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Unified data model in Utility industry

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ABSTRACT
This paper describes one possible model for implementing Business intelligence software in Utility company, based on unified data model compatible with CIM standards . It describes CIM standards for Utility industry, as well as the optimal way to implement decision support system based on Utility data model. Finally, it elaborates risks in implementing the new system, the way how to deal with them and gives some practical examples.

Keywords
Billing, Business intelligence, CIM, Data mining, Data model, Data warehouse

1. INTRODUCTION
Utility companies are facing many challenges when it comes to data management and relations between different data models and information systems. Until few years ago, the main priority of these companies was implementation of different applications in order to cover business processes. Paralel with implementing those solutions, the essential segment of the process was to exchange data and information between different and heterogenous information systems, as well as to consolidate and store data from different sources to the Data warehouse. The most important reason for implementing Data warehouse scenario would be to decrease the impact on production system performance, as well as to provide fast and efficient data search as well as the reporting on huge amount of real-time and historical data. Creating a unique data model for Utility industry is a demanding process, mainly because the business processes in Utility industry are complex, heterogenous and they require well designed and documented relationships between internal systems.

2. PROBLEM DESCRIPTION
Information systems that should be covered by unique data model in Utility company are:

- Meter Data Management (MDM)
- Billing system
- Customer Relationship Management (CRM)
- Distribution Management system/Outage Management system (DMS/OMS)
- Financial Management Information system (FMIS)

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These systems are connected using web services as a standard method for data exchange and synhronization. Each of these systems has its own reporting system that was implemented for the purpose of creating and managing reports locally. However, there is no centralized tool that will be able to: consolidate and analyse data from different data sources, correlate and validate them, do the root-cause analysis, predict different business scenarios, and based on all these scenarios propose optimal business decisions.

3. BUSINESS INTELLIGENCE MODEL

In general, there are two approaches when it comes to implementing a BI solution. First approach requires Data warehouse repository that will collect and store data from different data sources such as: databases, applications, files, social networks, etc. Collecting data could be done in a real-time or historical dimension and those data could serve as an input for data analysis, what-if scenarios and business predictions. The main advantage of this approach is in the fact that it implements a systematic solution for the entire company.
The second approach implies BI solutions existing at each data source separatelly, without centralized data repository. This method is limited to individual systems and does not represent a systematic solution for the entire environment. If we decide to implement BI system and data model using the first approach, we have two possible methods:

- Top-down approach that implements predefined data model for Utility sector with already included best practices. This built-in model keeps connected to certain data sources in order to get data needed for the analysis.
- Bottom-up approach implies starting up from data sources and building a specific Data model as a part of Data warehouse.

In both these approaches, after collecting data to the Data Warehouse, data aggregation, analysis and validation are needed in order to build analytical layer with predefined tables, relations, data marts and cubes. As a final step in this process, through the presentation layer and BI tools, different reports are generated and presented to the end users.

Taking into account all these facts, we propose bottom-up Data warehouse approach as an optimal solution for data management in Utility company. The next pixture shows one possible model of implementing BI solution in Utility company.

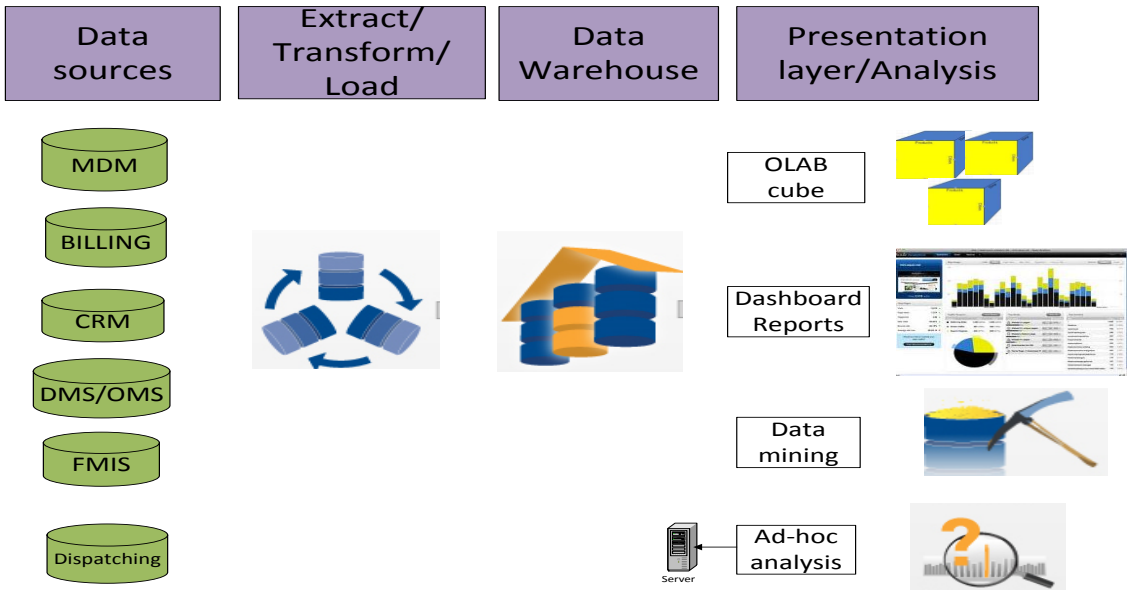

Fig 1: Business Intelligence model in Utility company

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4. DATA MODEL FOR UTILITY SECTOR

Data model as a part of BI solution in Utility industry should be predefined and standard-based solution designed to optimize database performance on a certain hardware infrastructure. It should be vendor and technology independent, and scalable enough to provide system growth according to specific business needs and requirements. Data model represents basis for business intelligence and advanced data analysis at the corporate level. Features that make Utility model that powerful and necessary for implementing all business requirements are: Data mining for deep insight into data, Online analytic processing (OLAP), multidimensional models and CIM standardization. Common Information Model (CIM) is sa standard developed by utility companies for distributed network data exchange between different software and information systems. CIM represents an apstract information model for better understanding business and technical data using relations between different systems inside the company. Utility CIM standard gives a multilayer framework for integrating different information systems in utility company and which is very important prerequisite for Data warehouse model. CIM standards that should be included in future Utility model are: IEC61968, IEC61970 and IEC62325.

Components of Utility data model should be:

- Logical data model-basis
- Logical data model-dimensions
- Physical model
- Intra-ETL package for data extraction
- OLAP model
- Predefined Data mining model
- Utility scripts
- Reports and dashboard
- Installation scripts

The next figure show one possible example of implementing Utility data model.

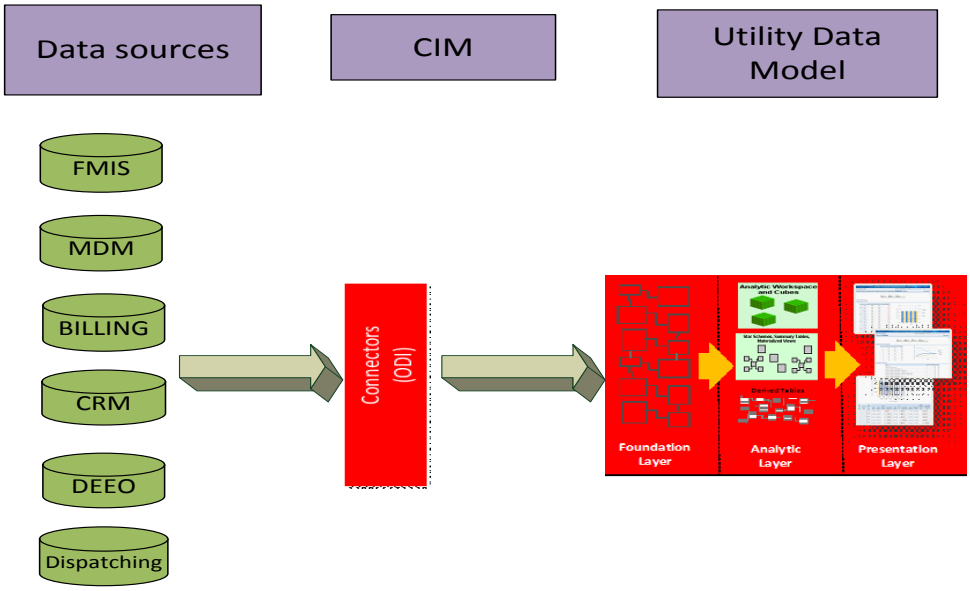

Figure 2. Utility Data model example

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