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# **SAP BW** **Data Retrieval**

Mastering the ETL process

 **PRESS**

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## Preface

Who hasn't experienced this? You're driving to a party and your passenger, with directions in hand, acts as the navigator: "... then the third left ... first ... second ... oh, closed due to construction, please follow detour." What happens next? Where will this detour take you? The directions contain only the basic "right/left information." If only you had the street names. Then, you would have a starting point and you might be able to reach your destination. However, if you only have "delta directions" available that lack any kind of synchronization, a successful journey is a remote possibility.

I never would have thought that such topics as data extraction, data transformation, and data loading could have filled an entire book. The current volume by Norbert Egger's team of experienced authors proves just the opposite. This book's simple description of data retrieval, and its numerous examples, is a pleasure to read, especially because all too often a considerable amount of an already limited budget is consumed by this process. Therefore, the project manager, for example, must deal with data retrieval as efficiently as possible. After all, what good is a data warehouse without data? The many hints and examples in this book emphasize what is described on a conceptual level, whether it involves the delta processes in data extraction, which is explained earlier in this preface, or the design of aggregates for performance optimization.

Business intelligence has been a topic of discussion for quite some time now. However, the implementation of this concept highlights, for the first time in large global businesses, how useful the company data is and this increases its perceived value dramatically. However, in an almost relentless manner, the system shows us how this data is often structured heterogeneously. Therefore, we must pay particular attention to such concepts as "data hygiene," data quality, and data economics in order to achieve the company-wide consistency of business views required for global management decision support.

By addressing these topics, this second volume ranks as a valuable and welcome edition to the *SAP BW Library*. It is, as expected, a complete and long overdue documentation of data warehouse techniques designed specifically for the implementation of SAP BW. Planning and designing the cultivation of "data warehouses" should help you to provide an organized product offering, unlike those bargain basement sales where it is

difficult to distinguish what you want because of the sheer quantity of items that you have to sift through.

I hope all readers enjoy this book and, to all those who like me do not want to or do not have to travel the long-suffering road to implementation, I hope you find it to be a useful guide and helpful navigator that enables you to reach your own *ETL milestone*.

Leverkusen, Germany, December 2005

**Lothar Burow**

Director of Business Intelligence Services

Bayer MaterialScience AG

# Foreword

When Wiebke Hübner, then an editor at SAP PRESS, asked me in December of 2002 if I wanted to write a book on SAP BW, I scoffed at the idea. Such a book would have to be too voluminous to provide an adequate presentation of the topic. I also believed that there would not be sufficient demand for this type of book, so as to make the effort worthwhile. Fortunately, she persisted, which resulted in *SAP BW Professional*, our first book on SAP Business Information Warehouse. I paid particular attention to the rapid development of the reporting functionality in SAP BW 3.x and other topics in that book.

**Background**

Writing the book not only proved to be enjoyable, but the collective interest generated by this subject came as a welcome surprise. That's why I'm so pleased to thank you, the readers, in the foreword of this book for your support and invaluable feedback. Furthermore, because of this mounting interest in SAP BW, a second edition of the first book was published in several languages.

**Thanks to the readers**

I hope to contribute to enabling companies to meet the challenges of adequate information acquisition and usage. That includes the successful use of business intelligence tools. With SAP BW, SAP has been offering a very powerful tool for several years now. However, implementations often fail to reach an appropriate standard, so that the ability of such a product to function in real-world situations remains questionable. My goal is to increase the public's awareness of the functionality of business intelligence tools and the options that are available, so that future implementations and the operation of these solutions are more successful and beneficial.

**My vision**

Based on the great interest shown in the first book, the rapid development of SAP Business Intelligence components, and the welcome growth of our company, the management of the CubeServ Group decided to approach the topic even more comprehensively in collaboration with SAP PRESS. This led to the idea of offering a progressively, comprehensive compendium—a compendium that would describe the functionality of SAP BW in even greater detail.

**The idea of a compendium**

It became readily apparent that it would take more than one book and one individual involved in the life of a project to complete such a task: The functionality (luckily) is too vast and such a book would be too comprehensive. Therefore, we needed to create a multivolume work that would focus on specific aspects, such as data modeling, extraction, trans-

**The SAP BW Library**

formation, and loading (ETL) processes, reporting, or planning. The notion of a new series, the *SAP BW Library*, began to take shape.

Because our wonderful CubeServ team consists of many highly motivated coworkers, we were quickly able to form a team of authors that was willing to distribute the work and produce a book on each topic.

**Volume 1: SAP  
BW Data  
Modeling**

Volume 1 of the *SAP BW Library*, an introduction to data modeling using SAP BW, was published a few months ago and, to our delight, met with a remarkable response.

**Volume 2: SAP  
BW Data Retrieval**

It gives me great pleasure to be able to present the second volume of the *SAP BW Library* with an introduction to data retrieval with SAP BW. As data acquisition becomes more difficult due to a variety of data quality problems, a stable and flexible solution to ETL processes becomes increasingly more important. Without a suitable data model or consistently operable ETL processes, business intelligence solutions are destined to fail. Our goal with this current volume is to support you in finding the right path to mapping ETL processes using SAP BW.

Because several authors are already working on the forthcoming volumes, I'm confident that, step by step, this series will offer you a comprehensive description of the functionality of SAP BW. And, if interest continues to remain high, additional books will appear after the first four volumes and address SAP Business Intelligence tools in even greater detail.

Jona, Switzerland—December 2005

**Norbert Egger**

## 5 ETL Process: Master Data

*Of what use are the most modern data warehousing systems, if they're based on master data for customers or material that is incomplete, outdated, or inconsistent? The quality of master data is critical to ensure the success of transactions and analytical processes in the company. Not only does the quality of master data substantially affect the efficiency of an organization; it also determines the quality of products and services.*

### 5.1 General Overview

The essential objective of any normalization is to eliminate any redundancies and anomalies that occur when data is changed, for example, during insertions, or changes and deletions of data records. It is only by acquiring and storing master data that a relatively high degree of normalization—is required for relational databases—is guaranteed in the SAP BW system. It is in this context that you must ensure that the acquired data is in a similarly normalized state when you store it.

#### Normalization

The theory of normalization that was established by E. F. Codd<sup>1</sup> consists of nine rules. These rules are also referred to as the *first through ninth normal form*, the first three of them being the most important. In a step-by-step process, a database is converted into the status of the first through ninth normal form.

The first five normal forms, which are predominantly used, are defined as follows:

► **First normal form**

In the first normal form, a relation exists if none of its attributes represents a subordinate relation and if all attributes contain only atomic values.

► **Second normal form**

In the second normal form, a database must always be set at the status of the first normal form before it can be set into the second

Excursus

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1 See Codd, 1983.

normal form. In this context, all the attributes that are not part of the key must be functionally dependent on the key. If a key consists of several subkeys, the element that is dependent on only one subkey must be extracted.

► **Third normal form**

In addition to the specifications outlined for the second normal form, the rule for each key is that attributes that don't belong to the key are not transitively dependent on it. This means that all attributes depend only on the key attribute, and not on other attributes. A potential dependency between the attributes must be resolved.

► **Fourth normal form**

The fourth normal form deals with attribute groups that contain multiple dependencies to a superordinate key (*super key*). These multiple dependencies must be resolved into single dependencies (cf. the third normal form).

► **Fifth normal form**

If in the fourth normal form, you can create single dependencies without experiencing data loss, it may be necessary to resort to a second or third super key. You must repeat this step as often as needed so that only single dependencies of the attributes to one or more super keys remain.

**Insufficient or incorrect master data acquisition**

In addition, the effects of larger deficits in how consistent and up-to-date the master data is can be noticed very quickly:

► **Wrong decisions**

Caused by a lack of transparency and incomplete data basis

► **High administration costs**

Caused by multiple data entries, troubleshooting, and complaint processing

► **High IT costs**

Arise when data is distributed among many different types of systems

► **Long runtimes for business processes**

Occur because individual units are constantly awaiting data from others, or responsibilities have not been clearly defined

For these reasons, we will now describe the process of master data acquisition in a clear and detailed manner.

## 5.2 Master Data

In SAP BW, three different types of master data can be differentiated in InfoObjects.

### 1. Texts

Texts

Texts are used to describe a master record. In SAP Business Information Warehouse (SAP BW), up to three texts can be maintained for each master record. These texts can consist of the following: one short text, one medium text, and one long text. An example of a master data text is the name of the supplier that goes with the supplier number.

### 2. Attributes

Attributes

Master data attributes are fields that are used to provide a more detailed description of master data elements. These attributes are used to display additional information so results can be better understood. An attribute table can be used by several InfoCubes. This ensures a higher level of transparency for the user and a more comprehensive consistency. An example of a master data attribute is the country of the supplier that goes with the supplier number.

### 3. Hierarchies

Hierarchies

Hierarchies can be used in the analysis to describe alternative views of the data. A hierarchy consists of a quantity of nodes that have a parent-child relationship with one another. The structures can be defined in a version-specific as well as a time-dependent manner. An example of this is the cost center hierarchy.

You can find a detailed description of the types of master data and their usage options as well as numerous examples in Volume 1 of the SAP BW Library.<sup>2</sup>

## 5.3 The ETL Process

As we already described at the beginning of this book, the extraction, transformation, and loading (ETL) process is the process of regularly updating the SAP BW data. For this process, the data must first be extracted from the source systems, then checked for consistency—and if necessary adapted—and finally loaded into a data target (see Figure 5.1).

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<sup>2</sup> See Egger, Fiechter, Rohlf: *SAP BW Data Modeling*. SAP PRESS 2005.

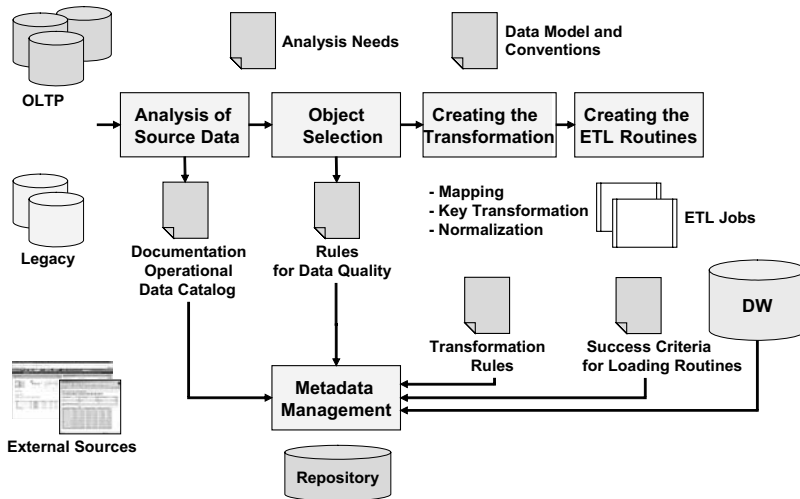


Figure 5.1 Schematic Diagram of the ETL Process

Reminder

### Phases of the ETL process

#### ► Extraction

In this first step, you must select all the source data and then provide it for the transformation process that follows. In this phase, you generally see a high level of heterogeneity because all initial data is generated in different data processing systems.

#### ► Transformation

Data transformation is the central task of the ETL process where the initial data must be adapted to the structure of the data target. Furthermore, the data quality should be analyzed and automatically increased.

#### ► Loading

Once the data has been checked and made available, it is integrated into SAP BW. In this context, the work area where the data is located is called the *Persistent Staging Area (PSA)*. The process of loading data always includes a probable aggregation of the extracted and transformed data.

## 5.4 Data Targets

The process of transferring master data into the SAP Business Information Warehouse is referred to as *update into the data target*. This is a generic term for the physical objects that are relevant for modeling the data

model and for loading the data. Data targets can be InfoObjects, InfoCubes, or Operational Data Store (ODS) objects. You must distinguish between the following two data targets:

- ▶ **Pure data targets for which you cannot create or execute any queries**  
InfoCubes may act as only a data source for another InfoCube. It is also possible that ODS objects and InfoObjects were not modeled for reporting purposes.
- ▶ **Data targets for which queries can be defined**  
A characteristic can become a data target if it carries texts or attributes. You cannot load hierarchies by using update rules. In order to declare a characteristic as a data target, the InfoArea must be entered in the relevant field of the object properties.

Different data targets

### Declaring Data Targets

By specifying an InfoArea, you can declare a characteristic as an InfoProvider (see Figure 5.2).

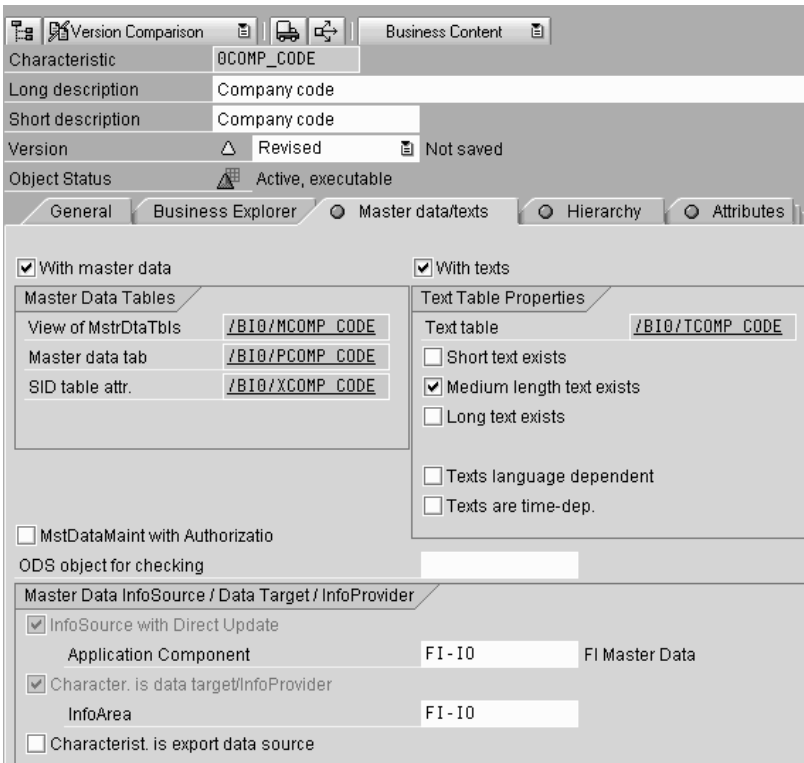


Figure 5.2 By Specifying an InfoArea, a Characteristic Is Declared as an InfoProvider.

Another option when declaring a data target is to call the Administrator Workbench via Transaction RSA10 and then to select the InfoArea to which you want to assign the InfoObject.



- ▶ Right-click on this InfoArea and select the **Insert Characteristic as Data Target** menu item (see Figure 5.3, Step 1).
- ▶ A popup prompts you to assign an InfoArea to an InfoObject (Step 2).
- ▶ After you have entered the object, confirm your entry so that the InfoObject is created as a data target and assigned to the InfoArea.

InfoProvider	Techn.name
InfoProvider	INFOCUBETREE
CubeServ Engines Business Intelligence Applications	ZEKOMPENDIUM01
SAP Business Content	ZSAP_BC
Unassigned Nodes	NODESNOTCONNECTED
SAP Business One	0SBO
Customer Relationship Management	0CRM
Industry Sectors	0INDUSTRIES
Product Lifecycle Management	0PLM
Supplier Relationship Management	0SRM
Supply Chain Management	0SCM
External Market Data	0EXT_MKT_DATA
Financials Management & Controlling	0FMCO
Cross-Application Components	0CA
Cross-application Master Data (Flexible Update)	0CA_IO
Consolidated InfoProviders	
Content Integrator	
Human Resources	
Marketplace	
Payroll	
Strategic Enterprise Management	

Context Menu Options:

- Create...
- Rename...
- Delete
- Create InfoCube...
- Create ODS Object...
- Create MultiProvider...
- Create InfoSet...
- Insert Characteristic as Data Target...

Assign InfoArea to an InfoObject Dialog:

InfoArea	Cross-application Master Data(
InfoObject	0COMP_CODE

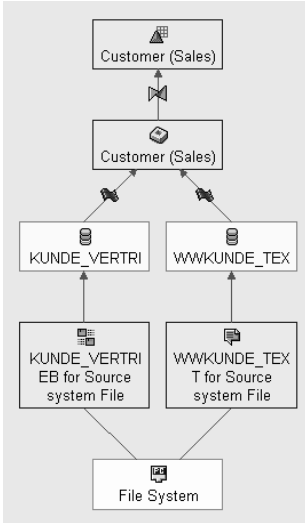
Figure 5.3 By Assigning a Characteristic to an InfoArea, the Characteristic Is Declared as an InfoProvider.

## 5.5 Types of Updates for Master Data

You must distinguish ETL processes with flexible update from ETL processes with direct update in the data target.

**Flexible update** An InfoSource with flexible update means that you can update the data from its Communication Structure into any data target. Hierarchies, how-

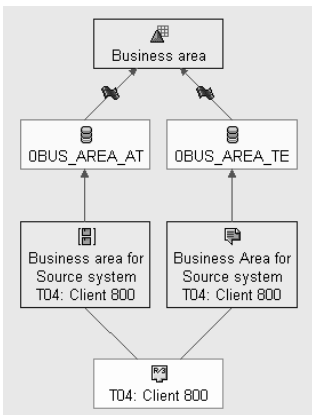
ever, are exceptions to this type of update. For hierarchies, update rules are used. It is therefore possible to store data in master data and text tables as well as in ODS objects. In addition, by using an InfoSource, several data targets can be provided with data concurrently (see Figure 5.4).



**Figure 5.4** During a Flexible Update, the Extracted Data Is Written into the Data Target via a Separate InfoSource with Update Rules.

For data targets with direct update, only one data target can be populated by the data acquisition process (see Figure 5.5). This data target is always the data-carrying characteristic. Note that this type of update cannot provide ODS objects with master data.

**Direct update**



**Figure 5.5** During a Direct Update, the Extracted Data Is Written Directly into the Data Target. The Characteristic Itself Represents the InfoSource.



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