SAP BW

CERTIFICATION

A Business
Information Warehouse
Study Guide

CATHERINE M. ROZE

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Foreword

In recent years, companies have replaced dozens of legacy systems and years of business data with a new ERP system to address the integration and modernization of daily transactions that run the business. As part of this process, they redesigned business processes and often developed new process measurements. SAP was often the ERP system of choice.

After having implemented ERP, most organizations found that these systems were good for gathering data, executing transactions, and storing data. Still, organization after organization discovered that getting information out of ERP systems was difficult.

In the face of increased pressures due to globalization and rapidly changing markets, these ERP customers have felt an increased need to use information as a competitive advantage for decision making while constantly monitoring and improving their business processes. They also require new data views to facilitate comparative studies and measurement of performance in order to increase their ability to achieve their tactical and strategic objectives.

Listening to the needs of its customers, SAP developed the Business Warehouse (SAP BW), an end-to-end data warehousing solution that has been gaining in acceptance. It is an integrated solution that includes not only the traditional data warehousing technology but also the supporting technology such as queries, reports, and key performance indicators, InfoCubes, InfoSources, and preconfigured extraction modules.

Many ERP customers worldwide are evaluating or implementing SAP BW to convert large amounts of data into integrated information systems. Because of the complexity of these business information systems there is a significant need for qualified SAP BW skilled analysts and consultants. If you are an analyst or consultant with SAP, ERP, or Business Intelligence skills, acquiring SAP BW certification is a must in further developing your skills.

While training is an important part of acquiring SAP BW skills, this book is an effective way to prepare for the certification test and to use your newly acquired knowledge. SAP BW certification covers several knowledge areas and this book will help you prepare for the exam.

Catherine Roze is a consultant with excellent knowledge of Business Intelligence and SAP BW in particular. She has been involved in a wide variety of projects and has put her practical experience to work in this book. The technical information on SAP BW has been organized in a simple and effective manner allowing you to quickly acquire the knowledge required. The sample questions prepare you for the exam. The book also contains a wealth of information that makes it a great reference when implementing SAP BW.

I am sure that you will find this book an excellent guide, reference, and invaluable aid in preparing for the SAP BW certification.

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Preface

The SAP Business Information Warehouse (SAP BW) Certification Test program is a rigorous testing and certification program for SAP BW practitioners. This book is a concise, comprehensive study guide to the areas covered on the SAP BW certification exam.

SAP offers consultants the opportunity to be recognized for their skills as an SAP Certified Consultant. Recognized worldwide, the certificate evidences their ability as a highly qualified SAP BW consultant to the marketplace. Certified consultants can also access the SAP information network, keeping their knowledge up-to-date to benefit customers.

The certification test for becoming an application consultant for SAP BW is intended to provide candidates with the opportunity to prove that they have a fundamental knowledge of this particular area of the SAP system and are able to apply this knowledge within a project environment.

Mission

The primary mission of this book is to provide a practical approach and strategies to help you prepare and pass the SAP BW Certification exam. In most cases, this study guide is not intended as a substitute for the classroom training offered by SAP, but rather to complement it. Therefore, it is usually best to take the test after having attended the SAP BW classroom training provided by the SAP education centers.

This book is designed to present SAP BW concepts in a clear and concise fashion. I have created this text specifically to help you identify the information that you need to know to prepare for the SAP BW Certification exam and give you an edge to pass.

What You Will Find in This Book

The book provides information about the exam, training offerings by SAP, a study guide, sample test questions, suggested exercises and one simulated certification test. This book covers the core (required) subject areas for the SAP Business Information Warehouse (SAP BW) certification:

- *SAP BW Data Modeling*. Basic concepts and techniques for data modeling in traditional data warehouses and SAP BW
- *SAP BW Building Blocks*. Basic concepts and tools of the configuration, technical architecture and warehouse management of the SAP Business Information Warehouse

- *SAP BW Reporting.* SAP BW reporting and analysis tools
- *SAP BW Extraction.* Mechanisms to extract data from SAP and non-SAP data sources within SAP BW

Useful reference information is also provided to assist you in becoming more knowledgeable and proficient in SAP BW, including SAP BW quick reference guide, SAP training offerings, and a list of useful on-line and published resources on data warehousing, business intelligence, SAP R/3, and SAP BW.

Target Audience

The audience for this book consists of all SAP Business Information Warehouse practitioners who wish to pass the SAP BW certification exam. This includes practitioners experienced in the subject matter areas – SAP BW, business intelligence, or SAP R/3 areas and beginners in SAP BW:

- Technical and functional consultants for SAP BW
- Certified SAP R/3 technical consultants interested in working in the SAP BW environment
- SAP BW partners and consultants
- SAP BW power users
- Project managers and team leaders of SAP BW implementations
- SAP BW practitioners seeking re-certification to current SAP BW release (Delta examination).

SAP BW Experienced Professionals

If you are experienced in the subject matter area—SAP BW, Business Intelligence/Data Warehousing, or SAP R/3 areas—this study guide will help you codify your knowledge, understand SAP's view of the universe, and prepare for the SAP BW certification exam. It will also aid those practitioners preparing for the SAP BW Delta examination (re-certification to current release).

SAP BW Beginners

If you are a beginner in SAP BW, this study guide should also prove useful. You will need real world experience that no book can provide and depending on your background, you may also need help from one or more resources such as *Business Information Warehouse for SAP* (Portland, OR: Premier Press, 2000) by Naeem Hashmi; *SAP BW Reporting Made Easy, 2.0/2.1C* (Palo Alto, CA: SAP Labs, Inc., 2001) by SAP Labs, Inc., Simplification Group; or classroom training.

Which SAP BW Versions Are Covered?

As SAP updates SAB BW in new releases, we expect most of the changes to be in the look and feel of the software and not the basic SAP BW concepts and process. As such you may find that some screens used in this book, terminology or software functionality or screens might have changed.

At this time, SAP BW certification exams are version independent. To keep this version independence in mind, you will find this book to be version neutral as it describes the SAP BW certification process.

The Author has attempted to provide sufficient guidelines to qualify exam with contents and hundreds of questions that will be valid for both SAP BW 2.1C and SAP BW 3.0.

Where appropriate, critical areas have been flagged when significant differences exist between BW 2.1C and BW 3.0, and additional reference and study material are provided for details.

The main intent of this book is to provide a practical approach to help you get certified in SAP BW. Its goals are not to present version-specific details and features but rather to be as version-independent as possible. To provide the required information while avoiding unnecessary confusion for the reader, the following has been done:

- When appropriate, the major changes between SAP BW releases are highlighted within the technical chapters (chapters 4, 5, 6, and 7) with a "New" icon.
- Appendix D presents new features in SAP BW 3.0.
- Additional resources provide more details regarding new developments in SAP BW.

In the future, our Web site will also provide information and links to new features and changes in SAP BW.

What This Book Covers

The book includes the following chapters:

Chapter 1: Enterprise Resource Planning, Business Intelligence, Data Warehouses, and SAP BW

This chapter provides a general introduction to the main themes herein: ERP, SAP, Business Intelligence, Data Warehousing, OLAP and SAP BW. Concepts in this chapter are not explicitly tested on the exam but are important to understand.

Chapter 2: Certification Exam

This chapter is a brief introduction to the SAP BW certification exam. It provides key information regarding the exam process, rules and logistics including prerequisites and certification requirements.

To assist you in prioritizing your efforts, it also suggests the relative weighting that these questions may carry on the exam.

Chapter 3: Training

This chapter is a brief introduction to the SAP BW Training offerings by the SAP Education Centers. It provides key information regarding the classroom training for SAP BW, prerequisites, resources, location, scheduling, and enrollment.

Chapter 4: Data Modeling

This chapter provides basic concepts and techniques of data modeling in traditional data warehouses and the SAP Business Information Warehouse.

Chapter 5: Building Blocks

This chapter provides basic building blocks for the architecture, configuration, and data warehouse management for the SAP Business Information Warehouse.

Chapter 6: Reporting

This chapter presents SAP BW reporting and analysis tools and concepts. You will learn SAP BW queries and reports design and management techniques, including Web reporting and authorizations.

Chapter 7: Extraction

This chapter describes the tools and mechanisms to extract data from SAP and non-SAP data sources into SAP BW.

Chapters 4, 5, 6, and 7 are organized based on the following structure:
- *Study Guide*. This is a comprehensive study guide for the areas covered on the exam. It can be read straight through or serve as a reference for the areas in which you feel that you need further study.
- *Suggested Exercises*. This section provides a list of exercises that you can perform, usually with a small test SAP BW server, to gain experience in the exam's subject area.
- *Practice Tests*. This section includes comprehensive test questions to assess your knowledge of the current exam topics and readiness for taking the exam. These questions are similar in content and format to those of the actual SAP BW certification exam.

  The questions on the certification exam are either one answer only or more than one answer. Because the questions on the certification exam usually indicate if a single answer or more than one answer is expected, the questions have been separated accordingly for studying purposes.
- *Answers to Practice Tests*. This section provides answers to the questions from the practice tests. You should take the opportunity to review incorrect answers to identify those subject areas where you need additional review before attempting the exam.

Chapters 8 and 9

These chapters offer
- Test-taking tips to maximize test performance
- SAP BW certification exam simulation to judge exam readiness

How to Use This Book and Pass the SAP BW Exam

To be successful in the SAP BW certification, follow these 10 steps for success and pass the SAP BW certification test:

1. Review chapters 1, 2, and 3 of this study guide to become familiar with the concepts, certification process, and training options.
2. Become familiar with the SAP BW concepts and terminologies by studying the key concepts in the study guide. Understand the test objectives for the SAP BW test by reading SAP BW Exam Content & Weighting (chapter 2).
3. Depending on your knowledge and experience level, attend one or more of the SAP BW curriculum training provided by SAP.
4. Read the "SAP BW Certification Study Guide" in detail.
5. Study additional resources and training materials as needed in the SAP BW and data warehousing areas.
6. Test your knowledge with the practice exam questions throughout the book.
7. Do a thorough review of the objectives and use the answers to the practice tests to learn from your mistakes and solidify the information in your head.
8. Take the simulated certification exam at the end of the book. Give yourself an hour and a half for each test and follow the Test-Taking Tips and Hints.
9. Schedule your exam with SAP Education Center (Internet *http://www.sap.com* or SAP central registration 888-777-1727).
10. Practice, Practice, Practice.

This study guide includes comprehensive test questions to assess your knowledge of the current certification exam topics and readiness for taking the exam. These questions are similar to both the content and format of the SAP BW certification questions.

Use this study guide or have someone ask you the questions to be sure you are prepared for the test. Don't be satisfied if you merely know 95% of the topics the exam covers. The questions are moderately hard and are a good test of your overall comprehension and will help you identify the areas where further study is needed.

You should not underestimate the difficulty of the SAP BW certification exam because you can probably expect to find harder questions on the actual exam. You should take the opportunity to review incorrect answers to identify the subject areas in which you need improvement before attempting the exam.

Be especially aware and knowledgeable about the benefits and restrictions listed in the study guide for the different components of SAP BW. For instance, the test questions will probe your knowledge of the benefits and restrictions of the star schema in regards to the

minimum and maximum number of dimensions and key figures or the benefits and restrictions of ODS, PSA, and InfoCubes in regards to type of data to be stored.

Throughout the study guide you will find the following icons that identify special content.

Information about areas that you should study for the certification exam and the type of questions that you should expect

Suggestions for improving performance of the SAP Business Information Warehouse in the areas of queries execution, data extraction, and overall system

These tips are directly related to the exam and you should expect questions on the certification test.

The limitations and specifics of SAP BW for a particular subject area

They are directly related to the exam and you should expect questions to test your knowledge of these restrictions.

The unique features of SAP BW when compared to traditional data warehousing and data modeling

You should also be prepared for questions assessing your comprehension.

Useful notes to enhance your understanding or help you clear up confusion

These notes will probably not be directly generating questions on the exam.

The major changes between SAP BW releases 2.1C and 3.0

Your Feedback

The information herein is provided on an "as is" basis. The author and John Wiley & Sons, Inc. shall neither be liable nor responsible to any person or entity with respect to any loss or damages arising from the information contained in this book.

This book is designed to provide information about the SAP BW certification exam. While every effort has been made to make this book as complete and accurate as possible, no warranty or fitness is implied. We have tested and verified the information in this book to the best of our ability, but as no human endeavor is perfect, we may have made an occasional error, notwithstanding our diligent efforts.

As the reader of this book, you are the most important critic and commentator. We value your opinion and want to know what we are doing right, what we could do better, what areas you would like to see us publish in, and any other words of wisdom you are willing to pass our way. Please let us know about any errors you may find, as well as your suggestions for future editions by writing to me electronically at SAPBWCR@yahoo.com. When you write please be sure to include your name, phone and fax number, and we will carefully review your comments. We have a Web site for the book where we will list examples, errata, and any plans for future editions at *www.certificationsap.com.*

I wish you good luck in your pursuit of a career in SAP BW.

Dedication

When I told my family and friends that I was writing a book, they thought it sounded like a really good idea. I do not think any of us realized the time, energy, and commitment that would be eventually required.

I would like to dedicate this book to the friends and families who supported me in my effort to write it.

Acknowledgments

Enterprise Resource Planning, Business Intelligence, Data Warehouses, and SAP BW

In This Chapter:

Enterprise resource planning (ERP)
SAP R/3
Business intelligence
Data warehousing
OLAP
ERP data warehousing
SAP Business Information Warehouse (SAP BW)

This chapter provides a general overview and background to enterprise resource planning (ERP), SAP R/3, business intelligence, data warehousing, OLAP, and the SAP Business Information Warehouse (SAP BW), the main themes of this book.

The contents in this chapter are not explicitly tested on the exam, but provide important background information. This section will assist you in answering general-purpose questions on the exam related to these topics.

Enterprise Resource Planning

Enterprise Resource Planning Systems (ERP) are commercial software packages that facilitate the seamless integration of all the information flowing through a company—financial, accounting, human resources, supply chain, and customer information. ERP systems fundamentally integrate the different processes necessary in a business into a centralized pool that facilitates data sharing and eliminates redundancy. ERP provides information management and analysis to organizations.

The major benefits of ERP systems include:

- On-line/real-time information made available throughout all the functional areas of an organization
- Improved data standardization and accuracy across the enterprise
- "Best practices" included in the applications
- The efficiency gained throughout an organization
- The analysis and reporting made available for long-term planning

The major players in the ERP software industry are Baan, J. D. Edwards, Lawson, PeopleSoft, Oracle, and SAP. Examples of ERP modules are human resource management systems (HRMS), financials, manufacturing, distribution, and sales. Each ERP module offers different functionality for different industries.

SAP R/3

The German software company SAP AG is the market leader in the ERP arena. Systems, Application and Products in Data Processing (SAP) consists of highly integrated software modules that perform common business functions based on multinational leading practices.

SAP R/3 is the third generation of SAP software. SAP R/3 is based on a client/server architecture and uses a relational database to track all information related to a corporation. SAP R/3 runs on several operating systems, including UNIX, Windows NT, and AS/400, and can use different database management systems, including Oracle, DB2, Informix, and Microsoft SQL Server.

The SAP R/3 client/server system architecture is built around several modules or applications. A module is a set of transactions that deal with the same area of business functionality. The current modules of SAP R/3 include:

- FI—Finance
- CO—Controlling
- MM—Materials Management
- HR—Human Resources
- PM—Plant Management
- PP—Production Planning
- LO—Logistics
- SD—Sales and Distribution

One of the reasons for the success of SAP R/3 is the tight integration of the business applications. One event in one module, such as materials, automatically triggers response in the others, such as sales, finance, and plant maintenance. For instance, when a customer places an

order, a purchase order is created, an inventory is created, appropriate documents are created, and so on. This functionality is a major advantage compared to that offered by other vendors who simply package the business functionality in one box with limited integration.

Business Intelligence, Data Warehousing, and On-line Analytical Processing

Data Warehousing and Business Intelligence

The twenty-first century belongs to those who exploit information as a strategic enterprise resource. Today's decision makers urgently need accurate information on production, sales and markets, finance, and personnel to obtain a complete and up-to-date picture of their business and environment. As illustrated in Exhibit 1.1, that information is usually spread throughout the corporate IT structure, on a wide variety of platforms and in a wide range of applications. In other words, getting hold of vital facts and figures can be a complex and time-consuming task.

Exhibit 1.1   **Business Intelligence Reality: Islands of Information**

The technical concept for meeting this data challenge is known as *data warehousing*. A *data warehouse* is a separate application environment with a dedicated database drawing on diverse data sources and designed to support query and analysis.

"Business Intelligence is the process of transforming data into information and transforming that information into knowledge through discovery."[1] Data warehousing and other business intelligence tools give meaning to all of that "useless" data. Using data warehousing and business intelligence functions, strategic decision makers can analyze, slice and dice, query, and generate reports. Closer integration of corporatewide data warehousing data with ERP data potentially enhances companies' return on their ERP and data warehouse investments.

On-line Analytical Processing

One significant functional component of business intelligence is *on-line analytical processing (OLAP)*. The OLAP Council defines OLAP as a category of software technology that enables analysts, managers, and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information that has been transformed from raw data to reflect the dimensionality of the enterprise as understood by the user.[2]

OLAP functionality is characterized by dynamic multidimensional analysis of consolidated enterprise data supporting end-user analytical and navigational activities, including:

- Calculations and modeling applied across dimensions, through hierarchies, and/or across members
- Trend analysis over sequential time periods
- Slicing subsets for on-screen viewing
- Drill-down to deeper levels of consolidation
- Reach-through to underlying detail data
- Rotation to new dimensional comparisons in the viewing area

While OLAP systems can answer "who and what" questions, it is their ability to answer "what, if, and why" questions that differentiates them from data warehouses. OLAP enables decision making about future actions. A typical OLAP calculation is more complex than simply summing data, for example, "What would be the effect on soft drink costs to distributors if syrup prices went up by $.10/gallon and transportation costs went down by $.05/mile?"

OLAP and data warehouses are complementary: A data warehouse stores and manages data. OLAP transforms data warehouse data into strategic information. OLAP ranges from basic navigation and browsing (often known as "slice-and-dice"), to calculations, to more serious analyses such as time series and complex modeling. As decision makers exercise more advanced OLAP capabilities, they move from data access to information to knowledge.

ERP Data Warehouses

The demand for data warehousing functionality for ERP systems has been growing exponentially as companies strive to gain and maintain a competitive advantage and executives are realizing that an ERP implementation alone does not provide the business intelligence edge that they need to take full advantage of emerging front-office applications such as supply chain management, sales force automation, and customer relationship management.

To improve the quality and accuracy of decision making in these areas, decision makers and business analysts need full integration and access to ERP and other source system data. However, some major hurdles prevent the flow of ERP data to business intelligence systems such as data warehouses. In response to these challenges, ERP vendors, data warehousers, and third-party tool vendors developed numerous products and solutions to meet this demand.

Aside from building a data warehouse from scratch, the three basic categories of vendor-based data warehousing solutions include:

1. Solutions from third-party vendors that analyze data within ERP systems
2. ERP-based solutions that analyze data within ERP systems
3. ERP-based solutions that build data warehouses outside their ERP systems

An ERP-based data warehouse is a classical, external data warehouse or data mart built with tools offered by an ERP vendor. Oracle and SAP are currently the only major ERP vendors with such offerings. Sooner or later other ERP vendors such as PeopleSoft and Baan will enter the market.

Limitations of ERP Data Warehouses

There has been a lot of skepticism about ERP vendor offerings of data warehouses. Wayne Eckersen, vice president of the Data Warehouse Institute,[3] stated that:

> The promise of closed-loop decision support gives the ERP vendors an advantage in building next-generation data warehouses. But making the leap from transaction systems to analytic applications involves a radical shift in the way systems are designed, developed, and used. It's not self-evident that ERP vendors will master the art of building decision support tools or analytic applications, let alone linking the two together to create a closed-loop environment. This gives data warehousing vendors an opportunity to compete as the markets for ERP systems and data warehouses converge.

Data warehouse professionals are not the only skeptics of ERP-based data warehousing solutions. In an article entitled "ERP Users Face Data Warehouse Dilemma,"[4] Frank Gillette, a Forrester, Inc. analyst, expressed doubt that ERP vendors are qualified to build data warehouses, saying, "You do not want to have data extraction and transformation going on in the same database that you run your transactions in."

The prime reason for this skepticism by the analysts in accepting ERP data warehouse initiatives can be traced back to the "cultural issues" as Naeem Hashmi, CTO of Information Frameworks, documented in his article "Mix It Up."[5] This article explains what ERP data warehousing really means and identifies the traditional and ERP-centric data warehouse evolution and the cultural issues.

Three major limitations of ERP applications prevent the productive flow of data for business intelligence:

1. ERP applications are designed to support high-volume transaction-level activity using highly normalized data structures; they are not designed to support business intelligence functions such as ad-hoc querying, reporting, and analysis.

2. ERP applications do not store historical data that are needed for trend analysis.
3. Finally it is notoriously difficult to access and analyze data in ERP applications, especially in SAP. Therefore ERP's limitations cause considerable difficulty when linking business intelligence and ERP technologies.

SAP Business Information Warehouse (SAP BW)

The SAP Business Information Warehouse (SAP BW) is a state-of-the-art, end-to-end data warehouse solution developed by SAP. As pictured in Exhibit 1.2, SAP BW provides knowledge workers and decision makers with rapid access to data from SAP R/3 systems, other enterprise applications, and external sources, such as Nielsen.

Based on proven SAP R/3 client/server technology and exploiting SAP's acknowledged business expertise, SAP BW combines state-of-the-art data warehousing technologies with SAP AG's expertise to create an end-to-end solution. It includes all the components required for installation, use, ongoing changes, and maintenance of a data warehouse.

The content-rich SAP BW sets a precedent for speed and ease of implementation and maintenance because it is preconfigured with intelligence about a company's business

Exhibit 1.2   **SAP BW Integrates Data from SAP R/3 and Other Enterprise Applications**
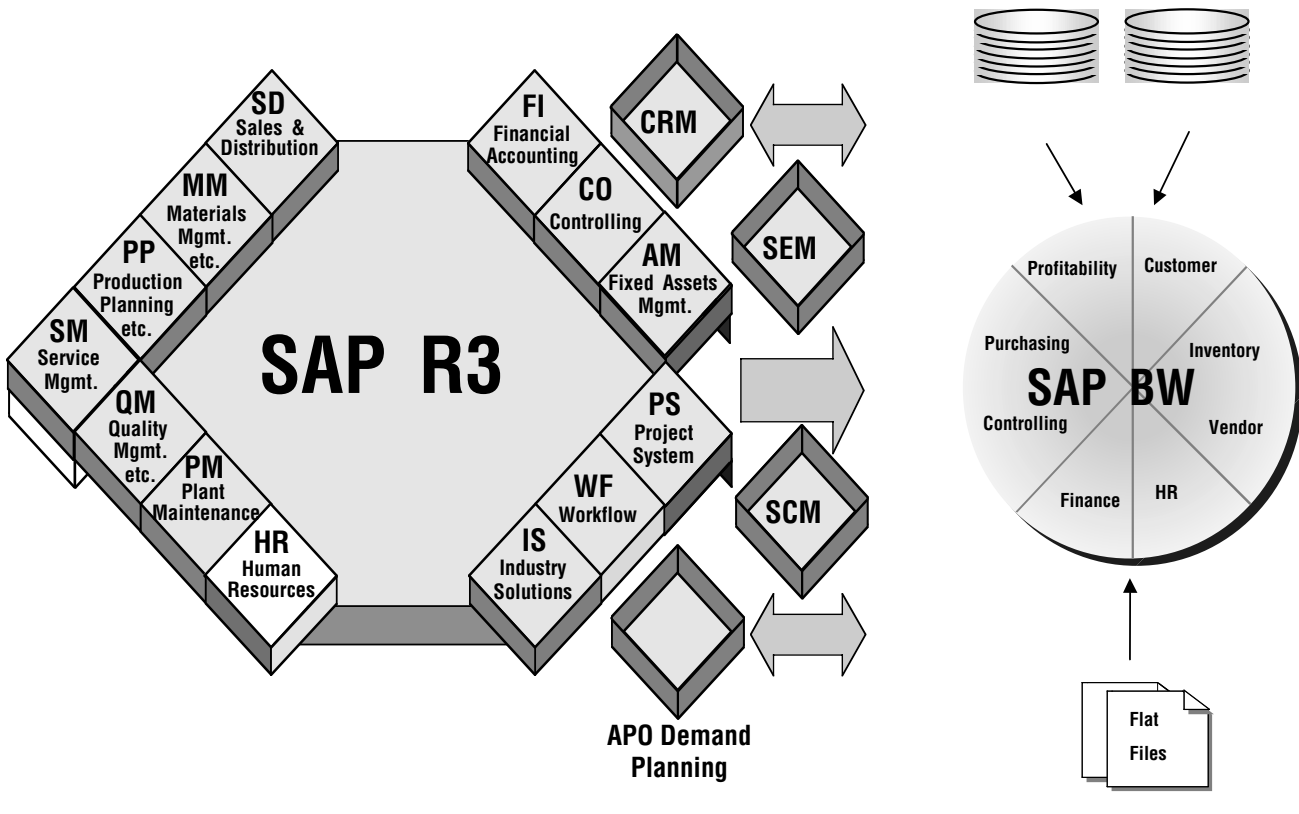
processes, providing a faster return on information. This new-generation solution provides users with a comprehensive view of data across an organization, including SAP R/3-based data as well as data from other systems.

SAP BW Drivers

When the ERP environment is SAP, the majority of the users face multiple problems in accessing, analyzing, and reporting of data. These problems prevent end users from easily accessing both current and historical data for better decision making.

It is difficult to extract customized reports from SAP R/3 and access enterprisewide analytical data while users are provided with a limited set of options:

- Build custom programs for each new reporting requirement.
- Use SAP's predefined reports—if you know where to find them.
- Do without the data.

Custom SAP reports can be written using Advance Business Application Programming (ABAP), a proprietary SAP coding language. ABAP reports, while costly, do not solve the problem because:

- *They are static.* They do not support ad-hoc querying capability.
- *They are expensive to maintain.* All changes have to be manually incorporated by ABAP programmers.
- They negatively impact the performance of the transaction system.

Integration of SAP and non-SAP data is difficult because data extraction from SAP is a difficult task and requires knowledge of SAP data structure and contents. As a consequence, flexible access to enterprisewide information becomes very difficult. Many organizations have tried to solve this problem by building data warehouses taking data feeds from SAP and non-SAP systems.

Alternative solutions exist but lack flexibility and ease of use. These attributes are essential if the data are to be exploited profitably. None of the available approaches optimally address key aspects of a desirable solution:

- *SAP R/3 ERP information systems.* While the SAP Logistics Information Systems are quite flexible in permitting multidimensional querying, significant issues remain:
  - All the data that compose the multidimensional cubes have to be available in SAP R/3 whereas most organizations have a significant amount of enterprisewide data in non-SAP transaction processing systems.
  - Use of the Logistics Information System (LIS) requires significant training, and end users need knowledge of SAP data before LIS cubes can be customized.
  - The execution of queries to LIS has a negative impact on SAP/R3 transaction processing performance.
- *Third-party solutions.* Third-party solution products are available to extract data out of SAP from multiple vendors. These products are components of a business intelligence solution rather than being an end-to-end solution.
- *Custom data warehouse solutions.* The creation of custom data warehouses taking data feeds from SAP and non-SAP systems is usually an expensive project that takes years to implement and usually has limited success due to the following issues:

- ◆ If the Metadata in the data warehouse are not synchronized with SAP/R3, the data warehouses can quickly lose relevance.
- ◆ Extracting data from SAP R/3 to obtain the data feeds has traditionally been a difficult task, because it relies on the underlying data model and data definitions.
- ◆ The integration effort is often plagued with difficulties, because different OLTP systems utilize disparate data.

SAP BW Features and Functionality

SAP BW is an end-to-end data warehousing solution with multiple features and functionality:

- • The SAP BW server includes an OLAP engine and a metadata repository, both of which are preconfigured with business content, saving the time and money that would be necessary to build a data warehouse from scratch. The SAP BW server is designed to provide fast retrieval, interpretation, and preparation of the information stored in its data stores.
- • The Business Explorer provides customers with a new easy-to-use multidimensional data access interface. The Business Explorer's navigation capability allows customers to build a personal catalog of reports for ongoing or recurring queries and reports displaying data using Microsoft Excel.
  - ◆ In addition to Business Explorer, the latest version of SAP BW 3.0 also includes a new Web-based multidimensional analysis environment to develop and publish analytical applications for the Internet community.
- • Automated data extraction and loading capabilities supply the SAP BW server with data from SAP R/3 applications, SAP R/2 applications, and non-SAP applications and external sources using flat files or using certified third-party extraction tools for any other data source.
- • The Administrator Workbench, another feature of SAP BW, provides a single point of control for creating, monitoring, and easily maintaining the complete data warehouse environment, reducing the total cost of ownership to customers.
- • SAP BW embodies all the advantages of leading-edge SAP R/3 BASIS technology with its multitier architecture: security, integrity, scalability, high availability, and interoperability within a uniform environment.
- • Desirable reporting architecture and features:
  - ◆ SAP BW includes a proven, consistent enterprise data model for the application of business rules to data. This builds on the enterprise model of SAP R/3 and greatly facilitates data warehouse implementation and management.
  - ◆ Preconfigured information models and reporting templates help users generate reports quickly and simply.
  - ◆ SAP BW supports predefined standard reports and ad-hoc analysis; both allow drill-down and multidimensional views.
  - ◆ Users can define their own collections of favorite reports, enabling them to access relevant information at the "touch of a button."
  - ◆ SAP BW is built for high performance. It resides on its own dedicated server. OLTP and reporting activities are therefore separated, and OLTP system performance is not compromised. Report caching mechanisms have also been carefully designed to maintain high performance.

Benefits of SAP BW

SAP BW remains open to different source systems and it will also come as a pleasant surprise for its ease of introduction and maintenance. SAP BW includes a broad range of predefined reporting templates geared to the specific needs of particular industries and user types, such as production planners, financial controllers, or human resources directors.

When implementing the Business Information Warehouse (SAP BW), customers obtain the following benefits:

- *Fast business intelligence solution.* As a business component of SAP R/3 Business Framework, SAP BW can be implemented quickly, especially when compared to a custom data warehouse solution.
- *Data access.* SAP BW significantly reduces the data load time, thereby providing global access to data on a timely basis and significantly lower maintenance and overhead costs.
- *Increased performance on the R/3 OLTP system.* The integration of decision support functionality into the existing business applications environment does not compromise the performance of the OLTP systems; on the contrary, it takes the reporting load away from the OLTPs.
  - ◆ *Open solution.* SAP BW is not limited to sourcing data from SAP R/3 and interfaces with third-party extract, transform, and load (ETL) tools and other systems through flat files.
  - ◆ *Function-rich solution.* SAP BW offers a wide range of powerful reporting and analysis features for effective exploration and interpretation of data.
  - ◆ *Adaptable solution.* SAP BW is designed to adapt to changes made to the business processes or IT environment. In addition, the Administrator Workbench provides effective support for easy maintenance of SAP BW and quick implementation of changes.
  - ◆ *Robust, business-driven solution.* Based on proven SAP expertise in SAP R/3 technology and business processes, SAP BW is built to answer the specific information needs of decision makers in all industries reliably and effectively.

Limitations of SAP BW

SAP BW was first introduced to the market by SAP AG in 1998 with version 1.0A. By all reasonable criteria, SAP BW is still a relatively new product and still in development as of this writing; SAP is providing functional updates every two weeks. As such, initial versions of SAP BW have been criticized for some of their limitations.

In 1999, William Inmon, the "founding father of data warehousing," criticized the architecture of the current SAP BW release (1.2) in his white paper, "SAP and Data Warehousing."[6] He noted the limitations of SAP BW as a true data warehouse solution, including:

- The redundancy in data movement and storage
- SAP's "open" interface is somewhat constraining in use and applicability.
- The SAP BW metadata repository only imports directly from SAP R/3 sources; non-SAP R/3 sources require manual managing of metadata.
- SAP BW requires an underlying star schema.
- Each cube is limited to 16 dimensions, three of which are reserved.

- The end-user interface of choice in SAP BW is Microsoft Excel extended through Visual Basic for Applications (VBA) macros.
- The lack of a true operational data store (in the data warehousing sense)
- The lack of accessibility by non-SAP tools to the data in the staging area
- The complexity of the creation and maintenance of the interfaces between SAP R/3 and the InfoCubes.

The most critical shortcomings noted above have already been addressed by SAP in later releases of the product. For instance, SAP has improved the architecture of SAP BW, and the Operational Data Store in SAP BW 2.0 is now a *true* Operational Data Store. Other limitations are being addressed as SAP is adding new features and functionality with every new release.

For instance, in release 3.0, SAP BW provides:

- Closed-loop analytical applications
- Open standards in heterogeneous environments
- Platform for e-business solutions
- Hub-and-spoke capability as an option in BW 3.0B

For further details on enhancements available with SAP BW 3.0, refer to "Development News for SAP Business Information Warehouse" (*www.service.sap.com*) and to Appendix D.

SAP BW's Competitors

Competition for SAP BW comes from ERP and data warehousing vendors, including:

- Other ERP vendors
  - Oracle
  - PeopleSoft
- Data warehouse tool vendors
  - Extraction tool vendors—extraction from legacy to SAP BW
    - ACTA
    - Informatica
  - Front-end tool vendors (can integrate with SAP BW)
    - Cognos
    - Business Objects
  - OLAP vendors—coupled with *many* analytical application vendors
    - Essbase/Hyperion
    - Microsoft SQL Server—Data Warehouse Consortium
  - Partnerships of these vendors
- Internally developed data warehouses

Future of SAP BW

There should be an explosion in the demand for SAP BW. First, demand from end-user companies needing expertise in the integration of ERP data into corporatewide data warehouses is growing exponentially. This trend is due to several business and technology drivers:

- Acquisitions and mergers lead to the requirement of consolidated data from disparate systems to perform decision support activities.

- *Integration of disparate systems*. To develop a comprehensive Business Intelligence solution, a data warehouse can incorporate data from all the systems.
- Companies demand better information about their customers and marketplace.
- Today's technology can support the promise of data warehousing:
  - ◆ Parallel computing technologies have made very large databases a reality.
  - ◆ Competition has significantly lowered computing and storage costs.
  - ◆ Tools are becoming more versatile and user friendly.
- Analytical applications such as strategic enterprise management (SEM) support the processes to provide the return on investment that companies are trying to achieve.

Second, end users and consulting companies alike are increasingly seeking data warehousing solutions for prepackaged ERP data warehouse implementations, especially for SAP's Business Information Warehouse.

The strategic direction for SAP AG is to move all reporting and analysis functionality away from SAP R/3 and into SAP BW. For instance, reporting for the new SAP products such as Advanced Planning Optimizer (APO) and Customer Relationship Management (CRM) is provided in SAP BW. Therefore, most companies with SAP R/3 implementations will be implementing SAP BW in the near future.

Finally, SAP will probably want to expand the current market of SAP BW to go beyond that of SAP-centric organizations. In the future SAP will certainly try to create more robust interfaces and technologies to incorporate non-SAP source systems and data access tools.

Summary

This chapter introduced the basic concepts behind the key topics of this book: ERP and SAP R/3, business intelligence, data warehousing, OLAP, and SAP BW. It also provided a general overview of SAP BW, its drivers, features and functionalities, benefits, limitations and future.

In the next chapter, you will learn more about the SAP BW certification exam, including the benefits of the certification, examination process, prerequisites and resources, preparation for the exam, certification requirements, scoring for the exam, exam retakes, and logistics. The content/weighting discussion provides the exam content and assists you in prioritizing your efforts in preparing for the exam.

Need to Know More?

Published Resources

- Thomas Curran, Andrew Ladd, Dennis Ladd. *SAP R/3 Reporting and E-Business Intelligence*. Upper Saddle River, NJ: Prentice Hall, 2000.
- Naeem Hashmi. *Business Information Warehouse for SAP*. Portland, OR: Premier Press, 2000.
- William Inmon, Claudia Imhoff, and Ryan Sousa. *Corporate Information Factory*. New York: John Wiley & Sons, Inc., 1998.
- Alan R. Simon. *Data Warehousing for Dummies*. New York: John Wiley & Sons, Inc., 1997.

On-line Resources

- Naeem Hashmi. "Mix It Up." *Intelligent Enterprise*. Intelligent ERP—feature, July 2000. *http://www.intelligenterp.com/feature/hashmi.shtml*.
- Naeem Hashmi. "SAP BW for Data Warehousing Professionals." The Data Warehouse Institute Winter Conference, December 2001. Available at *http://infoframeworks.com/Publications/TDWIFall2001/html/SAP%BW%20for%20DW%20Professionals.htm*

Endnotes

1. Gartner Group.
2. "OLAP Council White Paper," The OLAP Council, 1997, *http://www.olapcouncil.org/research/wht-paply.htm*.
3. Wayne Eckersen, "Analyzing ERP Data," The Data Warehouse Institute, 1999.
4. Frank Gillette, "ERP Users Face Data Warehouse Dilemma," *ComputerWorld*, October 1999.
5. Naeem Hashmi, "Mix It Up," *Intelligent Enterprise*, Intelligent ERP feature, July 2000, *www.intelligenterp.com/feature/hashmi.shtml*.
6. William Inmon, "SAP and Data Warehousing" (white paper), 1999.

Certification Exam

In This Chapter:

Benefits of the SAP BW certification
Where to take the exam and how to register
How to prepare for the exam: prerequisites and resources
Exam format, rules, and procedures
Certification requirements and scoring
SAP BW certification exam content and weighting
Getting the results

This chapter provides a brief introduction to the SAP BW certification exam. It gives key information regarding the exam process, prerequisites, scoring, rules, logistics, and certification requirements. It is organized chronologically and provides information to be used before, during, and after the exam.

To assist you in prioritizing your efforts, this chapter also suggests a list of key areas and the relative weighting that the questions in those areas may carry on the exam.

Benefits of Certification

The SAP BW certification is currently the most sought-after credential for SAP BW practitioners. It requires passing the SAP BW exam, which consists of three core areas:

1. *SAP BW System Configuration.* SAP BW data modeling and building blocks
2. *SAP BW Extraction.* Extraction mechanisms within SAP BW to pull data from SAP R/3 and non-SAP source systems
3. *SAP BW Reporting.* SAP BW reporting and analysis tools

Certified SAP BW consultants have passed a strenuous examination to certify that they possess the in-depth SAP BW product know-how required to successfully implement SAP BW for their clients. Certified SAP BW consultants are integrated in a closely coupled information network with SAP to ensure that their knowledge remains current and relevant and that they can continue to provide the highest level of professional guidance and service to their clients.

A certified SAP Business Information Warehouse consultant has the knowledge to advise customers on issues relating to SAP BW, including:

- Data analysis
- Reporting variables
- Data modeling
- Data extraction—OLTP, LIS, flat files, and so on
- InfoObject within SAP BW
- InfoSources
- Authorizations
- Web reporting

Benefits of the SAP BW certification include:

- *Acceptance.* Employers and recruiters benefit from the widespread acceptance of certification credentials.
- *Simplified recruiting and hiring.* Requiring an appropriate certification assures a minimum knowledge level in applicants, thereby ensuring higher-quality candidates while minimizing the initial applicant screening.
- *Flexibility.* Certified individuals have validated their technical knowledge while not being tied to a particular vendor's product. This means greater flexibility—a substantial advantage in the fast-changing technology marketplace.
- *Credibility.* Certification credentials provide a competitive advantage in highly competitive technology markets. This advantage applies to both the certificate holder and the hiring organization. Certified individuals benefit from the widespread acceptance of certification credentials.
- *Enhanced job opportunities.* Because recruiters and hiring organizations employ certification requirements, more opportunities are available to certified individuals.
- *Access to SAPNet (www.service.SAP.com/BW).* Unless you are already an SAP customer or partner, access to the SAP on-line repository is a major benefit because it includes BW system documentation, white papers, support information, OSS notes, and so on.

Location and Registration

The exam is given at an SAP Education Center. There are more than 15 SAP Education Centers in major cities in the United States and Canada.

- For up-to-date course descriptions, dates, locations, and availability, visit the SAP Education Center Web site (*www.sap.com/usa/education*).
- To register for classes and the exam and access on-line registration visit *www.sap.com*.

At the time of this publication, the certification exam is free when taken as part of the SAP BW curriculum training, or $500 USD ($700 CAD) when taken independently. The test is offered at the conclusion of the TABW*30* course (SAP BW Extraction) or can be taken independently of the class for those candidates who do not wish to take the SAP class. Candidates can register for the exam alone (without taking the SAP classes) or will be registered automatically when signing up for the SAP BW extraction class.

In case of failure the exam can be retaken as many times as necessary, at the current cost of $700 for each sitting thereafter. This fee applies whether you pass or fail. Thus, it is a good idea to prepare as thoroughly as possible before attempting to take the exam.

Logistics for the certification test and the classes are identical (e.g., dates, locations, availability, and registration). For more information, refer to Chapter 3, "Training."

Preparing for the Exam

There is no essential prerequisite to the SAP BW certification exam. However, experience with data warehousing and/or SAP R/3 is highly recommended. To get the most out of this certification study guide and maximize their chances on the SAP BW certification test, candidates should have one or more of the following:

- Previous experience and participation in an SAP BW project implementation
- A strong desire to learn SAP BW
- Detailed understanding of data warehousing, and specialization in one of the following areas:
  - Extract, transform, and load (ETL) design
  - Data modeling
  - Report design
  - Data warehouse project management
- Knowledge of reporting and analysis in SAP/R3 reporting environments, for example, Logistics Information Systems (LIS), Report Writer/Report Navigator, ABAP/4 Programming
- Some knowledge of SAP BASIS administration

Depending on your understanding of the subject matter, in addition to this book it may be useful to study other materials. SAP's documentation, such as the SAP BW Library, the on-line help documentation in the SAP BW software, and the reference materials provided in appendixes may be helpful.

It is recommended to attend SAP BW training offered by SAP Education Centers (more details provided in Chapter 3). One of the benefits of attending the training is to obtain the

SAP BW training material.[1] This material contains detailed and content-rich SAP BW information that is considered necessary for the test. This training curriculum also includes exercises to be completed during class on a live SAP BW system that will give you the opportunity to gain hands-on experience in the exam's subject area.

It is also very important to have hands-on experience with the system to apply the techniques and concepts covered in the exam. You should have access to an SAP BW server with which to experiment.

Although it is possible to attain the SAP BW certification by attending SAP classes and studying books and other documentation, you absolutely need real-world experience with SAP BW to successfully perform and contribute on an SAP BW project.

The Exam

This section describes the actual process for taking the exam, including:
- Examination rules and procedures
- Format of the exam

SAP dictates the rules used during the examination:
- Candidates must produce an official valid identification document with photo, for example, passport or driver's license, before they can receive the examination papers and logon password.
- Candidates must complete the examination alone and independently.
- No assistance is allowed, except as follows:
  - Candidates whose mother tongue is not the language of the examination may use a dictionary provided that it contains no notes and is inspected and accepted by the proctor before the start of the examination.
    - Errors in the dictionary or documentation are the candidate's responsibility and no such error will be reason for any review of the result of the examination.
    - The time available to candidates to complete the examination is limited and can be neither interrupted nor extended.
- Candidates must follow the proctor's instructions.
- The examination questions and tasks are copyrighted and must not be written down, copied, or otherwise reproduced in whole or in part or made available to others in any form.
- If a candidate disturbs the examination or breaks any examination rule, that candidate will be excused from the examination immediately.

The exam format is as follows:
- The tests are administered by computer.
- You are given a set time limit for the test (90 minutes) and must answer 60 questions. You can mark questions to return to later if you are not sure of the answers.
- Passing the exam requires a minimum of 70%. Your pass/fail grade will be reported to you four to six weeks after you have sat for the exam.

- The questions are chosen randomly from a pool of thousands of questions. Each candidate in the same classroom will have the same questions in the exam, but will have them presented in a different sequence from the other candidates to prevent teaming.

    The questions generally fall into two categories:
1. Questions that have only one correct answer
2. Questions that have more than one correct answer

Single Answer (only one answer)

Single answers are basic multiple-choice questions for which only one answer is correct and these are generally the easiest. Each question will have four or five answers listed. The correct answer must be selected. For example:

A conceptual description of data objects, their attributes, and the relationships between them is:
   a. A data warehouse
   b. A data model
   c. An InfoCatalog
   d. An InfoSet
   e. An InfoSource

Answer: b.

These questions often address facts and figures included in the exam objectives. Although these are relatively easy questions, many of them are purposely worded to be confusing or to encourage jumping to conclusions. Be sure to read the questions carefully and double-check your answers.

Multiple Choice (one or more answers)

Multiple choice are questions for which multiple potential answers are provided and where one or more of the answers are correct, and you must choose all that apply. For example:

Which of the following are types of SAP BW InfoCubes?
   a. MultiCube
   b. Inverted Cube
   c. Remote Cube
   d. Relational Cube
   e. Basic Cube

Answer: a, c, and e.

These questions can be tricky. Although they often address the same type of definitions and facts as the simpler questions, the multiple-choice questions increase the possibility of mistakes. Rather than look for one or more obvious answers to these questions, you may find it useful to consider them as a series of true/false questions, evaluating each of the possible choices separately. Otherwise, it is easy to overlook a correct answer. Be sure to read these questions carefully.

Passing and Scoring

The examination consists of 60 questions from the following SAP BW topic areas:

1. SAP BW Data Modeling
   - Data modeling
   - Data management
2. SAP BW Building Blocks
   - System configuration
   - Monitoring
   - Scheduling
3. SAP BW Reporting
   - Report definition and Web publishing
   - Data analysis in BEx Analyzer and a Web browser plus integration of analytical applications into mySAP enterprise portals
   - Organization of reports
   - Authorization
4. SAP BW Extraction
   - SAP BW extractors in mySAP.com components
   - Openness to external systems
   - Integration of extraction, transformation, and loading (ETL) tools

The passing score for the final exam is 70%.

It is useful to understand how SAP will score your answers on the exam so as to maximize your score:

If Only One Answer (maximum of two points)

- This type of question scores a maximum of two points and a minimum of zero points.
- If the answer you select is correct (true), you get full credit and score two points.
- If the answer you select is false, you do not score any points. There is no penalty for an incorrect response.

If More Than One Answer (maximum of 5 points)

- This type of question usually has five possibilities and scores a maximum of five points (one point for each correct answer) and a minimum of zero points.
- You should consider the potential answers provided as a series of true/false questions.
  - For each potential answer, if the answer is true and you select it or the answer is not true and you do not select it, you are correct and you score one point per question.
  - Conversely, if the answer is false and you answer true or the answer is true and you answer false, you are not correct and do not score any points for that question.

It is important to remember that there is no penalty for not answering a question correctly. Therefore, you should never leave a question unanswered even if you do not know the answer.

Regardless of the type of questions (one answer or more than one answer), scoring of the answers for the exam is based on Boolean logic:

Correct Answer	Your Selection	Your Score
True	True	1
False	False	1
True	False	0
False	True	0

For instance, for a test question with more than one answer (possible answers a, b, c, d, and e), if the correct answers are a, b, and c,

- If you select a, b, c, and d you score 4 points as follows; one point each for selecting a, b, c, one point for not selecting e, and no points for incorrectly selecting d.
- If you select a and b you score 4 points as follows: one point each for selecting a and b, and one point each for not selecting d and e. Had you also selected c in this scenario, you would have scored a perfect 5 for this question.

Scoring on the exam is summarized as follows:

	Correct Answer	Incorrect Answer	No Answer
If there is only one correct answer	2 points	0 points (no points deducted)	0 points
If there is more than one answer	1 point per correct answer	0 points (no points deducted)	0 points

The maximum number of points for each question is as follows:

		Potential Maximum Number of Points
If there is only one correct answer		2 points
If there is more than one correct answer	Four answers	4 points
	Five answers	5 points

SAP BW Certification Exam Content and Weighting

The certification test for SAP BW application consultants is intended to provide candidates with the opportunity of proving that they have a fundamental knowledge of this particular area of the SAP system, as well as that they are able to apply this knowledge within a project environment. The examination consists of questions, both one answer only and multiple choice, from the topic areas specified below.

To assist you in prioritizing your efforts, the weighting of the questions in the test is codified as follows:[2]

+   = 1–10% of the questions in the exam
++   = 11–20% of the questions in the exam
+++ = over 20% of the questions in the exam

As recommended by the SAP Education Center, the topic areas for the SAP BW certification exam are:

Reporting (++)

- Analyzing data
- BEx Analyzer within Business Explorer (BEx)
- Report Builder
- Roles
- Workbooks

Reporting Variables

- Types of variables
- Replacement types
- Variables
- Calculation of variables
- User-exit for variables

Reporting Tips and Tricks

- Customizing the BEx Browser
- Using the style tool
- Reporting monitor
- SAP BW statistics
- Version of BEx

Reporting OLE DB for On-Line Analytical Processing (OLAP)

- SAP BW architecture
- Object linking and embedding (OLE) and OLE DB for OLAP
- Use of open database for objects (ODBO) or OLE DB for OLAP
- Query blocks

Data Modeling (++)

- Data modeling for data warehouses
- Structure of information—entity relation model (ERM)
- Analytical processing—the multidimensional data model (MDM)
- Translating the MDM into SAP BW

Multidimensional Data Models within SAP BW

- Star schema and the SAP BW extended star schema
- InfoCubes
- Characteristics
- Hierarchies
- Aggregates
- Concept of granularity

Extraction (++)

- General aspects
- Flow of data
- Triggering extraction
- Data marts
- Data homogenization within SAP BW

Data Extraction

- Types of data to be extracted
- Extraction of SAP R/3 application data
- Production data extractor
- Metadata update
- Non-SAP data sources
- Third-party extraction tools

OLTP Extraction

- Extraction process from SAP R/3 OLTP and non-SAP R/3 OLTP systems
- Integration of data from multiple InfoSources
- Use of intermediate documents (IDOCS) and operational data store (ODS)
- Scheduler to initiate data extraction
- Monitor statuses

Flat File Extraction

- Flat file extraction process of transaction and master data
- Types of data that can be extracted via flat files

LIS Extraction

- Logistics information system (LIS) overview
- Connecting LIS InfoStructures
- Populating InfoCubes

Extraction from Controlling and Profitability COPA

- Creating the InfoSource
- Modeling the InfoCube
- Transferring the data

Administrator Workbench (+)

- Workbench features
- Design/maintenance of data warehouse
- Scheduler
- Monitor
- Source systems

InfoObject within SAP BW (+)

- Metadata in SAP BW
- Technical definition
- Master data, texts
- Attributes
- Hierarchies
- Compound information

InfoSources
- Components
- Creating an InfoSource

Warehouse Management (++)

- Architecture
- Data staging
- Data extraction
- Administrator workbench (AWB) new design
- InfoObjects
- InfoCubes
- Aggregates
- ODS
- Business document service (BDS)
- DataSources
- Update rules
- Scheduling
- Manage InfoCube

Metadata Repository (+)

- Architecture
- Functionality
- Business

Authorizations (+)

- Roles
- Transactions
- Activity groups
- Authorizations

Business Explorer (++)

- BEx Analyzer
- Toolbar
- Template

- Filter
- Conditions
- Exceptions
- MultiCubes
- Report-to-report Interface (RRI)
- BEx Browser
- Architecture

Web Reporting (+)

- View
- Elements
- Language objects
- Revenue
- Simple lists
- Using the wizard

Getting the Results

This section describes how you will get your results and the procedure for unsuccessful candidates and exam retakes.

The passing score for the final exam is 70%. The examination is assessed in accordance with general rules defined by SAP. Unlike most computer-based training tests, the results are not immediately known upon completion of the exam. It may take up to five weeks to receive your grade. Candidates are informed in writing of their grade, which is either "pass" or "fail." Successful candidates receive a certificate with a unique identification number. The certificate names the candidate and the candidate's employer.

SAP will hold the results of the examination in a database to ascertain, if necessary, what certification a candidate holds and whether a candidate can be admitted to other examinations. SAP may also use the data held to provide targeted information to certified candidates and to enable candidates to retrieve specific information. SAP may also inform others of successful candidates' certification.

If your results are not favorable, SAP will allow unsuccessful candidates to take the certification exam again with the following restrictions:

- Unsuccessful candidates may retake the same examination after a three-months waiting period.
- Unsuccessful candidates usually receive general information on identified gaps in their competence.
- Before admission to the same examination for a third time, the candidate must produce evidence of training suitable to rectify the gaps identified in the candidate's competence at previous examinations.
- No candidate may take the same examination for the same release more than three times. A candidate who has failed at an examination three times for a release may not attempt that examination again until the next release.
- The exam fees cover only one exam and candidates must pay the exam fee for all retakes.

Summary

In this chapter, you learned about the SAP BW certification exam. You now understand the benefits of the SAP BW certification exam, how to prepare for the exam, where to register for and take the exam, certification requirements, and what happens after the exam. A list of the key areas and the relative weighting that the questions in those areas may carry on the exam was also discussed. To assist you in prioritizing your efforts in studying for the exam, you should refer often to this list.

The next chapter provides information on the SAP BW training offered by the SAP Education Center. It will provide key information regarding the classroom training for SAP BW, location, scheduling, and enrollment.

Endnotes

1. SAP BW Configuration, SAP BW Reporting, and SAP BW Extraction, SAP BW Solution Academy, Training Participant Handbook, SAP BW release 2.0B, September 2000.
2. SAP Education Center Web site, *http://www.sap.com/education/*, February 2002.

Training

In This Chapter:

SAP Solution Academy
SAP BW training curriculum
How to decide what training to take
Location, scheduling, enrollment

This chapter provides a brief introduction to SAP BW training, including the training curriculum for SAP BW, how to decide what class to take, training locations, scheduling, and enrollment.

This study guide is not intended as a substitute for the classroom training offered by SAP but rather to complement it. Therefore, it is usually best to take the test after having attended the SAP BW classroom training provided by the SAP Education Centers.

SAP Solution Academy

SAP partners are technology and business consulting firms that offer assistance in all phases of SAP software implementation projects, including go-live, training, and education. Partners have proven knowledge of SAP products and expertise in using best practices for effective business process reengineering and work closely with clients in redefining roles and systems to optimize performance with SAP software.

As described in Exhibit 3.1, SAP has partners in all areas of SAP implementation projects, including software, service, technology, support, hosting, channels, and education. A list of SAP partners is available on SAP Web site at *www.sap.com/partners*.

The SAP Solution Academy is an international institution of higher education in SAP applications, including SAP BW. It is a training academy open to all SAP partners to provide certification through a variety of course offerings. The primary objective of the Academy is to instruct in features, functions, and the best use of SAP products for new consultants. The second objective is to provide continuing education and advanced training for experienced SAP product practitioners.

Exhibit 3.1   **SAP Partners**

Source: www.SAP.com.

The SAP Solution Academy offers comprehensive, hands-on classes for SAP partners, independent consultants, and customers who are seeking intensive training leading to SAP certification. The Solution Academy offers rigorous programs for both experienced attendees and newcomers. Participants who pass the optional exam at the end of each Academy program will receive SAP's highly regarded *consultant certification*, one of the most respected industry certifications available.

SAP BW Training Curriculum

The SAP BW training curriculum for partners and nonpartners is illustrated in Exhibits 3.2 and 3.3. There are three levels of classes:

1. *Level 1.* Introductory level
2. *Level 2.* Standard training for business content experts and SAP BW data extractors and developers to learn SAP R/3 application modules
3. *Level 3.* Specific for SAP BW application developers, support, and administration staff

Exhibit 3.2   **SAP BW Solution Training Curriculum (partners only)**

Level 1	Level 2	Level 3		
BW200 (1 day) BW Overview		**BW210*** (5 days) BW Configuration	**BW220*** (3 days) BW Extraction	**WNAPBW** (5 days) APO/BW Integration Workshop
		BW257* (5 days) MySAP BW Reporting	**BW209** (2 days) BW Web Reporting	**WNABWC** (3 days) BW/CO Integration Workshop
		BWNA40* (2 days) BW Authorization Workshop	**D20BW**** (5 days) BW Delta 1.2B-2.0B	**D30BW** BW Delta (3.0)

 * Class recommended for SAP BW certification.
 ** Class recommended for SAP BW delta certification.

Source: SAP.

Exhibit 3.3   **SAP BW Nonpartners Training Curriculum**
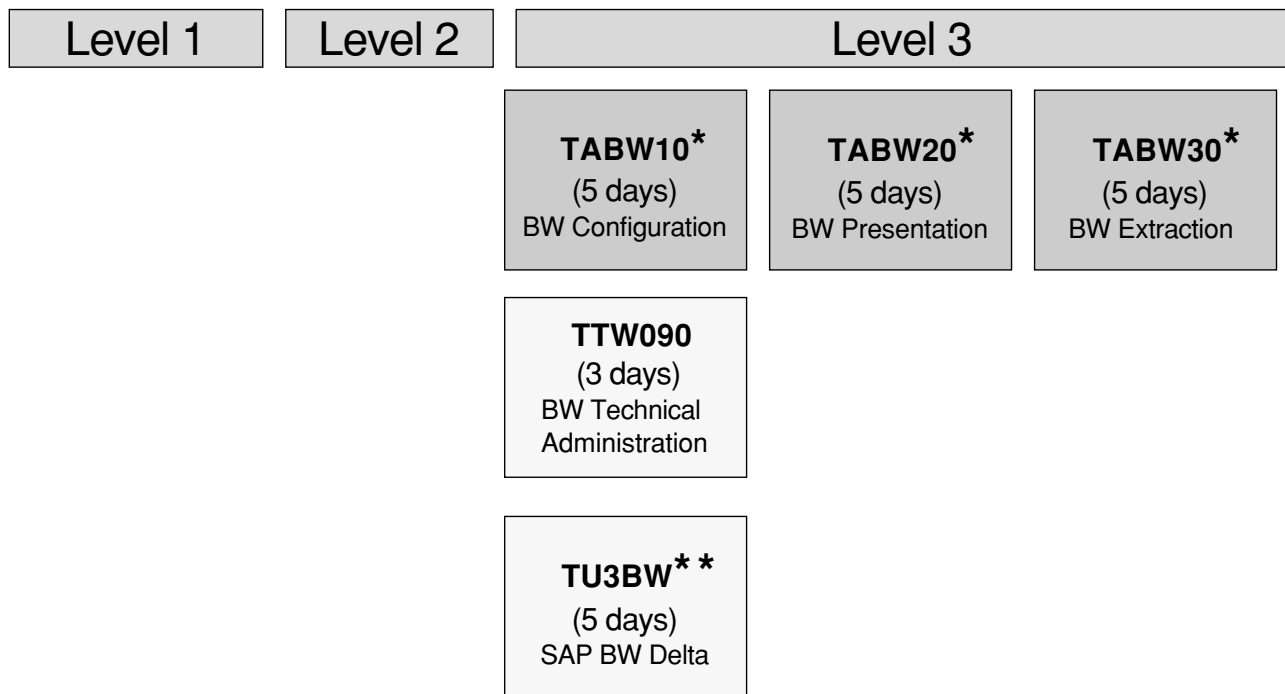
Level 1	Level 2	Level 3

TABW10*
(5 days)
BW Configuration

TABW20*
(5 days)
BW Presentation

TABW30*
(5 days)
BW Extraction

TTW090
(3 days)
BW Technical
Administration

TU3BW**
(5 days)
SAP BW Delta

* Class recommended for SAP BW certification.

** Class recommended for SAP BW delta certification.

Source: SAP.

The basic SAP BW curriculum is based on three level-3 classes of one week each in duration (course descriptions are provided in Appendix E):
1. SAP BW Configuration (BW210 or TABW10 for partners)—SAP BW data modeling and Building Blocks
2. SAP BW Reporting (BW257 or TABW20 for partners)
3. SAP BW Extraction (BW220 and BNNA40 or TABW30 for partners)

Several other classes offered are of interest to SAP BW practitioners, including SAP BW Delta and SAP BW Technical Administration (TABW90). The SAP Education Center or the SAP education Web site (*www.sap.com/usa/education*) will provide:
• The ability to register for SAP BW classes and exams
• SAP BW training course descriptions, dates, locations, and availability

Exhibit 3.2 provides an overview of the SAP BW training curriculum for SAP partners (Solution Academy). Exhibit 3.3 provides an overview of SAP BW training curriculum for nonpartners.

What Training Do You Really Need?

This study guide may be used as a teach-yourself program; however, prior knowledge and experience with SAP BW is assumed. At the same time, it is highly recommended that candidates for certification take one or more of the classroom courses offered by SAP to customers and business partners. One of the benefits of attending the training is to obtain the SAP BW training material.[1] This material contains detailed and content-rich SAP BW information that is considered necessary for the test. This training curriculum also includes exercises to be completed during class on a live SAP BW system that will give you the opportunity to gain hands-on experience in the exam's subject area.

Candidates who have completed the appropriate Solution Academy or SAP standard curriculum classes may test for SAP BW certification. Consultants may take the exam without attending classes if they have significant experience in SAP BW, BASIS, SAP system administration, or R/3 database administration.

In order to increase your knowledge in SAP BW and your probability of passing the exam, SAP recommends taking at least three SAP BW classes in the key exam topic areas SAP BW Configuration (data modeling and building blocks), SAP BW Reporting, and SAP BW Extraction.

One can and should attend as many classes as possible, based on budget and requirements. However, there is no mandate on the number of classes taken; some candidates may, for instance, take only one class to meet a specific requirement whereas other candidates will take all three classes.

When taking all three classes, the following is highly recommended:

- Take the three classes in the order suggested by SAP: System Configuration (data modeling and Building Blocks), SAP BW Reporting, and SAP BW Extraction. Each class builds on concepts learned from the previous one.
- Do *not* take all three classes in three consecutive weeks but rather take the first class (SAP BW Configuration), and then wait a month or two before proceeding. This strategy will allow you some time to study the training material in detail and avoid burnout.
- Attend Solution Academy classes (rather than customer classes) as those classes are more specifically geared to prepare you for the SAP BW certification exam. Solution Academy classes are for partners; however, SAP will usually allow nonpartners to attend, provided seating is available. As an alternative, the nonpartner class should provide you the same information but might be less oriented toward the certification exam.

As shown in Exhibit 3.4, if you plan to become certified you should take at least one class: the SAP BW System Configuration (SAP BW data modeling and Building Blocks) (BW 210 or TAB10). This class is fundamental to understanding the other two classes (Extraction and Reporting) and to your success on the exam. Therefore, you should spend most of your time and energy on understanding all of its concepts before proceeding to the other two SAP BW classes and the exam. Even if you already have significant knowledge and hands-on experience with SAP BW it is highly recommended that you take this class before attempting to pass the exam.

Exhibit 3.4   **Recommended Training Path for SAP BW Certification**

```
                                    ┌─────────────────────┐
                                    │   Take SAP BW       │
                                    │ Certification Exam  │
                                    └─────────────────────┘
                                              ▲
                          ┌───────────────────┘
                          │             ┌─────────────────────┐
                          │             │ Review Material***  │
                          │             │ SAP BW Extraction   │
                          │             └─────────────────────┘
                          │                       ▲
  ┌─────────────────────┐ │             ┌─────────────────────┐
  │ Study Material***   │ │        No   │ SAP BW Extraction   │
  │ SAP BW Extraction   │ │             │ TABW30** (5 days)   │
  └─────────────────────┘ │             │ Alternatively BW220*│
             ▲            │             └─────────────────────┘
             │            │                       ▲
             │        Yes │      ◇ Significant experience
             └────────────┤        in SAP R/3 or extraction? ◇
                          
                          ┌───────────────────┐
                          │            ┌─────────────────────┐
                          │            │ Review Material***  │
                          │            │ SAP BW Reporting    │
  ┌─────────────────────┐ │            └─────────────────────┘
  │ Study Material***   │ │                      ▲
  │ SAP BW Reporting    │ │        No  ┌─────────────────────┐
  └─────────────────────┘ │            │ SAP BW Extraction   │
             ▲            │            │ TABW20** (5 days)   │
             │            │            │ Alternatively BW257*│
             │        Yes │            │ and BWNA40*         │
             └────────────┤            └─────────────────────┘
                                                 ▲
                               ◇ Significant experience in SAP BW
                                 and data warehousing? ◇
```

  * Nonpartner class
 ** Partner class (preferred for certification)
*** Material includes:
    • SAP BW training class material
    • The SAP BW certification study guide
      and reference material

```
                          ┌─────────────────────────┐
                          │   Review Material***     │
                          │ SAP BW Data Modeling     │
                          │ and Building Blocks      │
                          └─────────────────────────┘
                                     ▲
                          ┌─────────────────────────┐
                          │  SAP BW Configuration    │
                          │  TABW10** (5 days)       │
                          │  Alternatively BW210*    │
                          └─────────────────────────┘
```

Location, Scheduling, and Enrollment

SAP offers more than 15 state-of-the-art training center locations for classroom training throughout the United States and Canada, including Boston (MA), San Francisco (CA), Atlanta (GA), Philadelphia (PA), and Toronto (Canada). For up-to-date course descriptions, dates, locations, and availability visit the SAP Education Center Web site (*www.sap.com/usa/education*). To register for classes and the exam and access on-line registration, visit *www.sap.com*.

SAP can also conduct a full complement of project team training on-site at your location. SAP's on-site training offers substantial cost and time savings through a more flexible scheduling approach. It can provide trained and qualified instructors for all technical and practical applications. In some instances, the number of employees to be trained makes an on-site approach more economical, and the on-site schedule can be more closely aligned than the published class schedule. The customer receives the added benefit of reduced travel costs and less disruption for the overall project team.

All the necessary information on SAP's curriculum content, course offerings, dates, locations, and hotel accommodations can be found in the following resources:

- SAP Education and Training Center: *www.sap.com/usa/education* or 1-888-777-1SAP (1-888-777-1727)
- SAP central registration in North America: 888-777-1727
- Internet: *http://www.sap.com*
- SAP On-line Service System (OSS) for customers and businesses

For more information, the SAP Solution Academy for SAP consultants can be contacted directly by phone in North America at (800) 790-7750, (612) 376-7750; fax (612) 376-7755; or e-mail: *academyinfo@sapacademy.com*.

Classroom capacity for both certification training and testing in SAP BW is limited; based on the growing interest in becoming SAP BW certified, you should plan to register a few months in advance.

Summary

In this chapter, you learned about the SAP BW training offerings. You now understand the SAP BW training curriculum, what training to take, and the training locations, enrollment, and scheduling.

In the next chapter, you will learn more about data modeling in traditional data warehouses and SAP BW. This chapter is fundamental to SAP BW and provides the foundation to the other areas of SAP BW. It represents a significant percentage of the questions on the certification exam.

Endnote

1. SAP BW Configuration, SAP BW Reporting, and SAP BW Extraction, SAP BW Solution Academy, Training Participant Handbook, SAP BW release 2.0B, September 2000.

Data Modeling

In This Chapter:

Data warehouses, data marts, and Operational Data Stores
Comparison of traditional data modeling and SAP data modeling
Traditional data modeling
SAP BW data modeling value-added proposition
Keys, IDs and pointers in SAP BW
Standard business content
Suggested exercises
Practice test
Answers to practice test

This chapter provides key concepts of SAP BW data modeling. It is critical to have a high-level knowledge and understanding of these concepts as they are the building blocks for all other areas of SAP BW and the basis for a large number of the questions on the certification exam.

Data modeling is an important component of the SAP BW certification exam. It tests your knowledge of BW in the data modeling subject areas for traditional warehouses and the SAP Business Information Warehouse, including:

* Data warehouses and data marts versus OLTP systems
* Data models
* Star schema/InfoCubes
* Business content for SAP R/3 OLTP systems

For readers interested in the SAP BW training curriculum, this chapter refers to the class "SAP BW Configuration" TABW10 (SAP partners) or BW210 (nonpartners).

NOTE

Data Warehouses, Data Marts, and Operational Data Stores

Data warehouse, data marts, and Operational Data Stores are concepts central to SAP BW. This section provides information related to the SAP BW certification exam on

- Data warehouses
- Operational versus data warehouse systems
- Data marts
- Operational Data Stores

This information is related to the SAP BW certification test and you can expect questions on the exam. For additional information on data warehouses, you should also refer to the data warehouse section in Chapter 1.

If you have limited experience and knowledge of data warehousing, additional reading in that area is recommended. Especially recommended are Bill Inmon's and Ralph Kimball's books. Other resources are provided in Appendix A.

Data Warehouses

A *data warehouse* is:

- "A collection of integrated, subject-oriented databases designed to support the DSS function, where each unit of data is relevant to some moment in time"[1]
- "A copy of transaction data specifically structured for query and analysis"[2]

As illustrated in Exhibit 4.1, the data warehouse architecture spans from the extraction of operational data to the management of warehouse data and delivery of information to the business users.

Operational versus Warehouse Systems

There are fundamental differences between operational (OLTPs) and data warehouse systems (DW). Table 4.1 provides a comparison of operational systems (e.g., OLTPs) and data warehouses (e.g., SAP BW).

Data Marts

A *data mart* is also known as a *local data warehouse*. It is an implementation of a data warehouse

- With a restricted scope of content
- With support for analytical processing
- Serving a single department, part of an organization, and/or a particular data analysis problem domain

Exhibit 4.1   **Datawarehouse Architecture**
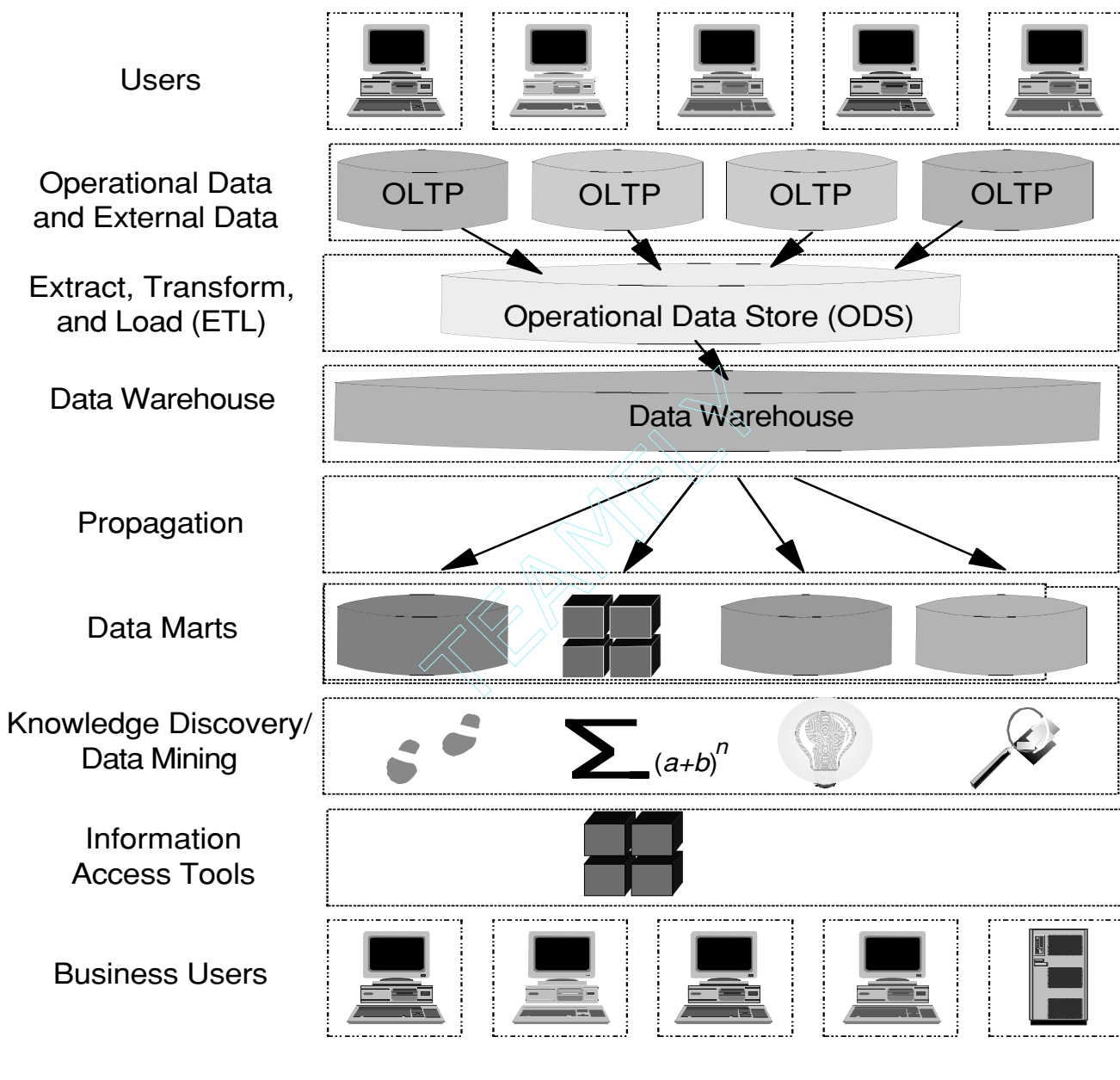
As presented in Exhibit 4.2, there are two types of data marts:

1. *Dependent data marts*. A data warehouse provides data to the data marts.
2. *Independent data marts*. The data marts provide data to the data warehouse.

Operational Data Store

An Operational Data Store (ODS) is a subject-oriented, integrated, volatile, current-valued data store containing only corporate detailed data."[3] The ODS is an intermediate storage area

Table 4.1   **Comparison of OLTP and Data Warehouse Systems**

Characteristic	Operational System (e.g., SAP R/3)	Data Warehouse
Applications and functions	Only data for specific functions of application	Data not associated with an application, but rather integrated from various applications
Business data	Used to run the business Data used to conduct a business transaction	Used to manage the business Data used to make a business decision and for analysis
Changes	Changing with business events	Fixed as of a specific point in time
Data	Original entry point for primitive/atomic data Usually primitive/detail data, not derived Limited historical data (e.g., 1–2 months)	Data are sourced from operational environment (primitive data) Lightly to highly summarized data, and some primitive data Greater historical data (e.g., 2–10 years)
Data currency	Current, real-time data	Usually current data but not real time
Data growth	Predictable data growth, finite	Data grows at an infinite rate
Data operations	Create, read, update, delete Single row operations Data are maintained by operational systems	Read only Multiple row operations Data are maintained by feeds from originating source
Data processed/available	Detailed transaction data (data intensive)	Summarized data (for OLAP only)
Integration with data from other modules/ applications	Minimal integration	Significant integration
Machine utilization	Stable and predictable	Unstable and unpredictable
Normalization	Highly normalized for performance	Highly denormalized for querying
Processing	Single row processing, individual records Predictable processing	Set row processing, groups of records (use a set of data at a time) Unpredictable processing
Response time	Seconds	Minutes
User community	Nonmanagerial	Managers, executives, decision makers

of operational data for the data warehouse. Its sources include several systems and it contains current or near-term data.

In traditional modeling, ODS contains very highly granular data and is based on flat tables, resulting in a very simple modeling of the ODS. In SAP BW the ODS plays a role that goes beyond the role of the ODS in traditional data warehousing. Unlike traditional ODS, where very few data transformations are done, SAP BW manages ODS objects just like other data objects and you can cleanse, transform, merge, and sort data to build staging tables that

Exhibit 4.2   **Data Mart Architecture**

Dependent Data Marts
(Data marts sourced by a data warehouse)

Independent Data Marts
(Data warehouse sourced by data marts)
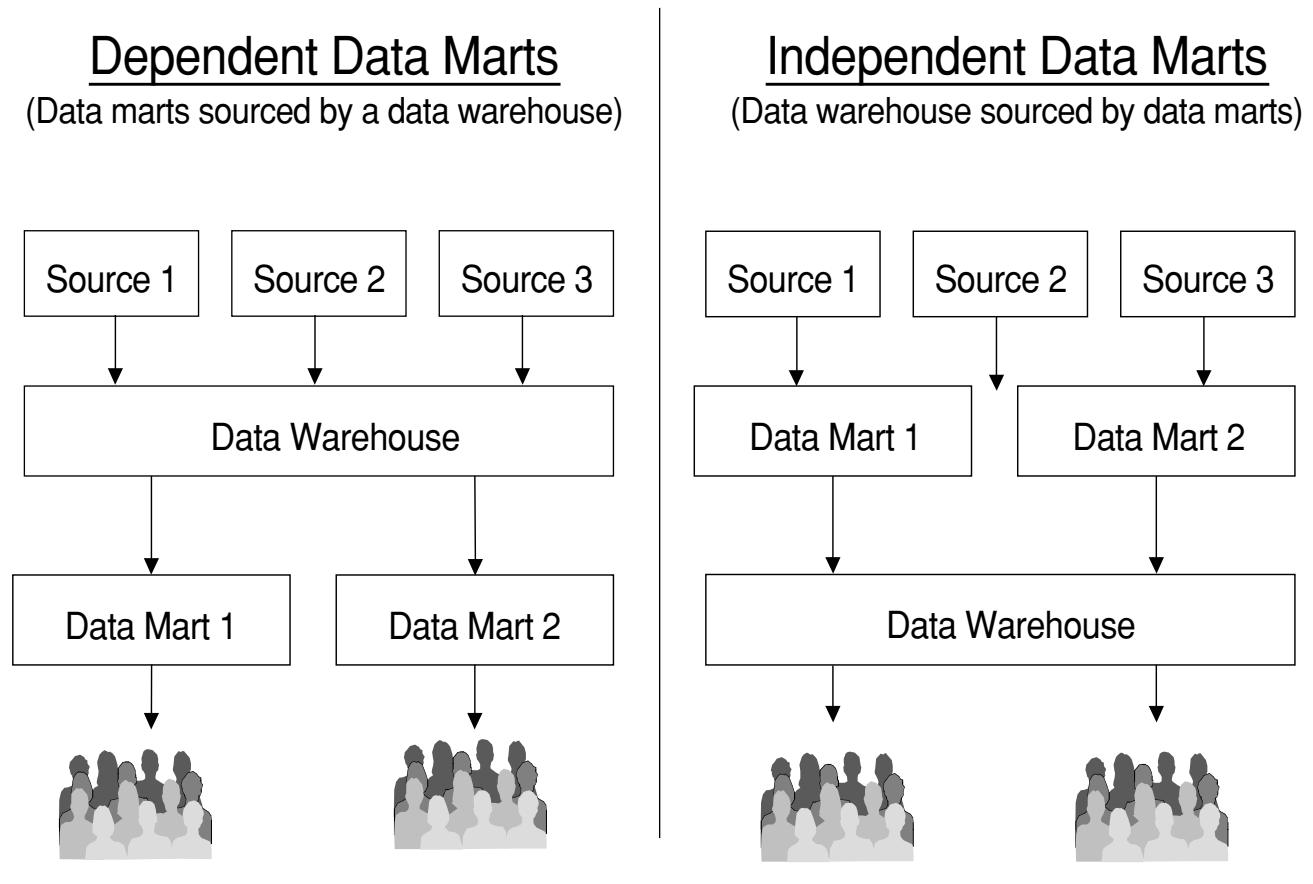
can later populate InfoCubes. Moreover, you can build ODS tables containing document-level details for end-user reporting. Using ODS for data staging or direct user inquiries does not fall in the traditional data warehouse definition.

Since SAP BW 2.0, the ODS is an important component in the SAP BW landscape. The reasons to use an ODS include:

- *ODS is technical in nature*. The ODS can be used as an intermediate data store for data consolidation, cleansing, and staging purposes. ODS can combine information from multiple DataSources (e.g., reconciliation) before storing the data in InfoCubes. Then custom scrubbing and preparation tasks can be performed on a complete extract before data are mapped into InfoCubes. This supports, for example, complex aggregation of data coming from different heterogeneous source systems during data load.

- *For analyses (using queries or the OLAP processor) that need access to more detailed data than what is stored in the InfoCube*. For instance, users may want to drill down from a report to a single document. A request of this type can be satisfied by SAP BW without entering the OLTP system. The ODS is organized as a set of flat tables, each assigned to a single InfoSource, which holds the extracted production data records. These records can be

regarded as pseudodocuments, that is, scrubbed OLTP documents composed of some fields from the original document that have been selected for transfer into SAP BW.

- *Take advantage of the overwrite capability* of the ODS for key figures and non-key characteristics since it is not possible to overwrite the data in the InfoCubes.

OPTIMIZATION

TIP

Queries and Data Staging

You should leverage the ODS to store data to be cleansed or consolidated (overwritten) at the document level rather than storing it in the InfoCube. This will contribute to smaller InfoCube tables and faster reads during query processing.

More details regarding the ODS will be discussed in Chapter 5.

Data Modeling

Data modeling in SAP BW is based on established data modeling theories, techniques, and concepts. The discussion of the data modeling concepts herein is based on

- General data modeling concepts and traditional data modeling
- Specifics that pertain only to SAP BW, for example, benefits, limitations, and salient features

For additional information on data modeling, you should consult the resources on that topic, especially the SAP BW data modeling white papers and accelerators and other resources such as Bill Inmon's book, *Building the Data Warehouse*.[4]

ON THE

EXAM

- Data modeling is one of the most important topics in SAP BW and will produce a large percentage of the test questions.
- You should be very aware and knowledgeable about the features, benefits, and restrictions of the SAP BW data model.

Comparison of the Traditional Data Model and the SAP BW Data Model

Note that there is a high degree of similarities in the terminology and concepts used in SAP BW as compared with traditional modeling. However, when reading the following sections you should be aware of the key differences in the terminology as they may create confusion. The two critical differences in the usage of terminology between SAP and traditional data modeling are dimensions and attributes.

In traditional data warehousing, the term *dimension* is used differently than in SAP BW. The "traditional" dimension maps to several components in the SAP data model:

- Dimension table
- Master table
- Text table
- External hierarchy table
- (SID) Table

In traditional data warehousing the term *attribute* is used differently than in SAP BW. The "traditional" attribute maps to several components in the SAP data model:

- Characteristic (part of dimension tables)
- Navigational attributes (part of master data)
- Display attributes (part of master data)
- (External) Hierarchy node

ON THE EXAM

Note that the SAP BW certification exam is focused around the SAP BW models rather than the traditional data model. Therefore you should pay careful attention to the SAP BW modeling terminology and understand the differences of SAP and traditional data models.

Table 4.2 summarizes the differences in the terminology and concepts between the basic star schema and the extended star schema employed by the SAP Business Information Warehouse.

Data Model

This section provides an overview of data models and their components, including granularity, normalization, relationships, entities, and ERD diagrams.

A *data model* is a conceptual description of data objects, their attributes, and the relationships between them. There are two main types of data models, depending on the data structures to be defined:

1. *Third normal form* is a model in which redundancy has been eliminated.

UNIQUE TO SAP

2. *Star schema/Multidimensional Model (MDM)* is an advanced data modeling technique that allows the analysis of data along several dimensions.

The SAP BW InfoCube data model is based on a multidimensional data model (MDM).

Logical Data Model

A logical data model describes the normalized organization of data based on business requirements, regardless of the way the data are physically implemented.

Table 4.2　　**Comparison of SAP BW and MDM/Star Schema Terminology**

Traditional MDM/Star Schema	SAP BW InfoCube/Star Schema
Cube	InfoCube
Measure	Key figure or KPI
Fact table	Fact table
(Dimension) Attribute	• Characteristic • Navigational attributes • Display attributes • (External) Hierarchy node
Dimension (Table)	• Dimension table • Master table • Text table • External hierarchy • Table • (SID) Table
n/a	Standard business content
n/a	Hierarchies
n/a)	MultiCubes*
n/a	Remote cubes

*The concept of MultiCube is unique to SAP BW. The equivalent in traditional data warehousing may be cube joins.

OPTIMIZATION

TIP

Queries

Data modeling is the factor with the most significant impact on database and query performance. For instance, the wrong data modeling decisions may increase database table size and number of database joins needed in queries. Therefore great care and analysis should be exercised in creating and optimizing the data model.

Physical Data Model

The physical data model specifies how the data will be physically stored and accessed, using the facilities provided by a particular database management system.

ERD (Entity Relationship Diagram)

An entity relationship diagram (ERD) is a high-level data model. It is a schematic that shows all the entities within the scope of integration and the direct relationship between these entities. An example of ERD is provided in Exhibit 4.3.

Exhibit 4.3   **Example of ERD (entity relationship model)**
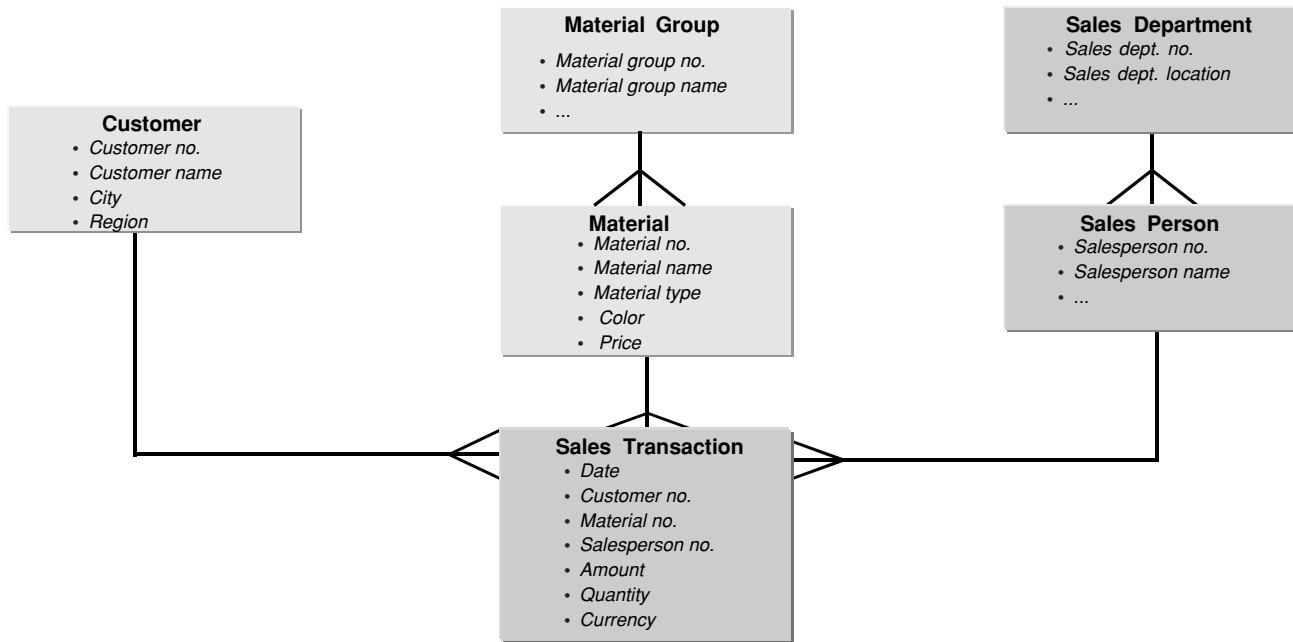
ERM (Entity Relationship Model)
The ERM is a data model based on the entity relation diagram.

Entities
Entities are concrete or abstract objects that can be uniquely identified and for which information is to be stored. For example, customer, material, and sales department are entities.

Strong Entity
A strong entity is an entity that spans the entire data model (e.g., customer, salesperson, and material). Strong entities are the major objects in a data model and other entities are dependent on them. They usually are the intersection entities in the ERD as they have many-to-many relationships with other strong entities (e.g., one customer purchases multiple materials that are sold by multiple salespeople).

Relationship
Relationships represent the association between the objects about which the enterprise is interested in keeping data. A relationship is expressed as a verb or verb phrase that describes the association. There are several types of relationships:
- One-to-one (e.g., a person is associated with one and only one bank)
- One-to-many (e.g., one person is associated with multiple bank accounts)
- Many-to-one (e.g., many customers are associated with one bank)
- Many-to-many (e.g., a person can have relationships with multiple banks and a bank can have a relationship with multiple persons)

Granularity

Granularity refers to the level of detail available for reporting and analysis. For example, we could store data by the month; that would mean that we could only report on the data monthly. However, if data were stored by the day, thus creating greater granularity, we could report on the data daily, weekly, and monthly.

OPTIMIZATION

TIP

<div style="border:1px solid black; padding:10px;">

Queries

The decision on granularity has the biggest impact on database space and performance and always involves a tradeoff:
- Reducing granularity means losing some ability to report at lower levels of detail, but it also means faster system response times.
- Increasing granularity provides greater reporting flexibility; however, it may negatively impact performance because it increases the amount of data that have to be sifted and summarized.

</div>

Normalization

Normalization is an attempt to reduce or eliminate the redundant storage of the same information across more than one database table. Data warehouses are often highly denormalized to provide for improved query performance. On the contrary, OLTP systems such as SAP R/3 are highly normalized to provide for enhanced performance in transaction processing.

Schema

A schema is a representation of the structure of a database. A schema may be expressed in graphic form or in a data definition language (DDL).

Multidimensional Data Modeling and the Star Schema

The second step in the data modeling of a data warehouse is to convert the entity relationship model (ERM) to a multidimensional model. With that conversion, you will go from an often complex and bottom-up relationship model to a simplified and top-down multidimensional model.

Multidimensional Modeling

Multidimensional modeling is an advanced data modeling technique that allows the analysis of data along several dimensions (e.g., analysis of sales revenues by product, customer, store, and over the last four quarters). It is based on measures (e.g., key figures), dimensions, granularity, and aggregation levels.

ON THE

EXAM

<div style="border:1px solid black; padding:10px;">

Understand the differences between traditional multidimensional data models and the SAP BW multidimensional data model.

</div>

MDM (Multidimensional Model)

An MDM is a type of data model based on multidimensional modeling. The most popular MDM is usually represented by a star schema. It could also be represented using:

- A cube (e.g., for MDMs with three dimensions, time, product, and market, each point in the cube contains measurements for a particular combination of product, market, and time)
- A graph representing points in a three-dimensional space (each axis being a dimension)

The overall goals of multidimensional models are to:

- Simplify the model and provide information to the end users in a way that corresponds to their understanding of the business (i.e., show the key performance indicators (KPIs), key figures, or facts from the points of view that influence the end users like sales organization, the product/material perspective, or time). In other words, deliver structured information allowing the end user easy navigation using any possible combination of business terms to illustrate the behavior of the KPIs.
- Offer the basis for a physical implementation that is understandable for the software (OLAP engine) and allows a program to efficiently navigate the database to access the required data.

Star Schema

In business terms, a star schema is a method of organizing information in a data warehouse that allows the business information to be viewed from many perspectives. A basic star schema is a multidimensional data model. It is based on a central fact table surrounded by several dimension tables in the shape of a star (hence the name). Points of the star are dimension tables.

Exhibit 4.4 provides an example of an MDM star schema. Note how the customer dimension and the fact table share a common field, "Customer ID"; thus these two tables can be *relationally* linked via use of that field.

The benefits of the basic star schema include:

- Flexible solution that can be easily adjusted to changing business requirements
- High reporting efficiency

The limitations of the basic star schema include:

- No structured drill-downs can be created.
- Only characteristics of the dimension tables can be used to access facts.
- Support for many languages is difficult.
- There is no link to language descriptions for attributes of dimension tables.
- Secondary indexes to the data are stored as alphanumeric fields in large tables, making data access more difficult.
- If attributes of the dimensions change over time, there is no way to maintain both the old and the new values for the attribute.
- Master data common across business processes must be duplicated in each star schema.
- Hierarchy relationships of the data must be modeled as attributes of a dimension.

Cube

A *cube* is synonymous with a star schema, which means it consists of a fact table and a surrounding group of dimension tables, all of which contain data that logically belong together, and are linked relationally. Cubes are the central objects, upon which reports and analyses are based in multidimensional modeling.

Exhibit 4.4   **Example of MDM Star Schema/Extended Star Schema**

Sales Rep ID

Last Name
Sales Dep.

MDM/Star Schema

Material ID

Material Name
Material Type
Material Group

Sales Org Dimension

Material Dimension

Material
Sales Rep
Time Code ID
Customer ID

Sales Amount
Unit Price
Quantity

Customer ID

Customer Name
City
Region
Office Name

Time Code ID

Year
Fiscal Year
Quarter
Month
Day of the Week

Customer Dimension

FACT

Time Dimension

Source: SAP.

UNIQUE TO SAP

In SAP BW a cube is called an *InfoCube*. More details on InfoCubes are provided in later in this chapter.

Facts and Key Figures

As noted earlier, the star schema is based on facts and fact tables. Facts are data elements from a fact table. This section also discusses key figures, including restricted and calculated key figures, and structures.

ON THE EXAM

You should memorize the restrictions of the fact table in SAP BW and understand the use, benefits, and restrictions (including partitioning) of the three types of key figures in SAP BW (standard, calculated, and restricted).

Fact

A *fact* is a measure that is normally (cumulative) and answers the question "how much?" or "how many?" A fact is referred to as a key figure in the SAP BW extended star schema. Revenues and expenses are examples of typical facts. Examples of noncumulative facts include closing stock price, daily movements, or inventory levels.

A *factless fact* is an artificial fact and does not represent a numerical measurement. Factless facts are used as a counter to record a large number of events (e.g., daily class attendance).

Fact Table

Facts, of course, reside in a fact table. A fact table is the central table in a star schema. It contains key figures and dimension IDs that point to the dimension tables. In a star schema, typically

- The fact table is very large with small dimension tables.
- The fact table has a relatively small number of columns (key figures) and a large number of rows (records) where associated dimension tables tend to have a large number of columns (attributes) and small number of rows.

As will be discussed in further detail in Chapter 5, "Building Blocks," partitioning of the fact table can be implemented.

SAP BW RESTRICTIONS

- Partitioning of the fact table is limited to 0CALMONTH or 0FISCPER.
- After partitioning, physically there will be more than one fact table.

The DBMS limits the size of the fact tables in SAP BW and this cannot be influenced by the SAP BW system, including:
- Minimum of 4 DIM IDs (time, unit, data packet, and 1 custom)
- Maximum of 16 DIM IDs (time, unit, data packet, and 13 customs)
- Maximum of up to 233 key figures, computed by 255 − 6 (no access) −16 (characteristics).

Key Figure

A key figure is a data element from a fact table and usually represents data that are numeric in nature or can be measured, such as revenues and gross profit (as opposed to a characteristic, which is more descriptive in nature):

- Key figures are also referred to as facts in traditional MDM/star schema.
- Key figures correspond to the data fields in a fact table.
- An artificial key figure can be used when a counter is needed (factless fact).
- For query performance optimization, key figures can be precalculated (during load) instead of created on-the-fly (calculated key figure).
- Key figures can be restricted by one or more characteristics in the queries (restricted key figures).

SAP BW RESTRICTIONS

- Key figure InfoObjects cannot be authorization relevant.
- There is a maximum of 233 key figures per InfoCube/fact table computed by 255 – 6 (no access) –16 (characteristics).

In SAP BW, two types of key figures can be created (in BEx Query Designer) based on the standard key figures (from the InfoCube): calculated key figures and restricted key figures.

1. *Calculated key figure*. A calculated key figure is data that are computed prior to, and in anticipation of, ad-hoc requests.
   - Calculated key figures can be based on key figures available in the query, constants, formulas, and variables.
   - Various functions (data, mathematical, percentage, etc.) can also be used to manipulate the calculated key figure.

OPTIMIZATION

TIP

Queries

Since attributes are stored in attributes tables that are physically kept outside of the InfoCube, precalculated key figures should be used during the data load when possible rather than creating on-the-fly key figures.

Data that are not precalculated must be calculated at query time. Therefore precalculated key figures improve query performance.

Benefits of calculated key figures include:
- Calculated key figures can be created for a specific query, or can be created at the InfoCube level so that all queries written against the InfoCube can use the calculated key figure.
- Contrary to a standard key figure, the data for calculated key figures are not physically stored in the fact table/InfoCube.

SAP BW RESTRICTIONS

- Although maintaining the key figures that include calculations in the database can enhance system performance, a subsequent change in the formula for the calculation could render the key figures obsolete and lead to erroneous reporting. One must always be cognizant of this exposure.
- Precalculation usually results in faster response to queries but at the expense of increased storage and higher InfoCube update times.

UNIQUE TO SAP

2. *Restricted key figures*. Restricted key figures are key figures that are associated with an InfoCube and used for reporting purposes. They are restricted (filtered) by one or more characteristics such as incoming orders for selected time periods, sales for selected materials, and so on.

A benefit of restricted key figures is that they allow users to focus the query results on certain values. A restricted key figure can be used, for example, to compare sales for the current month versus the same month the previous year: you could define the query with 2 sales columns, one of which is restricted by current month of this year and the other restricted by the same month last year.

SAP BW RESTRICTIONS

- Using restricted key figures, the restriction of the key figure(s) can be based only on the characteristics.
- With restricted key figures, the value of the key figure itself cannot be restricted using a restricted key figure. In that case you should use, for instance, a condition or exception report.

Structures

UNIQUE TO SAP

Structures are reporting objects that are related to InfoCubes and based on key figures. Having defined a number of structures (including calculated and restricted key figures) you can save and reuse them in other queries, rather than having to redefine them each time. They are used as part of a query and are associated with an InfoCube. Structures are freely definable evaluation objects that consist of combinations of characteristics and basic key figures (e.g., as calculated or restricted key figures) in the InfoCube. For example, a structure can be used to define planned and actual incoming orders. The structure planned/actual incoming orders can be reused in a query without having to redefine it.

The key benefit of structures is the automation of changes for complex structures. (If you change the structure, every query that incorporates that structure will be changed automatically.)

Complex structures can be saved as:

- *Global structure*. To be used in any query of an InfoCube if the change to the structure should affect all queries
- *Local structure*. To be used if a change to the structure should affect only one query.

Dimensions and Characteristics

The dimensions and characteristics are key components of a multidimensional model/star schema. The dimensions represent the points in the star.

ON THE EXAM

- Be knowledgeable about dimensions and characteristics. Know the special types of dimensions in SAP BW (degenerate, partitioning, categorical, slowly changing, and reserved) and understand when they should be used.
- You should memorize the restrictions of the SAP BW model in terms of the maximum number of dimensions (16) and characteristics (248).

Dimension

UNIQUE TO SAP

A *dimension* is a textual description of the dimensions/features of the business. The dimension answers the questions "who? what? when?" For example, the dimensions of a product may include product name, brand name, size, and packaging type. Dimensions are stored in *dimension tables*.

As a value added to other data warehouses, SAP has predefined three dimensions, *time, unit* and *package*, as reserved dimensions for the InfoCubes in SAP BW.

SAP BW RESTRICTIONS

It is important to note that the SAP BW InfoCube/star schema is limited to a minimum of 4 and a maximum of 16 dimension tables:
- Three standard/reserved dimensions (time, packet ID, and unit)
- At least one dimension to be defined by the SAP BW administrator
- The SAP BW system administrator can create up to 13 dimension tables (computed by 16 – 3 reserved).

NOTE

In the data warehousing community, sometimes each attribute/characteristic is called a dimension. This creates a potential misunderstanding when saying that the SAP BW schema can have a maximum of 16 dimensions and 3 of them are used internally.

This sounds very limiting. Using this definition of a dimension there are 13×248 dimensions possible with SAP BW, plus the dimensions defined by the navigational attributes.

Therefore the term *dimension* will be used in this book to refer to dimension tables, and characteristics will be used as the content of dimension tables.

A dimension of special interest in SAP BW is the *Unit dimension*. A unit fixes the unit of measures and currency characteristics needed to describe the key figures. U.S. dollar,

gallon, and meter are examples of units. In SAP BW, *Unit* is one of the three reserved dimensions.

Queries

Key figures of type *Unit* need to access the *Unit* dimension table during queries, which may cause degradation in system performance. Therefore, for query performance, key figure InfoObjects of type Number or Integer should be used whenever possible (unless you really plan to do currency/unit conversions in the queries).

- *Reserved dimensions*. In SAP BW there are three standard/reserved dimensions that are predefined by SAP (they exist whether they are used or not):
    - *Time*. Holds the time characteristics needed for analysis
    - *Data packet (packet ID)*. To identify discrete packets of information loaded into the InfoCube (this is needed to delete, reload, or maintain packets individually)
    - *Unit*. Contains the unit of measures and currency characteristics needed to describe the key figures properly.
- *Categorical dimensions*. A categorical dimension is an artificial attribute used to categorize another dimension (e.g., income bracket, age bracket). Categorical dimensions are common in a retail industry with thousands of customers. In that case, the queries are usually based on the income bracket categorical dimension rather than the customer name dimension.

Queries

You should use categorical dimensions for database optimization for very large dimensions. Categorical dimensions can reduce the number of records that need to be dealt with in the queries.

- *Slowly changing dimension*. A slowly changing dimension is a dimension for which value changes over time and needs to be tracked historically. Examples of slowly changing dimensions include product name, department, customer address, product price, and so on. A benefit of slowly changing dimensions is that they keep track of changes over time (track history). For historical reporting, slowly changing dimensions can be reported based on four scenarios:
    1. Report the historical truth (at the time of the transaction).
    2. Report at the time of the query.
    3. Compare existing versus unchanged.
    4. Report at any point in time.

Depending on the history reporting scenario that is needed, the dimension needs to be modeled accordingly. The following example is provided for tracking product price changes over time:

UNIQUE TO SAP

- ◆ *To report historical truth* (e.g., the product price at the time of sales). Model the product price as a characteristic on the material dimension.
- ◆ *To report the price at time of reporting.* Model the product price as a time-independent navigational attribute of material, or a time-independent hierarchy of material number.
- ◆ *To report only changes in the price* (compare existing versus unchanged). Model the product price as a time-dependent navigational attribute with two additional attributes to define the dates to be used for comparison (e.g., date from and date to).
- ◆ *To report the price at any point in time.* Model the product price as one of the following:
  - · A time-dependent navigational attribute of material or
  - · A time-dependent hierarchy of material
  - · A hierarchy with different user-defined versions
  - · A hierarchy with time-dependent structures

OPTIMIZATION TIP

Queries

Time dependencies require additional updates to InfoCubes and database reads during end user's query, which will use additional system resources. Therefore, time dependencies should only be used if necessary to meet the business analytical needs.

- ● *Degenerate dimensions (line item dimensions or big dimensions).* A typical dimension table should have only a small number of distinct values (traditionally fact tables should have a large number of records when compared to the dimension tables). A degenerate dimension is a dimension table with a very large number of values that causes the dimension tables to become very large and larger than the fact table. A degenerate dimension is modeled in BW by a dimension key attribute that has no corresponding dimension table. An example of a degenerate dimension is document control numbers, such as order numbers, invoice numbers, and bills of lading.
- ● *Partitioning dimensions.* A partitioning dimension is an artificial dimension and the equivalent of the versions in LIS in the SAP R/3 world. A partitioning dimension is used in a reporting scenario where the comparison of the same key figure is needed (e.g., actual, planned, forecast). Note that table partitioning is not related to partitioning dimensions.

  A partitioning dimension can be used, for example, to compare actual sales quantity and units (by sales area and customer) to forecast and planned sales. A new characteristic named value type can be created with three values (actual, planned, forecast) to support the same key figures (quantity and unit).

OPTIMIZATION

(star/lightbulb icon)

TIP

Queries

When the requirements include a reporting scenario where the comparison of the same key figure is needed (e.g., actual, planned, forecast) you should use a partitioning dimension to increase the flexibility of the queries and increase the performance by reducing the number of key figures in a fact table and the fact table size.

If you do not create partitioning dimensions, the number of key figures will double or triple (e.g., for actual, forecast, and planned) and the fact table will be sparsely populated.

UNIQUE TO

(SAP burst icon)

- *Dimension table*. A dimension table is a table linking the fact table and a group of similar characteristics. For example, a customer dimension table may contain three characteristics: customer name, address, and sales organization. There will be one customer dimension record for each unique combination of these three values. For example, each record in a customer dimension may represent a specific customer.

Each row in a dimension table in SAP BW is made of one DIM ID and an SID (surrogate key) for each characteristic of the dimension. The SID is the linking key value found in the fact table. (See "Keys, IDs, and Pointers" later in this chapter for more details on SID, DIM ID, and surrogate ID.)

SAP BW RESTRICTIONS

(prohibition icon)

- Each dimension table must have 1 DIM ID and can have up to 248 characteristics (InfoObjects), computed by 255 – 6 (no access) – 1 (dimension ID).
- There are a maximum of 16 dimension tables per InfoCube: 3 reserved for the SAP BW system (time, unit, and data packet) and 13 custom dimension tables.
- There is a minimum of 4 dimension tables per InfoCube (3 reserved plus at least one user-defined dimension).

Characteristic

In traditional data modeling, a characteristic is a field that allows activity to be categorized, such as by company code, product, customer group, fiscal year, period, or region. Characteristics correspond to the key fields in a fact table and can be used to sort, select, and subtotal in queries. It is important to note that characteristics are descriptive in nature and are not normally additive (as opposed to key figures).

UNIQUE TO

(SAP burst icon)

In SAP BW, attributes located in the dimension tables are called *characteristics*. In SAP BW, there are three special characteristics (reserved internally): time, unit (includes currency), and data package.

Similarly to other data warehouses, SAP BW offers four possible data types for characteristics:

1. CHAR (character)
2. NUMC (numeric character)
3. DATS (date)
4. TIMS (time)

SAP BW RESTRICTIONS

- There can be up to 248 characteristics per dimension table.
- The length of a characteristic value can be from 1 to 60.
- Characteristics in SAP BW may have a compound key and can refer to other characteristics.

Master Data and Attributes

In multidimensional modeling, master data are not part of the model. They exist outside of the multidimensional structure. One of the key advantages of the SAP BW architecture is that master data are shared across InfoCubes (extended star schema), which provides for consistency of master data across InfoCubes.

ON THE EXAM

- Understand the benefits of the SAP BW model in regard to its implementation of master data and the difference between characteristics and attributes.
- Memorize the two types of attributes and their restrictions.

A typical data warehouse contains the following three types of datasets:
1. *Transaction data*. Transaction data are transaction (business)-specific data that are short-lived and assigned to certain master data (e.g., orders transaction data).
2. *Master data*. Master data refers to the data that remain unchanged over an extended period of time. Master data contain information that is always used in the same fashion. For example, the master data of a customer contain name, address, and telephone information, and so on. The master data of a user in the SAP system contain the user's name, authorizations, default printer, and so on.
3. *Metadata*. Metadata are central to the data warehouse concept and the key to using information in a data warehouse. Metadata are data about the data and provide the description of the structure, content, keys, indexes, and so on, of the data in the data warehouse. They are used to describe the source, history, and many other aspects of data. For instance, metadata may describe the account number as a nine-digit number of INTEGER type. Metadata allow information stored in SAP BW to be used effectively for reporting and analysis, and to ensure that all users have one version of the truth.

In SAP BW, master data consist of the following three types:

1. *Attributes*. The details behind the characteristics
2. *Hierarchies*. Hierarchies will be discussed in further detail in the next section
3. *Texts*. Language specific textual description of the master data elements

In traditional data modeling, an attribute is a field used to describe the data that the enterprise is interested in keeping about objects. Attributes can be considered the detail behind a characteristic. For example, attributes for a car include make, model, year, and body style.

UNIQUE TO

In SAP BW, attributes refer to the master data fields. The key benefit of the SAP BW architecture is that each attribute table is shared across InfoCubes (this is transparent to the user). Therefore attributes can be shared across InfoCubes. Attributes can be time dependent or time independent.

There are two types of attributes in SAP BW, based on reporting needs:

1. *Display attributes*. Used only to list additional information for reports and queries; can only be listed in reports together with their characteristic (no navigation ability)
2. *Navigational Attributes*. Used for navigation (such as drill-down, up, across, or within) in queries and reports (They behave like a characteristic from the query point of view.)

OPTIMIZATION

TIP

Queries

Since attributes are stored in attributes tables rather than dimension tables, links to the fact table require additional database processing. Therefore navigational attributes are not as fast as characteristics in a dimension table.

SAP BW RESTRICTIONS

- Changes for attributes are available only after the "data change aggregate update" program has been run (more details on that topic to be discussed in later sections). This is needed even if there are no aggregates associated with the navigational attributes.
- Using navigational attributes, changes in the data do not require realignment of the fact table.
- Display attributes or time-dependent navigational attributes cannot be used to build aggregates.

For more details on aggregates, refer to Chapter 6, "Reporting."

One salient type of attribute is *status attribute*. Status attributes are attributes that describe the status of a characteristic such as the promotion status of a product.

OPTIMIZATION

TIP

Queries

Status attributes that change frequently may create a large number of records in a dimension table. Therefore status attributes that change frequently should be placed in a separate dimension table.

Dimensional Data Warehouse Design Decision Points

The nine decisions points in designing a dimensional data warehouse are to:
1. Identify the fact table (intersection entities).
2. Identify the dimension tables (strong entities).
3. Identify the attributes with complete descriptions and proper terminology (attributes of the entities).
4. Choose the grain of each fact table.
5. Identify the facts including the pre-calculated facts.
6. Determine how to track slowly changing dimensions.
7. Define the aggregations, query modes, and physical storage decisions.
8. Decide on the historical duration of the database (archiving).
9. Make a decision on the urgency with which the data are extracted and loaded into the data warehouse (time frame for loading).

SAP Data Modeling Value-Added Proposition

SAP BW leverages general data modeling and data warehousing theories with some unique and value-added techniques and terminology, including:
- SAP BW extended star schema, which allows the sharing of master data
- InfoCubes, MultiCubes, Remote Cubes
- Hierarchies
- SAP BW entities/objects (InfoObjects)
- The SAP BW standard business content

ON THE EXAM

- A number of questions will test your knowledge of SAP BW data modeling specifics and terminology.
- You should be especially familiar with the salient features, benefits, and restrictions of the SAP BW extended star schema and the InfoCube types.

SAP BW's Data Model (Star Schema)

SAP BW's star schema is based on the extended star schema (aka "snowflake" schema).

UNIQUE TO

SAP

SAP BW RESTRICTIONS

SAP BW's Star Schema

In SAP BW a star schema is a dataset consisting of one fact table and several dimension tables. An example of SAP BW extended star schema is provided in Exhibit 4.5.

- Maximum of 1 fact table per InfoCube
- Maximum of up to 16 dimension tables (containing different characteristics) per InfoCube
- Minimum of 4 dimension tables (3 system reserved plus at least 1 user defined) per InfoCube
- Maximum of 248 characteristics per dimension table
- Maximum of 233 key figures per InfoCube
- The SAP BW star schema does not contain master data, hierarchy, or texts (these data are stored outside of the star schema and are readily available for querying).

Exhibit 4.5   **SAP BW Star Schema**
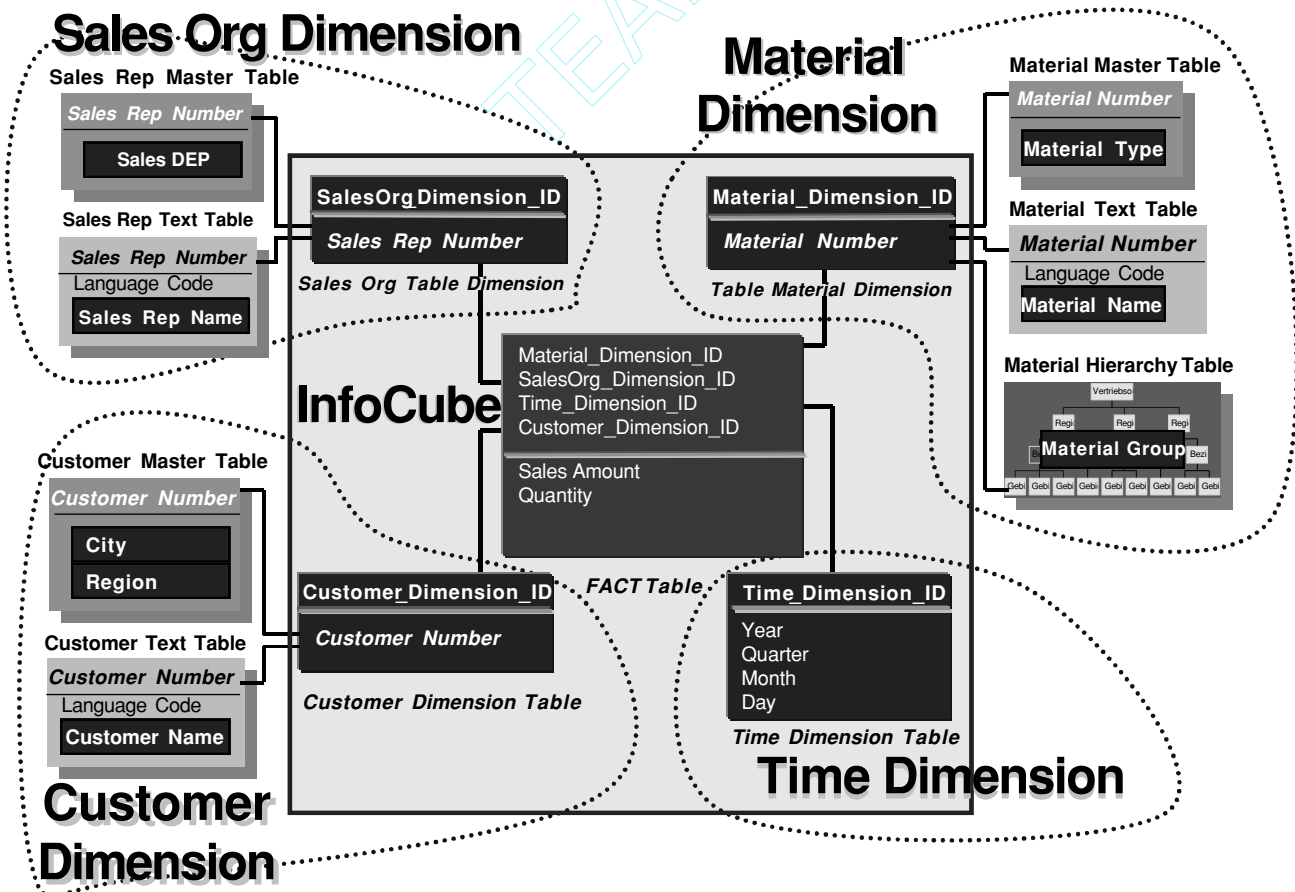
Benefits of extended star schema over basic star schema include:

- The last three limitations of the basic star schema (see page 42) do not exist in the extended star schema.
- Access to master data tables and their associated fields (attributes) can be added.
- Hierarchy tables are external to the schema for structured access to the data.
- Master data are consistent across queries (an attribute table is shared across InfoCubes; this is transparent to the user).
- Text tables are available with extensive multilingual descriptions.

Extended Star Schema

The extended star schema is the SAP version of a star schema with one or several attribute tables outside the InfoCube. In the extended star schema, attributes are removed from the dimensions and placed outside the InfoCube in master data tables.

The terms *InfoCubes*, *dimensional analysis*, *star schema*, and *data marts*, depending on their context, are essentially referring to the same concept—how data are structured within SAP BW tables.

You will find that SAP has adapted many terms and building blocks of data modeling and data warehousing in SAP BW. These terms usually start with "Info" (e.g., InfoCube, InfoObject, InfoSource, InfoCatalog, etc.).

NOTE

InfoCubes

InfoCubes are a unique implementation of a multidimensional model in SAP BW. This section will cover the three types of InfoCubes found in SAP BW.

ON THE EXAM

- You should memorize the three types of InfoCubes along with their use and limitations, and the key statistics of the SAP BW InfoCube/star schema, especially:
  - Maximum number of characteristics (248) and DIM ID (1) per dimension table
  - Minimum (4) and maximum (13 + 3 = 16) number of dimension tables per InfoCube
  - Maximum number of key figures (233) per InfoCube
  - One fact table per InfoCube

UNIQUE TO SAP

InfoCube

InfoCubes are SAP's enhanced version of the cubes used in traditional star schema models. In SAP BW the InfoCube is based on the extended star schema model.

InfoCubes are the central objects on which reports and analyses are based in SAP BW. As described in Exhibit 4.6, InfoCubes are used to store only transactional data (e.g., no master data or metadata).

Exhibit 4.6   **SAP BW InfoCube**
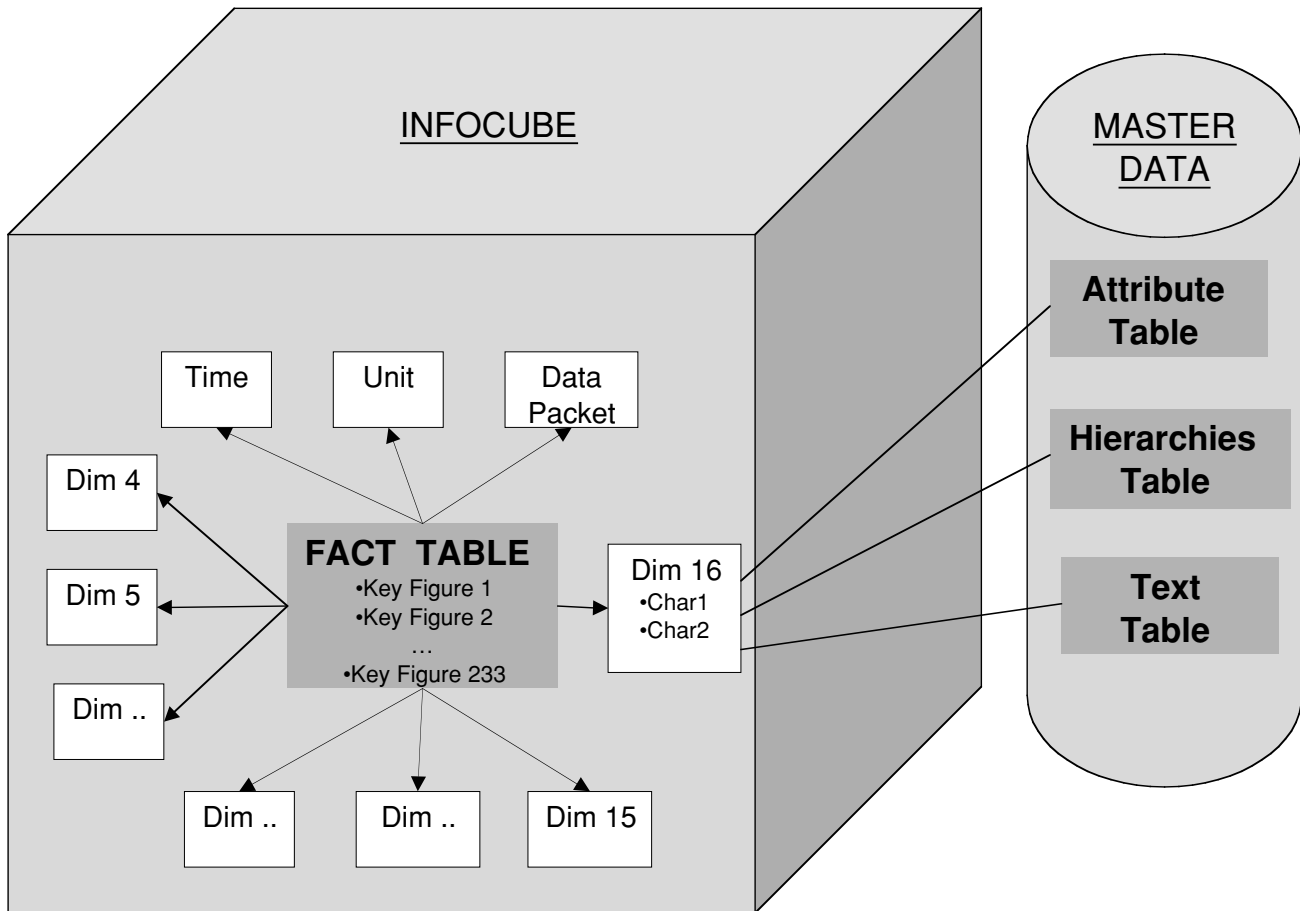
Tip: Transaction LISTSCHEMA can be used to clearly see all tables related to an InfoCube as well as their relationships and contents.

There are four key InfoCube types in SAP BW:

1. *Basic Cube (star schema)*. Combination of 1 fact table and up to 16 dimension tables (standard InfoCube)
2. *MultiCube*. Joining of several Basic and/or Remote Cubes (special implementation of the join of one or more basic InfoCubes)
3. *DemoCube*. SAP-supplied InfoCube (as part of the business content) to enable a complete data warehouse scenario to be implemented for demonstration and evaluation purposes (prepackaged intellectual capital)
4. *Remote Cube*. InfoCube whose transaction data are not managed in SAP BW but managed in a remote system (to access remote OLTP systems)

**SAP BW
RESTRICTIONS**

- There are no limitations to the number of InfoObjects and number of InfoCubes in an SAP BW instance, or the number of reports per InfoCube.
- There is a maximum of 16 dimension tables per InfoCube (3 from the system; time, unit, and data packet, and 13 customs dimension tables).
- There is a minimum of 4 dimension tables per InfoCube (3 from the system and one custom).
- InfoCubes/schemas can have more than one aggregate.

The available functions for InfoCube maintenance (using RNSIDs) include:
- *Roll-up*. Change of InfoCube forwarded to aggregates
- *Compression*. Delete the request Set IDs to save disk space.
- *Rebuild*. From the request set IDs that are already uploaded

InfoCube naming conventions are:
- SAP-owned InfoCubes start with "0" (zero).
- Customer-defined InfoCubes (customer range) name begins with letters (A–Z).

MultiCubes and Remote Cubes are special implementations of InfoCubes unique to SAP BW and discussed next in further detail.

**UNIQUE TO
SAP**

MultiCube
A MultiCube is a higher-level InfoCube that gathers together data from several basic InfoCubes and/or remote cubes. Benefits of MultiCubes include:
- *Smaller tables and less redundancy*. A MultiCube does not contain any data (data are in the original Basic and/or Remote Cubes).
- *Less complex data model and InfoCubes*

An example of a MultiCube is pictured in Exhibit 4.7. The MultiCube is built based on data from three InfoCubes: Sales, Billing, and Delivery.

**SAP BW
RESTRICTIONS**

- A MultiCube cannot gather data from ODS objects.
- A MultiCube cannot gather data from InfoCubes that do not share at least one characteristic. Therefore the Basic Cubes involved in the MultiCube should share at least one characteristic.
- Danger of incorrect reports exists if the same key figure exists in two of the Basic Cubes used to build the MultiCube.

Exhibit 4.7   **SAP BW MultiCube Example**

Cube to Use	Queries
1	Delivery Queries
2	Sales Queries
3	Billing Queries
4	Sales, Billing, and Delivery Queries

OPTIMIZATION

TIP
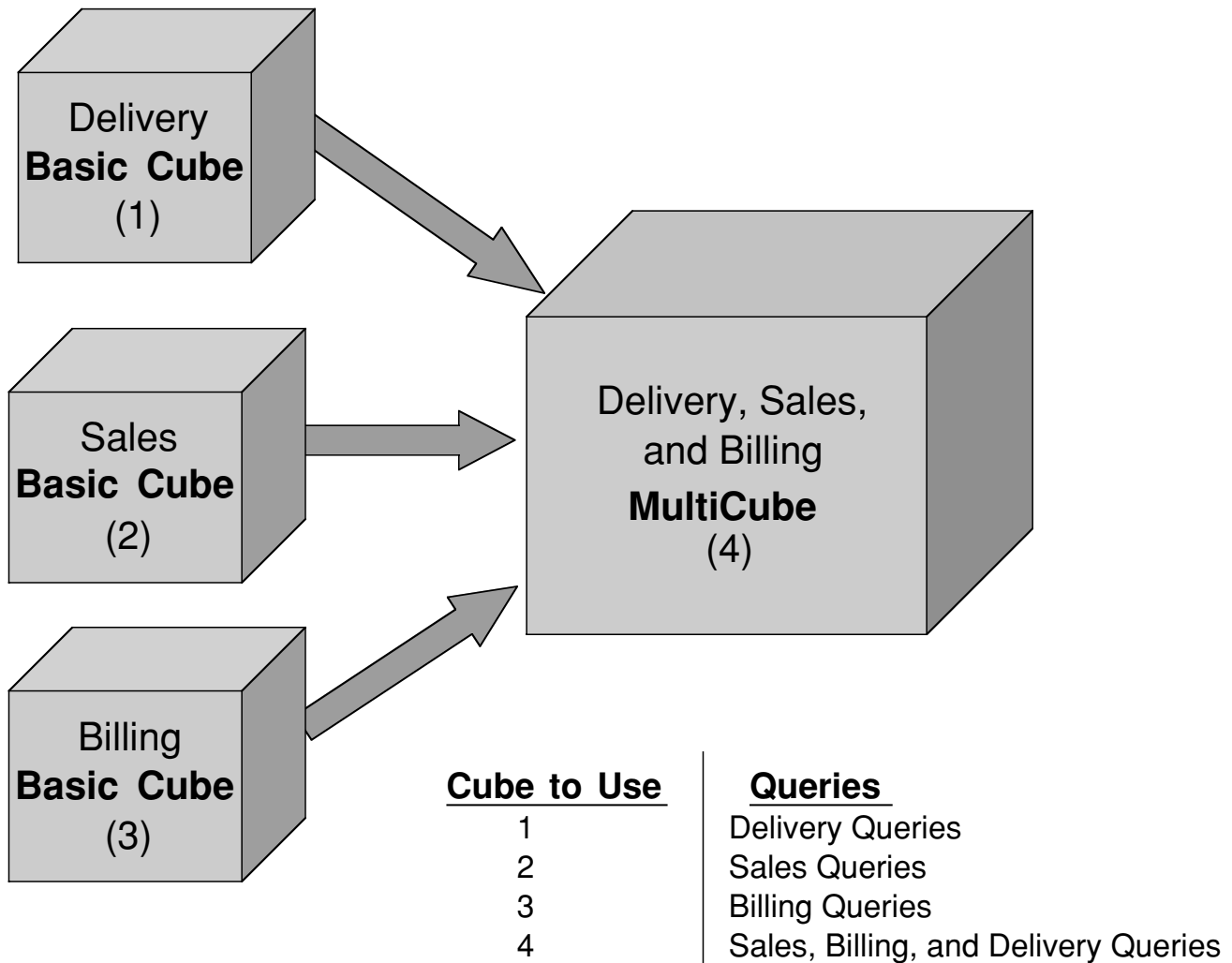
Queries

Since they do not store data, MultiCubes give you additional reporting flexibility without consuming additional system resources.

The decision to create a MultiCube should be based on up-front data modeling and does not impact performance.

NEW

In SAP BW 3.0, MultiCubes have been replaced and are now called "Multi-Providers." Multi-Providers are groupings that can get data from other objects for reporting purposes (BEx).

Many of the limitations of MultiCubes have been addressed with Multi-Providers. As opposed to MultiCubes, which could get data only from InfoCubes, Multi-Providers allow more flexible reporting and can get data from a variety of virtual and physical data stores:

- Physical data stores:
  - ◆ Basic Cubes
  - ◆ InfoObjects (characteristics with attributes or texts)
  - ◆ ODS objects that have the indicator for BEx reporting
- Virtual data stores:
  - ◆ InfoSets
  - ◆ Remote Cubes
  - ◆ SAP Remote Cubes
  - ◆ Multi-Providers

UNIQUE TO SAP

Remote Cube

A Remote Cube is also called a *Virtual Cube*. It is an InfoCube whose transaction data are not managed in SAP BW but in a remote system. Benefits of Remote Cubes are:

- They do not store data in SAP BW.
- Only the structure of the Remote Cube is defined in SAP BW.
- Remote cubes are SAP's alternative to OLTP reporting tools in SAP BW.

SAP BW RESTRICTIONS

Remote Cubes should be used in special circumstances because of several limitations:

- Remote Cubes suffer performance limitations (typically Remote Cube has better performance if there is a small amount of data in the remote cube).
- Remote Cubes are limited to one dimension (defaults).
- Remote Cubes provide limited user access (more users = more performance issues).
- Remote Cubes may create issues in data consistency (real time)

There are two types of Remote Cubes in SAP BW:

1. *SAP Remote Cubes*. The SAP Remote Cube is a Remote Cube that allows the definition of queries with direct access to transaction data in other SAP systems.
2. *General Remote Cubes*. A general Remote Cube is a Remote Cube that allows the definition of queries with direct access to transaction data in source systems other than SAP.

OPTIMIZATION TIP

Queries

When using Remote Cubes, you should restrict their access to a limited number of users and limit the scope of data for maximal query performance.

SAP BW InfoObjects

InfoObjects are the basic components of the SAP BW star schema:

> **ON THE EXAM**
>
> You should memorize the two types of InfoObjects (key figures and characteristics) and their three versions (A, M, D).

An InfoObject is a generic term for SAP BW business evaluation objects. InfoObjects are part of the SAP BW metadata repository. They describe the properties (technical definition and business logic) of the application field. Table 4.3 provides examples of InfoObjects.

There are two types of InfoObjects:

1. Characteristics (descriptive information, e.g., customer, material, sales organization)
2. Key figures (quantitative information, e.g., amount, count, quantity)

> **SAP BW RESTRICTIONS**
>
> Key figure InfoObjects cannot be authorization relevant.

The naming convention is SAP-supplied InfoObjects start with "0" (like all other technical names in SAP-delivered business content, e.g., 0REVENUE).

InfoObjects can exist in three versions in SAP BW:

1. *D: SAP-delivered version*. SAP-delivered (D) InfoObjects are reserved SAP objects. They can be used as templates or copy in the active SAP BW client.
2. *M: Revised version*. Revised (maintenance) version (M) is for objects that are under revision. They could be a copy of an SAP-delivered InfoObject under an active SAP BW client or a new InfoObject being defined by the customer. Before they can be used, revised objects have to be transferred to an active object and then activated.
3. *A: Active version*. Active (A) InfoObjects are InfoObjects that meet all specified rules and are ready for use in the SAP BW active client.

Activation is a process that makes revised objects available at runtime. Upon activation a runtime object is generated and can be accessed by application programs and screen templates.

Table 4.3   **Example of SAP BW InfoObjects**

InfoObject	Description	Attributes	Description
0COMP_CODE	Company code	0CHRT_ACCTS 0COMPANY 0COUNTRY	Chart of accounts Company Country
0DEBITOR	Customer number	0IND_CODE_1 0INDUSTRY 0CITY	Industry code 1 Industry key City

In SAP BW, all dependent objects need to be activated before they can be used, including InfoObjects, InfoCubes, transfer rules, communication structures, and so forth. Additionally, custom InfoObjects can be created (e.g., to define a custom data file).

UNIQUE TO SAP

InfoObjects are organized in two areas of the SAP BW Administrator Workbench (AWB):

1. *InfoArea.* An InfoArea is a folder in the AWB used to store and organize related InfoObjects.
2. *InfoObject Catalog.* An InfoObject catalog is a folder in the AWB containing related InfoObjects. There are two types of InfoObject catalogs:
   1. Characteristics
   2. Key figures

In *compounding*, a field or another object is attached to an InfoObject. A compounding characteristic is when the object's definition is incomplete without the definition of another characteristic. Some examples of compounding are:

- *CO.* Cost center has a compound object controlling area.
- *MM.* Storage location has a compound object plant.

NOTE

A compound field is similar to a superior organizational field in SAP R/3.

Hierarchy

SAP BW has a unique hierarchy implementation. *Hierarchies* are tree-like structures on characteristic's domain (e.g., ship to and bill to). In SAP BW, hierarchies are a type of master data.

Key benefits of the SAP BW implementation of hierarchies are that:

- Hierarchies are stored in a class of master data tables (/H***), which are similar to master data and can therefore be used and referenced in all of the InfoCubes within an SAP BW instance.
- You can define multiple hierarchies against one single characteristic.
- SAP BW supports multiple versions of a hierarchy, and internal and external hierarchies.

SAP BW RESTRICTIONS

- Changes for hierarchies are available only after the "data change aggregate update" program has been run. This is true even if there are no aggregates associated with the hierarchies.
- Time-dependent hierarchy structures are not allowed in aggregates.

OPTIMIZATION TIP

Queries

When using hierarchies you should filter out the 'Not assigned' node in the hierarchy. Often the user does not notice that all nodes are included in the output (even the ones that are not needed or blank), but it slows down the query result because a lot of useless data is being selected.

UNIQUE TO SAP

Several types of hierarchy exist in SAP BW, such as:
- Time-dependent hierarchies
- Version-dependent hierarchies
- Balanced hierarchies
- Unbalanced hierarchies (a hierarchy with different levels of depth, e.g., organizations with employees)

A hierarchy can be created using three methods:
1. Import from flat file
2. Manual creation in BW
3. Import from SAP R/3 (preferred option)

Two components of interest for hierarchies are:
1. *Leaves*. A leaves is a characteristic value and represents the last level of a hierarchy. The SID value for a leave is a positive random integer.
2. *Node*. A node is a set of leaves in a hierarchy. The SID value for a node is a negative random integer.

SAP BW Business Content

Another value proposition of SAP BW is the *standard business content*. The standard business content is a predefined analytical application model that is part of the SAP BW software. It is free intellectual capital material provided by SAP based on over 700 best practices to accelerate the implementation of SAP BW. The business content is part of the SAP BW metadata and its content is role and industry based.

The business content can be browsed via the metadata repository. A content wizard is provided to manage the business content. Refer to the SAP BW help files to list all InfoCubes, queries, and business content objects.

ON THE EXAM

Questions on the business content are high level and focus on the types of objects it can contain, its benefits, and how you can leverage it for data modeling.

In SAP BW 2.1C, preconfigured objects are categorized by the following:
- Business processes and applications
- Roles
- Scenarios (repetitive, discrete, continuous manufacturing)
- Industries

UNIQUE TO SAP

In SAP BW 2.1C, the business content includes hundreds of components:
- SAP R/3 extractor programs
- DataSources
- InfoObjects
- InfoSources
- Transfer and communication structures

- InfoCubes
- Report definitions
- Queries
- Key performance indicators (KPIs)
- Roles
- ODS objects
- Workbooks

As SAP continues enhancing its functionality, you will observe additional classes of business content objects as part of its business content. For example, in SAP BW 3.0, you will see several new classes such as CRWB (see the technical name for this class in Exhibit 4.8) for Crystal Reports, Web templates, and data mining).

Exhibit 4.8   **Business Content in SAP BW 3.0A**

AWB	Edit	Goto	Extras	System	Help

Administrator Workbench: Business Content

Collected | Delete | CTO | Conversion | BEx | Object

	All Objects According to Type	Technical
Modeling	▷ InfoArea	AREA
Monitoring	▷ Application	APCO
Reporting Agent	▷ InfoObject Catalog	IOBC
Transport Connection	▷ Role	ACGR
Documents	▷ Workbook	XLWB
Business Content	▷ Query Elements	ELEM
	▷ InfoSet Query	AQQU
Data Targets by InfoAreas	▷ Crystal Report	CRWB
InfoObjects by Applicaton Component	▷ Web Template Name	TMPL
InfoSources by Application Component	▷ Web Item	ITEM
Roles	▷ Query View	QVIW
Object Types	▷ MultiProvider	MPRO
Objects in BW Patch	▷ InfoCube	CUBE
Transport Request	▷ Aggregate	AGGR
Packages	▷ InfoObject	IOBJ
	▷ InfoSet	ISET
	▷ Classic InfoSet	AQSG
	▷ ODS Object	ODSO
	▷ Update Rules	UPDR
	▷ InfoSource	ISTD
	▷ Transfer Rules	ISMP
	▷ Source System	LSYS
	▷ DataSource / FileSource	ISFS
	▷ InfoPackage Group	ISIG
	▷ InfoPackage	ISIP
	▷ Process Chain	RSPC
	▷ Reporting Agent	REPA
	▷ Report-Report Interface	RRIF
	▷ Currency Translation Type	CTRT
	▷ Data Mining	MINI

Source: SAP.

In addition, the standard business content can be enhanced to provide additional functions. More details will be provided in Chapter 7, "Extraction."

The available functions in the business content include:
- Off-line documentation
- Where-used lists
- DemoCubes with flat files for upload

The benefits of the SAP BW business content include:
- Immediate access to interpreted information (ready-to-use reports, data models, extractors, transformations)
- Consistency of operational processes with management processes (for business professionals at all levels across all functions and easily extensible)
- Validated and comparable information (rich set of standard KPIs and best practice models from 800+ installations)

Keys, IDs, and Pointers

Keys, IDs, and pointers are used internally in SAP BW to logically and physically link database tables and manage data load and aggregation. This process is generated internally by the database management system and is transparent to the end user.

> You should understand the roles of the different keys (primary, foreign, surrogate), IDs (DIM ID, SID), pointers (read pointer and RNSID), and indexes in SAP BW.

Database Keys

In traditional data modeling and data warehousing, there are several types of keys and IDs:
- *Primary key*. Primary keys are unique keys created from one or more attributes that uniquely identify a single instance in an entity. For example, unique keys in the customer entity may include customer number, Social Security number, or first and last name plus telephone number.
- *Foreign key*. A foreign key appears in a child entity and represents the migration of the primary key of the parent entity to the child entity.
- *Surrogate key*. From the list of available unique keys, you can select the primary key that most efficiently accesses database information. You can, for example, create a surrogate key, such as customer number, to increase database access efficiency.

IDs in SAP BW

IDs are the data elements that are used to tie the building blocks of the data stores defined in SAP BW.

DIM ID

DIM IDs (aka Dimension IDs) are the technical links from the fact table to the dimension table. Each of the dimension tables has a single field primary key that has a one-to-many relationship with a foreign key in the fact table. As shown in Exhibit 4.9, each row in a dimension table in SAP BW is made of one DIM ID and a SID (surrogate key) for each characteristic of the dimension.

- DIM IDs are stored in dimension tables.
- In the dimension table, the DIM IDs are primary keys (primary identifier).
- In the fact table, the DIM IDs are foreign keys (not a key for that table).

NOTE

A dimension that points the fact table to more than one characteristic would illustrate the purpose of DIM IDs (for example, a customer dimension pointing to sold to and ship to).

SID (Set ID or Surrogate ID)

SIDs are surrogate IDs that provide the pointer/technical link to the master data (attribute, hierarchy, and text) tables, as illustrated in Exhibit 4.10.

Exhibit 4.9   **DIM IDs Are the Link to the Fact Table**

Star Schema

Sales Rep ID

Last Name
Sales Dep

*Sales Org
Dimension
(Table)*

Customer ID

Customer Name
City
Region
Office Name

*Customer
Dimension
(Table)*

Material ID
Sales Rep ID
Time Code ID
Customer ID

Sales Amount
Quantity

Fact (Table)

Material ID

Material Name
Material Type
Material Group

*Material
Dimension
(Table)*

Time Code ID

Year
Fiscal Year
Quarter
Month
Day of the Week

*Time
Dimension
(Table)*

Exhibit 4.10   **SAP BW DIM IDs and SIDs**

Master Table	
Material	Material Group
ABCDXYZTBBATVMMNOP	A
EFGHABBACRRTUVWZMP	B
WXYZATVBAEBIAADEFH	C

InfoCube

Dimension Table	
Dim ID	SID Material
1	111
2	222
3	333

Fact Table	
Dim ID	Key Figure
1	30,000
2	1,478
3	8,391

SID Table	
SID Material	Material
111	ABCDXYZTBBATVMMNOP
222	EFGHABBACRRTUVWZMP
333	WXYZATVBAEBIAADEFH

SID Attribute

SID Attribute

SID Attribute

Time-Independent SID Table

Traditional SID Table

Dimension Table

Time-Dependent SID Table

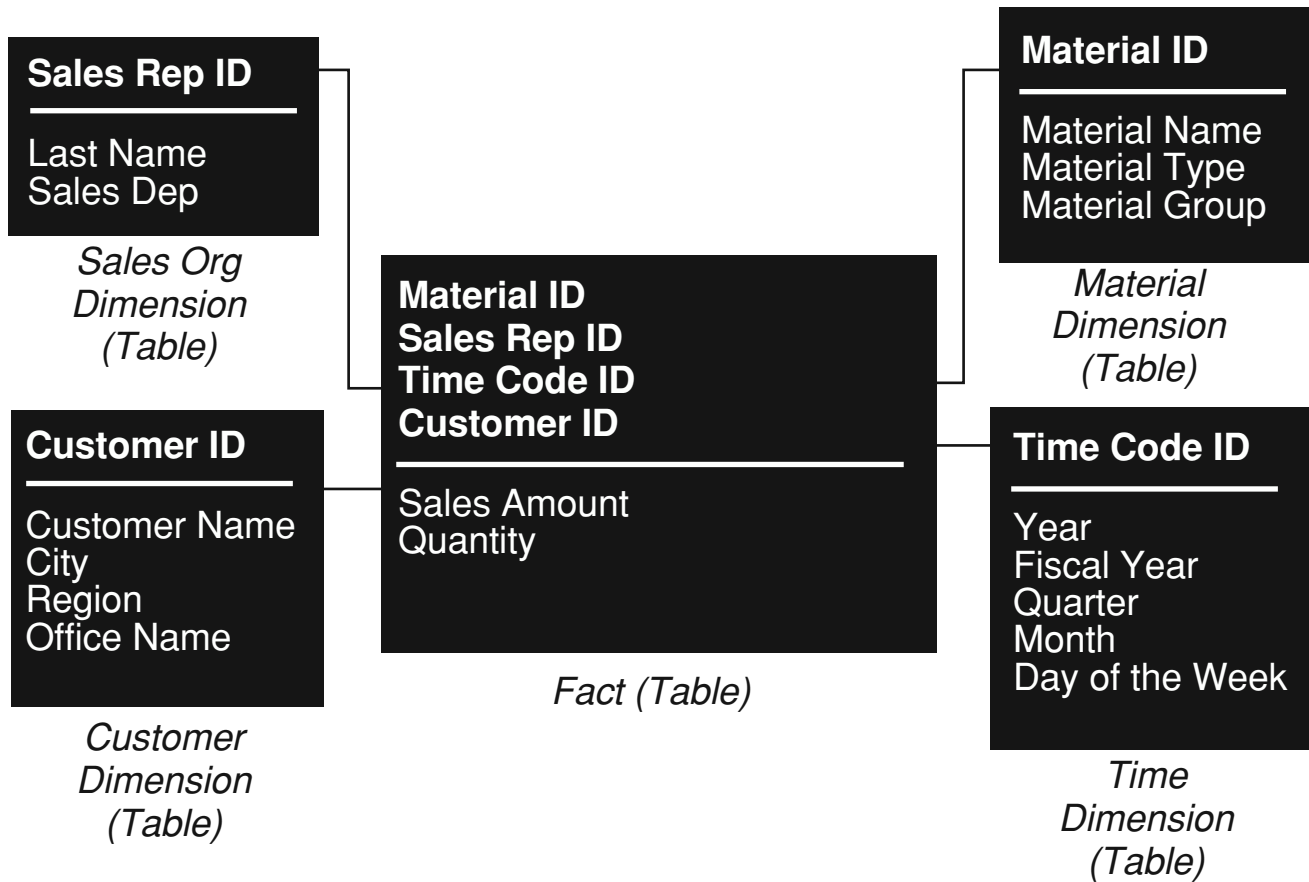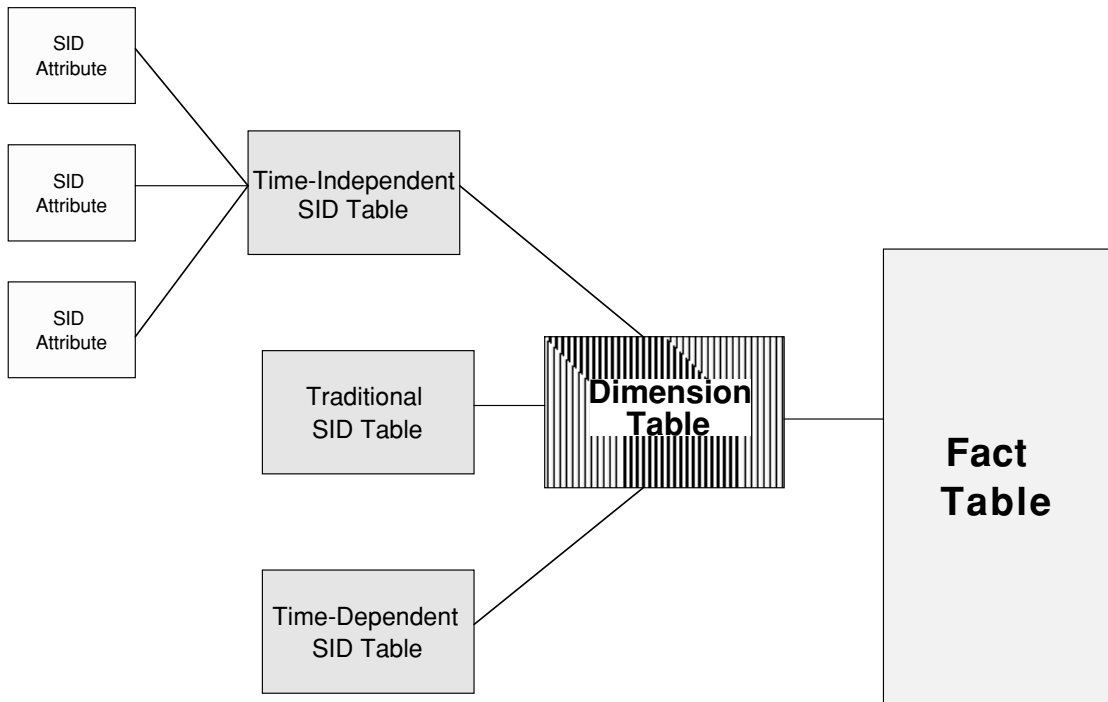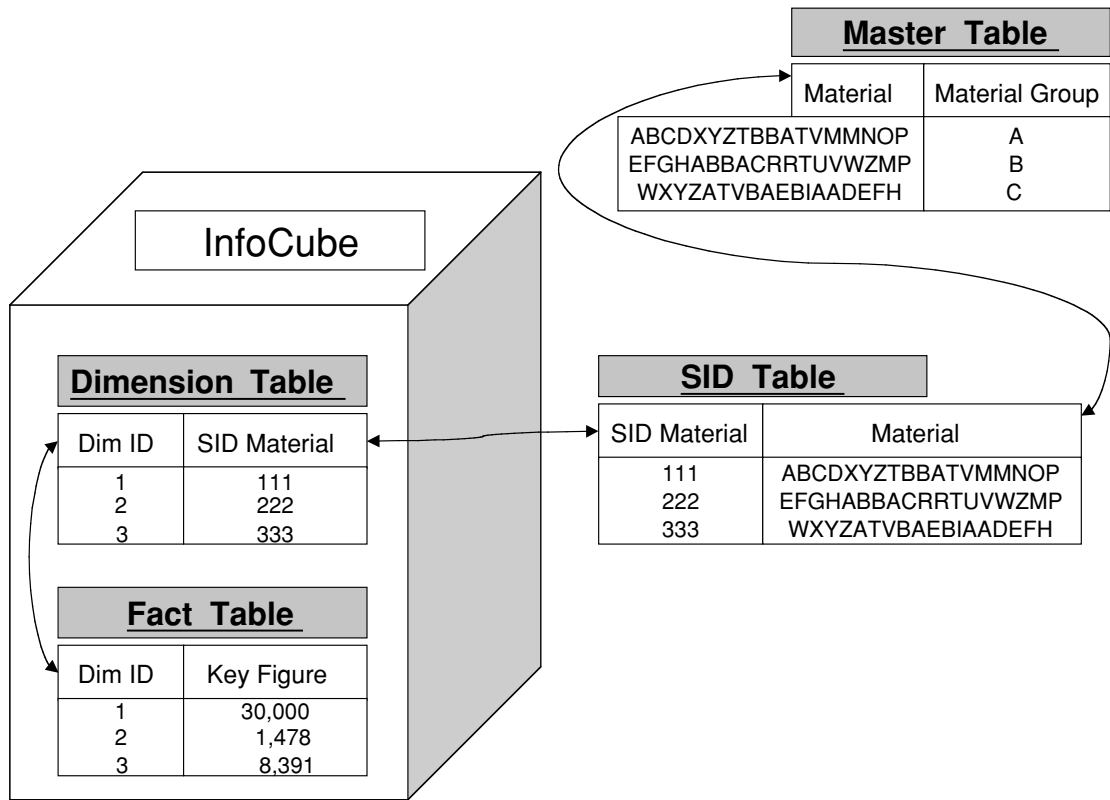**Fact Table**

- A Set ID (SID) is a system-generated ID for a characteristic value.
- SIDs are stored in SID tables.
- SID values are 4-byte integers.
- For time-dependent master data, the SID will contain a date.

Some benefits of SIDs include:
- Faster data access by using numeric fields as the indexes
- Faster data-staging process, since the larger master data tables will not be accessed unnecessarily during data staging

OPTIMIZATION

TIP

Queries

SetIDs can take significant disk space and should be deleted periodically to save space. To do so, perform an InfoCube compression.

SID Table

A SID table contains the SIDs. SID tables play an important role in linking the data warehouse information structured to the subject-oriented InfoCubes. The relationship between SID ID, master data, and DIM ID tables is shown in Exhibit 4.10.

The master data tables, text tables, and hierarchy tables are not directly linked to the associated dimension tables. These tables are InfoCube independent and joined with the dimension tables using a SID table. The SID therefore provides the link to the dimension tables.

Pointers in SAP BW

In addition to these logical keys and identifiers, some unique physical pointers play an important role in SAP BW for database performance and data load management:

Database Indexes

Indexes are special database objects that make finding information in a database table much faster by storing pointers to where needed data reside on disk (similar to the index in a book that helps you navigate the book more quickly). Indexes are essential for good database performance. Indexes can be primary or secondary indexes.
- *Primary index*. Primary indexes are unique identifiers created in the physical database against a database table. They consist of one field or a combination of fields. Primary indexes allow you to:
  - Enforce unique keys and avoid any duplicates (you should never drop primary indexes to maintain database integrity)
  - Increase performance on the database tables most often queried

Queries

It might be beneficial to add further indexes on individual SID fields in the dimension or master data tables, particularly if this SID refers to a characteristic that is frequently restricted by the queries.

- *Secondary index*. Secondary indexes are keys that do not uniquely identify a record but are used to speed up data access. Secondary indexes are not related to the primary key. For instance, if there are a lot of queries by geography and sales rep, you should create a secondary index on geography and sales rep.

Data Extraction and Staging

Due to the complexity of the star schema in SAP BW, a lot of secondary indexes are used to manage the joins of fact, dimension, and master data tables.

To optimize data load performance you should drop secondary indexes before the load. Note that upon query execution the secondary indexes will have to be recreated, which may negatively impact query execution performance.

Therefore, it is a balancing act in which you should consider the data that are currently in the database versus the new data to be loaded. A good rule of thumb is that if the incoming volume of data is more than 10% of the existing data you should drop secondary indexes. Otherwise too much overhead will be created.

Read Pointer

A read pointer reads the position of a new SID for combinations of characteristics; for example, a new Request ID is generated during a change in an InfoCube and related aggregates (roll-up). Reporting uses only the request up to the RNSID of the Read pointer.

Read pointers are used to keep aggregate data and cube data in sync. Aggregates and the use of Read pointers will be discussed in further detail in Chapter 6, "Reporting."

RNSID (Request Set ID)

RNSIDs are package IDs or InfoPackage IDs. The RNSID represents the chronological update history defined with a unique key created from the system for each load request and with the request for each data record.

Benefits of the RNSID include:

- Improved performance
- Identification of separate loads of data in the InfoCube and aggregates
- The RNSID is useful when it is necessary to remove or reload specific batches of data to/from the InfoCube and aggregates.
- Each data upload has a Request Set ID in the aggregates and the InfoCube. The RNSID column is hidden in the fact table.

InfoPackages and the use of RNSID will be discussed in further detail in Chapter 7, "Extraction."

SAP BW RESTRICTIONS

- Set IDs can occupy significant table space and should be deleted periodically (through InfoCube compression).
- After compression all Request IDs become zero so you cannot remove an InfoPackage once it has been compressed.

Suggested Exercises

The following are exercises that you can perform, usually with a small test SAP BW server, to gain experience in the SAP BW system data modeling subject area:

- Create InfoObjects (e.g., key figures, characteristics, attributes).
- Create basic InfoCubes.
- Set up Remote Cube.
- Use the business content tool.
- Create a hierarchy structure.
- Review business content components.

Practice Test

Check the answer(s) that apply:

1. Which of the following statements refer to a Remote Cube?
    This question has more than one answer.
    a. InfoCube that gathers data from several Basic Cubes
    b. Transaction data that are not managed in SAP BW but are available to SAP BW users
    c. Remote Cubes do not contain data
    d. A cube built in a non-BW data warehouse
    e. None of the above

2. If product price is a slowly changing dimension, how do you model product price if you want to report on the price at the time of the query?
    This question has more than one answer.
    a. As a characteristic on the material dimension
    b. As a time-dependent navigational attribute
    c. As a time-dependent hierarchy of material
    d. As a time-independent navigational attribute of material
    e. None of the above

3. Which of the following refer to pointer tables that provide the technical link to the master data outside of the InfoCube?
    This question has only one answer.
    a. Dimension tables
    b. Set IDs
    c. M tables
    d. SID tables
    e. ODS transparent tables

4. Which of the following Dimensions are delivered by SAP BW for each InfoCube?
    This question has more than one answer.
    a. Unit
    b. Time
    c. Transfer package
    d. Currency unit
    e. Info packet (Info package)
    f. GIS

5. Which of the following statements describes a categorical dimension?
    This question has only one answer.
    a. An artificial dimension used to describe the status of another dimension
    b. An artificial dimension/attribute used to categorize another dimension
    c. An artificial dimension used in a reporting scenario where the comparison of the same key figure is needed
    d. A dimension that is used across all cubes
    e. None of the above

6. Which of the following is an example of a slowly changing dimension?
   This question has only one answer.
   a. Customer on a sales order
   b. Date
   c. Person responsible for a cost center
   d. Value of a purchase order
   e. None of the above

7. Fact tables may be partitioned by which of the following characteristics?
   This question has only one answer.
   a. 0CALDAY
   b. 0CALMONTH
   c. 0CALYEAR
   d. 0CALPERIOD
   e. 0CALWEEK

8. Which of the following statements are correct concerning the operational data store (ODS)?
   This question has more than one answer.
   a. The data in the ODS are compressed and do not have a Request ID attached
   b. ODS can consolidate data from different source systems
   c. Data in the ODS cannot be reported upon
   d. The ODS is the inbound layer of the SAP BW system and data are written directly to it from the source system
   e. The ODS generally holds transaction data only

9. A Fact table consists of which of the following elements?
   This questions has more than one answer.
   a. Characteristic InfoObjects
   b. Key figures InfoObjects
   c. Calculated key figures InfoObjects
   d. Hierarchies
   e. DIM IDs

10. If you worked for a retail company that changed prices on a very frequent basis, how would you model the price?
    This question has only one answer.
    a. In the master data table as an attribute
    b. In the transaction table as a new characteristic
    c. In the ODS to enhance performance
    d. In the fact table
    e. None of the above

11. Which of the following occurs as a result of degenerating dimensions?
    This question has more than one answer.
    a. The grain of the fact table represents actual working documents like order number or invoice number
    b. All descriptive attributes of the grain are located in other dimensions

    c.   The InfoCube becomes very weak and performs poorly when it is run

    d.   The degenerating dimensions cannot be modeled using normal star schema

    e.   None of the above

12.   What values can a key figure retain?
     This question has only one answer.
- a.   Last value
- b.   Average value
- c.   First value
- d.   Sum
- e.   All of the above
- f.   None of the above

13.   Which of the following describes an unbalanced hierarchy?
     This question has only one answer.
- a.   A hierarchy with too many leaves within one branch
- b.   A hierarchy with fewer nodes within one or more branches
- c.   Hierarchy without leaves
- d.   The term used for data that are delivered from two or more sources on different aggregation levels
- e.   None of the above

14.   How many hierarchies can be created for a key figure?
     This question has only one answer.
- a.   10
- b.   2
- c.   5
- d.   More than 1
- e.   None

15.   Which of the following represents a characteristic that spans an entire data model and upon which all other entities are dependent?
     This question has only one answer.
- a.   Many-to-many relationship
- b.   A degenerated characteristic
- c.   A strong entity
- d.   An attribute
- e.   A data model characteristic

16.   Navigational attributes behave in a query like which of the following?
     This question has only one answer.
- a.   Attributes
- b.   Variables
- c.   Characteristics
- d.   Filters
- e.   None of the above

17. When should an attribute be placed in a separate dimension?
    This question has only one answer.
    a. Always
    b. If the attribute changes frequently
    c. If the attributes have a large number of distinct values
    d. Never
    e. None of the above

18. Which of the following objects is not provided in business content?
    This question has only one answer.
    a. InfoCube
    b. InfoSource
    c. KPIs
    d. Queries
    e. SAP R/3 extractor program
    f. None of the above

19. Which of the following objects keeps the aggregate and InfoCube in sync?
    This question has only one answer.
    a. Dim pointer
    b. Read pointer
    c. SID pointers
    d. Surrogate pointer
    e. None of the above
    f. All of the above

20. A MultiCube joins numerous other InfoCubes via which of the following?
    This question has only one answer.
    a. A common set of characteristics
    b. A common set of key figures
    c. A common set of InfoSources
    d. A common set of DataSource
    e. None of the above

21. Why do we want to normalize a data model?
    This question has only one answer.
    a. To avoid redundancy
    b. To make it look good
    c. To increase performance
    d. To comply with the multidimensional data modeling rules
    e. None of the above

22. Hierarchy can be which of the following?
    This question has more than one answer.
    a. Time-dependent name
    b. Version dependent
    c. With intervals

d.   Time-dependent structure

e.   Used by multiple InfoCube

f.   None of the above

23. If product price is a slowly changing dimension, how do you model product price if you want to report the price at any point in time?
This question has more than one answer.

a.   As a time-dependent navigational attribute

b.   As a time-dependent navigational attribute of material

c.   As a time-independent navigational attribute of material

d.   As a characteristic on the material dimension

e.   As a time-dependent hierarchy of material

24. Name the three differences between OLAP and OLTP systems?
This question has more than one answer.

a.   Software used

b.   Current data versus history required

c.   One to two months of data versus two to seven years of data

d.   Detailed transaction data versus summarized data

e.   None of the above

25. Sometimes we have to combine unrelated characteristics into one dimension, due to which of the following facts?
This question has more than one answer.

a.   We run out of dimensions and we have to include the data in the same InfoCube

b.   We are running out of space on the database

c.   We are looking for higher performance

d.   Lower number of dimensions is a way to optimize data staging

e.   To reduce the number of joins

f.   All of the above

26. Which of the following items refer to InfoObjects?
This question has more than one answer.

a.   Characteristics

b.   Key figures

c.   Queries

d.   Attributes

e.   None of the above

27. What are the three predefined dimensions in SAP BW?
This question has more than one answer.

a.   Date

b.   InfoPackage

c.   Time

d.   Unit

e.   None of the above

28. What are the advantages of a smaller dimension?
    This question has more than one answer.
    a. Available immediately after transaction data load
    b. Improves query performance
    c. Overhead during load time
    d. It is not an advantage but a liability
    e. None of the above

29. What are the limitations of a Remote Cube?
    This question has more than one answer.
    a. Additional requirements for extractors
    b. Slow
    c. System dependent
    d. Only for transaction data
    e. Small volume

30. Which of the following are examples of characteristics?
    This question has more than one answer.
    a. Monthly sales
    b. Products
    c. Cost centers
    d. Company codes
    e. Sales person

Answers to Practice Test

Question	Answer	Question	Answer
1	b, c	16	c
2	d	17	b
3	d	18	f
4	a, b, e	19	b
5	b	20	a
6	c	21	a
7	b	22	b, c, d
8	b, e	23	b, e
9	a, b	24	b, c, d
10	b	25	a, e
11	a, b, c	26	a, b
12	e	27	b, c, d
13	b	28	a, b, c
14	e	29	a, b, d
15	e	30	b, c, d, e

Summary

In this chapter, you learned about SAP BW data modeling concepts, one of the most important components of the SAP BW certification exam. You now have a good understanding of traditional and SAP BW data modeling.

In the next chapter, you will learn more about the building blocks for SAP BW architecture, configuration, and data warehouse management.

Need to know more?

Published Resources

- Naeem Hashmi. *Business Information Warehouse for SAP*. Portland, OR: Premier Press, 2000.
- William H. Inmon. *Managing the Data Warehouse*. New York: John Wiley & Sons, Inc., 1996.
- Ralph Kimball. *The Data Warehouse ToolKit*. New York: John Wiley & Sons, Inc., 1996.

On-line Resources

- "Basics of BW data model, SAP", *www.service.sap.com*.
- "BW ASAP for 2 0B phase 3: hierarchies in SAP BW (doc), SAP", *www.service.sap.com*.
- Data modeling with SAP BW, ASAP for BW Accelerator SAP (1998), *www.service.sap.com*.
- "SAP BW help CD or SAP help portal, *www.help.sap.com*.
- "SAP Multidimensional Modeling, SAP", *www.service.sap.com*.

Other Resources

- Training class and material, SAP BW—System Configuration, SAP Solution Academy.

Endnotes

1. William H. Inmon, *Building the Data Warehouse* (New York: John Wiley & Sons, Inc., 1996): 371.
2. R. Kimball, *The Data Warehouse Toolkit* (New York: John Wiley & Sons, Inc., 1996): 310.
3. William H. Inmon, *Building the Operational Data Store*, 2nd ed. (John Wiley & Sons, Inc., 1999).
4. William H. Inmon, *Building the Data Warehouse* (New York: John Wiley & Sons, Inc., 1996).

Building Blocks

In This Chapter

SAP BW technical architecture
Source system
Source layer
SAP BW server
Presentation layer
SAP BW warehouse management
Master data tables
Metadata repository
Other configuration concepts
Suggested exercises
Practice test
Answers to practice test

This chapter provides key concepts and understanding of the SAP BW Building Blocks area including configuration and data warehouse management. It is critical to have a high level of knowledge and understanding of these concepts as they are the building blocks for other areas of SAP BW and the basis for a large number of the questions on the certification exam.

SAP BW Building Blocks are an important component of the SAP BW certification exam. This topic tests your knowledge of SAP BW components, configuration, technical architecture, and warehouse management, including:

- Data transfer and access communication protocols in SAP BW
- Basic architecture of SAP BW and benefits
- Source systems
- Metadata management
- InfoObjects, DataSources, data targets, and InfoSources
- Transfer rules and update rules
- InfoCubes

- Data load monitor
- ODS and PSA
- Extract and transfer structure

NOTE

For readers interested in the SAP BW training curriculum, this chapter refers to the class "SAP BW Configuration" TABW10 (SAP partners) or BW210 (nonpartners).

Data Load and Access Communication Technologies

Communication technologies are methods used to interface systems and applications and allow them to exchange data. As illustrated in Table 5.1, several communication technologies are used in SAP BW to load and access data: BAPI, ALE, IDOC, TRFC, XML (in SAP BW 3.0), and DBLink.

ODBO

ODBO, Object Linking and Embedding (OLE) DB for OLAP, is a set of Component Object Model (COM) objects and interfaces that extends OLEDB to provide access to multidimensional data structures. It facilitates communication between providers and consumers of multidimensional data.

   The interface provides third-party vendors or customer developers an industry-standard method of accessing the data in SAP BW via their front-end presentation tool. Several third-party vendors have ODBO certified products to access data in SAP BW, including Brio, Business Objects, Cognos, and Seagate.

API (Application Programming Interface)

APIs are the common set of parameters needed to connect the communication between programs. An API provides a method for interfacing source systems and data access

Table 5.1   **Communication Technologies in SAP BW**

	Data Transfer	**Data Access**
ODBO for OLAP		X
BAPI	Staging BAPIs	Data Access/OLAP BAPI
ALE	Using IDOCs	
IDOC	X	Using ABAP
TRFC	X	
XML	X	X
DBLink	X	

software (including BEx) with SAP BW. In the SAP world, APIs are closed to third-party programs.

BAPI (Business Application Programming Interface)

BAPIs are critical to the Internet, SAP BW, and the multilayer SAP R/3 Internet architecture. BAPIs are methods (usually existing ABAP functions, such as function modules, transactions, and dialog modules) that represent open business management interfaces. In other words, BAPIs expose functionality embedded within SAP BW. BAPIs are open to third parties: They are defined and published, and external software companies provide software components that can be used with the SAP R/3 systems.

In SAP BW there are two types of BAPIs:

1. *Staging BAPIs*. Staging BAPIs facilitate the integration of non-SAP R/3 data in SAP BW. They work at the staging engine layer and support the extraction of data from non-SAP systems. Refer to Chapter 7, "Extraction," for more details.
2. *Data access BAPIs*. Data access BAPIs and Microsoft OLEDB for OLAP (ODBO) support the access and analysis of data from SAP BW with external methods to complement SAP BW BEx reporting. Refer to Chapter 6, "Reporting," for more details.

NOTE For additional information on BAPIs, you should refer to the BAPI user guide and BAPI programming documents that are part of the standard SAP help documents.

ALE (Application Link Enabling)

Extraction of data from SAP and non-SAP source systems into BW leverages SAP's Application Link Enabling (ALE). ALE technology enables organizations to construct and operate distributed applications while guaranteeing that the SAP R/3 installation is integrated at the same time.

IDOC (Intermediate Document)

IDOC is SAP's standard format for electronic data interchange between systems. IDOCs can be used in the following business scenarios:

- *Application link enabling (ALE)*. Communication between logical systems; logical systems can be SAP R/3, R/2, or non-SAP systems.
- *Electronic data interchange (EDI)*. Communication between an SAP R/3 or R/2 system and a non-SAP system

In SAP BW, an IDOC is a data container for data exchange between SAP systems or between SAP systems and external systems based on the EDI interface.

SAP BW RESTRICTIONS

- IDOCs support limited file size (1,000 bytes).
- Data cannot be loaded to PSA using IDOCs (ALE).

OPTIMIZATION

TIP

Queries and Data Staging

You should leverage PSA (and ODS) to store detailed data rather than in the InfoCube as it may contribute considerably to the increase in the query (keep detailed data out of the InfoCube) and system performance (due to higher throughput during data load since PSA uses TRFC rather than IDOC).

TRFC (Transactional Remote Function Call)

Transactional Remote Function Call (TRFC) is an SAP interface protocol. TRFC is used to extract data from the source systems into BW.

SAP BW RESTRICTIONS

TRFC supports a maximum of 1,962 bytes and 255 database fields.

The benefits of using TRFC over IDOC are:
- Data can be stored in the PSA (but not with IDOCs).
- Improved performance when loading data
- Higher throughput (overcoming the limit of 1,000 bytes for IDOCs)
- Possibility of synchronizing InfoSources
- API to access the data stored in the ODS (read and update)

DBLink

The DatabaseLink method (DBLink) allows you to access data from remote relational database management systems (DBMS). This method is supported only for Oracle in SAP BW 2.0 for versions prior to 3.0 versions and for all other DBMSs in SAP BW 3.0. For detailed information on DBLink implementation, consult the "BW-Data Upload Via a Database Link" white paper available at *http://service.sap.com/BI*.

XML

The eXtended Markup Language (XML) is a flexible mechanism to define documents that can be exchanged among various applications. Each XML document also includes metadata about the data being exchanged.

In BW 3.0, you can now send XML-formatted documents to SAP BW through its staging engine. The XML data load process is designed to move small datasets using Simple Object Access Protocol (SOAP) services provided with the SAP Web application server 6.10. The XML method is ideal for small e-business-oriented datasets and not for large data volumes or bulk loads.

Since XML integration is a new feature in BW 3.0, it may be added to the exam at some time in the future.

For detailed information on XML-formatted data integration with SAP BW 3.0, consult the white paper on "Transferring Data in XML" available at *http://service.sap.com/BI* and see *www.omg.com.*

SAP BW Technical Architecture

The SAP BW architecture is based on a three-tier architecture with the following key layers/functional areas:
1. *Database server*. Where the data is physically stored (e.g., ODS, PSA, InfoCube, and metadata repository)
2. *Application server*. The application server is based on the OLAP processor. It is used to retrieve the data stored in the database server (it does not store data except in transient memory).
3. *Presentation layer*. Manages reporting and data access

Most often, one database server is used with multiple application servers and each BW user has his or her own workstation (desktop or laptop to access SAP BW).

The SAP BW technical architecture displays many of the desirable features of an enterprise data warehouse, including:
- Administrative tools are built into the application.
- Open interfaces (business APIs) allow integration of third-party tools.
- An Operational Data Store (ODS) is built into the architecture.
- SAP BW resides on its own hardware environment.

The client is a technical, structural characteristic of the SAP system. In SAP R/3 there are multiple clients. Clients are used in a different way in SAP BW as compared with SAP R/3. In SAP BW, exactly one client (not 000) is created. For example, in a BW system, it is not possible to create a TEST client and a PRODUCTION client as technically separate units with separate master records and an independent record of tables are needed. Therefore all application data in SAP BW is *client-independent*.

As illustrated in Exhibit 5.1, the components of a BW system are:
- Presentation layer (A)
  - Report definition and Web publishing
  - Data analysis in BEx Analyzer and Web browser plus integration of analytical applications into mySAP Enterprise Portals
  - Organization of reports

Exhibit 5.1   **SAP BW Technical Architecture**
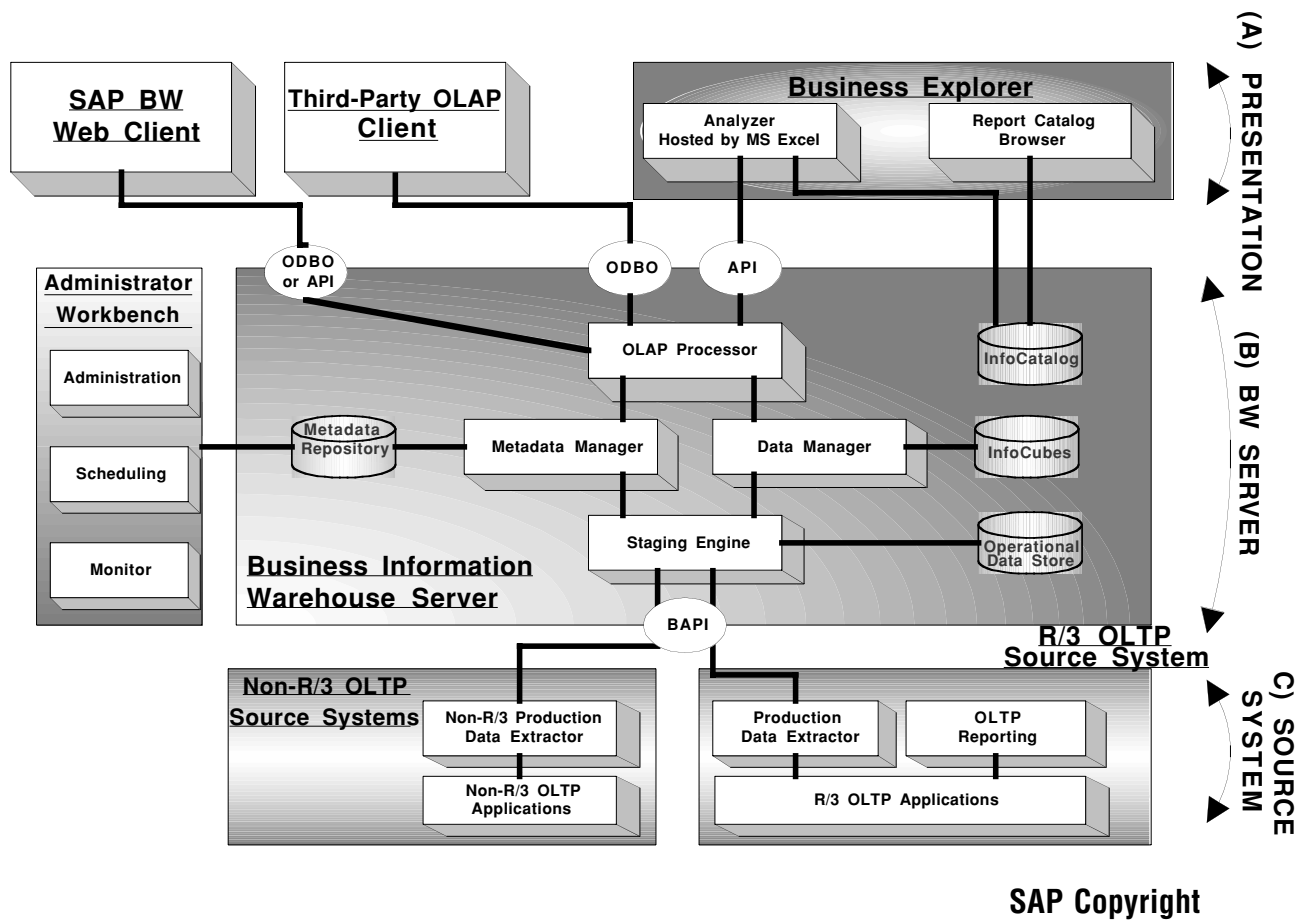
Source: SAP.

- BW Server (B) (application server and database server)
  - ◆ SAP BW database server
    - • Metadata
    - • Staging engine
  - ◆ Application server
    - • OLAP processor
  - ◆ Administrator Workbench
    - • Data management
    - • Monitoring
    - • Scheduling
  - ◆ Data extraction
    - • SAP BW extractors in mySAP.com components
    - • Openness to external systems
    - • Integration of extraction, transformation, and loading (ETL) tools

- Source System (C)
  - ◆ SAP OLTP source system
  - ◆ Non-SAP OLTP source system

Exhibit 5.2 provides a detailed technical architecture view of the SAP BW system and highlights the key SAP BW Building Blocks and their relationships. It is of the utmost importance to understand the diagram, data flow, and the key relationships between components in SAP BW.

ON THE EXAM

If you memorized only one item about the SAP BW Building Blocks subject area, it should be the high-level SAP BW architecture diagram and associated data flow provided in Exhibit 5.2. This exhibit is also critical to understanding the SAP BW extraction subject area.

In the following sections, the reference numbers/letters from Exhibit 5.2 will be cross-referenced with the corresponding BW system component. This will help the reader see how the technical components fit into the SAP architecture.

Presentation Layer (C)

The presentation layer manages reporting and data access (see Exhibit 5.2). In SAP BW the presentation layer is based on the following tools:
- Business Explorer (using OLAP BAPI)
  - ◆ Business Explorer Browser (19)
  - ◆ Business Explorer Analyzer (including BEx Map—GIS) (18)
- SAP GUI (20) (through InfoSet queries)
- Web browser (refer to the Web reporting section for more details)
- Third-party tools (17) (using OLE ODBO for OLAP or OLAP BAPIs)

Refer to Chapter 6, "Reporting," for more information on the presentation layer and Business Explorer.

Source System (A)

A source system is any system that provides data for SAP BW. As shown in Exhibit 5.2, the source system (A) includes the following objects:
- SAP source systems (1)
- Non-SAP source system (2)
- DataSource (F)
- Extract structure (3)
- Extract rules (4)

Exhibit 5.2   **SAP BW Building Block Components**
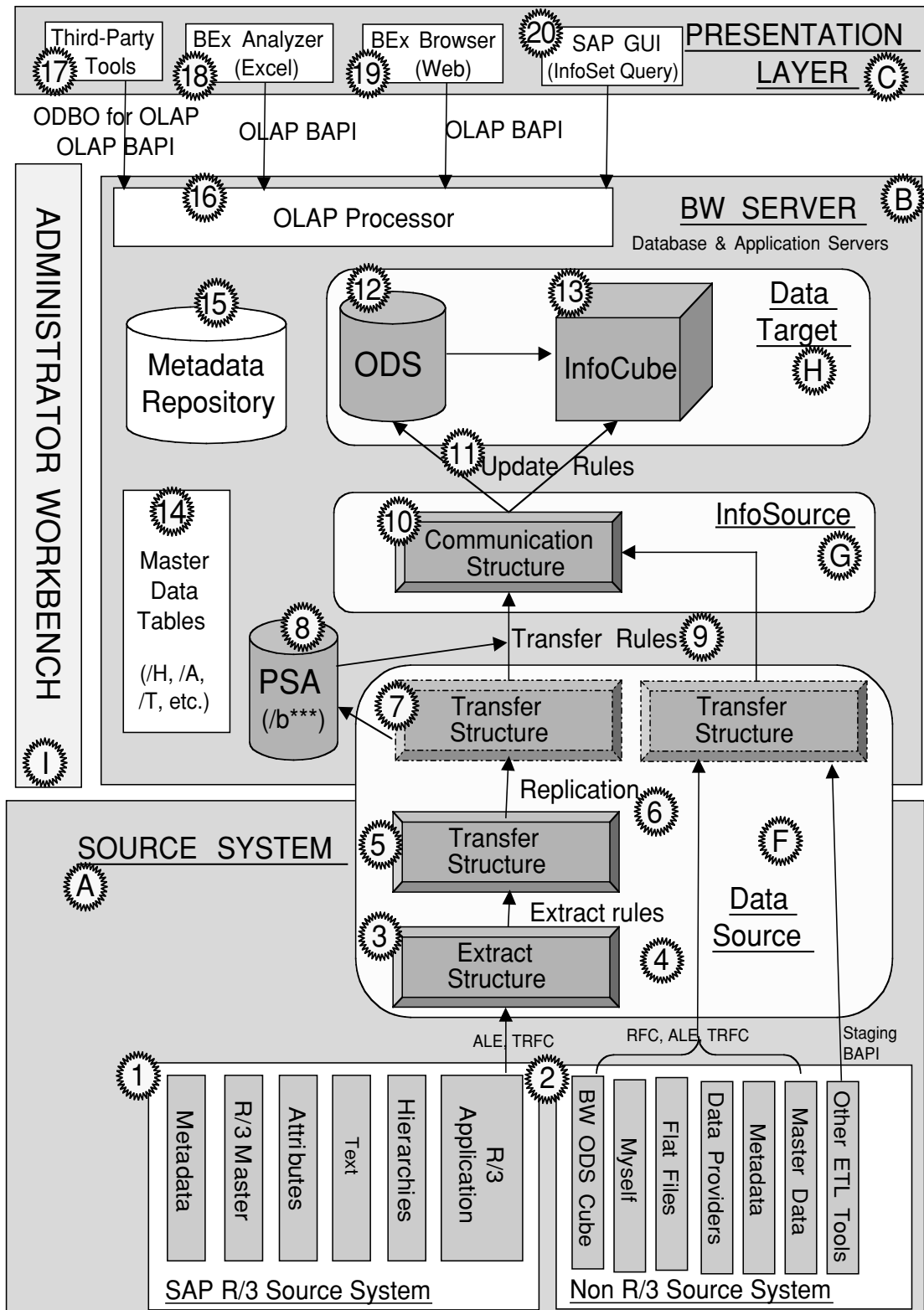
- Transfer structure (5)
- Replication (6)

> You should memorize the building blocks on the source system, their relationships, and the data flow between them.

Source Systems

Source systems or OLTPs (on-line transaction processing) contain operational data (legacy, SAP R/3, etc). SAP BW data can be extracted from several types of source systems:

- SAP source systems (1)
  - SAP R/3 (release 3.1H and up):
    transaction data, master data (attributes, text, and hierarchy), metadata
  - Other SAP BW systems (as data marts)
  - SAP-supplied "MySAP"
  - SAP new products such as APO, SEM, and CRM
- Non-SAP Source Systems (2)
  - Flat files
  - Third-party source systems
  - Information providers (A.C. Nielsen, Dun & Bradstreet, etc.)
  - Extractor provider (Informatica, etc.)
  - OLTP/legacy systems (e.g., Siebel, PeopleSoft, custom databases, etc.)
  - SAP R/2

DataSource (Source) (F)

A DataSource describes a type of infrastructure that allows the transport of information between an inbound data source (e.g., OLTP, flat file, etc.) and the SAP BW system. DataSources are common to the source system and SAP BW server. A DataSource refers to the combination of the extract and transfer structures of the source system (OLTP) and the transfer structure on the SAP BW system.

SAP tends to revise its definitions of SAP BW terminology. For instance, before v2.1C, the DataSource was referred to as only the extract and transfer structure on the source system. In that case, the transfer structure on the SAP BW system was referred to as a DataSource replica.

Extract Structure (3)

An extract structure is a record layout of InfoObjects. For flat files (CSV and ASCII) there is no extract or transfer structure on the source system side. The extract structure is created on the SAP BW system.

Extract Rule (4)

An extract rule is used to define how the data will be moved from extract structure to transfer structure.

Transfer Structure (Source System) (5)

The transfer structure is a structure in which the data from the source system are transported into the SAP BW server. A transfer structure is a record layout of data fields, as follows:

- A transfer structure displays a selection of fields from an extract structure of the source system.
- In the transfer structure maintenance you determine which fields of a DataSource should be transferred to SAP BW.
- These data are transferred 1:1 from the transfer structure of the source system and then are transferred into the communication structure with the aid of the transfer rules.
- On the SAP BW system, transfer structures are linked to the InfoSource via transfer rules.

Replication (6)

Replication is required to transport DataSources (extract structure and transfer structure definition) from SAP R/3 into SAP BW. This is the process that creates the same transfer structure in SAP BW and makes SAP BW aware of a specific data source. Note that replication is not required for flat file DataSource.

ON
THE

EXAM

You should understand the similarities and difference in the building blocks and setup involved when the data are loaded from SAP R/3 versus from a flat file or a non-SAP source system (see Exhibit 5.2):

- For flat files, there is no transfer structure on the R/3 DataSource structure; therefore the transfer structures need to be defined on the target system (i.e., SAP BW server).
- Replication is not required for flat file DataSource.
- Flat files already are in the format that SAP BW transfer structures need. There is no need for additional preparation.

Server (Target) (B)

The SAP BW server contains the database server and application server. It includes the following objects (see Exhibit 5.2):

- DataSource (F) (common to source system and SAP BW server)
- InfoSource (G)
- Transfer structure (target) (7)
- Transfer rules (9)
- Communication structure (10)
- Update rules (11)
- Data target (H)
  - ODS (12)
  - InfoCube (13)
- PSA (18)
- Master data tables (14)
- Metadata repository (15)
- OLAP

ON THE EXAM

- As with the source system, you should memorize the building blocks on the SAP BW server, their relationships, and the data flow between them.
- It is also important to know the methods to update the data targets and what technology they can use (e.g., TRFC vs. IDOC).

DataSource (Replica) (F)

A DataSource describes a type of infrastructure that allows information to be transported between OLTP systems and the SAP BW server. The term *DataSource* generally refers to the extract and transfer structures of both the source layer (OLTP) and SAP BW system.

Transfer Structure (Replica) (7)

The transfer structure on the target (SAP BW) system is usually created automatically by replication and takes its structure from the transfer structure defined on the source system. Therefore, the transfer structure on the source system and SAP BW server are identical. For a complete definition of transfer structures, refer to the definition provided for source system.

Transfer structures exist both on the source system and the SAP BW server. For flat files (CSV and ASCII) and non-SAPR/3 source systems there is no extract or transfer structure on the source system side; therefore the transfer structure needs to be defined on the SAP BW server. Transfer structures for master data do not have InfoObjects; instead they are defined by the data field names.

PSA (Persistent Staging Area) (8)

The PSA is a holding area (transparent table) of raw data (master and transactional). It contains detailed requests in the format of the transfer structure.

NOTE

The PSA was referred to as an ODS in SAP BW releases prior to SAP BW 2.0B. Prior to that release, the ODS was not a true ODS; it was not a true data staging area but more of an inbound area for data. With SAP BW release 2.0B, SAP implemented a true ODS with true data staging capability.

As illustrated in Exhibit 5.3, the PSA is the inbound layer of the SAP BW system and contains data in original context and format (inbound data go to the PSA before any transformation can take place). From the PSA, data can be uploaded to the ODS or InfoCube(s) via transfer rules. PSA represents an initial store of data in BW, in which the requested data are saved unchanged from the source system before they are further processed and loaded to ODS and/or InfoCubes.

ON THE EXAM

Expect several questions on PSA, especially on its architecture, benefits, and restrictions.

Exhibit 5.3   **PSA Is the Inbound Layer of SAP BW**
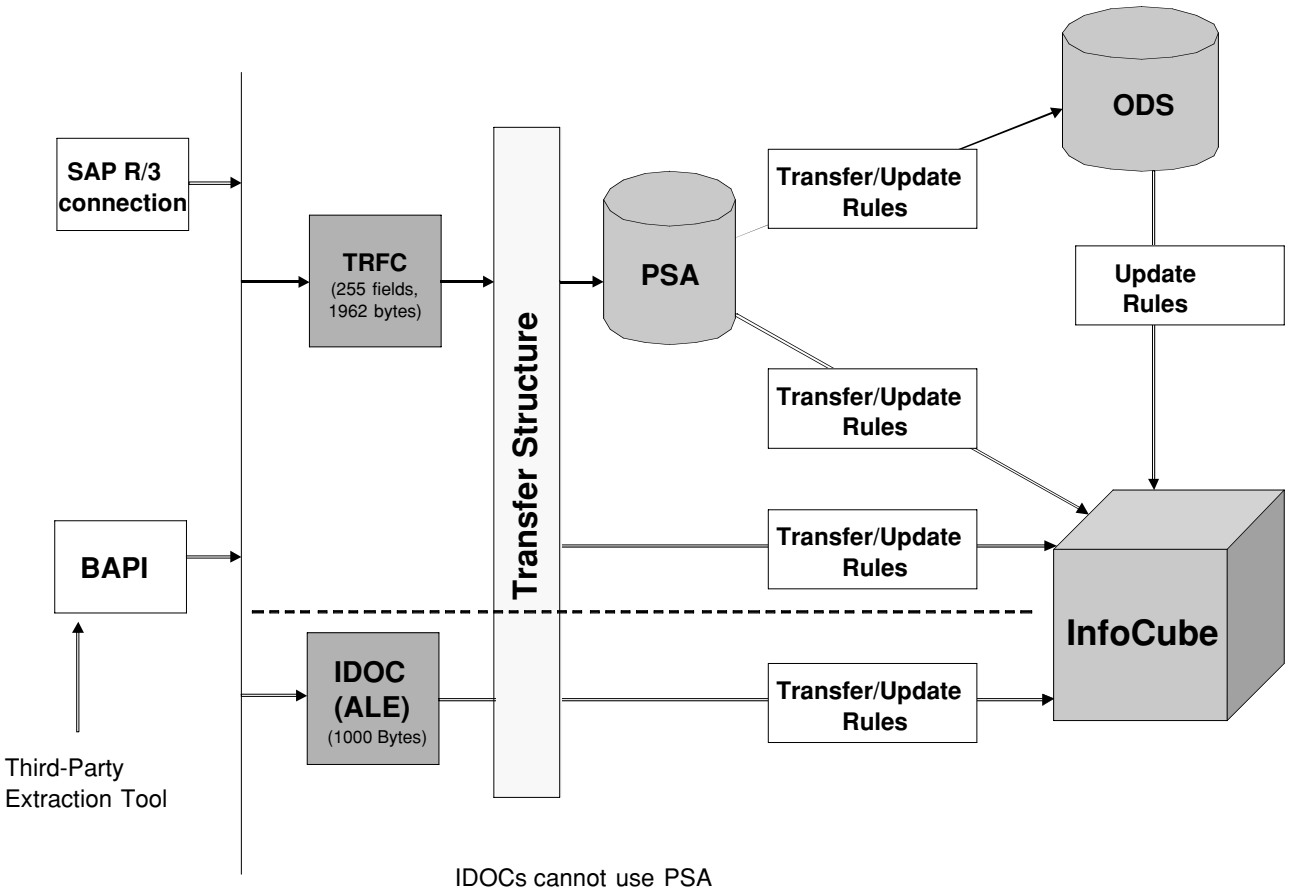
The architecture of the PSA is based on the following:
- SAP BW can have multiple PSAs (if needed).
- Updates to the PSA and InfoCube(s) can run sequentially or in parallel.
- Data in the PSA are based on the transfer structure (i.e., not transformed by the transfer rules).
- PSA is defined according to the DataSource and source system.
- PSA is source system dependent.
- PSA uses the key fields request number, packet number, and record number (request number is, however, not visible except in the change log).
- PSA partitioning is supported as of release 2.0B (to segregate data according to time and facilitate data removal from the PSA).

OPTIMIZATION

TIP

System

Over time, the PSA may fill up and contain a lot of data that are no longer used and it may become so large that it may start negatively affecting system (e.g., table space) and query performance. Upon creation of the PSA, you should partition it to aid in removing data removal from the PSA or in compressing data no longer used.

**SAP BW
RESTRICTIONS**

- You cannot report against the data in the PSA using standard reporting tools (e.g., BEx and InfoSet Query).
- Only one PSA can be created per transfer structure.
- Addition of data to the PSA is possible but there is no overwrite capability in the PSA (same as ODS).
- PSA cannot be partitioned once it contains data. Partitioning of the PSA needs to occur before data are loaded to it.

Transfer Rules (9)

Transfer rules are used to define how the fields of the transfer structure are assigned to the InfoObjects of the communication structure. Transfer rules connect a transfer structure and a communication structure (InfoSource). There are three types of transfer rules to keep in mind:
1. Field to field
2. Fixed value
3. Local transfer routine using ABAP (must be activated to take effect)

InfoSource (G)

An InfoSource is a collection of InfoObjects and the equivalent of a communication structure, as illustrated in Exhibit 5.4.

NOTE

SAP tends to revise its definitions of SAP BW terminology. For instance, in SAP BW release 1.2x, an InfoSource referred not only to the communication structure but also the transfer structure on the SAP BW server.

Exhibit 5.4   **InfoSource Configuration with Communication and Transfer Structure**
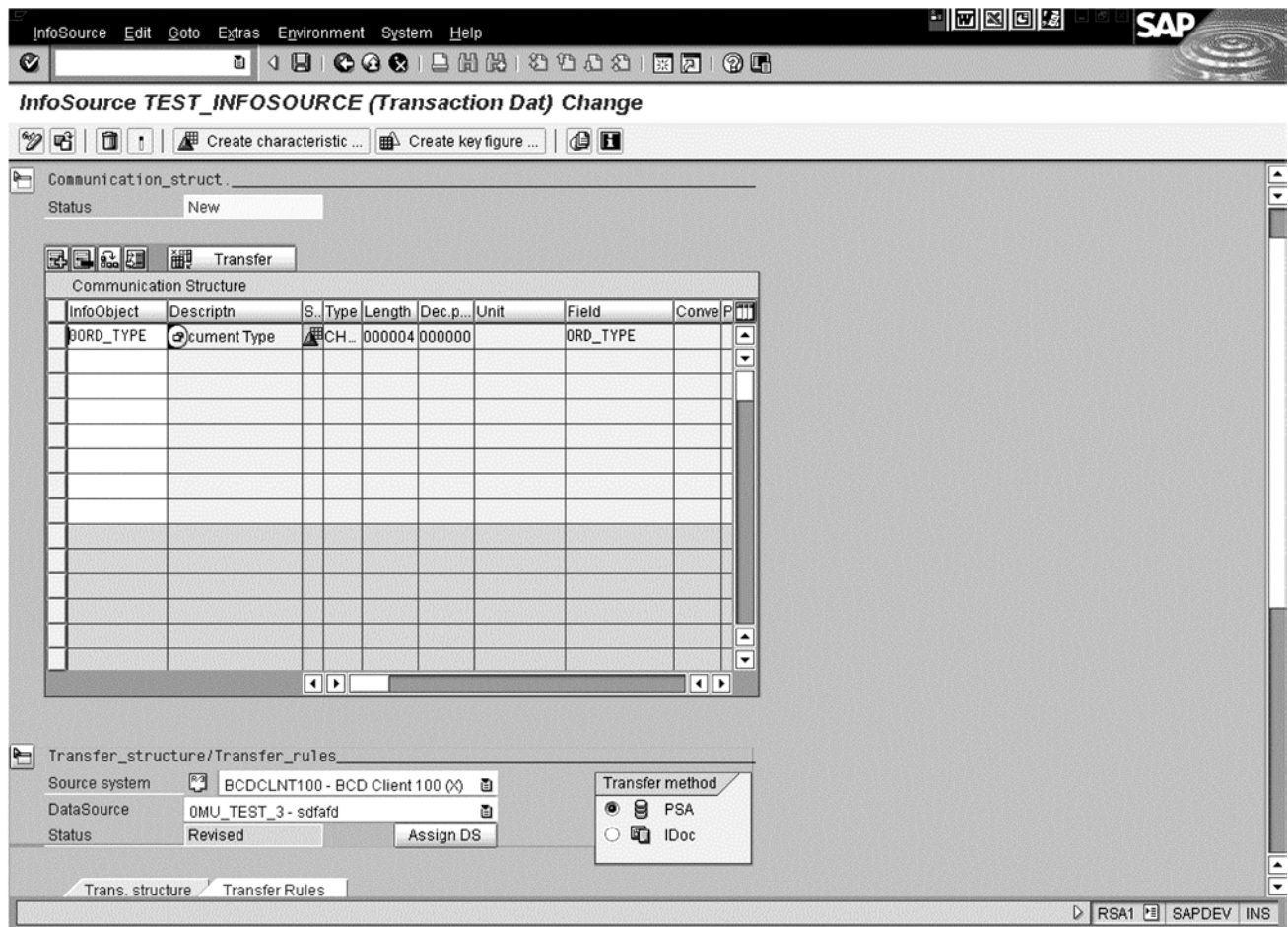
Source: SAP.

An InfoSource contains summarized information that logically belongs together as a unit. An InfoSource is always a quantity of InfoObjects that can be said to belong together logically. It always refers to one scenario from an application (e.g., financial accounting).

SAP BW has two types of InfoSources:

1.   Master data (attributes, texts, and hierarchies)
2.   Transactional data

Relationships of InfoSources with other SAP BW objects are:

●   InfoSource 1:1 Application component
●   InfoSource 1:M InfoSources
●   InfoSource 1:M Source systems

Application Component

An application component is a folder in the SAP BW Administrator Workbench (AWB) used to regroup InfoSource objects that are logically related.

SAP tends to revise its definitions of SAP BW terminology. For instance, you might find in older versions of SAP material that the application component referred not only to the InfoSource but also to the DataSource.

NOTE

Communication Structure (10)

A communication structure is a record layout of InfoObjects that defines the data provided to the InfoCube. Communication structures are created on the SAP BW server. The communication structure is independent of the source system and has the structure of an InfoSource. It contains all the InfoObjects that belong to an InfoSource.

Update Rule (11)

An update rule is used to define the way in which data from an InfoSource (from the communication structure) are mapped/transformed and loaded into the characteristic and key figure fields of a particular data target.

ON THE EXAM

Know the types of data rules, restrictions, and functionality provided with update and transfer rules.

There are three types of update rules to keep in mind:
1. Field to field
2. Routine using ABAP
3. Automatic reading of master data attribute of a characteristic of the InfoSource

For characteristic only, there are two more update rule types (total of five):
1. Constant
2. Initialization value

SAP BW RESTRICTIONS

Update rules can be copied only in three cases: (1) the source and target update rules are in the same InfoSource; or (2) the InfoCubes of the source and target rules are identical; or (3) the same InfoObject exists in two different InfoCubes.

New functionalities in SAP BW 2.0 are provided for update rules:
- Table look-up (e.g., to determine the values of a characteristic)
- Return tables
- Start routines (for more complex computations)
- Copy update rule from another InfoCube (same InfoSource)

OPTIMIZATION

TIP

Data Staging

When loading data, you should avoid complex update rules (e.g., data modification and verification). The additional processing involved in complex update rules has the potential to significantly impact data load performance.

Data Target (H)

A data target is the object onto which transaction data are to be moved on the SAP BW server. In SAP BW, a data target is either an ODS object or an InfoCube.

In BW there are four methods to update the data targets (ODS or InfoCube):

1. Update PSA, then data targets.
2. Update PSA and data targets in parallel.
3. Update PSA only (skip InfoCube or ODS object).
4. Update data targets only (skip PSA).

ODS (Operational Data Store) (12)

The Operational Data Store (ODS) is a holding area of consolidated or cleansed data from multiple InfoSources.

ON THE

EXAM

- The ODS is an important topic for SAP BW and it would be time well spent to read additional reference material such as the SAP white paper on ODS.
- You can expect several questions to test your knowledge of the ODS architecture, benefits, and architecture. Know the tables used to store data in the ODS.

The architecture of the ODS is based on the following:

- Merging data from different InfoSources
- The ODS (optional) contains nonaggregated data.
- Data are stored in a denormalized data structure and organized as a set of flat tables.
- Key and nonkey fields are defined by the customer.
- SAP BW can have multiple ODS objects.

SAP BW RESTRICTIONS

By default the ODS contains transactional data only. (On an exception basis master data elements could be defined and loaded in the ODS using transfer rules.)

As noted in Chapter 4, "Data Modeling," the ODS is an optional component in SAP BW and should be used based on the following rules of thumb:

- When you need an intermediate store for data consolidation, cleansing, and staging purposes. The ODS can combine information from multiple DataSources (e.g., reconciliation) before storing the data in InfoCubes.
- To satisfy queries (using queries or the OLAP processor) that require more detailed data than are stored in the InfoCube
- If you want to take advantage of the overwrite capability of the ODS for key figures and nonkey characteristics since it is not possible to overwrite the data in the InfoCubes

The benefits of using the ODS include:

- Overwrite capability (technical or data changes) of nonkey characteristics and key figures
- Ability to report from the ODS using the OLAP processor or directly using an ODS query (more details in Chapter 6, "Reporting")
- Ability to drill down to get more details from InfoCube to the ODS using the report-to-report interface (RRI)
- Direct access to the original documents in the OLTP system
- InfoCubes are usually less granular with data held for a longer period of time than in the ODS (which is very granular and holds data for a shorter period of time).
- Potential to create an external data file

OPTIMIZATION

TIP

Queries

If the same data are available both in the InfoCube and in the ODS, your first choice should be to run the query against the ODS (if your goal is to do flat reporting—no slicing/dicing—no OLAP) rather than the InfoCube (OLAP query).

Since the ODS is based on a two-dimensional database structure the number of database table joins will be minimal and the query will be executed more efficiently.

In SAP BW 2.xx, ODS objects are stored in three tables:

1. One table containing *modified and new* data: This table contains data on the upload from the PSA.
2. One table containing the *active* data: This table contains data that reflect the current status after changes (as per the last update). Reporting takes place on this table.
3. The *change log*: This table contains new data records as well as modifications in the form of cancellations and new postings of a data record. This table is used to update the InfoCubes and additional ODS objects, or can be used as a data mart feeding the PSA on different SAP BW systems.

In SAP BW 3.xx, the table structure of the ODS changed from that of previous versions. The *modified and new* table has been done away with and the ODS now only contains two tables (rather than three). The benefits of the new ODS structure are:

NEW

- With one less table to load, the load time is reduced and the data are available for reporting more quickly.

- The new queuing mechanism gives you the option to upload data in parallel.

The change log table provides the support for the delta update mechanism in SAP BW. In SAP BW, delta update is supported as follows:

- *ODS to ODS (within the same system)*. Export InfoSource is automatically generated.
- *ODS to InfoCube (within the same system)*. Export InfoSource is automatically generated.
- *ODS to PSA (different system)*. Export InfoSource needs to be manually generated.

For more information on the SAP BW delta update process, refer to Chapter 7, "Extraction."

OPTIMIZATION

TIP

Queries

When modeling InfoCubes, ODS, and Queries, you should anticipate how the users are going to query the data and model based on real-world scenarios. For instance, you could model the ODS to include the key figures and master data that are most often requested in the queries to optimize query performance.

InfoCube (13)

InfoCubes were covered in detail in the SAP BW data modeling section. InfoCubes contain the transaction data in multidimensional format.

Master Data Tables (14)

The key benefit of the SAP BW architecture is that master data are not stored in the InfoCubes structures. They are stored in dedicated tables outside of the InfoCube. Master data tables are created when the InfoObject definition is activated:

- /M—master data tables
- /P—time-independent master data table
- /Q—time-dependent master data table
- /H—hierarchy table
- /A—attributes table
- /T—text table (may be upper or lower case)
- /X—master data table—time-independent navigational attribute
- /Y—master data table—time-dependent navigational attribute

SAP BW RESTRICTIONS

SAP BW recognizes only uppercase for master data.

Metadata Repository (15)

SAP BW's metadata repository contains both business and technical metadata. Business metadata include definitions, descriptions, and rules used for reporting.

 The metadata repository is the equivalent of data element and domain in SAP R/3's Data Dictionary.

NOTE

OLAP Processor (16)

The OLAP processor is a central component of the application server. The OLAP processor allows on-line analytical processing (OLAP) in SAP BW for the preparation of large quantities of current and historical data, typically for subsequent presentation by reporting tools (including BEx). OLAP technologies allow multidimensional analyses according to various business perspectives. The OLAP processor will be discussed in greater detail in Chapter 6, "Reporting."

ON THE EXAM

It is important to remember where each type of data can and cannot be stored in SAP BW (by default). For instance, ODS and InfoCubes can store only transaction data but PSA can also store master data. Table 5.2 provides an overview of where data can be stored in BW.

Table 5.2 **Where the Data Are Referenced in SAP BW (by default)**

Structures	Transaction (Business) Data	Master Data: Attributes	Master Data: Hierarchy	Master Data: Text	Other
Communication	X	X	X	X	
Transfer structures	X	X	X	X	
PSA	X	X	X	X	
ODS	X				
InfoCube	X				
Business Document Service (BDS)					Documents, Web templates, etc.
Metadata repository					Metadata
Attributes master data table (BI tables /m)		X			
(ODS) Text master data table (BI tables /t)				X	
Hierarchy master data table (BI tables /h)			X		
Master data tables (/p, /q, /x, /y)		X	X	X	

Data-Staging Process

Data staging consists of cleansing, homogenizing, and manipulating data. This section provides an overview of the SAP BW data-staging process for SAP R/3 and non-SAP R/3 data.

Staging Engine

A staging engine is responsible for cleansing, homogenizing, and manipulating data within the scope of an InfoSource.

Data Staging

Data staging is the process of extracting and transferring cleansed data from the transfer structure to the communication structure using transfer rules.

> **ON THE EXAM**
>
> It is important to understand the difference in SAP between master and transaction data in terms of storage and data staging.

As depicted in Exhibit 5.5, SAP BW does not process master data in the same fashion as transaction data in terms of storage, data staging, and tables. It is important to remember the key differences between master and transaction data:

- PSA is not involved in the transfer of master data.
- Master data use different storage compared to transaction data (e.g., master data are stored in master tables and transaction data in PSA, InfoCubes, and ODS).
- Master data are usually loaded and used "as is" in SAP BW. Transaction data require more transformation and aggregations.
- Transaction data are not part of the InfoSource when master data are pulled out of the R/3 system.
- Data sourced from flat files and non-R/3 source systems can share actual transfer structure (specific to master and transaction data).

NOTE

PSA is an important component of data staging in SAP BW and it holds data received by the SAP BW server in its original format (e.g., without any transformation). PSA is not represented in Exhibit 5.5 to simplify the data flow and focus on the different flows for master and transaction data.

To summarize, in SAP BW data are not all created equal; each data type has unique storage and staging methods. Table 5.2 provides a high-level overview of the data in SAP BW and where they can be referenced.

Warehouse Management

Warehouse management involves all activities to control, monitor, and maintain the processes connected with data staging and processing in the data warehouse, using various tools such as the Administrator Workbench (AWB), the scheduler, and the data load monitor.

Exhibit 5.5   **SAP BW Data-Staging Process**
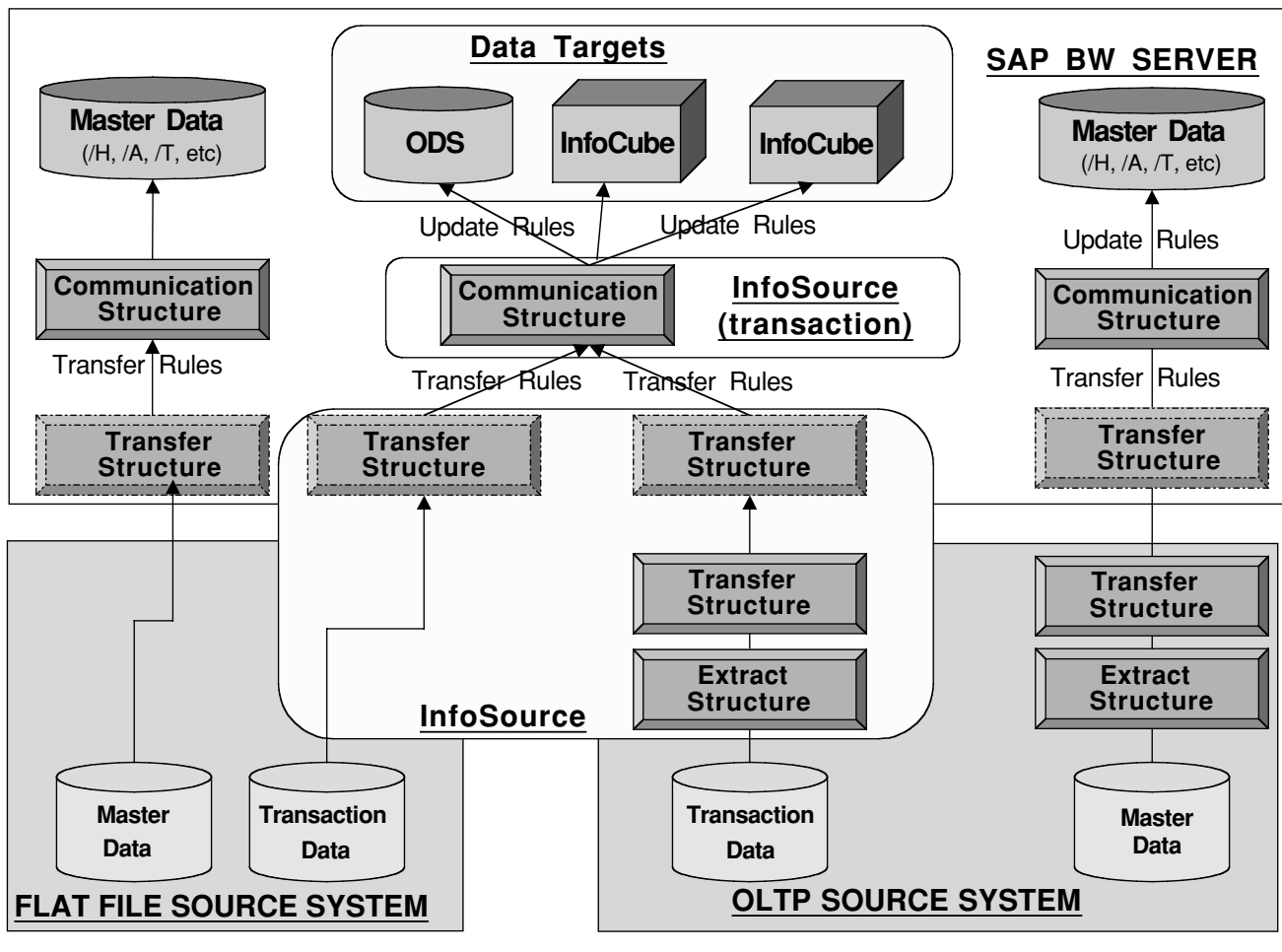
Source: SAP.

There will be a significant number of questions on SAP BW warehouse management, especially on the AWB, scheduler, and data load monitor.

ON THE EXAM

Security in SAP BW exploits the standard SAP R/3 security model but with important extensions. It is an important concept in warehouse management and will be discussed in detail in Chapter 6, "Reporting," in the context of authorization and control for queries and reports.

NOTE

Warehouse Performance Management

As illustrated in Exhibit 5.6, warehouse performance management is a complex process based on several factors, including the number of users, query complexity, network topology, data extraction and load time, and so on. Due to the dependencies and relationships that exist between these factors, performance optimization in SAP BW is a balancing act. For instance, if the number of aggregates increases, the overall system performance will be improved at query time but the data load and transformation time might be negatively impacted.

Additional information on SAP BW performance management can be found in SAP's white papers (*www.service.sap.com/bw*) and in *Business Information Warehouse for SAP*, by Naeem Hashmi.[1]

Administrator Workbench (AWB)

The Administrator Workbench is the tool for warehouse management in SAP BW. As illustrated in Exhibit 5.7, the AWB includes a scheduler, data load monitor, and metadata maintenance. The AWB provides several warehouse management functions:

- Access to the design of all components of SAP BW
- Monitor data load and data updates (data load monitor).
- Schedule and group extract jobs (scheduler).
- InfoCubes can be maintained with the option «maintain InfoCubes content» (right-click on InfoCubes and select Manage) including the following functions:
  - ◆ Check deletes, recreate indexes.
  - ◆ Rebuild InfoCubes.
  - ◆ Compress InfoCubes.
  - ◆ Analyze InfoCubes status.

Scheduler

The scheduler manages data requests to the source system as well as activities within SAP BW operations. Requests are per InfoSource and source system and differentiate between master and transaction data.

The scheduler automates the data transfer using InfoPackages and InfoPackages groups. For further information on the scheduler, refer to Chapter 7, "Extraction."

Data Load Monitor

The data load monitor provides a complete view of data loading activities and their status. It monitors the data requests and data processing. It contains several windows that provide information on header, detail, and status. The data load monitor is not to be confused with the query monitor. The status indicator in the data load monitor is based on three states:

Exhibit 5.6   Performance of a Data Warehouse

Data Extraction Time

Data Scrubbing Time

Data Transformation Time

Number of Users

Data Delivery Time

**Data
Warehouse
Performance**

Data Load Time

Query Complexity

Backup and Recovery Time

Data Delivery Time

Network Topology
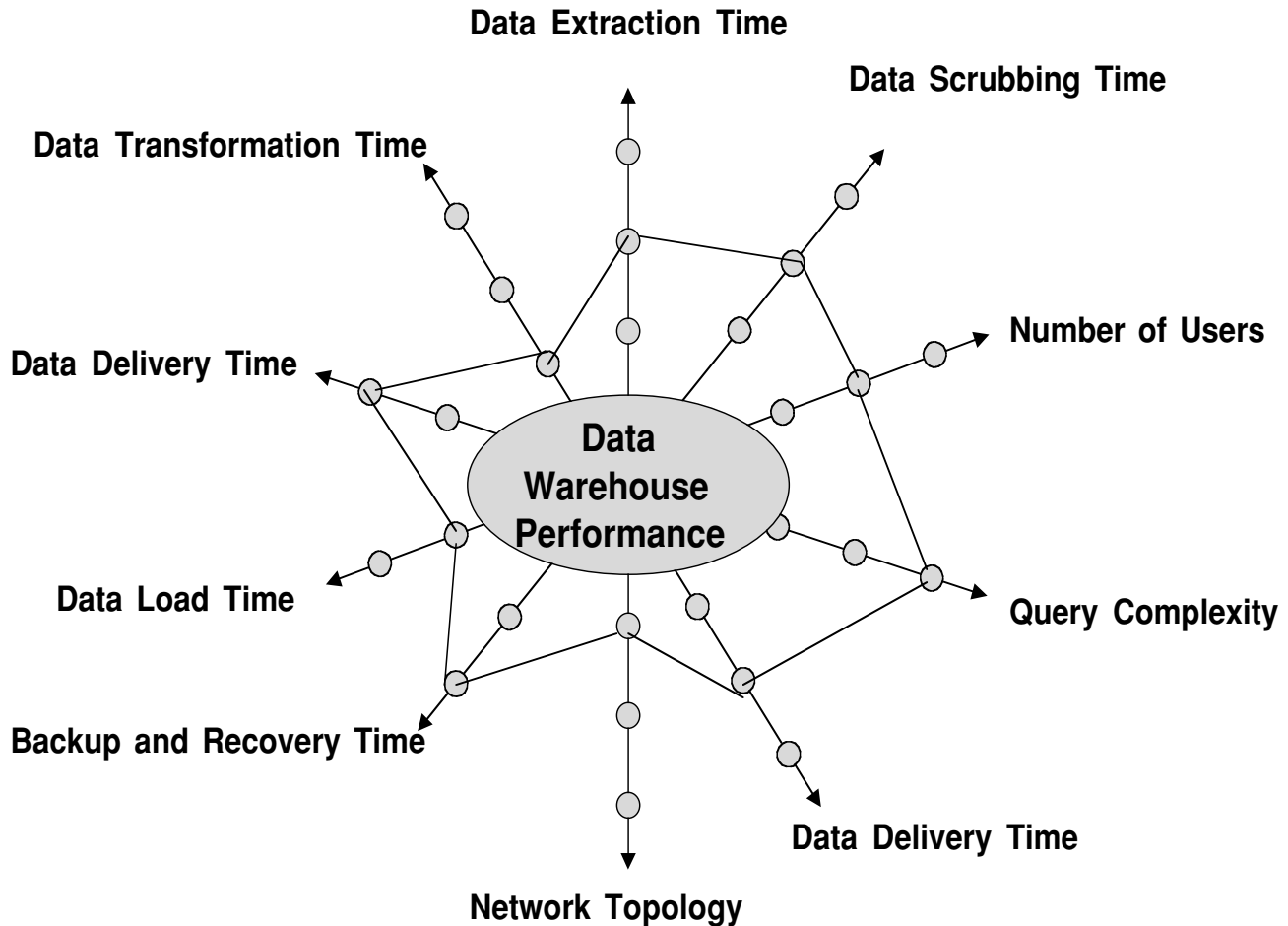
Source: Naeem Hashmi, *Business Information Warehouse for SAP* (Portland, OR: Premier Press, 2000).

- *Green.* Status okay (no error and data loaded)
- *Yellow.* Status indeterminate (data update not finished, incorrect number of data packages, incorrect data request, or no data in source system)
- *Red.* Status not okay (data loaded with error, undetermined with error, data only booked into ALE incoming logs)

Data Flow

A data flow is a display of all SAP BW elements from the source system (including source system, DataSources, transfer rules, InfoSource, update rules, and InfoCubes) up to the InfoSource or InfoCubes. It can be started from the Administrator Workbench and can display the data flow for the InfoSource and InfoCube dynamically.

Data Browsing

Three transactions are of interest to browse data in BW:

Exhibit 5.7   **SAP BW Administrator Workbench**
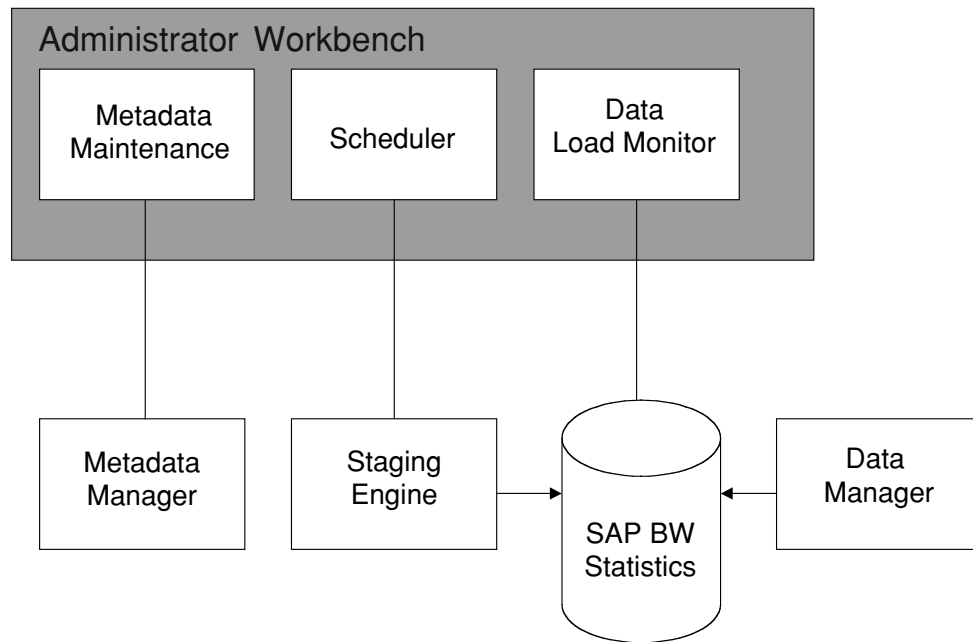
Source: SAP.

1. *LISTCUBE.* LISTCUBE is a transaction that provides listing of the InfoCube tables: dimension and fact tables.
2. *LISTSCHEMA.* LISTSCHEMA is a transaction that provides indented and nested listing of all InfoCube tables and supporting tables with access to each table via the data browser transaction.
3. *ABAP dictionary browser.* The ABAP dictionary browser can be used to access and review nested structures.

The difference between LISTSCHEMA and LISTCUBE is that LISTSCHEMA provides not only the InfoCube tables but also the other tables in the extended star schema, including dimension tables, master data tables, SID tables, and attribute tables.

Several techniques and tools are available for the management and optimization of the SAP BW operational system:
- Table partitioning
- Compression
- Data archiving (in SAP BW 3.0)

The exam will test your knowledge of SAP BW performance management with questions on system and parameter settings, aggregates, BW statistics, table partitioning, archiving, and compression. You should be familiar with the system performance optimization techniques available in BW.

Table Partitioning

Table partitioning of the PSA, ODS, and fact tables can be implemented. Note that table partitioning is not related to partitioning dimensions (logical partitioning).

OPTIMIZATION

TIP

> ### Queries
>
> You should partition tables to improve performance of queries and data load while increasing InfoCube size potential. But be aware of the implications for database sizing and data load.

SAP BW RESTRICTIONS

> Partitioning of the fact table is limited to 0CALMONTH or 0FISCPER.
> - After partitioning, physically there will be more than one fact table.
> - Partitioning should be set up on creation of the InfoCube and cannot occur after data have been loaded (partitioning cannot occur if data are in the InfoCube.
> - If you want to partition an InfoCube that already has data in it, you need to create a new InfoCube and partition it, then move data from the nonpartitioned InfoCube to this partitioned InfoCube.

InfoCube Compression

Compression of the InfoCube can be carried out in the AWB to delete the request Set IDs and save disk space.

OPTIMIZATION

TIP

> ### System
>
> Set IDs can occupy significant table space and should be deleted periodically. In addition, there are a maximum of 1,000 data packages per InfoCube (as of SAP version 2.0B). Therefore you should compress InfoCubes to save disk space and delete Set IDs.

After compression, two physical fact tables coexist in the BW database: /F and /E compressed version (logically there is still only one fact table per InfoCube):
- When an InfoCube is compressed, the content of the original fact table /BIC/F*** is compressed and copied in the /BIC/E**** table.
- The original /BIC/F*** table is emptied.
- Future data requests are automatically directed to the /BIC/E*** table.

InfoCube compression is an irreversible process and should be used with caution. After InfoCube compression, all Request IDs become zero so you can no longer remove an InfoPackage once the InfoCube has been compressed.

SAP BW RESTRICTIONS

Error Handling

Error handling is supported to ensure data quality and integrity based on the status of the requests in the update rules. The options for reporting based on errors in the update rules are:
- No update, no reporting
- Update of valid records, no reporting (red request)
- Update of valid records, reporting possible (green requests)

In SAP BW 3.0, more options for error handling are available and can be based on the following processing steps:
- Update rules
- Master data, text, and hierarchy updates
- InfoCube updates
- Referential integrity of an InfoObject for master data tables or ODS objects on the level of the communication structure

Data Archiving

Data archiving involves reading data that are no longer needed on-line from the database, and saving these data in an archive file. Archived data are usually deleted from the system. Note that archiving is available in SAP BW 3.0 but was not supported in prior versions.

Archiving is supported for ODS and InfoCubes. However, at this time archiving of the PSA is not available.

SAP BW RESTRICTIONS

Archived data can be restored or read at a future time:
- Archived data can be extracted from SAP BW (BW archive only).
- The scheduler provides the additional option to read from archives as well as input help for the existing archive files.

OPTIMIZATION

TIP

System

You should archive data that are no longer needed in SAP BW periodically to relieve the system. Database tables will be emptied so that program runtimes are reduced because of the smaller data volume that must be processed, and new data can be entered if required. Data archiving enables you to simplify InfoCube and ODS object administration and improve performance.

Configuration and Data Load Enrichment Techniques

This section provides some key configuration and data load enrichment tools and techniques available in SAP BW, including third-party tools for data standardization and quality, ABAP programs, start routines, exits, and return tables. Only high-level definitions are provided and you should refer to other resources for further details.

> **ON THE EXAM**
>
> You should understand at a high level the use and benefits of these enrichment methods. Detailed knowledge of these methods is not critical for the exam.

Third-Party Data Reengineering and Quality Tools

Third-party data quality tools are software that can be used to provide standardization, quality assurance, and additional value added for the data before they are loaded into SAP BW. These tools are useful when there are data issues in the source systems such as:

- Data in varied formats, inaccurate or incomplete
- Redundant data across systems
- Different account or part numbers for the same person or product due to recent mergers or acquisitions
- Multiple variations of the name of the same customer, vendor, or supplier

These third-party tools can be used to complement SAP BW and can be integrated independently (before the data load) or in an automated fashion (through a user exit). An example of a third-party data reengineering tool is Integrity by Vality Technology.

ABAP

Advanced Business Application Programming (ABAP) is the programming language developed by SAP for application development purposes. All SAP R/3 applications are written in ABAP.

ABAP is used by the developers of SAP and by customers to customize the SAP R/3 application and provide additional business functionality. The most common uses for ABAP programs are:

- Producing custom reports
- Developing custom interfaces for SAP
- Adding custom routines during the transfer and update rules processes within SAP BW

Return Table

A return table can be used in update rules and transfer rules when you need to return more than one value for the same key figure. A return table is the result of a key figure routine that provides more than one value, instead of the single value that is brought by the key figure. For example, a return table can be used to compute sales per employee: the return table provides the sales for each employee (there will be as many entries in the return table as there are employees).

Start Routine

A start routine is a user exit that can be executed before the update rule starts to allow more complex calculations. For example, a start routine can be used to generate internal tables, which can then be used for the key figure and characteristic routines. There is no return value in the routine.

Exits

Exits are techniques to enhance standard SAP code, tables, and functions. They provide points in SAP programs where enhancements can be added. Three types of exits can be used in SAP BW:

1. *SAP exits*. An SAP exit is an enhancement technique that allows you to add additional functions to the SAP standard code and programs.
2. *User exit*. A user exit is a point in an SAP program supplied by SAP where an ABAP program can be called. In contrast to customer exits, user exits allow developers to access and modify program components and data objects in the standard system (e.g., modification to customize SAP BW business content, extractors, and transfer rules).

   User exits keep custom changes transparent from the point of view of SAP BW maintenance level or release upgrade. However, when upgrading, each user exit must be checked to ensure that it conforms to the standard system.
3. *Customer exit*. A customer exit is a point in an SAP program where you can add a nonstandard custom enhancement. For example, you could use a customer exit in the transfer rule to consolidate and process data from different sources before saving them into the ODS.

VBA (Visual Basic for Applications)

Visual Basic for Applications can be used to program more complex reporting functions in SAP BW (beyond the standard features of BEx reporting) through VBA programming in Microsoft Excel.

Life Cycle

Once all building blocks are in place and activated, you are ready to roll out SAP BW. The SAP BW *landscape* provides the infrastructure architecture for the rollout of SAP BW from development to production.

ON THE EXAM

- This section is good background information but probably not tested on the exam.
- Transport may be mentioned on some questions. For example, the CTO and CTS may be mentioned as trick answers to throw you off. So you should know that they exist and understand what they do.

As illustrated in Exhibit 5.8, the BW landscape recommended by SAP is based on three individual systems to optimize system performance and reliability:

- Development system for SAP BW developers
- Test system for quality assurance
- Production system for live SAP BW implementation

Data Transport

SAP BW development projects are usually not executed in a productive system, but rather in one or more development systems. In this case, the developments must be transported into the target system (test or productive system). The transport connection can be used to collect newly created or changed SAP BW objects in the respective development system, and subsequently transport the objects.

CTO

The correction and transport organizer (CTO) is a tool used to move objects between SAP systems: development to test and test to production. CTO includes two key components:

1. *The change and transport system (CTS).* The change and transport system is a tool to organize development projects, customize, and then transport the changes between the SAP systems in your system landscape.

Exhibit 5.8   **SAP BW System Landscape**

SAP BW Production Landscape

| SAP BW Development | SAP BW Test | SAP BW Production |

| SAP R/3 Development | SAP R/3 Test | SAP R/3 Production |

SAP R/3 Production Landscape

→ RFC
----> CTS
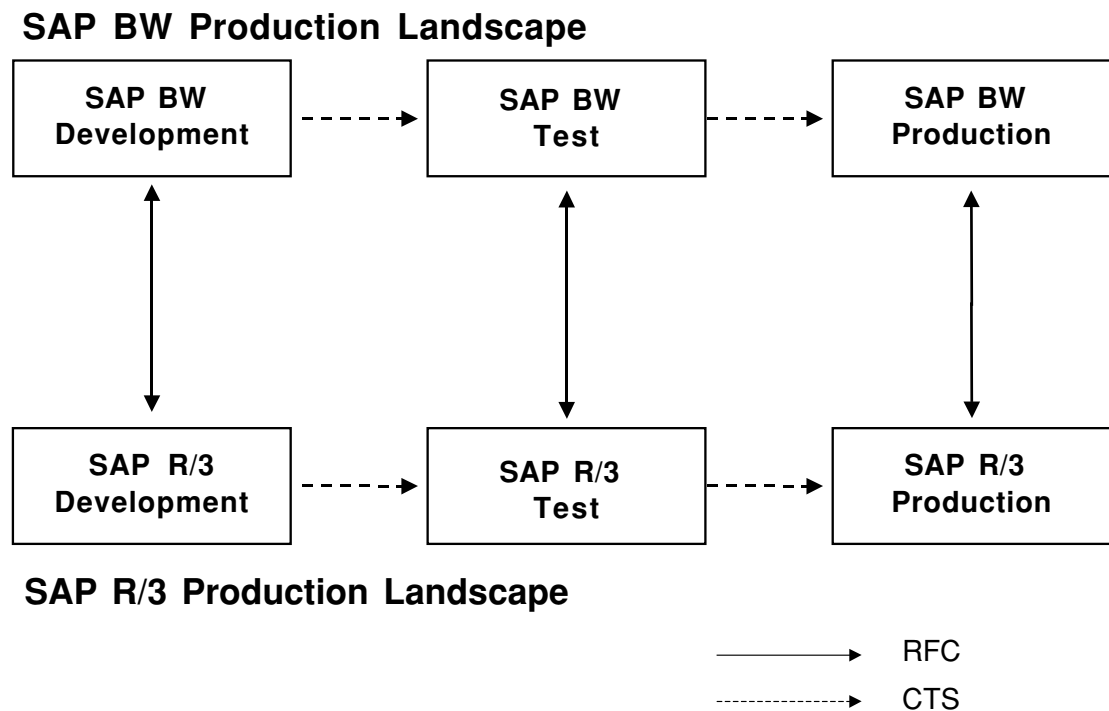
2. *The transport management system (TMS).* The transport management system is a tool to organize, perform, and monitor transports between SAP systems.

RFC

Remote Function Calls (RFCs) are interface techniques/tools that enable you to call and execute predefined functions in a remote system, or even in the same system.

Suggested Exercises

The following are exercises that you can perform, usually with a small test SAP BW server, to gain experience in the SAP BW architecture subject area:

- Create an InfoSource for master data.
- Create an InfoSource for transaction data.
- Load data from SAP R/3: attributes.
- Load data from SAP R/3: texts.
- Load data from SAP R/3: transaction data.
- Load flat file hierarchy.
- Create ODS objects and update rules.
- Load data into the ODS.
- Review SAP BW statistics.
- Report on ODS data.
- Maintain the contents of an InfoCube.
- Extract data from an InfoCube into a flat file.
- Browse the metadata repository.

Practice Test

Check the answer(s) that apply:

1. In which of the following elements can data transformation take place in SAP BW?
   This question has more than one answer.
   a. Extract rule
   b. Report result
   c. Transfer routine
   d. Transfer rules
   e. Update rules

2. What type of table does the PSA consist of?
   This question has only one answer.
   a. Transparent table for sorting the detailed request in the format of the Transfer structure
   b. Relational
   c. Binary
   d. It depends on the DBMS
   e. None of the above

3. Which of the following does an update rule connect?
   This question has only one answer.
   a. InfoSource and source system
   b. InfoCube and InfoSource
   c. InfoCube and report
   d. Data target and InfoCube
   e. None of the above

4. Which of the following methods can be used to manipulate characteristics in update rules?
   This question has only one answer.
   a. Access an external program
   b. Replace with a constant
   c. Sum information
   d. Use an ABAP exit routine
   e. All the above
   f. None of the above

5. Which of the following can you do with the Administrator Workbench?
   This question has only one answer.
   a. Schedule the data load from several sources
   b. Execute the data load
   c. Monitor the data load and the data update
   d. Design all components of SAP BW including customizing/maintenance
   e. All the above

6. Which of the following do you use to map the transfer of transfer structure fields to the communication structure fields?
   This question has only one answer.
   a. Transfer rules
   b. Update rules
   c. Direct mapping only
   d. Handled automatically by SAP BW
   e. None of the above

7. Which of the following data types can be in the PSA?
   This question has more than one answer.
   a. Transaction data
   b. Metadata
   c. Master data
   d. All of the above
   e. None of the above

8. How can data be updated in the PSA and InfoCube?
   This question has more than one answer.
   a. In parallel
   b. Sequentially
   c. They can be loaded to PSA but not to ODS
   d. They can be loaded to ODS but not to PSA
   e. None of the above

9. What are transfer rules and update rules?
   This question has more than one answer.
   a. Where I can change data and add ABAP routines
   b. Rules on the target system
   c. A record layout of InfoObjects that defines the data that are updated into the InfoCube
   d. Start routines
   e. None of the above

10. Which of the following statements are not correct about the PSA?
    This question has more than one answer.
    a. Created for each communication structure
    b. Transfer rules have been applied
    c. You can load from the PSA to an InfoCube
    d. Queries can be generated from the PSA
    e. None of the above

11. Which of the following tables do ODS objects consist of?
    This question has more than one answer.
    a. Active table
    b. Extended table
    c. Change log table

    d.   Modified and new table

    e.   None of the above

12.   Table partitioning is used to optimize which of the following?
This question has more than one answer.
    a.   Data deletion
    b.   Activation of InfoCube
    c.   Reporting
    d.   Data extract
    e.   None of the above

13.   Which of the following statements are not correct concerning SAP BW InfoSources?
This question has more than one answer.
    a.   An InfoSource is a set of logically associated information
    b.   InfoSources are not delivered with SAP BW business content
    c.   InfoSources can contain transaction data but not master data
    d.   InfoSources contain all the information on a business transaction or a type of business transaction (for example, cost center accounting)
    e.   The transfer structure transports the InfoSource data from a source system to an SAP BW system

14.   Which of the following statements are correct concerning transfer rules?
This question has more than one answer.
    a.   All transfer rules are created and must be activated in order to take effect
    b.   Transfer rules are objects, such as customer, product, and revenue
    c.   Transfer rules are stored in master data tables
    d.   Transfer rules determine which transfer structures fields should be populated
    e.   Transfer rules facilitate the data load into the SID tables

15.   From which of the following do transfer rules get generated?
This question has only one answer.
    a.   From the AWB
    b.   They are generated automatically
    c.   They are replicated from the source system
    d.   From selected Info objects in the template DataSource in SAP BW and in the SAP R/3 OLTP system
    e.   None of the above

16.   Which of the following items are part of an InfoObject definition?
This question has more than one answer.
    a.   Attributes
    b.   Hierarchies
    c.   Text information
    d.   Dimension
    e.   Transaction codes
    f.   None of the above

17.　Which of the following are benefits of the ODS?
　　　This question has more than one answer.
　　　a.　Overwrite capability
　　　b.　Reporting
　　　c.　Data compression
　　　d.　Store data on the document level
　　　e.　None of the above

18.　Which of the following are correct concerning the ODS?
　　　This question has more than one answer.
　　　a.　Data from multiple InfoSources can be consolidated in the ODS object
　　　b.　ODS data must be activated before they can be available for reporting
　　　c.　One ODS object consists of three transparent tables
　　　d.　Reporting on ODS data must be done with InfoSet queries
　　　e.　Updating InfoCubes with data from the ODS requires TRFC

19.　Where are InfoObjects stored in SAP BW 2.0?
　　　This question has only one answer.
　　　a.　In SAP BW
　　　b.　In SAP BW and in the OLTP
　　　c.　In the OLTP
　　　d.　In the BDS
　　　e.　None of the above

20.　The data monitor can be accessed from which of the following?
　　　This question has only one answer.
　　　a.　Administrator Workbench
　　　b.　Scheduler
　　　c.　BDS
　　　d.　InfoCube
　　　e.　None of the above

21.　PSA supports hierarchies. (True or False)
　　　This question has only one answer.
　　　a.　True
　　　b.　False

22.　Does the PSA support partitioning (Yes/No)?
　　　This question has only one answer.
　　　a.　Yes
　　　b.　No

23.　Which of the following statements are correct concerning SAP BW metadata?
　　　This question has more than one answer.
　　　a.　The metadata repository contains check and text table references for InfoObjects
　　　b.　Domain and data elements references in the metadata repository are created for characteristics, but not for key figures

   c. Each time a new InfoObject is created and activated, new information is added to the metadata repository

   d. Metadata can be used as a basis for defining structures that transfer data from the OLTP systems to SAP BW

   e. The metadata repository physically is stored on the OLTP system, not on the SAP BW system

24. Can multiple source systems be assigned to an InfoSource (Yes/No)?
This question has only one answer.
   a. Yes
   b. No

25. Which of the following statements are correct regarding the copying of update rules?
This question has more than one answer.
   a. All parts of the update rules are copied if the InfoCubes are equal to each other
   b. If the InfoCubes are not equal, update rules are copied for the InfoObjects that exist in both InfoCubes
   c. Update rules can be copied by creating new update rules, if source and target rules are in same InfoSource
   d. Update rules cannot be copied
   e. None of the above

26. Which of the following can you perform with the Administrator Workbench?
This question has only one answer.
   a. Schedule the data load from several sources
   b. Execute the data load
   c. Monitor the data load and the data update
   d. Design all components of SAP BW including customizing/maintenance
   e. All of the above

27. It is mandatory to load data to PSA first to be able to load it to ODS. (True or False)
This question has only one answer.
   a. True
   b. False

28. What are the essential parts of an InfoSource?
This question has only one answer.
   a. Communication structure
   b. Extract structure
   c. Transfer rules
   d. Transfer structure
   e. Update rules

29. Which of the following protocols do the PSA tables use for data transfer?
This question has only one answer.
   a. TRFC
   b. ODS

    c. ALE

    d. IDOC

    e. None of the above

30. What is an InfoPackage?

    This question has only one answer.

    a. A structure used to move transaction and master data from the source system to the SAP Business Warehouse

    b. A generic term for business evaluation objects

    c. The central objects, on which reports and analyses are based in SAP BW

    d. A folder used to store related InfoObjects

    e. None of the above

Answers to Practice Test

Question	Answer		Question	Answer
1	c, d, e		16	a, b, c
2	a		17	a, b, d
3	b		18	a, b, c
4	e		19	a
5	e		20	a
6	a		21	b
7	a, c		22	a
8	a, b		23	a, c, d
9	a, b		24	a
10	a, b, d		25	a, b, c
11	a, c, d		26	e
12	a, c		27	b
13	b, c, e		28	a
14	a, d		29	a
15	d		30	a

Summary

In this chapter, you learned about SAP BW Building Blocks, one of the most important components of the SAP BW certification exam. You now have a good understanding of SAP BW Building Blocks used in configuration, architecture and warehouse management.

In the next chapter, you will learn more about reporting and data access in SAP BW, including the BEx tools, Web reporting, business content, and authorization.

Need to know more?

Published Resources

- Naeem Hashmi. *Business Information Warehouse for SAP*. Portland, OR: Premier Press, 2000.
- John Marnewec, et al. *Basis Administration for SAP*. Portland, OR: Premier Press, 1999.
- Arvind Nagpal. *ALE, EDI and IDOC Technologies for SAP*. Prima Communications, Inc.: Schoolcraft, MI, 1999.

On-line Resources

- Naeem Hashmi. "Not Just another ODS." *Intelligent Enterprise*. Intelligent ERP—feature, September 2000. *www.intelligenterp.com/feature/hashmiSep8.shtml*
- BW ASAP for 2.0B—phase 4: SAP BW Performance Tuning (doc). SAP. *www.service.sap.com*.
- How to Implement Flexible Master Data Staging 3.0. SAP, *www.service.sap.com*.
- How to Implement the ODS (Implementation Scenarios) 2.x. SAP, *www.service.sap.com*.
- Operational Data Store in BW 2.0B. SAP, *www.service.sap.com*.
- SAP BW Operational Data Store 2.0B (doc). SAP, *www.service.sap.com*.
- SAP BW Help CD or SAP Help Portal, *www.help.sap.com*.

Other Resources

- Training class and material, SAP BW—System Configuration, SAP Solution Academy.

Endnotes

1. Naeem Hashmi, *Business Information Warehouse for Sap* (Portland, OR: Premier Press, 2000).

CHAPTER 6

Reporting

In This Chapter:

SAP BW reporting architecture
Database server
SAP BW application server
Data access/end user layer
Business Explorer and its components
BEx Browser
BEx Analyzer—reports and queries
Multidimensional reporting
Flat file reporting
Query design
Advanced query techniques
Query management tools and techniques
Authorizations/security
Geographic Information Systems and BEx Map
Web reporting
Suggested exercises
Practice test
Answers to practice test

This chapter describes the key concepts of SAP BW reporting and authorization. The focus is on how SAP BW analyzes and presents data using the SAP BW data access and reporting environment, including:
• Architecture and reporting structure in SAP BW
• Reporting systems
• Reports
• Complex reporting functions
• Mapping results (GIS)
• Web reporting
• Authorization

For readers interested in the SAP BW training curriculum, this chapter refers to the "SAP BW Presentation" class (TABW210) for nonpartners and to a combination of two classes for nonpartners:
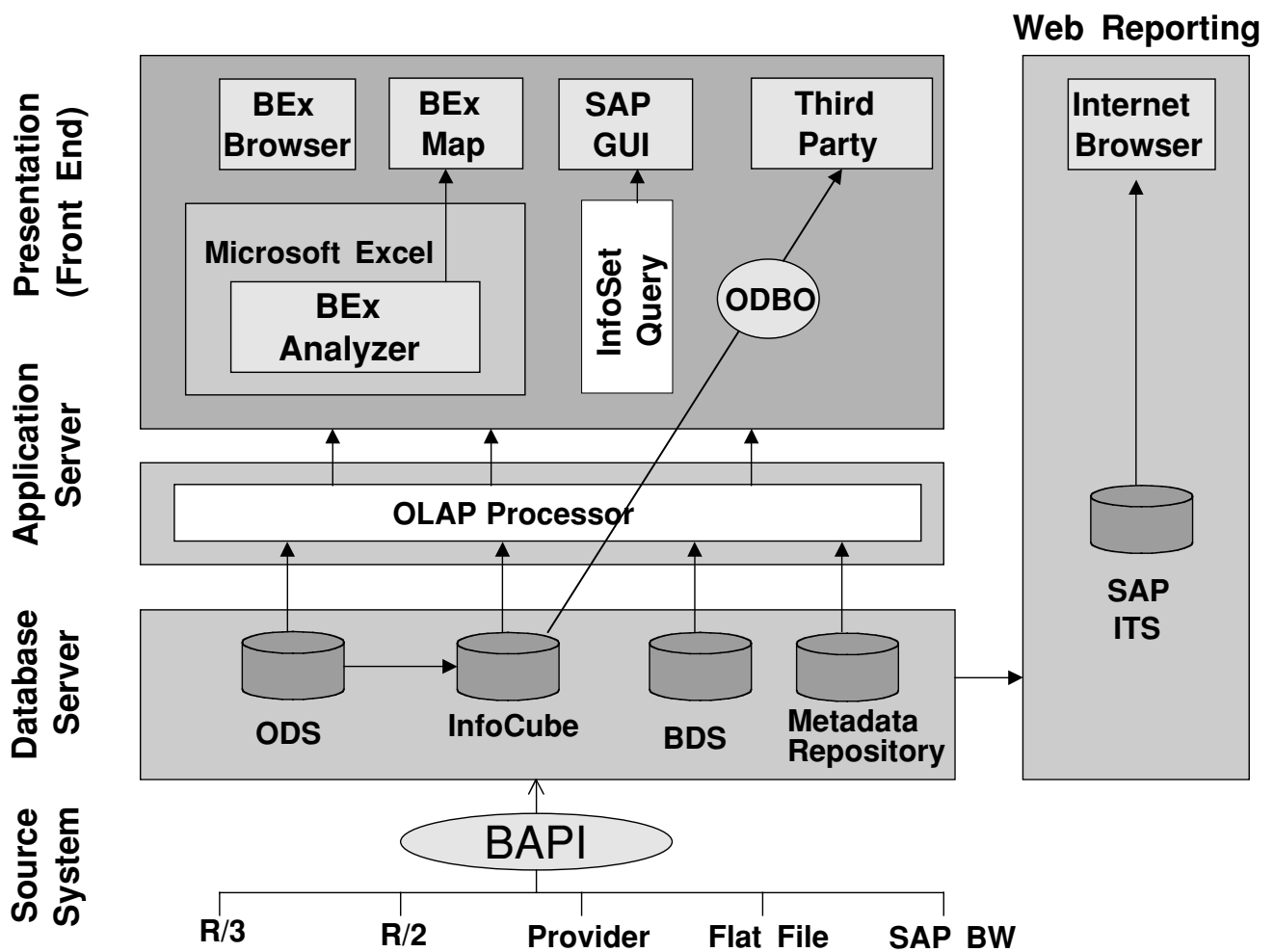
- MySAP BW Reporting (BW210)
- BW Authorization Workshop (BWNA40)

Reporting Architecture

As discussed in the previous chapter and illustrated in Exhibit 6.1, the data access and reporting architecture in SAP BW is based on three layers:

1. SAP BW database server
2. SAP BW application server
3. Presentation layer

Exhibit 6.1   SAP BW Reporting Architecture

Be clear on the different components of the reporting architecture. Make certain that you clearly differentiate the application server (OLAP) and the database server.

Database Server

The SAP BW database server is used to store the data. Its key components for reporting include:
- InfoCube
- ODS
- BDS
- Metadata repository

As described in Chapter 5, the database server also includes PSA and SAP BW internal operational data stores (e.g., IDOCs). However, this section presents only the data stores specific to reporting.

InfoCubes

InfoCubes are the central data stores and form the basis for reports and analysis in SAP BW. They contain key figures (maximum 233 key figures) and characteristics (maximum 248 characteristics). For further detail refer to Chapter 4, "Data Modeling."

ODS

The Operational Data Store (ODS) contains the consolidated details. For further detail refer to Chapters 4 and 5, "Data Modeling" and "Building Blocks."

BDS (Business Document Service)

The Business Document Service (BDS) is an easy-to-integrate document management component in the Basis system. BDS may contain documents relating to SAP BW, including:
- The InfoCube star schema data models
- User guides
- Files for geocoding for a BEx Map

Due to the heavy focus on Web-enabling BW functionality, the BDS role is being moved to the Web Content Management (WCM) technology. How much has been implemented in SAP BW 3.0 is still not clear.

Metadata Repository

SAP BW's metadata repository contains both business-related and technical metadata. Business metadata includes definitions, descriptions, and rules used for reporting.

NOTE The metadata repository is the equivalent of the data element and domain in the SAP R/3's Data Dictionary.

SAP BW Application Server

The application server is used to retrieve the data stored in the database server (it does not store data except in transient memory). It is based on the OLAP processor, query cube, and query cache.

OLAP Processor

The OLAP processor is the central component of the application server:
- The OLAP processor allows on-line analytical processing (OLAP) in SAP BW for the preparation of large quantities of current and historical data, typically for subsequent presentation by reporting and analytical tools.
- OLAP technologies allow multidimensional analyses according to various business perspectives.

Query Cube

A query cube is a source of datasets (set that contains specific basic key figures, dimensions, or formulas) formed by applying a prebuilt query on an SAP BW InfoCube through the OLAP processor. Query cubes are the objects that provide data in the SAP BW OLAP API.

Query Cache

When a query is executed, the OLAP processor evaluates the query definition and builds a subset of the InfoCube data known as query cache:
- This process is done in memory for performance reasons.
- The only data in the query cache is that needed to satisfy the query definition.

NEW In SAP BW 3.0 and higher, the OLAP query caching provides a crosstransactional cache to save query results in a session. Similar queries can then access the previous query results and therefore improve query performance and reduce load on the database instance.

Data Access/End-User Layer

The end-user layer provides access to the data and reporting function of SAP BW using the following tools:
- The Business Explorer (BEx):
 - BEx Browser
  - BEx Analyzer
  - BEx Map (GIS)

- SAP GUI and InfoSet queries (ODS)
- Web browser
- Third-party reporting tools

BEx (Business Explorer)

BEx is the reporting tool of the Business Information Warehouse and provides query and re-port generation. It is an end-user environment used to define and locate reports, analyze in-formation, and view reports. As described in Exhibit 6.2, the Business Explorer consists of three components:

1. *BEx Analyzer*. Front-end tool to build queries and reports
2. *BEx Browser*. Front-end tool to execute and present the results of queries and manage reports

Exhibit 6.2   **Business Explorer Architecture**
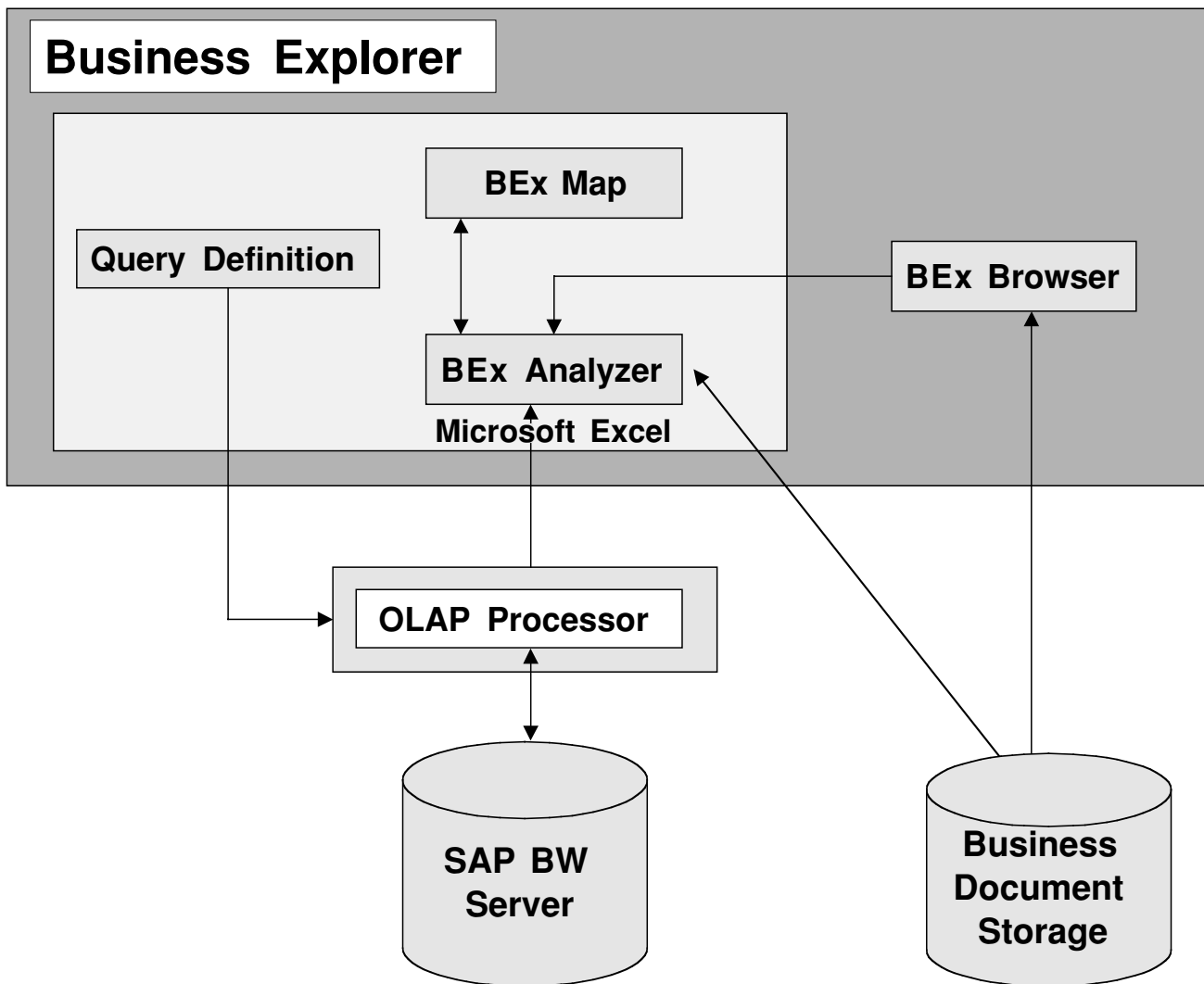
3. *BEx Map*. BEx Map is SAP's Geographic Information System (GIS) for SAP BW. A GIS is a computer system capable of assembling, storing, manipulating, and displaying data based on geographic locations. It enables the display of query key figures on a map according to geographical criteria. SAP BEx Map is fully integrated with BEx Analyzer and the user can call the BEx Map from any query that contains geospecific characteristics.

Refer to the BEx Analyzer, BEx Browser, and BEx Map sections in this chapter for further details.

SAP GUI

In SAP BW the users can drill through from a report into an SAP R/3 OLTP system to display data not loaded into SAP BW. The data are displayed through the SAP GUI.

InfoSet Query

An InfoSet query is a query using flat tables (ODS object). An InfoSet query can be built on top of
- ABAP programs
- Logical databases
- Tables
- Views

Refer to the flat file reporting section in this chapter for further details.

In SAP BW prior to release 3.xx, building InfoSet queries requires SAP GUI, (but viewing InfoSet queries can be done in BEx Browser). In SAP BW 3.xx and higher you can use activated InfoSets to define queries in the BEx Analyzer.

NEW

OPTIMIZATION

TIP

Queries

When possible, if the intent is to generate simple row/column reports you should use an InfoSet query (flat file) rather than an InfoCube query (OLAP query).

Since InfoSet queries are written against two-dimensional tables (rather than multidimensional tables), the number of joins will be reduced and the query performance therefore optimal.

Web Browser

SAP BW reports can be accessed over the Internet using an Internet browser (e.g., Netscape Navigator and Microsoft Internet Explorer). Refer to the Web Reporting section later in this chapter for further details.

Third-Party Front-End OLAP Tools

Several vendors can integrate their front-end software with SAP BW (through ODBO), including ArcPlan, Cognos, Brio, IBI, Crystal Decision, Business Objects, Seagate Software, and many more. Refer to the SAP Web site, *www.sap.com/partners/software/directory*, for a list of certified software partners.

In SAP BW 3.0, Crystal Report has been integrated in the Crystal Server Enterprise (delivered with SAP BW) to publish formatted reports. These reports meet the requirements for form-based reports (the production of formatted reports was one of the weak points in BEx reporting).

Queries, Reports, and Workbooks

Reporting in SAP BW is based on the concepts of queries, reports, and workbooks, including query views, query definitions, and query templates. This section presents the key reporting concepts in SAP BW.

The SAP BW reporting flow is described in Exhibit 6.3 and flows from extractor to InfoObject to InfoSource to mapping rules to InfoCube to query and workbook.

> You should be especially familiar with the reporting flow described in Exhibit 6.3, and the query restrictions of SAP BW (e.g., one query can only be written against the data from one InfoCube, unless a MultiCube is created).

Report

In SAP BW a report is the result of a query as viewed in the BEx Browser. An example of a report as provided in BEx Browser is shown in Exhibit 6.4.
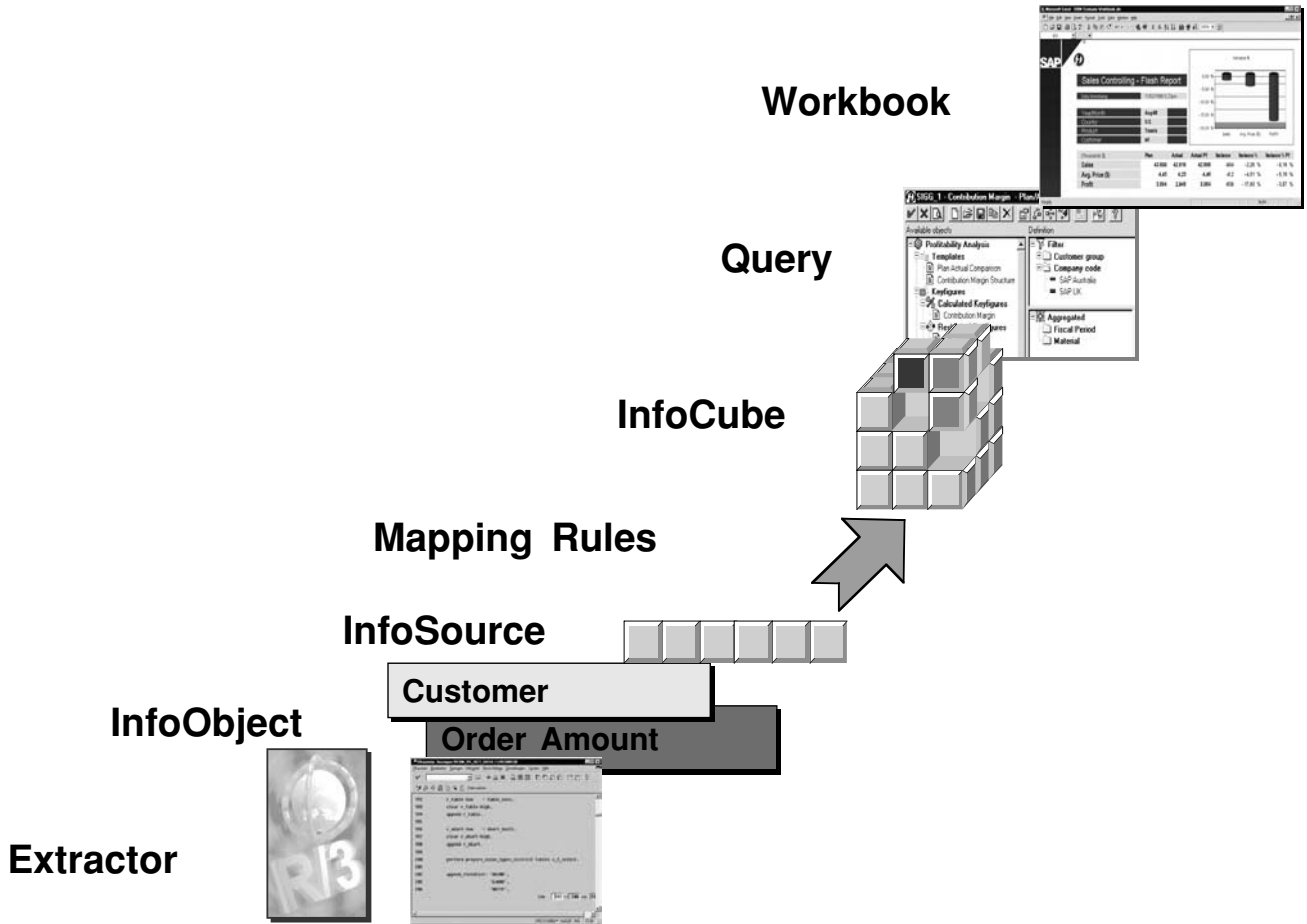
Query

As depicted in Exhibit 6.5, a query is linked to a specific InfoCube (or ODS) and provides the definition of the data to be retrieved into a report. In SAP BW, queries can be written against
- One InfoCube: multidimensional data reporting
- The ODS: flat data reporting

Salient features of SAP BW queries are:
- Queries can be stored in workbooks.
- One workbook can contain one or more queries.
- Queries can be assigned to one or more channels.
- Exception(s) can be defined for each query.
- There is no limit on the number of queries that can be written against one InfoCube.

Exhibit 6.3   **BW Reporting Flow**

Source: SAP.

⊘ **SAP BW RESTRICTIONS**	• A given query can be based only on the data in the same InfoCube; that is, it can use only the key figures, characteristics, and query template from that InfoCube. • To report on data that are contained in more than one InfoCube, you need to first build a MultiCube and then build queries against the MultiCube.

SAP BW includes several types of queries of special interest that will be further defined in later sections:

- OLAP (multidimensional) query versus InfoSet query (two dimensional, e.g., ODS query)
- Standard versus ad-hoc queries
- Nested query: prequery (first query) and Result Set query
- Drill-through query (reporting): jump queries with sender and receiver query

Exhibit 6.4   **Reports in BEx Browser**

| Sales organization		Material	Sold-to party		Actual Billed Qnty	Net value
1000	FRANKFURT, GERMANY	M01	2000	COMPU Tech. AG	87.000	£ 7,104.00
1000	FRANKFURT, GERMANY	M01	2100	Computer 3000	120.000	£ 9,799.00
1000	FRANKFURT, GERMANY	M01	2130	Damien Foods Interna	385.000	*
1000	FRANKFURT, GERMANY	M01	2210	DelBont Industries	89.000	*
1000	FRANKFURT, GERMANY	M01	Result		681.000	*
1000	FRANKFURT, GERMANY	M03	2210	DelBont Industries	50.000	13,146.00 DM
1000	FRANKFURT, GERMANY	M03	2500	Electro Engines Detr	243.000	£ 22,889.00
1000	FRANKFURT, GERMANY	M03	3000	Henderson Inc.	199.000	*
1000	FRANKFURT, GERMANY	M03	Result		492.000	*
1000	FRANKFURT, GERMANY	M09	3000	Henderson Inc.	90.000	55,253.00 DM
1000	FRANKFURT, GERMANY	M09	Result		90.000	55,253.00 DM
1000	FRANKFURT, GERMANY	M15	1500	Carbor GmbH	142.000	*
1000	FRANKFURT, GERMANY	M15	1650	Christal Clear	183.000	*

Source: SAP.

In SAP BW, ad-hoc queries are distinguished from standard queries based on users' needs:
- *Standard queries*. Standard queries are queries where specific information is sought in a specific format about specific subjects on a regular basis. Standard queries are defined in SAP BW and can be reused as needed.
- *Ad-hoc queries*. Ad-hoc queries are queries/reports that cannot be answered with an existing, predefined query. Ad-hoc queries are written by end user/business analysts using the BEx Analyzer at the time the information is needed. Ad-hoc queries may be saved for later use.

Workbook

In Microsoft Excel, a workbook is the file in which end users work and store data for reporting. Each workbook can contain many spreadsheets. The SAP BW reporting environment is Microsoft Excel based and a workbook contains one or more Microsoft Excel spreadsheets with embedded queries. When the query is run, the retrieved data are presented in a workbook and one workbook can contain one or more queries.

Exhibit 6.5   **Relationship between InfoCube, Query, and Report**
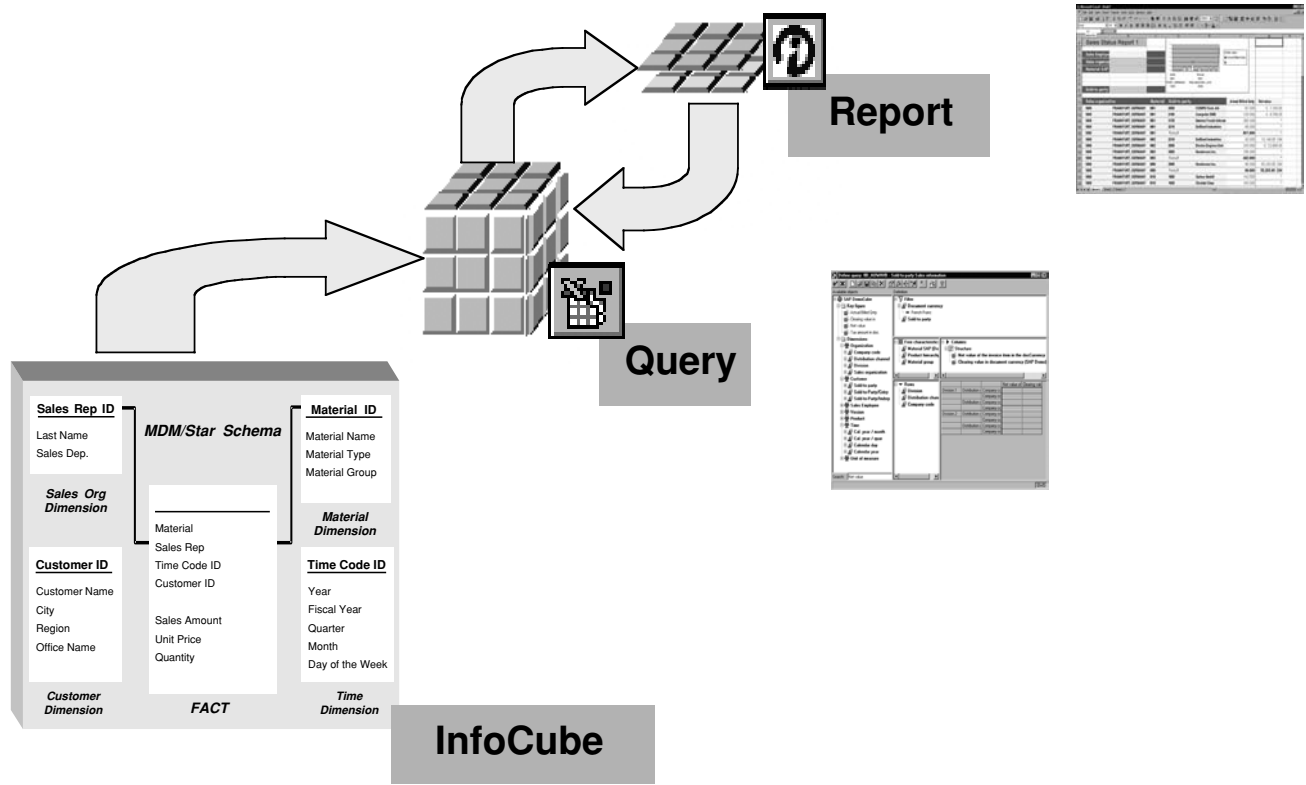
Source: SAP.

Workbooks are constrained by the limitations of Microsoft Excel, for example, maximum number of rows (65536) and columns (256)

Query View

A query view is the basic query result layout posted in the SAP BW database server. A query is linked to a specific InfoCube and provides the definition of the data to be retrieved. When the query is run, the retrieved data are presented in a workbook as illustrated in Exhibit 6.6. You navigate within a workbook, sorting and filtering data as required. This particular spin on the information can be saved as a query view, which itself is linked to the workbook.

Query Definition

A query definition describes the reporting objects in the query (i.e., rows, columns, filters, and free characteristics). A query definition can be changed in two ways:

Exhibit 6.6   **Queries, Workbooks, and Query Views**
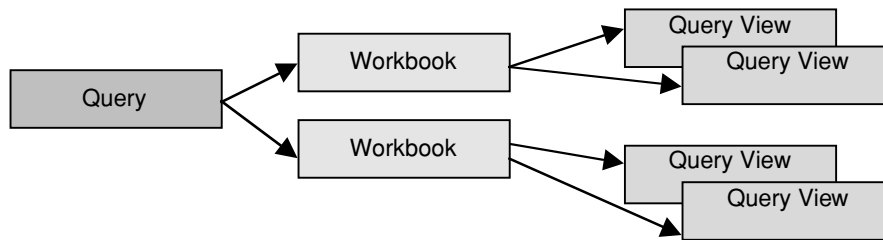
1. Locally (affects only the worksheet or report)
2. Globally (affects all workbooks and queries where the query being changed is embedded/used). Changes require adequate authorization.

For additional details, refer to the section on advanced query techniques later in this chapter.

Query Template

The query template in SAP BW is based on the concept of templates in Microsoft Word and Excel, where a template is a boilerplate that can store various settings including text, logos, page margin, custom toolbars, macros, shortcut keys, and styles.

In BEx Analyzer users can define a query template if they wish to reuse parts of a query definition in other queries. The format for the new queries using a given query template will be based on the format defined in that template. Templates save time and ensure a consistent presentation of data for reports that are based on them. For example, structures can be saved as query templates.

Multidimensional Reporting

Know the restrictions of multidimensional reports and understand the functionality they offer to the user for analysis.

Multidimensional Report

A multidimensional report is a report against several dimensions or characteristics of the business. Exhibit 6.7 provides an example of a sales multidimensional report, where sales can be reported by product, business unit, geography, channel, customer, and so forth. Refer to Chapter 4, "Data Modeling," for more information on multidimensional modeling.

Exhibit 6.7   **Example of Multidimensional Reporting**

Region	=	North
Division	=	Pharmaceuticals
Cust. gp	=	Wholesale
Sales	=	256,000 USD
Sales qty	=	4,260 Pcs
Sales ded	=	11,500 USD
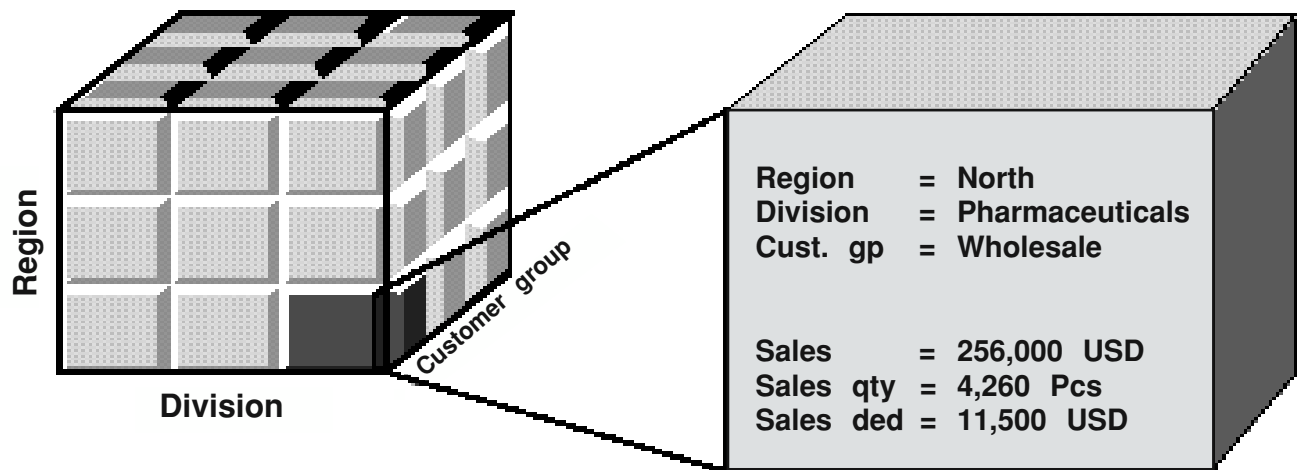
For example, sales by PRODUCT, BUSINESS UNIT, GEOGRAPHY, CHANNEL, CUSTOMER, GROWTH, FORECAST

Source: SAP.

SAP BW RESTRICTIONS

- Multidimensional reports/queries can be written against only one InfoCube (not ODS).
- Reporting/querying against several InfoCubes is not possible in SAP BW, unless a MultiCube is created first.
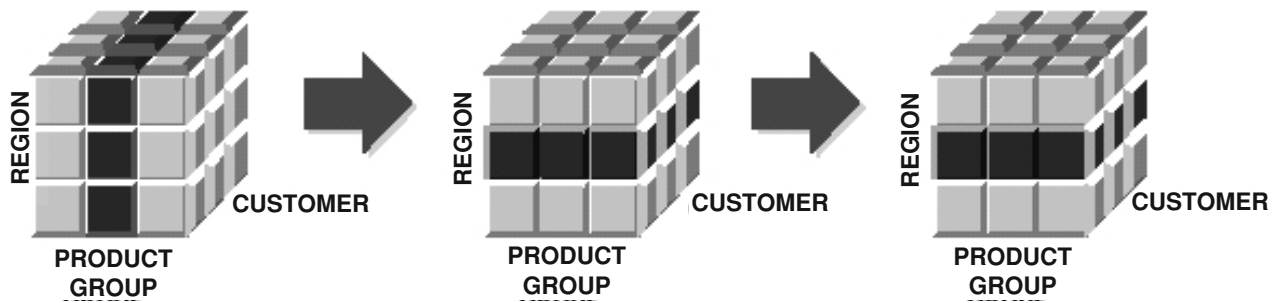
Slice-and-Dice

Slice-and-dice means looking at the data from different business points of view (dimensions).

Exhibit 6.8 illustrates slice-and-dice reporting, where a manager is examining sales figures. The manager can look at sales for a particular region, for instance, Europe, then slice-and-dice sales for individual countries within Europe. The manager may then decide that this is the level of detail at which he or she wishes to remain geographically, but that he or she now wants to change the query view to see sales according to product groups.

Drill-Down

Reports are not "frozen in time" and users can explore data and trigger report views that show information from a new perspective. Drill-down is a method in which the results of a query are manipulated to see increasing levels of detail without having to rerun the query. A drill-down is typically a breakdown across the rows of a report.

Exhibit 6.8   **Example of Slice-and-Dice Functionality in SAP BW**

The difference between drill-down and slice-and-dice is that drill-down gets details against one selected view (slice) of data whereas slice-and-dice considers multiple views (dimensions) of data.

Drill-Up

Drill-up or roll-up is the opposite of drill-down. Drill-up is a method in which results are manipulated to consolidate detailed data to a higher level of summarization without having to re-run the query.

Drill-Across

Drill-across is a method in which increased levels of detail about the data are displayed across the top of a report. A drill-across is typically a break down across the columns in the report.

Result Set Query

A Result Set query is a nested query where the results of a first query (prequery) are used as entry values for a second query. For example, a Result Set query can be used to return the customer sales for the top 10 products:
- The prequery returns the top 10 products.
- The second query returns the customer sales for this set of products only.

RRI (Report-to-Report Interface)

The report-to-report interface (RRI) is a technique used in SAP BW to link reports for drill-through reporting:
- Call a second, more detailed report (the receiver query) from an initial report (the sender query).
- Allow drill-down from the InfoCube to the ODS for more detail (one of the three scenarios for ODS reporting).

Drill-Through

Drill-throughs are calls from one query to another (using the RRI). In SAP BW drill-through is possible from:

- *Query to query*. Drill-through from an overview query to a more detailed query of an InfoCube
- *Query to ODS*. Drill-through from an overview query to a more detailed query of an ODS object
- *Query to OLTP*. Drill-through from a report into an SAP R/3 OLTP system to display data not loaded into SAP BW

Jump Queries

Jump queries are pairs of queries that are linked based on given characteristic values. A jump query allows you to automatically access a specific BEx query, InfoSet query, SAP R/3 transaction, or ABAP report.

These are collectively referred to as jump targets (linking points within a query).

Flat File Reporting

As opposed to a multidimensional report, flat file reporting is used to report against SAP BW data that are in tabular format (rows and columns) such as the data in the ODS objects and SAP BW database tables. Flat file reporting is typical of production-formatted reports.

ON THE EXAM

- Know the restrictions of flat files reports and understand the limitations they have as compared to multidimensional reports.
- You can expect some questions on InfoSet queries and ODS reporting.

SAP BW RESTRICTIONS

Flat file reporting does not support multidimensional reporting. It consists of one set of rows and columns for display only with no drill-up/down or slice-and-dice capability.

InfoSet

An InfoSet is an SAP query element. InfoSets determine to which tables, or fields within a table, a query can refer. InfoSets can be based on several data sources:

- Database tables/views
- Joins of database tables
- Logical databases
- DataSource programs written by the user

ODS Query

An ODS query is the same as an InfoSet query. It is a tool designed for reporting on flat, tabular data. It can be used to join multiple ODS tables or additional SAP BW tables as needed.

ODS Reporting

ODS reporting is based on data contained in the ODS. There are three scenarios for ODS reporting in SAP BW:
1. An ODS query permits direct analysis of the data in the ODS object (usually not the most efficient way to access ODS data).
2. An ODS query can be run to analyze the data of an InfoCube and in a second step the RRI is used to drill down to the ODS to get more detail.
3. The original documents can be directly accessed in the OLTP system. From the ODS, jump directly to the OLTP system and run an SAP R/3 transaction (such as a document or customer record display) or start an existing report.

In addition to these three scenarios, InfoSet query can also be used to create reports. InfoSet query is closely related to SAP queries on the SAP R/3 system.

BEx Browser

The BEx Browser is one of the BEx reporting tools in SAP BW and the main entry point to SAP BW reporting. It includes favorites and channels.

> Understand the role of BEx Browser, favorites, channels and favorites.

As illustrated in Exhibit 6.9, BEx Browser provides an easy-to-use tool to execute queries and manage reports.
With BEx Browser users can:
*   Access workbooks that are assigned to them in channels.
*   Select the workbook with which they wish to work.
*   Manage their most often used workbooks in the favorites.

Favorites

Favorites are personal folders used to store the workbooks that users frequently access. Users can copy frequently used workbooks into their favorites. Users manage their favorites themselves and can individually name or group their content. Users can save modified or new workbooks in their favorites.
As shown in Exhibit 6.10, favorites is a graphical interface made of two panels (note that visuals are version dependent; there might be some differences with your visuals if you are working with another release of SAP BW):

Exhibit 6.9   **BEx Browser**
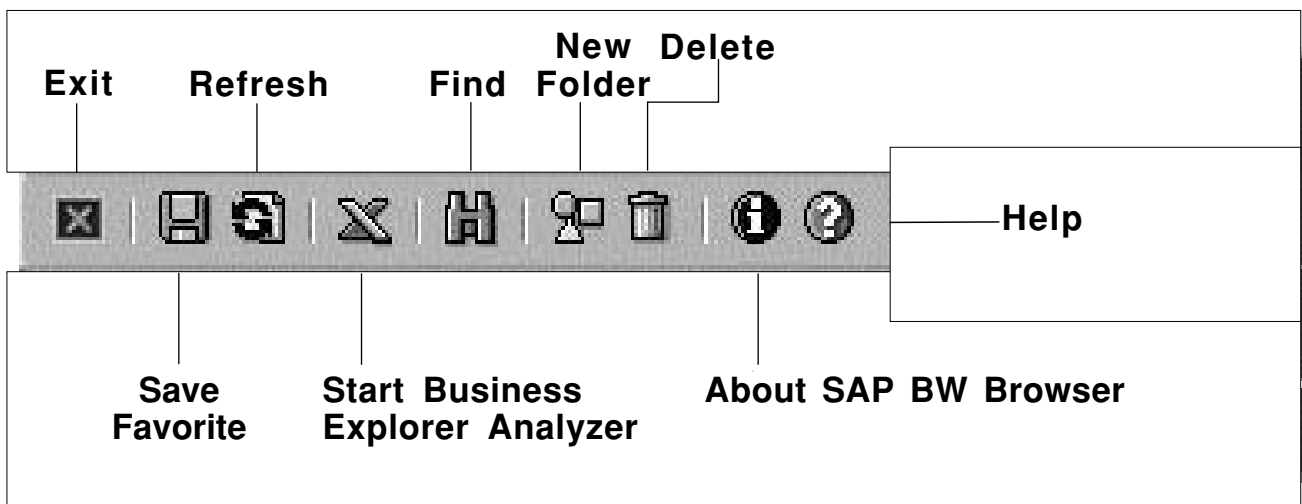
Source: SAP.

- *The folders tree*. In the left panel is the folders tree. It contains a favorites folder and folders for roles. The user can modify this folders tree, adding cascading folders as required to create a filing system.
- *The folders*. The right panel is used to organize individual documents, transactions, workbooks, and queries into groups called "folders." In the example described in Exhibit 6.10, folders include "Report," "SAP Transactions," "Web Addresses," and so on.

Queries and workbooks can be organized using InfoCatalogs (AWB) and in SAP BW before release 3.xx using channels (BEx Browser):

- *InfoCatalog*. The InfoCatalog is a repository of all SAP BW reports and solutions. The InfoCatalog is a tree-like structure in the Administrator Workbench that displays SAP BW workbooks. A user accesses his or her InfoCatalog workbooks using the Business Explorer Browser.
- *Channel*. A channel is a supply of workbooks in SAP BW arranged according to topic areas. Channels are used to organize the queries and workbooks.

Note that channels exist only in SAP BW releases 2.x and prior. This component no longer exists in SAP BW 3.0.

Query Design in BEx Analyzer

The BEx Analyzer is the other component of the BEx reporting tools in SAP BW and includes the ability to create queries, workbooks, and reports based on rows and columns, free characteristics, filters, formulas, and query preview.

Exhibit 6.10   **Favorites in the SAP BW BEx Browser for SAP Release BW 2.0B**
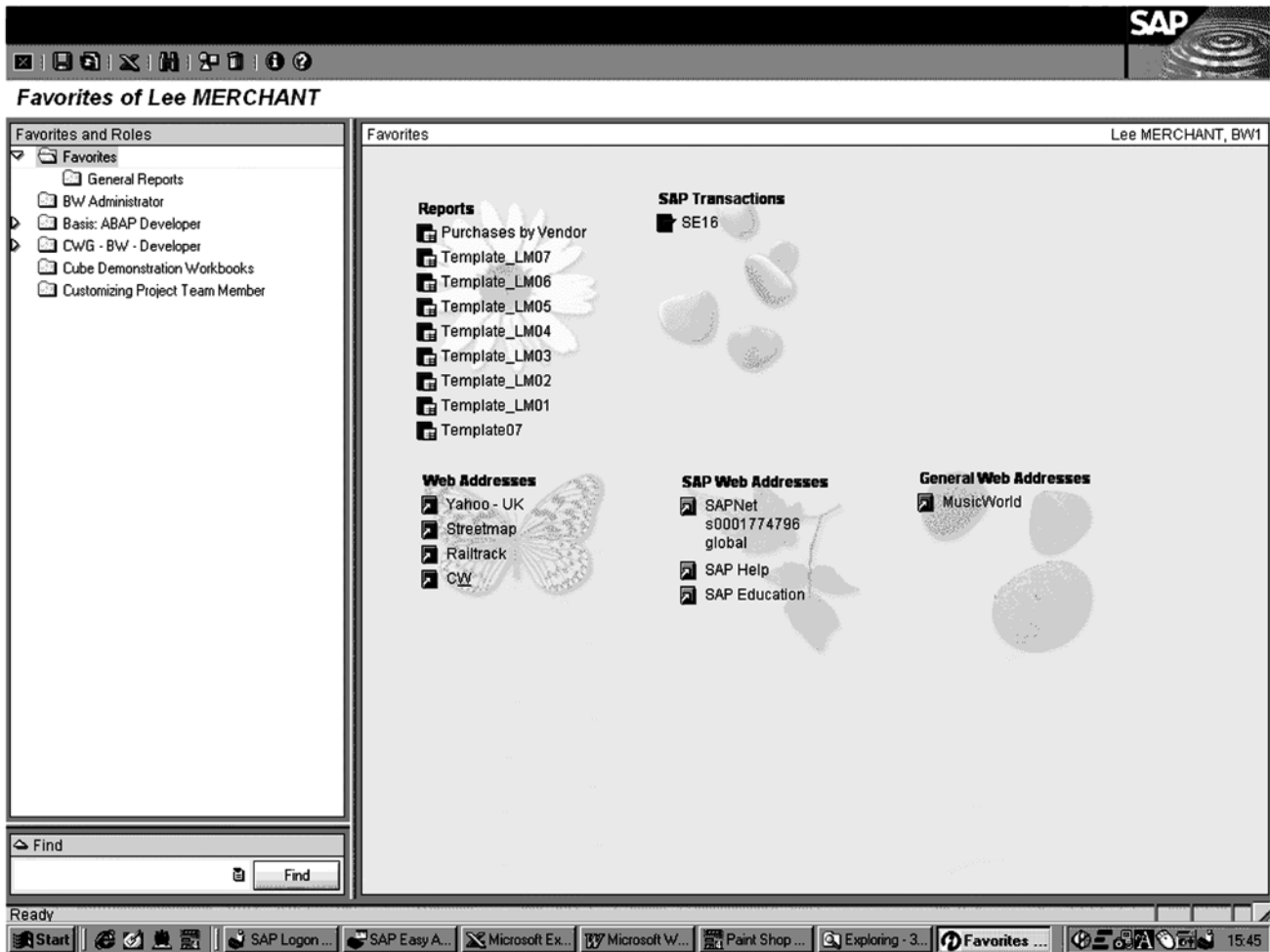
Source: SAP.

Understand the role of BEx Analyzer and navigation. Know the components of BEx Analyzer and how they are used to build reports.

BEx Analyzer (Business Explorer Analyzer)

BEx Analyzer is a Windows-based front-end tool that allows you to design queries by selecting and dragging-and-dropping query components. As illustrated in Exhibit 6.11, BEx Analyzer is hosted by Microsoft Excel and its functionalities are provided as an add-in menu to the standard Microsoft Excel menu. Therefore BEx Analyzer users will be able to leverage all standard Excel functions and concepts for reporting in SAP BW (e.g., sort, format, etc.).

In the BEx Analyzer, you can define queries that are based on a selection of characteris-

Exhibit 6.11   **BEx Analyzer Add-in Menu in Microsoft Excel (SAP BW 2.1C)**
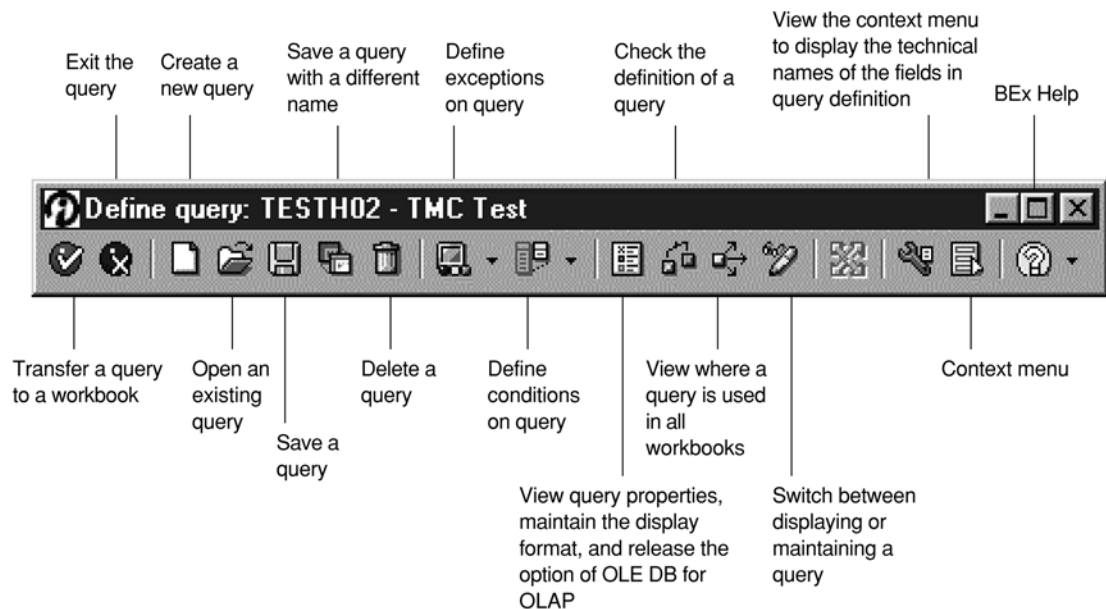
Source: SAP.

tics and key figures (InfoObjects), as well as on predefined query templates of an InfoCube. Users can analyze the selected InfoCube data by navigating on a query, through which they generate different views of the data.

Navigational States
Navigational states are various views of the query data that enable the user to analyze and view the data in different ways.

Navigation
Navigation refers to changing between views of the query data during the analysis.
    As pictured in Exhibit 6.12, the BEx Analyzer user interface consists of two panels:
1. The left panel contains the objects available for building a query: key figures, calculated key figures, dimensions, and so on.
2. The right panel contains the query components as built: filter, free characteristic, rows and columns, formulas, and query previews.

NOTE Exhibit 6.12 is for multidimensional queries. For flat file reporting (e.g., InfoSet and tabular queries), the screen is similar but only row, column, and filters are present (there is no free characteristic).

Free Characteristic
A free characteristic is a characteristic that is not initially displayed as a row or column but is available to the user for drill-down.

Exhibit 6.12   **BEx Analyzer Query Components (SAP BW 2.1C)**
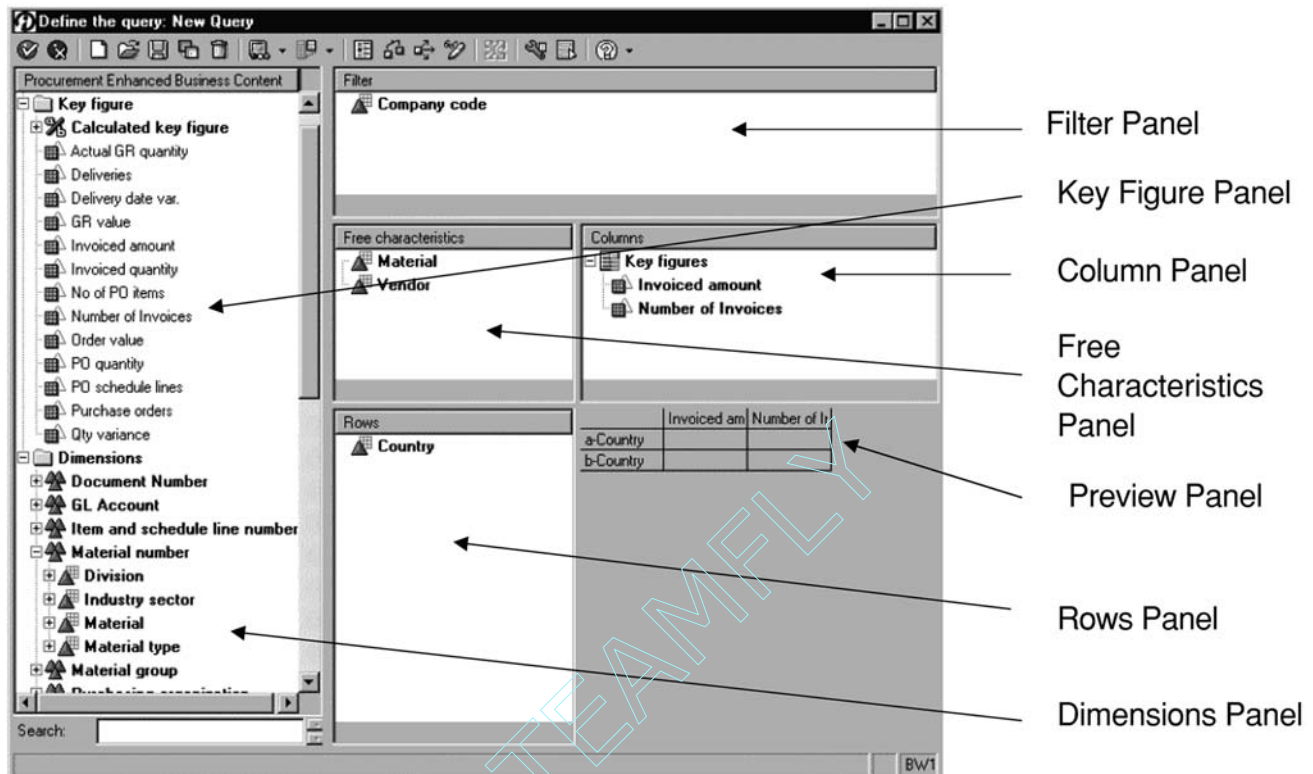
Filter

A filter restricts the result sets of queries. The filter is set in the BEx Analyzer (in the query builder) and not shown in the query. For instance, a filter can be set up to selectively restrict the query results only for certain customers or company codes. You can restrict (filter) the values of a characteristic in the rows, columns, free characteristics, and in the filter. In SAP BW, data can be restricted using filters, restricted key figures, or free characteristics.

Restricted key figures and filters are two similar methods to restrict data in BW. The difference between restricted key figures and filters is that

- A filter restricts the entire query while a restricted key figure restricts only that key figure.
- A filter restricts characteristics while a restricted key figure restricts key figures (as its name indicates).

Filters and free characteristics are also two similar methods to restrict data in BW and both restrict the values of a characteristic in a query. The difference between free characteristics and filters is that with the filter you will not see the restricted data in the query and will not be able to navigate on the data. Conversely, with a free characteristic the user will be able to navigate, including drill-down/across, on the restricted data and that data will be displayed by means of navigation steps.

Rows and Columns

The report rows and columns are defined in the layout area of the BEx Analyzer. Due to the restrictions of MS Excel (only 256 columns):

- Rows in a report are usually characteristics.
- Columns in a report are usually key figures.

Formula

In BEx Analyzer you can define formulas to describe calculations that consist of characteristics that are linked via arithmetic operands and functions (e.g., percentage, sum, exponential, etc.). As illustrated in Exhibit 6.13, various operands are available, including Boolean operators and mathematical and trigonometric functions.

Query Preview

The query preview panel provides an illustration of how the final query (rows and columns) will be displayed to allow you to verify that the query definition is meeting your expectations.

Advanced Query Techniques

SAP BW provides advanced query functionality, including conditions, exception reporting, variables, currency conversion, and Visual Basic for Applications.

Conditions

Conditions are used to analyze the query results in more detail.
Combinations of characteristics can be used to display, for instance, the top 10 customers, sales > $100,000.

The following operators can be used in a condition:

- Is equal to/Is not equal to
- Is less than/Is greater than
- Top N of/Bottom N of
- Top % of/Bottom % of
- Is between . . . and . . ./Is not between . . . and . . .

Exception Report

Exception reporting is used to highlight particular key figures in a report that fits within specified ranges of values. An exception report is a result set that meets certain criteria for exceptions as defined by the user in BEx Analyzer. When the condition for an exception is met, this process can trigger the sending of an e-mail to specific users and the creation of an entry in the alert monitor.

Reporting Agent

The Reporting Agent is a tool used to schedule reporting functions in the background. The following functions are available:

Exhibit 6.13   **Formulas in BEx Analyzer**
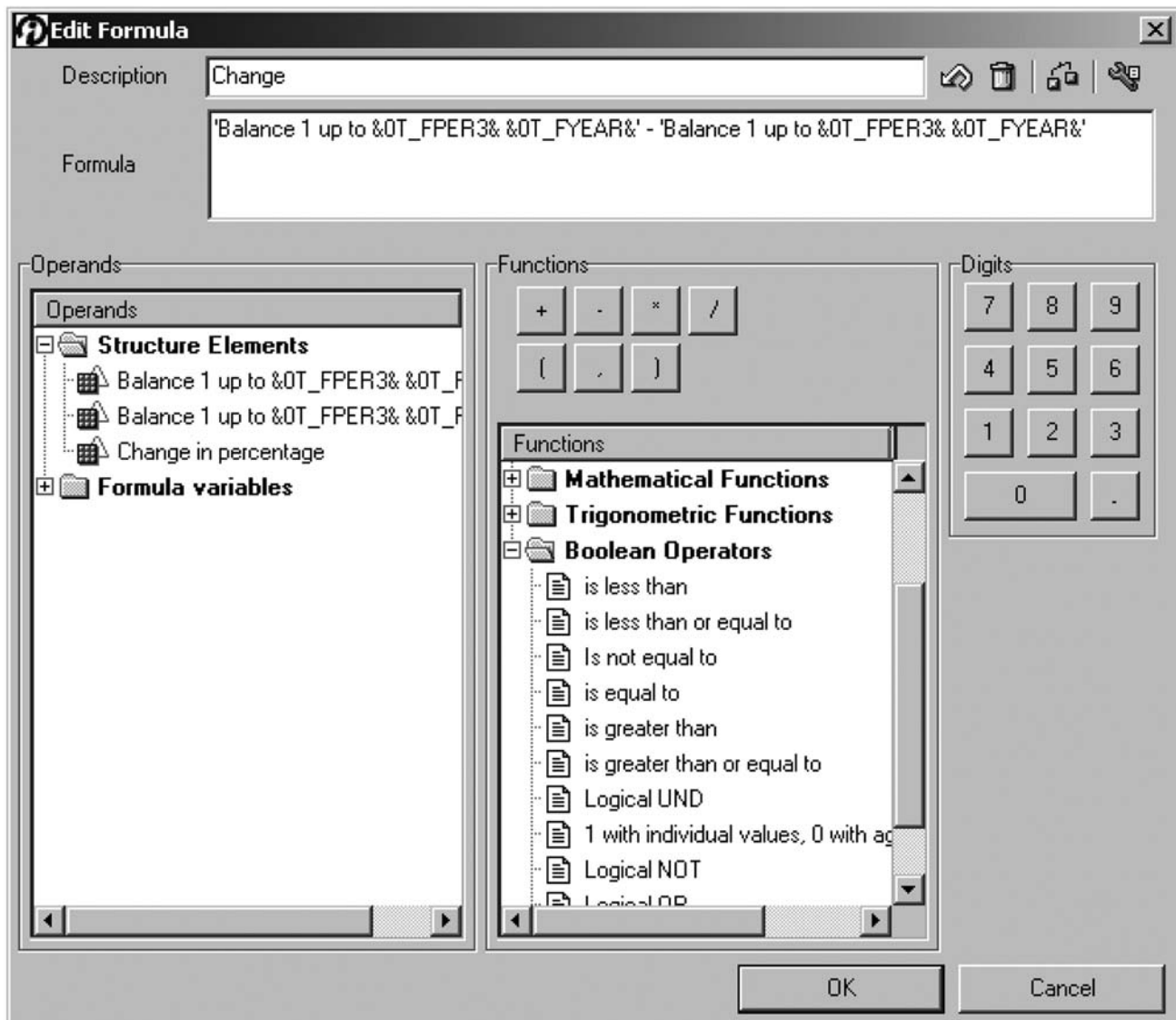
Source: SAP.

- Evaluating exceptions
- Printing queries
- Precalculating Web templates
- Precalculating characteristic variables of type precalculated value sets

Variable

A variable is like a parameter associated with characteristics. For example, variables can be used to control selection values for a query or to define repeating formulas (e.g., sales same

month last year, last year to date, last month year to date). A benefit of using variables is that they make the design of queries more flexible and dynamic.

There are four types of variables in SAP BW:
1. Variable for characteristic values
2. Variable for formulas
3. Variable for hierarchies and hierarchy nodes
4. Variable for texts

Currency Conversion

This function enables the translation of posted data records from the source currency into a target currency, or by repeated translation into different target currencies. Currencies can be translated at two different times in SAP BW:
1. During the data update of the InfoCubes of the SAP BW server (during data load, in update rules)
2. During the analysis of data in the Business Explorer:
   - At query definition (permanent conversion)
   - At query execution (nonpermanent conversion)

VBA (Visual Basic for Applications)

Visual Basic for Applications can be used to program more complex reporting functions in SAP BW (beyond the standard features of BEx reporting) through VBA programming in Microsoft Excel.

User Exits

User exits can be used to provide additional processing capability at query runtime.

Query Management Tools and Techniques

The query management section addresses the administration and optimization of the queries in SAP BW. Topics in this section include
- SAP BW query monitor
- Aggregates
- SAP BW statistics
- Data Changes Aggregate Update Program
- Query modes

- The exam will test your knowledge of query management with questions on the query monitor, aggregates, SAP BW Statistics, and query modes.
- Also, remember what type of data cannot be in an aggregate and the role of the Data Changes Aggregate Update Program.

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OPTIMIZATION

TIP

Queries

To improve overall end-user query response in SAP BW, several techniques and guidelines may be used:

- Create aggregates to speed up query response as the data requested by the end user will be in the summarized format required.
- Understand query modes and their benefits/impact on system performance (e.g., memory) and queries
- Regularly tune SAP R/3 infrastructure (e.g., memory), data models for Info-Objects (InfoCubes, ODS, aggregates), and queries
- Keep security simple to minimize checks and balances of authorizations and authorization objects. High levels of authorization can impact query performance.

</div>

Query Monitor

The query monitor (transaction RSRT in AWB) is a tool to regenerate, execute, and debug queries. It includes the following capabilities:

- It defines when and how much data needs to be fetched from the database to fulfill end users' query needs.
- It can be useful for aggregates, as you can check if the aggregate was found during query debugging.
- It allows you to debug and regenerate queries.

Note that the RSRT transaction is available only under SAP GUI front-end (not in BEx). You can execute RSRT transaction from within AWB or other Basis Admin Interfaces. The query monitor is not to be confused with the data load monitor.

Query Modes

There are three query modes in SAP BW:

1. Read all data (all data read and stored in user memory space).
2. Read data during navigation (data read on demand during navigation.
3. Read data during navigation and when expanding the hierarchy.

Table 6.1 compares the three query modes available in SAP BW and provides the benefits, limitations, and use for each query mode.

<div style="border:1px solid #000; padding:10px">

OPTIMIZATION

TIP

Queries

When setting up query modes, you should use "read data mode during navigation" by default for all your queries to minimize the impact on the database and application server resources.

Reserve the "read all data" mode for special queries, for instance, when a majority of the users run a given query that needs slicing and dicing against all dimensions or when the data are needed for data mining. This mode has significant impact on the database and application server resources.

</div>

Table 6.1   **Benefits and Limitations of Query Modes**

Query Mode	Description	Use	Benefit	Limitation
Read all data	Data are stored in user memory space.	Limited to special queries	Fast query navigation	Heavy on database and application server memory resource consumption. May impact other SAP BW processes and tasks. May take extra time to return initial query results.
Read data during navigation	Data are read on demand during navigation.	Default query mode	OLAP processor will read the data only as needed.	Delays in navigation response for queries that
Read data during navigation and when expanding the hierarchy	Data are read on the hierarchies level from the database when requested by the user.	Queries using hierarchies during navigation	Same as the "read during navigation" mode if the queries do not use hierarchies.	require data mining or slice-and-dice against all dimensions.

Aggregates

Aggregates are information stored in a data warehouse in a summarized form. Instead of recording the date and time each time a certain product is sold, the data warehouse could store the quantity of the product sold each hour, each day, or each week. An aggregate is a "baby cube" for an InfoCube. An aggregate stores the data of an InfoCube redundantly in a summarized or condensed form in an aggregate table. This aggregate table no longer contains certain characteristics of the InfoCube and has been summarized across attributes, characteristic values, or a hierarchy level.

    Aggregates are used for one main reason: primarily to improve the performance of business intelligence tools. When queries run faster they take up less processing time and resources in addition to the users getting their information back more quickly.

OPTIMIZATION

TIP

Queries

You should use aggregates to minimize query evaluation cost and maximize query performance by reducing the volume of data accessed per query and the system resources to find requested data from a large InfoCube.

The lifecycle of aggregates is as follows:
- Aggregates are defined by the database administrator against an existing InfoCube.
- Aggregates are updated when loading InfoCubes from an InfoSource using the same update rules as the InfoCubes.
- During loading, data are aggregated to the specified level of the InfoCube's dimensions.
- During query, the OLAP processor dynamically determines if an aggregate exists to satisfy the query.
- The Data Changes Aggregate Update Program makes all data changes effective in the associated aggregate and should be run periodically.

OPTIMIZATION

TIP

Queries

Aggregates store redundant InfoCube data and may create significant overhead in updating after new data load and changes to master data and hierarchies. Therefore, when creating aggregates you should
- Balance the aggregate maintenance cost versus the query evaluation cost.
- Take into consideration the following factors:
  - The frequency of changes that will cause recalculations
  - The availability of time to run the calculations (e.g., during recalculations, there is no roll-up, no master data update, no hierarchy update, and the changed aggregate data are not available)

Aggregates have three names:
- A system-generated 25-digit unique name
- A 6-digit integer aggregate name for the database table (random number)
- A user-defined, description only (text)

The relationships between aggregates, queries, and InfoCubes are:
- InfoCubes 1:N aggregates (an InfoCube can have more than one aggregate)
- Query step 1:1 aggregate (an aggregate is used in one query step)

The strategies for building aggregates include:
- *Dimension aggregation.* Based on any SAP-supplied dimensions (time, unit, and data packet) or custom dimensions
- *Attributes aggregation*
- *Hierarchy aggregation* (not time dependent)
- *Summarization of values or facts*
- *Exception aggregation.* Based on exceptions and defined using SUM, MIN, MAX, different averages and counters, FIRST, LAST, variance, and so on.

OPTIMIZATION

TIP

Queries

An aggregate that contains a navigational attribute can cause high aggregate mainte-nance cost. Therefore if an aggregate is no longer used it should be either deactivated or turned off:

- *Aggregate deactivation* will result in DATA LOST.
- *Aggregate turned off* will result in NO DATA LOST.

OPTIMIZATION

TIP

Queries

It is recommended to use aggregates if:

- An InfoCube contains a lot of data.
- Attributes in queries are used often.
- Reporting is slow and performance can be enhanced by using characteristic hier-archies through the aggregation of certain hierarchy levels.
- Hierarchies and attributes do not change much.
- Delays occur with a group of queries when executing and navigating through the query data.
- Execution and navigation of a certain query needs to be improved.

SAP BW RESTRICTIONS

- An aggregate holds only transactional data.
- Each query step can use only one aggregate.
- Aggregates must be recreated after changes to the master data attributes or hier-archies.
- Aggregates are built against the InfoCubes and cannot be built against the ODS.
- Aggregates are useful only for key figures with SUM, MIN, or MAX functions.
- An aggregate is selected by the OLAP processor during query processing and nothing can be done to make sure that a given aggregate will be selected, other than making sure that some/most of the items and criteria used in the query are also included in the aggregate.
- Hierarchy structure time-dependent characteristics and attributes of time-dependent characteristics are not allowed in an aggregate (BW 2.xx).
- Aggregates cannot be built with display attributes or time-dependent naviga-tional attributes.

NEW

Unlike SAP BW 2.xx, SAP BW 3.0 now offers the ability to use time-dependent attributes and hierarchies in aggregates. This requires a key date in the aggregate and time-dependent attributes and hierarchies are analyzed based on this key date.

Aggregates can be optimized using SAP BW statistics. SAP BW statistics can suggest the following:

- *Defaults for new aggregates*. For all the suggested aggregates
- *Aggregates to be deleted*. For all the aggregates that are already activated but to be deleted because they are unused or no longer good.
- *Available aggregates*. For all the activated and filled aggregates on which you do not have to carry out any changes

OPTIMIZATION

TIP

Queries

You should leverage SAP BW Statistics to find new aggregate suggestions or aggregates that are no longer used.

SAP BW Statistics

SAP BW Statistics is a tool delivered as part of the technical content to support the administration and performance review of an SAP BW live system. It is useful to note that reporting from SAP BW Statistics is done through a MultiCube approach.

OPTIMIZATION

TIP

System and Queries

You should leverage the SAP BW Statistics tool to detect and resolve performance problems and optimize SAP BW in the areas of aggregates, queries, and infrastructure (hardware, network, database, and application server, etc.).

SAP BW Statistics may create significant overhead on system resources due to the additional data capture, storage, and reporting involved. When using this tool it should be on only a short-term basis (e.g., until you identify and resolve performance problems to minimize impact on the system).

SAP BW Statistics provides optimization recommendations in the following areas:

- Select suitable aggregates based on the use and cost of aggregates.
  - ◆ Compare aggregate maintenance times and queries speed-up.
  - ◆ SAP BW Statistics supplies aggregate suggestions given from the SAP BW statistics InfoCube (0BWTC_C01).
- Detect performance problems remotely and off-line, including
  - ◆ Database server: database tables optimization
  - ◆ Application server (load on server, memory, work processes)
  - ◆ Network load or bandwidth

◆   Microsoft Excel/front-end installation
◆   Scale hardware according to users (e.g., number of users, power users)
● Optimize query design.
◆   Design of queries (a lot of data selected, little viewed)
◆   Use of hierarchies and associated overhead

Data Changes Aggregate Update Program

The Data Changes Aggregate Update Program is a function in the AWB that makes all changes in data effective and should be run periodically. It is equivalent to a data refresh. This program can be found in the Administrator Workbench under Tools/Apply Hierarchy/Attribute Changes. The Data Changes Aggregate Update Program recognizes changes in attribute/hierarchy data and the effect these changes have on aggregates.

SAP BW RESTRICTIONS	Changes for hierarchies and attributes are available only after the Data Changes Aggregate Update Program has been run. This is true even if there are no aggregates associated with the hierarchies and navigational attributes.

Authorizations/Security

Security and authorizations are key to controlling the data access of SAP BW users in queries and reports. Security also may have a significant impact on query execution performance.

ON THE EXAM	• Security is an important concept in SAP BW and you should expect several questions on the exam to test your knowledge of that topic. • You should be familiar with SAP BW security, roles, profiles, and authorization objects and understand the use of the profile generator. • It would be time well spent to read additional reference material such as the SAP white paper on security.

SAP BW provides extensive security and controls to restrict access to sensitive data at different levels, for instance, access to reports that contain sensitive data that needs to be restricted to authorized persons only. Access rights may be defined for:

- A report as a whole
- Certain key figures (e.g., salary in a personnel InfoCube)
- Specific values of a characteristic (e.g., a certain cost center).

Access rights can be specified or modified by using the Administrator Workbench.

OPTIMIZATION

TIP

Queries

Due to the checks required during query processing (e.g., authorizations and authorization objects), security in SAP BW has a significant impact on query performance. In general, the more security rules implemented, the less efficient the query will be.

Authorization

Authorizations in SAP BW are based on the standard SAP authorization concept. An authorization is the empowerment to carry out a certain activity in SAP BW. Each user can be assigned different authorizations to handle various scenarios. Each authorization refers to an authorization object and defines one or more values for each field that is contained in the authorization object.

SAP BW gives you the option to define authorizations at a very complex level of security and control: user, user role, InfoAreas, InfoCubes, Queries, InfoObjects (key figures and characteristics). However, to avoid an overly complex security landscape, authorization should be kept simple.

As illustrated in Exhibit 6.14, there is a hierarchical relationship between the authorization concepts: user master record, role, profile, and activity groups.

User Master Record

A user master record contains the data concerning the user. It may include, for instance, the person's system authorizations, standard printer, start transactions, and so on. A user master record is used for security management in SAP BW. The relationships for the user master record are:
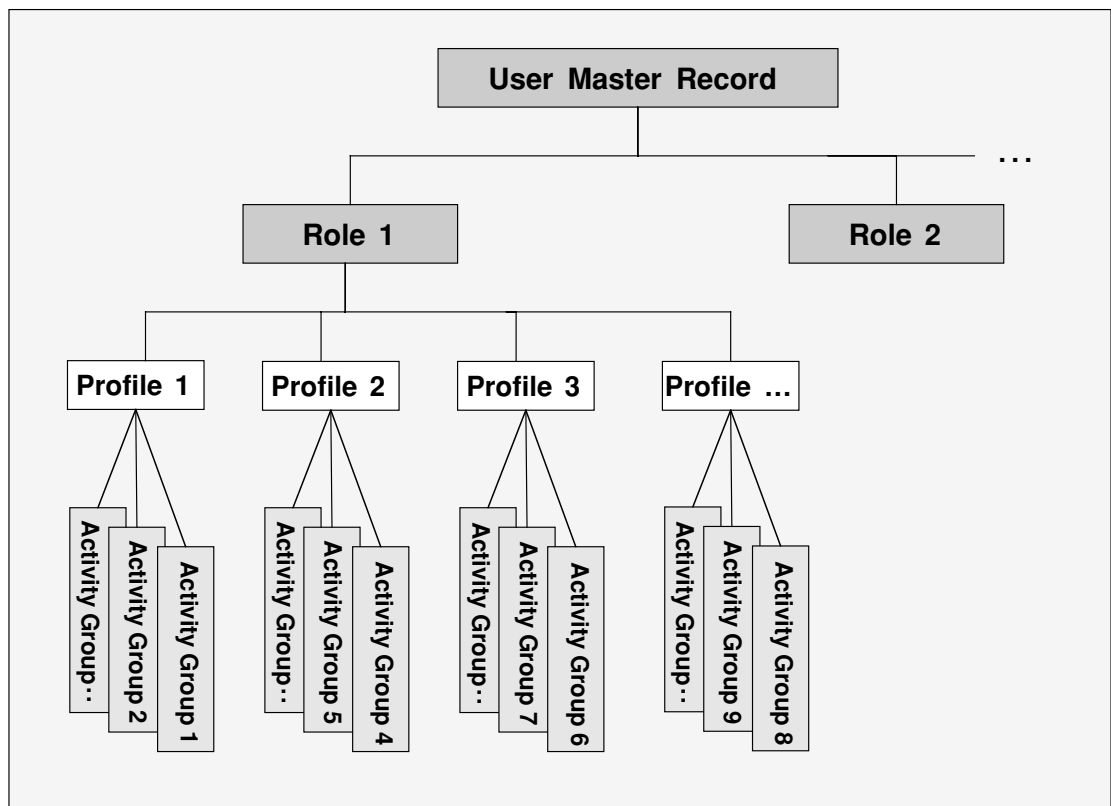
- User master record 1:1 SAP BW user
- User master record 1:M roles
- User master record 1:M profiles
- User master record 1:M activity groups

Role

A role represents a combination of activities/tasks that a user may perform:

- A role contains transactions and workflow tasks.
- Security in SAP BW is role based.

Exhibit 6.14   **SAP BW User Master Record Concept**

Source: SAP.

- For instance, roles can be created for sales managers, production managers, and customer service managers to provide users with access to data based on their job functions.
- Roles allow date-dependent authorization profiles that assign the authorization for each activity for a given period of time.
- Roles can have multiple validity periods.

There are two types of roles:

1. *Single roles*. These contain the authorizations users need to access the transactions and reports in the user-specific menu.
2. *Composite roles*. These consist of several single roles and are for users that need authorization for several roles.

Profile

A profile is used in user master records (security) to define the authorizations that a user or role will bear. The key benefit of profiles is that they can be created once and applied to multiple users/roles.

Profile Generator

The Profile Generator is a tool used by the authorization administrator to automatically generate and assign authorization profiles and authorization or menu objects required by a user in order to perform a specific role. It is used to:

- Select transactions from the company menu.
- Retrieve all authorization objects to transactions selected.
- Generate authorizations once field restrictions have been entered for each transaction selected.
- Group authorizations in autogenerated profiles.

Activity Group

An activity group organizes workbooks, roles, and users. Activity groups are managed in the Administrator Workbench.

ON THE EXAM

It is important to understand the difference between authorizations and authorization objects.

- Authorizations define values that are accessible for the user (e.g., cost center from 1,000 to 2,000)
- Authorization objects define fields or groups that are authorization relevant (e.g., cost center).

Authorization Object

An authorization object is used in security to define authorization fields/groups (e.g., cost center, company code, customer, etc.).

SAP BW RESTRICTIONS

Key figure in InfoObjects cannot be authorization relevant.

There are two classes of authorization objects:

1. *Reporting object*. A reporting object is an authorization object that relates to InfoCubes to prevent users from seeing sensitive data of an InfoCube.
2. *Administration object*. An administration object is an authorization object that relates to the Administrator Workbench, InfoCatalog, and query definition. An authorization object may contain:
   - ◆ Warehouse design elements: Workbench objects, InfoCube objects, InfoSources, InfoObjects, query objects, variables
   - ◆ Warehouse administration elements: InfoPackages, Monitor, Metadata, and settings

A key difference between reporting and administration objects is that administration objects are standard objects delivered with SAP BW, whereas there are no standard objects delivered for reporting objects. The steps for creating a reporting object are as follows:
1. Select the InfoObject (characteristic or key figure) as relevant for authorization.
2. Create an authorization object for reporting.
3. Select the relevant InfoCube.
4. Create authorization with the values of the InfoObjects.

Geographic Information Systems and BEx Map

SAP BW offers an additional reporting option using Geographic Information System (GIS) to assemble, store, manipulate, and display geographically referenced information, that is, identify data according to geographic locations. The BEx Map is SAP's Geographic Information System (GIS) for SAP BW. The following section provides GIS reporting features and components.

BEx Map

BEx Map enables the display of query key figures on a map according to geographical criteria. SAP BEx Map is fully integrated with BEx Analyzer and the user can call the BEx Map from any query that contains geospecific characteristics.

BEx map enables you to display query key figures on a map (provided the InfoObject was activated for geographical analysis in the InfoObject maintenance):
- Key figures are displayed on different layers.
- The number of layers available depends on the depth of the information defined in the InfoObject.
- Geographical InfoObjects are saved in the metadata repository on the BW server.

Geocharacteristics

Geocharacteristics describe data with geographical reference (e.g., characteristics such as customer, sales region, and country). This georelevant data can be displayed and evaluated on a map with the help of the BEx Map.

There are two types of geocharacteristics:
1. *Static geocharacteristic.* A static geocharacteristic is a characteristic where the geographical coordinates do not often change (e.g., country and region). They are stored as shape files in the Business Document Service (BDS).
2. *Dynamic geocharacteristic.* A dynamic geocharacteristic is a characteristic where the geographical coordinates often change (e.g., customer and plant).

These basic types of geocharacteristics can be subdivided further:
- *Dynamic geocharacteristics with values as attributes.* Dynamic geocharacteristics with values as attributes are characteristics that are subject to change and whose geocoordinates are transferred from a referenced static geocharacteristic with geoattributes.

- *Static geocharacteristics with geo-attributes*. Static geocharacteristics with geoattributes are static geocharacteristics enhanced with geo-coordinates in order to determine the geographical location. They are used with dynamic geocharacteristics that have values as attributes.

Web Reporting

Another key front-end option in SAP BW is Web reporting. This section provides Web reporting features, architectures, and components.

Web reporting allows Internet users to access data in the SAP BW system. This includes the startup of reports and navigation around the reports by pointing and clicking. Benefits of Web reporting include:
- Minimize the footprint for users (no SAP GUI/SAP BW front-end required).
- Minimize the administration required for these users.
- Allow the distribution of reports to a large number of users.

ON
THE

EXAM

- There may be a couple of questions testing your knowledge of SAP BW Web reporting.
- You should have a high-level understanding of SAP BW Web architecture and components.

Web reporting is based on BEx reporting functionalities. However, Web reporting provides less functionality than BEx and is usually used for "lightweight reporting." Areas that are available in BEx reporting but not in Web reporting include:
- Charting functionality
- Integration of Microsoft products (e.g., MS Word, Excel, etc.)
- Ability to save query for later execution
- Ability to customize reports formats using MS Excel
- Ability to print formatted reports (e.g., loss of formatting when printing from the Web)

Web reports are written using the Web Publisher.

Web Publisher

The Web Publisher is part of the BEx Analyzer. You can store navigational states as views. In turn, you can create items for these views.

Web Publisher Wizard

The Web Publisher wizard is a tool within the Web Publisher to provide user assistance in Web publishing.

In SAP BW 3.0 the BEx Web Publisher has been completely revised and is now referred to as the BEx Web Application Designer. It offers new Web reporting functionality such as the ability to design Web templates independently of MS Excel and publish them on the Web.

SAP BW Web Reporting Architecture

As represented in Exhibit 6.15, the SAP BW 2.1C Web reporting architecture is based on three components:
1. Web browser (Microsoft Internet Explorer or Netscape)
2. The SAP Internet Transaction server
3. The SAP BW server

SAP BW release 3.0 will have significant changes and improvements in the Web architecture and functionality. For more information consult
- SAP Web site
- SAP white paper on Web technology
- SAP BW 3.0 documentation for details and new developments

Web Browser

A Web browser is a program that allows a user to read hypertext. The browser provides a means of viewing the contents of pages and navigating from one page to another in the World Wide Web. The Web browsers supported by SAP BW are Microsoft Internet Explorer and Netscape Navigator.

ITS (Internet Transaction Server)

To allow Web reporting in SAP BW, the Internet Transaction Server (ITS) must be set up. ITS is the intermediate stage between the Web browser and the SAP BW database server. The ITS server calls the Web query from the SAP BW server, retrieving the appropriate data for display.

In SAP W 3.xx, the SAP Web application server will become the SAP BW Web reporting server (instead of ITS). The features of ITS will be embedded in that Web application server.

Table 6.2 provides SAP BW 2.C WEB reporting concepts and terminology.

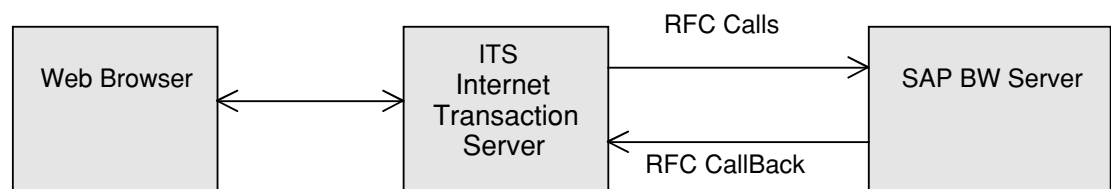Exhibit 6.15 **SAP BW Web Reporting Architecture (as of SAP BW 2.1C)**

Table 6.2   **Web Reporting Concepts and Terminology (SAP BW 2.1C)**

Concept	Description
Data Provider	Object that serves as a data source and delivers data. Data for an item, for example, is obtained from this object.
HTML	HTML (Hyper-Text Mark-Up Language) is the publishing language of the World Wide Web.
Item	Object set into an HTML page that gets data from a data provider. Examples are tables, navigation blocks, charts, exception blocks, condition blocks, text elements, filter values, and the alert monitor.
Object Tag	With the help of the object tag, you create data providers and items in a template. The object tags are replaced by the created items HTML when you create an HTML page.
URL	URL (Uniform Resource Locator) identifies the unique locations of files on the Internet (e.g., *www.sap.com*, *yahoo.com*.
View	Synonym for a navigational state (view) stored in the BEx Browser.
Web Reporting Template	A web reporting template is the equivalent of a simple HTML page that has been enhanced with SAP BW elements. It is stored on the ITS or BDS. Using the Web Publisher, you insert bookmarks for items, data providers, and SAP BW URLs in an HTML document.

Suggested Exercises

The following are exercises that you can perform, usually with a small test SAP BW server, to gain experience in the SAP BW reporting subject area:

- Adjust query properties, create several queries in one workbook, and detach queries.
- Create authorization objects.
- Create key figures, calculated key figures, and restricted key figures.
- Create drill-through and report/report interface.
- Create drill-through query-to-query and drill-through query-to-OLTP.
- Create exception reports and batch printing.
- Create geocoded static characteristics.
- Create InfoCube aggregates.
- Create InfoSet query.
- Create new query with variables.
- Create queries, navigate, and build text elements.
- Create Result Set query.
- Create workbooks.
- Define variables and global structures.
- Edit the published items to the Web with the Publisher wizard.
- Publish a workbook to the Web.

- Publish items to the Web with the Publisher wizard.
- Set up a Web development environment.
- Set up the ITS environment.
- Use a static geocharacteristic and maintain the SAPBWKEY.
- Use HTML editor.
- Use the report monitor.

Practice Test

Check the answer(s) that apply:

1. In which of the following can you implement currency translations?
    This question has more than one answer.
    a. Query definition
    b. Report result
    c. Transfer rules
    d. Update rules
    e. None of the above

2. What is the aim of aggregates?
    This question has more than one answer.
    a. Balance of cost of aggregate
    b. Maintenance to the cost of data retrieval
    c. Reduce data storage requirements
    d. Increase query performance
    e. None of the above

3. SAP BW supports different ways to enhance performance of queries during reporting by a proper data model. Please check the correct answer(s).
    This question has more than one answer.
    a. Use categories in order to assign data to several categories
    b. Use aggregates
    c. Create InfoCubes with low rate of sparsity
    d. Use hierarchies to display data
    e. Use InfoPackage groups to have better load performance
    f. Manually delete unused entries in InfoCubes
    g. Use precalculated key figures (during load) instead of on-the-fly-created key figures

4. A profile is a list of authorization objects. (True or False)
    This question has only one answer.
    a. True
    b. False
    c. Just the opposite; authorization object is a list of profiles
    d. There is no such concept in BW
    e. None of the above

5. Which of the following refers to reporting consistency?
    This question has only one answer.
    a. New rows added to the InfoCube cannot be used until the aggregates are updated
    b. There is no such thing as "reporting consistency"
    c. Reports generated by all users on the InfoCube are the same
    d. All of the above
    e. None of the above

6. Which software driver is used to give standard front-end tools access to SAP BW?
   This question has only one answer.
   a. ODBC
   b. OLE DB for OLAP (ODBO)
   c. IDOC
   d. NETBUI
   e. None of the above

7. In which case can you *not* use aggregates in SAP BW?
   This question has more than one answer.
   a. Attributes of time-dependent characteristics
   b. Slowly changing dimensions
   c. Hierarchy structure
   d. Degenerate dimension
   e. None of the above

8. It is mandatory to define rows and columns in a query. (True or False)
   This question has only one answer.
   a. True
   b. False

9. Which of the following is a function of the BEx Browser?
   This question has only one answer.
   a. Browse the Internet
   b. Build queries and reports
   c. Execute queries and manage reports
   d. All of the above
   e. None of the above

10. BEx Analyzer is a tool used for which of the following?
    This question has more than one answer.
    a. End users
    b. Administrators
    c. Managers
    d. Power users
    e. None of the above

11. How many aggregates can you build against the ODS?
    This question has only one answer.
    a. 1
    b. 3
    c. 13
    d. 248
    e. None

12. Which of the following statements is correct?
    This question has only one answer.
    a. A role is directly made up of a transaction
    b. Roles are parts of an InfoCube
    c. A role is (or corresponds with) a combination of activities
    d. A role is a tool to automatically generate authorization profiles
    e. None of the above

13. How many aggregates can you build against an InfoCube?
    This question has only one answer.
    a. 1
    b. None
    c. 13
    d. 248
    e. More than one

14. If an aggregate is no longer used and deactivated, it will not result in DATA LOST. (True or False)
    This question has only one answer.
    a. True
    b. False

15. Which of the following is *correct* about InfoCatalogs?
    This question has only one answer.
    a. InfoCatalog presents queries structured in report trees
    b. InfoCatalog is organized into channels
    c. InfoCatalog is an OLTP utility
    d. InfoCatalog is part of the InfoCube when it is designed
    e. None of the above

16. Which of the following is *correct* about SAP BW Statistics?
    This question has only one answer.
    a. The volume of data in the SAP BW Statistics cannot be anticipated, as it is highly dependent on the usage of the SAP BW
    b. SAP BW Statistics are delivered as a part of the technical content
    c. Turning on SAP BW Statistics does not have any impact on overall system performance
    d. All SAP BW Statistics InfoObject catalogues start with "OSAP BWTCT-"
    e. SAP BW Statistics are loaded in the InfoCube via an internal InfoSource

17. Third-party reporting tools can access SAP BW data directly via ODBO. (True or False)
    This question has only one answer.
    a. True
    b. False

18. What types of variables are available in SAP BW?
    This question has only one answer.
    a. Characteristic values
    b. Formulas
    c. Hierarchy
    d. Hierarchy nodes
    e. Text
    f. All of the above

19. What do filters in a query do?
    This question has only one answer.
    a. Increase query performance
    b. Restrict result sets
    c. Filter authorizations
    d. None of the above
    e. All of the above

20. Which of the following refers to a channel?
    This question has more than one answer.
    a. A workbook is the file in which end users work and store data for reporting
    b. A supply of workbooks in SAP BW arranged according to topic areas
    c. Channels are used to organize the queries and workbooks
    d. A repository of all SAP BW reports and solutions
    e. None of the above

21. Which statement describes the functionality of drill-down?
    This question has only one answer.
    a. Jump from one query to another
    b. Manipulate the results of a query to see increasing levels of detail about the data displayed across the top of a report without having to rerun the query
    c. Manipulate the results of a query to see increasing levels of detail without having to rerun the query
    d. Manipulate the results of a query to consolidate detailed data to a higher level of summarization without having to rerun the query
    e. None of the above

22. Which of the following statements are correct concerning InfoSet queries?
    This question has more than one answer.
    a. An InfoSet can contain data from one or more tables that are connected together using key fields
    b. InfoSet queries allow you to drill through to non-SAP R/3 systems and display detailed data not loaded into SAP BW
    c. The InfoSet query functions allow you to report using flat data tables (master data reporting)
    d. The only way to access InfoSet maintenance is by using the BEx Explorer
    e. InfoSet queries give you the option of creating an InfoSet with a join over two tables, to enable you to execute queries over a wider database

23. Where can data be filtered in SAP BW?
    This question has more than one answer.
    a. Query
    b. Workbook
    c. AWB
    d. None of the above
    e. All of the above

24. What are the scenarios by which we can report on the ODS?
    This question has more than one answer.
    a. Analyze the data in the ODS object directly via an ODS query
    b. Direct access of the original documents
    c. Report-to-report
    d. You cannot report from ODS
    e. None of the above

25. What does the Data Changes Aggregate Update Program do?
    This question has more than one answer.
    a. Activate all hierarchies and attributes
    b. Generate all aggregates affected with a new change ID
    c. Set the pointers to the right change ID
    d. Roll up all aggregates that have been changed since the last update
    e. None of the above

26 Which of the following statements are correct concerning the report-to-report interface (RRI)?
    This question has more than one answer.
    a. It is not possible to call a query directly using the RRI
    b. The RRI allows you to analyze data summarized in SAP BW on a higher level, and also to look at detailed line items on a document level
    c. The RRI allows you to drill through from an overview query of an ODS object but not to a detail query of another InfoCube
    d. The RRI allows you to drill through to an SAP R/3 OLTP system to display detailed data not loaded into SAP BW
    e. Using the RRI, you are able to call various reports (receiver reports) from a single report (sender report)

27. Which of the following statements is correct concerning roles?
    This question has only one answer.
    a. A role is directly made up of a transaction
    b. Roles are part of an InfoCube
    c. A role is (or corresponds with) a combination of activities
    d. A role contains workflow tasks
    e. None of the above

28. Which of the following statements are correct about the difference between a filter and a restricted key figure?

    This question has more than one answer.

    a. Filter is defined in the InfoCube
    b. Filter is not shown in the query
    c. Filter restricts entire query
    d. A restriction on the key figure restricts only one column
    e. All of the above

29. What options do you have to restrict a characteristic?

    This question has only one answer.

    a. Single value
    b. Interval
    c. Hierarchy node
    d. Variable
    e. Groups
    f. All of the above

30. Which of the following statements is true?

    This question has only one answer.

    a. Calculated fields are stored in the InfoCube
    b. Calculated fields are stored in the PSA
    c. Calculated fields are stored in the query
    d. Formulas can be reused
    e. Formulas are saved in the BDS

Answers to Practice Test

Question	Answer
1	a, b, c, d
2	a, b
3	a, b, g
4	a
5	c
6	b
7	a, c
8	b
9	c
10	a, c, d
11	e
12	c
13	e
14	b
15	a

Question	Answer
16	b
17	a
18	f
19	b
20	b, c
21	d
22	a, c, e
23	a, b
24	a, b, c
25	a, b, c
26	b, c, e
27	c
28	b, c, d
29	f
30	a

Summary

This chapter covered reporting and data access in SAP BW. You learned how to use Business Explorer Analyzer to build queries and reports and Business Explorer Browser to execute queries and manage reports.

This chapter also gave you a high-level understanding of Web reporting and mapping results using BEx Map. Finally, you also understand how security can be applied to restrict access to sensitive data to authorized persons only.

In the next chapter, you will learn the concepts of SAP BW data extraction, including the extraction of data from flat files, non-SAP R/3 systems, and SAP R/3 applications (including LIS, LO, CO/PA, and FI/SL).

Need to know more?

Published Resources

- Naeem Hashmi. *Business Information Warehouse for SAP*. Portland, OR: Premier Press, 2000.
- Gareth De Bruyn and Robert Lyfareff. *Introduction to ABAP/4 Programming for SAP*. Schoolcraft, MI: Prima Communications, 1998.
- SAP Labs, Inc., Simplification Group. *Authorizations Made Easy Guidebook (4.6A/E)*. Palo Alto, CA: SAP Labs, Inc., 2001.
- SAP Labs, Inc., Simplification Group. *SAP BW Reporting Made Easy, 2.0B/2.1C*. Palo Alto, CA: SAP Labs, Inc., 2001.

On-line Resources

- BW ASAP for 2.0B phase 2: Authorizations in SAP BW. SAP, *www.service.sap.com*.
- Changes in Web Applications 3.0A SP05 (pdf). SAP, *www.service.sap.com*.
- Web applications design (WEBAPPLDESIGN_30A_P05_E.PDS). *www.service.sap.com*.
- SAP BW 2.0B Web Reporting Function Description (pdf). *www.service.sap.com/bw*.
- SAP BW Help CD or SAP Help Portal. *www.help.sap.com*.
- Web Reporting in BW 3.0. SAP, *www.service.sap.com*.

Other Resources

- Training class and Material, SAP BW - BW Presentation, SAP Solution Academy.

CHAPTER 7

Extraction

In This Chapter:

The SAP BW data extraction process
Data transfer into SAP BW
Flat file data extraction
Third-party data extraction
SAP BW extractors for SAP R/3
SAP BW update methods
Extraction methods
Generic data extraction
CO/PA data extraction
LIS and LO data extraction
FI-SL data extraction
Data extraction setup process
How to enhance standard business content
Suggested exercises
Practice test
Answers to practice test

One of the key benefits that SAP BW enjoys is its high level of integration with the SAP R/3 OLTP system. This chapter provides key concepts on the methods used to load data from SAP R/3 to SAP BW, with special focus on CO/PA, LIS, LO, and FI/SL. It also provides information on data extraction from OLTP systems other than SAP R/3 via flat file and third-party extraction tools.

This chapter tests your knowledge of the following areas:
- The SAP BW data extraction process
- Extraction from SAP R/3 system, flat files, and non-SAP R/3 source systems
- Transfer of data from LIS information structures
- Customizing logistics (LO) extract structures and LO cockpit
- Extract CO/PA data
- Extract FI/SL data
- Generic extractor to retrieve master and transaction data

NOTE

For readers interested in the SAP BW training curriculum, this chapter refers to the "SAP BW Extraction" class (TABW30 for SAP partners or BW220 for nonpartners).

Data Extraction Process

This section discusses the SAP BW extraction and load process of data from various source systems:

- Non-SAPR/3 data extraction through extract, transform, and load (ETL) tools and flat files
- SAP source systems extraction through SAP extractors (for SAP R/3, BW, and other SAP products)

Note that this chapter focuses on the topics that are tested on the exam and may only provide high-level extraction concepts. For additional information on SAP BW extraction you should consult additional resources such as SAP BW white papers and accelerators (available at the SAP Web site, *www.service.sap.com/BI*) and other resources such as the *Business Information Warehouse for SAP* by Naeem Hashmi.[1]

ON THE EXAM

A few questions on the certification exam will test your knowledge of the SAP BW extraction process, especially the types of source systems from which SAP BW can load/extract data, and the CO/PA data extraction method.

As noted in previous chapters, SAP BW can extract and load data from a variety of source systems including:

- *Non-SAP source systems*. Data from non-SAP data sources can be loaded into SAP BW in one of three ways:
    1. Flat file source systems (loaded through flat files)
    2. External source systems—connect to external systems with third-party custom extraction tools (using staging BAPIs).
    3. External data providers such as Nielsen
- *SAP source systems:*
    1. SAP R/3 source systems (after release 3.1H)
    2. SAP BW systems—using Myself
    3. Other SAP products

Non-SAP Source Systems

Non-SAP source systems include:

- Flat file source systems (loaded through flat files)
- *External source systems*—connect to external systems with third-party custom extraction tools (using staging BAPIs).
- External data providers such as Nielsen

Flat Files

Flat files can be used to load both master and transaction data from non-SAP source systems into SAP BW. All data that come from systems other than SAP R/3 (release 3.1H or higher) can be loaded via flat files into SAP BW:

- Other OLTP systems (e.g., PeopleSoft, Siebel, Oracle, Hyperion, etc.)
- SAP systems prior to version 3.1H (e.g., R/2 and SAP R/3 3.0)
- Other applications (e.g., Excel, Word, etc.)

Four types of data can be loaded into SAP BW through flat files:

1. Master data
2. Texts
3. Hierarchies
4. Transaction data

Know the three methods that can be used to load non-SAP source systems and what type of data can be loaded through text files, and in what format, and the difference in loading data from SAP versus non-SAP source systems.

SAP BW can load data from 3 non-SAP formats (2 formats in SAP BW 2.xx).

1. *CSV* is a character-separated values file type (extension .CSV).
2. *ASCII* is a fixed-length record format file.
3. *XML files* (SAP BW 3.xx only)

Data Load

Use a predefined record length (ASCII file) when loading data from a flat file to reduce processing time. Loading a CSV file requires the conversion to a predefined fixed record length during the load process.

In addition, errors may arise with CSV files since records are not fixed length and may be too long and result in data loss due to truncation.

The overall process to load data using flat files utilizes a process similar to loading data from SAP R/3 but involves manual definition and mapping of the metadata for the transaction and new master data InfoObjects.

Note that for flat files (CSV and ASCII) there is no extract or transfer structure on the source system side. In that case, the format of the file may be controlled by a control file (ASCII). For CSV files, the format is equal to the transfer structure generated by SAP BW.

Another option to extract data into SAP BW from non-SAP source systems such as Oracle and Microsoft SQL server is to use third-party extraction tools.

Third-Party Extraction Tools

Third-party extraction tools can be used to extract data from non-SAP source systems into SAP BW. These tools supply extracted data directly to a staging engine BAPI on the SAP BW platform. The staging engine then performs the mapping and update rules and thus ensures the consistency of data in SAP BW for administration and reports. Third-party vendors of extraction products certified for SAP BW include:

- *ActaWorks for SAP* from Acta Technologies
- *Evolutionary Technology Inc. (ETI)*. This product is certified to load data into SAP BW using staging BAPI.
- *Genio* from Hummingbird is another tool to load data into SAP BW.
- *Informatica* offers another option for extract, transform, and load into SAP BW.
- For additional information on third-party extraction tools, you may refer to Appendix G, where you will find a white paper on that topic: "SAP BW and Third-Party Data Access and ETL Tools."

The final data extraction option for non-SAP source system is to use data from external data providers.

External Data Providers

External data providers are suppliers of data to SAP BW (e.g., A.C. Nielsen and Dun & Bradstreet). They usually are value-added services that are available for an additional fee. External data providers leverage staging BAPIs to load data into SAP BW.

SAP Source Systems

SAP source systems for SAP BW include the following:

- SAP R/3 source systems (after release 3.1H)
- SAP BW systems using Myself
- Other SAP products

> **ON THE EXAM**
>
> - You should know the SAP source systems that can be used as source systems for SAP BW.
> - Remember that SAP BW can be used as a source system to itself or other SAP BW systems. Be aware of the benefits and high-level functions of Myself.

SAP R/3 Data Source Extraction

SAP BW can extract data from all application components of SAP R/3. SAP provides extractors that are programmed to extract data from most applications of SAP R/3 and delivered as part of the business content. More details will be provided in later sections regarding SAP extractors.

SAP extractors exist only for SAP R/3 release 3.1H and up. Data can also be extracted from SAP R/2 and R/3 systems prior to release 3.1H. However, these systems will be treated as non-SAP source systems for SAP BW extraction purposes.

SAP BW as a Source System: Myself

Myself is a BW data mart. An SAP BW system can behave as a data mart to itself or another SAP BW system (using SAP-supplied Myself source system). The system that delivers data is called the *source* BW, and the system that receives data is called the *target* BW. Sources of data can be the ODS tables or the InfoCubes. Delta extraction is possible.

The benefits of Myself include:

- You can connect the SAP BW system to itself and reimport InfoCube or ODS data into SAP BW (via an InfoSource) and thereby fill another InfoCube or ODS object. For instance, this can be used to carry out a data cleanup between two InfoCubes using transfer rules and update rules.
- You can export the InfoCube content and download its content to non-SAP warehouses.
- Large amounts of data can be processed.
- The respective speeds of data transfer, logging, and analysis can be increased.
- Conciseness and maintenance of individual data warehouses can be improved.
- Data separation relating to the task area can be enabled, and analyses of the state of the entire dataset can be performed.
- Reduced complexities when constructing and implementing a data warehouse
- Construct hub-and-spoke scenarios in which an SAP BW stands in the middle and the data from distributed systems run together consistently.
- Increased performance

When an SAP BW system behaves as a data mart to another SAP BW system, the metadata of the two systems must be consistent.
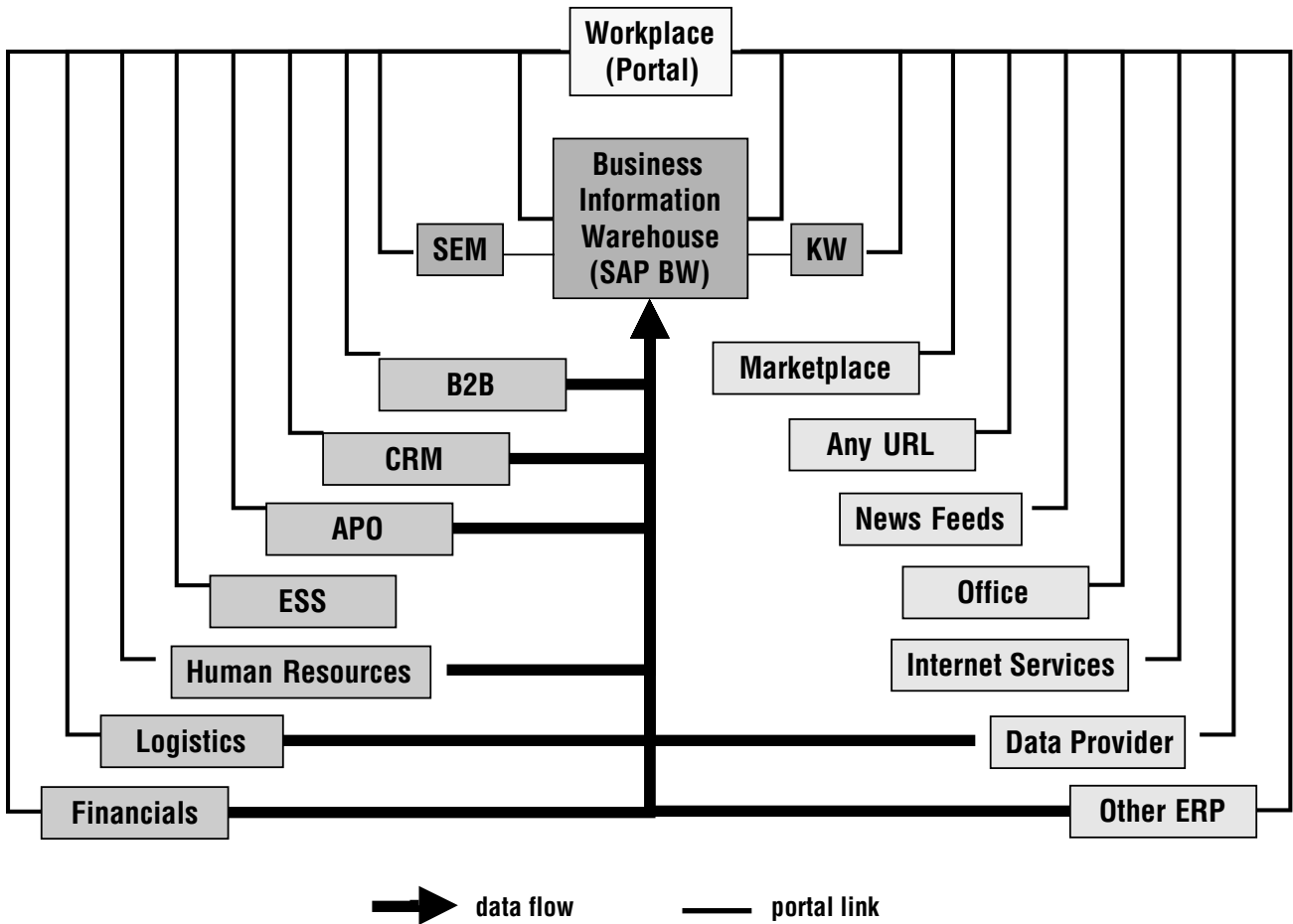
SAP Products

SAP BW can be integrated with other SAP products for reporting and analysis, including:

- SEM—Strategic Enterprise Management
- CRM—Customer Relationship Management
- APO—Advanced Planning Optimizer (supply chain planning)

One of the reasons for the success of SAP R/3 is the tight integration of the business applications. As pictured in Exhibit 7.1, these SAP products are highly integrated with SAP BW and use SAP BW functionality for reporting through BEx. Communication between these systems is supported by means of BAPI and ALE technologies. SAP BW is characterized by

Exhibit 7.1   **SAP Products: Data Links**

Source: SAP.

separate shipment, separate release cycle, and separate maintenance from other SAP products and is available beginning with SAP R/3 release 3.1H (releases before 3.1H are regarded as non-SAP source systems).

> The other SAP products used to be called "new dimension products," or new products.

NOTE

## Methods of Data Load into SAP BW

ON THE EXAM

> Some questions on the certification exam will test your knowledge of transfer methods, especially the four methods to update the data targets and the advantages of TRFC over IDOC. Also remember that IDOCs cannot use ODS/PSA.

As illustrated in Exhibit 7.2, there are four methods to update the data targets (ODS or InfoCube) in SAP BW:

1. *Update PSA, then data targets*. This is the standard data transfer method. Data are first updated in the PSA and can be subsequently updated.
2. *Update PSA and data targets in parallel*. This is a way of carrying out a high-performance update of data in the PSA and one or more InfoCubes.
3. *Update PSA only*. You can store data in the PSA and bypass InfoCube or ODS objects. For example, if a high volume of data needs to be extracted into SAP BW, the PSA can be loaded several times a day (e.g., every 15 minutes) and the InfoCube and ODS can be loaded subsequently once a day (outside of business hours when there is limited on-line activity and load on the BW server). This is one method to improve overall performance and manage high volumes of data.
4. *Update data targets only*. You can load the InfoCubes and bypass the PSA. This is one way to reduce the overhead associated with the PSA. The drawback of this method is that you lose the ability to do the following:

Exhibit 7.2   **SAP BW Extraction Methodologies**
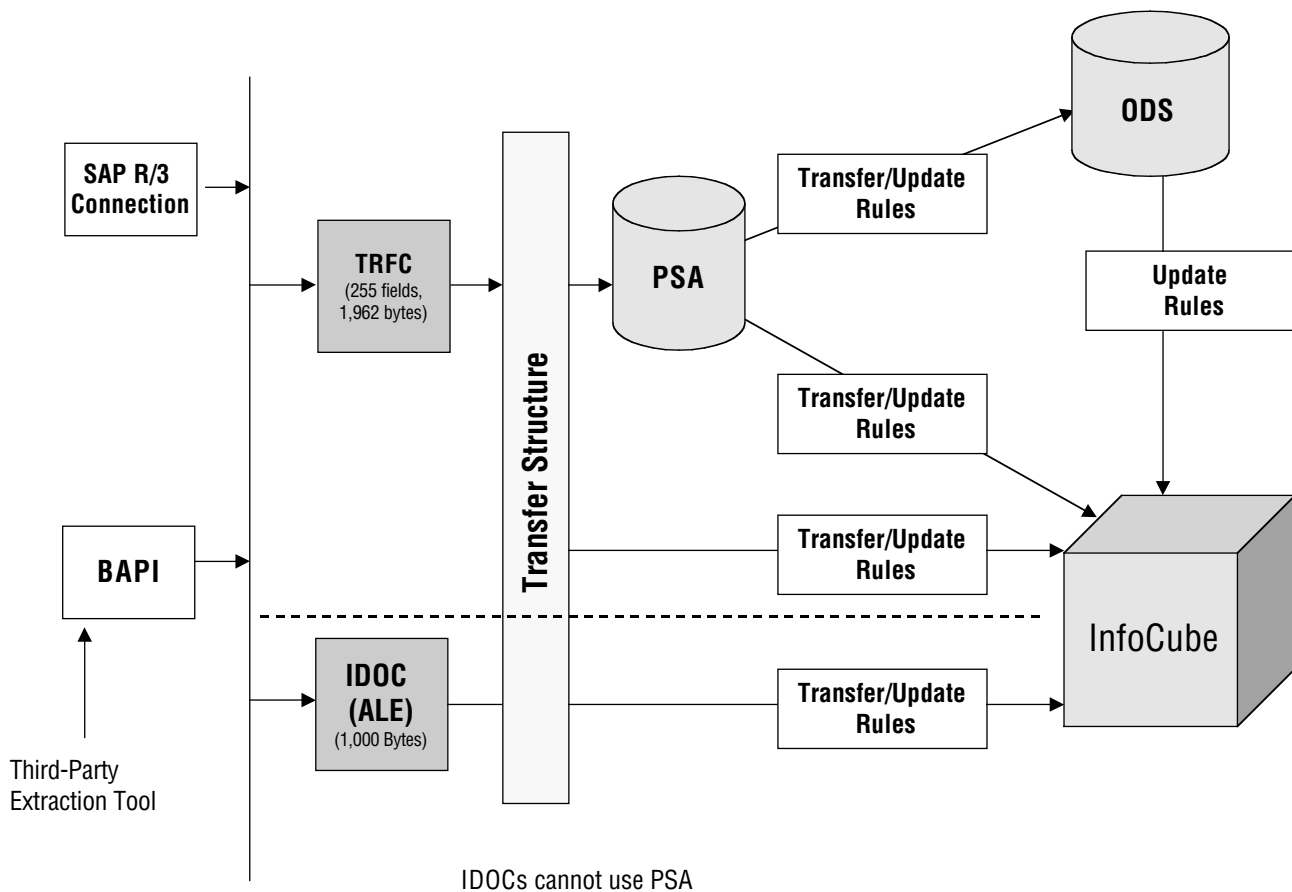
Source: SAP.

♦   Keep the original data (it is available in the source system).
♦   Run quality and additional data manipulation against the incoming data.
♦   Use the ODS objects (ODS can be loaded only using PSA).

The preferred method for loading data into SAP BW is to use the PSA if possible.

SAP BW RESTRICTIONS

As an exception to the above statement, it is not currently possible to use PSA to load hierarchy data.

OPTIMIZATION

TIP

Data Extraction and Staging

Optimizing data extraction and load time in SAP BW is another major factor in improving overall data warehouse performance. To optimize the data load process, you may use several techniques and guidelines, including:[2]

● Always load master data first to reduce the time required for SID table creation during InfoCube population.
● Index management (e.g., drop the secondary indexes on the fact tables, do not drop the primary key, reload primary indexes on the fact table).
● Load data in parallel (except for PSA data).
● Load data in the PSA first, and then load data from the PSA into the data targets (InfoCube or ODS).
● When loading large quantities from files, it is recommended that you break the files into several parts. These files can be loaded in parallel into SAP BW.
● Sort data to be loaded beforehand.
● Adjust IDOC-related parameters.
● Change the buffering of the number range objects (sequence number).
● Update the database statistics for cardinality information (e.g., number of attributes or columns in a relation) needed for the query optimizer to best query the execution path.
● Avoid reading load files from tape; instead copy them to disk first.

Objects and Tools for Data Extraction

Unlike traditional data warehouses, where the OLTP applications schedule and trigger data extract ("push model"), SAP BW uses the "pull model" to pull data from their data sources. Data extracts are scheduled in SAP BW using the scheduler in the SAP BW Administrator Workbench.

- The majority of the questions on the certification test in the extraction area relate to SAP BW extractors.
- You should know the three types of extractors and when they should be used.
- Expect a few questions to test your awareness of the data extraction process (e.g., the scheduler and type of data that can be requested in InfoPackages).

Scheduler

The scheduler is a tool to manage the data requests to the source system. Requests are per InfoSource and source system and differentiate between master and transaction data. The scheduler automates the data transfer using InfoPackages and InfoPackage groups.

InfoPackage

An InfoPackage defines the data in an InfoSource to be requested from a source system. An InfoPackage can request the following types of data:
- Transaction data
- Attributes for master data
- Hierarchies for master data
- Master data texts

The data can be selected using selection parameters (e.g., controlling only area 001 and period 10.1999).

The SAP BW InfoPackage screen contains five InfoPackage tabs (Select data, Processing, Data targets, Update parameters, and Schedule).

InfoPackage Groups

Groups of InfoPackage can be created. The benefit of using InfoPackage groups is that you can collate data requests that logically belong together and schedule them using the scheduler.

OPTIMIZATION TIP

Data Staging

The extraction of data from the source system should not be concurrent with on-line activity in both the source and the data warehouse system. Schedule data loads outside of business hours when there is limited on-line activity and less load on the network.

Communication Path

A communication path is a transfer method used to transfer data between a source system and SAP BW:

- From SAP R/3: IDOC-ALE (not available for PSA) or TRFC (PSA)
- From an external system: BAPIs

SAP BW Extractors

SAP BW extractors are the programs in SAP R/3 that enable the extraction and load of data from SAP R/3 to SAP BW.

SAP provides extractors that are programmed to extract data from most applications of SAP R/3 and delivered as part of the business content. Extractors exist in release 3.1H and up.

There are three types of extractors in SAP BW, as illustrated in Exhibit 7.3:

1. *SAP BW content extractors*. For extraction of data from SAP R/3 application-specific data (e.g., FI, CO, HR, LO cockpit)
2. *Customer generated, application specific (generic extractors)*. For extraction of cross-application data in SAP R/3 (e.g., LIS, FI/SL, CO/PA)
3. *Generic extractors, cross application*. For extraction of data from SAP R/3 across application database table/views and SAP query.

Exhibit 7.3   **SAP BW Extractors**
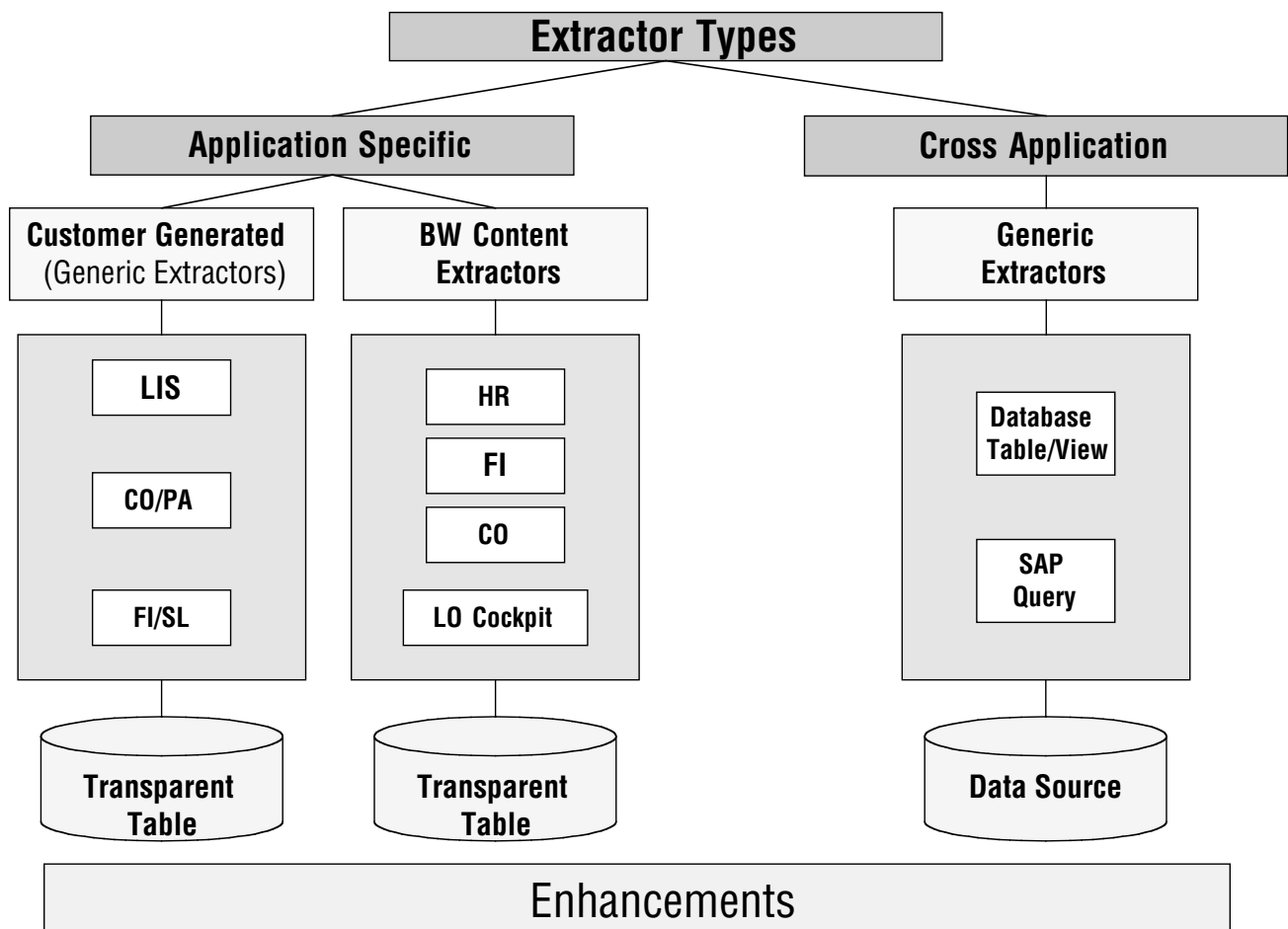
Source: SAP.

Update Methods

This section discusses the methods that can be used in SAP BW to bring data up to date, including update methods, delta management, delta update, and pseudodelta.

- You should be familiar with the update methods and what extraction methods allows delta update in SAP BW.
- Be aware of pseudodelta and change log.

Update Method

An update method is a scheme used to update data in SAP BW. There are four update methods in SAP BW:
1. Full update—extract all the data from source.
2. Initialization—reset.
3. No update
4. Delta update—extract only the data that have been changed or added since the last extract.

Delta Management

Delta management is an update method used for the most important master data, which are typically associated with a very large number of characteristics (e.g., plant, batch number, G/L Account). The delta management method is based upon a change log (defined on p. 171).

Delta Update

Delta update is an update method in which the system adds only the data that have changed from the last data load to the current data load. Delta updates are client specific. A key benefit of delta update is that it is especially suitable for a large quantity of data to reduce extraction time. It avoids the importing of a large quantity of redundant data as opposed to a full extract, in which the same data could be imported multiple times. SAP BW delta update methods are illustrated in Table 7.1.

- CO/PA, HR, LIS, and SD are supported for delta update.
- There are no extractors for FI/SL data, as of 2.0B.

Table 7.2 provides the salient features of the SAP BW delta update for three types of delta updates, including system and export InfoSource generation.

Table 7.1   **SAP BW Delta Update Methods**

	LIS	**LO**	**CO/PA**	**FI/SL**	**Generic**
Delta method	LIS InfoStructures	Change log	Time stamp	Pseudodelta	Pseudodelta

Table 7.2   **Salient Features of SAP BW Delta Update**

Delta Update	**System**	**Export InfoSource Generation**
ODS to ODS	Within the same system	Automatic
ODS to InfoCube	Within the same system	Automatic
ODS to PSA	Different systems	Manual

Change Log

A change log is a text file created automatically by the system that contains all revisions (e.g., additions, deletions, updates, etc.) that have occurred since the last data load from SAP R/3. The change log process uses two tables: Sxxx BIW1 and SxxxBIW2 tables (where xxx is the information structure number).

Pseudodelta

The Pseudodelta extraction method is based on a fake or dummy delta used for extraction methods that do not support delta extraction (e.g., generic data extraction). During the pseudodelta process, a time stamp is used to detect the records that have been changed since the last data extract. Then BW selectively drops and reloads the data that have changed.

Special Extraction Methods for SAP R/3

Special extraction methods have been provided by SAP for some SAP R/3 application data. The salient features and steps required for each data extraction method are provided in Table 7.3, including the method for delta update, application-specific indicator, the extractors, and tables used in the process.

ON THE EXAM

Know the key features and tables used for the main extraction methods. Remember which method supports delta updates.

Table 7.3   **Salient Features of SAP BW Data Extraction Methods**

Extraction Method	Method for Delta	Application Specific	Extractors	Tables Used
Generic	Pseudodelta	Cross application	Generic	Custom tables/views/program/logical DB
CO/PA	Time stamp	Y	Customer generated	Line item tables (Time stamp)
LIS	LIS infostructure	Y	Customer generated	1 structure (s5nn), 2 tables (BWI1 and 2) and Control change log (TMCBIW)
LO	Change log	Y	SAP BW content	V3 update (asynchronous) and two tables: VBDATA and ARCFC (change log from SAP R/3)
FI/SL	Pseudodelta	Y	Customer generated	Three types of tables: 1. Line item tables: ZZP (plan) and ZZA (actual) 2. Totals table: ZZT 3. Object tables: ZZO and ZZC

Generic Data Extraction

The generic data extraction method is used when:
- There is no DataSource in business content.
- There is no application-specific extract method in business content.
- The SAP R/3 tables to be extracted from are cross-application or custom tables.

LIS, CO/PA, and FI/SL are examples of generic data extraction.

SAP BW RESTRICTIONS

Delta is not supported in generic data extraction (pseudodelta is available.)

CO/PA Data Extraction

Controlling Profitability Analysis (CO/PA) is possibly the most popular application-specific data extraction method in SAP BW.

CO/PA

CO/PA is an application component of SAP R/3. It collects all of the OLTP data for calculating contribution margins (sales, cost of sales, overhead costs). The CO/PA data extraction

method is specific to the extraction of data from the CO/PA application component from SAP R/3.

> **ON THE EXAM**
>
> Know the basic CO/PA concepts, structure, naming conventions, and salient features provided here. CO/PA usually carries a lot of weight on the exam relative to the other extraction methods.

> **SAP BW RESTRICTIONS**
>
> - No hierarchies in CO/PA
> - No integrated cross-application reporting in CO/PA

The basic CO/PA objects are:

- *Characteristics*. The levels on which information is required (e.g., region, division). Characteristics in CO/PA correspond to characteristics in InfoCubes.
- *Characteristic values*. The values that can be assumed by a characteristic (e.g., for region the value can be eastern region, southern region, etc.).
- *Profitability segment*. A combination of organizational data or a set of characteristics (usually unique in SAP R/3; e.g., western region, computer division).
- *Value fields*. The equivalent of key figures in a fact table (with additional summarization; e.g., revenue, cost of goods sold). In CO/PA the value fields are summarized at profitability segment and period level.
- *Operating concern*. An organizational structure that combines controlling areas together in the same way as controlling areas group companies together.

The CO/PA database structure is based on four tables:

1. Line items—DETAILS table (time stamp) Ce1 (Actual) and Ce2 (Plan). Line items are the details equivalent to the line items in the ODS in SAP BW).
2. Segment level—tables (no time stamp) Ce3 (equivalent to the fact table in SAP BW)
3. Segment table—tables (no time stamp) Ce4 (equivalent to the dimension table in SAP BW)
4. Summarization levels Ce3 + Ce4—summarized copies of segment tables and segment levels to speed up data access (equivalent to aggregates in SAP BW)

The naming conventions used in SAP R/3 for CO/PA are:

- The name of a CO/PA DataSource is based on client, operating concern, and system ID.
- The name of a CO/PA InfoSource is the same as the name of CO/PA DataSource without system ID (e.g., client and operating concern).
- The CO/PA organization structure is operating concern > controlling area > company code > business area.
- Profitability segment = operating concern (4 digit max) + controlling area profit center + company code + business area.

Other salient features of CO/PA:
- The CO/PA partitioning is used to decrease package size (e.g., company code).
- The CO/PA extraction is based on SAP R/3 costing model.
- The CO/PA DataSource model is based on costing (value fields) and accounting (G/L no time stamp) methods.
- A realignment in CO/PA is a change in the organization structure or reporting hierarchy.

LIS and LO Data Extraction

LIS and LO provide two very closely related application-specific extractor types.

LIS (logistics information systems) is a cross-application component of SAP R/3 collecting supply chain information from the following:
- Sales information system
- Purchasing information system
- Inventory controlling
- Shop floor information system
- Plant maintenance information system
- Quality management information system

The LIS data extraction method is used to extract data from the LIS application component in SAP R/3. 2LIS_11_VAITM is a common LIS extractor. Historically, the original BW extractors were based on LIS. The LIS data extraction method suffers from limitations including performance, volume of data, and complexity of usage. To remedy these limitations, SAP developed the LO data extraction method called *LO cockpit* to provide the same functionality with improved performance.

LO (logistics) is an application component of SAP R/3. It collects the transaction data for logistics. The LO data extraction method is used to extract data from the LO application component in SAP R/3:
- The LO extractors require an extraction setup that is similar in its usage to the LIS method for refreshing statistical data.
- LIS and LO share the same communication structure.

> **ON THE EXAM**
>
> You should expect a couple of questions on the LIS and LO extraction methods, especially the restrictions of LIS extraction, advantages of LO extraction (compared to LIS), V3 update, and LO cockpit.

V3 Update

The delta update process used in LO extraction is based on the V3 update. The V3 update is a program in the R/3 source system that schedules batch jobs to update extract structure to data source collectively (collective run).

Table 7.4   **Steps for Conversion of LIS to LO**

1. Maintain extract structure.
2. Extract structure active and LIS update off.
3. Upload open delta queue (from LIS).
4, Empty setup tables.
5. Set up/start periodic V3 update.
6. Simulate delta initialization.

LO Cockpit

The LO cockpit is a tool to manage the extract of logistics data from SAP R/3. It consists of:
- New standard extract structures
- New DataSources

The functionality of the LO cockpit includes
- Maintaining extract structure.
- Maintaining DataSources.
- Activating the update.
- Controlling the V3 update.

The advantages of using the LO extraction cockpit compared with LIS data extraction include:
- Improved performance and reduced volumes of data
- Simplified handling
- Single solution for all logistics applications
- No use of LIS functionality

For SAP BW systems that were implemented with LIS extractors (e.g., before LO existed), the LIS extractors can be converted to LO extractors. The required steps are described in Table 7.4.

    The structure of LO extractors is based on:
- ODS
- Fact table
- DIM table
- Aggregates

FI/SL Data Extraction

Financial, special ledger (FI/SL) is another application-specific extraction method of interest.

ON THE EXAM

The favorite extraction methods for SAP seem to be CO/PA, LO, and flat file extraction. You should expect fewer questions on the exam regarding FI/SL and LIS. Just in case, know the FI/SL restrictions and naming conventions.

- FI/SL is an application component of SAP R/3. It collects all of the OLTP data for financial accounting, special ledger.
- FI/SL combines data (planned and actual) from different levels of OLTP applications (e.g., FI/GL, EC/PCA, CO/CCA).

The reasons to use FI/SL reporting in SAP BW (rather than in SAP R/3) include:
- FI/SL cross-application reporting in SAP R/3 is not as diverse as FI/SL in SAP BW.
- A high reporting load on SAP R/3 due to FI/SL could impact overall OLTP system performance.

The naming conventions used in SAP R/3 for FI/SL are:
- ZZA (actual line items)
- Plan line items: ZZP
- Object table_1: ZZO
- Object table_2: ZZC (optional)
- Summary table: ZZT—totals

Data Extraction Setup Process

Table 7.5 provides the steps needed for the setup of the SAP BW data extraction methods.

> You do not need to remember all setup steps for each method, but try to remember what is unique to each extraction method. For instance, V3 update is only needed for LO extractors.

How to Enhance Standard Business Content

As defined in Chapter 4, "Data Modeling," the business content is a predefined analytical application model that is part of the SAP BW software. Business content (e.g., standard SAP BW extractors) can be customized using enhancements.

Enhancements in SAP BW do not have the same functionality as in SAP R/3.

SAP R/3 Enhancements

SAP R/3 enhancements are customization tools to allow the BW Administrator to add additional functions to the SAP standard programs. Additional SAP R/3 repository objects can be developed using customer exits (ABAP). User exits are points in an SAP program where a customer's own program can be called.

> You should be familiar with the features, restrictions, and methods to enhance the standard business content in SAP BW.

Table 7.5   **Steps for Setup of SAP BW Data Extraction Methods**

Steps	LIS Extractors	LO Extractors	CO/PA Extractors	FI/SL Extractors	Generic Extractors
1. Define extract structures	Set up LIS environment	Maintain extract structure		Generate an extractor structure for a totals table	Choose basic characteristic, object table, class type, and characteristic to be extracted
2. Generate/maintain DataSources in OLTP	X	X	X	For a ledger only	Maintain DataSources for classification data*
3. Replicate/assign DataSources	X	X	X	X	X
4. Maintain communication structure (assign InfoSource)	X	X	X	X	X
5. Maintain transfer rules	X	X	X	X	X
6. Maintain InfoCubes and update rules	X	X	X	X	
7. Generate/activate structures	Generate update of LIS InfoStructure	Activate extract structure			
8. Create InfoPackage for full update				X	X
9. Setup of structures	X	X			
10. Delta update	Activate delta update	Perform delta extract to the queue			
11. Delta initialization	X	X	X		
12. Delta update	Turn on updating	Set up V3 update			
13. InfoPackage for delta upload	X	X	X		

*Applied only to classification/generic master data.

Enhancements to Business Content

Enhancements can be made to provide additional value to the business content and meet the business requirements more closely. Examples of enhancements to the business content are:

- Include additional attributes to the characteristics (master data) provided with the standard SAP BW system (e.g., use old material number for reporting).
- Integrate additional characteristics in the DataSource for transaction data that are provided with the standard SAP BW system.

- Business content enhancement can be created for transaction data, master data, and texts.
- The additional data required for business content enhancements must be available when the extraction function is executed.
- All of the keys required to read the additional data for the business content are part of the original data.

SAP BW RESTRICTIONS

There are two methods to enhance master data:

1. *Extract structure enhancements*. Enhance the standard extract structure with an append structure and fill the new fields with the function exit.
2. *Extractor modification*. Create a new view or an ABAP query InfoSet and overwrite the extractor for BW and the extract structure in the maintenance function for DataSources (master data attributes).

The extractor modification is the recommended method due to its ease of use and time efficiency compared with extract structure enhancements.

Suggested Exercises

The following are exercises that you can perform, usually with a small test SAP BW server, to gain experience in the SAP BW extraction subject area:

- Access metadata tables.
- Attach the special ledger to SAP BW.
- Build an InfoCube.
- Create generic DataSources for master data attributes/texts.
- Create InfoSources for transaction data.
- Define a CO/PA DataSource.
- Enhance a DataSource for transaction data.
- Enhance an InfoSource for transaction data.
- Enhance with the InfoSet/data retrieval program.
- Fill InfoCubes.
- Link InfoStructures to SAP BW.
- Set up LIS InfoStructures.

Practice Test

Check the answer(s) that apply:

1. Which of the following are correct concerning CO/PA?
   This question has more than one answer.
   a. Summarization levels for an operating concern have the same function as aggregates for an InfoCube
   b. CO/PA summarization levels are managed by the InfoCube, and always contain the same numbers as the InfoCube that they are based on
   c. Characteristics in CO/PA correspond to the characteristics in InfoCubes
   d. The value fields in CO/PA can be regarded as key figures with additional summarization in each characteristic
   e. Line items in CO/PA can be compared to line items in the ODS

2. Which of the following are methods used in SAP BW to manage delta updates?
   This question has more than one answer.
   a. Change logs
   b. Change pointers
   c. Metadata uploads
   d. Time stamps
   e. All of the above

3. For what type of CO/PA data source can selection criteria be used to implement a delta scenario?
   This question has only one answer.
   a. Cost based
   b. Time based
   c. Account based
   d. Value based
   e. None of the above

4. When should the tools for generic data extraction for creating a data source be used?
   This question has only one answer.
   a. After each plug-in installation
   b. For all flat file loads
   c. If it is not possible to create IDOCs on your system
   d. When the business content does not include a DataSource for your application
   e. When the extractor programs are upgraded to a new release level

5. What is the V3 control, background processing?
   This question has more than one answer.
   a. Tool to process CO/PA data load in the background
   b. Define job parameters
   c. Scheduled batch jobs for updating extract structure to data source
   d. Maintenance of FI/SL extractors
   e. None of the above

6. Which of the following is the method used within the LO extractor cockpit to accomplish the delta management utilities?
   This question has only one answer.
   a. Several tables with pointers that open and close the delta tables
   b. The V2 asynchronous update method
   c. The same communication structure that the LIS method uses
   d. Business content
   e. The V3 synchronous update method

7. Which of the following tables can be created for a ledger in FI/SL?
   This question has only one answer.
   a. Aggregate tables
   b. InfoCube level tables
   c. Line item level tables
   d. Summarization level tables
   e. Totals tables

8. Which of the following data is it better to load first?
   This question has only one answer.
   a. Attributes
   b. Hierarchies
   c. It does not matter
   d. Text
   e. Transactional data
   f. None of the above

9. Which of the following steps are common to CO/PA, LO extraction, and LOS extraction when setting up delta management of uploads?
   This question has only one answer.
   a. On the scheduler you initialize a full upload
   b. On the scheduler you initialize the delta upload
   c. Set up delta tables
   d. The delta is managed in the service AI
   e. The InfoStructures are used
   f. VBDATA and ARFCSDATA tables

10. What tables are generated once the LIS environment has been configured?
    This question has more than one answer.
    a. One structure (55nn BIWS)
    b. Two transparent tables (55nn BIWI and 55nn BIW2)
    c. Four tables (line items table, segment level table, segment table, and summarization levels tables)
    d. Four tables (Plan line items, object table_1, object table_2, and summary tables)
    e. None of the above

11. A full load must be done before a delta load can be performed. (True or False)
    This question has only one answer.
    a. True
    b. False

12. Which of the following are the recommended ways to speed loading?
    This question has more than one answer.
    a. Create multiple jobs to run in parallel
    b. Delete secondary indexes
    c. Increase the size of the number range buffer
    d. Load transaction data before master data
    e. All of the above

13. Where can you initially specify PSA or IDOCs?
    This question has only one answer.
    a. In the assignment of the InfoSource
    b. In the communication structure
    c. In the scheduler
    d. Transfer methods tab in the transfer rules
    e. None of the above

14. What is considered an SAP R/3 versus a non-SAP R/3 system?
    This question has only one answer.
    a. Siebel vs. Oracle
    b. LIS vs. LO
    c. UNIX vs. ABAP
    d. 3.0D vs. 3.1H
    e. None of the above

15. Which of the following data can go through PSA?
    a. Attributes
    b. Hierarchies
    c. Text
    d. Transaction data
    e. None of the above

16. Which of the following is correct concerning delta updates?
    This question has only one answer.
    a. All SAP BW applications support the delta update process
    b. The update programs information structure can be regenerated only if the LIS up-
       dating function is active
    c. Delta updates are client independent
    d. Delta updates are client specific
    e. Before you start a delta update request in SAP BW, you must make sure that the
       OLTP system is down, and that no users are on that system

17. What steps do CO/PA, LO extraction, and LIS extraction methods have in common when setting up delta management of uploads?
    This question has only one answer.
    a. On the scheduler you activate a full upload
    b. On the scheduler you initialize the delta upload
    c. Setup of delta tables
    d. The delta is managed in the service API
    e. The InfoStructure tables are used

18. What application does not support delta update?
    This question has only one answer.
    a. FI/SL
    b. CO/PA (time stamp)
    c. Cross-application generic data extraction using a creation and change date
    d. LIS (based on separate delta tables)
    e. None of the above

19. What are the elements of the name of a data source CO/PA?
    This question has more than one answer.
    a. System ID
    b. Client
    c. Operating concern
    d. Controlling area
    e. Company code

20. What extractor types are available in SAP BW 2.0?
    This question has more than one answer.
    a. Application specific
    b. Object specific
    c. Cross application
    d. InfoCube specific
    e. None of the above

21. What is the scheduler?
    This question has more than one answer.
    a. A tool that manages data requests to the source system
    b. A tool that provides a view of data-loading activities and their status
    c. A tool that automates the data transfer using InfoPackages and InfoPackages groups
    d. A tool to display all SAP BW elements (source system, DataSources, transfer rules, InfoSource, update rules, and InfoCubes) from the source system up
    e. None of the above

22. In which of the following do you specify TRFC or IDOCs?
    This question has more than one answer.
    a. Transfer method tab
    b. Update rules
    c. Transfer rules
    d. BEx Analyzer
    e. None of the above

23. Data from non-SAP data sources can be loaded into SAP BW via which of the following?
    This question has more than one answer.
    a. Flat files
    b. Third-party extraction and load tools
    c. Access database files
    d. CSV files only
    e. None of the above

24. Which load method can be used when using TRFC?
    This question has more than one answer.
    a. To InfoCube only
    b. To ODS and InfoCube in parallel
    c. To ODS only
    d. To ODS, then to InfoCube
    e. To PSA

25. Which of the following describe a realignment in CO/PA?
    This question has more than one answer.
    a. A change in the organization
    b. A change in the reporting hierarchies
    c. Creation of a new summation table
    d. Creation of a profitability segment
    e. All of the above

26. Which of the following is not a step in the definition of an InfoSource for master data?
    This question has only one answer.
    a. Define the InfoObject
    b. Define the transfer structure
    c. Define the update rule
    d. Activate the InfoObject
    e. All of the above
    f. None of the above

27. What kind of data can be extracted and loaded with SAP BW?
    This question has more than one answer.
    a. Master data
    b. Transaction data
    c. Hierarchies
    d. Attributes
    e. None of the above

28. On the update rule, when I choose to initialize the data, what does that mean?
    This question has only one answer.
    a. I want to add information to my data target
    b. I want to fill a characteristic with master data of some sort
    c. I want to create a routine that uses a user exit
    d. I want to create a routine that blanks out the characteristic
    e. I want to read the data in certain way

29. Which of the following does the scheduler allow you to do?
    This question has more than one answer.
    a. Determine which InfoCube should be supplied with data
    b. Which reports should be updated
    c. Start batch jobs to load data
    d. Perform a master data check
    e. None of the above

30. Which of the following is correct concerning SAP BW InfoSources?
    a. The InfoSource allows the system to transfer data to the communication structure in SAP BW.
    b. Only key figures are contained in the InfoSource.
    c. The InfoSource helps prepare data to be stored in the InfoCube.
    d. An InfoSource is comprised of InfoObjects.
    e. InfoSources include extract structure.

Answers to Practice Test

Question	Answer
1	a, c, d, e
2	a, d
3	c
4	d
5	b, c
6	e
7	e
8	a
9	b
10	a, b
11	b
12	a, b, c
13	d
14	d
15	a, c, d

Question	Answer
16	d
17	b
18	a
19	a, b, c
20	a, c
21	a, c
22	a, c
23	a, b
24	a, b, c, d
25	a, b
26	c
27	a, b, c, d
28	d
29	a, c, d
30	a, c, d

Summary

In this chapter, you learned about data extraction in SAP BW. You now have a good understanding of all SAP BW data extraction methods for SAP and non-SAP source systems. You should be especially knowledgeable of the process and methods to load data from SAP R/3 to SAP BW, with special focus on CO/PA, LIS, LO, and FISL.

The next chapter offers test-taking tips to help you maximize your chances to pass the test, including the 10 steps for success that you need to follow. The tips and tricks will be useful when preparing for the exam, during the test, and after the test. Finally, the chapter will provide guidance in managing changes in the SAP BW certification exam.

Need to Know More?

Published Resources

- Naeem Hashmi. *Business Information Warehouse for SAP*. Portland, OR: Premier Press, 2000.

On-line Resources

- SAP BW Help CD or SAP Help Portal, *www.help.sap.com*.
- Naeem Hashmi. "Third Party Data Access and Data Load Tools for SAP Business Information Warehouse," September 2001. *http://infoframeworks.com/BW/SAP_BW_3rd_Party_ Access_ETL_Tools.htm*
- SAP OEM ETL Vendor: Ascential's DataStage
  http://www.ascentialsoftware.com/community/infoframeworks/ds_xe.html
  http://www.ascentialsoftware.com/community/infoframeworks/ds_ent_apps.html
  http://www.ascentialsoftware.com/community/infoframeworks/ds_family.html

Other Resources

- Training class and material, SAP BW SAP OLTP Extraction, SAP Solution Academy.

Endnotes

1. Naeem Hashmi, Business Information Warehouse for SAP (Portland, OR: Premier Press, 2000).
2. "Performance ASAP for BW Accelerator," SAP Business Information Warehouse, performance issues and tuning of a BW system, SAP AG, 1999.

Getting Ready for Certification: Tips and Tricks

In This Chapter:

Ten steps for success
Tips and tricks to be used when preparing for the exam
Tips and tricks to be used during the test
Tips and tricks to be used after the test
Managing changes in the SAP BW certification exam

The following 10 steps should be followed in order to successfully achieve certification:

1. Review Chapters 1, 2, and 3 of this study guide to become familiar with the concepts, certification process, and training options.
2. Become familiar with the SAP BW concepts and terminologies by studying the key concepts in the study guide. Understand the objectives of the SAP BW test by reading the SAP BW exam content and weighting information in Chapter 2.
3. Depending on your knowledge and experience level, attend one or more of the SAP BW curriculum training classes provided by SAP.
4. Read this study guide in detail.
5. Study additional resources and training materials as needed in the SAP BW and data warehousing areas.
6. Test your knowledge with the practice exam questions throughout the book.
7. Do a thorough review of the objectives and use the answers to the practice tests to learn from your mistakes and solidify the information in your mind.
8. Take the simulated certification exam provided in Chapter 9. Give yourself an hour and a half and follow the test-taking tips and tricks provided in this chapter.
9. Schedule your exam with the SAP Education Center (Internet *http://www.sap.com*) or SAP central registration (888-777-1727).
10. Practice, practice, practice.

This chapter provides tips and tricks that will help you identify and develop a practical and successful test-taking strategy for the SAP BW certification exam. It also provides information and resources to help you manage changes in the SAP BW releases.

Preparing for the Exam

The exam incorporates a variety of questions from a test bank intended to determine whether you have mastered the subject. Some tips to keep in mind as you prepare to take the exam are:

- Make sure that you understand the material thoroughly.
- Go through all the practice problems.
- Reread sections that you are having trouble with.
- Review the certification exam objectives.

What to Memorize

The exam will test your ability to recall a set of memorized facts, and analyze and apply knowledge. The amount of memorization that you need for the exam depends on how well you remember what you have read and how well you know the software.

At a minimum, you will want to memorize the following kinds of information:

- Items highlighted throughout this study guide as "On the Exam"
- Architecture and data flow of SAP BW (e.g., source system, DataSource, InfoSource, InfoCube, MultiCube, RNSID, etc.)
- Terms and techniques of data modeling (e.g., normalization, slowly changing dimensions, etc.)
- Unique terminology and concepts used in SAP BW Building Blocks (e.g., transfer rule, extract structure, data source, etc.)
- Terms and techniques of SAP BW reporting (e.g., InfoSet query, report-to-report interface, etc.)
- Terms and techniques of SAP BW extraction (e.g., SAP R/3 data extractors, data transfer methods, etc.)
- Salient features and restrictions of SAP BW components as highlighted in the "Restrictions" boxes (e.g., maximum number of key figures, dimensions, characteristics in SAP BW, etc.)
- Benefits of SAP BW components, including those described in the "Optimization Tips"

What to Expect

It may sound basic, but you should be sure to carefully read the questions and answers. In the excitement of the exam, some candidates may read too quickly and jump to conclusions. You will have an average of a minute and a half to answer each question (60 questions and 90 minutes). That is probably more time than you need and most candidates finish the exam before the allocated time.

After you have read each question and all of its possible answers thoroughly, double-check your responses. Many of the questions are designed to encourage jumping to conclusions. This is especially true for the one-answer-only questions. Many candidates lose points because they select the first answer that looks correct when there is often a better answer. After you have made sure that you understand the question, eliminate the answers that you know to be wrong. If you still have two or three choices, consider which of them is the best answer and select it.

If a question is open to interpretation, you should not try to read too much into it but rather take it at face value and remember that some of these questions may have been translated from German.

What to Do the Night before the Exam

The night before the exam you should:
- Review the SAP BW exam content and weighting information (Chapter 2); especially revisit the areas in which you feel that you need to brush up.
- Review the glossary provided at the end of this book.
- Take one or more simulated test exams to assess your readiness and put yourself in the frame of mind for the exam.
- Check that you have a valid form of picture identification; you will not be allowed to take the test without it.
- Make sure that you are well rested so you can think clearly during the exam.
- Draw the SAP BW architecture diagram from memory.

Leveraging the Exam Rules

Allocated Time

The exam is timed and you have up to 90 minutes to answer 60 questions. Each screen of the exam contains a clock that is there to remind you of the amount of time that you have left for the test. At the end of the allocated time, the exam will automatically terminate or you might choose to terminate the exam at any time. Even if you have completed all questions before the allotted time, it is a good strategy to take advantage of any time that may be remaining to once again review your answers.

Scoring

For the SAP BW certification exam, a score of 70% or higher is considered passing. The exam scoring process does not deduct points for wrong answers, so it is beneficial to guess rather than leaving a blank answer. You can usually eliminate some of the choices that are obviously incorrect and thereby increase your odds of selecting the correct response. Be aware of the time limit and set aside the last 5 to 10 minutes to double-check your answers and make educated guesses for those questions previously left unanswered.

Material to Be Used during the Test

The exam is on-line, closed system, and closed book with no SAP R/3 Help Library available (with the exception of a dictionary for those candidates taking the test in a language other than their native language). In addition, you may not bring any material (paper, calculators, books, etc.) into the exam room. SAP will provide paper(s) (usually one sheet at a time) that

will be collected at the end of the exam to prevent candidates from sharing and distributing questions from the test. You can use this paper to write notes before and during the exam.

Since the exam timer does not start until you actually choose to do so by clicking the "start exam" button on the computer, you should take as much time up-front as you wish to write down the most critical items that you have memorized for reference during the exam. For instance, you may have memorized key concepts in anticipation that they may reinforce your knowledge on critical items, which you may shortly encounter on the test (e.g., SAP BW architecture diagram).

Marking Answers for Return

If you are not sure of an answer, you can mark the question by selecting a check box. You can then return to the question at the end when you are given the option to review your answers. Pay particular attention to related questions later in the test, in case you can learn enough from them to figure out the answer to the question you were unsure of.

Tips and Tricks to Use during the Test

Pacing Yourself

Because the SAP BW exam is timed, pacing is important for success. The exam allows you the flexibility to review the questions and change your answers if necessary. In addition, you can check a box to highlight a question for later review.

A recap screen is accessible at any time during the exam and provides the following:
- Questions that have been answered
- Questions that have been marked for review
- Questions that have not yet been answered

The screen that recaps the questions spans more than one page, so if you forget to flip to the next page you might be under the impression that you have completed all the questions on the exam when you have actually completed only half of them.

Using these tools, you may find it a good strategy to first review all of the questions on the test while your mind is fresh, then answer those that you are sure of. Mark the questions that you may be able to answer with more time and come back to those questions after your first pass. Then take another pass through the marked questions, answering all that you can.

Test Instructions

In the actual SAP BW certification exam, the questions generally fall into two categories:
1. Questions that have only one correct answer
2. Questions that have more than one correct answer

Most of the answers are multiple choice with some true/false questions. The number of correct answers for the question (either one or more than one answer) is specified directly after the question. You should read the text for each question carefully even though the system should accept only one answer if the question calls for only one correct answer.

Picking the Correct Answer

Obviously the only way to pass the exam is to select the correct answers and obtain a passing score. However, SAP's exam questions are not standardized like the SAT, GMAT, or GRE. They are far more diabolical and convoluted. In some cases, questions are strangely worded, and deciphering them can be a real challenge. In these cases, you may need to rely on answer elimination skills.

For the multiple-choice questions at least one of the answers usually can be eliminated immediately, because it matches one of these conditions:

- The answer does not apply to the situation.
- The answer describes a nonexistent issue, an invalid option, or an imaginary state.
- The answer may be eliminated because of information in the question itself.

After you eliminate all answers that are obviously incorrect, you can apply your retained knowledge to eliminate further answers. Look for items that sound correct but refer to actions, commands, or features that are not present or available in the situation the question describes.

If you are still faced with a blind guess between two potentially correct answers, reread the question and try to picture how each of the possible remaining answers would alter the situation. Be especially sensitive to terminology; sometimes the choice of words can make the difference between a right answer and a wrong one.

Decoding Ambiguity

SAP has a reputation for including questions that can be difficult to interpret, confusing, or ambiguous. On occasion, the grammar and vocabulary of a question—or associated answers—in the test may leave you puzzled and hesitant. The only way to pass the exam is to be prepared. You will discover many exam questions that test your knowledge of topics not directly related to the question at hand. This means the answers you must choose from, even the incorrect ones, are just as much a part of the skill assessment as the question itself.

If you do not know something about most aspects of the question, you may not be able to eliminate obviously wrong answers. In other words, the more you know about the subject, the easier it will be for you to tell right from wrong. Vocabulary and grammar are common difficulties in the SAP certification exam. SAP has an uncanny knack for naming some utilities and features entirely obviously in some cases and completely inanely in other cases. SAP has also changed the names of some of its technologies.

Translation

One of the things to keep in mind is that SAP AG is a German company and that most of the questions on the exam have been translated from German into English. The translation of the questions may not be 100% accurate and may result in

- Improper grammar or sentence structure
- Use of terms that do not correspond to the original technical term, for example, Information Source (probably *InfoSource*), updating regulation (probably *update rule*), basis cube (probably *Basic Cube*)

- Improper spelling
- Use of German words (on rare occasions a word was not translated and is still presented in German)

If you come across a sentence where the wording or grammar leaves you confused, try not to read too much into it. It is most probably a translation error.

Tips and Tricks to Use after the Test

For questions that are clearly incorrect or confusing, due to changes in SAP BW releases or the phrasing of the question, you may write a request for SAP to review the question. You should include the question number and description along with an explanation of why you are questioning or disputing the question or answer(s).

If legitimate, SAP should consider your request for review, especially if a large number of candidates request a review for the same question. Since the exam is timed, you may want only to take notes for those questions during the allocated time for the exam and spend as much time as necessary to write a detailed dispute after you finish the exam.

Managing Changes in the Exam

Sooner or later, the information about SAP BW, the SAP BW certification test, and the other Web-based resources mentioned throughout this book may become outdated or be replaced by newer information. In some cases, the URLs you find in this book might lead you to their replacements; in other cases, the URLs will go nowhere, leaving you with the famous "File not found" error message. In this case, do not give up, you can always find what you want on the Web if you are willing to invest some time and energy.

To find general information on a given topic, you should leverage one of the multiple search tools available on the Internet such as the following: *www.Whatis.com, www.Google.com, www.yahoo.com, www.excite.com, www.altavista.com, www.search.com.*

SAP BW Release Planning and Maintenance Strategy

SAP BW is still a relatively new product, still in development as of this writing, and SAP is providing functional updates every two weeks. The release planning and maintenance strategy of SAP BW is described in Table 8.1.

Note that there are significant new features in SAP BW 3.0, including:
- Closed-loop analytical applications
- Open standards in heterogeneous environments
- Platform for e-business solutions
- Hub-and-spoke capability as an option in BW 3.0B
- Restructured ODS
- Archiving

Table 8.1   **SAP BW Release Planning and Maintenance Strategy**

SAP BW Release	SAP Basis/SAP Web	Availability	End of Maintenance	Can Be Upgraded To:
2.0B	4.6C	Aug. 2000	Aug. 2003	2.1C, 3.0A, 3.0B
2.1C	4.6D	Dec. 2000	Aug. 2003	3.0A, 3.0B
3.0A	6.10	Dec. 2001	Sept. 2002	3.0B
3.0B	6.20	June 2002	May 2005	

Be aware of the key new features of the latest release of SAP BW at a high level. However, you should expect the exam to be version independent.

Table 8.2 provides a high-level view of the new features in SAP BW 3.0. For the latest information on SAP BW and new developments, we strongly recommend that you consult additional resources such as:

- The individual development news publications in the SAP Service Marketplace, at *http://service.sap.com/developmentnews* (requires OSS account)
- The knowledge repository provided by American SAP Users Group (ASUG) to its members at *http://www.asug.com/members/repository/index.cfm*

Changes in the SAP BW Certification Exam

To keep your SAP BW certification current, you must continue to meet the SAP BW requirements as SAP updates them. When new products/releases containing updates and new functions are added, existing exams are often retired or replaced with new versions.

SAP usually retires (discontinues) an exam when the release it refers to becomes obsolete or is replaced by a new release. For example, the SAP BW 2.0B software and exams are scheduled to be retired in August 2003. When the release of SAP BW for which you are certified has been retired, you can upgrade your existing certificate to the current SAP version with a delta examination. For more information on that topic refer to the SAP development news page at *http://www010.SAP-AG.DE/developmentnews*. This book should also prove useful to those preparing for the delta certification exam.

Despite the changes in the product, the overall SAP BW concepts and process will remain unchanged. Future SAP BW certification tests will probably not change significantly from their retired counterparts.

Significant changes in SAP BW releases are additions to the business content (e.g., new features, KPIs, queries, and reports). The business content is usually not tested in detail by SAP during the certification exam. Rather SAP will check that you understand the business content at a high level (e.g., what type of objects are provided in business content and what are the benefits of business content).

Table 8.2   **New Features in SAP BW 3.0**

Area	New Features in SAP BW 3.0
Warehouse management	• Archiving • Process chain improvements • ODS objects • Master data reorganization • Document management • Documentation of data sources • Scheduler • New search dialogue in AWB • Noncumulative key figures • New monitor feature • New objects for XML metadata exchange • PSA enhancements
Business explorer	• Web application designer enhancements • Ad-hoc query designer • Web application enhancements • Mobile intelligence enhancements • Drag and relate • Enhanced document handling • Query designer enhancements • OLTP enhancements
Business content/supply chain performance management	New business content to enhance the existing functions by adding new KPIs to mySAP based on the supply chain operations reference (SCOR) model: • Procurement • Inventory management • Production and planning • Order fulfillment
Business content/ transport management	New business content to enhance the existing travel management functions by adding new features including: • Reporting on city pairs and negotiated airfares • Drill down with geographical hierarchy • Display travel planning data on geographical maps • Unification of drill-down capabilities in all queries with new free characteristics

SAP periodically releases new exams and training classes. These may cover new versions as well as some features of prior versions. It is unknown at this time how SAP will deal with some of these changes across releases during the certification exam. Confusion might be created in the exam based on which release the questions refer to. For instance, the ODS had three tables in the SAP BW 2.xx version and will have only two tables in version 3.0. Therefore, if you encounter a question asking you how many tables an ODS has, there are arguably two correct answers (2 and 3), depending on which version of the software you are referring to. In such cases, one hopes that SAP will not ask questions that are subject to confusion.

Changes in This Book

It is difficult to write about a moving target. As SAP updates SAP BW in new releases, we expect most of the changes to be in the look and feel of the software and not the basic SAP BW concepts and process. As such you may find that some screens, terminology, or software functionality used in this book, might have changed. Most of this book was written based on the SAP BW 2.xx release and reflects some of the changes between BW 2.1C and BW 3.0. We expect that over 95% of the content of this book will be pertinent and valid for certification tests of SAP BW 3.xx.

Summary

In this chapter, you learned tips and tricks that will help you identify practical strategies for taking the SAP BW certification exam. These tips will give you an edge before, during, and after the exam. This chapter also provided information and resources to help you manage changes in the SAP BW releases.

In the next chapter, you will have the opportunity to take a simulated SAP BW certification test. Instructions, answers, and scoring are also provided to prepare you and help you maximize your chances to pass the test.

Need to Know More?

As of the time of this writing, the following Web sites, white papers, and presentations offer information regarding the new features of SAP BW 3.0:

Published Resources

- Kevin McDonald, Andreas Wilmsmeier, David Dixon, William H. Inmon. *Mastering SAP Business Information Warehouse* (New York: John Wiley & Sons, Inc., 2002).

On-line Resources

- The knowledge repository provided by ASUG to its members: *http://www.asug.com/members/repository/index.cfm.*
- The SAP individual development news publications at *http://service.sap.com/development news* (requires OSS account), including:
  - ◆ Business Content, Supply Chain Performance Management
  - ◆ Business Content, Travel Management
  - ◆ Warehouse Management
  - ◆ Business Explorer
- The SAP Service Marketplace at www.service.sap.com/BW (requires OSS account):
  - ◆ BW 3.0A Patch 5—features list, SAP portals.
  - ◆ Brian Katis, Mike Eacrett, Katie Beavers. "Upgrading to BW 3.0, Getting Prepared, Tips and Tricks."
  - ◆ Scott Braker-Abene and John Polus. "Enabling Drag and Relate in BW 3.0 and EP 5.0."

Simulated Certification Exam

In This Chapter:

Instructions
Assessing your exam readiness
Simulated test
Answers to simulated test

This chapter provides instructions, assessment guidelines, and a simulated certification test (covering all areas of the certification) to help assess your readiness to pass the actual SAP BW certification exam.

Instructions

The examination rules were provided in Chapter 2. The same instructions apply and should be followed when taking the simulated certification exam:

- Each test includes 60 questions from all areas (configuration, extraction, and reporting).
- Simulate the exam conditions (closed book and SAP systems).
- Respect the time available (90 minutes).
- Keep in mind the test-taking tips described in Chapter 8.

Scoring the Exam

It is useful to understand how SAP will score your answers on the exam in order to maximize your score:

If Only One Answer (maximum of two points)

- This type of question scores a maximum of two points and a minimum of zero points.
- If the answer you select is the correct one (true), you get full credit and score two points.
- If the answer you select is false, you do not score any points. There is no penalty for an incorrect response.

If More Than One Answer (maximum of 5 points)

- This type of question usually has five possibile answers and scores a maximum of five points (one point for each correct answer) and a minimum of zero points.
- You should consider the potential answers provided as a series of true/false questions.
    - For each potential answer, if the answer is true and you select it or the answer is not true and you do not select it, you are correct and you score one point per question.
    - Conversely, if the answer is false and you answer true or the answer is true and you answer false, you are not correct and do not score any points for that question.

It is important to remember that there is no penalty for not answering a question correctly. Therefore, you should never leave a question unanswered even if you do not know the answer.

Regardless of the type of questions (one answer or more than one answer), scoring of the answers for the exam is based on Boolean logic:

Correct Answer	Your Selection	Your Score
True	True	1
False	False	1
True	False	0
False	True	0

For instance, for a test question with more than one answer (possible answers a, b, c, d, and e), if the correct answers are a, b, and c:

- If you select a, b, c, and d you score 4 points as follows: one point each for selecting a, b, c, one point for not selecting e, and no points for incorrectly selecting d.
- If you select a and b you score 4 points as follows: one point each for selecting a and b, and one point each for not selecting d and e.
- Had you also selected c in this scenario, you would have scored a perfect 5 for this question.

Scoring on the exam is summarized as follows:

	Correct Answer	Incorrect Answer	No Answer
If there is only one correct answer	2 points	0 points (no points deducted)	0 points
If there is more than one answer	1 point per correct answer	0 points (no points deducted)	0 points

The maximum number of points for each question is as follows:

		Potential Maximum Number of Points
If there is only one correct answer		2 points
If there is more than one correct answer	Four answers	4 points
	Five answers	5 points

Assessing Your Exam Readiness

Based on the scoring model provided in the previous section, you can score yourself on the simulated SAP BW certification test provided herein and assess your own results. The actual passing score for the SAP BW exam is 70% or better. Although there is no guarantee, if you pass a simulated exam at 80% or better, you are probably ready to tackle the real SAP BW certification exam.

If your score is not above that crucial threshold, identify your areas of weakness and strengthen them by studying, taking a class, or obtaining more practice tests if possible. In any case, pay special attention to answers where you did not answer correctly. These can help you reinforce your knowledge of the material. Knowing how to recognize correct answers is good but understanding why incorrect answers are wrong is certainly more valuable.

In the future, additional simulated SAP BW certification exams will be available on-line through our Web site: *www.certificationASAP.com*. This will allow you to assess your readiness to pass the test based on a test bank of thousands of questions.

Simulated Test

Check the answer(s) that apply:

1. Which of the following objects are connected by update rules?
   This question has more than one answer.
   a. Communication structures
   b. Extract structure
   c. InfoCube
   d. InfoStructure
   e. Transfer structure
   f. None of the above

2. How can the business content be extended?
   This question has more than one answer.
   a. SAP BW provides function exits
   b. Extend the standard extraction structures
   c. Function exit must be programmed to enrich data
   d. New fields must be assigned
   e. None of the above

3. Which of the following is *correct* about Profile Generator?
   This question has only one answer.
   a. It is a tool to automatically generate Authorization Profile
   b. It is a tool existing in OLTP systems only
   c. Complete the Administrator work with extra tasks to set up authorization
   d. A tool that can be used by end users to modify their authorizations
   e. None of the above

4. Which of the following applications in SAP support delta update?
   This question has more than one answer.
   a. CO/PA (time stamp)
   b. MM
   c. LIS (based on separate delta tables)
   d. FI/SL
   e. None of the above

5. Which of the following describes a Result Set query?
   This question has only one answer.
   a. A nested query where the results of a first query are used as entry values for a second query
   b. A query using flat tables (ODS object or InfoObject)
   c. A prequery
   d. There is no such thing in SAP BW
   e. None of the above

6. Which of the following can be extended in SAP BW?
   This question has more than one answer.
   a. Transaction data
   b. Master data
   c. Texts
   d. Metadata
   e. All of the above

7. What do the SAP BW content extractors provide?
   This question has only one answer.
   a. Generic extractors
   b. Custom extractors
   c. There is no such thing in SAP BW content
   d. Data sources that can be activated for all applications
   e. None of the above

8. Which of the following is usually the largest table in the star schema?
   This question has only one answer.
   a. None—they are all equal
   b. The fact table
   c. The first dimension table
   d. The metadata table
   e. The SID table

9. For which of the following objects can authorization be created?
   This question has more than one answer.
   a. Characteristic values
   b. Hierarchy leaves
   c. Hierarchy levels
   d. Hierarchy modes
   e. None of the above

10. Where are customer-specific documents stored?
    This question has only one answer.
    a. DNS
    b. BDS
    c. ITS
    d. AWB
    e. None of the above

11. What does an extract structure represent?
    This question has only one answer.
    a. Data from the target system
    b. Data from the source system
    c. Transport process
    d. Communication process
    e. None of the above

12. What method is used in CO/PA (SAP R/3 side) to manage delta updating?
    This question has only one answer.
    a. Several new tables are created to manage the delta upload
    b. A V3 delta management setup table is created
    c. A person manually monitors the data as they come to SAP BW
    d. Based on the time stamp that is attached to each line item
    e. None of the above

13. Where can data be filtered in BEx Analyzer?
    This question has only one answer.
    a. By the end user in a report
    b. During query execution
    c. In the query builder
    d. When checking users' authorizations
    e. None of the above

14. Using PSA as a loading process, which of the following methodologies can be used?
    This question has only one answer.
    a. To PSA, then to the data target
    b. To PSA only
    c. To data target only
    d. To PSA and data target in parallel
    e. All of the above

15. Which of the following is *correct* about Request ID (RNSID)?
    This question has more than one answer.
    a. It represents the chronological update history
    b. A unique key is created by the system
    c. Administrator can use RNSIDs to identify certain upload sequences in case of wrong data
    d. Only requests that have "green traffic lights" will update the related InfoCube
    e. Once an InfoCube is compressed, the SAP BW Administrator loses the capability of deleting a single request

16. What is a MultiCube query?
    This question has only one answer.
    a. A query using flat tables (ODS object or InfoObject)
    b. A nested query where the results of a first query are used as entry values for a second query
    c. It is a query divided using the relevant Basic Cubes into several queries that can be processed in parallel
    d. All of the above
    e. None of the above

17. Which of the following objects contains transactional data?
    This question has only one answer.
    a. Query
    b. InfoSources
    c. InfoCube
    d. Report
    e. Templates
    f. None of the above

18. Which of the following objects keeps the aggregate and InfoCube in sync?
    This question has only one answer.
    a. DIM pointer
    b. Read pointer
    c. SID pointers
    d. Surrogate pointer
    e. None of the above
    f. All of the above

19. What is the scheduler?
    This question has more than one answer.
    a. A tool that manages data requests to the source system
    b. A tool that provides a view of data loading activities and their status
    c. A tool that automates the data transfer using InfoPackages and InfoPackages groups
    d. A tool to display all SAP BW elements (source system, DataSources, transfer rules, InfoSource, update rules, and InfoCubes) from the source system up
    e. None of the above

20. Which of the following data extractions is possible with SAP BW?
    This question has only one answer.
    a. Provider
    b. SAP R/3
    c. Flat file
    d. SAP R/2
    e. All of the above
    f. None of the above

21. Which of the following statements are true regarding authorization in BW?
    This question has more than one answer.
    a. Each authorization refers to one InfoCube
    b. Authorization is data concerning the user that remain unchanged over a reasonably long period of time
    c. Each authorization refers to an authorization object
    d. Each authorization defines one or more values for each field that is contained in the authorization object
    e. None of the above

22. Which of the following elements refers to objects that deliver data in a Web report?
    This question has only one answer.
    a. Data deliverers
    b. Data providers
    c. Data suppliers
    d. Web providers
    e. Web suppliers

23. Which of the following characterize a Remote Cube?
    This question has more than one answer.
    a. All of the characteristics are in one dimension
    b. It is attached to an InfoSource
    c. It has a physical table
    d. It stores OLAP data
    e. You can see updated data immediately from the source system

24. Which of the following is a supply of workbooks in SAP BW arranged according to topic areas?
    This question has only one answer.
    a. An InfoSource
    b. A channel
    c. An InfoArea
    d. An InfoCatalog
    e. An InfoObject

25. Which of the following are correct concerning SAP BW InfoSources?
    This question has more than one answer.
    a. An InfoSource is comprised of InfoObjects
    b. Each time an InfoSource is generated a new extract structure is created on the OLTP system
    c. Only key figures are contained in the Info Source
    d. The InfoSource allows the system to transfer data to the communication structure
    e. The InfoSource helps prepare data to be stored in InfoCubes

26. What tables do ODS objects consist of?
    This question has more than one answer.
    a. Active table
    b. Extended table
    c. Change log table
    d. Modified and new table
    e. None of the above

27. How can the business content be activated in SAP BW?
     This question has more than one answer.
     a. No need to activate—it is automatically activated on installation of SAP BW
     b. The business content for one SAP module can be activated in one step
     c. Single business content objects can be activated
     d. After the activation a complete scenario can be used
     e. None of the above

28. What step do CO/PA, LO extraction, and LIS extraction methods have in common when setting up delta management of uploads?
     This question has only one answer.
     a. On the scheduler you activate a full upload
     b. On the scheduler you initialize the delta upload
     c. Setup of delta tables
     d. The delta is managed in the service API
     e. The InfoStructure tables are used
     f. VBDATA and ARFCSDATA tables

29. In which of the following objects can data transformation take place?
     This question has more than one answer.
     a. Extract structures
     b. ODS
     c. Transfer routines
     d. Transfer rules
     e. Update rules
     f. None of the above

30. When translating the ERM to MDM/star schema, which of the following guidelines apply?
     This question has more than one answer.
     a. N:M relationships are broken into smaller 1:N relationships
     b. The central intersection entity becomes the fact table
     c. The ERM is divided over BSIP rollout schedule
     d. The foreign-primary key relationship becomes the dimensions
     e. Dimensions are summarized into aggregates

31. Which of the following are InfoCube types in SAP BW?
     This question has more than one answer.
     a. Aggregate
     b. B—Basic
     c. R—Remote
     d. T—Temp
     e. V—Virtual
     f. All of the above

32. What is the recommended way to increase the speed of loading?
    This question has only one answer.
    a. Increase the size of number range buffer
    b. Delete secondary indexes
    c. Load master data before transaction data
    d. Create multiple jobs to run in parallel
    e. All of the above

33. What extractor types are available in SAP BW 2.0?
    This question has more than one answer.
    a. Application specific
    b. Object specific
    c. Cross application
    d. InfoCube specific
    e. None of the above

34. On top of which of the following objects can an InfoSet query be built?
    This question has more than one answer.
    a. Tables
    b. Logical database
    c. Views
    d. Transaction data
    e. ABAP programs

35. What is the maximum number of key figures in an InfoCube?
    This question has only one answer.
    a. 13
    b. 85
    c. 322
    d. 233
    e. None of the above

36. In order to report on data without any key figure (e.g., employee names), which of the following would one introduce?
    This question has only one answer.
    a. An ABAP program to count the master data table entries
    b. An artificial key figure (counter) filled with a "1" for each employee
    c. Reports that count with Visual Basic functions the number of records
    d. A categorical dimension
    e. None of the above

37. What is a reporting object?
    This question has only one answer.
    a. A folder used to store related InfoObjects
    b. A generic term for business evaluation objects
    c. A record layout of InfoObjects
    d. An authorization object with an additional relationship to InfoCubes
    e. None of the above

38. How does SAP BW support geocoding?
    This question has more than one answer.
    a. SAP BW does not support geocoding
    b. Choose geo-info objects to be geocoded
    c. Generate geocoordinates with external tool
    d. Upload geocoordinates via SAP BW InfoSource
    e. None of the above

39. Where are data stored during the execution of a query?
    This question has only one answer.
    a. An aggregate cube
    b. A cache (temp) cube in the application server
    c. A virtual cube
    d. A view cube
    e. None of the above

40. What are the characteristics of the ODS?
    This question has only one answer.
    a. Data available for reporting
    b. Denormalized data structure
    c. Merge data from different InfoSources
    d. Potential to create external files
    e. Technical and data changes
    f. Transaction data only
    g. All of the above

41. How many communication structures can be part of a master data InfoSource?
    This question has only one answer.
    a. None
    b. One
    c. Two
    d. Three
    e. None of the above

42. In FI/SL we can create a ledger based on what type of tables?
    This question has only one answer.
    a. Aggregate tables
    b. InfoCube level tables
    c. Line-item level tables
    d. Summarization level tables
    e. Total tables

43. According to which of the following levels can the DataSource replication occur?
    This question has more than one answer.
    a. Application component
    b. DataSource
    c. Extract routines
    d. Hierarchies
    e. Source system

44. Which of the following are advantages of using MultiCubes?
    This question has more than one answer.
    a. Fast reporting on multiple Basic Cubes
    b. A large amount of dataset aggregation takes place by uploading
    c. Avoid redundancies
    d. The data can be substituted when uploading into the MultiCube
    e. A MultiCube report can make selections using a maximum of 10 Basic Cubes

45. Which statements are not correct about the PSA?
    This question has more than one answer.
    a. Created for each communication structure
    b. Transfer rules have been applied
    c. You can load from the PSA to an InfoCube
    d. Queries can be generated from the PSA
    e. None of the above

46. Which of the following tools helps in the Web reporting area?
    This question has only one answer.
    a. The Web agent
    b. The front-page tool
    c. The Web wizard
    d. The query view
    e. None of the above

47. In which of the following can data be filtered in the BEx Analyzer?
    This question has more than one answer.
    a. In the query builder
    b. During query execution
    c. By the end user in a report
    d. When checking users' authorizations
    e. None of the above

48. From which of the following can a multprovider get its data?
    This question has more than one answer.
    a. Remote cubes
    b. Multiproviders
    c. ODS objects with BEx indicator
    d. PSA
    e. All of the above

49. What are Metadata?
    This question has only one answer.
    a. Data from the BDS
    b. Data from the ITS
    c. Data about the data
    d. Data that do not change often
    e. None of the above

50. How do OLTP applications communicate with SAP BW?
    This question has only one answer
    a. Via ODBO
    b. Via SAPI
    c. Via communication structure
    d. Via BAPI
    e. None of the above

51. When are aggregates useful?
    This question has only one answer.
    a. Always
    b. They are useful only for key figures with aggregation SUM, MIN, or MAX
    c. For reorganizations and realignments
    d. To increase the speed of loading during data update
    e. None of the above

52. What are the statuses in the monitor in SAP BW?
    This question has more than one answer.
    a. There is no status in the monitor in SAP BW
    b. Green light
    c. Yellow light
    d. Red light
    e. None of the above

53. Which of the following is *correct* about SAP BW Statistics?
    This question has only one answer.
    a. Data volume of the SAP BW Statistics cannot be anticipated, as it is very strongly dependent on the usage of the SAP BW
    b. SAP BW Statistics are delivered as a part of the technical content
    c. All SAP BW Statistics query objects start with OSAP
    d. All SAP BW Statistics InfoObject catalogues start with OSAP
    e. SAP BW Statistics is automatically activated
    f. SAP BW Statistics is loaded in the InfoCube via an internal InfoSource

54. Which of the following is included in SAP BW business content?
    This question has only one answer.
    a. SAP R/3 extractors, InfoSource, and queries
    b. SAP R/3 extractors, InfoSource, and InfoCubes
    c. SAP R/3 extractors, InfoSource, InfoCubes, and queries
    d. SAP R/3 extractors, InfoSource, InfoCubes, queries, and workbooks
    e. None of the above

55. Which of the following describes business content?
    This question has more than one answer.
    a. Role based
    b. Internet based
    c. Industry specific
    d. Defined only by SAP
    e. None of the above

56. Non-SAP data sources can load data into SAP BW via which of the following elements?
    This question has more than one answer.
    a. Flat files
    b. Third-party extraction and load tools
    c. ACCESS database files
    d. CSV files only
    e. None of the above

57. Which of the following statements are not correct about PSA?
    This question has more than one answer.
    a. It is created for each communication structure
    b. Queries can be generated from the PSA
    c. Transfer rules have been applied
    d. You can load from the PSA to an InfoCube
    e. None of the above

58. What is the procedure for the LIS delta update?
    This question has more than one answer.
    a. There is no delta update in LIS
    b. "Generate updating" regenerates the update program and ensures that a delta update is possible
    c. Activate "delta updating in the LIS" setting in the report "RMCSBIWC"
    d. The active delta table is defined in "TMCBIW"
    e. None of the above

59. How many dimension tables can the SAP BW system administrator create per InfoCube?
    This question has only one answer.
    a. 13
    b. 16
    c. 233
    d. 248
    e. None of the above

60. Which of the following are parts of an InfoSource?
    This question has more than one answer.
    a. Communication structure
    b. Transfer rules
    c. Update rules
    d. Transfer structure
    e. Extractor

Answers to Simulated Test

Question	Answer
1	a, c
2	a, b, c, d
3	a
4	a, c
5	a
6	a, b, c
7	d
8	b
9	a, b, c, d
10	b
11	b
12	b
13	c
14	e
15	a, b, c
16	c
17	c
18	b
19	a, c
20	d
21	c, d
22	b
23	a, b
24	b
25	a, d, e
26	a, c, d
27	b, c, d
28	b
29	a, c, d, e
30	a, b

Question	Answer
31	a, b, c
32	e
33	a, c
34	a, b, c, e
35	d
36	b
37	d
38	b, c, d
39	b
40	g
41	c
42	e
43	a, b, d
44	a, c
45	a, b, d
46	c
47	a, c
48	a, b, c
49	c
50	d
51	b
52	b, c, d
53	b
54	d
55	a, c, d
56	a, b
57	b, c
58	b,c, d
59	b
60	a, b, c, d, e

Summary

In this chapter, you had the opportunity to take a simulated certification test and read the test-taking tips to help you assess your readiness to pass the SAP BW certification exam.

The appendixes provide useful reference information, including a list of on-line and published resources, SAP BW and SAP R/3 quick reference guides, white papers, and SAP BW class descriptions. (This reference information is useful to refer to but is not tested on the certification exam.)

SAP BW and Data Warehousing Resources

The following SAP BW and data warehousing resources can be found in this Appendix:
- SAP Career Opportunities
- Data warehousing on-line and published resources
- SAP R/3 and SAP BW on-line and published resources
- SAP Solution Briefs and White Papers of interest
- Other resources

SAP Career Opportunities

The following on-line resources provide SAP career opportunities:
- *www.computerjobs.com*
- *www.mySAPcareers.com*
- *www.sapfans.com*
- *www.dice.com*
- *www.monster.com*
- *www.erp-jobs.com*

Data Warehousing On-Line Resources

The following table provides key data warehousing on-line resources (in alphabetical order).

URL	TOPIC
www.infoframeworks.com	Naeem Hashmi's InfoFrame Works Web site
www.billinmon.com	William H. Inmon
www.crmcommunity.com/bizintell.cfm	CRM community
www.dama.org	Data Administration Management Association

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URL	TOPIC
www.data-warehouse.com	The data warehouse community
www.datawarehouse.ittoolbox.com	The Data Warehouse tool box
www.datawarehousing.com	Data warehousing information, including success stories, industry news, events, articles, and discussion forums
www.datawarehousingonline.com	Data warehousing information, including vendors, products, and solutions
www.dci.com	Data warehousing information, including links to companies, papers and articles, event lists, directories, and list server
www.dmreview.com	*DM Review* magazine—Business Intelligence
www.dwinfocenter.org	Data Warehousing Information Center
www.dw-institute.com	The Data Warehousing Institute
www.gartner.com/default/html	Gartner Group—industry analyst group
www.heinz.cmu.edu/irm/nyc.html	Information Resource Management Certification Program
www.idcresearch.com	IDC Research—industry analyst group
www.idwa.org	International Data Warehousing Association
www.infoimpact.com	Information Quality
www.IntelligentERP.com	Intelligent ERP—publication
www.irmac.ca/links/index.htm	Interesting links on data, data warehouse, data management, etc.
www.metagroup.com	MetaGroup—Industry Analyst Group
www.olapreport.com	The OLAP report (by Business Intelligence)
www.rkimball.com	Ralph Kimball
www.tdan.com	*Data Administration Newsletter*
www.visible.com/AboutUs/whitepapers.html	White papers on data warehousing, data modeling, and information management

Data Warehousing Published Resources

The following table provides key data warehousing published resources:

Author	Title	Publisher	Year
William H. Inmon	*Building the Data Warehouse,* 2nd ed.	New York: John Wiley & Sons, Inc.	1996
William H. Inmon	*Building the Operational Data Store,* 2nd ed.	New York: John Wiley & Sons, Inc.	1999

Author	Title	Publisher	Year
William H. Inmon, Claudia Imhoff, and Ryan Sousa	*Corporate Information Factory,* 2nd ed.	New York: John Wiley & Sons, Inc.	1998
William H. Inmon, Ken Rudin, Christopher Buss, and Ryan Sousa	*Data Warehouse Performance*	New York: John Wiley & Sons, Inc.	1998
Alan R. Simon	*Data Warehousing for Dummies*	New York: John Wiley & Sons, Inc.	1997
William H. Inmon and Chuck Kelley	*Developing the Data Warehouse*	New York: John Wiley & Sons, Inc.	1993
Bruce Love	*Enterprise Information Technologies: Designing the Competitive Company*	New York: Van Nostrand Reinhold	1993
Larry P. English	*Improving Data Warehouse and Business Information Quality: Methods for Reducing Costs and Increasing Profits*	New York: John Wiley & Sons, Inc.	1999
William H. Inmon	*Information Systems Architecture: Development in the 90s*	New York: John Wiley & Sons, Inc.	1992
Kamran Parsaye and Mark Chignell	*Intelligent Database Tools and Applications: Hyperinformation Access, Data Quality, Visualization, Automatic Discovery*	New York: John Wiley & Sons, Inc.	1993
William H. Inmon	*Managing the Data Warehouse*	New York: John Wiley & Sons, Inc.	1998
Robert S. Kaplan and David P. Norton	*The Balanced Score Card: Translating Strategy into Action*	Boston: Harvard Business School Press	1996
Ralph Kimball, Laura Reeves, Margy Ross, and Warren Thirnthwaite	*The Data Warehouse LifeCycle ToolKit: Expert Methods for Designing, Developing and Deploying Data Warehouses*	New York: John Wiley & Sons, Inc.	1998

Author	Title	Publisher	Year
Ralph Kimball	*The Data Warehouse Toolkit: Practical Techniques for Building Dimensional Data Warehouse*	New York: John Wiley & Sons, Inc.	1996
William H. Inmon	*Third Wave Processing: DataBase Machines and Decision Support Systems*	New York: John Wiley & Sons, Inc.	1993
Douglas Hackney	*Understanding and Implementing Successful Data Marts*	Boston: Addison-Wesley	1997
William H. Inmon and R.D. Hackathorn	*Using the Data Warehouse*	New York: John Wiley & Sons, Inc.	1994

SAP R/3 and SAP BW On-line Resources

The following table provides key SAP R/3 and SAP BW on-line resources:

URL	TOPIC
www.asug.com/ContactUs/index.cfm	*ASUG (Americas SAP User's Group)*
www.erp-jobs.com	ERP jobs, including BW opportunities
www.FICOexpertOnline.com	Newsletter for mastering FI/CO concepts, technology, and best practices
www.help.sap.com	SAP documentation—SAP help portal
www.help.sap.com/saphelp_bw	On-line help—SAP BW specific or SAP BW help CD or SAP BW on-line help
www.infoframeworks.com/BW/MainBWWorld.htm	Collection of public resources on SAP BW
www.sap.com	SAP home page
www.sap.com/bw	SAP home page—SAP BW
www.SAPfans.com	The SAP fan club
www.SAPfaq.com	SAP frequently asked questions, including SAP BW FAQs
www.sapinsider.com	SAP professional magazine
www.sappro.com	SAP professional journal
www.saplabs.com	SAP Labs—including downloads
www.Service.sap.com	SAP Service Marketplace
www.service.sap.com/bw	SAP Service Marketplace—SAP BW specific
www.service.sap.com/developmentnews	Development news publications in the SAP Service Marketplace

SAP R/3 Published Resources

There are hundreds of published resources that will provide a deeper understanding of SAP R/3 issues and concepts. The following table provides a selection of SAP R/3 published resources:

Author	Title	Publisher	Year	Description
Simon Sharpe and Deanna Wright	*10 Minute Guide to SAP R/3*	Indianapolis, IN: Sams Publishing	1997	SAP R/3
Bernd Matzke	*ABAP/4 Programming the SAP R/3 System*	Boston: Addison-Wesley	2000	SAP R/3 reporting/ABAP
Stewart Miller	*Accelerated SAP: Implementation at the Speed of Business*	New York: McGraw-Hill	1998	SAP R/3 implementation
Jonathan Blain	*Administering SAP R/3: The FI-Finance Accounting and CO-Control Modules*	Indianapolis, IN: Que Publishing	1998	FI/CO
Jonathan Blain	*Administering SAP R/3: The HR-Human Resources Module*	Indianapolis, IN: Que Publishing	1999	SAP R/3 support/ administration
Jonathan Blain	*Administering SAP R/3: The MM Materials Management Module*	Indianapolis, IN: Que Publishing	1997	R/3 MM
Jonathan Blain	*Administering SAP R/3: The SD-Sales & Distribution Module*	Indianapolis, IN: Que Publishing	1998	R/3 SD
Gareth M. deBruyn, Robert Lyfaveff, and Ken Kroes	*Advanced ABAP/4 Programming for SAP*	Portland, OR: Premier Press	1999	SAP R/3 reporting/ABAP
Arvind Nagpal	*ALE, EDI & IDOC Technologies for SAP*	Portland, OR: Premier Press	2000	ALE, EDI, IDOC
SAP Lab, Inc., Simplification Group	*Authorizations Made Easy Guidebook 4.6A/B*	SAP Labs, Inc.	2001	SAP security/ authorization
John Marnewec, Robert Parkinson, Kay Taylor, and Victor Wood	*Basis Administration for SAP*	Portland, OR: Premier Press	1999	Basis
Ken Kroes and Gareth M. deBruyn	*Becoming an SAP Consultant*	Portland, OR: Premier Press	1999	SAP R/3

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Author	Title	Publisher	Year	Description
Mathias Kirchmer	*Business Process Oriented Implementation of Standard Software: How to Achieve Competitive Advantage Quickly and Efficiently*	Berlin, Germany: Axel Springer-Verlag	1999	SAP R/3 implementation
Tom Curran	*Client Server Development with SAP's ABAP/4 Development Workbench 3.0*	Upper Saddle River, NJ: Prentice Hall	1996	SAP R/3 reporting/ABAP
Rudiger Kretchmer and Wolfgang Weiss	*Developing SAP R/3 Applications with ABAP/4*	Alameda, CA: Sybex, Inc.	1996	SAP R/3 reporting/ABAP
Prima Publishing	*Essential Guide to Reporting in SAP R/3*	Roseville, CA: Prima Publishing	1999	SAP R/3 reporting
Dennis Prince and Gareth M. deBruyn	*Getting Started with SAP R/3*	Portland, OR: Premier Press	1998	SAP R/3
Donald K. Burleson	*High Performance Oracle Database Applications: Performance and Tuning Techniques for Getting the Most from Your Oracle Database*	Scottsdale, AZ: Coriolis Group	1996	Oracle DBMS
Nancy H. Bancroft and Henning Seip	*Implementing SAP R/3: How to Introduce a Large System into a Large Organization, 2nd ed.*	Upper Saddle River, NJ: Prentice Hall	1997	SAP R/3 implementation
Glynn Williams and Simon Yates	*Implementing SAP Sales and Distribution*	Osborne/McGraw-Hill	2000	SD
The Computer Consultants Network	*Instant Access: SAP Developer's Reference for ABAP/4*	The Computer Consultants Network	1996	SAP R/3 reporting/ABAP
The Computer Consultants Network	*Instant Access: SAP Reference for Sales and Distribution*	The Computer Consultants Network	1997	SD
Gareth M. deBruyn and Robert Lyfareff	*Introduction to ABAP/4 Programming for SAP (revised and expanded edition)*	Portland, OR: Premier Press	1998	SAP R/3 reporting/ABAP

Author	Title	Publisher	Year	Description
Annette Clewett, Dana Franklin, Ann McCown	*Network Resource Planning Using SAP R/3*	New York: McGraw-Hill	1998	SAP R/3 infrastructure planning
Peter Corrigan and Mark Gurry	*Oracle Performance Tuning*	Cambridge, MA: O'Reilly	1996	Oracle DBMS management
Oleg Ovanesyan	*Professional Visual Basic SAP R/3 Programming*	Chicago: Wrox	1999	SAP R/3 reporting
Ken Greenwood	*Sams Teach Yourself ABAP/4 in 21 Days*	Indianapolis, IN: Sams Publishing	1998	SAP R/3 reporting/ABAP
Michael Doane	*SAP Blue Book—A Concise Business Guide to the World of SAP*	Doane Associates	1998	SAP R/3
Kathy E. Park	*SAP Documentation and Training Development Guide*	Evans Mills, NY: Bobkat Enterprises	1997	SAP R/3
Dennis Barrett	*SAP R/3 ABAP/4: Command Reference*	Indianapolis, IN: Que Publishing	1997	SAP R/3 reporting/ABAP
Lianne Will	*SAP R/3 Administration*	Boston: Addison-Wesley	1997	SAP R/3 support/ administration
Joey Hirao and Jim Meade	*SAP R/3 Administration for Dummies*	New York: John Wiley & Sons, Inc.	1999	SAP R/3 support/ administration
Gerhard Keller	*SAP R/3 Business BluePrint: Understanding the Business Process Reference Model*	Upper Saddle River, NJ: Prentice Hall	1997	SAP R/3 implementation
Stewart S. Miller	*SAP R/3 Certification Exam Guide*	New York: McGraw-Hill	1999	SAP R/3 certification
Kelley-Levey Associates, Bradley Miquet, and Antony Kelly	*SAP R/3 Implementation Guide: A Manager's Guide to Understanding SAP*	Macmillan Technical Publishing	1998	SAP R/3 implementation
Hartwig Brand	*SAP R/3 Implementation with ASAP: The Official SAP Guide*	Alameda, CA: Sybex, Inc.	1999	SAP R/3 implementation
Gerhard Keller, Thomas Teufel, et al.	*SAP R/3 Process Oriented Implementation*	Boston: Addison-Wesley	1998	SAP R/3 implementation
Thomas Curran, Andrew Ladd, and Dennis Ladd	*SAP R/3 Reporting & Business Intelligence*	Upper Saddle River, NJ: Prentice Hall	2000	SAP R/3 reporting

Author	Title	Publisher	Year	Description
Buck-Emden, Jurgen Galimow, et al.	*SAP R/3 System: A Client Server Technology*	Boston: Addison-Wesley	1996	SAP R/3 technical/ implementation
Lianne Will	*SAP R/3: System Administration: The Official SAP Guide*	Alameda, CA: Sybex, Inc.	1999	SAP R/3 support/ administration
SAP Labs, Inc., Simplification Group	*SAP Script Made Easy*	Dallas, TX: Johnson Printing Service	2000	SAP R/3 reporting
Grant Norris, Ian Wrigth, James Hurley, John Dunleavy, and Alison Gibson	*SAP: An Executive's Comprehensive Guide*	New York: John Wiley & Sons, Inc.	1998	SAP R/3
Michaelson Buchanan	*SAPScript (SAP Technical Expert Series)*	New York: McGraw-Hill	1999	SAP R/3 reporting
Ulrich Mende	*Software Development for SAP R/3: Data Dictionary, ABAP/4, Interfaces*	Berlin, Germany: Axel Springer Verlag	2000	SAP R/3 reporting
Jonathan Blain	*Special Edition Using SAP R/3*	Indianapolis, IN: Que Publishing	1998	SAP R/3
Dennis Prince, Robert Lyfaveff, and Gareth M. deBruyn	*Supporting SAP R/3*	Portland, OR: Premier Press	1998	SAP R/3 support/ administration
Jose Anntonio Hernandez	*The SAP R/3 Administrator's Handbook*	New York: McGraw-Hill	1999	SAP R/3
Mario Perez and Bernd Matzke	*The SAP R/3 System on the Internet*	Boston: Addison-Wesley	1999	Web
Ben W. Rockefeller	*Using SAP R/3 FI: Beyond Business Process Reengineering*	New York: John Wiley & Sons, Inc.	1998	FI
Michael Doane	*Whirlwind Series of SAP: In the path of the Whirlwind: An Apprentice Guide to SAP*	Consulting Alliance	1999	SAP R/3
Ted Hoffman	*Writing SAP ABAP/4 Programs*	Osborne/ McGraw-Hill	1998	SAP R/3 reporting/ ABAP

SAP BW Published Resources

In contrast to SAP R/3, SAP BW is a relatively new product and at this time only a very limited number of SAP BW published resources are available beyond this certification guide:

Author	Title	Publisher	Year	Description
Naeem Hashmi	*Business Information Warehouse for SAP*	Portland, OR: Premier Press	2000	Design, development, and implementation of SAP BW
Kevin McDonald, Andreas Wilmsmeier, David Dixon, William H. Inmon	*Mastering SAP Business Information Warehouse*	New York: John Wiley & Sons, Inc.	2002	Design, development, and implementation of SAP BW
SAP Labs Inc. Simplification Group	*SAP BW Reporting Made Easy, 2.0B/2.1C*	Dallas, TX: Johnson Printing Service	2001	SAP BW reporting
SAP Education Center	*SAP BW10 - System Configuration*	SAP	2001	Training material
SAP Education Center	*SAP BW20 SAP OLTP Extraction*	SAP	2001	Training material
SAP Education Center	*SAP BW30—BW Presentation*	SAP	2001	Training material

SAP Solution Briefs and White Papers of Interest

SAP has published white papers on individual topics that will provide a deeper understanding of the associated concepts and issues. Though hundreds of white papers are available that provide further reading on a particular BW issue, a list of a few key white papers is provided here. Further reading on data modeling, ODS, and security concepts is strongly recommended. Solution briefs and white papers from SAP are available on the SAP ASAP Methodology CD or on the SAP Web site.

SAP Solution Briefs (public)

Available at *http://www.sap.com/solutions/bi/brochures.asp*:
- SAP Business Information Warehouse and Pervasive Computing
- SAP BW—New Tools and More Support
- SAP BW—Efficient Human Resources Management with SAP HR Business Content

- Ready-to-Go Business Content
- SAP Knowledge Management Executive Summary
- SAP Knowledge Warehouse
- SAP Quality Manual in SAP Knowledge Warehouse
- SAP Education Products and Services
- SAP Documentation Products and Services
- SAP Knowledge Management—Integration with SAP Human Resources
- Supporting User Performance

Interesting White Papers on SAP BW:

- Naeem Hashmi, "Mix-It-UP," Intelligent ERP, Defining ERP Data Warehousing, July 2000, *http://www.intelligenterp.com/feature/hashmi.shtml*
- Naeem Hashmi, "Not Just Another ODS," September 2000, Operational Data Store Concepts and the SAP BW ODS, *http://www.intelligenterp.com/feature/hashmiSep8.shtml*
- Naeem Hashmi, "Third-Party Tools: Reporting Tools for SAP BW," August 2001, *http://infoframeworks.com/BW/SAP_BW_3rd_Party_Access_ETL_Tools.htm*
- Naeem Hashmi, "SAP BW for Data Watehousing Professionals," Data Warehouse Institute Winter Conference, December 2001, *http://infoframeworks.com/Publications/TDWIFall2001/html/SAP%BW%20for%20DW%20Professionals.htm*

SAP White Papers

The following is a list of white papers as provided by SAP on *www.service.sap.com/bw*. Access to these white papers will require an OSS account.

Archiving
- How to Archive in BW 3.x (doc)

Authorizations
- BW ASAP for 2.0B Phase 2: Authorizations in SAP BW (doc)
- BW ASAP for 2.0B Phase 2: Documentation Template for BW Authorizations (zip)
- How to Grant Authorizations for Query Components by Creator 3.0 (doc)

BAPI
- How to Use the Staging BAPIs in Visual Basic 2.x (zip)
- 2.0B OLAP BAPIs (pdf)
- 2.0B Staging BAPIs (pdf)

BEx MAP
- 2.0B BEx Map (incl. Geocoding) (pdf)
- How to Create and Modify ArcView Maps 2.1C/3.0 (zip)

BW and APO
- APO/BW Ad-hoc Reporting 2.0B (ppt)
- BW ASAP for 2.0B: SAP BW—APO Interface Considerations (doc)

BW and CRM
- Analytical CRM 2.0B (ppt)
- Analytical CRM—Transcript 2.0B (doc)

BW and SEM
- Integration SEM BCS—BW 2.0B (ppt)
- Integration SEM BCS—BW—Transcript 2.0B (doc)
- BW ASAP for 2.0B: SAP BW and SEM Interface Considerations (doc)

BW Frontend (Hardware Prequisites, Information on Planned Patches, etc)
- Support Strategy (htm)
- BW 2.0B Frontend Patches (htm)
- BW 2.1C Frontend Patches (htm)
- BW 3.0A Frontend Patches (htm)
- BW 3.0B Frontend Patches (htm)
- BW 3.1 Content Frontend Patches (htm)
- BW 2.1C Frontend Patches: Frontend Process for Installation and Patches (ppt)

Characteristic Values
- 2.0B Permitted Characters in Characteristic Values (pdf)

Conditions
- Display Options for Key Figures 3.0 (doc)

Correction and Transport System
- BW ASAP for 2.0B—Phase 2: SAP BW System Landscape and Transport (doc)

Counting in BW
- How to Count the Occurrences of a Characteristic 2.x (doc)

Currencies; Euro
- Currency Conversion in BW 2.x (ppt)
- Currency Conversion in BW—Transcript 2.x (doc)
- SAP's Euro Solution for the BW 2.x (ppt)
- SAP's Euro Solution for the BW—Transcript 2.x (doc)
- How to Upload Currency Exchange Rates from a Flat File 2.x (doc)

Data Base
- Database Memory Parameters for PSA table 3.0A SP05 (PDF)

Data Modeling
- BW 2.0B: MultiCube (doc)
- BW ASAP for 2.0B Phase 2: MultiDimensional Datamodeling (doc)
- Partitioning and MultiCubes in BW 2.0B—Transcript (doc)
- Partitioning and MultiCubes in BW 2.0B (ppt)

DB Connect
- DB Connect 3.0B (pdf)

Disaggregation of Data
- How to Disaggregate on Upload 2.x (doc)

Display Options for Key Figures
- Display Options for Key Figures 3.0 (doc)

Documentation
- Documentation (htm)

Exits
- How to Drilldown to OLTP Using User Exit Mapping 2.x (doc)
- How to Link BEx Queries via VB Exits 2.x (doc)
- User Exits in SAP BW (ppt)
- User Exits Examples (doc)

Extraction & Loading
- How to Create Monitor Entries from an Update Routine 2.x (doc)
- How to Extend Master Data to Include Social Security Numbers 2.x (doc)
- How to Perform Data Consistency Checks 2.x (doc)
- How to Send XML Data to BW 3.0 (doc)
- How to Update Master Data During an Upload of Transactional Data 2.x (doc)
- Scheduler 3.0A SP05 (pdf)
- Scheduler—Early Delta Initialization 3.0A SP07 (pdf)
- Scheduler—Usability Improvements 3.0A SP07 (pdf)
- Update Simulation (debugging tranfer rules) 3.0A SP05 (pdf)

Formula Operators
- 2.0B Formula Operators (pdf)

Hierarchies
- BW ASAP for 2.0B Phase 3: Hierarchies in SAP BW (doc)
- How to Use Hierarchy Variables and Hierarchy Node Variable 2.x (doc)
- How to Upload CO-PA Hierarchies 2.x (doc)

Inventory Management
- How to Handle Inventory Management Scenarios 2.x/3.x (pdf)

Mobile Intelligence
- BEx Mobile Intelligence 3.0 (ppt)
- How to Use BEx Mobile Intelligence 3.0 (doc)

MOLAP
- How to use MOLAP Aggregates 3.0 (doc)

Non-Cumulatives
- Non-Cumulatives 3.0A SP05 (pdf)
- BW 2.x: Non-Cumulative Values (ppt)
- Changes in Inventory Handling in SAP BW 3.x (ppt)

ODS Functions
- How to Implement Flexible Master Data Staging 3.0 (doc)
- How to Implement the ODS (Implementation Scenarios) 2.x (zip)
- Operational Data Store in BW 2.0B (ppt)
- Operational Data Store in BW 2.0B—Transcript (doc)
- White Paper BW Operational Data Store 2.0B (doc)
- 2.0B Staging Scenarios (doc)

OLE DB for OLAP
- 3rd Party Reporting Tool Integration Using OLE DB for OLAP 2.x (ppt)
- 3rd Party Reporting Tool Integration Using OLE DB for OLAP—Transcript 2.x (doc)

Performance (including aggregate and indexes)
- BW Indexing (under Oracle) 2.x/3.x (ppt)
- Performance Tuning for BI (htm)
- BW ASAP for 2.0B—Phase 2: SAP BW Hardware Sizing (doc)
- BW ASAP for 2.0B/Phase 2: Sizing Tool (zip)
- BW ASAP for 2.0B—Phase 3: Performance Tuning for Queries with BW Aggregates (doc)
- BW ASAP for 2.0B—Phase 4: SAP BW Performance Tuning (doc)

Process Chains
- Process Chains 3.0A SP05 (pdf)
- Process Chains 3.0A SP07 (pdf)

Reporting Agent (for Exception Reporting in the Background, Batch Printing, Value Sets, and Web Functions)
- Reporting Agent 2.x (zip)
- Reporting Agent 3.0B (pdf)
- Reporting Agent—Transcription 2.x (doc)

Third-Party Tool Integration
- Tealeaf (htm)
- Ascential (htm)
- ESRI (htm)

- Crystal Decisions (htm)
- Integrating Data Using Ascential 2.x/3.x (ppt)

Upgrade/Go-Live
- How to check your BW System before Go-Live 2.x (doc)
- How to Customize BW 3.0 after an Upgrade from 2.0B/2.1C (doc)

Variables
- How to Derive a Variable Value from Another Variable 2.x (doc)
- How to Use Hierarchy Variables and Hierarchy Node Variable 2.x (doc)
- How to Verify the Variable Input 2.x (doc)

Virtual Characteristics
- How to Identify Comparable Results 2.x (doc)

Virtual Key Figures
- How to Work around the "Single Key Date" Limitation 2.x (doc)

Web Application Design (3.X)
- How to Enhance the Context Menu in Web Applications 3.x (pdf)
- How to Realize an ABC Analysis 2.x/3.x (doc)
- Web API Reference 3.0A SP05 (pdf)
- Web Application Designer (zip)

Web Reporting (2.X)
- 2.0B Web Reporting Function Description (pdf)
- BW Web Reporting 2.0B (ppt)
- BW Web Reporting—Transcript 2.0B (doc)
- 2.0B Web Reporting—2.1C (Documentation Enhancement) (pdf)
- 2.0B Web Reporting with ITS Templates (Documentation Enhancement) (pdf)
- 2.0B Web Reporting: Charts (Documentation Enhancement) (pdf)
- How to Change a Navigational Block in a Web Query 2.x (doc)
- How to Create an Information Cockpit 2.x (doc)
- How to Create Multiple Selections with a Selection List Item in Web Reporting 2.x (doc)
- How to Download from a Web Query into Excel 2.x (doc)
- How to Enhance Your Web Query with the Table Interface 2.x (doc)
- How to Get BW Data into Excel without Having an SAP Frontend Installed 2.x (doc)
- How to Realize an ABC Analysis 2.x/3.x (doc)

SAP BW Quick Reference Guide

This appendix covers:
- SAP BW naming conventions
- Key SAP BW tables
- SAP BW transaction codes
- SAP BW programs

SAP BW Naming Conventions

Table B.1 provides SAP BW Naming Conventions (BW release 2.0).

InfoCube Naming Conventions

- SAP InfoCubes start with "0" (as part of BW business content)
- Customer range name begins with A–Z

Key SAP BW Tables

Table B.2 provides a list of key SAP BW tables and associated descriptions.

SAP BW Transaction Codes

The transaction codes in Table B.3 can be used as a shortcut to a menu command (the same functions can be accessed through the Administrator Workbench menus).

SAP BW Programs

Table B.4 shows SAP BW programs for extractors, LIS setup, and miscellaneous functions.

Table B.1   **Table Naming Conventions**

		Table Name	Description
Master	Text	/BI0/T****	Master data text
		/BI0/U****	Master data text view
	Hierarchies	/BI0/H****	Hierarchy
		/BI0/I****	Hierarchy SID structure
		/BI0/J****	Hierarchy interval
		/BI0/K****	Hierarchy SID
	Other	/BI0/N****	Generated table view
		/BI0/P****	Time-independent master data table
		/BI0/Q****	Time-dependent master data table
		/BI0/S****	Master data SID
	Attributes	/BI0/A****	Attributes table
		/BI0/M****	Master data attribute
		/BI0/X****	Master data—time-independent navigational attribute
		/BI0/Y****	Master data table—time-dependent navigational attribute
Infocubes	Dimensions	/BI0/D****N	Characteristics dimension (N is the dimension)
		/BI0/D****P	Data packet
		/BI0/D****T	Time dimension
		/BI0/D****U	Unit dimension
	Fact	/BI0/F****	Fact table
		/BI0/E***	Fact table—compressed version
	InfoObjects	/BI0/OI**	Data element
		/BI0/O****	Domain
	Communication structure	/BI0/CS****	Communication structure
	Transfer Structure	/BI0/CAC****	Transfer structure application
		/BI0/CID****	Transfer structure IDOC

Table B.2   **SAP BW InfoSource Tables**

SAP BW Table	Description
ROOSOURCE	Data source view
RSIS	InfoSource
RSISFIELD	InfoSource/InfoObjects relationship
RSISFIELDSH	Shadow table: InfoSource fields
RSISIST	InfoSource texts
RSISODS	ODS
RSISOFIELD	InfoSource fields—provider structure of a source system
RSISOLTP	InfoSource (transaction data) in source system
RSISOLUDEL	InfoSource hidden by user in OLTP
RSISOSELFD	InfoSource selection fields of a source system
RSISSELFDSH	Shadow table: InfoSource Fields
RSISSH	Shadow table: InfoSource
RSISTSH	Shadow table: InfoSource texts
RSISUDEL	InfoSource hidden by user
RSMDDELTA	Master data delta handling

Table B.3   **Key BW Transaction Codes**

T Codes	Description
BALE	ALE inbound IDOC (ALE manual processing)
LBWF	Shows the LIS data being updated by the LO extraction cockpit
LISTCUBE	List viewer for InfoCubes
LISTSCHEMA	Provides indented and nested listing of all InfoCube tables and supporting tables. *Limitations:* Hierarchy and text tables are not shown.
PFCG	Maintain roles
PFCG	Profile Generator tool
RRMX	BEx Analyzer
RSA1	Administrator Workbench
RSA3	Extractor Checker PI 2000
RSA7	Delta update queue
RSBBS	Query jump targets
RSD1	Edit InfoObject
RSDDV	Provides detailed information about the aggregation usage.
RSQ10	Set up roles for InfoSet query
RSQ11	Web reporting administration
RSQ12	Maintain InfoSets
RSSM	Reporting authorization objects
RSZC	Copy queries
RSZDELETE	Delete query object
RSZV	Maintain variables
SBIW	IMG for BIW
SE0G	Manage transports
SM13	Update queue
SM59	RFC connections/destinations maintenance
SPRO	*SAP BW Customizing Implementation Guide*

Table B.4　　**SAP BW Programs**

	Program	Description
Extractors	RMCSBIWC	SAP BW connection for LIS InfoStructure
	RKEBW100	CO/PA → SAP BW metadata maintenance utility
	RKEBW200	Display CO/PA → SAP BW: tool functions
	RGUCBIW0	GL table
	RGUCBIW1	TL InfoSource: GO, LO, and LR (i.e., 3FI_SL_LR)
	RSAO0001	InfoSource maintenance for customer appends
	RSAO0002	InfoSource maintenance for user-defined InfoSources
	RSAO0003	InfoObject assignment for attributes
	RSAO0004	List of application areas with InfoSource
	RSAO0005	Test of the existing InfoObject—display not used IOBJ
	RSAO0007	Create InfoObjects structure
	RSAO0008	Create InfoSource structure
LIS setup	RMCVNEUA	Statistical setup of InfoStructure from old: order
	RMCVNEUL	Statistical setup of InfoStructure from old: delivery
	RMCVNEUF	Statistical setup of InfoStructure from old: invoice
	RMCBNEUA	Statistical setup of InfoStructure from old: material movement
	RMCBNEUB	Statistical setup of InfoStructure from old: stocks
	RMCENEUA	Statistical setup of InfoStructure from old: purchasing movement
	RMCQNEUA	Reorganization of QM information structures
	RMCENEUA	Statistical setup of InfoStructure from old: purchasing documents
	RMCSBIWX	S262-settings (SD-InfoStructures for SAP BW)
	RMCSBIW0	Activation of InfoStructure
Others	RSTBHIST	Report for table changes
	RSRTRACE	OLAP dumps
	RS_START_HIER_ MASTER_ACT_ONE	Activation of master data on SAP BW

Table B.5   **Miscellaneous OLTP Tables**

Table	Description
BIW*	SAP BW master data
CDHDR	Change document header
CDPOS	Change document items
RODCHA	Characteristics
RODCHABAS	Basic characteristics
RODCHABGEN	Generated objects for the basic characteristic
RODIOBJ	InfoObject of the source system
RODIOBJCMP	Compounded InfoObjects
RODIR	Released objects directory
RODKYF	Key figures
RODTIM	Time characteristics
RODUNI	UOM characteristics
ROHIEBAS	Hierarchy for basic characteristic
ROIDOCPRMS	IDOC parameter source system (SM30)
ROIS	InfoSources
ROISGEN	Generated objects for the InfoSource
ROISIOBJ	InfoSource /InfoObject relationship
ROMSIOBJ	Generated objects for the InfoSource
ROO*	Additional 2.0B tables
RSMDDELTA	Assignment basic characteristic—change pointer
T8*	FI/SL report writer
TMCBIW	InfoSource status (delta)
TMCBIWU	Infostructure used in SAP BW
TSTC	SAP transaction codes

*All table names beginning with this prefix

SAP BW R/3–Related Quick Reference Guide

This appendix covers:
- SAP R/3 transaction codes
- Key SAP R/3 tables

SAP R/3 Transaction Codes

The following transaction codes can be used as a shortcut to a menu command (the same functions can be accessed through the SAP menus):

T Code	Description
BALE	ALE inbound IDOC: ALE manual processing
BWMD	Some check programs on OLTP
CMOD	SAP enhancements: project management
DB02	Table space monitoring
MC23	Display InfoStructure
OLIS	Implementation guide LIS
OMO1	Update InfoStructures SD
OMO2	Update InfoStructures purchasing
OMO9	Update InfoStructures inventory control
SALE	ALE configuration
SCC4	Display view "Clients": overview
SE01	Transport organizer
SE10	Customizing organizer
SE11	Dictionary
SE16	Data browser

T Code	Description
SE37	ABAP editor function modules
SE38	ABAP editor program
SE91	Check error messages
SM04	Overview of users
SM12	Select lock entries
SM30	Maintain table views: initial screen
SM31	Table maintain
SM37	Job overview
SM38	Define job
SM50	Process on current application server
SM59	Display and maintain RFC destinations
SM62	Display/edit events
SM66	Processes on all application servers
SNUM	Number ranges object maintenance
SPAM	SAP patch manager
ST22	TRFC-queue
SU01	Create user profile
SWU3	Check error message
WE07	IDOC statistics
WE20	Partner profiles
WE21	WF-EDI port definition

Commonly Used SAP R/3 Tables

The following is a list of commonly used SAP R/3 tables. Tables in scope are:
- Master data (Table C.1)
- Production planning (Table C.2)
- Materials management (Table C.3)
- Sales and distribution (Table C.4)
- Financial accounting (Table C.5)
- Miscellaneous OLTP (Table C.6)

With the exception of the CO/PA table names, knowledge of these table names is not necessary for the SAP BW certification exam.

Table C.1   **Master Data**

Master Data	Table Name	Description
Customer master	KNA1	Customer basic data
	KNB1	Customer company-level data
	KNBK	Customer bank details
	KNKA	Customer credit data—centralized
	KNKK	Customer credit data—control area level
	KNMT	Customer—material info record
	KNMTK	Customer—material info record—header
	KNVH	Customer hierarchies
	KNVL	Customer licenses
	KNVP	Customer partnering data
	KNVV	Customer sales-level data
Material master	MARA	Material basic data
	MAKT	Material descriptions/short texts
	MARC	Material MRP (plant) data
	MARD	Material storage data
	MARM	Material units of measure
	MBEW	Material valuation data
	MKAL	Material production version data
	MKSU	Special stocks with customer
	MLGN	Material warehouse data
	MTXH	Material long text
	MVKE	Material sales-level data
	MVKE	Material sales data
Vendor master	LBC1	Vendor master—transaction figures
	LFA1	Vendor master—general data
	LFB1	Vendor master—company code data
	LFB5	Vendor master—dunning data
	LFBK	Vendor master—bank details
	LFBW	Vendor master—withholding tax types
	LFM1	Vendor master—purchasing organization data
	LFM2	Vendor master—purchasing data
	LFMC	Vendor master—condition type short text
	LFMH	Vendor hierarchy
Workcenter	CRCA	Workcenter capacity allocation
	CRCO	Workcenter cost center assignment
	CRHD	Workcenter header data
	CRHH	Hierarchy header
	CRHS	Hierarchy structure
	CRTX	Workcenter text
	KAKO	Capacity header
	KAZY	Intervals of capacity

Table C.1   **(Continued)**

Master Data	Table Name	Description
Routing	MAPL	Routing link to material
	PLAB	Relationships—standard network
	PLAS	Task list—selection of operations
	PLFH	PRT allocation
	PLKO	Routing header details
	PLMK	Inspection characteristics
	PLMZ	Component allocation
	PLPH	CAPP suboperations
	PLPO	Routing operation details
	PLWP	Maintenance package allocation
Bill of material	MAST	BOM group to material
	STAS	BOM item selection
	STKO	BOM header details
	STPF	BOM explosion structure
	STPO	BOM item details
	STZU	BOM history records
Factory calendar	TFACD	Factory calendar definition
	TFACS	Factory calendar display (days/month)
	TFACT	Factory calendar texts
	TFAIN	Factory calendar—special rules
	TFAIT	Text for factory calendar intervals
	THOC	Public holiday calendar IDs
	THOCD	Public holiday link to holiday calendar
	THOL	Public holiday definition
	THOLT	Public holiday texts
Line design	LDLBC	No. individual capacities per line
	LDLBH	Line balance header
	LDLBP	Line balance items
	LDLBT	Line hierarchy entry and exit Takts
	LDLH	Line hierarchy header
	LDLP	Line hierarchy items
	LDLT	Line hierarchy takt times
PRTS	CRFH	PRT master data
	CRVD_A	Link of PRT to document
	CRVD_B	Link of document to PRT
	CRVE_A	Assignment of PRT data to equipment
	CRVE_B	Assignment of equipment to PRT data
	CRVM_A	Link of PRT data to material
	CRVM_B	Link of material to PRT data
	CRVS_A	Link of PRT internal number to PRT external number
	CRVS_B	Link of PRT external number to PRT internal number

Table C.2		Production Planning

Production Planning	Table Name	Description
Demand management	PBED	Independent requirements data
	PBIM	Independent requirements by material
Repetitive manufacturing	CEZP	Reporting point document logs
	CPZP	Reporting points—periodic totals
	S025	LIS—run schedule quantities
	S026	LIS—material usage
	S028	LIS—reporting point statistics
	SAFK	RS header master data
MRP records	MDFD	MRP firming dates
	MDKP	MRP document header data
	MDVM	Planning file entries
	PLSC	Planning scenario (long-term planning)
	S094	LIS—stock/requirements analysis
Reservations	RESB	Reservations/dependent requirements
Planned orders	PLAF	Planned orders
Discrete production	AFBP	Order batch print requests
	AFFH	Order PRT assignment
	AFFL	Order sequence details
	AFFW	Confirmations—goods movements with errors
	AFKO	Order header
	AFPO	Order item detail
	AFRC	Confirmations—incorrect cost calculations
	AFRD	Confirmations—defaults for collective confirmation
	AFRH	Confirmations—header info for confirmation pool
	AFRU	Order completion confirmations
	AFRV	Confirmation pool
	AFVC	Order operations detail
	AFWI	Confirmations—subsequently posted goods movements
Classification	AUSP	Characteristic values
	CABN	Characteristic detail
	CAWN	Characteristic values
	CAWNT	Characteristic value texts
	KLAH	Class detail
	KSML	Characteristic allocation to class
	KSSK	Material allocation to class

Table C.3   **Materials Management**

Materials Management	Table Name	Description
Purchasing	EINA	Purchasing info record—general data
	EINE	Purchasing info record—purchasing organization data
	EKKO	Purchasing document header
	EKPO	Purchasing document item detail
	EORD	Source lists
	EQUK	Quota arrangement header
	EQUP	Quota arrangement item detail
	KOMV	Header conditions
	KONP	Item conditions
	S011	LIS—purchasing groups
	S012	LIS—purchasing
	S013	LIS—vendor evaluation
	S080	LIS—purchasing—movements
	S081	LIS—purchasing—stock
	S082	LIS—purchasing—movements and stock
Batch management	MCHA	Batches
	S038	LIS—inventory controlling—batches
Inventory management	IKPF	Physical inventory header
	ISEG	Physical inventory document item detail
	MSKU	Special stocks with customer
	MSLB	Special stocks with vendor
	S032	LIS—statistics table—current stocks
	S039	LIS—inventory controlling
Material documents	MKPF	Material document header
	MSEG	Material document item detail
Warehouse management	LAGP	Storage bin master
	LTAK	Transfer order header
	LTAP	Transfer order item detail
	LTBK	Transfer requirement header
	LTBP	Transfer requirement item detail

Table C.4   **Sales and Distribution**

Sales and Distribution	Table Name	Description
Sales documents	VBAK	Sales document—header data
	VBAP	Sales document—detail data
Delivery documents	LIKP	Delivery document—header data
	LIPS	Delivery document—detail data
Billing documents	VBRK	Billing document—header data
	VBRP	Billing document—detail data
Condition tables	KONH	Condition header
	KONP	Condition detail
	KONV	Condition procedures
	KOTE*	Rebate condition tables—many

*All table names beginning with this prefix

Table C.5   **Financial Accounting**

Financial Accounting	Table Name	Description
Accounting	BKPF	Accounting document header
documents	BSEG	Accounting document detail
Controlling (CO/PA)	CE10010	ABC operating concern—details
	CE20010	ABC operating concern—summary
	CE30010	ABC operating concern—summary
	K8*	CO/PA summarization levels

*All table names beginning with this prefix

SAP BW 3.0 New Features

Development News

Aggregate Type – MOLAP Aggregate

Component

BW-WHM.

General Information

You can create aggregates for MOLAP (Multidimensional Online Analytical Processing) cubes in BW systems using an SQL server database.

MOLAP is a format that was designed specially for storing multidimensional data in a multidimensional database.

In certain models, MOLAP aggregates perform better than ROLAP aggregates, which are based on *relational* database tables.

MOLAP aggregates do not provide more functions than ROLAP aggregates.

Description of Enhancement

- Defining an InfoCube enables you to save aggregates for this InfoCube as MOLAP aggregates instead of as ROLAP aggregates.

- You can convert InfoCubes from ROLAP to MOLAP, and vice versa.

- Within the BW installation procedure, an additional RFC (Remote Function Call) destination is set up. This refers to the RFC server that manages the MOLAP store. SAP recommends that you set up an additional background process for each application server, since MOLAP aggregate processing is often performed in the background.

Limitations

This function is available only in BW systems with an SQL server database.

Development News

SAP™

Archiving

Components

BW-WHM.

General Information

Data archiving enables you to simplify the administration of InfoCubes and ODS objects and to improve performance. The archiving development kit (ADK) is designated for this purpose. The ADK is a tool from SAP Basis for the development of archiving solutions, and it stages the runtime environment for archiving. Its main purpose is to write and read data to and from file systems. The ADK guarantees platform and release independence for the data stored in the file system.

Description of Enhancement

From the main menu in the InfoCube (for example, ODS object maintenance), select *Archiving*, in which you maintain the properties of an archiving object. Among other things, this includes the choice of selection characteristics and the maximum size for an archive file. An archiving object is created from these properties when a data target is activated. From the context menu, access the administration for the corresponding archiving object. From there, you can schedule archiving sessions and call up more archiving functions.

The archiving session consists of writing, deleting, and storing phases. Archive files are created for a particular archiving object during the writing phase, are deleted after a verification phase from the database, and are stored in Customizing, according to the definition.

Special features of the archiving session:

- The archiving is controlled by the selection criteria. You don't need to make any additional IMG entries (for example, age of documents) — unlike archiving in SAP Basis.

- Data is no longer stored in multidimensional tables for InfoCubes, but rather in a flat structure.

- Only the contents of the A table are archived for ODS objects — not those of the change log.

- For data updated previously, the archiving information is not transferred to the data targets, which means that the data remains in the additional data targets and is not archived.

- The deletion phase is based on the chosen selection criteria of the archiving session. Existing aggregates are thereby adjusted or built again. You can schedule the deletion phase to occur at a later date.

Development News

Archived data can also be extracted again. However, this is possible only for BW archives at present. There is an option in the scheduler to read from the archives and to get input help for the existing archive files.

The advantage of archiving lies in how it improves query performance and simplifies the administration of InfoCubes and ODS objects.

Overview Graphic
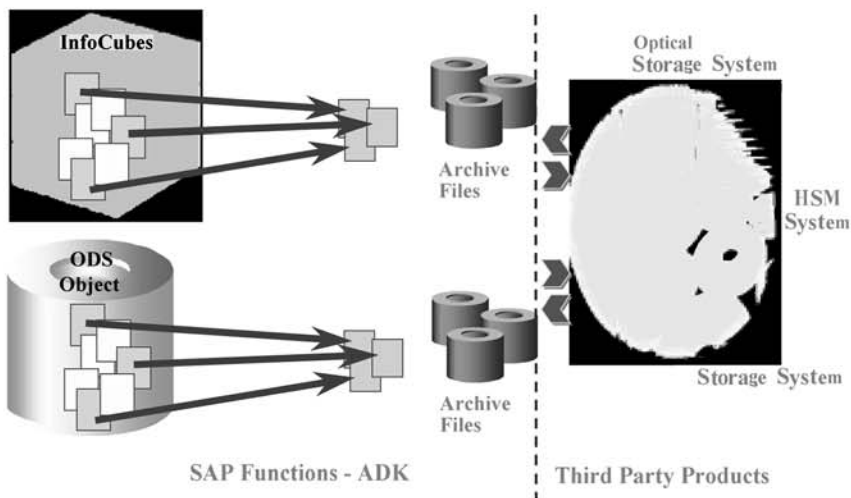
Limitations

At present, the archiving of data is supported only from InfoCubes and ODS objects. The archiving of data from other data stores, such as master data or PSA, is not possible with this release.

The archived data areas in InfoCube and ODS objects are not protected against future changes. If data is loaded into an InfoCube or an ODS object after an archiving session, inconsistent states can occur, depending on the update method, if new records (as regards their keys) are in an archived data area. In the case of ODS objects, this can lead to an inconsistent delta for data targets. The user must still ensure consistency.

Development News

A direct reload to the original object is not supported. Reloading is possible using an extraction interface, but this should not take place in the original object, but rather in a copy of the object (both objects can be combined as a MultiProvider, so that all data in an object is available in Reporting).

Extraction from R/3 archives is also supported. However, this requires archive-capable extractors. No such extractors are available for Business Content at present.

Future Plans

It is planned to enhance R/3 extractors and DataSources to enable extraction from R/3 archives.

Development News

SAP

Enhanced Document Management for BW Objects

Component

BW-WHM.

General Information

Enhanced functions are now available for document management in the Administrator Workbench (AWB) of the Business Information Warehouse (BW).

You can add a document or several documents to different BW objects, and edit, delete, or browse through these documents.

Description of Enhancement

- You create documents for the different BW objects in the relevant document class

    - Metadata in document class META

    - Master data in document class MAST

    - Transaction data in document class TRAN

- You perform the following on the documents for the individual BW objects

    - Recreate them in various formats and link them in formats that support hyperlinks

    - Import them from files

    - Export them as copies or for local processing

    - Manage them in different versions

    - Manage them in different languages

- You can select one of the documents for a specific metadata object to be displayed in the online documentation.

Development News

- You can call up the documents created in the AWB in the queries that you executed in the BEx Analyzer. You do this from the context menu or by using the *Goto—Documents* option in the BEx tabstrip.

- If you have the SAP search machine TREX installed, you have the following extensive search options

  - Search by document properties and attributes

  - Search (with Altavista syntax) by document text

- BW uses the content model in the SAP Knowledge Provider to manage documents. According to the requirements of your application, you can choose different storage categories as a physical storage medium in document management administration

  - An SAP database

  - An HTTP content server

Limitations

Searching and indexing are subject to the limitations defined in TREX.

Development News

Enhanced Functions for Aggregates

Component

BW-WHM.

General Information

An aggregate stores the dataset of an InfoCube redundantly and persistently in a compressed form in the database. By enabling fast access to InfoCube data in reporting, aggregates improve performance.

Enhanced functions for aggregates are now available. These increase the possibilities of aggregation and, in particular, improve performance.

Description of Enhancement

- Using time-dependent attributes and hierarchies in aggregates

If an aggregate contains a time-dependent component, it must be assigned a key date. By filling the aggregate, the key date behaves like the key date of a query—that is, the time-dependent attributes and hierarchies are analyzed on this key date.

You can use aggregates with a time-dependent component for a query only if the key date of the query agrees with the key date of an aggregate.

As a key date, you can choose

- A variable, provided that this can be calculated automatically and used for the key date

- A specific calendar day

- Setting the automatic compression

For each InfoCube, you can choose whether the aggregate of the InfoCube should be compressed automatically.

Previously, the compression was always executed automatically when filling an aggregate with data, or after rolling-up data packages (requests) into an aggregate. To delete a request (from the InfoCube) that had already been rolled-up into the aggregates, you had to deactivate the aggregates and rebuild them.

Development News

If you choose not to use the automatic compression, the aggregates are first compressed together with the InfoCube. Use this setting when you have to delete requests from the InfoCube frequently.

- Reading data in blocks

If the dataset becomes very large, the SAP System does not read all the data from which an aggregate is built *all at once*. The block size can be set in Customizing. In this way, you can avoid difficulties with the temporary tablespace from the database when you have very large InfoCubes.

- Optimization of performance of aggregates with few characteristics

Aggregates with less than 14 characteristics are created for all databases (including the Oracle databases) so that each characteristic is contained in its own dimension. These dimensions are created as line item dimensions.

Aggregates that consist exclusively of line item dimensions are filled directly from the database. This improves the performance for filling and rolling-up.

If you use an Oracle database, to profit from this improvement SAP recommends you perform an upgrade to deactivate aggregates with less than 14 characteristics and to reactivate them.

Development News

Enhanced Functions for ODS Objects

Component

BW-WHM.

General Information

An ODS object describes a consolidated dataset from one or more InfoSources. This dataset can be analyzed with a BEx query or with an InfoSet query. The functions have been enhanced for Release 3.0.

Description of Enhancement

The architecture of ODS objects has been changed as the basis for these enhanced functions. For Release BW 2.0B, ODS objects consisted of an M table (for new data), an A table (for activated data), and a change log. They now consist of an A table and a change log. The data is loaded directly to the change log and arrives in the A table when it is activated. This has the following advantages:

- Loading times are shorter, and the data is available for Reporting more quickly.

- The parallel upload of data is supported.

Data can be uploaded from several source systems at the same time. A queuing mechanism enables inserts and parallel upload. No table locks result from this. The data requests are identified uniquely by the provision of a package ID, a request ID, and a record number. When activation takes place, the requests are sorted by logical key of the A table and by the key of the change log. This ensures that the data is in the correct sequence for Reporting.

Other administrative functions:

- Serial activation of requests

- Deletion or rollback of requests that have already been updated—When a request is deleted from the change log, a cancellation request is generated. This cancellation request forwards the deletion information to the data target into which the request has already been updated.

- Selective deletion of requests from an ODS object—Technically, this is realized by deleting all requests that have been posted since the request to be deleted, as well as the actual request to be deleted, from the change log. Then, all requests apart from the one to be deleted are reposted.

- Deletion of requests from the change log

Development News

There are also the following functions:

- Simulation of update from an ODS object to other data targets

- Download from ODS objects

- Read-API as look up for data targets and to provide ODS data for external applications

- Write-API

In addition to the standard ODS objects already available, there is now a new ODS object type transactional ODS object. This was developed for the requirements of SAP Strategic Enterprise Management (SEM), and consists of only an A table. Transactional ODS objects get their data from external systems using an add-/overwrite-API. The loading process is not supported by the BW system. After loading, the data is available immediately for use in Reporting.

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Development News

SAP

Flexible Master Data Staging

Component

BW-WHM.

General Information

You can create update rules for InfoObjects (characteristics with attributes or texts).

Description of Enhancement

Flexible updates of master data enable you to fill ODS objects and other data targets with master data using update rules. The objects are in the data target tree and you can update them from there in the same way as other data targets.

When you create InfoSources, you no longer distinguish between master data and transaction data InfoSources, but between:

- Updating master data directly in an InfoObject, as before

- Updating master data and transaction data flexibly in any data target (except for hierarchies)

It is better to update master data into ODS objects or master data tables.

You can also update from ODS objects into other InfoObjects. When you create update rules, you can also select InfoObjects with attributes or texts as data targets. By doing this, you can calculate attributes such as key fields through source InfoObjects, routines, constants, or master data reads. If at least one attribute in the InfoObject is time dependent, the characteristics 0DATETO and 0DATEFROM are included in the key and can be filled in exactly the same way as all other characteristics.

For example, a master data ODS object gives you the following options:

- It represents an additional level on which master data from the entire enterprise can be consolidated.

- You can use ODS objects as check tables for checking the reference integrity for characteristic values in the update rules.

- You can use it as a central repository for master data in which master data from different systems can be consolidated. This master data can then be distributed to other BW systems using the Data Mart Interface.

Development News

Overview Graphic
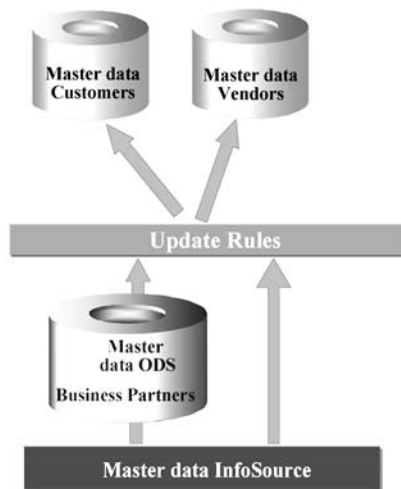
Development News

Handling Data Records with Errors

Component

BW-WHM.

General Information

Good quality data in a data warehouse is the cornerstone for a successful business intelligence operation. It is essential that data is consistent for analysis and data mining processes. As of Release 2.0, the BW system has offered suitable methods for error handling. A number of enhancements have been made in monitoring to the functions for this central topic.

Description of Enhancement

The following options for error handling, available from BW 2.0B, were relevant only for checking the update rules:

- No update, no reporting

- Update of valid records, no reporting (red request)

- Update of valid records, reporting possible (green request)

They are now also relevant for checking the following processing steps:

- Update rules

- Master data, text and hierarchy updates

- InfoCube update

- Referential integrity of an InfoObject for master data tables or ODS objects on the level of the communication structure

The number of records edited in every step is displayed in the monitor. You can activate a check on these numbers in the scheduler.

Development News

The records that contained errors when being posted into data targets are marked and returned to the error handler, which finds the original PSA records and writes the log. This function is not available for loading processes in ODS objects at present.

If an error occurs during posting for master data updates and text updates (for example, a characteristic value occurs several times, time overlaps and invalid dates or invalid characteristic values), it is logged with an error message and a record number.

For handling duplicate records, you can make a setting in the scheduler specifying that only the last data record for a key is to be written in a request (see *Development News* article on skipping duplicate data records).

If errors occur when posting to InfoCubes, new requests are generated for each record with errors per InfoCube combination, by which the records with errors are posted in the PSA. These new requests have entered the InfoCubes that had records with errors as data targets. If a record has been posted, for example, in two InfoCubes by mistake, a request is created for this record that contains both InfoCubes as the data target. The requests appear in the PSA tree as successfully booked in the PSA. These new requests can then be replaced in the InfoCubes for updating.

Development News

InfoProviders

Component

BW-WHM.

General Information

InfoProviders are BW objects by which BEx reports can be defined and executed. They can be grouped as MultiProviders in any combination, and therefore are available as objects in Reporting.

Description of Enhancement

InfoProvider is the grouping term for the following reportable objects:

- InfoCubes (the types BasicCube, RemoteCube, SAP RemoteCube, MultiProvider)

- ODS objects that have the indicator for BEx Reporting

- InfoSets

- InfoObjects (characteristics with attributes or texts)

Thus, InfoCubes, ODS objects, and InfoObjects are physical data stores, whereas InfoSets (joins of ODS objects or InfoObjects), RemoteCubes, SAP RemoteCubes, and MultiProviders are virtual data stores. In a MultiProvider, InfoProviders can be grouped in any combination.

All InfoProviders are maintained using the Administrator Workbench. They all belong to the same class, which means they share a standard handling procedure. Access to all objects takes place using the InfoProvider tree. When an InfoProvider is accessed in Reporting, it makes no difference which object it is based on.

InfoProviders constitute an enhancement of reportable objects in BW and enable more flexible Reporting.

Development News

InfoSets

Component

BW-WHM.

General Information

InfoSet is the name of a new type of InfoProvider. An InfoSet describes data sources that are defined as joins of ODS objects or InfoObjects (characteristics with attributes or texts), or both. An InfoSet is not a data target. InfoSets are managed in the Administrator Workbench, or by using their own transactions. You can use activated InfoSets to define queries in the BEx Analyzer. From Release 3.0A, the Query Designer has a "flat mode" that supports the construction of flat lists.

For Release 2.0B, the InfoSet Query in BW was introduced for master data and ODS Reporting. From now on, objects of the type "InfoSet" that are used in the InfoSet query are called Classic InfoSets in a BW system. The functions offered by the InfoSet query have been retained in full, although special BW enhancements are not being developed further.

Description of Enhancement

- Objects in join – You can define a join with any ODS object or any InfoObject (characteristics with master data), or a combination of both. The individual objects can appear in a join as often as you want.

- Definition of a join condition—To be able to activate an InfoSet, the join condition must be defined so that all available objects are linked directly or indirectly. The technical prerequisite for the validity of a join condition is that the linked InfoObjects are the same as regards data type and length (equal join condition). However, typically, only those rows that contain the same InfoObject, or whose InfoObjects have the same basic characteristic, are linked. Generally, all objects are linked using inner join operators. However, a single object can be linked with other objects using a left outer join operator.

- Field selection for an InfoSet—You can select from the available fields or attributes of an InfoProvider those fields that should be included in the InfoSet. Fields and attributes that are not selected are not available in the BEx Analyzer for the definition of a query.

- Temporal join—If one of the InfoObjects in the join is a time-dependent characteristic, the join also becomes time-dependent (or temporal).

Development News

- In a temporal join, every record of the resulting set is valid only for a particular time interval. If two or more time-dependent InfoObjects are in the join, only those combinations of records that have an overlapping area of validity are included in the resulting set.

- In a temporal join, fields or attributes of an InfoProvider that have the data type D, or that are time characteristics, can be defined as temporal operands. A key date or time interval can be derived from a temporal operand. A temporal operand influences the resulting set of the join in the following ways

  - Derivation of a key date—A record is included in the resulting set only if it falls within the valid time interval.

  - Derivation of a time interval—The InfoProvider concerned is treated like a time-dependent InfoObject. This means that a record is included in the resulting set only if the derived time interval has an overlapping area of validity with the other time-dependent objects.

- Changeable descriptive test for InfoProviders and InfoObjects within an InfoSet—As InfoProviders and InfoObjects can appear in duplicate as attributes in an InfoSet, you can change the descriptive texts from the metadata repository within the InfoSet.

- Display of an InfoSet in the Query Designer—Every InfoProvider in a join has its own dimension in the Query Designer. Each dimension contains the fields or attributes selected for the InfoSet.

  If the join is temporal, there is also

  - A separate dimension where the InfoObjects for the valid time interval (*valid from* and *valid to*) are ordered

  - A special characteristic for selection according to the *valid time interval*. This selection is subject to its own limitations.

- Transport connection—InfoSets are connected to the usual BW transport procedures.

- The definition and delivery of Content takes place in the usual way for BW. InfoSets are delivered in the D version and must be activated by the user.

SAP™

Development News

Interface for Analysis and Repair Tools

Components

BW-WHM.

General Information

There is a new interface for analysis and repair tools in BW.

You can select the desired tests (analyses) individually from a hierarchy list.

You can save the results of a test and, for example, compare them with later test runs or send them to SAP Portals Support.

Some tests offer a repair mode.

Description of Enhancement

- A test (analysis) consists of a row of elementary tests. You determine the composition of a test by entering parameters. To avoid performing unnecessary checks, you can also select the necessary elementary tests individually.

- The selected tests are combined in test packages. Test packages can be

  - Started immediately (the progress of processing is displayed)

  - Loaded and saved

  - Scheduled for processing in the background

- The output of the test is written to the central storage location for logs—the application log.

- If the test that was performed offers a repair mode, you can recheck the errors found and eliminate repairable inconsistencies.

Development News

Limitations

To be able to use the benefits of the new interface, existing tests must be re-implemented.

You can still use the old tests in Transaction RSRV.

Future Plans

SAP plans to deliver some of the new functions in Support Packages.

Development News

Metadata Exchange in XML (CWM)

Component

BW-WHM.

General Information

In the functional area *Transport Connection* of the Administrator Workbench, you can now export and import BW metadata objects in XML format. This process uses a model derived from the CWM (Common Warehouse Metamodel) standard system.

> For further information on the CWM standard system, see the homepage of the OMG (Object Management Group) at www.omg.org

Description of Enhancement

The current BW model enables exports to take place according to the XMI (XML Metadata Interchange) standard system.

> For further information on the XMI standard system, see www.omg.org

The XML files can be exported or imported (downloaded or uploaded to a PC) using the Administrator Workbench.

There is also an HTTP service. This enables you to request data in the same way as from a Web server.

Limitations

The Metadata Exchange in XML supports those objects with details that also have BAPIs. Only these objects can be imported again after they have been changed. Other BW objects cannot be re-imported.

As the XML files also contain the data of the SAP transport system (TLOGO definition), many unchanged objects that have no corresponding BAPIs can be exported and imported despite the above restriction.

Development News

Process Chains

Component

BW-WHM.

General Information

Previously, BW standard processes could be scheduled in the background to wait for a background event to trigger them. The actual processes could even trigger events. Events could be grouped with the event collector (previously, event chain). This could trigger an event in its turn after successful processing.

The automation of processes in BW has now been simplified. A generic tool enables you to maintain process chains. A process chain consists of a sequence of processes that are scheduled in the background to wait for an event. Each of the processes can trigger one or more events that then trigger other processes. With the help of event-driven processing, you can now automate complex chains of processes in BW.

Description of Enhancement

- Automation of BW administration

- Visualization of process chains with network graphics

- Monitoring of process chains

- Openness as regards the processes

    - Integration of customer-specific programs as processes

    - Implementation of customer-specific processes

- Support when creating BW standard process chains

- The start of processes within a process chain can take place under various conditions

    – And (last)—Process starts if all events of the predecessor processes have been triggered successfully.

    – Or (each)—Process starts each time that an event of a predecessor process is triggered successfully.

    – Exor (first)—Process starts if the first event of one of the predecessor processes has been triggered successfully.

Limitations

Cross-system process chains are not supported at present.

Future Plans

The implementation of the process categories "Reporting Agent" and "Operating System Command" is planned. Cross-system process chains should also be supported.

Development News

SAP

Skipping Duplicate Data Records

Components

BW-WHM.

General Information

Several applications require that data records transferred in duplicate must be dealt with by the BW when loading master data attributes. In this case, the occurrence of duplicate data records can be explained by its connection to the application, and is not to be treated as an error. BW can now deal with duplicate data records of this type by updating only the last data record to a key within a loading process.

This process is also useful for loading file data.

Description of Enhancement

From Release 3.0, the BW deals with duplicate data records occurring within a master data update of time-independent data records using either of the following methods:

- Duplicate data records lead to an error.

- The duplicates are updated only to the last data record to be posted relating to a key.

A DataSource transfers information that states whether duplicate data records might have been transferred to the BW. This information is transferred to the scheduler when you create new InfoPackages. The last data record in a request for a specific key in the BW is posted by default when records are transferred several times. The remaining data records for this key in the same request are ignored.

Your system administrator can remove the default settings. Transferring duplicate records then leads to an error.

If you have made the setting in a DataSource that transfers this potentially duplicated data, then the setting is made automatically for the InfoPackage that the data is first written only to the PSA. After it has been posted successfully in the PSA, it can then be transferred into the master data table or text table for the InfoObject. This is a new loading method for master data. If duplicates are possible, serial posting in the BW is forced. This is because duplicate keys can be distributed among different data packages, and packages must not be posted in any order that you want. Otherwise, inconsistencies can occur.

The possibility of duplicate keys occurring is particularly high if not all of the characteristic keys for the InfoObject can be mapped from DataSource fields. In this case, a message appears when you activate the update rules.

Development News

Transformation Engine

Component

BW-WHM.

General Information

The transformation engine has been enhanced by the addition of a toolbox that has predefined functions. This toolbox can be reached from the formula builder. This formula builder makes it easier to create mathematical formulas. It is a function of R/3 Basis and has been enhanced in BW. It is available in the maintenance of an InfoSource transfer structure and in the update rules for a data target.

Description of Enhancement

The formula builder, in conjunction with the toolbox, enables you to create routines and formulas simply, using a context-sensitive interface, and without using ABAP coding.

The toolbox provides the following functions:

- If—performs a calculation when the condition is fulfilled. If it is not fulfilled, an alternative calculation is performed (for example, default value).

- Date conversion—converts a data format into an SAP data format. Two types of date depiction can be converted

  - Day, month, and year have a fixed format (they are always in the same place in the string for example, yyyy/dd/mm).

  - Day, month, and year have varying formats. In this case, the sequence of day, month, and year must be kept (for example, 1.1.2001 and 31.12.2001).

  Result: The date is converted to the format yyyymmdd.

- Time conversions—for example, date to calendar week, calendar week to date

Development News

- String operations:

  - Concatenate: The fields *f1* and *f2* are concatenated and sent to the results field. The attributes *f1* and *f2* and the results field must have the type *character*.

  - Only use substrings: A string is taken from a character string and sent to the results field. A value of the type *character* is sent to the results field.

  - Translate to upper case: All lower case letters in a string are converted to upper case letters.

In the formula builder, the fields of the transport structure (in the transfer rules) or communication structure (in the update rules) are available for you to use in the formula. You can choose formula elements and operands. The formula builder displays only those options whose use is allowed in the current place in the formula. It also highlights permitted operands. During entry, the formula is checked for correctness automatically.

You can also implement the expert mode. This enables you to enter your formulas directly without using the formula elements and operands. In this case, the automatic syntax check does not start you must start it manually.

These toolbox-linked functions of the formula builder simplify the maintenance of the transfer structure and update rules because you can now create routines with predefined functions without using ABAP coding.

Copyright

Development News

Additional ODBO Interface Functions

Component

BW-BEX.

General Information

The OLE DB for OLAP (ODBO) is an interface implemented in BW that enables manufacturers of third-party reporting tools and customers' application developers to access BW data using a normalized method. You gain access from the BEx Analyzer.

The functions of the ODBO interface have been enhanced.

Description of Enhancement

New ODBO interface functions:

- Supports calculated key figures

- Enhances functions for calculating time series (periods to day, year to day, and so on).

- Evaluates parallel periods

- Supports generic time hierarchies

Development News

BEx Mobile Intelligence

Component

BW-BEX.

General Information

With BEx Mobile Intelligence, you can use BEx Web applications extensively on mobile devices. "Mobile devices" is subdivided into:

- Personal Digital Assistants (PDA) with Windows CE (HTML 3.2 with Javascript 1.1)
- Mobile telephones with WAP capability (WML)

For WAP devices, a distinction is made between Nokia and Openwave Mobile Browser (formerly known as phone.com).

Description of Enhancement

You call up BEx mobile applications on mobile devices using the same URL as with BEx Web applications. The BW server recognizes the device automatically (PDA, WAP, or regular desktop browser) that has placed the request and generates a device-specific HTML or WML page. This means that BEx mobile applications are regular BEx Web applications. For WAP devices, Web items are distributed automatically across several WML pages.

You create BEx mobile applications using the BEx Web Application Designer, as with BEx Web applications.

BEx WAP applications can display tables of any size. You can filter characteristics or key figures, or drill down on them by rows or columns using various Web items. You can switch exceptions and conditions on and off, but you cannot define them. You can display charts, but not maps, because of the size of the display. A restricted context menu is offered for WAP devices in the options. The specification of variables and input help are not supported.

As a rule, in comparison to BEx Web applications, there are no limitations on BEx PDA applications. The Reporting Agent enables you to precalculate PDA-specific HTML pages. Using WebDAV connection to the BW servers, you can stage the precalculated pages for offline use.

Limitations

The previous ITS Service bwwork for supporting WAP devices is no longer used. However, you can continue to use the previous URLs.

BEx Query Designer – Cell Editor

Component

BW-BEX.

General Information

A cell editor integrated into the BEx Query Designer enables you to define formulas and selection conditions for individual cells.

Description of Enhancement

Previously, you could only implicitly create generic cell definitions that determined cell values at the junction of two appropriately defined structures in a query.

The cell editor enables you to explicitly define the contents of an individual cell. This makes detailed and flexible query design possible, because:

- The required cell value can be entered directly, or determined beforehand using a formula.

- The contents of a cell can be used in a formula and, with the help of the formula editor, be used to calculate other key figures.

SAP™

Development News

BEx Web Application Designer

Component

BW-BEX.

General Information

The application for creating BEx Web applications (BEx Web Application Designer, formerly known as BEx Web Publisher) has been revised completely.

Description of Enhancement

The BEx Web Application Designer is now an independent application (as are the BEx Analyzer and the BEx Browser). You can now create Web templates independently of *Microsoft EXCEL*, and publish them on the Web. You can organize the Web templates that you create as independent objects in user-specific roles and in user favorites. They are no longer linked to an Excel workbook.

Creating Web templates is supported visually—using Drag&Drop, you can position Web items in a Web template. The Web Application Designer also supports Web template formatting—for example, you can arrange Web items simply in tabular form. This means that you can create extensive Web templates without any knowledge of HTML.

You can now link Web items directly with the data that a query delivers. You no longer have to define query views, although this is still possible. You can also execute queries directly with a standard Web template. You can still display query data in Excel using the BEx Analyzer.

You can define queries and query views straight from the Web Application Designer or define them in the BEx Analyzer, as before.

Additional Web items have been created for structuring Web applications.

The Web Application wizard has also been revised completely. It helps you to create new Web templates using a step-by-step screen sequence and is integrated completely in the Web Application Designer.

You no longer need an Internet Transaction Server (ITS) installation—the Web templates are saved and executed on the SAP Web Application Server (WAS). All functions that were available only with an ITS installation in Release 2.0B (in particular, interactive charts and maps) are still available.

Development News

Technically, in Release 2.0B, the workbook was the "parenthesis" for Web templates, Web items, and query views – that is, Web templates, Web items, and query views were saved in a workbook and transported. In BW 3.0, the Web templates, Web items, and query views are independent objects (this also applies with transports).

You must perform a conversion so that you can continue to work with the Web templates, Web items, and query views that you created in Release 2.0B. You have to perform this conversion immediately after the upgrade or reinstallation.

Web templates that you stored on the BW server in Release 2.0B are converted completely. Web applications that are stored in roles or favorites are also converted if you used the "normal" BW functions when you saved the Web application (for example, saving on the Web Application Designer or Web Application wizard or the BEx Browser).

Web templates that are stored on the ITS in Release 2.0B are not converted, but continue to function.

Development News

Change Mode for Flat Reporting

Component

BW-BEX.

General Information

A mode has been integrated into the Query Designer allowing the tabular depiction of all queries that have no structure, or one structure.

Description of Enhancement

The change mode for flat Reporting enables you to create or edit queries in the form of a simple table. It is aimed at all queries in which the complete OLAP complexity for the evaluation of data is not needed (for example, master data reports).

Even queries that have already been defined can be transferred into the tabular display by using the change mode.

The change mode can be called by selecting an option in the Query Designer.

Limitations

Queries with more than one structure cannot be executed in tabular display.

Development News

Defining Calculated Key Figures with Restricted Key Figures

Component

BW-BEX.

General Information

When defining calculated key figures in the BEx Query Designer, you can now use restricted key figures as well as basic key figures and other calculated key figures.

Description of Enhancement

In the Query Designer, calculated key figures can be created and stored as reusable objects using the InfoProvider. Previously, a calculated key figure was calculated using a formula in which only basic key figures and other calculated key figures could be used.

Now, restricted key figures can also be implemented in formulas for the calculation of calculated key figures.

Development News

Enhanced Reporting Agent Functions

Component

BW-BEX.

General Information

New reporting agent functions have been developed.

Description of Enhancement

The following functions are available:

- Precalculating Web templates as complete HTML documents — This function enhances the function for precalculating data for Web templates already available in Release 2.0B.

- The Reporting Agent supports various classes of device — HTML documents are precalculated for browser and mobile devices.

- HTML documents and the MIME objects belonging to them are stored in the content management system (KWF/KPro), enabling simple management of your document.

- Offline reporting — You can parameterize batch reports for precalculating Web templates through a control query so that you can create a bundle of HTML documents in one batch run. Along with the WebDAV service of the document store, simple download and (restricted) offline reporting are possible.

- Enhanced functions for sending emails automatically as a follow-up action in batch exception reporting—Free email layout, attachments, to any receiver.

- Calling up a function module as a follow-up action in batch exception reporting — This function module is implemented as an application BAPI. The data of the BW exceptions found is transferred to the interface, as well as further information such as InfoCube and query name. The application can trigger a business workflow from the data transferred.

- Scheduling, precalculating, and the administration of bucket select variables — Buckets are materialized selections that you can use as global filters in a query. The Reporting Agent enables buckets to be filled from a query in batch.

Development News

SAP

Formatted and Form-Based Reporting

Component

BW-BEX.

General Information

With SAP BW Business Content, customers receive pre-defined formatted reports that were created by SAP with the *Crystal Reports Designer* from Crystal Decisions. These Crystal reports display the full range of form elements and correspond well to the requirement for form-based reports.

Using the server component *Crystal Enterprise* (delivered with BW), you can publish these reports on the Web and make them available to your users.

Description of Enhancement

- The pre-defined Crystal reports are based on existing BW queries.

- Crystal Reports are stored on the BW system. They are integrated into the BW system infrastructure. This means that they can be transported and delivered within the context of SAP Business Content.

  You manage the new *Crystal Report* object type in the Administrator Workbench.

Development News

New Functions for BEx Web Applications

Components

BW-BEX.

General Information

New functions are now available for BEx Web applications.

Description of Enhancement

The following features are available:

- Bookmarking—Bookmarking enables you to save the complete current version of a BEx Web application (with or without data). The bookmark is a URL that you can use as you want. For example, you can copy it into your favorites or send it in an e-mail. When you call up the URL, the Web application is started with the status in which it was saved.

- Stateless Web applications—Instead of setting the property STATELESS=X, you can now execute further navigation steps. Depending on the navigation step, the session is released on the ITS and the application server. This procedure is better for resources, but the response time is longer for each navigation step.

- Input help enhancement—You can now search for values and formulate complex selections (for example, intervals) in input help.

- Defining exceptions and conditions—You can now create and change exceptions and conditions directly from a Web application.

- Report and report interface—With the report/report interface, using parameters, you can call up different Web applications from another Web application or transaction.

- Exporting to *Microsoft EXCEL*—You can export data from a Web application to Microsoft Excel and then continue navigating in Excel.

- Dialogs—There are new dialogs for currency conversion, query properties, characteristics and structural components.

- Charts—Charts are not new for Release 3.0, but the processing method for them has changed. By using the Web Application Server (WAS), you no longer create charts on the ITS, but on the Internet Graphic Server (IGS). Complete interactive navigation (the same as with a table) and the display of Content information are supported in charts using Tool Tips. You can still use the

Development News

interactive charts that you implemented from Web templates on the ITS. However, SAP recommends that you replace these with the new charts (from Web templates on the BW server).

- Maps—The use of maps is not a new feature. However, there are several new Web items for maps in Release 3.0. Maps now offer a much larger range of features. By using the WAS, you no longer create maps on the ITS, but on the IGS. You can display and evaluate information in Web applications geographically (on maps). The interactive navigation and the display of information using Tool Tips is also supported on maps. You can still use those maps that you implemented from templates on the ITS, but SAP recommends that you replace them with the new maps (from templates on the BW server). You cannot create maps from templates on the ITS by using the BW 3.0 Web Application Designer.

- Document integration—You can create and display documents from a Web application. Interactive navigation is also supported.

- Drag&Relate—Supports Drag&Relate within the context of portal integration.

- Hierarchical dropdown box—You can now display hierarchically structured values in a hierarchical format using a dropdown box.

- Stylesheets—Browser-specific stylesheets that you maintain in the MIME repository (Transaction SE 80) are supported.

- Offline reporting—You can schedule and precalculate Web templates with the Reporting Agent (Transaction RSA1). You can then copy these precalculated Web templates to your local PC using the WebDAV service. You can also precalculate Web templates for PDA applications.

Limitations

You create charts and maps with SAP's IGS. You have to install and set up this component before you can execute BEx Web applications that contain charts or maps.

The IGS runs under the operating systems *WINDOWS NT4.0* or *WINDOWS 2000*. If you are already running a BW application server under *WINDOWS NT 4.0* or *WINDOWS 2000*, you can install the IGS on the same system.

You can now use the SAP WAS to take over from the Web server, which took over from the ITS in Release 2.0B/2.1C. This enables you to stop using and maintaining the ITS completely. The prerequisite for this is that all Web templates are saved on the BW server. If you have stored Web templates on the ITS and want to continue to use these, you will still need the ITS.

Before you can use the new functions for BEx Web applications, you must upgrade the Web templates, Web items, and query views.

Development News

Overview Graphic

Concept for Web Application Design (3.0) - Architecture

BEx Analyzer

BEx Web Application Designer

Any Web Design Tool

Any Web Browser

BEx Query Designer

Create Queries / Views

Save HTML templates in Web Content Management Generate URL automatically

http

OLAP Processor

BW Web Service

Database

BW Charting Engine

HTML Templates

BW Server (Using mySAP Web App Server Technology)

Development News

SAP™
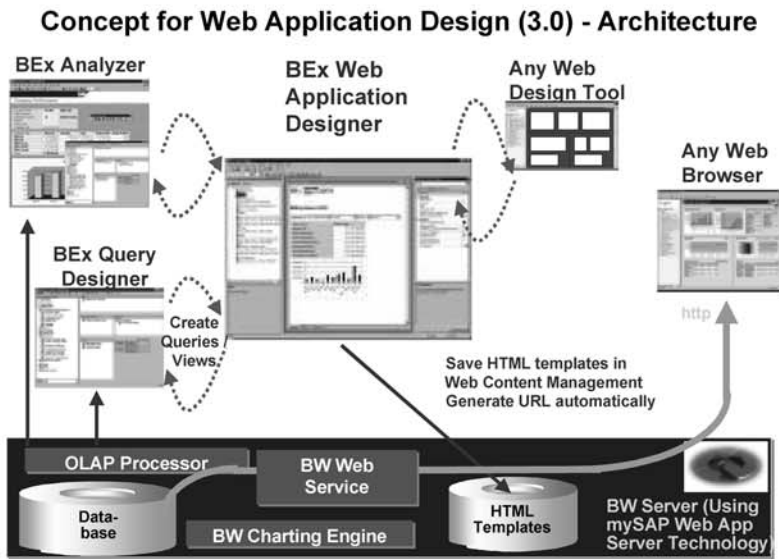
New Hierarchy Functions in BEx

Component

BW-BEX.

General Information

Many new options have been developed for the presentation of characteristics with hierarchies. Existing hierarchy functions have been enhanced.

Description of Enhancement

Extensive flexibility is available when using hierarchies in queries:

- Several presentation hierarchies in rows or columns can be displayed at the same time, and be used for navigation.

- Presentation hierarchies can be defined in the rows as well as in the columns, and be used for navigation.

- Characteristics with and without presentation hierarchies can be combined in any way.

- All characteristics in rows and columns (regardless of whether they have their own hierarchies) can be presented together in the form of a display hierarchy.

- When defining presentation hierarchies, sort criteria can be given (by key, text, attribute).

- The display of subnodes in a presentation hierarchy in a query can take place either above or below the main nodes.

- If desired, main nodes that have only one subnode can be hidden in a presentation hierarchy.

- Structures can be ordered as hierarchies.

- Structures can be combined freely with other characteristics (as hierarchies, or not).

Development News

New Web Items for BEx Web Applications

Component

BW-BEX.

General Information

Several new Web items have been added in Release 3.0. You can use these in the Web Application Designer to create Web applications.

Description of Enhancement

The new Web items are as follows:

- Hierarchical dropdown box —You can now display hierarchically structured values in a hierarchical format using a dropdown box.

- Charts—Charts are not new for Release 3.0, but the processing method for them has changed. By using the Web Application Server (WAS), you no longer create charts on the Internet Transaction Server (ITS), but on the Internet Graphic Server (IGS). Complete interactive navigation (the same as with a table) and the display of content information are supported in charts using Tool Tips. You can still use the interactive charts that you implemented from Web templates on the ITS. However, SAP recommends that you replace these with the new charts (from Web templates on the BW server).

- Maps —The use of maps is not a new feature. However, there are several new Web items for maps in Release 3.0. Maps now offer a much larger range of features. By using the WAS, you no longer create maps on the ITS, but on the IGS. You can display and evaluate information in Web applications geographically (on maps). The interactive navigation and the display of information using Tool Tips is also supported on maps. You can still use those maps that you implemented from templates on the ITS, but SAP recommends that you replace them with the new maps (from templates on the BW server). You cannot create maps from templates on the ITS by using the BW 3.0 Web Application Designer.

- Document integration —You can create and display documents from a Web application. Interactive navigation is also supported.

- Checkbox —You can make value selections using checkboxes.

Development News

Limitation

The IGS runs under the operating systems *WINDOWS NT4.0* or *WINDOWS 2000*. If you are already running a BW application server under *WINDOWS NT 4.0* or *WINDOWS 2000*, you can install the IGS on the same system.

Development News

Opening and Saving Objects in BEx

Component

Business Explorer (BW-BEX).

General Information

The dialog for opening and saving objects in the Business Explorer (BEx) has been revised completely.

Description of Enhancement

The following changes have been made to the open dialog:

- The open dialog is now context sensitive. When you open queries, workbooks and alerts from BEx, a different dialog is displayed for each object type—not all three object types in one dialog as before.

- The open dialog contains various views that you can switch using the application toolbar on the left-hand side. There is a history, a view of your own favorites, and a role-specific view. The tree structure from Release 2.0 is still available for queries, workbooks, and alerts. You cannot use the *Favorites* or the *Roles* views for alerts, query views or InfoCubes.

- There is a history that displays the last 15 objects used (for example, queries, Web templates, query views), depending on the user and the system. The data for personalizing the BEx Open History is contained in the ODS object 0PERS_BOD. You manage the ODS object in the Administrator Workbench. You can deactivate or reactivate the personalization of the BEx Open History using the Implementation Guide (IMG).

- For queries, workbooks, Web templates, and Web items, there is a favorites view and a role-based view. The objects are displayed in a tree structure at present.

- Searches are now executed in the back end of the BW system. You have the following search options

  - Search by creator

  - Search by last changed date

  - Search by technical name, description, or both

Development News

- Search for queries by the InfoProvider

- Any combination of the individual search options

- Search support using wildcards

The search feature is not available for alerts.

• You can add objects to your favorites and store them in a hierarchical directory structure, which you can define how you like.

• You can remove objects from your favorites or roles and can delete queries (as in Release 2.0B).

• You can specify an object directly in the field in the lower part of the dialog and open it immediately. If the entry is unclear, a search results list is displayed from which you can select the required entry. This service is not available for alerts.

Changes have also been made to the save dialog. In the new save dialog there is a favorites tree and a roles view, in which you select the folder in which you want to save the object. You can add or delete folders. When you save objects, you have to specify a name and a description.

Development News

Personalized Default Values for Variables

Component

BW-BEX.

General Information

From Release 3.0A, you can stop the variable screen from appearing by filling the variables with your user-specific values in the SAP System. By using variables that cannot be changed in query navigation, the system can also fill the values for filter value selection specifically for each user.

Values can be personalized by:

- The current user
- The administrator (using extractors)
- Using delivered extractors within the context of Business Content

The user-specific variable values are contained in the ODS object 0PERS_VAR. You manage the ODS object in the Administrator Workbench.

You can deactivate or reactivate personalization for variables using the Implementation Guide (IMG).

Development News

Personalized Start Views for Web Applications

Component

BW-BEX.

General Information

From Release 3.0A, you can create a user-specific start view for your Web applications, in which (among other things) you set your user-specific filter values.

The personalized start views for Web applications are in the ODS object 0PERS_WTE. You manage the ODS objects in the Administrator Workbench.

You can deactivate or reactivate the personalization for Web applications using the Implementation Guide (IMG).

Development News

SAP

Selecting Display Attributes in Query Designer

Component

BW-BEX.

General Information

Display attributes are shown in the selection tree of the Query Designer directly under the appropriate characteristic. They can be pulled into the query definition using Drag&Drop.

Description of Enhancement

Previously, the selection of display attributes for characteristics for a query took place in the *Properties* window. This could be called from the context menu of the appropriate characteristic.

The display attributes are now found directly under the individual characteristics in the selection tree of the Query Designer (this tree can be expanded by clicking on the plus sign before the characteristic). All display attributes can be seen at one glance and can be easily added to the query definition using Drag&Drop. This procedure simplifies the selection of display attributes.

Development News

Wizard and Editor for Variables and Enhanced Variable Functions

Component

BW-BEX.

General Information

The previous procedure for maintaining variables in the back end has been replaced by a wizard for creating variables and an editor for maintaining variables. You call up both the wizard and the editor from the BEx Query Designer.

As well as all the functions for variables already available, variables are offered for hierarchy attributes and bucket variables (filling variables from database tables).

Description of Enhancement

You can now create and maintain variables directly in the Query Designer. When you define and process queries, you can add or maintain variables.

- You can find the variable wizard in the context menu of the individual objects at the places in the query designer where you can create a variable. To create a new characteristic value variable, you call up the required characteristic of the variable wizard from the context menu—the formula editor creates formula variables. You can create other types of variables such as hierarchy (node) variables and text variables using the relevant context menus for the objects in the Query Designer.

- You can easily change variables that have already been created using the variable editor, which you can start using the context menu for the relevant objects.

- You can no longer maintain variables in the back end.

Enhanced functions for variables:

- You can define replacement variables from hierarchy attributes.

- Bucket variables are filled from a database table in the background—you can use the result as the basis for a query.

Development News

XML for Analysis

Component

BW-BEX.

General Information

XML (Extensible Markup Language) for Analysis enables direct communication between a third-party Reporting tool connected to the BW and the OLAP (Online Analytical Processing) processor using OLAP-BAPI (OLAP-Business Application Interface).

Description of Enhancement

Previously, communication between third-party Reporting tools and the BW OLAP processor had to run using the ODBO (OLE DB for OLAP) interface. The request from the third-party tool was transferred using the RFC (Remote Function Call) library into the RFC log before being transferred to the OLAP processor using the OLAP-BAPI. You had to create the report you wanted on a PC.

Now, third-party Reporting tools can communicate directly with the OLAP processor. XML for Analysis enables you to call up the query you want using a browser. This uses HTTP (Hypertext Transfer Protocol).

This simplifies communication between third-party Reporting tools and the BW considerably.

Development News
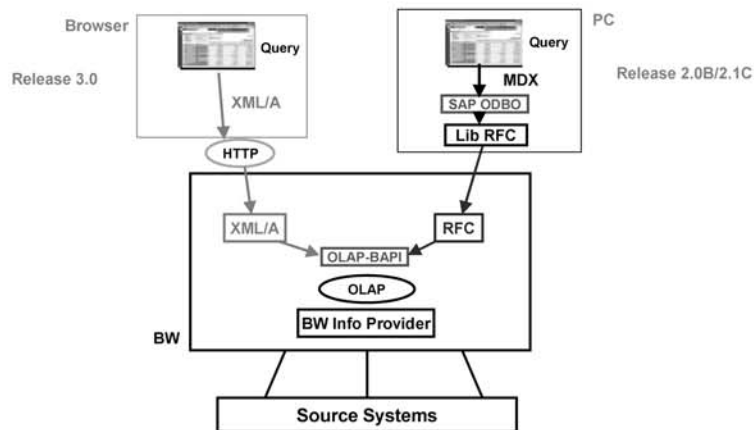
Overview Graphic

SAP BW Training Offerings: Course Descriptions

In this appendix, we examine:
- SAP BW customer course description (nonpartners)
- SAP BW Academy course description (partners only)

Below are the training offerings, including course description, price, duration, objectives, content, and notes for SAP BW training curriculum for both partners and nonpartners.

NOTE
The information is per the SAP Web site at the time this book was published. For up-to-date course descriptions, dates, locations, and availability, visit the SAP Education Center Web site *www.sap.com/usa/education*.

To register for classes and exam, and access on-line registration, visit *www.sap.com*.

There are three levels of classes:
1. Introductory level
2. Standard training for business content experts and SAP BW data extractor developers to learn SAP R/3 application modules
3. Specific for SAP BW application developers, support, and administration staff

SAP BW Customer Course Description (nonpartners)

Figure E.1 provides all SAP BW training curriculum recommended for non-SAP partners. It includes course description, price, class name, level, and length.

SAP BW200—Business Information Warehouse (BW) Overview (2.0)

Course Description
- Code: BW200
- Name: Business Information Warehouse (BW) Overview (2.0)
- Price: United States: $550.00; Canada: $725.00
- Level: 1
- Length: 1 day

Exhibit E.1 **SAP BW Training Curriculum for Nonpartners**

Level 1	Level 2	Level 3		
BW200 (1 day) BW Overview		**BW210*** (5 days) BW Configuration	**BW220*** (3 days) BW Extraction	**WNAPBW** (5 days) APO/BW Integration Workshop
		BW257* (5 days) MySAP BW Reporting	**BW209** (2 days) BW Web Reporting	**WNABWC** (3 days) BW/CO Integration Workshop
* Class recommended for SAP BW certification. ** Class recommended for SAP BW delta certification.		**BWNA40*** (2 days) BW Authorization Workshop	**D20BW**** (5 days) BW Delta 1.2B-2.0B	**D30BW** BW Delta (3.0)

Source: SAP.

Objectives

Participants receive a technical and functional overview of the SAP Business Information Warehouse. They gain familiarity with how the SAP Business Information Warehouse works, its functions, and its use.

Content

- SAP data warehousing strategy in the SAP Business Information Warehouse (SAP BW)
- Metadata administration
- The SAP BW data model
- Transferring and homogenizing application data
- Organizing and monitoring data transfer
- On-line analytical processing with the Business Explorer
- Organization of the BW using InfoCatalogs, user groups, and new browser techniques

NOTE

This is a Level 1 overview course that introduces participants to the topics covered in the SAP BW Level 3 courses.

SAP BW210—SAP BW Configuration (2.0)

Course Description
- Code: BW210
- Name: SAP BW Configuration (2.0)
- Price: United States: $2,750.00; Canada: $3,625.00
- Level: 3
- Length: 5 days

Objectives
Participants gain the detailed SAP BW knowledge needed to implement and administer SAP BW successfully.

Content
- Overview of the basic concepts and architecture of the SAP Business Information Warehouse
- SAP BW data modeling
- SAP BW Administrator Workbench
- Extraction, transformation, loading of data
- Introduction to the functions of the SAP BW metadata repository

NOTE

BW210—SAP BW Configuration is the first in a series of SAP BW courses that will enable participants to understand the various features and functions of SAP BW from both a reporting and a configuration perspective.

If participants are primarily interested in the analysis functions of the SAP Business Information Warehouse, they may wish to attend the one-day BW200—SAP BW Overview course and follow it with BWNA01—mySAP BW Reporting (and other SAP BW reporting courses).

SAP BW257—mySAP BW Reporting (2.0)

Course Description
- Code: BW257
- Name: mySAP BW Reporting (2.0)
- Price: United States: $2,750.00; Canada: $3,625.00
- Level: 3
- Length: 5 days

Comments
Please note: This course replaces BWNA01.

Objectives
This course will enable you to demonstrate the reporting and analytical capabilities of the mySAP Business Intelligence Warehouse.

Content
- Create and execute queries against an SAP BW database.
- Save and retrieve workbooks using BEx Browser.
- Modify the properties of all query components to suit the needs of the user.
- Use variables to increase the flexibility of the query environment.
- Use hierarchies in query analysis.
- Change the visual type of the query result.
- Notify users of exceptions in the data with the Reporting Agent.
- Publish information to targeted groups with roles and authorization techniques.
- Map the data visually using BEx Map.

SAP BWNA40—SAP BW Authorizations Workshop (2.0)

Course Description
- Code: BWNA40
- Name: SAP BW Authorizations Workshop (2.0)
- Price: United States: $1,100.00; Canada: $1,450.00
- Level: 3
- Length: 2 days

Objectives
Participants will learn the principles of security for a data warehousing solution as well as the authorization concept delivered with SAP BW. Participants will be able to administer authorizations in the SAP BW environment.

Content
Participants will gain knowledge of the following topics:
- SAP BW structure, functionality, and architecture
- Basics of security
- Authority concept in SAP BW
- Administration of authority
- Role-based authorizations
- SAP BW and central user management
- Workplace and SAP BW

SAP BW220—SAP BW Extraction (2.0)

Course Description
- Code: BW220
- Name: SAP BW Extraction (2.0)
- Price: United States: $1,650.00; Canada: $2,175.00
- Level: 3
- Length: 3 days

Objectives

Participants gain detailed knowledge of the various options available for extracting data from an SAP R/3 OLTP system.

Content

- Overview of OLTP extraction
- Generic data extraction
- Using function enhancements for extraction
- Customizing logistics extract structures
- Transferring data from self-defined LIS information structures into the SAP BW
- Transferring CO/PA data from SAP R/3 into the SAP BW

SAP BW209—SAP BW Web Reporting (2.0)

Course Description

- Code: BW209
- Name: SAP BW Web Reporting (2.0)
- Price: United States: $1,100.00; Canada: $1,450.00
- Level: 3
- Length: 2 days

Objectives

Participants will acquire the knowledge and skills needed to fully utilize the SAP BW Web reporting tools.

Content

- Publishing queries on the Web
- Overview of the basic concepts behind SAP BW Web reporting
- Basic functions of the BEx Web Publisher (e.g., charts, tables, and navigations)
- Maintenance and administration of HTML pages on the SAP BW server

Participants are expected to have a basic understanding of the SAP BW data warehouse.

NOTE

SAP D20BW—Business Information Warehouse Delta, 1.2B–2.0B (2.0)

Course Description

- Code: D20BW
- Name: Business Information Warehouse Delta, 1.2B–2.0B (2.0)
- Price: United States: $2,750.00; Canada: $3,625.00
- Level: 3
- Length: 5 days

Objectives

Identify the major differences between SAP BW releases 1.2B and 2.0B

Content
- Design of the Administrator Workbench
- InfoObjects
- DataSources
- Data staging
- InfoCubes
- Update rules
- Monitor
- Aggregates
- BAPIs
- Business Document Service (BDS)
- Metadata repository
- Authorizations in reporting
- Business Explorer (BEx) Browser
- Web BEx Browser and Web reporting
- BEx Analyzer
- Business content
- Geographical Information System (GIS) integration

SAP WNAPBW—APO/BW Integration Workshop (3.0)

Course Description
- Code: WNAPBW
- Name: APO/BW Integration Workshop (3.0)
- Price: United States: $2,750.00; Canada: $3,625.00
- Level: Workshops
- Length: 5 days

Objectives
At the conclusion of this course, you will be able to:
- List integration points between SAP BW and APO.
- List the components of APO.
- Identify delivered business content in SAP BW for APO.
- Configure areas of the Business Information Warehouse (SAP BW) so that it may be used in conjunction with the Advanced Planner Optimizer (APO) application.

Content
SAP BW will be used as an extraction, storage, and reporting tool for several modules of APO. Students will be instructed in general SAP BW topics and APO content with the intention of creating and maintaining the integration of the APO and SAP BW. The course will be laid out in a case study format from beginning to end. Students should have a general understanding of SAP BW and the various APO modules.

SAP WNABWC—SAP BW/CO Integration Workshop (2.0)

Course Description
- Code: WNABWC
- Name: SAP BW/CO Integration Workshop (2.0)
- Price: United States: $1,650.00
- Level: Workshops
- Length: 3 days

Objectives
- Understand the business background and typical questions a cost accountant or a line manager expects to have answered by a data warehouse.
- Understand the technical background of the architecture in SAP BW and the data flow from the CO module to SAP BW.
- Understand how to use the delivered business content for controlling in SAP BW.

Content
- Introduction to reporting requirements in controlling
- Introduction to Business Information Warehouse
- Reports for the line manager and the sales business analyst in SAP BW
- Overhead management in SAP BW (data flow, delivered InfoCubes, query building)
- Product cost controlling in SAP BW (data flow, delivered InfoCubes, query building)
- Profitability analysis in SAP BW (how to replicate the CO/PA operating concern in SAP BW, how to handle high-volume installations)

SAP D30BW BW DELTA 3.0

Course Description
- Code: D30BW
- Name: Business Information Warehouse Delta (3.0)
- Price: United States: $2,750.00; Canada: $3,875.00
- Level: 3
- Length: 5 days

Objectives
Participants will gain detailed knowledge of the new features of BW Release 3.0.

Content
- BW Service API 3.0A
- Integration of XML Data
- Extracting Non-SAP Data with Ascential
- XML MetaData Interchange
- Open Hub
- Flexible Master Data Staging
- Transformation Engine

- Flexible Hierarchy Upload
- Operational Data Store ODS
- Aggregates
- MOLAP Aggregates BW3.0
- BW Archiving in 3.0
- Process Chains in BW3.0
- InfoProvider
- Document Integration
- Business Explorer 3.0 and WAS
- Introduction to Query Designer
- Restricted Key Figures and Calculated Key Figures
- Tabular Editor
- Variable Wizard
- Hierarchies
- Other Query Designer Features
- Analytics
- Designing BI Web Applications
- Template Structure & Commands
- Enhanced Reporting Agent
- Mobile Reporting
- Overview Analytical Applications and Business Content

SAP BW Solution Academy Course Description

Figure E.2 provides all SAP BW training curriculum recommended for SAP partners (non–SAP partners may also attend provided seating is available). It includes course description, price, class name, level, and length.

SAP TABW10—Business Information Warehouse Configuration (2.0)

Course Description
- Code: TABW10
- Name: Business Information Warehouse Configuration (2.0)
- Price: United States: $2,750.00; Canada: $3,625.00
- Level: 3
- Length: 5 days

Objectives
Participants gain the detailed knowledge needed to configure SAP BW.

Content
- Overview of the basic concepts and architecture of SAP BW
- Hands-on experience working with SAP BW tools

Exhibit E.2   **SAP BW Solution Academy Training Curriculum (partners only)**
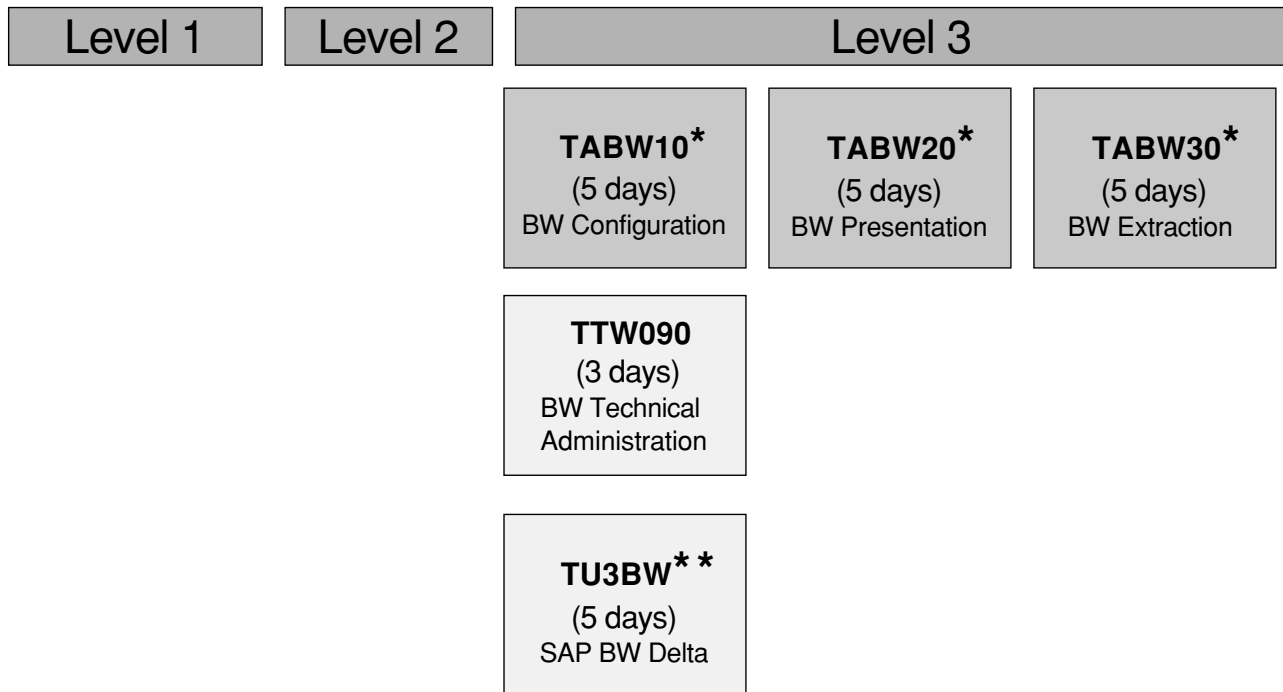
* Class recommended for SAP BW certification.

** Class recommended for SAP BW delta certification.

Source: SAP.

- SAP BW data modeling
- Extraction, transformation, and loading of data
- Introduction to the functions of the SAP BW metadata repository

NOTE The content of this course is covered in the certification exam that is offered at the conclusion of the TABW30 course. This course is similar in content to the customer course BW210—SAP BW Configuration.

SAP TABW20—SAP BW Presentation

Prerequisite
- TABW10

Audience
- SAP BW consultants from SAP partners
- SAP BW project team members from SAP customers

Course Description
- Code: TABW20
- Name: Presentation (2.0)
- Price: United States: $2,750.00; Canada: $3,625.00
- Level: 3
- Length: 5 days

Objectives

Participants gain the SAP BW knowledge they need to use the SAP BW analysis tools extensively and professionally, as well as the knowledge and skills they need to use the SAP BW Web reporting tools successfully.

Content

Introduction to working with the SAP BW analysis tools:
- Overview of the basic concepts and OLAP functions of SAP BW reporting
- Introduction to the basic ideas behind the SAP BW business content
- Creating reports with the query builder of the Business Explorer Analyzer
- Introduction to special features of SAP BW reporting, for example, exception reporting, report-to-report interface, Web reporting
- Introduction to the BEx Map tool for geographical visualization and analysis
- Introduction to professional advanced analysis in the SAP BW
- Activating the SAP BW business content through the Administrator Workbench
- Workbench-automated decision support using the SAP BW report agent
- Agent implementing of cartographic navigation elements with the BEx Map
- Map-enhanced query navigation through the report-to-report interface
- Publishing queries on the Web using the SAP Business Explorer Web Publisher
- Overview of the basic concepts behind SAP BW Web reporting
- Reporting overview of the basic functions of the BEx Web Publisher (e.g., charts, tables, and navigations)
- Maintenance and administration of HTML pages on the SAP BW server

NOTE

TABW20 is the second in a series of SAP BW courses for SAP BW consultants that will enable the participants to understand the various themes within SAP BW. The content of this course is tested in the SAP BW Certification 2000 exam that is offered at the end of the TABW30 class.

SAP TABW30—SAP BW Extraction

Prerequisites
- TABW10
- TABW20

Audience
- SAP BW consultants from SAP partners
- SAP BW project team members from SAP customers

Course Description
- Code: TABW30
- Name: Extraction 2.0 (2.0)
- Price: United States: $2,750.00; Canada: $3,625.00
- Level: 3
- Length: 5 days

Objectives
Participants gain detailed knowledge of the various possibilities for extracting data from an SAP R/3 OLTP system. Participants gain detailed knowledge of how to successfully implement SAP BW.

Content
Participants gain a better understanding of various extraction mechanisms within the SAP R/3 OLTP:
- Overview of the basic concepts of OLTP extraction
- Possibilities offered by generic data extraction
- Implementing individual extraction techniques using function enhancements
- Customizing logistics extract structures
- Transferring data from self-defined LIS information structures into the SAP BW
- Transferring CO/PA data from SAP R/3 into the SAP BW

Participants gain an understanding of how to handle currency translation in SAP BW and gain an overview of how to approach SAP BW implementations using ASAP.

SAP TTW090—SAP BW Technical Administration

Prerequisites
- Knowledge and experience as system administrator for an SAP BW-supported operating system
- Basic knowledge of SAP BW or BW200 overview

Audience
- Future technical consultants for SAP BW
- Certified SAP R/3 technical consultants interested in working in the SAP BW environment
- SAP BW consultants

Course Description
- Code: TTW090
- Name: SAP BW Technical Administration (2.1)
- Price: United States: $1,650.00; Canada: $2,175.00
- Level: 3
- Length: 3 days

Comments
Please note: This course replaces TABW90.

Objectives

Participants will understand how SAP BW-specific functions are administered and will receive an overview of the technical implementation/upgrade of an SAP BW system.

Content
- SAP BW performance issues (system and parameter settings, aggregates, statistics, partitioning, MultiCubes)
- Authorizations in SAP BW
- SAP BW installation
- SAP BW frontend setup (planning, preinstallation, postinstallation)
- SAP BW upgrade (planning, preupgrade, postupgrade)
- SAP BW specific change and transport features
- SAP BW extraction and load
- Plug-ins

NOTE

This course does *not* include the installation of an actual system.

SAP TU3BW—SAP BW Delta (3.0)

Prerequisite
- Students should have a solid understanding of the features and functions of SAP BW 2.0B.

Audience
- Consultants with experience in SAP BW release 2.0B

Course Description
- Code: TU3BW
- Name: SAP BW Delta (3.0)
- Price: United States: $2,750.00; Canada: $3,875.00
- Level: 3
- Length: 5 days

Objectives

Participants are presented with a technical and functional overview of new features in the SAP Business Information Warehouse in release 3.0. Participants gain the SAP BW knowledge they need to use the new SAP BW 3.0 features and functions extensively and professionally.

Content

New features in extracting data, such as the improvements to the service API in 3.0, enhanced XML integration, metadata interchange, and open hub concepts:
- Overview of ETL with Ascential DataStage
- New features in staging data, which include flexible master data staging, the transformation engine, and the possibility to upload hierarchies

- Enhancements to existing data storage techniques such as the ODS, aggregates, MOLAP cubes, and archiving and the addition of process chains
- New architecture for Web reporting based on the elimination of the ITS, which has been replaced by the Internet graphics server
- General improvements to query design and Web application design
- Information on new features such as mobile reporting, additions to business content, and analytics

NOTE At the end of the course a recertification test will be offered. Prerequisite for participating in this recertification test is a "Business Information Warehouse Certificate 2000." This course is suitable for both partner consultants and customers with an equivalent skill profile.

Roles and Skills for BW Projects

This appendix describes the roles and skills for BW projects as defined by SAP, including role time commitment, key attributes, key tasks, and don'ts.

The SAP BW project team is made up of technical and functional areas:

Team	Role
SAP BW team	• SAP BW project manager
	• SAP BW deployment architect
	• SAP BW technology lead
	• SAP BW consultants
	• SAP BW data modeler
	• SAP BW query developer
	• SAP BW subject content analyst
	• SAP BW quality/audit analyst
	• SAP BW database administrator
	• SAP BW configuration specialist
Data warehouse team	• Corporate data warehouse lead technologists
	• Data modelers
	• Extract, transform, and load (ETL) specialists
Business team	• Business partner lead
	• Business analyst
	• Business end users
SAP R/3 team	• SAP R/3 subject area lead
	• SAP R/3 production administrator
	• SAP R/3 functional consultant
	• SAP Basis consultant
Developers team	• Interface developer
	• Excel, VBA, ODBO developers
	• Query developers (e.g., ABAP, report writer, LIS developers)

For further information on data warehouse team structures, roles, and responsibilities, consult other resources such as:

- *The Data Warehouse LifeCycle Toolkit* by Ralph Kimball et al. (New York: Wiley, 1998)
- The ASAP templates "BW Roles and Skills" (*www.service.SAP.com)* in the ASAP methodology

The following is a list of the roles necessary for an SAP BW project:
- BW data extraction consultant
- BW data access consultant
- BW data architect
- BW application consultant
- Project manager/lead
- Basis consultant (BW)

Comments

- A role is not necessarily filled by one person; several persons could fill it (e.g., one SAP BW application consultant per application).
- One person could have several roles and "wear more than one hat" (e.g., the Basis consultant could also be the SAP BW data extraction consultant).
- A role is not necessarily a full-time job.

BW Data Extraction Consultant

Description

The BW data extraction consultant is responsible for identifying and obtaining the data required to satisfy the requirements of the BW project. This data may include:
- SAP R/3 data
- New Dimension product data
- Data external to SAP within the organization (legacy data)
- Data external to SAP from outside the organization (provider data—D&B, Nielsen)

The BW data extraction consultant role has a broad range of responsibilities and may require multiple individuals to satisfy the role depending on the scope of the BW project and the complexity and quality of the data.

If only SAP R/3 and New Dimension data are required to satisfy requirements and if these data are included in the standard business content of BW, this role may be combined with the BW application consultant role. This standard business content allows for extraction of R/3 and New Dimension data in a straightforward and rapid manner.

If non-SAP data are required, if standard business content must be enhanced significantly, and/or if the data quality from the source system is insufficient, this role can be quite complex and can require significant resources. This complexity and quality of data is a primary contributor to the size and scope of the BW project.

If legacy data are being extracted a close relationship is required with the legacy extraction expert. In some cases, the legacy extraction expert may assume this responsibility.

Time Commitment

The table describes the time that must be committed to this role to ensure the project requirements are met.

Project Complexity	Time Commitment
Low	If standard business content of BW is the only data required, this role can be combined with the BW application consultant. The role is primarily performed during the early to mid-phases of the project with completion of extractions required by the middle of the project so that testing, training, and implementation can be completed.
Medium	If extensions to the standard business content of BW are required (either by including additional SAP data or extracting from non-SAP sources), this role should be satisfied by individuals other than the BW application consultant so that efforts may continue in parallel.
High	Depending on the complexity and quality of the data necessary to satisfy the requirements, this role may require a significant number of resources. A resource could potentially be required for each major extraction that has to be developed.

Key Attributes

Key attributes of an individual supporting the analysis and design functions of this role include:

- SAP R/3 and BW application knowledge in the business process area
- The ability to develop a solution using BW to solve a company's business requirements
- The ability to work effectively in a diversified team
- Strong analytical skills
- The ability to work independently and as a team member
- Strong time management skills and multitasking capabilities
- Knowledge of application software tools, including presentation, spreadsheet, and word processing applications
- A working understanding of the accelerated SAP methodology and tools
- Experience in the customer's industry
- An understanding of the source data (both SAP and non-SAP data)

Key attributes of an individual supporting the development functions of this role include:

- Experience with data warehouse data analysis
- Experience with data extraction development
- Detailed knowledge of the data required to be extracted
- Knowledge of the customer's current business processes
- Knowledge of data quality issues
- An in-depth understanding of specific data extraction tools or development language being used to extract the data (e.g., 4GLs or specialized data extraction tools)
- Strong written and oral communication skills
- Strong analytical skills
- The ability to work in diversified teams

Key Tasks

Specifically, the BW data extraction consultant is responsible for:

- Designing the data solution to satisfy defined business requirements
- Identifying the data in the source environment
- Mapping the data to the BW environment
- Identifying data quality gaps
- Developing a plan to close data quality gaps
- Developing the required extraction programs, if necessary
- Developing the associated interface programs, if necessary
- Testing of all developed programs
- Ensuring integration testing of data from various sources
- Developing a production support plan

Don'ts

The BW data extraction consultant should not become ineffective because of long-standing data quality problems, but should identify these problems and escalate them to the customer project manager for resolution. Often data quality and inconsistency issues are systemic in the organization and must be addressed at a higher level in the organization to be resolved. Avoid the tendency to attempt to cleanse all data within the BW extraction process. Often data cleansing is best performed at the legacy source system level.

BW Data Access Consultant

Description

The BW data access consultant is responsible for assessing the business requirements, and designing and developing a data access solution for the BW project. This solution may include use of:

- BW's Business Explorer
- Non-SAP data access tools (e.g., business objects, Cognos, Crystal Reports, and other certified data access tools)
- Visual Basic development
- Web development

The BW data access consultant role has a broad range of responsibilities and may require multiple individuals to satisfy the role depending on the scope of the BW project and the requirements associated with data access.

The BW data access consultant should work closely with the individuals responsible for business requirements gathering and analysis and have a thorough understanding of the way the data will be used to make business decisions.

Often significant change management issues are generated as a result of modifications required by end users to the data access design and implementation. As a result the BW data access consultant is in a key position to provide valuable information to the change agent or change management process.

Time Commitment

The table describes the time that must be committed to this role to ensure the project requirements are met.

Project Complexity	Time Commitment
Low	If standard queries from BW are used and the Business Explorer is the tool selected, this effort can be performed by the BW application consultant.
Medium	If modifications or significant extensions are required to the queries from BW, a resource should be committed specifically to work in this area.
High	If a product other than the Business Explorer is selected, a skilled consultant with this expertise should be committed to the project. If VBA or Web development is needed, this too requires specialized skills and resources.

Key Attributes

The BW data access consultant should have:
- Strong business emphasis and perspective
- Excellent communication skills since the role works closely with the end users of the BW
- Experience with the appropriate data access tool(s)
- Strong analytical skills
- An understanding of the customer's business processes
- An understanding of the associated output/display requirements
- The ability to work with diversified teams

Key Tasks

Specifically, the BW data access consultant is responsible for designing the data access solution to include:
- Understanding the data that will be available in BW in business terms
- Identifying the way end users want to analyze the data in BW
- Designing the data access solution to satisfy defined business requirements

The BW data access consultant is also responsible for developing the data access solution to include:
- Developing options for data access
- Developing prototypes of data access for review with end users
- Developing the required data access solutions
- Developing the associated interface programs, if necessary
- Testing of all developed solutions
- Ensuring integration testing of data access solution

- Developing a production support plan
- Working with training development to include data access solution in BW course materials

Don'ts

The BW data access consultant should not assume knowledge of what the end users want without developing and demonstrating prototypes throughout the process. Often end-user requirements evolve as they see the kind of data that are available.

Also, the BW data access consultants should not wait until all valid data are available in BW before developing prototypes, but rather use data that are not valid where the end user will focus on the design of the access method rather than the data.

BW Data Architect

Description

The BW data architect is responsible for the overall data design of the BW project. This includes the design of the:

- BW InfoCubes
- Logical models
- BW process models
- BW enterprise models

The BW data architect plays a critical role in the BW project and is the link between the end user's business requirements and the data architecture solution that will satisfy these requirements. All other activities in the BW project are contingent on the data design being sound and flexible enough to satisfy evolving business requirements.

Time Commitment

The table describes the time that must be committed to this role to ensure the project requirements are met.

Project Complexity	Time Commitment
Low	If the BW project utilizes standard BW content and InfoCubes, this role can be satisfied by the BW application consultant.
Medium	If the BW project requires enhancements to the standard BW content and InfoCubes and/or requires the integration of non-SAP data, this role may require a committed resource.
High	If the BW project requires significant modification and enhancement to standard BW content and InfoCubes, it is highly recommended that an experienced resource be committed full-time to the project.

Key Attributes

The BW data architect must have:
- An understanding of the BW data architecture
- An understanding of multidimensional modeling
- An understanding of the differences between operational systems data modeling and data warehouse data modeling
- An understanding of the end user's data
- An understanding of the integration points of the data (e.g., customer number, invoice number)
- Excellent troubleshooting and analytical skills
- Excellent communication skills
- Technical competency in data modeling
- Multilanguage skills, if an international implementation
- Working knowledge of the BW and R/3 application(s)
- Experience with data modeling application software (i.e., ERWIN, Oracle Designer, S-Designer, etc.)

Key Tasks

The BW data architect is responsible for capturing the business requirements for the BW project. This effort includes:
- Planning the business requirements gathering sessions and process
- Coordinating all business requirements gathering efforts with the BW project manager
- Facilitating the business requirements gathering sessions
- Capturing the information and producing the deliverables from the business requirements gathering sessions
- Understanding and documenting business definitions of data
- Developing the data model
- Ensuring integration of data from both SAP and non-SAP sources
- Fielding questions concerning the data content, definition, and structure

This role should also address other critical data design issues such as:
- Granularity of data and the potential for multiple levels of granularity
- Need for aggregation at multiple levels
- Need for storing derived BW data
- Ensuring overall integrity of all BW models
- Providing data administration development standards for business requirements analysis and BW enterprise modeling
- Providing strategic planning for data management
- Impact analysis of data change requirements

As stated above, the BW data architect is responsible for the overall data design of the BW project. This includes the design of the
- BW InfoCubes
- Logical models

- BW process models
- BW enterprise models

Don'ts

The BW data architect should not become distracted with issues outside the data modeling arena but should be allowed to focus on the issues surrounding optimizing the data design for the BW project. The BW data architect should design to satisfy specific business requirements, but should not ignore the overall long-term goals of the BW in the organization.

BW Application Consultant

Description

The BW application consultant is responsible for utilizing BW to satisfy the business requirements identified for the project. As provided in the other roles, *if the scope of the BW project is tightly controlled and can use standard BW business content, InfoCubes, and queries*, the BW application consultant may assume the responsibility to perform several roles concurrently, including:

- BW data architect
- BW data access consultant
- BW data extraction consultant
- SAP project manager
- Business process team leader
- Authorization administrator

If this occurs, the BW application consultant must have a broad range of skills and this position will be under significant pressure during the course of the BW project. In this situation, the BW application consultant must be inherently responsible for the overall integrated design and realization of the BW solution.

If the project scope is broad and must extend business content, InfoCubes, and/or queries, then the project warrants resources being assigned to the roles identified above. In this case, the BW application consultant is responsible for the overall integrated design and coordinated realization of the BW solution.

If this role is assumed by an SAP consultant, often the expectation is that the consultant is familiar with all components and functionality of the Business Information Warehouse. This role often naturally becomes a focal point for all design considerations related to BW.

Time Commitment

The table describes the time that must be committed to this role to ensure the project requirements are met.

Project Complexity	Time Commitment
Low	If the BW project utilizes standard BW content, InfoCubes, and/or queries, this role can be satisfied by the BW application consultant. If this occurs, this is a full-time responsibility.
Medium	If the BW project requires enhancements to the standard BW content, InfoCubes, and/or queries, and/or requires the integration of non-SAP data, this role should not assume responsibility for all activities, but other resources should be assigned. If this occurs, the BW application consultant can assume a less-than-full-time role.
High	If the BW project requires significant modification and enhancement to standard BW content, InfoCubes, and/or queries, it is highly recommended that an experienced resource (other than the BW application consultant) be committed to the project to satisfy these roles. If this occurs, the BW application consultant should assume a full-time responsibility.

Key Attributes

The BW application consultant must have:
- Excellent troubleshooting and analytical skills
- Excellent communication skills
- Excellent time-management skills
- Excellent problem-resolution and organizational skills
- Technical competency with strong computer skills
- Multilanguage skills, if an international implementation
- Working knowledge of the BW and R/3 application(s)

Key Tasks

The BW application consultant (or one of the resources identified above) uses the BW Administrator Workbench to perform the functions provided by the BW:
- Establish connections to the BW sources.
- Activate the standard business content.
- Enable the standard InfoCubes and queries.
- Enhance the InfoCubes as required by the BW data architect.
- Enhance the queries as required by the BW data access consultant.
- Define authorization profiles and access.
- Evaluate statistical performance and make recommendations to BASIS support for optimization where possible.
- Manage the CTS layer.

Don'ts

There is a tendency to rely completely on this resource for the project. This is not recommended, since these resources will consistently be in demand and individuals having this broad range of skills are difficult to find and keep on a project. Cross-training of resources is essential to ensure the sustainability of the project. Ensure that this role does not assume ownership responsibility for OSS notes related to BW.

SAP BW White Paper

This Appendix provides a white paper on third-party reporting tools:

> "Third Party Data Access and Data Load Tools for SAP Business Information Warehouse" by Naeem Hashmi[1]

Please note that this white paper will not be explicitly tested on the certification exam. However, it is useful for gaining greater understanding and clarification of the SAP BW topics.

Third-Party Data Access and Data Load Tools for SAP Business Information Warehouse*

This document is prepared based on available information at the time of composing this report. As SAP certifies additional technology vendors or SAP adds new interfaces to SAP BW, information in this document may change at any time without notice.

Author recommends readers to visit the SAP Web site *http://www.sap.com* for the latest information.

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Certified Third-Party Data Extraction, Transformation, Load (ETL)
    Products to Load Data in SAP BW
Certified Data Provider BAPIs (BW-DPI- BAPIs)
Summary

*Used with permission.

The SAP BW 2.0B: Open Data Interfaces

The SAP Business Information Warehouse (SAP BW) is an open data warehouse environment. What this "openness" means is that SAP provides several methods to integrate SAP BW in any enterprise. These open methods include the following types of interfaces:

- *Flat Files Interface.* This is native to SAP BW. SAP BW supports common flat data file formats, such as comma separated files, Microsoft Excel files, etc.
- *DB-Link Interface.* This is a database specific technology that enables SAP BW to import data. In SAP BW 2.0B, this type of interface was limited to Oracle and Microsoft SQL Server database only.
- Application Programming Interfaces (APIs) to load data in as well as to access information from its data stores that are platform independent (hardware, software, databases, etc.)

The BASIS technology on which SAP BW is built offers several classes of APIs. Most of the APIs are based on Remote Function Calls (RFCs) that are common to all SAP products including SAP BW. The RFCs are the most widely used mechanisms to interact with SAP business functions, processes, and data. Java and COM implementations established to interact with SAP processes are nothing more than wrappers around RFCs to make development tasks simple.

SAP provides several product-specific Business APIs (BAPIs), which are object-oriented interface implementations using RFCs that most developers use to interact with SAP products.

SAP offers the following categories of BAPIs for SAP BW:

1. *Data Load.* APIs are called Staging BAPIs or SBAPI.
2. *Data Access.* OLEDB for OLAP and OLAP BAPI
3. *Data Mining.* APIs to integrate BW with Data Mining Tools (in BW 3.0)

In addition to data load BAPIs, SAP BW also supports a flat file interface to import data from common flat file data formats, such as a comma delimited file or Microsoft Excel file. In addition to BAPIs, SAP BW also supports Microsoft OLEDB for OLAP API to access data from SAP BW and develop analytical applications against SAP BW data stores. This OLEDB for OLAP interface is often used by third-party OLAP tools to build ad hoc query, reporting, and analytical applications.

To assure that integrity of SAP BW components is not compromised, third party tools vendors and SAP go through a rigorous exercise to certify that third-party products are in compliance with available APIs for each version of SAP BW. In Chapter 15 of my book *Business Information Warehouse for SAP*, you will find an example of how to integrate third-party data access tools with SAP BW.

The following sections list SAP certified products that load data in SAP BW or access data from SAP BW.

Certified Third-Party Data Access Products (BW ODB)

Vendor	Product	Product Version	BW API Version
Arcplan Information Services AG URL:*http://www.arcplan.com*	inSight	2.5	BW-ODB 1.2
	dynaSight	3.0	BW-ODB 1.2 BW-ODB 2.0
Brio Technology, Inc. URL:*http://www.Brio.com*	Brio Enterprise	6.0	BW-ODB 1.2
Business Objects URL:*http://www.businessobjects.com*	BusinessObjects BW Connect	5.1.1	BW-ODB 2.0
	BusinessObjects		BW-ODB 1.2
Cognos, Inc. URL:*http://www.cognos.com/sapbw*	PowerPlay SAP BW Interface	1.0	BW-ODB 1.2 BW-ODB 2.0
Comshare URL:*http://www.comshare.com*	Comshare Decision	2.5.1	BW-ODB 1.2
Information Businders URL:*www.informationbuilders.com/products*	WebFOCUS for SAP BW	4.3	BW-ODB 2.0
MIS Technologies URL:*http://www.misag.com*	MIS Alea	3.7	BW-ODB 1.2
	OnVision	2.0	BW-ODB 2.0
PointOut GmbH URL:*http://www.pointout.de*	PointOut for BW	8.01	BW-ODB 1.2
Seagate Software URL:*http://www.seagatesoftware.com*	Seagate Worksheet Seagate Crystal Reports Seagate Holos	7 7 7	BW-ODB 1.2
SAS Institute URL:*http://www.sas.com*	Enterprise Guide	1.2	BW-ODB 2.0
Ton Beller AG URL:*http://www.tonbeller.com*	Qubon	2000	BW-ODB 1.2

Certified Products for OLAP BAPI (BW-OBI)

The OLAP BAPIs are new as of SAP BW, release 2.0 and are more powerful than OLEDB for OLAP. OLAP BAPIs are more powerful because the OLEDB for OLAP API is based on Microsoft's OLAP standard, which is based on Microsoft's Analysis Services and is limited to Microsoft's platform. On the other hand, OLAP BAPIs are platform independent and provide additional functionality that may be limiting due to ODBO specifications. Thus far, there is only one vendor that has been certified for OLAP BAPI.

Vendor	Product	Product Version	BW API Version
Arcplan Information Services AG URL:*http://www.arcplan.com*	dynaSight	2.5	BW-OBI 2.0

Certified Third-Party Data Extraction, Transformation, Load (ETL) Products to Load Data in SAP BW

The data Extraction, Transformation, and Load (ETL) process is common to all data warehouses. SAP BW provides built-in methods to perform ETL as part of the business content for SAP R/3 OLTP. However, when data sources are not generated from SAP R/3 OLTP, third-party ETL tools can be used to perform ETL functions along with SAP BW data transformation capabilities.

The most common data load API for SAP BW is called the Staging BAPI (SBAPI). The reason behind the name "staging" is that such BAPIs do not load data directly in a database data store; they interact with the database engine through the SAP BW Staging engine, which handles data manipulations and loads data in the reporting data stores. The basic principle behind Staging BAPIs is that the third-party tools communicate with the SAP BW staging engine through a Remote Function Call (RFC) server. The RFC server is registered in SAP BW as part of the third-party data source definition. In Chapter 14 of my book *Business Information Warehouse for SAP*, you will find an example of how to integrate third-party ETL tools with SAP BW.

The following list shows certified vendors/products for SAP BW 1.2x and BW 2.0x. Other vendors may also provide products to load data in SAP BW but have not been certified by SAP.

Vendor	Product	Product Version	BW API Version
Acta Technology, Inc. URL:*http://www.acta.com*	ActaWorks	3.0	BW-STA 1.2
	ActaWorks	5.0	BW-STA 2.0
Ascential Software, Inc. URL:*http://www.ascentialsoftware.com*	DataStage load pack for SAP BW	3.6	BW-STA 1.2
Evolutionary Technologies URL:*http://www.eti.com*	ETI*EXTRACT	1.0	BW-STA 1.2
Hummingbird Communications URL:*http://www.hummingbird.com*	Génio	3.0	BW-STA 1.2
Informatica Corporation URL:*http://www.informatica.com*	PowerCenter	4.5	BW-STA 1.2
Informix Software URL:*http://www.informix.com*	Prism Connect for BW	2.0	BW-STA 1.2
		3.6	
Information Builders URL:*www.informationbuilders.com/products*	SNApack Data Migrator	2.6	BW-STA 1.2
SeeBeyond Deutschland URL:*http://www.seebeyond.com*	e*WayTM Adapter for R/3	4.1	BW-STA 2.0

systemfabrik GmbH URL:*http://ssystemfabrik.com*	Business Warehouse Connector	4.0	BW-STA 1.2
Mercator Software URL:*http://www.tsisoft.com*	Mercator for R/3	1.4.2	BW-STA 1.2
NSX Software: URL:*http://www.nsxsoftware.com*	NSX Data Stager	1.1	BW-STA 1.2
SeeBeyond URL:*http://www.seebeyond.com*	e*Way Adapter for R/4	4.1	BW-STA 2.0
systemfrabrik URL:*http://www.systemfabrik.com*	Bw Connector	4.0	BW-STA 2.0
WRQ, Inc. URL:*http://www.wrq.com*	VeraStream for Business Warehouse	7	BW-STA 1.2
		8	BW-STA 2.0

Certified Data Provider BAPIs (BW-DPI BAPIs)

The Data Provider BAPIs (BW-DPI BAPIs) support a real-time interface for transaction applications to display and analyze data at the business explorer level without storing data in an InfoCube. Through the use of BW-DPI BAPIs, real-time interfaces to syndicated data providers can be designed. The BW-DPI interface provides a method to update and retrieve metadata, send master data extracts to the SAP BW and retrieve external transaction data. The following vendor provides a Data Provider BAPI that is certified to work with SAP BW.

Vendor	Product	Product Version	BW API Version
ACNielsen U.S. URL:*http://www.acnielsen.com*	EDW*Connect	1.02	BW-DPI 1.2

Summary

This document lists all SAP-certified products that either load data into SAP BW or access data for reporting as of April 18, 2001. There are other vendors not included in this list who also claim their products work with SAP BW. It is a good idea to make certain that any product that you select has been certified for the version of SAP BW that you are planning to implement, as BAPI and OLAP interfaces are often SAP BW version specific.

To date, SAP has not defined any BAPIs or a certification process to extract data from SAP BW. Third-party ETL vendors suggest that their tools can be used to extract data from SAP BW. If you choose to use ETL tools to extract data from SAP BW make sure that when the tool accesses SAP BW at the database level, the integrity of extracted information is not compromised and does not interrupt the SAP BASIS operations.

The extraction of data from SAP R/3 is a huge challenge. Some of the tools listed in this document can also extract data from SAP R/3 at an application layer. Check with the vendor of choice listed in this document to see if their product can help you extract data from SAP R/3 OLTP. Also make sure that the third-party ETL tool you choose to work with does not ac-

cess data from SAP R/3 OLTP at the database level. Not accessing data at the application layer will interrupt SAP R/3 OLTP operations and cause you to get inconsistent data. Furthermore, SAP does not recommend users access information from SAP R/3 OLTP at the database level.

Endnote

1. "Third-Party Data Access and Data Load Tools for SAP BW," Naeem Hashmi, August 2001, *http://infoframeworks.com/BW/SAP_BW_3rd_Party_Access_ETL_Tools.htm*.

SAP BW Standard Business Content

Standard business content is a predefined analytical applications model delivered by SAP as part of the SAP BW software. In SAP BW 2.1C, the business content includes hundreds of components:

- SAP R/3 extractor programs
- DataSources
- InfoObjects
- InfoSources
- Transfer and communication structures
- InfoCubes
- Report definitions
- Queries
- Key performance indicators (KPIs)
- Roles
- ODS objects
- Workbooks

The following provides a list of the predefined SAP BW queries available in standard business content. Refer to the SAP BW help files for a list of all InfoCubes, queries, and business content objects.

SAP BW Standard InfoCubes in Standard Business Content

Procurement

- Delivery Dates for Shipment Stages
- External Services
- Goods Movements: Plant and Stocks
- Purchasing Data
- Purchasing Groups
- Shipment Costs Details

- Shipment Costs Overview
- Shipment Header
- Shipment Stage
- Subsequent Settlement—Evaluation
- Vendor Evaluation
- Vendor Evaluation Data
- Vendor Evaluation Data (Semiautomatic)
- Warehouse and Stocks

Production

- Capacity Load Utilization
- Downtimes
- Period-Specific Material Consumption
- Period-Specific Operation/Work Center View
- Period-Specific Order/Material View
- Plan /Actual Comparison Order/Material View
- Plan/Actual Comparison Material Consumption
- Plan/Actual Comparison Operation/Work Center View
- Repetitive Manufacturing Material Consumption
- Repetitive Manufacturing/Goods Receipts
- Status of Manufacturing Orders

Sales and Marketing

- Activities
- Activities (Customer/Product)
- Activities (Customers)
- Customer
- Deliveries
- Delivery Service
- Opportunities (Pipeline Analysis)
- Opportunities (with reference to material)
- Quotations/Orders
- Revenues
- Sales Overview

Financials

- ABC: Costs and Allocations
- ABC: Process Quantities and Prices
- Accounts Payable: Transaction Data
- Accounts Receivable: Transaction Data
- Activity Allocation (Costs and Quantities)

- Activity Allocation (Primary Cost Component Split)
- Activity Allocation (Variances)
- Activity Types
- Activity-Based Costing (Costs and Quantities)
- Activity-Based Costing (Primary Cost Component Split)
- Activity-Based Costing (Statistical Key Figures)
- Activity-Based Costing (Variances)
- Actual Cost Component Split
- Actual Costing/Material Ledger
- Changes in Investee Equity, Consolidation
- Changes in Investments, Consolidation
- Commitment/Actuals and Budget in Funds Management
- CO/PA: Consumer Goods Industry (S_CP)
- CO/PA: CRM Marketing
- CO/PA: Published Key Figures
- CO/PA: Quickstart (S_GO)
- Cost Object Controlling
- Costs and Allocations (COOM)
- Costs and Allocations (Full Costs)
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- Costs and Allocations (WBS Elements)
- Costs and Allocations Using Delta Extraction (COOM)
- Costs and Allocations Using Delta Extraction (Cost Centers)
- Statistical Key Figures (Cost Centers)
- FI-AA—Annual Values
- FI-AA—Annual Values and Transactions
- FI-AA—Transactions
- General Ledger: Transaction Figures
- IM-FA: Assigned Plan and Budget
- Inventory Valuation: Prices and Inventory Values
- PCA Statistical Key Figures
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- Product Cost Planning: Any Cost Estimates
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Human Resources

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- Applications and Applicant Actions
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- Payroll Data
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Note to the Reader

These appendixes were up to date at the time this book was written. In addition, the products and vendors mentioned are examples but not recommendations by the author.

If you would like more information about new products and developments, we recommend that you refer to the individual development news publications in the SAP Service Marketplace at *http://service.sap.com/developmentnews*.

Glossary

ABAP Advanced Business Application Programming. A proprietary SAP coding language, similar in style to COBOL.

Ad-Hoc Reporting Reporting in response to a query that cannot be answered with an existing, pre-defined query. Ad-hoc queries are distinguished from standard queries, where specific information is sought in a specific format about specific subjects on a regular basis.

Agent An application that searches the data and sends an alert when a particular pattern is found.

Aggregates Precalculated and prestored summaries stored in the data warehouse to improve data warehouse performance.

Aggregations Information stored in a data warehouse in a summarized form. Instead of recording the date and time each time a certain product is sold, the data warehouse could store the quantity of the product sold each hour, each day, or each week.

ALE Application Link Enabling. A protocol for exchanging data between different applications.

Analytical Processing Calculations and reporting focused not on the event reporting, but on totals, trends, and support of managerial decisions.

API Application Programming Interface. A predefined method for integrating existing or new function to another existing program or system.

APO Advanced Planner Optimizer. SAP's suite of advanced supply chain planning tools for real-time planning and decision support.

ASAP Accelerated SAP. An implementation methodology for the rapid deployment of SAP software applications.

Atomic Data Atomic data is the lowest level of fact information, not summarized or changed. Storing atomic data takes the most work and space, but offers the most flexibility.

Attributes The detail behind the characteristic, for instance "telephone 1", "industry" are attributes. for vendor, and "gross weight", "manufacturer" are attributes for material. A property or characteristic of any entity. An attribute has a name and a value.

Authorization Refers to the security profile for a user.

AWB Administrator Workbench (or Transaction RSA1). The primary dialog in Business Information Warehouse where most of the development and configuration is performed.

BAPI Business Application Programming Interface. A published API that allows third-party software to integrate with SAP software.

BASIS The technical infrastructure of the R/3 implementation, and involved system, database, functional modules, enterprise resource planning, etc.

BDS   Business Document Server/Service. A repository for storing and sharing forms and other document with SAP Dimensional Products.

BEx   Business Explorer. A collection of Visual Basic for Applications macros that enables Microsoft Excel to perform as an OLAP query tool.

BEx Analyzer   Microsoft Excel-based tool used to access and analyze the SAP BW information.

BEx Browser   A front-end used to organize SAP BW queries and reports. It can also be used to organize documents and web addresses, and as a link to SAP R/3 transactions.

BI   Business Intelligence. The term used to define a category of computer applications that enables an organization to model its business.

Brio   A common reporting application used in conjunction with a data warehouse.

Business Content   SAP term for a whole package of R/3 extraction codes, pre-built InfoCubes and reports, organized around specific business areas such as Financials or Human Resources.

Business Explorer   A component of SAP's BW product, which displays reports in MS Excel (with Business Information Warehouse extensions), allowing users to exploit existing skills and familiar MS Excel features to create custom documents on the basis of Business Information Warehouse report views.

Business Intelligence Tools   Software that enables business users to see and use large amounts of complex data. Includes an OLAP (Online Analytical Processing) Software, Query Tools, and Data Mining Tools.

Business Model   A view of a business at a given point in time from the business perspective. The view can also be from a process, data, event, or resource perspective, and of the past, present, or a future state of the business.

BW   SAP Business Information Warehouse (SAP BW), a Data Warehousing solution.

Change Management   Change management is the discipline that provides for the planning, scheduling, tracking, and implementation of changes to enterprise information systems.

Changing Dimensions   A dimension that has level or attribute data that needs to be updated. Data changes in the fields for levels or attributes is one of the most challenging design issues for multidimensional (star schema) data modeling.

Channels   A supply of workbooks in SAP BW arranged according to topic areas. Using the channels of the Business Explorer end users access workbooks that are assigned to him/her.

Characteristic   A criterion to which data can be selected such as company code, product, material, customer group, fiscal year, period, or region. Characteristics provide classification possibilities for the dataset. The master data encompasses the permitted values of a characteristic, the so-called characteristic values. Characteristic values are discrete names. The characteristic region could for example, have the values "north," "central" and "south."

Column (Relational)   Relational object that is a data item within a relational table.

COPA   Controlling and Profitability. A module in the SAP R/3 application suite that enables an organization to model its profitability based on several factors, including the SAP financial model.

CRM   Customer Relationship Management. An applications suite that enables an organization to better serve its customers.

Cube   Also known as a Multidimensional Cube. It is the fundamental structure for data in a multidimensional (OLAP) system. A cube contains dimensions, hierarchies, levels, and measures. Each individual point in a cube is referred to as a cell.

Data Administrator   An individual with an overview of the organization's data, responsible for designing the data model and obtaining agreement about data definitions maintained in the data dictionary.

Data Architecture   Refers to all principles, models, and standards needed to provide the infrastructure by supplying quality information to the businesses to optimize business decisions.

Data Asset Management   Refers to the management of corporate asset—data. It provides a set of management procedures to assure maximizing the potential of corporate data throughout the enterprise and to minimize potential loss of this corporate asset.

Data Cleansing   Removing errors and inconsistencies from data being imported into a data warehouse in order to improve its integrity.

Data Life Cycle   Represents the phases through which data traverses: planning, business definition, technical definition, implementation, employment, deactivation, and destructive phases.

Data Management   A systematic approach to storing, updating, and retrieving information stored as data items where many users will use common databases.

Data Mart   Made up of data structures tailored to support the specific analytical requirements of a given business unit or business function. It has the same characteristics as a data warehouse, but is usually smaller and focused on the data for one division or one workgroup within an enterprise.

Data Mining   Process of finding hidden patterns and relationships in the data. With typical data analysis requirements fulfilled by data warehouses, business users have an idea of what information they want to see. Some opportunities embody data discovery requirements, where the business user wants to correlate sets of data to determine anomalies or patterns in the data.

Data Mining Tools   Software that automatically searches for significant patterns or correlation in the data.

Data Model   A formal description of the business information or IT system information requirements.

Data Warehouse   An integrated store of historical data for strategic decision-making.

Data Warehousing   The process of visioning, planning, building, using, managing, maintaining, and enhancing data warehouses and/or data marts.

Database   A collection of related data, organized to serve one or more independent applications, stored in one or more physical files with security, privacy, and integrity controls.

Database Administrator (DBA)   An individual with an overview of one or more databases who controls the design and use of these databases.

Database Management System (DBMS)   A computer application that enables the physical organization of data in a logical fashion.

DDL   Data Definition Language. The subset of Structured Query Language (SQL) that enables the creation of data structures in a relational database.

Decision Support System (DSS)   A computer system designed to assist an organization in making decisions.

Denormalization   The process whereby, after defining a stable, fully normalized data structure, you selectively introduce data redundancy to facilitate specific performance requirements.

DIM ID   A Dimension ID. The unique identifier for a dimension in a star schema.

Dimension   Categories by which the data in a data warehouse is organized and reported on. For example, sales can be reported by the PRODUCT, REGION, and TIME dimensions.

Dimension Table   In a star schema, a table that contains the data for one of the cube's dimensions. The dimension table has a primary key that is used to connect it to the fact table. The dimension table has one field for each level of each hierarchy contained in the dimension. The data values in these fields become the members of each of the dimension's levels.

Dimensional Data Model   An implementation (physical) data model, generally in a cube, star, or snowflake schema, designed for rapid access to decision support information and tailored to specific query criteria.

DataMart   A repository of data gathered from operational data and other sources that is designed to serve a particular community of knowledge workers. In scope, the data may derive from an enterprise-wide database or data warehouse or be more specialized. The emphasis of a data mart is on meeting the specific demands of a particular group of knowledge users in terms of analysis, content, presentation, and ease-of-use.

Drill Down   Changing the view of the data to a greater level of detail.

Drill Down and Drill Up   The ability to move between levels of the hierarchy when viewing data with an OLAP browser.

Drill Up   Changing the view of the data to a higher level of aggregation.

Drill-Across   Progressively exposes more column details on a report.

Drill-Down   Progressively exposes more row details on a report. Example: "Southeast Region Totals = $5,000" could drill down to "GA Totals = $3,500" and "AL Totals = $1,500."

Drill-Up   Removes a row header or replaces a row header in a report to break down the rows of the answer set in less detail. Example: "East Region Totals = $5,000," "West Region Totals = $10,000," could drill up to "US Totals = $15,000."

DSS   Decision Support System. An automated application system that assists the organization in making business-related decisions.

DW   See Data Warehouse.

EDI   Electronic Data Interchange. A public domain API for exchanging information between computer systems, particularly financial systems.

EDW   Enterprise Data Warehouse. A "master" data warehouse that contains all the necessary information for an organization at the enterprise level.

EIS   Executive Information System. A data warehouse applications that renders key performance indicators, which allow executive management to make beneficial decisions.

Enterprise   An entire company and all of its trading partners.

Entity A set of real-world objects (people, places, things, events, ideas) about which you will record information such as customer and material. Each entity has a name that is a singular noun or noun phrase describing the object it represents.

ERD Entity Relationship Diagram. A graphical representation of the fundamental data elements in a database and the business rules governing the associations among those data elements.

ERM Entity Relation Model. An ERD that can be used to generate a physical database.

ERP Enterprise Resource Planning. A single packaged software solution that integrates all traditional enterprise management functions like financials, human resources, manufacturing, and logistics.

Essbase Essbase is a common reporting application that is widely used.

ETL Extraction, Transformation, Load. A common industry term for the steps to retrieve information from the source systems and place it in the database or data warehouse.

Fact Table In a star schema, the central table, which contains the individual facts being stored in the database.

FI Finance. The finance module of SAP R/3, which includes all accounting and bookkeeping functions.

FI-SL Finance- Special Ledger.

Free Characteristic SAP term for a characteristic that is used in a query. It can be used freely for navigation allowing the user to drill down through the values in the column.

Functional ODS Functional Operational Data Store. An archive of original operational data, not organized for analysis such as DSS.

GIS Geographical Information System. An add-on application that allows the graphical presentation of information based on latitude, longitude, and altitude.

Granularity The level of detail of the facts stored in a data warehouse.

GUI Graphical User Interface. The screens and windows, the part of the system that an end user works with. Synonyms: Front-end, Client.

Guiding Principles Statements of policy or standards that govern the execution of a process. They provide a framework for process definition and implementation and should be consistent with business and IT strategies of the enterprise. The value and validity of principles may be tested by requiring a supporting rationale and assessing the implications of each principle.

Hierarchy Organization of data into a logical tree structure.

HR Human Resources. A module of SAP to manage Human Resources functions such as personnel administration and payroll.

HTML Hyper Text Markup Language. A set of tags that is imbedded in a document to be displayed in a particular format. The tags are interpreted by presentation software that formats the document as it is displayed.

HTTP HyperText Transmission Protocol. A set of rules for exchanging files (text, graphic, images, sound, video, and other multimedia files) on the World Wide Web.

ID Identifier. Also known as Primary Key.

IDES International Demonstration and Education System. A SAP demonstration system and can be used for training purposes.

IDOCS   Intermediate DOCumentS. Data structures used as API working storage for applications, which need to move data in or out of SAP systems.

Index   A separate storage structure within a database that associates each value of one or a set of columns for a given table with a logical storage address for the corresponding row of the table.

InfoAreas   Used, like "folders" in a Windows Explorer environment, to organize InfoCubes and their queries.

InfoCatalog   The front-end collection of queries and reports an end-user sees.

InfoCube   The central data container for queries and evaluations. InfoCubes contain two types of data, namely key figures and characteristics. An InfoCube is a number of relational tables, which is put together according to the star schema: a large fact table in the center, surrounded by several dimension tables. The fact table is set up in order to save all key figures on the lowest level of detail while the dimension tables are used to save the characteristics that are required both in reporting and in the evaluations of these key figures. Dimension tables are seen as being independent of one another. Only the fact table connects the dimensions with the key figures. Therefore all of the data is stored multidimensionally in the InfoCubes.

InfoObject   Describes the technical make-up of characteristics and key figures, for instance field size, field type, decimal places, etc.

Information Resource Management   Manages the planning, organization, administration, control, and protection of enterprise data.

Information Resource Process Model   A set of ordered activities necessary to manage an enterprise's data environment.

Infrastructure   The underlying technological components that comprise an organization's systems architecture. The seven components of an IT infrastructure include: hardware, operating system, network, database, development environment, user interface, and application.

IT   Information Technology. A term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms.

ITS   Internet Transaction Server. The Interface between the SAP BW system and the Internet. The Internet Transaction Server (ITS) allows Internet and Intranet users to communicate directly with the SAP BW system by running standard transactions, function modules, and reports as Internet applications.

Join   Used to match one database table against another based on a condition. Creating a third file with data from the first two is a join. For example, a customer table can be joined with an order table by creating a table of records for all customers who purchased a particular product.

KD   Knowledge Discovery. The end result of Data Mining—discovering useful information from the relationships in your data. One of the innovative business benefits made possible by a data warehouse.

Key Figure   The numeric value used as measures in a report, for instance "invoice amount," "purchase quantity," and so on. Values or quantities such as sales revenue, fixed costs, sales quantity, or number of employees. In addition to the key figures saved on the database, there is a possibility of defining derived (calculated) key figures in the query definition in the Business Explorer. Such key figures are calculated using a formula from

the key figures of the InfoCube. Examples of derived key figures are sales revenue per employee (sales revenue divided by the number of employees), or variance as a percentage or the contribution margin.

KPI   Key Performance Indicator. (1) Predefined calculations that render summarized and/or aggregated information, which is useful in making strategic decisions. (2) Also known as Performance Measure, Performance Metric measures. KPIs are put in place and visible to an organization to indicate the level of progress and status of change efforts in an organization. KPIs are industry-recognized measurements on which to base critical business decisions. In SAP BW, Business Content KPIs have been developed based upon input from customers, partners, and industry experts to ensure that they reflect best practices.

KPIs.   Key Performance Indicators (KPIs),

Latency   The time gap between when a fact enters the system and when it shows up in a report or query.

LIS   Logistics Information Systems. An analytical module in SAP R/3 that allows for the multidimensional analysis and reporting of supply chain information.

LO   Logistics. An enhancement over LIS that allows a clean, straightforward way of moving supply chain information from R/3 into BW.

Logical Data Model   A pictorial representation of a business in data terminology, with supporting terminology and definitions. A logical map of data, which represents the inherent business properties of the data independently of the software, hardware, or machine performance considerations. The model shows data elements / attributes grouped into entities / records, as well as the associations / relationships around those entities / records.

Master Data   The data that remains unchanged over a long period of time. Master data contains information that is needed again and again in the same way. For example, the master data of a supplier contains its name, address, and bank details (branch, sort code, account, etc.).

MDM   Multidimensional Data Model. A particular method for graphically presenting a star schema.

Menus (Favorites/Roles)   Menus (displayed in a folder tree) will include a Favorites folder (which is personal to the individual user) as well as the menu options dictated by the users' authorizations.

Metadata   "Data about the data." Data that describes other data and the data environment, such as information about data stored in data dictionaries, data models, database structures, and so forth. Metadata refers to all the descriptive information needed about the application itself, needed to build reports and queries. Examples: field name, length, data type. A simple example of metadata would be a printed data dictionary report.

Middleware   The software that manages the communications between the front-end client and the back-end database or OLTP.

Model   A representation or pattern of something to be built.

MOLAP   Multidimensional On-Line Analytical Processing. An OLAP that stores data in a multidimensional database.

Multidimensional Analysis   A process of analysis that involves organizing and summarizing data in a multiple number of dimensions.

Navigation   Refers to manipulating the report information in Microsoft Excel using filtering, sorting, slice-and-dice, and drill techniques.

Normalization   The process of organizing data in accordance with the rules of a relational database so that there is no redundancy in the data and all of the data elements are dependent solely on the primary key of each respective record.

ODBC   Open Database Connectivity. An open standard application programming interface (API) for accessing a database. By using ODBC statements in a program, you can access files in a number of different databases, including Access, dBase, DB2, Excel, and Text.

ODBO   Open Database for Objects or OLE DB for OLAP. An interface that enables access multi-dimensional data structures. ODBO enables SAP BW to access an OLAP server.

ODS   Operational Data Store. An archive of original operational data, perhaps untransformed from its original legacy format.

OLAP   On-Line Analytical Processing. A descriptive term for DSS applications, tools, and vendors. OLAP systems are focused on reporting results to end users, not the daily nuts-and-bolts of running the business. Contrast with OLTP.

OLE   Object Linking and Embedding. Microsoft's framework for a compound document technology. A compound document is something like a display desktop that can contain visual and information objects of all kinds: text, calendars, animations, sound, motion video, 3-D, controls, and so forth. Each desktop object is an independent program entity that can interact with a user and also communicate with other objects on the desktop.

OLE DB   OLE DB is Microsoft's strategic low-level application program interface (API) for access to different data sources. OLE DB includes not only the Structured Query Language (SQL) capabilities of the Microsoft-sponsored standard data interface Open Database Connectivity (ODBC) but also includes access to data other than SQL data.

OLTP   On-Line Transaction Processing. The nuts-and-bolts system for entering data and running the business. SAP commonly refers to R/3 as "the OLTP system." There are fundamental differences between OLTP and OLAP systems.

Operational Data   The data required to support the current operational and predictable information system processes of an enterprise. Typically data stored in production system files and databases associated with the enterprise's legacy and application systems.

Operational Data Store (ODS)   An integrated store of current data for tactical decision-making.

OSS   On-Line Support System. A database that contains SAP support information including error reports, notes on problems, and requests for development.

Physical Data Model   A physical implementation map of data, which represents properties in the form of relational tables consisting of rows and columns specific to a DBMS, hardware, and performance considerations.

PM (Plant Management)   The module in SAP R/3 that contains all of the applications needed for plant management.

PP (Production Planning)   The module in SAP R/3 that contains all of the applications needed to plan and execute production.

Process   A set of ordered activities of business functions to achieve a business result.

Process Model   The fundamental areas of responsibility necessary to enable an organization to meet its areas of responsibilities; a process model focuses on what to do, not how to do it.

PSA   Persistent Staging Area. An initial store of data in BW, in which the requested data is saved unchanged for the source system before it is further processed and loaded to ODS and/or InfoCubes.

Query Used to define the data required in the report from the InfoCube.

Query Tools Software that allows the user to ask questions about patterns or details in the data.

Relational Database Management System (RDBMS) A Database Management System based on relational theory in which information is stored in two dimensional data structures made up of rows and columns, where each row represents a single, complete record.

Relationship The representation of the association between entities.

Repository A data dictionary system that serves as a storehouse for all the information that describes a computing environment.

RFC Remote Function Call. A remote function call based upon ActiveX technology. RFC component offers an easy access method to ABAP remote functions and allows a program to call up and process predefined procedures/functions in a remote SAP system.

RNSID Request Set ID. A pointer used in SAP BW to represent the chronological update history defined with a unique key created from the system for each load request and with the request for each data record.

ROLAP Relational On-Line Analytical Processing. OLAP that stores data and aggregations in a relational database.

ROLAP Relational OLAP. The implementation of a multidimensional schema in a relational database.

Row (Relational) An instance of related data items (columns) within a relational table.

RRI Report-to-Report Interface. A method for providing a fastpath from one report to another.

SAP Systems and Application Products in data processing (SAP) is an ERP package.

SAP BW SAP Business Information Warehouse is a data warehousing solution optimized for reporting. It is separate from, but gets most of its information from, SAP R/3.

Schema A representation of the structure of a database (physical or logical). A schema may be expressed in graphic form or in a data definition language.

SCM Supply Chain Management. SAP's product line for supply chain management including several new features, including APO, LES, and Business-to-Business Procurement.

SD Sales and Distribution. A module in R/3 that contains the applications that enable an organization to conduct market activities.

SID Set Ids. Surrogate IDs that provide the pointer/technical link to the master data (attribute, hierarchy, and text) tables.

Slowly Changing Dimensions (SCD) A dimension that has levels or attributes that are changing on an occasional basis. SEE Changing Dimensions.

SQL SQL (Structured Query Language) is a standard interactive and programming language for getting information from and updating a database.

SQL (Structured Query Language) The standard language for accessing relational databases.

Star Schema The Star Schema is the name given to a common DSS data structure, which graphically looks like a star or snowflake.

Star Schema (Business Definition) A method of organizing information in a data warehouse that allows the business information to be viewed from many perspectives. The star is a picture of the way the data is being stored. The basic factual information is in the middle of the star. The points of the star represent various perspectives from

which the factual information can be viewed. In Figure 1, the Shipments can be grouped and viewed from the perspective of any of the five points of the star.

Star Schema (Technical Definition)   A database design that consists of a fact table and one or more dimension tables. Each of the dimension tables has a single-field primary key, which has a one-to-many relationship with a foreign key in the fact table. The star schema is an intentional simplification of a physical database design to increase the performance of certain classes of queries.

Stored Procedures   A named, pre-compiled code module, usually containing SQL statements, that is known to be a database manager and executes at the site of the database manager.

Syndicated Data   Data purchased about clients or markets, from sources such as Equifax or AC Nielsen.

System Landscape   Refers to the overall design of a system.

Table (Relational)   A relational object that is a set of named, related data items (columns), and an arbitrary number of unnamed rows.

TCP/IP   Transmission Control Protocol/Internet Protocol. A simple, layered approach to network connectivity between computer systems on a network.

Transaction Code   A shortcut to a command that you want to perform. Transaction codes are typed into the command field.

Transactional Analysis   The analysis of the data access within a unit of work for an application.

Transformation   (Or Data Transformation). The modification of data as it is moved into the data warehouse, such as splitting or combining data elements, calculations, or changing data types.

TRFC   Transactional Remote Function Call.

URL   Uniform Resource Locator. Provides a unique location for an object in the Internet. It contains:

- The name of the protocol used to access the object
- The name of the server that can generate the document
- The directory path to the file
- The name of the file on the server

Variables   Used in queries to prompt the user to input values when the query is run, for instance, to select a specific vendor for a report.

Variant   A set of variables whose values have been pre-selected and saved as a specific unit. The variant can subsequently be used for a specific purpose without the user typing in all the values. It is a method for passing values to a query executed in a background job.

VBA   Visual Basic for Applications. Microsoft coding language used by many Windows applications including Microsoft Excel and SAP BW.

Workbook   Presents the data retrieved using Microsoft Excel. This can be "navigated" and formatted as required.

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