Ingo Hilgefort

Integrating SAP® BusinessObjects™ BI with SAP NetWeaver®
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Introduction

SAP and SAP® BusinessObjects™ (and former companies Crystal Decisions and Seagate Software) have been delivering integration with SAP Enterprise Resource Planning (ERP) (R/3, R/3 Enterprise) and SAP NetWeaver® Business Warehouse (SAP NetWeaver BW) for over 10 years now. When SAP acquired Business Objects in 2008, the software started to reach a much greater number of customers because SAP positioned SAP BusinessObjects Business Intelligence (BI) as its BI solution on top of SAP NetWeaver BW. The demand for good instruction on how to use the SAP BusinessObjects BI products in an SAP landscape increased, and customers were looking for simple product documentation explaining the usage and deployment of the SAP BusinessObjects BI software with a focus on SAP NetWeaver BW and SAP ERP. Customers were seeking instruction on how to bring their existing knowledge of SAP NetWeaver BW into the SAP BusinessObjects BI world, and this is what I am aiming to teach here. You are holding the updated version of my very first book in your hands—revised to show how customers can use release 4.1 of the SAP BusinessObjects BI platform in combination with their SAP landscape.

### Release 4.1 of SAP BusinessObjects BI Platform

| The official name of release 4.1 of the SAP BusinessObjects BI software is the SAP BusinessObjects Business Intelligence platform, which was previously referred to as SAP BusinessObjects Enterprise. Hereafter, we will refer to it simply as the SAP BusinessObjects BI platform. The instructions and guidelines shown in the book are based on release 4.1 of the software. |

I hope this book gives you a simple but sufficiently technically detailed overview of what you can do with the latest SAP BusinessObjects BI software in combination with your SAP landscape. I wrote this book from an SAP angle to show you how to take advantage of existing knowledge and investment in your SAP system with SAP BusinessObjects BI on top.
Introduction

Target Group
The book is written for those who are looking for simple instructions on how to use and deploy the SAP BusinessObjects BI software in combination with an SAP landscape. The book focuses on putting you in a position to use an SAP BusinessObjects BI system on top of your SAP system, to install and configure the software, and to create your first reports with tools such as SAP Crystal Reports®, SAP BusinessObjects Web Intelligence, SAP BusinessObjects Explorer, SAP BusinessObjects Analysis, SAP BusinessObjects Dashboards (formerly Xcelsius), SAP BusinessObjects Design Studio, and SAP Lumira. It is not the goal of this book to make you an SAP BusinessObjects BI expert or to explain every detailed aspect of the SAP BusinessObjects BI software, because several other resources already fulfill such a need.

As a reader of this book, you should have some previous knowledge of SAP NetWeaver BW and SAP ERP. On the SAP BusinessObjects side, I tried to keep the need for previous knowledge as minimal as possible. You should be able to follow this book even without any SAP BusinessObjects BI knowledge, but you should consider further product documentation and training.

Technical Prerequisites
All steps and examples in this book are based on SAP BusinessObjects release 4.1 in combination with an SAP NetWeaver BW 7.x and SAP ECC 6.0 system.

You can download the SAP BusinessObjects BI software from the SAP Service Marketplace or from the DOWNLOADS section of the SAP Community Network (SCN). The book is very practical, so I highly recommend that you download the following components so you can follow all outlined steps:

- SAP BusinessObjects BI platform 4.1
- SAP Crystal Reports for Enterprise 4.1
- SAP Crystal Reports 2013
- SAP BusinessObjects Dashboards 4.1
- SAP BusinessObjects Analysis, edition for Microsoft® Office® 1.4
- SAP BusinessObjects Analysis, edition for OLAP 4.1
- SAP BusinessObjects Design Studio 1.1
- SAP BusinessObjects Explorer 4.1
- SAP Lumira 1.0, service pack 11
You should ensure that you have access to an SAP NetWeaver BW and SAP ERP system so that you can follow the examples. If you can’t get access to an existing system, you can download a trial version of SAP NetWeaver via the DOWNLOADS section of the SAP Community Network (SCN).

**Structure of the Book**

When this project started, I wasn’t sure whether I would be able to explain the topic in enough detail and yet still keep this a simple book that doesn’t overwhelm the reader. In each chapter, I try to give you a very practical and step-by-step approach to using the software so you’ll have very quick and early success with it.

Here is an overview of the content of the chapters.

- **Chapter 1: SAP BusinessObjects BI and SAP NetWeaver Overview**  
  This chapter introduces you to the SAP BusinessObjects BI platform and the SAP BusinessObjects suite of BI client tools that you will use in the following chapters. You’ll get a brief overview of the main parts of the SAP BusinessObjects BI platform components and take a quick look at the purpose of each of the tools.

- **Chapter 2: Installation and Configuration**  
  In Chapter 2 you’ll learn how to install and configure the SAP BusinessObjects BI platform server and client components. You’ll receive step-by-step instructions on the installation of the software, the configuration steps on the SAP BusinessObjects BI platform side, and the configuration steps on the SAP NetWeaver side.

- **Chapter 3: Semantic Layer and Data Connectivity**  
  In Chapter 3 you’ll learn about the role of the semantic layer from SAP BusinessObjects BI as part of your overall BI landscape and get details on how you can establish data connections to your SAP systems with the SAP BusinessObjects BI tools.

- **Chapter 4 to Chapter 12: SAP BusinessObjects BI tool chapters**  
  In Chapter 4 to Chapter 12 you’ll receive an overview of how each of the SAP BusinessObjects BI tools is able to connect to your SAP system and what the supported elements are. In addition, each of these chapters includes step-by-step instructions on how you can use the client tool to create your first report, ad hoc analysis, or dashboard on top of your SAP data. Topics new to this edition include brand new chapters on SAP BusinessObjects Design Studio and SAP Lumira.
Chapter 13: Publications with SAP Data-Level Security
Publications are the SAP BusinessObjects BI counterpart to the information broadcasting capabilities of SAP NetWeaver. In this chapter you'll receive details on how to configure your SAP and SAP BusinessObjects BI system to use publications with your configured SAP authorizations and distribute reports and analytics to a large number of recipients.

Chapter 14: Integration with SAP NetWeaver Portal
In this chapter you'll learn the necessary steps to integrate your SAP BusinessObjects BI system into SAP NetWeaver Portal. You'll learn how to create iViews based on SAP BusinessObjects BI templates and how to integrate your SAP BusinessObjects BI system with the Knowledge Management component of SAP NetWeaver Portal.

Chapter 15: Integrating SAP BusinessObjects Lifecycle Manager with CTS+
In this chapter you'll learn the necessary steps to integrate your SAP BusinessObjects BI system into your existing lifecycle management solution on the SAP NetWeaver BW side and to configure both environments so that you can use your SAP system transports in combination with SAP BusinessObjects BI.

Chapter 16: Troubleshooting and Tips
In this chapter you'll receive additional details on how to trace and troubleshoot your SAP BusinessObjects BI deployment. You'll also receive tips on performance-related questions.

Chapter 17: Outlook
This chapter offers a brief outlook on topics that might be of interest for you and your deployment. These topics are part of the integration roadmap given out by SAP and SAP BusinessObjects BI, but were technically not finalized at the time this book was written.

Acknowledgments
Special thanks go to the team from SAP PRESS, who made it possible for me to focus on the writing and not to worry about style, layout, or publishing a book. Thank you, Kelly Weaver—without you this would not have happened. I cannot forget to mention the SAP community here, which always provides excellent feedback and input.

In addition, I would like to thank the following people for providing their valuable feedback during the updating of this book:
Tammy Powlas, Fairfax Water and ASUG BI Community
Joyce Butler, Cameron International and ASUG BI Community

Finally, many thanks to Gaby, Ronja, and Sally for giving me the time to write, but more importantly, for giving me great writing breaks even while writing my 11th book.
In this chapter we review the different options for using semantic layer technology as part of the SAP BusinessObjects BI stack to connect to your SAP system.

3 Semantic Layer and Data Connectivity

The goal of this chapter is to review the options for connecting the data in your SAP systems and to explain the role the semantic layer plays in the overall SAP BusinessObjects BI stack. This chapter does not review the actual steps for creating the different connections, as these are discussed in the chapters about each of the BI products.

3.1 Semantic Layer Terminology

Before we discuss the details of data connectivity for your SAP system, we should clarify some key terms that are used not only in this book but also in other published materials.

- The semantic layer is a technology that is part of the SAP BusinessObjects BI stack. It allows you to expose a given data source to your end users with user-friendly business terms.
- Universes are artifacts created using the Information Design Tool (starting with the SAP BusinessObjects BI platform 4.0 release) or the Universe Designer (previous releases). Universes represent a model using a data connection and a business term and can be used by most of the SAP BusinessObjects BI tools to expose the information to your end users.
- Dimensional universes are one form of universe, focusing on multidimensional capabilities such as hierarchies.
- Relational universes are another form of universe, presenting business terms in a flat view to your end users.
Multisource universes allow the combination of multiple data sources into a single universe, presenting a single logical view to your end users.

BI Consumer Services (BICS) is a direct-access option provided by the semantic layer. The BICS connectivity option allows the semantic layer to expose a BEx query directly to the SAP BusinessObjects BI tools without the need to create a universe.

The Information Design Tool is the client tool that allows you to establish data connections to data sources and expose them to your end users in the form of business layers.

Universe Designer is the previous version of the Information Design Tool for the SAP BusinessObjects XI 3.1 release.

All of the above are elements and components of the overall semantic layer as part of the SAP BusinessObjects BI environment.

Note that as part of SAP BusinessObjects BI, all the BI client products try to remain consistent in the terms they use. It is important to acknowledge that all the SAP BusinessObjects BI products are moving away from using the terms specific to SAP NetWeaver BW and are instead focusing on common terminology.

Table 3.1 shows the terms previously used by SAP NetWeaver BW and the matching terms for the SAP BusinessObjects BI platform.

<table>
<thead>
<tr>
<th>BEx Query Terms</th>
<th>SAP BusinessObjects BI Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key figure</td>
<td>Measure</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Dimension</td>
</tr>
<tr>
<td>Variable</td>
<td>Prompt</td>
</tr>
<tr>
<td>Characteristic value</td>
<td>Member</td>
</tr>
<tr>
<td>Condition</td>
<td>Filter by measure</td>
</tr>
<tr>
<td>Exception</td>
<td>Conditional formatting</td>
</tr>
</tbody>
</table>

Table 3.1 Terms Used in SAP BusinessObjects BI
3.2 **Data Connectivity Overview for SAP Landscapes**

In this section we review the options that you have to connect from your SAP BusinessObjects BI tools to the different SAP landscapes. We look at the data connectivity options for SAP NetWeaver BW, SAP ERP, and SAP HANA.

As shown in Figure 3.1, you have two main options to connect to the SAP NetWeaver BW system. You can use a direct access method that uses BICS to expose a BEx query to the SAP BusinessObjects BI tools. The alternative is to create a universe as part of the semantic layer on top of the relational schema of SAP NetWeaver BW.

As you can see in Figure 3.1, SAP Crystal Reports and SAP BusinessObjects Web Intelligence are able to use direct connectivity using the BICS interface and connecting to
BEx queries. They can also use an authored universe based on the SAP NetWeaver BW Info Provider level. In addition to these options, you can still use an XI 3.1 Universe (UNV) based on a BEx query in your SAP BusinessObjects BI platform in combination with SAP BusinessObjects Web Intelligence.

Figure 3.2 shows the data connectivity for SAP BusinessObjects Explorer; SAP BusinessObjects Analysis, edition for Microsoft Office; SAP BusinessObjects Analysis, edition for OLAP; and SAP Lumira. As you can see in Figure 3.2, the SAP BusinessObjects Analysis products are able to use direct connectivity to the BEx queries, and SAP BusinessObjects Explorer is able to use the relational universe based on the SAP NetWeaver BW InfoProvider. SAP BusinessObjects Explorer is not able to use connectivity to the BEx query layer, and the SAP BusinessObjects Analysis products are not yet able to use universe-based connectivity. In addition to these options, you will also notice that SAP Lumira (formerly SAP Visual Intelligence) and SAP BusinessObjects Explorer are able to use direct connectivity to SAP HANA in the case of SAP NetWeaver BW on SAP HANA. We discuss the option to expose your SAP NetWeaver BW InfoProvider to SAP HANA in the form of an analytic view later in this chapter.

**Figure 3.2** Data Connectivity for Discovery and Analysis
Figure 3.3 shows the data connectivity for SAP BusinessObjects Dashboards and SAP BusinessObjects Design Studio. Both of these tools can use direct connectivity to BEx queries. In addition, SAP BusinessObjects Dashboards can also use connectivity based on the relational universe layer.

In addition to data connectivity for SAP NetWeaver BW, your SAP BusinessObjects BI platform also provides you with the ability to set up data connectivity to your SAP ERP system. As shown in Figure 3.4, most of the SAP BusinessObjects BI tools—with the exception of SAP BusinessObjects Design Studio; SAP BusinessObjects Analysis, edition for Microsoft Office; and SAP BusinessObjects Analysis, edition for OLAP—can use an authored universe based on the SAP ERP system. The universe can provide data connectivity to classic InfoSets, ABAP queries, and ABAP functions from your SAP ERP system.

Figure 3.5 shows an additional option for connecting to the SAP ERP system. By activating the BI client of your SAP ERP system you can also use the transient provider (which requires SAP ERP 6.0, enhancement package 05 or higher). This
allows a direct connection using a BEx query based on a transient provider and based on classic InfoSets in your SAP ERP system.

Figure 3.4  Authored Access for SAP ERP

Figure 3.5  Direct Access for SAP ERP
3.3  Data Connectivity for SAP NetWeaver BW

In this section, we talk about two ways to access the SAP NetWeaver BW system: direct access and relational access. We then give some information about data connectivity for SAP NetWeaver BW on SAP HANA. Finally, we talk about SAP NetWeaver BW’s metadata support for the different SAP BusinessObjects BI tools.

3.3.1  Direct Access to SAP NetWeaver BW via BICS

SAP BusinessObjects BI provides you with the option to expose a BEx query directly to tools such as SAP BusinessObjects Analysis, edition for Microsoft Office, and SAP Crystal Reports for Enterprise. This direct connectivity to the SAP NetWeaver BW system is based on BICS and exposes all the necessary metadata to the SAP BusinessObjects BI software.

The following are the advantages of direct access to SAP NetWeaver BW:

- Reuse of existing BEx queries.
- Shared connectivity across all SAP BusinessObjects BI tools.
- True hierarchical metadata and data.
- A single connection to point to multiple BEx queries.
- Advanced BEx query elements, such as restricted and calculated key figures, formulas, and custom structures.

The following are the disadvantages of direct access to SAP NetWeaver BW:

- Does not allow for customization of metadata.
- Does not allow for the creation of custom objects.
- Does not allow for administration limits such as a connection timeout on the SAP BusinessObjects BI stack.
- Does not allow for the creation of universe-based parameters. All parameters need either to be based on variables in the BEx query or to be created as parameters on a report level.

Using direct access to SAP NetWeaver BW requires establishing a connection in the CMC of your SAP BusinessObjects BI system, which we explain in detail in the chapters about each of the BI products.
3.3.2 Relational Access to SAP NetWeaver BW

In addition to direct access to the SAP NetWeaver BW system, the semantic layer also offers you the option to create a relational or multisource universe on top of SAP NetWeaver BW. The relational interface on top of SAP NetWeaver BW provides the option to create a universe on top of the SAP NetWeaver BW system and to combine data coming from SAP NetWeaver BW with other data sources using a multisource universe.

The following are advantages of relational access to SAP NetWeaver BW:

- Allows direct access to the InfoProvider level.
- Allows combining multiple data sources into a single logical view.
- Allows customization of the metadata.
- Allows creation of custom objects.

The following are disadvantages of relational access to SAP NetWeaver BW:

- No support for external SAP NetWeaver BW hierarchies.
- No support for restricted and calculated key figures.
- No support for custom structures.
- No support for SAP variables.

As you can see, relational access provides access to the bare minimum of information about the necessary InfoProvider. The factors listed as disadvantages are not impossible to overcome, but those components need to be re-created as part of the universe and cannot be used as preexisting objects in SAP NetWeaver BW.

Table 3.2 shows possible workarounds for the most important metadata from your SAP NetWeaver BW system and how you might be able to re-create it as part of the universe.
### BEx Query Elements vs. Relational Universe

<table>
<thead>
<tr>
<th>BEx Query Elements</th>
<th>Relational Universe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated/restricted key figures</td>
<td>Define calculated measures as part of the universe.</td>
</tr>
<tr>
<td>Variables</td>
<td>Define prompts as part of the universe or SAP Business-Objects Web Intelligence query panel. Not possible for exit variables or variables filled through authorizations.</td>
</tr>
<tr>
<td>Currency and unit conversion</td>
<td>Possible with manual modeling of tables with conversion rates in the SAP BusinessObjects Universe Designer and joins in the Data Federator interface.</td>
</tr>
<tr>
<td>Display attributes</td>
<td>Possible with joins from an InfoProvider to the master data tables in the universe.</td>
</tr>
<tr>
<td>External BW hierarchies</td>
<td>No workaround.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Use filters on measures.</td>
</tr>
</tbody>
</table>

**Table 3.2 Possible Workarounds**

---

**Further Details**

You can find further details on the relational interface for SAP NetWeaver BW at this URL: [http://help.sap.com/saphelp_nw70ehp2/helpdata/en/e3/e60138fede083de10000009b38f8cf/frameset.htm](http://help.sap.com/saphelp_nw70ehp2/helpdata/en/e3/e60138fede083de10000009b38f8cf/frameset.htm)

The relational access approach with a universe can be used in combination with SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, SAP BusinessObjects Dashboards, and SAP BusinessObjects Explorer.

### 3.3.3 SAP NetWeaver BW on SAP HANA

In addition to the previously mentioned data connectivity, you also have the ability to use your SAP NetWeaver BW models in combination with SAP HANA when your SAP NetWeaver BW system runs on SAP HANA.

Figure 3.6 shows a high-level architecture of the scenario where you are exposing an SAP NetWeaver BW–based InfoProvider via SAP HANA Studio to the end user in the form of an SAP HANA model.
Such a scenario consists of two main steps:

1. First, configure the SAP NetWeaver BW InfoProvider or BEx query in SAP NetWeaver BW so that they can be exposed in the form of an SAP HANA model.

2. Second, use SAP HANA Studio to import the SAP NetWeaver BW model into SAP HANA. After the import, any of the SAP BusinessObjects BI products can use the SAP HANA model.

This integration is especially relevant for SAP BusinessObjects Explorer, SAP Lumira, and SAP Predictive Analysis, as these tools do not have direct connectivity to the BEx query. As such, this integration with SAP NetWeaver BW on SAP HANA is the best way to connect to SAP NetWeaver BW data at this time (October 2013).

We will take a closer look at the integration of SAP NetWeaver BW with SAP HANA in the chapters on SAP Lumira and SAP BusinessObjects Explorer.
If you are using SAP NetWeaver BW on SAP HANA and are interested in publishing an SAP NetWeaver BW InfoProvider or BEx query in the form of an SAP HANA model, refer to SAP Note 1764251 for the latest updates.

### 3.3.4 Support for Metadata

Now we’ll show the different levels of support for the elements from your SAP NetWeaver BW system across the different tools. In Table 3.3 through Table 3.14, the columns shown for the separate products assume direct connectivity to SAP NetWeaver BW via direct BICS data connectivity. The columns for SAP BusinessObjects Explorer and relational universes assume data connectivity using the relational universe option on top of SAP NetWeaver BW. In addition to these two options, SAP BusinessObjects Explorer can also use direct connectivity to SAP NetWeaver BW Accelerator and use the preexisting indexes.

As shown in Table 3.3, you can see that support for the most common metadata elements is relatively similar.

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>InfoProvider</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Dimension</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Characteristics</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Key Figures</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Free Characteristics</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Restricted Key Figures</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Table 3.3** Support for Common BEx Query Elements
Defaults defined in the BEx query (not to be confused with default values for variables) are only supported by SAP BusinessObjects Analysis, edition for Microsoft Office; SAP BusinessObjects Analysis, edition for OLAP; and SAP BusinessObjects Design Studio.

Table 3.4 shows the level of support for custom structures. As you can see, the relational universe cannot use custom structures because it is based upon SAP NetWeaver BW InfoProviders.

In addition, SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards cannot use a hierarchically organized custom structure based upon key figures.
Table 3.4  Support for Custom Structures

Table 3.5 shows the support for the data types that are available in SAP NetWeaver BW. Notice that support for the data types date (DATS) and time (TIMS) is limited for SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards.
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMC (Characteristics)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CHAR (Characteristics)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DATS (Characteristics)</td>
<td>Yes</td>
<td>Yes</td>
<td>Key value as string, description value as date</td>
<td>Key value as string, description value as date</td>
<td>Key value as string, description value as date</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TIMS (Characteristics)</td>
<td>Yes</td>
<td>Yes</td>
<td>As string value only</td>
<td>As string value only</td>
<td>As string value only</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Amount and Quantity (Key Figures)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DATS (Key Figures)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TIMS (Key Figures)</td>
<td>Yes</td>
<td>Yes</td>
<td>As string value only</td>
<td>As string value only</td>
<td>As string value only</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Information About Configured Filters in the BEx Query</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>BEx Text Elements</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Table 3.5** Support for Data Types
Table 3.6 shows the support for the different types of variables you can create as part of your BEx query. As mentioned already, the relational universe on top of SAP NetWeaver BW does not support those variables. Some key items to be aware of include the following:

- A selection option variable is fully supported only by the SAP BusinessObjects Analysis products. All other BI clients turn the selection option variable into an interval variable.
- Hierarchy version variables are not supported by SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, or SAP BusinessObjects Dashboards.
- SAP BusinessObjects Dashboards combined with the BICS connectivity provided by SAP BusinessObjects BI offers proper variable support only for single-value and multi-single-value variables. Hierarchy and hierarchy node variables are supported but lack the cascading factor, which means the list of nodes is not updated after you select a hierarchy.

<table>
<thead>
<tr>
<th>Optional Variables</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Characteristic Value Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Formula Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hierarchy Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hierarchy Node Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hierarchy Version Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Key Date Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Text Variables</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 3.6  Support for Variables
Table 3.7 shows the support for the different variable processing types. In this area you have only one limitation for SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards: the limited use of the Replacement Path option.

Table 3.7 Support for Variable Processing Type

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User Entry/Default Value</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Replacement Path</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Customer/SAP Exits</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Authorizations</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 3.7 Notes

* To be able to use BEx queries with SAP Crystal Report for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards, the BEx queries need to be configured to allow external access in BEx Query Designer. For limits of BEx queries that are released for external access, please also take a look at SAP Note 820925.

Specifically for the Replacement Path variable processing type, note that variables with Replacement From Query Result are not supported if the query has variables that are ready for input.

Table 3.8 shows the support for the different variable representation options. Notice that SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards do not fully support the Selection Option variable but instead create an interval variable.
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Value</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes**</td>
</tr>
<tr>
<td>Multiple Single Value</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes**</td>
</tr>
<tr>
<td>Interval/Range Value</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes**</td>
</tr>
<tr>
<td>Selection Option</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Yes</td>
<td>No</td>
<td>Yes**</td>
</tr>
<tr>
<td>Selection Option Operator Functionality (except Contains Pattern)</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Yes</td>
<td>No</td>
<td>Yes**</td>
</tr>
<tr>
<td>Selection Option Operator Functionality (Contains Pattern)</td>
<td>No</td>
<td>No</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Selection Option Includes/Excludes Functionality</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Yes</td>
<td>No</td>
<td>Yes**</td>
</tr>
<tr>
<td>Precalculated Value Set</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes**</td>
</tr>
</tbody>
</table>

**Table 3.8** Support for Variable Presentation

**Table 3.8 Notes**

* SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards create range variables for a selection option variable from a BEx query. In addition, the option to include or exclude values and to select an operator is not supported.
SAP BusinessObjects Design Studio 1.1 does offer a prompting UI that can be triggered using the scripting, but it is recommended to set the variable value via scripting.

Table 3.9 shows the support for a set of basic variable functionalities, such as the option to manually enter values. There are several limitations in this area:

- SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards do not offer the ability to manually enter a value for a BEx variable, which means that the user has to load a list of values before selecting the value from the list.
- SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards do not support variables that are placed in the DEFAULTS area of the BEx query.
- BEx queries with multiple key date variables are not supported by SAP BusinessObjects Web Intelligence or SAP BusinessObjects Dashboards.

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</thead>
<tbody>
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<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>N/A</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Variables in DEFAULTS Area for BEx Query</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Single Key Date Variable</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Multiple Key Date Variables in Single BEx Query</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 3.9 Support for Variable Functionalities
Table 3.9 Support for Variable Functionalities (Cont.)

Table 3.10 shows the level of support for conditions and exceptions. Full support for conditions and exceptions is only available with SAP BusinessObjects Analysis, edition for Microsoft Office, and SAP BusinessObjects Analysis, edition for OLAP. Limitations include the following:

- The support for conditions is limited to the SAP BusinessObjects Analysis products in the SAP BusinessObjects 4.1 release.
- Exceptions are supported only by the SAP BusinessObjects Analysis products. For products such as SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards, you can use the functionality each of these tools provides to achieve the same goal. For example, you can use highlighting and conditional formatting in SAP Crystal Reports for Enterprise and alerts in SAP BusinessObjects Web Intelligence.
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</thead>
<tbody>
<tr>
<td>Currency/Unit Conversion (from BEx query)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
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<td></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Possible with manual modeling</td>
<td>No</td>
<td></td>
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</tr>
<tr>
<td>Condition in Rows (from BEx query)</td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>Yes</td>
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<td></td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>Yes</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition for Fixed Set of Characteristics (from BEx query)</td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>Yes</td>
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<td></td>
</tr>
<tr>
<td>Condition for Independent Characteristics (from BEx query)</td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.10  Support for Conditions and Exceptions
### Table 3.10  Support for Conditions and Exceptions (Cont.)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Defining Conditions in the Report</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Yes*</td>
<td>No</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Exceptions (from BEx query)</td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>N/A</td>
<td>No, not planned for future release</td>
<td>Yes</td>
</tr>
<tr>
<td>Defining Exceptions in the Report</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Constant Selection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 3.10 Note

* The tools are able to create condition type filters (for example, top N) in the report, but these filters are applied after the data has been retrieved from SAP NetWeaver BW.

Table 3.11 shows the level of support for another set of multidimensional capabilities in combination with BEx queries. Note the following limitations:

- The option to configure a so-called local calculation (for example, a ranking) as part of a BEx query is only supported by SAP BusinessObjects Dashboards and the SAP BusinessObjects Analysis products. If you use a BEx query configured with such a local calculation with SAP Crystal Reports for Enterprise or SAP BusinessObjects Web Intelligence, the key figure with this configuration will not be available as part of the metadata; it will be removed and not shown in the tool.
- SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards do not support zero suppression as part of the data connectivity to a BEx query.

- SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards have limited support with BEx queries that use the Cell Editor.

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Cell Editor Calculation</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited*</td>
<td>Limited*</td>
<td>Limited*</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Local Calculations (from BEx query)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Defining Calculations in the Report (runtime)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Exception Aggregation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Zero Suppression</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Read Mode for Characteristics (master data, InfoCube)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Table 3.11** Support for Multidimensional Capabilities

**Table 3.11 Note**

* SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards support BEx queries with two structures and cell definitions created with the Cell Editor. However, in cases where the cell definition combines different data types, the resulting output in these tools will be a string value instead of a numeric value.
Table 3.12 outlines the support for the most common display settings from the BEx query. The defined scaling factor for a key figure is used and the correct result set is shown. The scaling factor is shown as a separate field for each of the key figures configured with a scaling factor in SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, and SAP BusinessObjects Dashboards. For both of the SAP BusinessObjects Analysis products the scaling factor is shown automatically as part of the result set.

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<tr>
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<tbody>
<tr>
<td>Scaling Factor</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td>Reverse Sign (+/-)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td>Number of Decimals</td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td>Hide/Show the Element</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td>Sort Characteristics</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td>Display Options for Characteristics (KEY, KEY &amp; TEXT, TEXT)</td>
<td>Yes</td>
<td>Yes</td>
<td>Elements can be included as part of the report design</td>
<td>Elements can be included as part of the report design</td>
<td>Elements can be included as part of the report design</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td>Result Rows (SHOW, SUPPRESS)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
</tbody>
</table>

Table 3.12  Support for Common Display Settings
In addition to the support for the metadata that we’ve discussed in this section, it is also important to understand the different level of hierarchical functionality that is available when using a BEx query with hierarchies as data sources. Table 3.13 shows that all of the SAP BusinessObjects BI tools support the different hierarchy types from SAP NetWeaver BW.

Table 3.12 Note

* For SAP BusinessObjects Design Studio 1.1: possible to define at design time, but not possible to define or change at runtime.

Table 3.13  Support for Hierarchies: Part 1
Table 3.14 shows the differences in the BI tools' abilities to use a hierarchy and compares the different BI tools along a range of hierarchical functionality. Notice that the advanced capabilities, in particular, are only available with the SAP BusinessObjects Analysis suite—SAP BusinessObjects Analysis, edition for Microsoft Office; SAP BusinessObjects Analysis, edition for OLAP; and SAP BusinessObjects Design Studio. For example, the option to use the DISPLAY AS HIERARCHY setting from the BEx query is only supported in the SAP BusinessObjects Analysis products. For the other BI clients such as SAP Crystal Reports for Enterprise and SAP BusinessObjects Web Intelligence there are options to design the report in a similar way.

The following capabilities are only available with the SAP BusinessObjects Analysis suite:

- Skipping levels of a hierarchy
- Showing leaf members only
- Ranking data according to a hierarchy
- Exchanging hierarchies in the BI tool
- Expanding to level functionality
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</tr>
</thead>
<tbody>
<tr>
<td>Hierarchical Member Selection (nodes and leafs)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (only as filter)</td>
<td>No</td>
<td>Yes*</td>
<td></td>
</tr>
<tr>
<td>Member Selection Based on Hierarchy Levels</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes*</td>
</tr>
<tr>
<td>Show Specific Hierarchy Levels</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Yes*</td>
<td></td>
</tr>
<tr>
<td>Skip Levels of Hierarchy</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Show Leaf Members Only</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Ranking Data Along a Hierarchy</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Exchange of Hierarchies in the BI Client Tool</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Expand to Level Functionality (BEx Query Designer)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td>Expand to Level Functionality (runtime)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>N/A</td>
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Table 3.14  Support for Hierarchies: Part 2
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<tbody>
<tr>
<td><strong>Compact Axis in the Rows</strong> (Display as Hierarchy)</td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td><strong>Compact Axis in the Columns</strong> (Display as Hierarchy)</td>
<td>Yes</td>
<td>Yes</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>No, not planned for future release</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td><strong>Hierarchical Report Design</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Yes*</td>
</tr>
<tr>
<td><strong>Hierarchical Charting</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>No</td>
</tr>
</tbody>
</table>

**Table 3.14** Support for Hierarchies: Part 2 (Cont.)

**Table 3.14 Note**

* For SAP BusinessObjects Design Studio 1.1: possible to define at design time, but not possible to define or change at runtime.

Based on the superior support for your existing SAP NetWeaver BW metadata and the option to share metadata across all the SAP BusinessObjects BI tools, we highly recommend using direct connectivity to SAP NetWeaver BW via the BICS connectivity option. The connectivity option provided by the relational universe can be a compelling option for scenarios where you need to combine data stored in SAP NetWeaver BW with another data source. So, as a rule of thumb, use the
direct BICS connection to BEx queries unless you want to combine SAP NetWeaver BW with another data source.

### 3.4 Data Connectivity for SAP ERP

As we briefly introduced in Section 3.2, you have several options to connect directly to the information in your SAP ERP system (refer back to Figure 3.4 and Figure 3.5). You can create a universe based on classic InfoSets, SAP queries, and ABAP functions. These universes can then be used by SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, SAP BusinessObjects Dashboards, and SAP BusinessObjects Explorer.

SAP Crystal Reports 2013 offers the same data connectivity options that were available with SAP Crystal Reports 2011, which means that SAP Crystal Reports 2013 can connect directly to classic InfoSets, SAP queries, ABAP functions, and tables in your SAP ERP system.

An alternative to the universe-based approach is to use the transient provider, which is available with SAP ERP 6.0, enhancement package 05, and to use the direct access method with the BICS layer. This then can be used by SAP Crystal Reports for Enterprise; SAP BusinessObjects Web Intelligence; SAP BusinessObjects Dashboards; SAP BusinessObjects Design Studio; SAP BusinessObjects Analysis, edition for Microsoft Office; and SAP BusinessObjects Analysis, edition for OLAP. The semantic layer can use a classic InfoSet, ABAP functions, and SAP queries as data sources. Figure 3.7 shows the list of sources that are available when you establish a data foundation on top of an SAP ERP system.

Each export that is part of an ABAP function is returned as a single table (see Figure 3.8) in the semantic layer, and input parameters from ABAP functions or InfoSets are returned as input columns for these tables (see Figure 3.9). In addition, each input for an ABAP function and each table from an ABAP function are also presented as input columns. If the input is configured as an actual table, each field of the table definition is presented as an input column.
Figure 3.7  Data Foundation

Figure 3.8  BAPI_SFLIGHT_GETLIST

Figure 3.9  Input Columns
Figure 3.10 shows the resulting table of the function BAPI_SFLIGHT_GETDETAIL, where you can identify the result set being returned as part of the table FLIGHTDATA, and the first set of columns are marked as input columns.

This new capability of creating a semantic layer on top of your SAP ERP system allows you to go beyond SAP Crystal Reports 2013 for your operational reporting; you can use a single definition of the metadata for SAP Crystal Reports for Enterprise, SAP BusinessObjects Web Intelligence, SAP BusinessObjects Dashboards, and SAP BusinessObjects Explorer.

We will provide you with a step-by-step approach to create a universe on top of SAP ERP in Section 4.2 in Chapter 4.
Recommendation for SAP ERP Access

We are often asked whether customers can report on top of their SAP ERP system without the need to create a complete data warehouse. The simple answer is “Yes.” But you need to keep in mind that in such a scenario you are using your operational system for reporting and that you are putting an additional load—in addition to running your business—on the system. This is something you always should keep in mind when creating reports and analytics directly from the SAP ERP system.

There is, of course, a need to have real-time information, and there are even systems that have no data warehouse as part of the overall landscape. From a technical viewpoint, it is possible to report on top of an SAP ERP system without a complete data warehouse. However, when considering this option, you have to remember that your SAP ERP system might not be sized for the additional load. In such scenarios, using SAP BusinessObjects BI capabilities (such as scheduling a report and creating a publication, where you schedule a report for several users in a single step) will help to mitigate the risk that the reporting and analytics aspects impose on your day-to-day business operations.

3.5 Summary

In this chapter, you received an overview of the different connectivity options you can use as part of your SAP BusinessObjects BI platform. You learned some of the advantages and disadvantages of each connectivity option, and you should now have a better understanding of which type of connectivity is best for your requirements. In the next chapter we discuss SAP Crystal Reports for Enterprise and SAP Crystal Reports 2013, and provide step-by-step instructions for connecting SAP Crystal Reports to your SAP system.
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