1 application.
- Therefore, knowing your end user requirements is an important factor in order to build effective cubes.
- Some of the following are questions you should ask yourself to assist in building dimensions, cubes, and other TM1 objects:
    - Will your users be looking at sales, unit sold, expenses, or other account balances?
    - Will you be reviewing data by day, week, month, quarter, or full year?
    - Do your users look at sales by cost center, department, or country? Will people need to view actual values versus budgets and a variance between the two?
    - How many levels within an account or company hierarchy will you need? Is it in an ERP? How will it be maintained?
    - Do you need to go down to the SKU level? Usually lower end managers need to go down to the SKU level, while corporate managers would need a plan at a higher level.

Once cubes are created you will need to determine the source of the data:

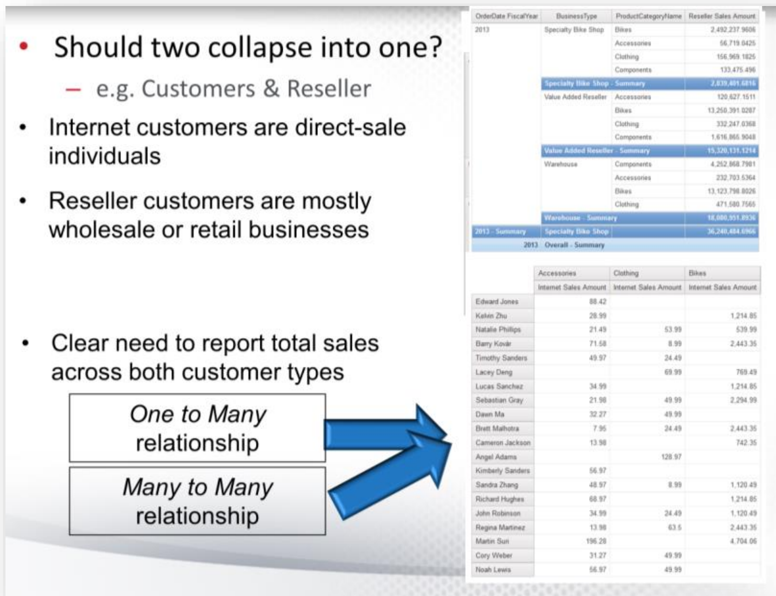
- Some data may be stored in relational databases, ASCII files, spreadsheets or other cubes
- Within your source, you will also need to determine whether or not hierarchies are required
    - You may need to create the hierarchies within TM1 and have a strategy for maintaining them

After populating your cubes with data, you will need to add business rules to your cubes:

- Cubes can do basic aggregations with additions and subtractions, but you may need to build advanced calculations such as currency conversions, calculate Gross Margin %, or share data between cubes, such as salary information

How to choose names for a dimension: Avoid using reserved words, such as Time within TM1. “Time” is not a good name for a dimension of time periods because TIME is the name of a rules function. Try to be consistent regarding singular–vs-plural. We recommend plural names, for example, Regions, Accounts, Companies, and Periods.

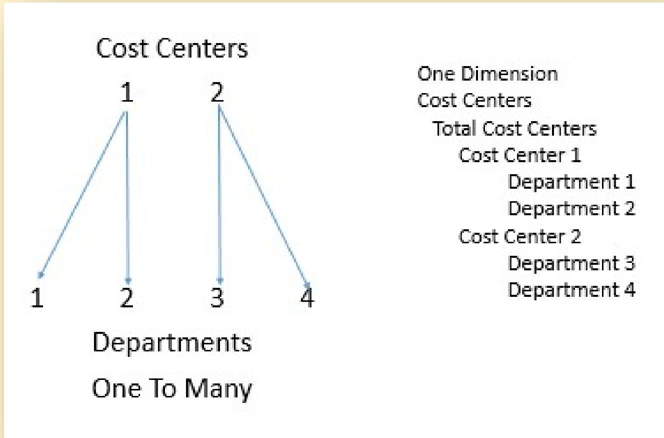
Facilitator Tip: Why put the measures dimension, even if it is not called "measures" last? Because if you decide to store text in a cube, you can only define S: elements (strings) in the final dimension of the cube.
Is it a problem if exchange rates add up across the quarters? It may not be a problem, and may only be a question of user education. For example, users will need to realize that some intersections are not meaningful.



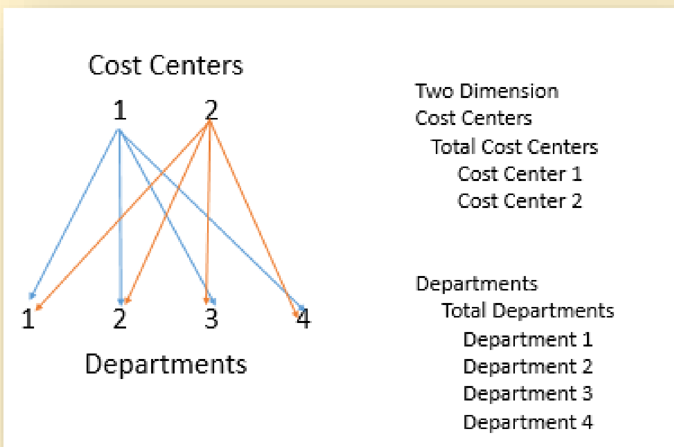
2.5.3 How Many Dimensions

- When looking at a report or your data, you must decide whether to combine items to make one dimension or to separate the items into separate dimensions.
- Whenever possible, you should try to combine dimensions. This will assist in performance and ease your end user's understanding of the data they are analyzing.
- You will need to analyze the relationship between the data items to determine how many dimensions will be needed.

Facilitator Tip: You can use this section as an opportunity to engage in an easel discussion with the following diagrams:



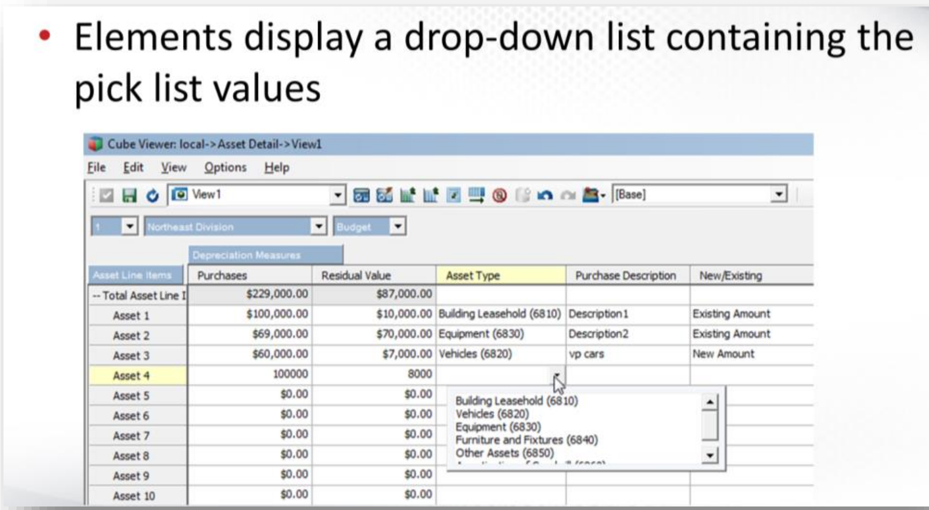
The above diagram show a correlation between Cost Centers 1 and Departments. The arrows represents the data being stored for the different departments. This is assuming that Cost Center 1 will never have data against Departmetn 3 and 4, for example.



In the above diagram, you the cost centers can have data against any department. Therefore, this is a many to many relationship, causing the modeler to create two dimensions.

2.5.4 Do You Need a Dimension or a Picklist

- While dimensions act as an array of data points on an axis, a picklist is an array of data points that live within a specific cell.
- You can create picklists, which are drop-down menus that users can choose from a predetermined list, created by the administrator or developer.

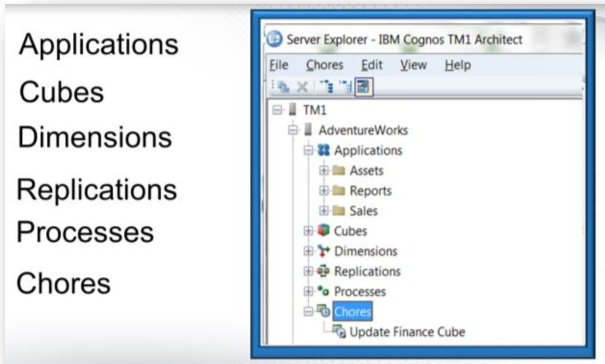


- Picklists can be dimensions, subsets of an existing dimension, or a static list.
- When creating picklists, you will create a text attribute for a text element, such as Asset Type.
- The Attributes Editor now contains a new column titled Picklist.
- For each element you want to create a picklist, enter a valid picklist definition at the intersection of the element name and the Picklist column.
- To enter a static picklist, enter a comma-delimited list of values using the syntax static:value1:value2:value3:value4
- To enter a subset pick list, enter the picklist definition using the syntax subset:dimension_name:subset_name
- To enter a dimension picklist, enter the picklist definition using the syntax dimension:dimension_name

Facilitator Tip: You may want to open the Asset Detail – View 1 within the AdventureWorks Server to show the students this specific example.

2.6 TM1 Objects

TM1 consists of the following components:



2.6.1 TM1 Server

Before creating dimensions, cubes, and populating your cubes, you will need to set up a new TM1 server on which your cubes will be stored. It is best practice to have both a development and production environment. There are three methodologies to run a TM1 server:

- as a service
- as a desktop application
- as a local server

Both servers that run as services or desktop applications register themselves with the TM1 Admin server, which acts as a traffic cop between the servers and clients.

Clients connect to the TM1 Admin server in order to see which TM1 servers are available to them. Servers that are registered with the TM1 Admin server are displayed in the Server Explorer window.

Clients can then select the TM1 server containing their appropriate data.

A local server is not managed by the Admin server. It is simply referenced by pointing to the data directory in the Server Explorer under Options in the File menu.

NOTE: You may have only one local server and it is named Local.

Local TM1 Server

A local TM1 server gives you access to data and objects in a Windows folder (called a data directory) based on proper security credentials and rights and is stored on your computer.

Your computer is the TM1 server as well as the client. With a TM1 client session, you will be able to create, browse, and modify data or objects stored within your local server. You may also control where the data directories are located. However, you will not be able to verify security changes.

NOTE: You will need Perspectives (Excel add-in) installed in order to use a local TM1 server.

Remote TM1 Servers

Remote TM1 servers provide access to shared data (cubes, dimensions, Excel reports etc.) and objects in your company.

The level of access to the remote server will depend on the security assigned by your TM1 administrator.

Core TM1 Server Folder Structure

When creating a TM1 server, the following folder structure is required:

- **Server** – Top level folder containing all server assets
    - **Data** – contains TM1 server data files
    - **Logs** – location TM1 log files are saved
    - **Config** – contains the TM1s.config file

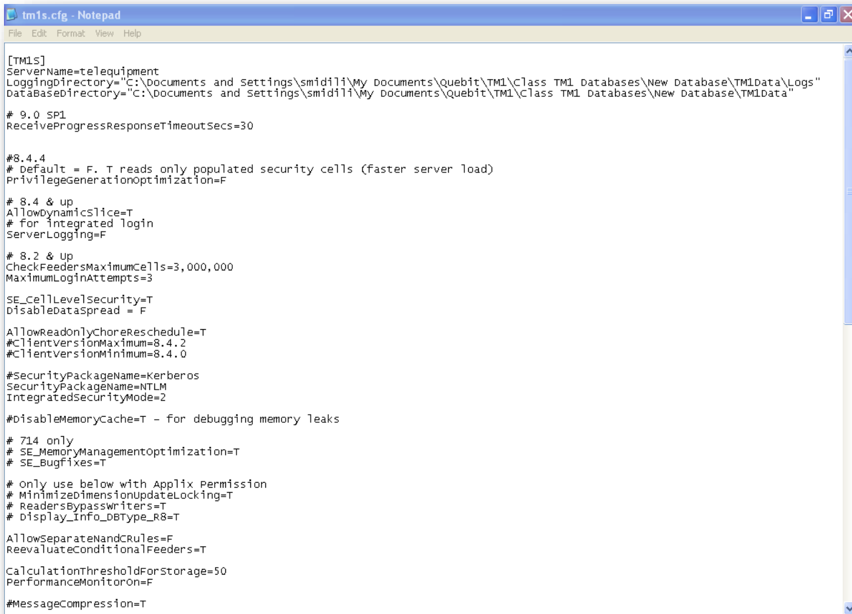
2.6.2 TM1 Admin Server

The TM1 Admin server will track the TM1 servers on your network.

The TM1 Admin server is created upon installation when the TM1 option to install both the client and the server is chosen. You may select to install up to 3 TM1 servers to run as services when you select to install the client and the server, you will need to select the custom installation option.

If standard installation is chosen, you will only set up the Planning Sample server. In order to run as a desktop application, you will need the TM1s.cfg server configuration file and the TM1s.lic file.

Sample of TM1s.cfg file:




```
[TM1S]
ServerName=telequipment
LoggingDirectory="C:\Documents and Settings\smidili\My Documents\Quebit\TM1\Class TM1 Databases\New Database\TM1Data\Logs"
DataBaseDirectory="C:\Documents and Settings\smidili\My Documents\Quebit\TM1\Class TM1 Databases\New Database\TM1Data"

# 9.0 SP1
ReceiveProgressResponseTimeoutSecs=30


#8.4.4
# Default = F. T reads only populated security cells (faster server load)
PrivilegeGenerationOptimization=F

# 8.4 & up
AllowDynamicSlice=T
# for integrated login
ServerLogging=F

# 8.2 & Up
CheckFeedersMaximumCells=3,000,000
MaximumLoginAttempts=3

SE_CellLevelSecurity=T
DisableDataSpread = F

AllowReadOnlyChoreReschedule=T
#ClientVersionMaximum=8.4.2
#ClientVersionMinimum=8.4.0

#SecurityPackageName=Kerberos
SecurityPackageName=NTLM
IntegratedSecurityMode=2

#DisableMemoryCache=T - for debugging memory leaks

# 714 only
# SE_MemoryManagementOptimization=T
# SE_Bugfixes=T

# Only use below with Applix Permission
# MinimizeDimensionUpdateLocking=T
# ReadersBypassWriters=T
# Display_Info_DBType_R8=T

AllowSeparateNandCRules=F
ReevaluateConditionalFeeders=T

CalculationThresholdForStorage=50
PerformanceMonitorOn=F

#MessageCompression=T
```

Parameter	Description
Server Name	Sets the name of the TM1 server. If a parameter is not supplied, TM1 names the server Local and treats it as a local server.
DataBaseDirectory	Specifies the data directory from which the server loads cubes, dimensions, and other objects. Multiple data directories can be listed by separating them with semicolons.
AdminHost	Specifies the name of the Admin Host on which the Admin server is running. Multiple Admin Hosts can be specified by separating each host name with a semicolon. For example: AdminHost=*hostnaeme1;hostname2*
PortNumber	Sets the port number used by the server to distinguish between multiple servers running on the same computer. When a TM1 server is installed, the default port is 12345. Valid port numbers are between 5001 and 49151. If the TM1s.cfg file does not contain the PortNumber parameter, the TM1 server uses port 5000. Local TM1 servers use port 5000.

NOTE: A complete listing of parameters available in the TM1s.cfg file may be found in the TM1 Administrator manual.

2.6.3 TurboIntegrator (TI)

TurboIntegrator (TI) is the tool used to load data into TM1. It can also be used to create and maintain dimensions.

Because all objects reside in memory and not on a hard-drive, processing is very fast.

When objects are saved, only the leaf-level elements are saved.

Consolidations and calculations are not stored; they are performed as required.

You are prompted to save files when you stop the TM1 data server, or you can choose to save data manually or by using TurboIntegrator.

2.7 Create a TM1 Database

A TM1 database consists of one or more models on the back end and forms on the presentation layer, cubes, dimensions, elements, rules, TurboIntegrator (TI) processes:

- define dimensions by populating the dimensions with elements either in the Dimension Editor or from external sources
- create cube structures
    - You can create cubes and load data within one TurboIntegrator (TI) process or as separate TI processes as well
- identify and load data either manually or from external sources
- apply business rules
- deploy the application to Microsoft Excel and via the web interface

Within Server Explorer you will be able to maneuver between different objects. The valid objects within the TM1 Server Explorer are as follows:

2.7.1 Applications

A TM1 application is a compilation of other TM1 objects and Excel files.

These objects are logically organized into job specific groupings.

The folder structure is customizable and the objects and files will be grouped by object type and sorted alpha-numerically. You can include things like hyperlinks to other websites, PDF and Word documents, Excel templates and reports, etc. You also have the ability to rename objects so that they appear in a particular order. For example:

- 01 Administration
- 02 Financial Reporting
- 03 Budgeting and Planning

- 04 Help

Objects referenced by a TM1 application are automatically made available through TM1 Web.

In essence, the objects and Excel files are organized into folders equivalent to Windows Explorer.

Facilitator Tip: To actually create a new application, within Windows Explorer create a file path to a new TM1 Data folder, then point the local server to the applicable path.

2.7.2 Cubes

- You will be able to see a list of cubes available on each server within TM1 Server Explorer.
- By clicking on the "+" symbol next to each cube, you will be able to expand the cubes and therefore see the dimensions making up each cube.
- A cube must contain a minimum of two dimensions with a limit of 256.
- Most cubes typically have between six and 12 dimensions for better understanding of the data and for usability for the end user.
- A cube is a container that stores data. If there is no value, the cube will display a "0", however, it does not actually store the 0. By only storing non-zero values and doing so in a very efficient way, TM1 is able to store large amounts of data in RAM (Random Access Memory) very efficiently.

2.7.3 Dimensions

- Dimensions describe the data coming into TM1. Dimensions are made up of elements and may or may not include a hierarchy.
- Typical dimensions are Accounts, Regions, Departments, Products, Cost Centers, Version, and Periods-Months. Dimensions may be reused across different cubes.

2.7.4 Replications

- A replication is a process of sharing information between servers. For example, you can copy cubes from one server to another.
- You may also have TM1 synchronize the updates among the copied cubes on demand or at specific time intervals.

2.7.5 Processes

- A process is a TurboIntegrator (TI) task.
- TI might be used to bring in data to build dimensions (often called metadata).
- TI can also be used to load data into cubes or transfer data between cubes.
- TI can access data from various sources, such as ASCII files, ODBC sources, other cubes, or dimensions.
- You can also zero out, export data using TI processes.

2.7.6 Chores

You can create a chore to schedule TI processes to run automatically. For example, you may want to update the Account dimension and the General Ledger data nightly.

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