



TIBCO® Data Virtualization

SAP BW BEx Adapter Guide

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Using SAP BW BEx with TDV

This topic gives an overview of TDV adapters, and describes important usage information for SAP BW BEx data sources.

For installation requirements, see the TDV Installation and Upgrade Guide.

See the TDV User Guide Chapter “Configuring Advanced Adapters” section “Installing the SAP Java Connector Library” for more details on where to download SAP JCo connection library and how to install it.

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Query Limitations and Workarounds

The following limitations and workarounds apply to TDV when it is used with the BEx adapter:

- The adapter cannot perform aggregate operations.
- A query that uses the Conditions on Selected Characteristics feature of BEx returns an exception in Studio.

- If a query contains execution steps that cannot be pushed to the data source, the query as a whole is executed in TDV.
- In many cases you can express a BEx query as a parameterized query so that it always pushes its parameters.

Application Views for SAP

The organization of the views and folders mirrors that of SAP's Business Object Repository (BOR). Field names are aliased to provide human-readable names. In some cases several objects in BOR are synthesized in a single query to produce a more detailed, unified view of the data.

A common pattern employed in application views is that of List and Details. Views with names ending in "List" return a minimal set of columns that serve to uniquely identify an object. The identifiers are passed as arguments into a corresponding view, its name ending in "Details," to produce a more extensive set of columns.

Filter Data from Application Views

There are two ways to filter data from SAP using application views: using a filter provided by SAP itself, or by filtering within TDV. Both methods are used by application views depending on the view and the capabilities of SAP.

SAP BW BEx Characteristics

This section describes the characteristics of SAP BW BEx data sources:

- [Quantity of Metadata](#)
- [Introspection and Query Behavior](#)
- [Search Behavior](#)
- [Back-end File Preparation](#)
- [Maximum Cells](#)
- [BW Statistics Tables](#)

Quantity of Metadata

Large data sources with complex schemas and big tables with many columns have correspondingly large amounts of metadata, which can have significant impact on TDV performance. For TDV, the most important factor affecting performance is the amount and complexity of metadata that defines the data source, particularly during introspection. For additional information on how to use TDV when introspecting large data sources, see the TDV User Guide.

TDV examines the TABLE-COLUMN relationships in the metadata and queries the data dictionary for full column names.

Introspection and Query Behavior

- **Time-Dependent Hierarchies**—No introspection or SQL changes are required to use time-dependent hierarchies. The adapter uses the default settings for each hierarchy in a query, such as its version and effective date.
- **Multiple Structures in Columns Axis**—TDV projects two or more structures onto the columns axis. Before TDV version 7.0, the adapter flattened multiple structures projected on the rows axis, but assumed a single structure (typically Key Figures) on the columns axis.

TDV tables display technical names of the variable from BEx Query Designer. Users are only exposed to the final value in reports, calculated from an input (prompt) parameter. The correct data is returned, but query developers might prefer to alias the column name to a friendlier one in a TDV View.

- **Maximum Cells**—Maximum Cells is an internal proprietary value that is passed from the BEx Adapter directly to BW. It appears to limit the number of cells processed by BW in preparing a result, but in fact Maximum Cells controls the amount of resources that SAP BW uses for a query. Maximum Cells can be set to a value greater than its default value of 500,000.

Search Behavior

In the SAP BEx adapter's introspection UI, the Search box does not work the way it does for most other data sources.

The BEx adapter loads nodes on demand. Initially, if you search for a BEx query, you get no hits, because nothing has been navigated yet. All TDV knows at this point is the list of top container names.

To see queries, you must pick a top level container, navigate down to a folder containing BEx queries, and expand this folder. Those objects are now indexed and searchable.

To make other queries searchable, you need to go back to the top and drill down another folder path and expand *that* list of BEx queries. TDV can return BEx queries from all paths you have navigated from top level to query folders.

Back-end File Preparation

A back-end properties file (introspection.properties) containing customer-defined variable values is needed for introspection of BEx queries. If a BEx query cannot be introspected, try again after setting up this file with default values for any variables the query might need. Default values enable TDV to configure the BEx query's state correctly to obtain its metadata.

The location of this file is:

<TDV_install_dir>/apps/dlm/app_ds_sapbwex/conf/

Each input parameter in this file has one line with the query's technical name, the input parameter name, and its literal value. For example, for a query named QRT7_D2_GMT_008 and its five variables, you would use:

```
QRT7_D2_GMT_008.QRT7ABC=NONE
```

```
QRT7_D2_GMT_008.QRT_D2_RUNIT=BG0007
```

```
QRT7_D2_GMT_008.QRT7DEFG=ISOLATED
```

```
QRT7_D2_GMT_008.QRT7HJK=STRICT
```

```
QRT7_D2_GMT_008.QRT7LMN=LOLD
```

The assigned values just need to be plausible default values. They do not need to be exact for the query to execute.

Those values are used even during normal queries, unless values are provided for required variables. The BEx query is in an invalid state and cannot be executed if required variable values are not provided.

The file is designed to provide values in “unattended mode” (that is, during introspection). In normal queries, you should explicitly provide values for your variables rather than relying on the introspection.properties file.

Maximum Cells

Maximum Cells is an internal parameter of the SAP BW RFC that TDV uses when retrieving cells from an open query. The BEx Adapter simply passes the value to SAP BW.

Maximum Cells limits the resources that SAP uses to execute a query and retrieve results. It is not an upper limit on the result set, like LIMIT in SQL.

BW Statistics Tables

The BEx Adapter calls an extra RFC to cause SAP to write statistics to the OLAP statistics table, mirroring the behavior of the BEx Analyzer. These statistics help the user to understand query performance characteristics before queries are allowed to run on production systems.

SAP BW BEx Basic Tab

When you create an SAP BEx data source, you need to set basic connection properties. For details, see the *TDV User Guide*.

Field	Description
Application Server	Name or IP address of the machine hosting SAP BW BEx. For load-balanced configurations of SAP BW BEx, leave this property empty.
SAP Router String	Routing entry. If an SAP Router is used to connect to the Application Server, specify its routing entry here. Sample: /H/saprouter/H/194.117.106.130/S/3297/H/
System Number	Two-digit system number of the SAP BW BEx instance. Also known as the gateway service number.
Client	Three-digit client number of the SAP BW BEx system.

Field	Description
User and Password	Valid user name and password to SAP BW BEx.
Save Password (check box)	<p>This option works in combination with the Pass-through Login option. By default, this option is disabled and cannot be edited. It becomes editable when you select the Pass-through Login option.</p> <p>If you accept the default, the password is saved and the Pass-through Login option remains disabled. In this case, you can perform the following operations without having to supply the password again:</p> <ul style="list-style-type: none"> • Introspect the current data source. • Reintrospect the data source. • Add or remove data source resources. • Perform query/update or insert operations on a table in the data source. • Invoke a stored procedure. • Refresh a cached view based on data source resources.
Pass-through Login	Works in combination with the Save Password check box (above). By default, this mode is disabled (non-pass-through mode).and the password is saved. If you select the Enabled option (pass-through mode), the Save Password check box is enabled.

The operations you can and cannot perform depend on whether or not Save Password is checked, as follows.

Save Password?	Operations You Can Perform	Operations You Cannot Perform
Yes	<ul style="list-style-type: none"> • Introspection. You do not need to resupply the password. 	N/A
No	<ul style="list-style-type: none"> • QUERY. You need to resupply the original login credentials for the current session. 	Schedule reintrospection.

Save Password?	Operations You Can Perform	Operations You Cannot Perform
	<ul style="list-style-type: none"> Reintrospect a data source, or add or remove data source resources. You are prompted to provide the same password that was used when the data source was originally introspected. 	

SAP BW BEx Advanced Tab

Some of these properties refer directly to the configuration of the SAP BW BEx Server and must be provided by an SAP BW BEx Administrator. Other properties are specific to TDV and how it interacts with SAP BW BEx.

Option	Description
Maximum Connections in Pool	SAP JCo parameter specifying the maximum number of simultaneous connections in an SAP BW BEx connection pool.
Maximum Idle Connections in Pool	SAP JCo parameter specifying the maximum number of simultaneous idle connections (in an SAP connection pool) kept open by the destination. A value of 0 means no connection pooling (each connection closed after each request has completed).
Maximum Cells	Maximum Cells is an internal proprietary value that is passed from the BEx Adapter directly to BW. Maximum Cells controls the amount of resources that SAP BW uses for a query. Maximum Cells can be set above its default value of 500,000.
Display Descriptive Names	<p>Display only descriptive names in the resource tree and in the Introspection dialog box. (Technical names still appear in the popup when the cursor hovers over the resource name, and on the resource's Info tab.)</p> <p>Use this set of three “display” radio buttons consistently for any given SAP BW data source; otherwise, results can be unpredictable.</p>

Option	Description
Display Technical and Descriptive Names	<p>Display both technical and descriptive names and use them in the TDV resource tree.</p> <p>Use this set of three “display” radio buttons consistently for any given SAP BW data source; otherwise, results can be unpredictable.</p>
Display Technical and Descriptive Names, Use Technical Names In TDV Resource Namespace	<p>Display technical names in the TDV resource tree (“namespace”), and both the technical names and the descriptive names in the Introspection dialog box.</p> <p>Use this set of three “display” radio buttons consistently for any given SAP BW data source; otherwise, results can be unpredictable.</p>

Reintrospecting SAP BW BEx

Because SAP BW BEx contains resources that are unique to it, you need to take added steps when you reintrospect it, to make sure that you can see all expected metadata within Studio.

If you removed any SAP BW BEx resources from the Studio view of its metadata, the following steps make sure those resources are put back into the Studio resource tree.

To reintrospect SAP BW BEx

From Studio, open the SAP BW BEx data source.

1. Click Add/Remove Resources.
2. Select one or more schemas that you want to reintrospect

Avoid using the Find field during introspection of SAP BW BEx data sources. TDV cannot load all of the SAP BW BEx metadata before introspection. Attempts to use the introspection Find feature can result in SAP BW BEx database service interruptions.

3. Select the following check boxes:
 - Reintrospect previously introspected resources
 - Allow partial introspection, omitting resources with errors

- Detect New Resources During Reintrospection

4. Click Next.
5. Review the summary.
6. Click Finish to begin reintrospection.
7. When the status message indicates that reintrospection was successful or completed, click OK to close the dialog box.

Clearing the Metadata Cache

TDV caches SAP BEx metadata to improve query performance. These caches are automatically cleared after every TDV restart, but you might want to do this at other times.

For example, your SAP BEx data source might become out of sync with the SAP BEx database, even after reintrospecting the data. If the metadata is still out of sync after reintrospection, you can restart the TDV instance, or you can clear the metadata cache as described in this section.

To clear the metadata cache

Open the SAP BEx data source.

1. Select the Re-Introspection tab.
2. Click Clear Metadata Cache.

Generating an Execution Plan

Execution plans are important tools when designing resources that are to be consumed by others, especially if performance is a high priority.

Note: Pay particular attention to the Estimated Rows Returned value, which might be very large.

To generate an execution plan

Open a view that you have created from an SAP BW BEx data source.

1. Select the SQL tab.

2. Click Show Execution Plan on the editor toolbar.
3. Review the Execution Plan Node and Field Contents. Descriptions for how to interpret much of this information can be found in the *TDV User Guide*.

Also see [Query Limitations and Workarounds](#).

Accessing Data Lineage

You can use data lineage to determine where metadata originates, so you can track how changes to data sources can affect data that clients are consuming.

To view data lineage

Open a view that you have created from an SAP BW BEx.

1. Select the SQL tab.
2. Click the Show Lineage Panel toolbar button on the editor toolbar.

The Lineage panel opens in the lower section of the view's editor and displays all the resources involved with the view in a graphical format. Descriptions for how to interpret this information can be found in the TDV User Guide.

SQL Support for SAP BW BEx

This section describes SQL support for SAP BW BEx resource types and their behavior within TDV SQL queries.

- [Introspection Resource Hierarchy](#)
- [SQL Capabilities](#)

Introspection Resource Hierarchy

This section describes the details of introspecting SAP BW BEx resources, including how the resource hierarchy appears in TDV and how metadata is mapped in TDV.

The organization of SAP BW BEx resources in TDV mirrors SAP BW BEx as much as possible.

InfoAreas in BEx Analyzer are displayed as folders in TDV, and these folders are named after the InfoAreas' descriptions. If a description for an InfoArea is not available, its technical name is used in TDV. Move the mouse over an item to see a tooltip with its technical name and type.

SQL Capabilities

SQL capabilities characterize the features and limitations of data sources. For example, an Oracle data source can execute subqueries, while SAP BEx cannot. Capabilities are consulted when a query is processed so that data sources receive only the query processing work they support; otherwise, TDV performs the work itself.

The following table lists capabilities that apply to ODS Objects only—whether they are supported in queries against ODS Objects or can be pushed to SAP BEx for execution. For efficient queries, minimize use of non-push capabilities.

The capabilities for ODS objects are listed in the table.

Capability	Supported	Pushed	Notes
BETWEEN	Yes	Yes	See notes in WHERE .
CASE	Yes	No	
CAST	Yes	Yes	
DELETE	No	No	
DISTINCT	Yes	No	
Filters	Yes	Yes	See Filters .
Functions	Yes	No	CAST is pushed. Other functions are supported but not pushed.
GROUP BY	Yes	No	
IN	Yes	Yes	See notes in WHERE .
INSERT	No	No	

Capability	Supported	Pushed	Notes
JOIN	Yes	No	See Joins and Semijoins .
LIKE	Yes	No	
ORDER BY	Yes	Yes	Because of SAP BAPI limitations, order is always ascending (ASC). The ASC and DESC keywords are ignored.
Subquery	Yes	No	
WHERE	Yes	Yes	See WHERE .

Filters

All conditional operators are supported. The keywords OR, AND, and grouping of terms with parentheses are supported, but have no impact on the query other than to indicate the list of filters. Filters containing NULL literals are ignored. Filters on key figures are not supported and are ignored.

Joins and Semijoins

Joins cannot be pushed to SAP BW. Meanwhile, executing joins in TDV can degrade performance, because a table scan would be required, and it would fetch every row of the joined tables. The technology that TDV uses to connect with SAP BW BEx is not optimized for large data sets, so it is best to avoid table scans.

A semijoin is the best way to reduce the number of SAP BW BEx rows retrieved and processed by TDV. To force a semijoin to occur in a query, add it immediately before the table to be joined. For example:

```
SELECT *
```

```
FROM X INNER {OPTION SEMIJOIN} JOIN Y ON X.Key = Y.Key
```

Values of X.Key are collected and passed in a query to Y as the filter:

```
SELECT * FROM X
```

```
SELECT * FROM Y WHERE Key IN ({values of X.Key from previous query})
```

Note: TDV semijoins involving BEx queries echo the input values (underscore columns) in the result set.

If X has many rows, queries against Y can be lengthy. If the queries against Y become too large, TDV automatically partitions them and reassembles the results into a unified set.

Whenever possible, put the table that returns the larger number of rows on the right side of the join. When running a new query for the first time, activate the Execution Plan tab in the Studio and click Execute and Show Statistics. Examine each node's row count and query after processing has begun to make sure that filters are pushed down to SAP BW BEx. This is a good way to see the mechanics of a semijoin in action. If the interaction between TDV Server and SAP BW BEx is still unclear and performance is poor, enable debug logging as described in the TDV Installation and Upgrade Guide.

WHERE

SQL WHERE processing brings TDV closer to parity with BEx Analyzer and other tools in their ability to execute BEx queries. The BEx adapter supports these selection types:

- Single Value—Characteristic, Hierarchy, and Hierarchy Node.
- Several Single Values—Multiple parameter (or prompt) values of three variable types can appear in a single SQL statement via the IN clause. These variable types are: Characteristic, Hierarchy, and Hierarchy Node.
- Intervals—The BEx adapter can set upper and lower bounds of an intervals using:
 - A BETWEEN clause
 - An equivalent pair of inequality operators

Exclusion Lists—Using the SQL NOT operator or equivalent inequality operator, you can modify the selection type of a variable value to exclude rather than (by default) include. This applies to all three supported selection types (above).

Security for SAP BW BEx with TDV

This topic describes assumes knowledge of SAP BW BEx's security infrastructure.

- [Required Authorizations](#)

- [Troubleshooting Security-Related Errors](#)

Required Authorizations

The following authorizations are required to log into the SAP BW BEx data source from TDV and introspect queries:

```
Class: AAAB (Cross-application Authorization Objects)
Object: S_RFC (Authorization Check for RFC Access)
Field: Activity . Value : 16 ( Execute)
```

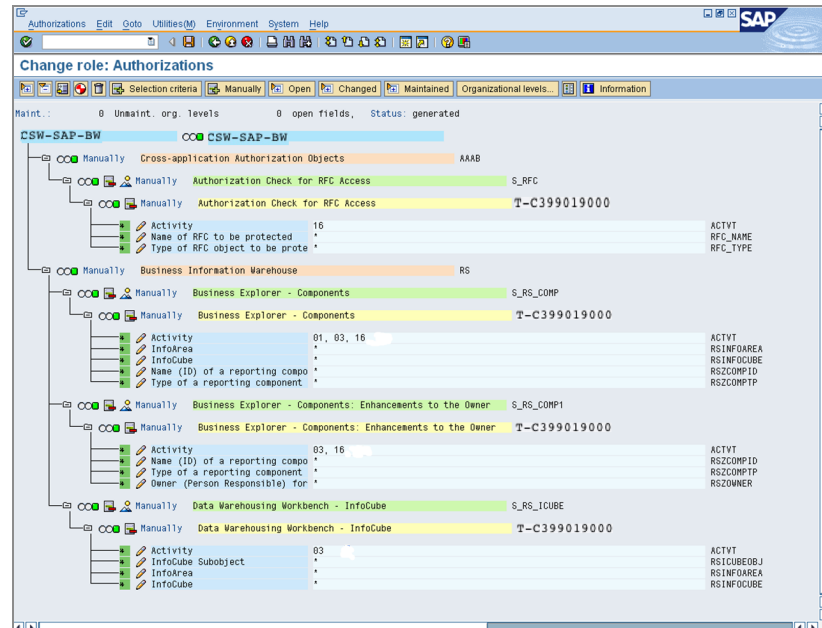
In addition, the following authorization objects can be used to limit the InfoAreas visible to the TDV user, as well as limiting the InfoProviders and Queries accessible:

```
Class: RS (Business Information Warehouse)
Object: S_RS_COMP (Business Explorer - Components)
Field: Activity . Value : 01 ( Create), 03 ( Display) and 16 ( Execute)
```

Note: Although the SAP ODBO interface does not modify InfoObjects, Activity 01 is still required. Otherwise, SAP BW BEx introspection does not fetch any metadata.

```
Class: RS (Business Information Warehouse),
Object: S_RS_COMP1 (Business Explorer - Components: Enhancements to the Owner)
Field: Activity . Value : 03 ( Display) and 16 ( Execute)
```

```
Class: RS (Business Information Warehouse),
Object: S_RS_ICUBE (Administrator Workbench - InfoCube)
Field: Activity . Value : 03 ( Display)
```

Troubleshooting Security-Related Errors

This section describes common security-related errors and their remedies.

RFC Authorization

ERROR: User TESTUSER1 has no RFC authorization for function group SYST

TDV is logging into SAP with an SAP BW BEx user that lacks the authorization object S_RFC. Set authorization S_RFC_ALL to grant access to all RFCs, or restrict them to only the OLAP BAPIs required by TDV:

BAPI_MDPROVIDER_GET_DIMENSIONS	BAPI_MDPROVIDER_GET_MEASURES
BAPI_MDPROVIDER_GET_PROPERTIES	BAPI_MDPROVIDER_GET_CATALOGS
BAPI_MDPROVIDER_GET_CUBES	BAPI_MDPROVIDER_GET_HIERARCHYS
BAPI_MDPROVIDER_GET_LEVELS	BAPI_MDPROVIDER_GET_MEMBERS
BAPI_MDPROVIDER_GET_VARIABLES	BAPI_MDDATASET_GET_CELL_DATA

BAPI_MDDATASET_DELETE_OBJECT	BAPI_MDDATASET_CREATE_OBJECT
BAPI_MDDATASET_SELECT_DATA	BAPI_MDPROVIDER_SET_KEY_DATE
BAPI_MDDATASET_GET_AXIS_DATA	BAPI_MDDATASET_GET_AXIS_INFO

SAP BW BEx Global Properties

This topic describes the SAP BW BEx global properties file that you can edit to control how TDV works with SAP BW BEx. Global properties apply to all instances of the SAP data source. You can edit the properties to control how TDV works with SAP BW BEx.

SAP BW BEx Global Trace Level Property File

Global properties are stored in the file:

```
<TDV_install_directory>\apps\dlm\app_ds_sapbw\conf\product.properties
```

Edit global properties using a text editor such as Notepad on Windows. TDV must be restarted for property changes to take effect.

SAP BW BEx has only one global property.

sap.jco.traceLevel

Default Value: 2

Description:

Turns on the SAP JCo trace. Allowed levels are 0 through 10. The commonly ones used are:

0—Nothing

1—Errors

2—Errors and warnings

3—Info messages, errors and warnings

4—Execution path, info messages, errors and warnings

5—Verbose execution path, info messages, errors and warnings

6—Verbose execution path, limited data dumps, info messages, errors and warnings

7—Full execution path, data dumps with metadata, verbose info messages, errors and warnings

8—Full execution path, full data dumps with metadata, verbose info messages, errors and warnings

TIBCO Product Documentation and Support Services

For information about this product, you can read the documentation, contact TIBCO Support, and join the TIBCO Community.

How to Access TIBCO Documentation

Documentation for TIBCO products is available on the [TIBCO Product Documentation](#) website, mainly in HTML and PDF formats.

The [TIBCO Product Documentation](#) website is updated frequently and is more current than any other documentation included with the product.

Product-Specific Documentation

The following documentation for this product is available on the [TIBCO® Data Virtualization](#) page.

- **Users**
 - TDV Getting Started Guide
 - TDV User Guide
 - TDV Web UI User Guide
 - TDV Client Interfaces Guide
 - TDV Tutorial Guide
 - TDV Northbay Example
- **Administration**
 - TDV Installation and Upgrade Guide
 - TDV Administration Guide
 - TDV Active Cluster Guide
 - TDV Security Features Guide
- **Data Sources**

TDV Adapter Guides

TDV Data Source Toolkit Guide (Formerly Extensibility Guide)

- **References**

TDV Reference Guide

TDV Application Programming Interface Guide

- **Other**

TDV Business Directory Guide

TDV Discovery Guide

- *TIBCO TDV and Business Directory Release Notes* Read the release notes for a list of new and changed features. This document also contains lists of known issues and closed issues for this release.

Release Version Support

TDV 8.5 is designated as a Long Term Support (LTS) version. Some release versions of TIBCO® Data Virtualization products are selected to be long-term support (LTS) versions. Defect corrections will typically be delivered in a new release version and as hotfixes or service packs to one or more LTS versions. See also

https://docs.tibco.com/pub/tdv/general/LTS/tdv_LTS_releases.htm.

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Get an overview of [TIBCO Support](#). You can contact TIBCO Support in the following ways:

- For accessing the Support Knowledge Base and getting personalized content about products you are interested in, visit the [TIBCO Support](#) website.
- For creating a Support case, you must have a valid maintenance or support contract with TIBCO. You also need a user name and password to log in to [TIBCO Support](#) website. If you do not have a user name, you can request one by clicking **Register** on the website.

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