

Best Practices: Crystal Reports with SAP BW



Applies to:

SAP BusinessObjects BI 3.x, Crystal Reports 2008 and SAP BI NetWeaver 2004s. For more information, visit the [EDW homepage](#).

Summary

Crystal Reports is a business intelligence application used to design and generate reports from a wide range of data sources. As a product from SAP's suite of analytic offerings, Crystal Reports comes with tighter integration with SAP BW.

This document provides the essential and time-saving tips and tricks of creating formatted reports using Crystal Reports by means of accessing data stored in SAP BW.

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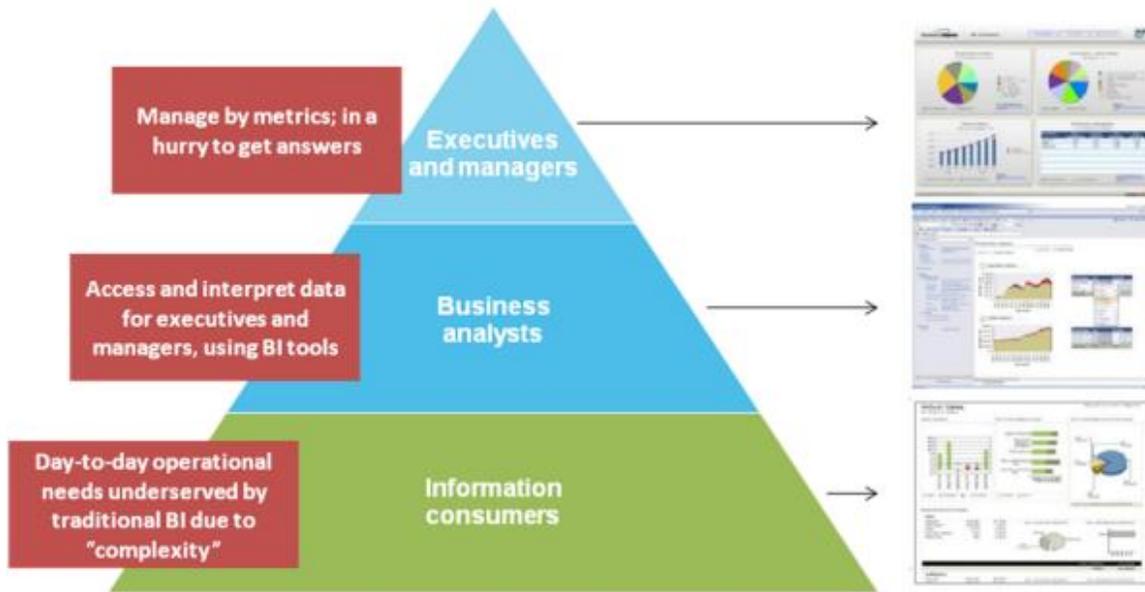
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Overview

Crystal Reports allows business users to build a wide range of formatted reports, from a statutory report addressing legal requirements to financial reports with end-user interactivity. Integration of Crystal reports and SAP BW (SAP NetWeaver BW) enables a verity of options for creating pixel precise reports for enterprise. This paper presents a perspective into the recommendations and best practices for Crystal Reports development with SAP BW. Goal of this document is to accelerate the deployment of Crystal Reports and avoid common mistakes by developers trying their hands for first time with SAP BW based data connections.

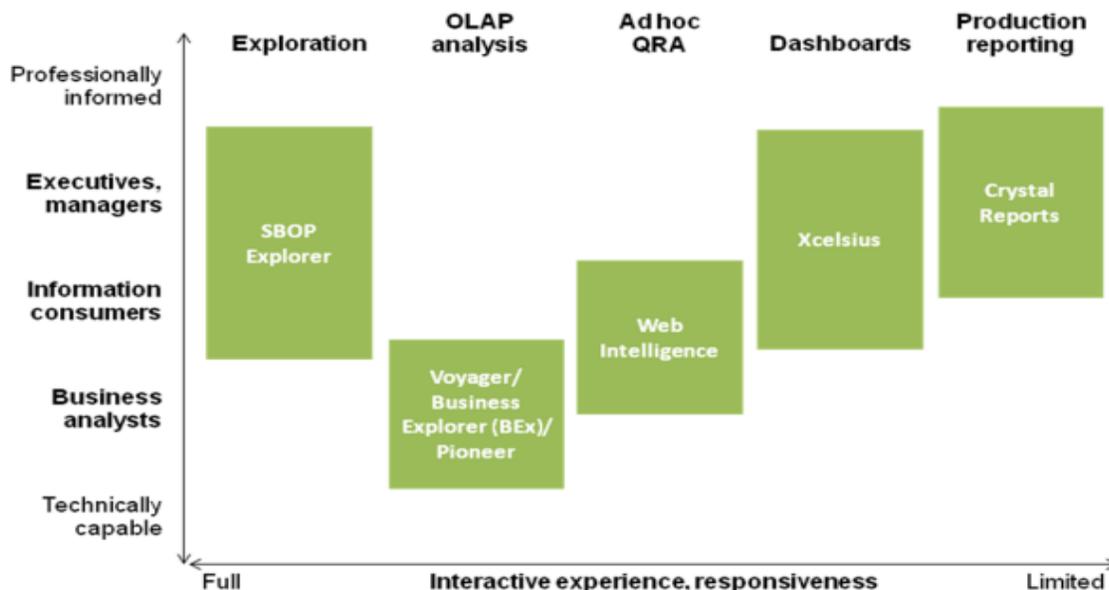
The Right Tools for Every Business Role

There has to be an appropriate tool for addressing specific reporting requirements of user community.



Mapping the Right Tool to the Right Scenario

According to the scenario, selection of tool should happen. BusinessObjects provides a variety of tools for different information needs.



BI Solution: Enterprise Reporting (Crystal Reports)

It is the market-leading standard in enterprise reporting that provides connectivity to any type of data and empowers all end users with a simple and scalable deployment model.

The standard in reporting	<ul style="list-style-type: none"> • The SAP standard enterprise reporting tool for all applications from SAP Business All-in-One to SAP Business Suite • Easy access to Crystal Reports skills in the market
Report formatting	<ul style="list-style-type: none"> • Precise object layout and positioning • Complete control over font, layout, pagination • High fidelity rendering in all clients and in print
Open connectivity	<ul style="list-style-type: none"> • Access to both SAP NetWeaver BW and SAP ERP data • Access to virtually any data source or back-end system
End-user empowerment	<ul style="list-style-type: none"> • Sort and filter without querying the database • Embed Flash for powerful visualization and what-if scenarios • Interoperability with other clients like Pioneer
Enterprise deployment	<ul style="list-style-type: none"> • Create multiple broadcasting and file format options for enterprise-wide deployments • Consume reports offline with Crystal Reports Viewer

SAP BusinessObjects and Crystal Reports offering

SAP, after the acquiring BusinessObjects, offers both base and premium products for existing BI customers. Crystal Reports is one of the premium product offerings that give users an option of creating reports for existing BI queries (queries developed using the BEx Query Designer).

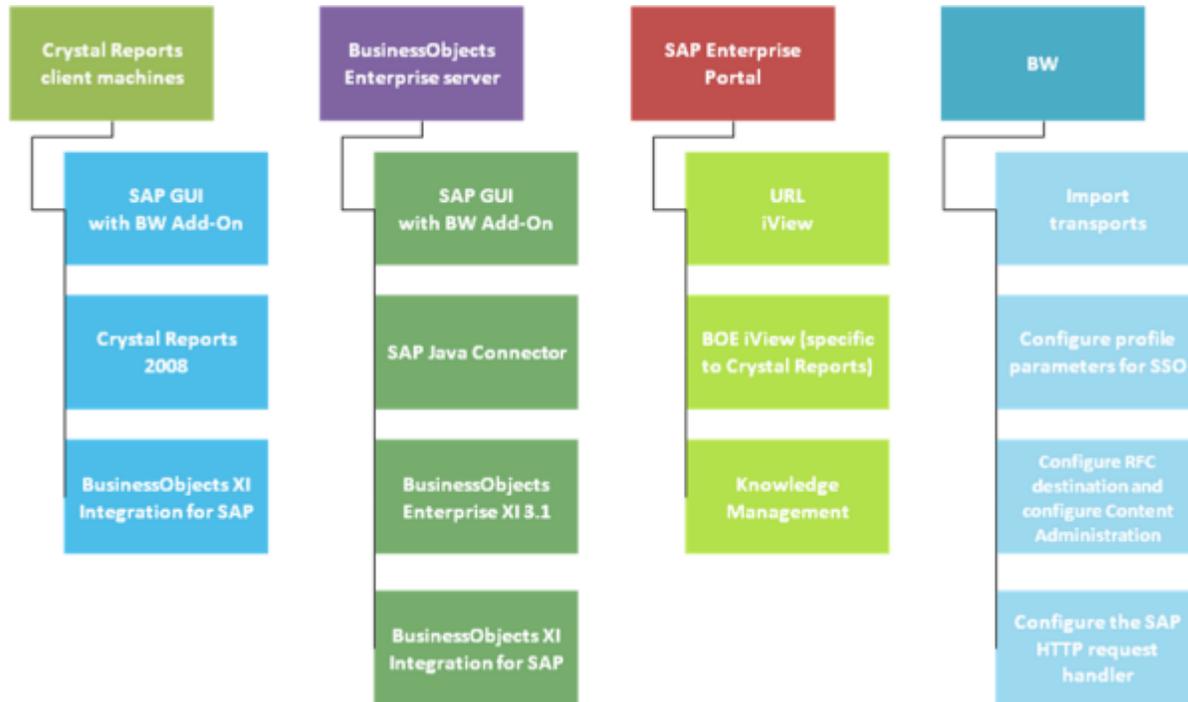
This product is tightly integrated with BW system and exercises the MDX (MultiDimensional eXpressions) query language to retrieve the query output for the Crystal Reports fields.

Crystal Reports Installation

Proper installation and sequencing plays a major role in using Crystal Reports with ease.

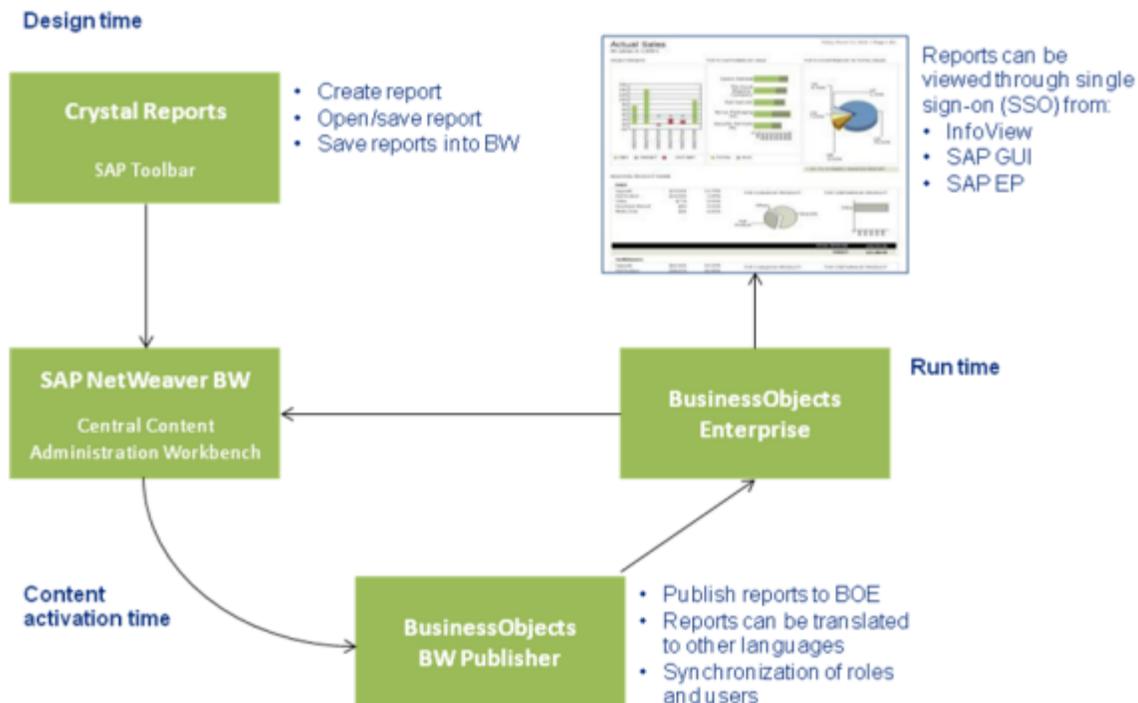
Installation and Configuration

Here is a summary of interdependent areas and the cycle of installation.



Crystal Reports Publishing Cycle

In order for Crystal Reports to work in SAP environment, integration with SAP NetWeaver is required.



Crystal Reports designing

There are many areas where considerable amount of time can be saved by following suggest best practices.

When to use Crystal Reports

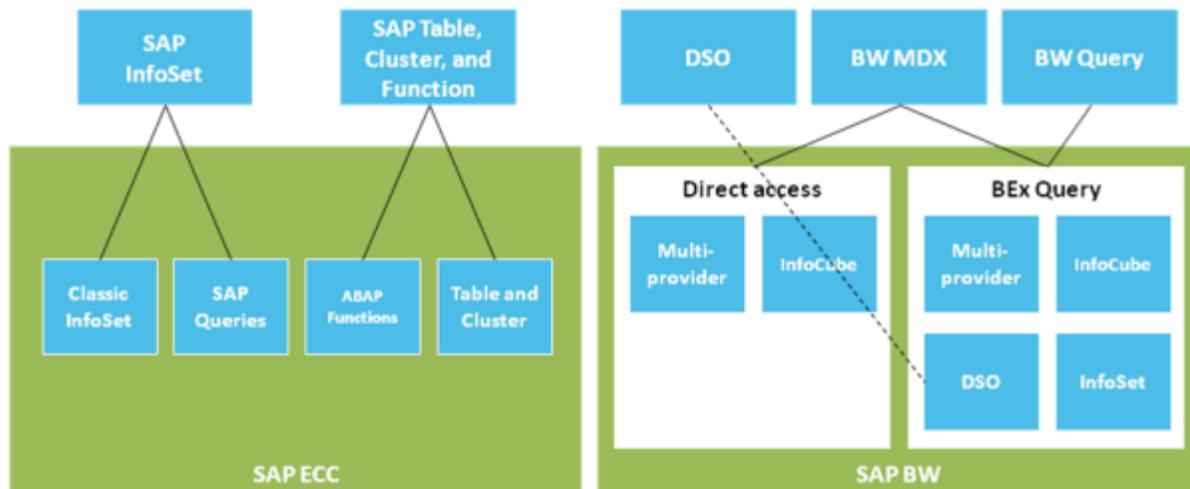
- Reports and analytics need to be accessible online and offline.
- Reports and analytics need to be distributed via e-mail.
- Users need to be able to leverage hierarchies.
- Users need to be able to leverage custom BW query structures.
- Users need the capability to drill down or navigate into more detailed data.
- Reports and analytics need to present highly textual information.
- Reports and analytics need to follow strict layout and will be used as official documents.
- Reports and analytics need to present highly aggregated information.
- Reports and analytics need to be delivered in a response time below five seconds.

When not to use Crystal Reports

Requirement	Justification	Better suited
Users need to be able to create new calculations on the fly.	Crystal Reports does not provide the functionality to create calculations on the fly when viewing reports; such functionality is available only in the actual Crystal Reports Designer but not in the Crystal Reports Viewer.	Advanced Analysis, Web Intelligence
Users need to be able to change the view of the data (example: weekly to monthly to quarterly).	Crystal Reports is offering such capability only via prompting, and it requires the actual design of the report to be prepared for the workflow.	In case this is a frequent requirement: Web Intelligence or Advanced Analysis
Users should be able to customize existing reports or create their own reports.	Crystal Reports is not offering actual design capabilities as part of the viewing experience.	Web Intelligence or Pioneer
Users need the option to leverage scenario based content, such as a what if scenario.	Crystal Reports is able to integrate Xcelsius models, but those models are created with Xcelsius and not Crystal Reports.	Xcelsius
Reports and analytics need to present highly visualized information.	Crystal Reports is — compared to the other tools — lacking in terms of visualization capabilities and ease of use.	Xcelsius

Crystal Reports drivers

Crystal Reports provides different database drivers for reporting off SAP data; knowing which one to use to best meet the specific report request is a key consideration for a successful reporting strategy.



Selecting Crystal Reports Drivers

Driver	Best for	Comments
SAP BW MDX Query	Reporting off BW Queries. This is the recommended driver when reporting from BW Queries or InfoCubes.	BW only. Recommended
SAP BW Query	Legacy driver used for reporting off BW Queries.	BW only. Not all BW features are supported (i.e., multiple structures, display attributes). Should not be used in new developments.
SAP InfoSets	R/3 reporting; allows direct access to R/3 prebuilt business views, thereby saving time in reporting as opposed to hunting for the required R/3 data.	Familiarity with R/3 InfoSets is required.
SAP Operational Data Store (ODS)	Access to ODS for detailed, transactional-level data.	Bypasses BW Query business logic. BW only.
SAP Table, Cluster, or Function	R/3 reporting; access to most R/3 metadata objects for most reporting needs.	Familiarity with R/3 data mode is required.

InfoCubes versus BEx Queries

BEx Queries are recommended as data sources versus InfoCubes for the following reasons:

- BEx Queries offer a flexible extension to the data-modeling environment. InfoCubes require more effort to change.
- BEx Queries offer significant functionality to create customized data sources that meet end-user requirements, such as calculated key figures, restricted key figures, and SAP variables.
- In the OLAP BAPI interface, not all BI metadata features can be retrieved on an InfoCube level.

The following table summarizes the differences when accessing an InfoCube and a BEx query.

BI metadata feature	SAP OLAP BAPI support level
Characteristics (including time and unit)	InfoCube/BEx Query
Hierarchies	InfoCube/BEx Query
Basic key figures	InfoCube/BEx Query
Navigational attributes	BEx Query only
Display attributes	InfoCube/BI Query
Calculated key figures formulas	BEx Query only
Restricted key figures	BEx Query only
Custom structures	BEx Query only
Variables	BEx Query only

OLAP Universes

Crystal Reports does not support OLAP universes. When you create Crystal Reports against BW data, you use one of the Crystal Reports drivers; these drivers do not use ODA layer, as does Web Intelligence.

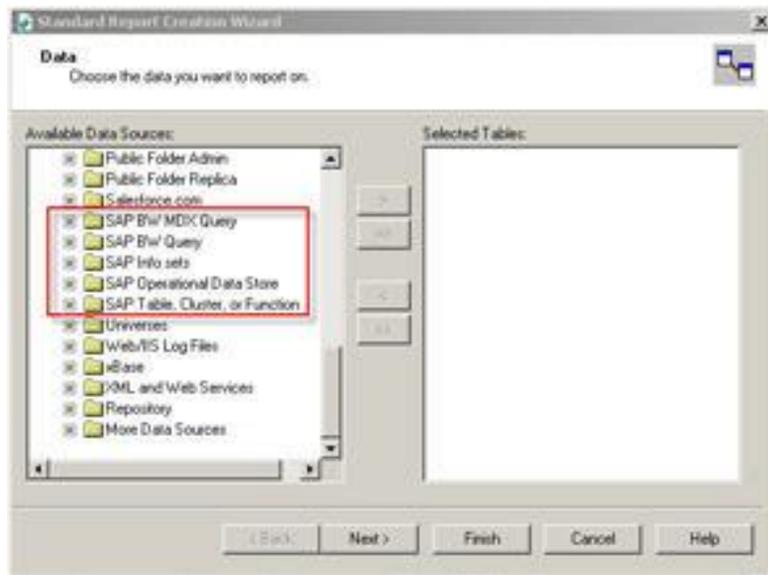
Although Crystal Reports provides the option of creating OLAP reports against BW, it is **not a best practice** to use this method for BW reporting from Crystal Reports.

New Report

New button

When reporting from InfoSet, Table, Cluster, Function, ODS, or InfoCube:

You can select the specific driver to use.



New button in SAP toolbar



When reporting from BEx Queries:

Crystal Reports automatically uses the SAP BW Query or SAP BW MDX driver, depending on the options specified in SAP options, and presents the list of BEx Queries available to you.

For InfoCubes, you use the same driver that you use for BEx Queries (SAP BW MDX driver), but you must use New (File>New) so you can see InfoCubes and select the one you want to report off. The SAP toolbar is only for reporting off BEx Queries.

Can I use File>New to Create Reports from BEx Queries?

If you create a report from a BEx Query using the File>New menu rather than the SAP Toolbar, your report will be missing the list of values from the BEx Query variables.

If there are variables in the BEx Query, the variables will appear as parameters in Crystal Reports; and only if you used the SAP Toolbar will a list of values will be created automatically. If you use File>New, parameters are created but they won't have a list of values.

Save As or Save to BW

When you save your Crystal Reports, you can choose to save it to BOE or you can save it to BW and publish to BOE. **It is not mandatory to save to BW and then publish to BOE**, but if you don't do so, you miss some functionality, such as:

- Online list of values for prompts
- Hierarchical display for hierarchical node prompts
- SAP variable personalization
- Life cycle management of Crystal Reports (from DEV to QA to PROD) with the SAP transports

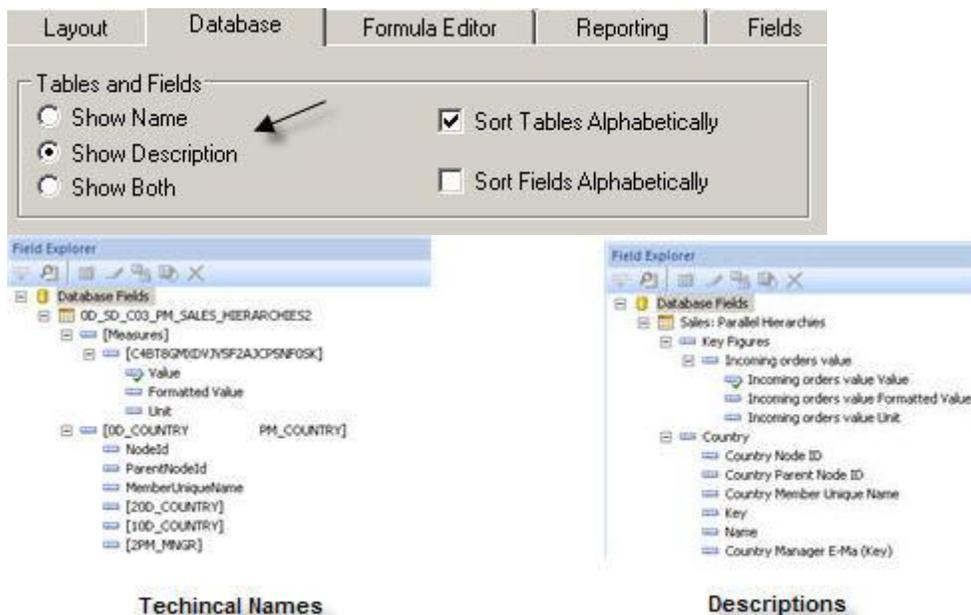
When you select the File>Save menu after you create a report with the SAP Toolbar, you will be presented with the Save to BW dialog where you will be saving the report to BW with the option to publish the report to BOE at the same time. If in your implementation you are using BW Publisher, then a good practice is to always create your reports with the SAP Toolbar when reporting from BEx queries.

When you select File>Save menu after you create a report with File>New, you will be presented with the regular File>Save menu, which does not give you the option of saving to BW and publishing to BOE. You can still get the Save to BW dialog if you click the Save button in the SAP Toolbar.

When you select File>Save As menu after you create a report with the SAP Toolbar, SSO won't work because the connection information will be incomplete.

Turning SAP Technical Names on/off

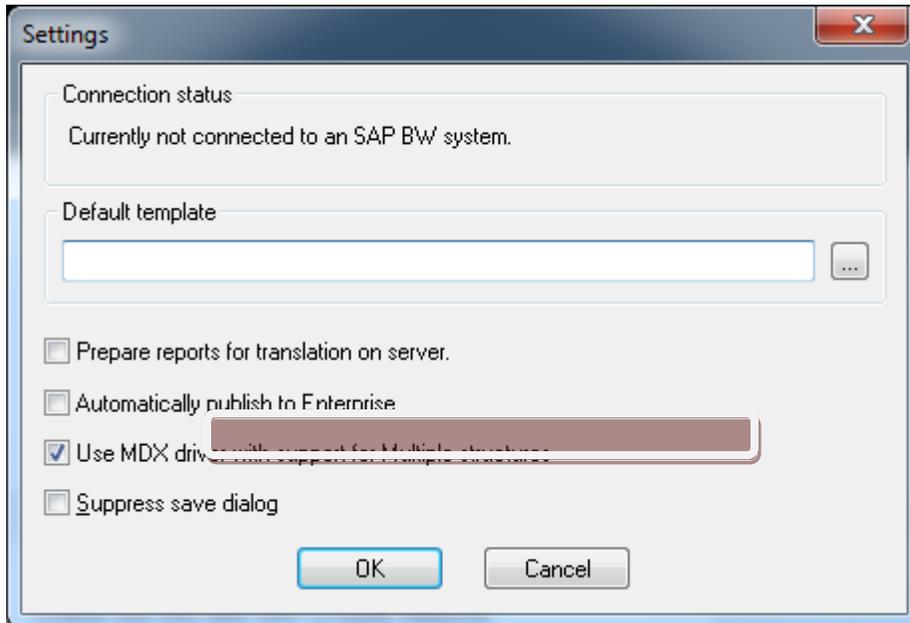
When you are designing a report, you can choose to view only technical names, view descriptions, or both. This can be achieved by configuring the Tables and Fields settings in the Database tab in the File>Options menu.



Configuring the SAP Toolbar to always use the SAP BW MDX Driver

If you select the SAP>Settings menu, you will see the option “Use MDX driver with support for Multiple structures.” This option is what determines whether, when using SAP Toolbar to create a report, Crystal Reports will use the BW Query driver or the BW MDX driver. If this option is not selected when you use the SAP toolbar to create a new report, it will be using the SAP BW Query driver, which is the driver that you should not use for creating reports off BEx Queries, as this is an old driver that has limited functionality.

Before you start creating reports, make sure you check the option to “Use MDX driver with support for Multiple structures” so you use the recommended BW MDX driver.

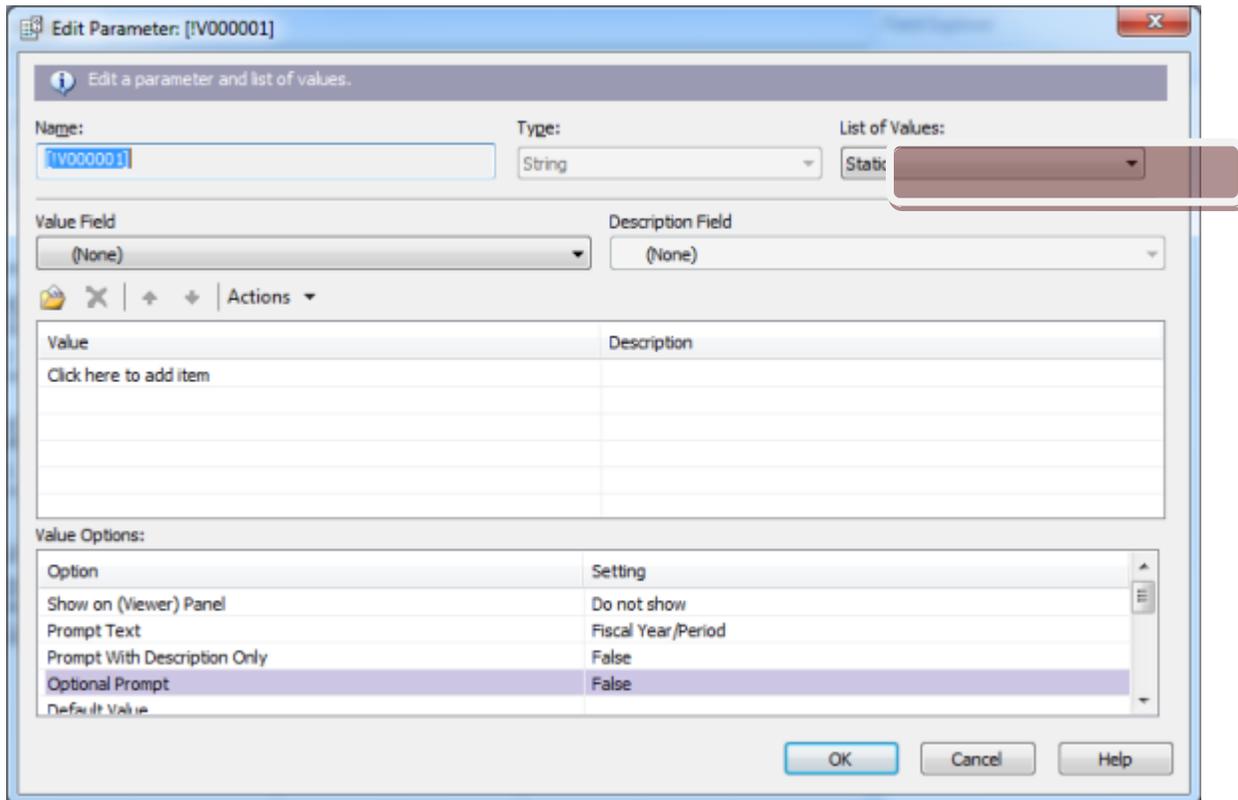


List of Values for Variables

The list of values for SAP variables are created automatically by Crystal Reports only when you use SAP Toolbar to create the report:

The list of values for a variable in Crystal Reports will be static, but the list will be always dynamic in InfoView as long as you use BW Publisher (save reports to BW, publish to BOE) and you log on to BOE using SAP Authentication.

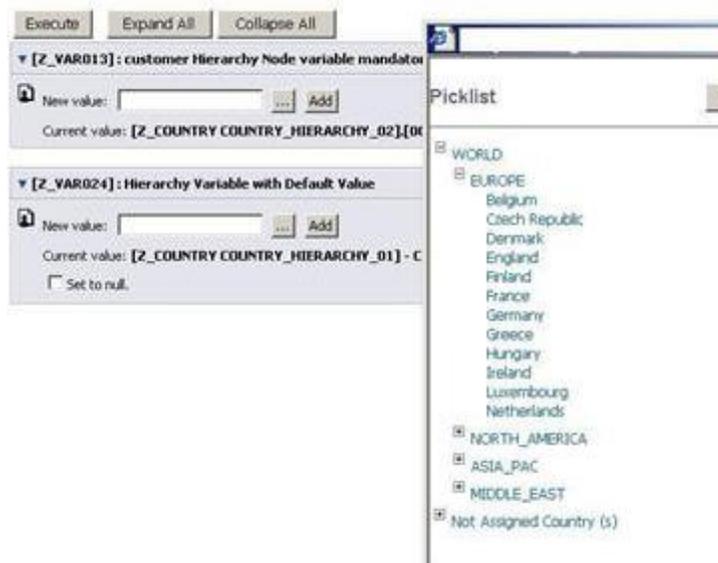
If you edit the parameter created in Crystal Reports from the SAP variable, you will see that the list of values that was created automatically is set as static — this is the way it should be. The list is static in Crystal Reports but dynamic in InfoView; don't change the list of values to dynamic.



List of values as a hierarchy or flat list

Crystal Reports is able to leverage the hierarchies and use a parent-child relationship and show the hierarchical levels from BW. When designing reports that have hierarchies, you need to create hierarchical grouping to leverage BW hierarchy.

When you refresh a report that contains hierarchy node variables, the list of values appears as a flat list in Crystal Reports and as a hierarchy in InfoView **only if you used BW Publisher to publish the report to BOE**.



Exit Variables and Default Values

When you create an exit variable in BEx, you can't define default values; however, in I_STEP=1 of an exit, you can define default values. The default values that appear in the Crystal Reports parameter window come from default values defined in BEx.

If you define default values in an exit (I_STEP=1), these default values won't appear and won't be used when running the report. A solution to this issue is to configure the variable in Crystal Reports to accept nulls. When null is used as the value for the parameter, the default value defined in the exit will be used, and the default value won't appear in the parameters window when running the report, however it will be used.

Managing Changes to the Structure of the Data Source

If changes are done to the structure of an InfoCube or BW Query used by a Crystal Report, you have to open the report and select the Database>Verify Database menu for Crystal Reports to be aware of the changes.

For example, if you create a Crystal Report off a BEx Query and later you add a SAP variable and remove a characteristic from the BEx Query, you need to open the report in Crystal Reports, run Verify Database, save the report again to BW, and then publish to BOE for the Crystal Reports to be aware of the changes.

Crystal Reports Performance Tuning

Here are few more areas where performance of Crystal Reports can be tweaked for improvement.

BW Query Design Time Considerations

- Clearly determine the output of the reporting requirement of end users.
- Maximize filters and restrictions in the BEx Query.
- Design BEx Queries correctly with limited no of objects.
- Decide on navigational attributes; keep them minimum.
- Create SAP variables rather than using Crystal Reports parameters.
- Create efficient BW aggregates.
- Compress data requests at the BW side regularly.
- Prefer BEx Queries on InfoCube vs MultiProvider vs. Virtual Provider.
- Avoid using large and complex BEx Queries.

General Guidelines for Optimized Performance

Performance gain is possible in different scenarios with following recommendations:

Scenario	Options	Details	Recommendation
Subreports	On-demand subreports	Appears as a hyperlink within the body of the main report	Use it for better performance
	Linked subreports	Crystal Reports coordinates the data in the subreport with the matching records in the primary report	Use in case large number of users need to see subreport
Multiple data sources in the same report	Cross DataSource join	Creates reports with more than one DataSource can result in slow performance	Consolidating all the data you need in one data source OR use subreports

Page number tracking	Page N of M Total page count	The report needs to finish processing entirely before it can calculate this value and display the first page	Do not use on first page: avoid unless: 1. Report is small 2. Page number is necessary
Live data vs. saved data	Live data (on demand)	Gives users real-time access to live data, straight from the database server	Keep access for less users
	Saved data (historical instances)	Gives users access to the saved data	Schedule these reports within BusinessObjects Enterprise

Crystal Reports performance information

The performance information found in the Crystal Reports designer can be helpful when troubleshooting issues with report performance. To access performance information for a report, open the report in Crystal Reports, and choose Performance Information from the Report menu.

The performance information contains information about the report definition, saved data, processing, latest report changes, and performance timing.

Some of this information is not available until the report is previewed. If there are any subreports, they appear listed under the main report, and each subreport will have its own performance information. You can save the report information to a file to compare the values after you have optimized changes in the report or in BW.

BW metadata in Crystal Reports

SAP BW terminology and Crystal Reports names are different. So this table will help in identifying integrated components.

BW queries element	Crystal Reports designer element
Characteristic	Separate fields for key and description per characteristic.
Hierarchy	Fields representing a parent-child relationship.
Key figure	Measure element in a grouping called Key figure. Each Key figure can have up to three elements: numeric value, unit, and formatted value.
Calculated Key figure	Measure element in the folder Key figure. (Information about the details of the calculated Key figure is not available in Crystal Reports.)
Restricted Key figure	Measure element in the folder Key figure. (Information about the details of the restricted Key figure is not available in Crystal Reports.)
Filter	Filters will be applied to the underlying query but are not visible in the Crystal Reports designer.
Navigational attribute	Separate fields for key and description per navigational attribute.
Display attribute	Each display attribute becomes one field in the field explorer. The display attributes are grouped together with the actual characteristic.
SAP variables	Parameters.

Crystal Reports Transport

There are two choices when it comes to publishing/transporting Crystal Reports. Based the resource availability and scope, a decision should be taken. It behaves in diverse manner when published with different methods.

Transporting Crystal Reports

Using a BW publisher makes a lot of difference in the usability of crystal report later on. So this option should be chosen very carefully.

NetWeaver Change and Transport System (CTS) and BW Publisher	LifeCycle Management (LCM)
Reports are organized in folders based on the roles you have defined in your SAP system.	Reports are organized in the folders that you create in BOE, based on your business requirements.
When you select the reports to transport, CTS will detect dependencies in the SAP repository like BEx query, InfoProvider, etc. All of them can be transported with CTS.	LCM only detects dependencies in the BOE repository. BEx Queries and InfoProviders have to be transported using CTS.
Connection information is modified only after you publish the reports to BOE. This means you have to use CTS to transport and then BW Publisher to publish the reports to BOE.	Connection information is updated at the time of the promotion. In LCM, you can specify the new connection information for all the reports you are promoting in a particular job.
Translation of Crystal Reports support.	Translation of Crystal Reports is a feature available only when using BW Publisher.
All functionalities in InfoView are available when using BW Publisher.	The following features are only available when you use BW Publisher. Online list of values for prompts: <ul style="list-style-type: none"> • Hierarchical display for hierarchical node prompts • SAP variable personalization

Miscellaneous Design dos and don'ts

Do make use of guidelines when aligning fields and text objects in your report. Simply clicking on either the horizontal or vertical ruler bar with your mouse will create a new guideline.

Do use borders for creating subtotal and/or grand total lines (single or double). To create borders for a summary, right click on the summary and then select "Format Field." Go to the "Border" tab and select a single or double top border. If you create borders using the line tool, you will regret it later if you have to move the summaries around.

Do take advantage of the browsing feature of Crystal Reports. This can be done at various places in Crystal Reports by right-clicking on a field and selecting "Browse Field Data." This will provide you with three valuable pieces of information: the data type of the field, the length, and a sampling of the data. This is especially useful when first getting acquainted with a new DataSource.

Do attempt to perform grouping functions on the server whenever possible. This only applies to summary reports (the detail is hidden or suppressed). To turn this feature on, go to Database, Perform Grouping on Server. If you have a summary report that does not include any print time formulas or running totals, the SQL statement will include a GROUP BY clause that will allow the server to perform the aggregations and prevent the detail records from being retrieved.

Do become familiar with conditional formatting, especially the conditional formatting of sections. Conditional formatting allows you to add intelligence to a report so that certain data is presented and highlighted for the user based upon conditions in the data. Bottom line: you can make the report more informative and more flexible and perhaps prevent the need for an additional report.

Don't refresh a report unless you need to, especially when working with large datasets and/or a production database. Unnecessary refreshes can waste a lot of development time.

Don't overuse subreports. While it is difficult to come up with a hard and fast rule about how many subreports are appropriate for a given report, the point here is to be careful about adding too many subreports, as each one is creating a subquery that is being sent to and performed on the server. It is also generally not a good idea to place a subreport in the detail section of a report.

Don't forget to take advantage of the built-in date range functions when creating a record selection based on a date field. If you select a date field in the Select Expert and then choose the "is in the period" option, you will see all the date range functions available to you (Last7Days, LastFullWeek, etc.). These functions allow your date record selection to be based upon the report run date.

Don't forget to include the end user in the report development process. As obvious as this may sound, this is probably the most common cause of problems with reports. You must know the question before you can provide the answer. There are plenty of reports that are technically correct but do not provide the information the user requires.

Related Content

[SAP Crystal Reports Design](#)

[Crystal Reports 2008 and BW](#)

[Crystal Reports and SAP BI Queries](#)

For more information, visit the [EDW homepage](#).

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