EIS and Data Warehousing applications in the Telecommunications Industry

Garth Brown, Mobile Telephone Networks (MTN), Johannesburg, South Africa

Background to MTN EIS and Data Warehouse Project.

The MIS manager received a brief from the CEO to construct an EIS system in a short time span of four months. This included the selection of an EIS tool and the full implementation of the EIS project. After an intensive investigation of nine EIS, two database and five reporting products, the SAS \textsuperscript{®} System proved itself above all others. The EIS was developed on time and above all expectations, and has proved to be such a success that many new applications have arisen from the initial project, one being the construction of a Data Warehouse.

Challenges Faced in developing the EIS / Data Warehouse.

Mobile Telephone Networks had only been in operation for 8 months at the time the project was initiated, therefore no formalised MIS structure was yet in place. This resulted in the need to construct an MIS structure at the same time as develop the above mentioned system.

Being a communications company, large amounts of transaction data needed to be read, analysed and stored. To complicate this even further the transaction data was stored in a RMS flat file structure with a propriety form of using packed decimals. To eliminate the need for a staging database, which would have created storage problems, an access engine had to be built.

The Data Warehouse

There are many models in the market place on how a Data Warehouse should look, at MTN we analysed these and came up with a model that suited MTN best, outside of this was the need to store and utilise Metadata and here we constructed a model of our own. The main concern to MTN was not the method of storage or analysis to be done on the Warehouse but how were we going to automate the population and extraction of data from the Warehouse.

This is a simplified picture of how the MTN Data Warehouse looks. As mentioned the automated population was a concern and so a “Warehouse Manager” was developed to solve this and a “User Metabase” to solve the data extraction. Although these applications use much of the same information, MTN split them into two separate projects.

Fig. 1
The Warehouse Manager.

The Warehouse Manager is mainly a registration system where information is stored on all the data and programs that run the MTN Warehouse. All inputs, input programs, outputs (SAS Data Sets), lookup tables and utility data is registered at this stage including the data within the Warehouse. The transaction data that is fed into the warehouse consists of hundreds of small files created by the transaction based Billing system.

This is the largest application within the Warehouse and consists of many small SAS/AF applications that have their own specific tasks. Below is a small subset of one of the applications to show the type of functionality that the Warehouse Manager provides.

Review & Maintenance Facility for Data Sets.

Functionality to:

a. Review registered Data Sets.
   - LIBREFS
   - (All) DATASETS (and Generic data sets)
   - (All) VARIABLES
b. Rename/Edit Data Set NAME & DESCRIPTION
   - WARNING: Affected Programs (used as Inputs or Outputs)
c. Delete Data Sets.
   - WARNING Affected Programs (used as Inputs or Outputs)
d. Rename/Edit VARIABLE …….. etc…………

Within the Warehouse Manager there is a flow of information between the different sections as well as a data flow as the warehouse is updated. The registration section holds the registration of and links between the Inputs and Outputs where as the sections of the Scheduler references the Lookup tables that assist in the data scrubbing. These Lookup tables act as both a tool for data scrubbing and as a input for the generation of Formats. A columns database is used to define default attributes to the data and feed this information to the “User Metabase”. These default attributes describe more how the data looks than how it is used. The attributes describing the manner in which the data will be used, are added when the information flow reaches the User Metabase.
User Metabase and Exploitation

This layer consists of three different environments, one being the SAS/EIS environment, another which is a combination of SAS/AF and SAS/EIS and the last which is solely a SAS/AF environment. The Warehouse Manager updates both the SAS/EIS columns database as well as the MTN specific columns database and so drives the User Metabase.

Additional attributes are assigned on entry to the User Metabase, these attributes allow the user to enter the specific environment in which they wish to work. The Selector Metabase checks which data sets can be merged and what are the lowest keys for this to happen. According to the users selections the Selector automatically merges and consolidates the files to the desired level. This the feeds the selected information to a number of sources, one of the most used in the application being the SAS/EIS Multi-Dimensional Viewer (MDV).

This resulted in the necessity to create a dynamic SAS/EIS Metabase and use the SAS/EIS MDV without a build screen. This was achieved by altering the internal methods of the SAS/EIS viewer that was being used and updating the application lists at run time. The user now has the capability to use the SAS/EIS tool as an adhoc query tool without having to register data in a metabase or knowing how to initialise a SAS/EIS class.

The Selector in turn also feeds the information required to MTN Multi-Dimensional Row Selector and Reporter. These are specific applications that were developed to allow the user to construct their own reports in a user friendly manner. The reporting tools within the SAS System although user friendly still require knowledge of how the data is stored and how to use this data. This application was found to be necessary for a user at executive level who wants to do further analysis on the information that is supplied to them.

The Warehouse is also what supplies the Executive system the information it needs to run. This information does not require a metabase as this is a SAS/AF application that reports directly off the Warehouse.
**Executive Application.**

The executive application that reports directly off the Data Warehouse uses many of the same summary files that are used for adhoc reporting. The layout and design of the Executive system was conceived after extensive interviews with the executives concerned. The idea was to provide a user friendly, point & click system that reported the information stored in the warehouse to End Users at an executive level.

The Executive system needed many files at different levels of summarisation to allow for an executive to see both detail information and trends at a higher level. This caused many development problems when it came to the various display formats that the users required the information to be shown.

One of the simplest problems faced in developing the Executive system is described below:

Controlling rolling balances within a drill down hierarchy.

The application needed to show an Opening balance, New connections, Cancellations and a Closing Balance for many different variables. This was easily done with a set hierarchy of four or five dimensions, the problem arose when the selections were dynamic and the application had to be able to determine when a rolling balance was required and when not. The balance can only roll forward across Time and not across products and as the user was able to select time to be displayed at any stage of the drill down hierarchy the application had no way of knowing when this would be. This was complicated further as Time was not consistent, the user wanted to see daily, weekly, monthly and yearly totals across all variables.

This was solved by pre constructing files that contained time in set places and limiting the user to those specific options. The user was still able to rotate the hierarchy at run time but by doing this we knew where Time would be.

**Conclusion.**

Think big start small, when creating the Data Warehouse, it does not matter how MUCH data you have in the warehouse but how you can get at it and utilise it the best. Try to stay away from copying your transaction data directly into the warehouse, attempt to add value to the data and turn it into useful information, in most cases this will require summarisation and so decreases your storage capacity needed.

When supplying the user with an exploitation tool, give them exactly what they want, not what you think they should have. Most important, listen to the users requirements.

**Acknowledgements.**
The author would like to acknowledge the following members of the original project team:

Francois Badenhorst, Mobile Telephone Networks
Andrew Cosmatos, Mobile Telephone Networks
Dr. Kendal Jordi, IDS Consulting
Stuart Birch, IDS Consulting
Gordon Meyer, IDS Consulting
Cuan Sawyer, IDS Consulting
Graham Moore, ISIS

SAS, SAS/EIS and SAS/AF are registered trademarks of the SAS Institute Inc.

Other product names are registered trademarks or trademarks of their respective companies.

Garth Brown
Management Information Systems Manager
Mobile Telephone Networks
P.O. Box 782508
Sandton
2146
South Africa
(27)(11) 445 6336
Mobile (27)83 212 0717