SAP BAPI Connector

An ICONICS White Paper

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Visualize Your Enterprise™

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CONTENTS

1 Introduction

Scope of the Document

This document is written to introduce ICONICS Customers, Representatives, Distributors and System Integrators to upcoming technology. It provides an overview of the ICONICS' SAP BAPI Connector for training and product selection purposes.

1.1 Revision History

Version 1.0 – W.R. van Diepen, June 14, 2006

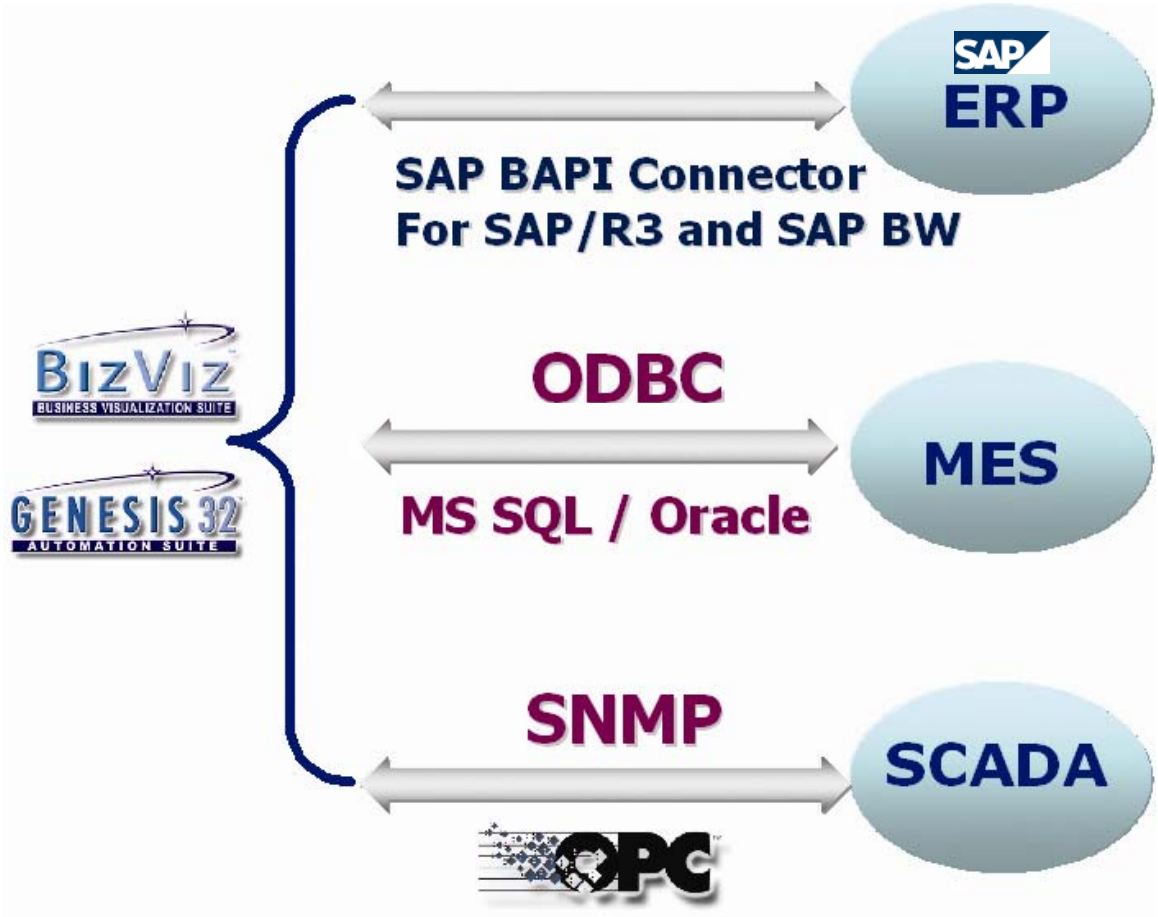
Version 1.1 – Rene Arnost, July 28, 2006

2 Introduction

2.1 ICONICS SAP BAPI Connector

SAP is the world's most implemented ERP system. Every day, 12 million people work with SAP solutions in over 100.000 installations worldwide. Most often, SAP is implemented in large companies, such as those with more than 100 employees.

With ICONICS products, it's possible to get data from various data sources. With the ICONICS SAP BAPI Connector installed together with ICONICS GENESIS32™ Automation Suite or BizViz™ Manufacturing Intelligence Software Suite, you can exchange data directly with every level of your business.



2.2 How to Get Relevant Data Out of Your SAP System

Sometimes it's a challenge to get the right data out of SAP. For most companies, the SAP system is like a black box. It's been set up and implemented by an external company. In many instances, the clients users may not have the know-how to get the relevant data out of the system (e.g. to create KPIs), especially when it comes to communication between the SAP system and other systems such as those used in real-time manufacturing.

The ICONICS SAP BAPI Connector may attach to any data exposed by existing SAP BAPI, which is a function call method of connecting to data within an SAP system. When an SAP application is developed, it contains all BAPIs necessary for internal communication within that SAP project. New BAPI connections may be developed by SAP system integrators who know the data structure and location in the SAP system.

There are three options for connect to your data with the ICONICS SAP BAPI Connector:

1. Use already existing BAPI functions and filter the data
2. Create a specific BAPI function
3. Create a common BAPI function and filter the data
4. Periodically move blocks of data to an intermediate database that has connections with ICONICS applications

Many BAPIs are available in typical SAP implementations, including those that are used by the SAP system itself. A BAPI call to the SAP system is comparable with a SQL query to a database. If you choose to have an SAP specialist define a BAPI, be sure to specify which data you want to get returned and to define search parameters.

The first option is straightforward. Existing BAPI functions return more data than typically required. Use BAPI parameters to filter the returned data and ICONICS software (DBOPC Server, ReportWorX and BridgeWorX) to query the filtered data so that you connect to the data you require. It is so easy!

The second option requires an SAP specialist to configure a BAPI function that will return the data. This has an advantage that parameters are set so that you receive exactly the data you want.

In the third option, you create a more generic BAPI. It is advised to establish parameters to filter the returned data through the BAPI function. Alternately filtering may be done on the ICONICS application side. For example, if you have a BAPI that will return the turnover of all your branch offices, the data can be retrieved as a table that can be imported via the ICONICS Data Mining Server, which allows filtering with your own, configurable queries. You may want to receive data of all the branch offices in the state of Florida, which is easily configured within the ICONICS Data Mining Server or other applications such as ICONICS ReportWorX or ICONICS BridgeWorX data connectors.

Note that you can also use BAPI parameters as the filtering conditions directly in the SAP connector.

Keep in mind that an SAP specialist is needed to define generic BAPI calls. To get other data out of the SAP system, you must use/create another BAPI. This method is more flexible than the previous option but you may have to do more work on the ICONICS application side. Another advantage can be seen in re-usability of the BAPI function for other purposes.

In the fourth option, one may use general BAPI calls to periodically move entire blocks of data out of the SAP system and copy this data to a (local) SQL database. Internal SAP policies may need to be established in the destination SQL database. You should determine the time and bandwidth required to move blocks of data as you evaluate whether this approach is feasible for your applications. ICONICS BridgeWorX software can be readily configured for data bridging with this approach.

Of course it is possible to combine these options. However, in such a case you should consider policies that are internally implemented in the SAP application, e.g. security or data access policy. When you move data into a SQL database, the internal SAP policy should be implemented as well. For more details on how to bridge SAP data into a SQL database see the Section 6 “Using the ICONICS SAP BAPI Connector with ICONICS BridgeWorX”.

3 Communication Architecture

3.1 ICONICS and SAP BAPI Communications Overview

GENESIS32 and BizViz32 products post to and retrieve data from the SAP system via the OLE DB interface. When installing the SAP BAPI connector a new OLE DB connector is available in the OLE DB Provider list. See Figure 1.

The complete communications overview is illustrated in the diagram in Figure 2. The ICONICS Modules (like ReportWorX™, BridgeWorX™ and the Data Mining Server) connect to the SAP BAPI connector via the OLE DB interface. The ICONICS SAP BAPI Connector communicates to SAP BAPIs via UDL.

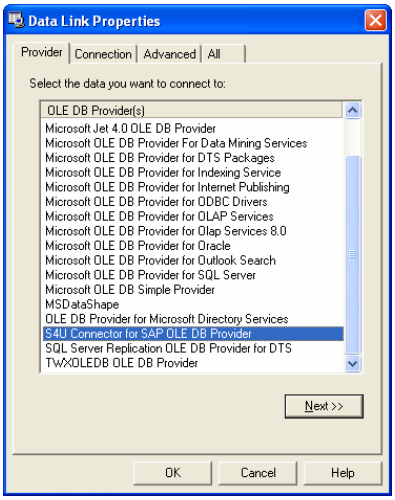


Figure 1:
ICONICS' OLE DB Provider List

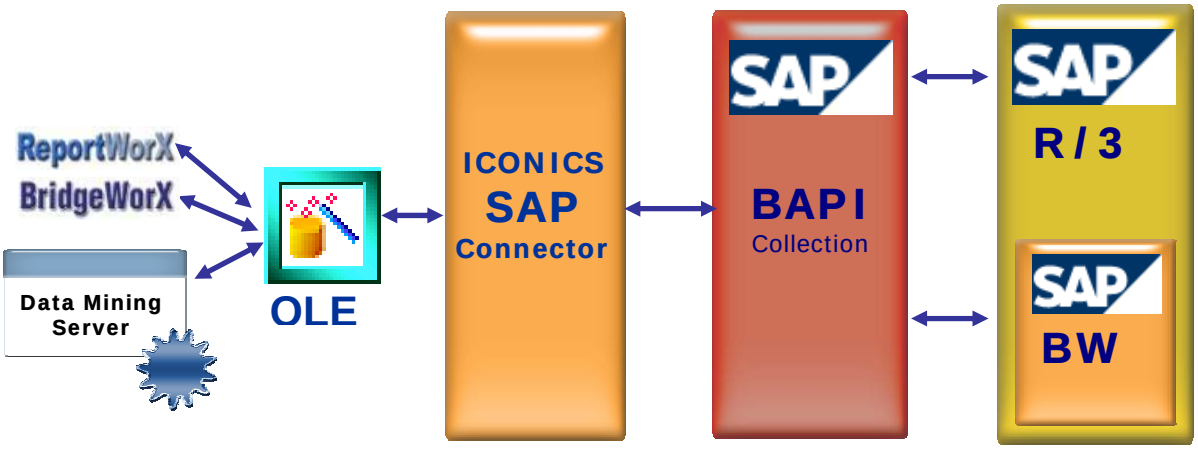


Figure 2:
Communication Overview

3.2 SAP BAPI Connector Communications Overview

The SAP BAPI Connector will connect to the BAPI collection and not to the SAP table structure itself. The connection to the BAPI collection is done by Remote Function Call (RFC). RFC is the standard SAP interface for communication between SAP systems or between SAP and external software (clients).

After connecting to the SAP system with the ICONICS SAP BAPI Connector, it's possible to get three different data sources (See Figure 3.):

- BAPI functions
- BAPI tables
- BW queries

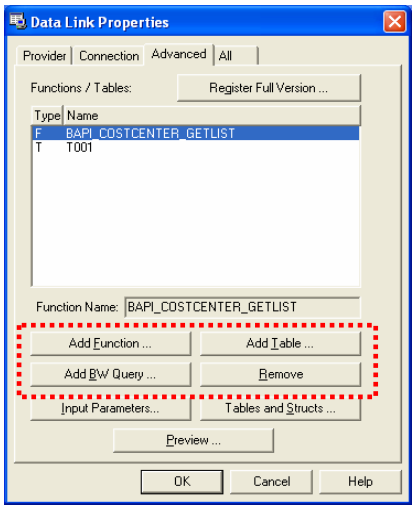


Figure 3:
SAP BAPI Connector Overview

The BAPIs and BW queries are internal to SAP.
The complete communication structure for SAP BAPI connectors is depicted in Figure 4.

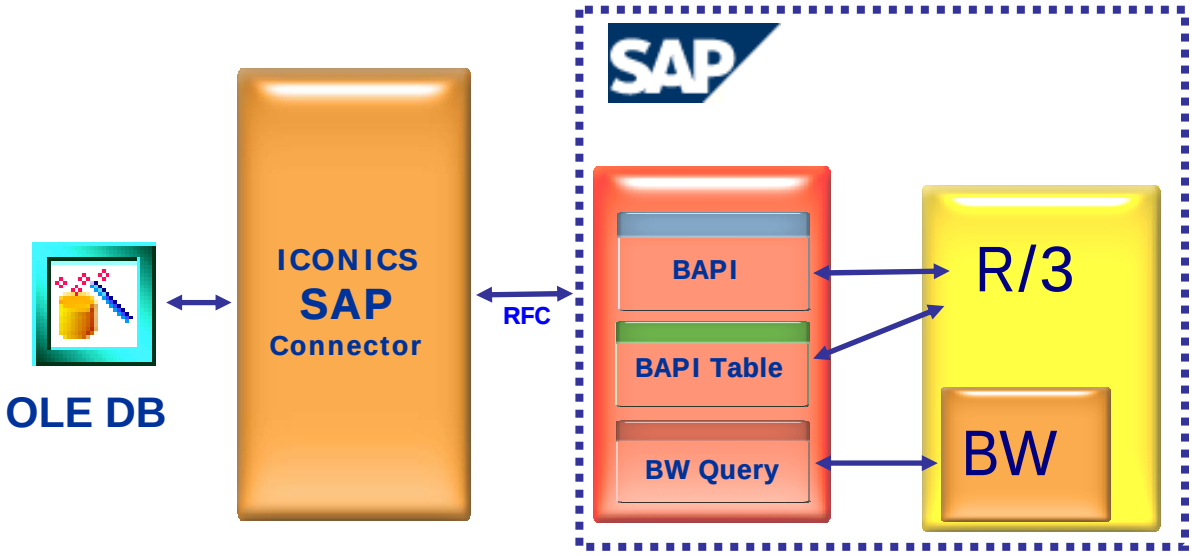


Figure 4:
BAPI Overview

3.3 BAPIs

BAPIs present a communication interface on top of the SAP system/table structure. From the data exchange point of view, there are 2 types of BAPIs:

- Read BAPIs
- Write BAPIs

BAPIs can also connect to BAPI tables. These play important role in the "SAP application ⇔ SAP Connector ⇔ ICONICS applications" communication scheme. Therefore, we shall discuss the BAPI tables first and then we get back to the Read or Write BAPI functions.

➢ **BAPI Table:**

The "BAPI table" is a parameter of a BAPI function module. Within the BAPI it can be used to:

- store results of a query when reading data from SAP
- write data from the table parameter into SAP

The use of the table depends on the implementation of the BAPI. Naturally, the BAPI function is executed on the SAP Server and that is also where the data for the table is stored. However, when the BAPI function is called through the SAP RFC interface, the complete data of all function parameters (i.e. input parameters, export parameters and tables) is transferred to the RFC client, which is in our case is the SAP connector. This is because the SAP RFC library does not implement a method to transfer the table parameters row by row, so the complete BAPI table has to be transferred between SAP Server and RFC Client when a BAPI is called.[1]

Thus the "real" BAPI table parameter resides on the SAP Server, but for the data processing on the client (the ICONICS SAP Connector) a dynamic copy of the data exists in the client memory[2] in a structure that matches the BAPI table from the SAP Server. See also the "Write BAPIs" paragraph bellow.

Note:

It is also possible to use structured internal SAP tables. These are defined directly in the SAP system and contain the system data. However SAP Company recommends against using them. SAP does not document this approach, so if one decides to use them, there can arise some incompatibility issues between patches or versions of SAP system (e.g. after applying a SAP patch on legislature change). Hence, ICONICS suggests users should not use the internal SAP tables in their projects or to visualize data from SAP.

➢ **Read BAPI:**

Read BAPIs use input parameters to return a dataset that can be a structure (one record – data structure) or a complete dataset (table). Depending on the BAPI implementation, some input parameters are mandatory. Without them, the BAPI will not return any data.

[1] This communication can be described in more details as follows:

- When reading data from SAP, the result is first stored on the SAP Server when executing the BAPI. But when data is being fetched from the client, the complete result is transferred to the Client, from where the OLE DB Provider (implemented in the ICONICS SAP Connector) can provide the data row by row.
- When writing data, the OLE DB provider can fill the BAPI table on the client side row by row until the command is committed, i.e. until the BAPI for writing data is executed. Then the complete BAPI table is transferred the other direction, i.e. from the Client to the SAP Server, where the actual BAPI function can write back the data from the BAPI table to the SAP data store.

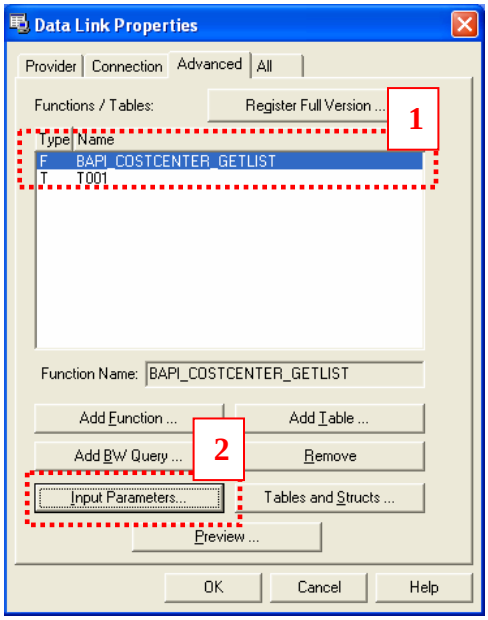
[2] i.e. the memory of the process that is using the SAP Connector, e.g. ADO, DTS or any client that can use OLE DB providers

The mandatory parameters should be documented in the BAPI description by the SAP integrator.

There are two ways of entering the input parameters:

1. Directly via the ICONICS OLE DB Interface

After selecting the BAPI (step 1), you can click on input parameters (step 2), and a window will appear with the input parameters (step 3).



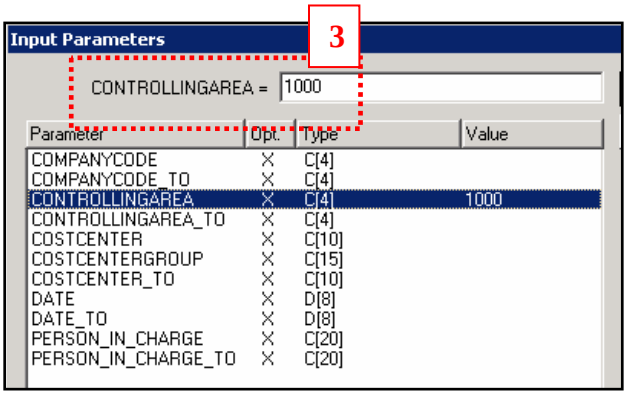


Figure 5:
Input Parameters

2. Using SQL statements

The second method is also via the ICONICS OLE DB interface but the parameters are specified through ICONICS applications, such as BridgeWorX or ReportWorX, instead of directly in the SAP Connector interface. The input parameters are exposed as column names with "s$" at the beginning of their names. They can be used in a SQL query and will overwrite the input parameters in the above described method. It will also overwrite the input parameters set in previous queries.

Example:

```
SELECT    COSTCENTER, PERSON_IN_CHARGE, COSTCTR_HIER_GRP, BUS_AREA
FROM      BAPI_COSTCENTER_GETDETAIL1.COSTCENTERDETAIL
WHERE     s$CONTROLLINGAREA = 2000
```

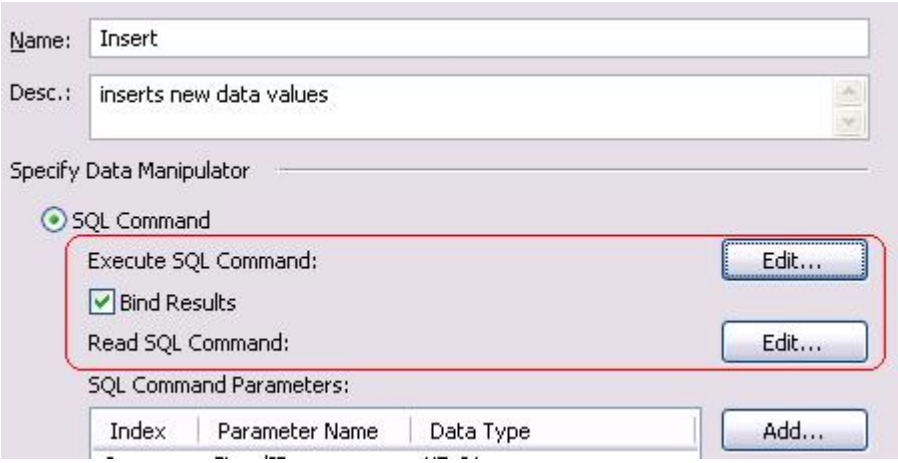
Changing the input parameter will change the return data set of the BAPI.

- **Write BAPI:**

Write BAPIs can write data to a SAP system. When you execute an insert-statement on a connected writable BAPI with using the SAP Connector (client), the data is first written into a corresponding table of the BAPI on the client (this table resides in the process memory of the SAP Connector, NOT in the SAP data store). The values are written into SAP data store:

1. When executing the OLE DB command "Execute" (in case there is no transaction involved). The data is written to the BAPI table first and afterwards into the SAP data store, but both steps happen during the same execution of the OLE DB - command. Note there is a configurable exception when using the ICONICS Data Mining OPC Server – please see the paragraph bellow.
2. When a transaction is committed having the insert command as its part. In this case it is possible to insert as many rows into the BAPI table using consequent calls of the "execute" command (e.g. using command parameters). All rows will be written into the SAP data store in one go when the "commit" of the transaction is called. If the transaction is aborted, no data is written to SAP, and the BAPI table will be cleared.

We should discuss the #1 with respect to the Data Mining OPC Server now. One may want to configure a Data Manipulator to write data into the SAP system (to the SAP data store). You need to use a writable BAPI to do so. When you configure the "Execute SQL Command" in the ICONICS Data Mining Server Configurator, the engine inserts the data into the BAPI table in the SAP connector. The write action is accomplished in the SAP server (OLE DB Execute command is called on the SAP Connector) only when you "Bind Results" with a "Read SQL command" – see the following picture.



From the Data Mining OPC server this issue is OLE DB specific. It works in this way by design as the binding is to be configurable. BridgeWorX is by design developed so that no binding is necessary – see Sections 5 and 6.

The OLE DB interface and Data Mining Server will only allow insertion of one line into the BAPI table at a time. This is a limitation of Data Mining Server. If you want to send more lines at one time, you can use BridgeWorX, ScriptWorX or a script in a GraphWorX32 display.

4 Installation of the ICONICS SAP BAPI Connector

4.1 Installing the ICONICS SAP BAPI Connector

The ICONICS SAP BAPI Connector will automatically install when installing GENESIS32 or BizViz. You can check if the ICONICS SAP BAPI Connector is installed

- with the ICONICS DBOPCServer, BridgeWorX or ReportWorX configurators or
- with the following steps:

1. Right mouse click on the desktop and select New-> Text Document.
2. Save this document as “test.udl”.
3. Select “Yes” when asked if you want the change the extension.
3. The icon will change and look like Figure 7.
4. Double click on the icon and click on “Provider” tab sheet.
5. In the list, you’ll see ICONICS SAP BAPI Connector for SAP OLE DB Provider.

Figure 7: UDL icon

4.2 Registering

The product is automatically installed in demo mode, which is restricted to 50 lines for each output dataset. Please contact your ICONICS sales representative to acquire a Customer ID and Serial Number to register the product.

Please follow these steps to register the product.

1. Use the UDL file you’ve created (See section 4.1.)
2. Double click on the file and select “SAP BAPI Connector for SAP OLE DB Provider” then click on the “Next” button.
3. Select the advanced tab sheet.
4. You’ll see a “Register Full Version” button. (If you don’t see it, your product is already fully licensed)
5. Click on this button and a popup screen will appear. Fill in the Customer ID and Serial Number and click on “OK”.
6. The “Register Full Version” button will disappear and the product is now fully licensed.

5 Using the ICONICS SAP BAPI Connector with the ICONICS Data Mining Server

5.1 Using the ICONICS SAP BAPI Connector with the ICONICS Data Mining Server

With the ICONICS Data Mining Server, a component of GENESIS32, it is possible to visualize SAP data and write data to SAP directly from any ICONICS Version 9 or greater GENESIS32 application. The visualization of data can be done in different ways:

1. as a table using DBGrid
2. as a process point
3. as a dynamic object in GraphWorX32

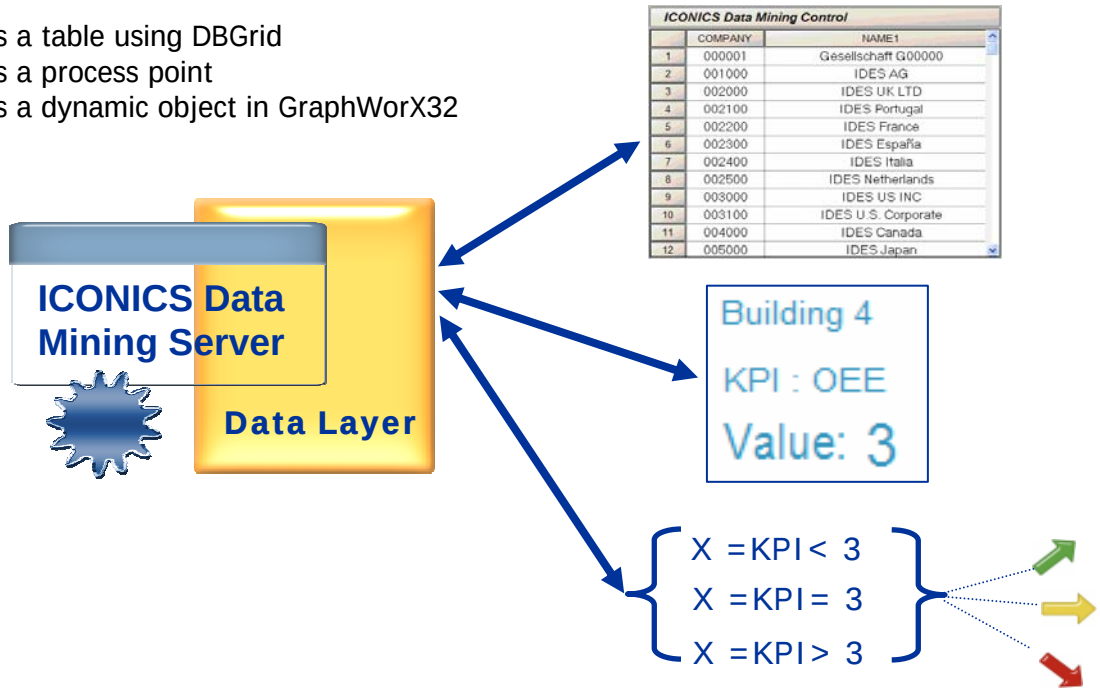


Figure 8: Visualize SAP Data

Writing to a BAPI via the ICONICS Data Mining Server works as follows:

A button with a small VBA or VB script (step 1) will connect to a pre-configured DataMining ActiveX inside GraphWorX32 (step 2). The DataMining ActiveX will execute the Write command inside the Data Mining Server (step 3) and this will send the information to a BAPI table in the SAP Connector (client) and then to the SAP Server.

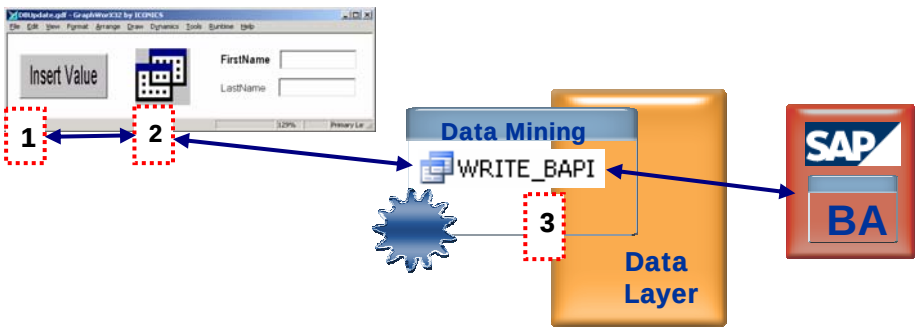


Figure 9: Writing to SAP

5.2 Configuring the Data Mining Server for the SAP Connector

Follow next steps to configure the Data Mining Configurator to get connected to a SAP application:

1. Start the Data Mining Configurator by going to Start-> Program -> ICONICS Tools -> Data Mining Configurator

2. Right Mouse click on “Databases” in the tree control and select New -> Database connector.

3. According to Figure 10, enter a Name in box # 1 and select “SAP R/3 System” as the connection type. Fill in the Connection Information in # 4. This credential set is provided to you by your SAP administrator.

Note: You can test the connection by clicking on the “Advanced” button and then click on the “Test Connection” button. Before you click on “Apply” you have to select to which BAPIs you want to connect.

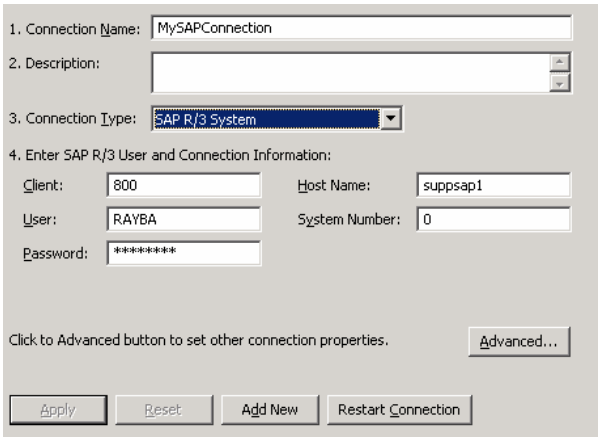


Figure 10: SAP Connection in Data Mining Configurator

4. Click the “Advanced” button and select the “Advanced” tab.

Note: There are 3 different connections: BAPI Table, BAPI Functions and BW Query. See Sections 2 and 3 for more details.

5. Click on the “Add Function” button. A popup will appear where you can search for certain BAPIs. You can use “*” as wildcards in the search input box.

6. Select the BAPI and click on the “Add” button. The BAPI name is now added to the list. For some BAPIs, you have to define input parameters to get data back. You can do this by clicking on the “Input Parameters” button. To test the returned set of values, you can click on the preview button.

7. After testing the return set of values, click on “OK”. The popup box will disappear and you’ll return to the Data Mining Configurator. Click on the “Apply” button to save the Database connection.

5.3 Configuring the Data Mining Server to Read Data from SAP

In the next steps, we'll connect two Data Sources. The first will return a complete rowset. This will be for the DB Grid. The other will be used for a process point.

1. Right mouse click on the SAP database connection you've just created and select New -> DataSource. Name the connection "BAPI_Table". Select "Database Table" and search for the table from which you require information. Select "Enable Multi-row Dataset" and change the Update Rate. An update rate of 1 sec could have a negative impact on the performance of the SAP system. Thirty (30) seconds would be a better Update Rate. Click on "Apply" and your table data source is configured. See Figure 11.

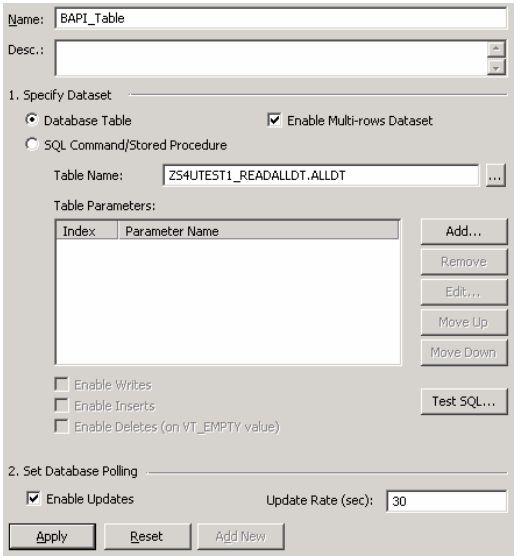


Figure 11: Configure BAPI Table Data Source

In the next step, we're going to configure the data source that will return a value from a single cell. For this, we will use two BAPI input parameters to filter the data. The BAPI input parameter names begin with the "s$".

2. Right mouse click on the SAP database connection you've just created and select New -> DataSource. Name this connection "BAPI_Search". Select the Database Table from which you want to get your data. Uncheck "Enable Multi-row Dataset" (we are interested in a singular value in this case). Click "Add" and select the input parameter(s). Click Apply; the Data Source is ready. See Figure 12.

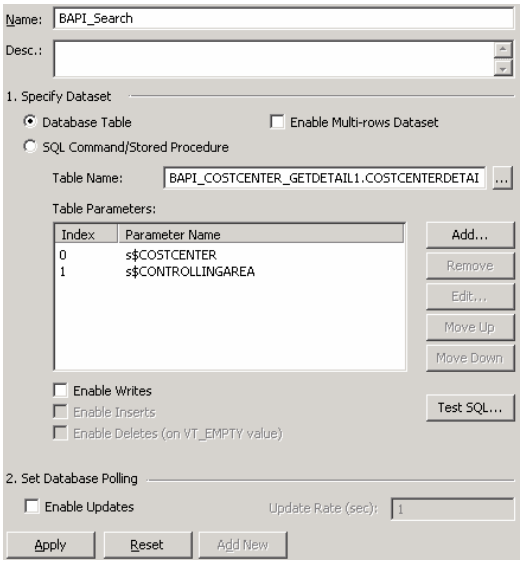


Figure 12: Configure BAPI_Search Data Source

In the following section we will visualize the data in GraphWorX.

5.3.1 Visualize SAP data in the form of a table

Start GraphWorX32 by going to Start -> Programs -> ICONICS GENESIS32 -> GraphWorX32 -> GraphWorX32.

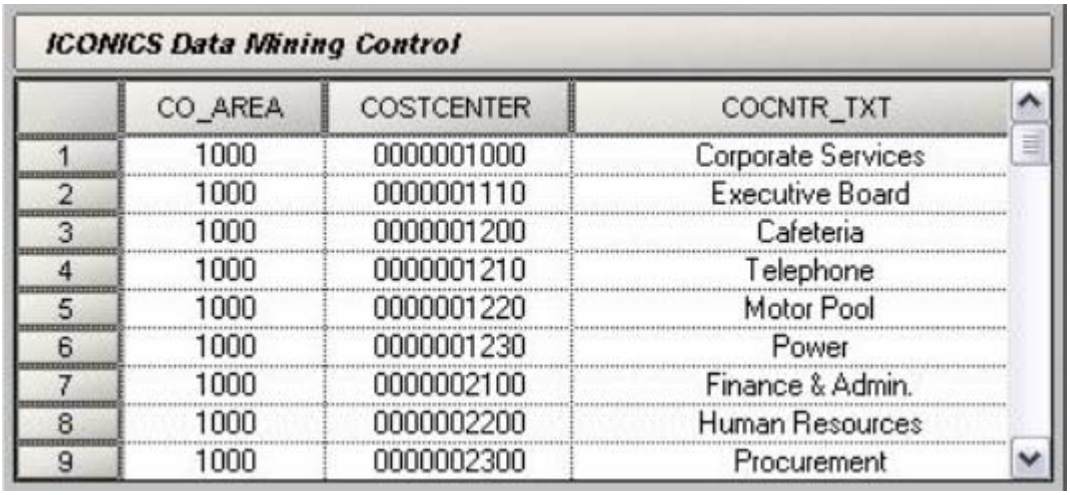
1. Click on the DB Grid button:  This will add a Database grid to the screen in order to visualize the SAP data in the form of a table.

2. Double click on the Data Mining Grid that appeared on the screen and select "Data Mining" as Data Source Type. Click on the "Connection Parameters" button and then on "Add Tags". The ICONICS Unified Data Browser will appear.

3. Select the Database Access tab sheet. Browse to the SAP database connection then select "BAPI_Table" and double click on "@@ RecordSet" so that, in the Selected Items above the tree control, the following tag will appear:

```
ICONICS.DatabaseOPCServer.3\SAP.BAPI_Table<>.@@Recordset
```

Click three times on the "OK" button and then click on "Runtime" in the top menu. A table similar to the bellow depicted will appear in your GraphWorX32 display:



	CO_AREA	COSTCENTER	COCNTR_TXT
1	1000	0000001000	Corporate Services
2	1000	0000001110	Executive Board
3	1000	0000001200	Cafeteria
4	1000	0000001210	Telephone
5	1000	0000001220	Motor Pool
6	1000	0000001230	Power
7	1000	0000002100	Finance & Admin.
8	1000	0000002200	Human Resources
9	1000	0000002300	Procurement

Figure 13: DB Grid in GraphWorX32with SAP Data

5.3.2 Visualize SAP data in the form of a process point

Now, bring the GraphWorX32 screen back to configuration mode by clicking on "Configure". Add a process point to the screen by clicking on the "Process Point" button:  and then clicking on the screen at a position where you want to place the process point will launch the property inspector.

Click on "Data Tags" and select the "Database Access" tab sheet and browse for the SAP connection and data sources you created before. After you navigate to your data source, select it and click on the "@@Column" tag. The following string will appear above the tree control.

```
ICONICS.DatabaseOPCServer.3\SAP.BAPI_Search<s$COSTCENTER;s$CONTROLLINGAREA>.<Column>
```

You can then see the two search criteria (and the column):

- s$COSTCENTER
- s$CONTROLLINGAREA

We'll enter search criteria and the column name in there so the tag looks like this:

```
ICONICS.DatabaseOPCServer.3\SAP.BAPI_Search<"0000001000";"1000">.<COCNTR_TXT>
```

Click on "OK" and select the "Client Display Type: String". Click on "OK" and put the screen into Runtime. In this example the process point returns "Corporate Services" from the SAP application.

5.4 Configuring the Data Mining Server to Write Data from GraphWorX32 to SAP

In this section, we are going to configure the Data Mining Server and a GraphWorX32 screen so that data will be written to the SAP system. See section 5.1 and Figure 9 for further explanation.

Follow these steps:

1. Start the Data Mining Configurator by going to Start-> Program -> ICONICS Tools -> Data Mining Configurator

2. Use the SAP BAPI connection you created in section 5.2. Click on the SAP connection icon and click the "Advanced" button. A popup screen will appear. Select the "Advanced" tab sheet. Click on the "Add Function" button and search for a BAPI to which you can write. Click twice on "OK" to return to the Data Mining Configurator.

3. Right mouse click on the SAP BAPI connector and Select New -> Data Manipulator

4. Name this Data Manipulator "BAPI_Write". Click on the "EDIT" button then use the following SQL syntax:

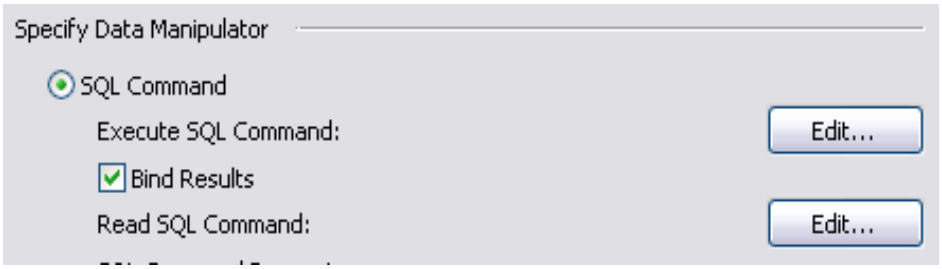
   - INSERT INTO *BAPI_NAME.TableName* (COLUMN_NAME1, COLUMN_NAME2) VALUES (?,?)

   This can look like this:

   INSERT INTO *ZSAP BAPITEST1_WRITE_DTALL.DTALL* (P_TEXT, P_INT4) VALUES (?,?)

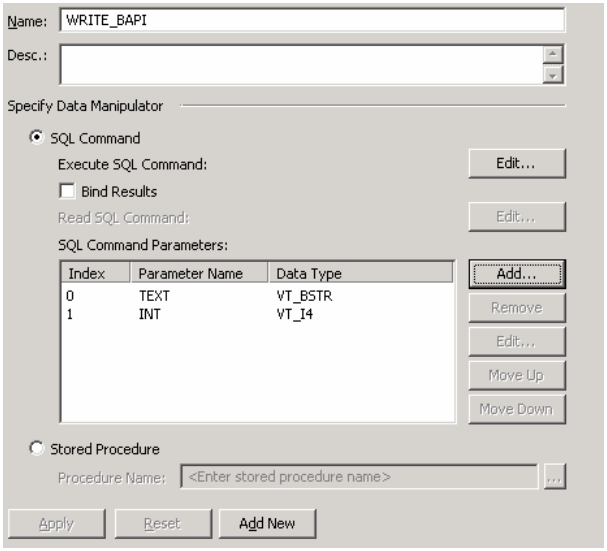
Note: There are two question marks in the SQL query. Those will be connected to the SQL command parameters.

As discussed in Section 3, you need to configure your Data Manipulator (in the Data Mining OPC Server Configurator – see picture bellow) to write data into the SAP application (to the SAP data store). When you use a writable BAPI and configure the "Execute SQL Command", the engine inserts the data into the BAPI table. The write action is in Runtime accomplished (OLE DB execute command is called) ONLY when you "Bind Results" with a "Read SQL command" in the ICONICS DBOPC Server Configurator – see the following picture. This holds only for the ICONICS Data Mining Server as the binding is to be configurable. BridgeWorX is by design developed so that no binding is necessary.



5. Click on the Add button to add a new SQL Parameter. Enter a Parameter name and select the right Parameter Data Type according to Figure 14.

6.Click on Apply and the Data Manipulator configurator is ready to use.



In the following steps, we're going to configure the GraphWorX32 screen to send data to the Data Mining Server.

7. Start GraphWorX32

8. Add a Data Manipulator ActiveX to the screen by clicking on the “OLE” button: then select “Create Control” and search for the “ICONICS DBOPCManipulator” ActiveX. Click on “OK”.

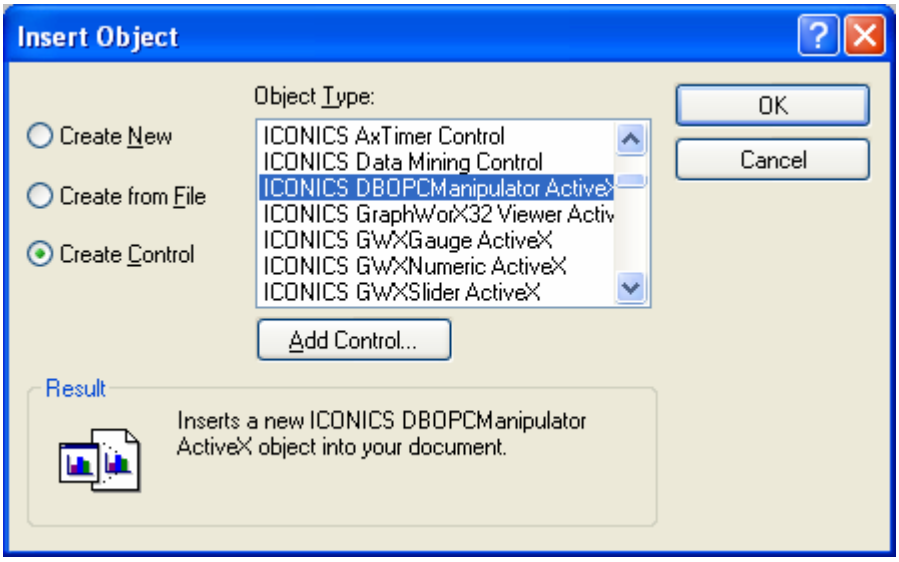


Figure 15: Data Manipulator ActiveX

9. A new icon will appear on the screen:  Double click on it.

10. A new window will appear. Click on the button with the 3 dots: . The Unified Data Browser will appear. Click on the “Database Access” tab sheet and select the “SAP BAPI Connector” and then the “BAPI_Write Datamanipulator” in the tree control. You will see a “@@Execute” tag in the right window, select so the following tag will appear above the tree control”

ICONICS.DatabaseOPCServer.3\SAP.BAPI_Write.@@Execute

11. Click “OK” and “OK” again.

12. Right mouse click on the “Data Manipulator” ActiveX and select “Application Property Inspector”. Fill in “BAPI_Write” as the object name and click “OK”.

In the next step we are going to add a button with a VBA script. Click on the “Button” icon and then click on the screen where you want the button located.

13. Select “Run Script” as “Action” in the property inspector, then click on “Create” and name the script “Write”. Click “OK”.

14. The VBA editor will open and you type in the following code:
Dim Proc As DBOPCManipulatorActiveX

Set Proc = ThisDisplay.GetVisibleObjectFromName("BAPI_Write").GetOLEObject()
Call Proc.Execute(Array("Value1", 123))

9. The VBA editor will look like Figure 16 (below). Return to GraphWorX32. Go Runtime and click on the button to test if it will write the string “Value1” and the number “123” to your SAP application.

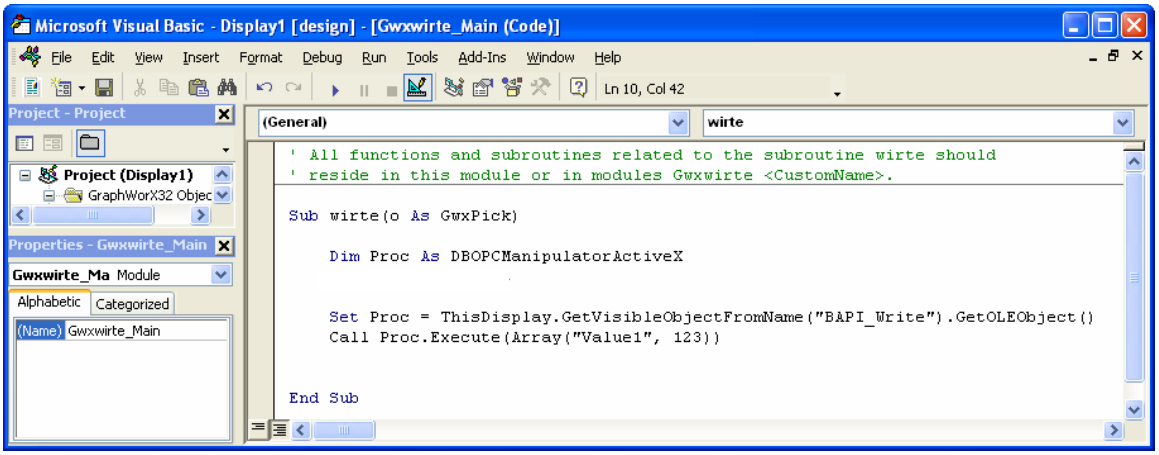


Figure 16: VB Code for Data Manipulator ActiveX

You can use ICONICS Data Mining ActiveX to check your new values were written to SAP data store. Configuration of ICONICS Data Mining ActiveX was discussed above. If supported by a BAPI you can see the results also directly with the OLE DB interface – BAPI table.

6 Using the ICONICS SAP BAPI Connector with ICONICS BridgeWorX

6.1 BridgeWorX and the ICONICS SAP BAPI Connector

Using the ICONICS SAP BAPI Connector in combination with BridgeWorX will create various solutions. BridgeWorX enables you to move data from SAP, databases, and OPC tagged Web services. With BridgeWorX and the SAP BAPI connector you can do the following:

- read SAP data and move this data to OPC tags
- read SAP data and move this to a database record
- read OPC tags and write this to SAP
- read Database records and write this to SAP

But, of course, you can do a lot more.

6.2 How to Use the ICONICS SAP BAPI Connector with BridgeWorX

In this paragraph, we'll create an example that enables to read SAP data and move this to OPC tags.

In the first step we'll configure BridgeWorX:

1. Start the BridgeWorX configurator by going to Start->Programs->ICONICS BizViz -> BridgeWorX-> BridgeWorX Configurator

2. Open the tree control on the left hand side and open the Data Connector menu. Right mouse click on "Database Connectors" and select "New Database Connector". Name this connector "SAP" and click on the "Database Login" button.

3. Select "Generic OLEDB", right click it and select "Insert New Connection".
4. Select "S4U BAPI Connector for SAP OLE DB Provider" in the provider tab sheet and then click on "Next".

5. Enter the connection details to your SAP systems in the Connection Tab Sheet. Test the connection with the "Test Connection" button. Continue only if the connection test was successful. Otherwise check your connection parameters and SAP login credentials.

6. Select the "Advanced" tab sheet and click on the "Add Function" button.

7. Select a readable BAPI and click on "OK" and "OK" again to return to the BridgeWorX Configurator.

8. Select "ONLY read" as "Data Direction", then click on the "Read from Database" tab sheet.

9. Click on "Edit Command" and "Edit SQL Query". Use the following SQL Query syntax:
    - SELECT *columnA,columnB* FROM *BAPI_Name.Table* WHERE (*s$column = parameter*)

Note: You CANNOT use aliases in the query. An easy way of creating the query is to first select “Simple SQL Query Wizard”, define the query and then edit the query by clicking on the “Edit Command” button and select “Edit SQL Query”. You can add a parameter by clicking on the “Insert Parameters” button.

10. The query in this example is of the following form:
SELECT cocntr_txt
FROM BAPI_COSTCENTER_GETLIST.COSTCENTER_LIST
WHERE (s$COSTCENTER = {{@Param3:str}})

In the next step, we’ll add two OPC tags to the Data Connectors. One of them will be used to in Runtime dynamically modify parameters of the SQL (=BAPI) query.

11. Right mouse click on OPC connectors in the tree control under Data Connectors and select “New Data Connector”.

12. Select “Read/Write” as data direction. Select the “Read from OPC” tab and click on “Tag Menu”. Add the following tag:

ICONICS.Simulator.1/SimulatePLC.OUTPUTS.WORD

Then, select the “Write to OPC” tab sheet. Click on “Add” and select the following OPC tag then click on “Apply”:
ICONICS.Simulator.1/SimulatePLC.OUTPUTS.STRING

Now we are going to create a new BridgeWorX Transaction diagram.

13. Open your folder in the “Configurations” of the tree control and add a new transaction by right mouse clicking on the transaction folder.

14. Name the transaction “SAP read” and create a new transaction diagram by clicking on the “Create New Diagram” button  and then click on the “Edit Selected” diagram button  . This will open the diagram window.

15. Click on “Run Diagram Designer” button and a new window will appear.

16. Drag and drop a Database to OPC block in the editor.

17. Double click on the button and select the Database to OPC data mapping tab sheet.

18. Select “BAPI_Read” as “Database Connector” from which to read data. Bind this OPC tag as Read Parameter:
ICONICS.Simulator.1\SimulatePLC.OUTPUTS.WORD

19. And this one as Data Records Mapping:
ICONICS.Simulator.1\SimulatePLC.OUTPUTS.STRING

20. The configuration will look like Figure 17 (below). Click on “OK” and “OK” again.

21. Close the transaction diagram to return to the BridgeWorX configurator.

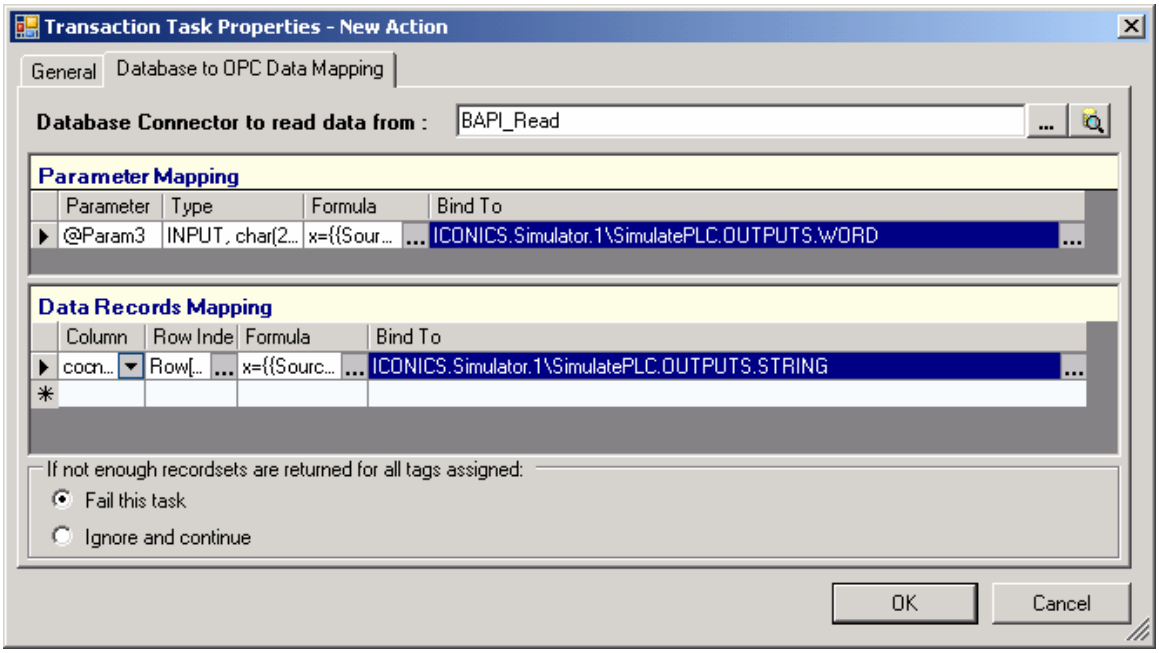


Figure 17: Database to OPC Writing

The configuration is now ready to test. Check “Enable” in the transaction diagram and create a GraphWorX32 display where you can read a value in the WORD tag. After executing the transaction, the String OPC tag will contain the SAP value.

Note: If you schedule the transaction to run every minute, it gives you the possibility to change the value of the “Word” tag whereupon the value of the “String” tag will be automatically changed by the transaction (run every minute) according to the given input parameter contained in the “Word” tag.

7 Using the ICONICS SAP BAPI Connector with ICONICS ReportWorX

7.1 ReportWorX and the SAP BAPI

With ReportWorX in combination with the ICONICS SAP BAPI Connector it is possible to create reports that contain SAP data, database data and real time OPC DA and historical OPC HDA data. You can create dynamic reports and e.g. email them automatically as PDFs to people in your organization.

7.2 How to Use the ICONICS SAP BAPI Connector with ReportWorX

In the following example, we'll setup a ReportWorX template to gather data from SAP.

1. Start the ReportWorX configurator by clicking on Start->Programs -> ICONICS BizViz -> ReportWorX -> ReportWorX Configurator

2. Open the configuration in the tree control and add a new report by right clicking on a report folder and selecting New -> Report

3. Name the report SAP and click on the "Create New Template" button: 

4. This will open the ReportTemplate Wizard. Name the template "SAP_template" and click on "Next" then select "Create Blank Excel Workbook" and click on "Next". Click on "Finish" and Excel will automatically open.

5. Select 3 cells next to each other.

6. Right mouse click on the cells and click on "Connect to New Data Source" and then "Open Database"

7. A new popup will appear. Right mouse click SAP connections and click on "Insert New Connection". (you can also use the connection created when configuring BridgeWorX for transaction connected to SAP in the previous Section)

8. The data link properties window will appear and fill in the acquired data to connect to the SAP system.

9. Click on the "Advanced" tab sheet and click on "Add Function". Search for a BAPI that will return a dataset. Set the Input Parameters that are required for the BAPI.

10. Click on "OK" and "OK" again to return to the Database Connection Configuration Wizard, then click on "Next".

11. Click on “Edit” and select “Custom Query”. A new window will appear where you can fill in the SQL query. Use the following SQL syntax:

- SELECT *columnA, columnB*
- FROM *BAPINAME.BAPITABLE*
- WHERE *s$parameter = 1000*

This can look like Figure 18

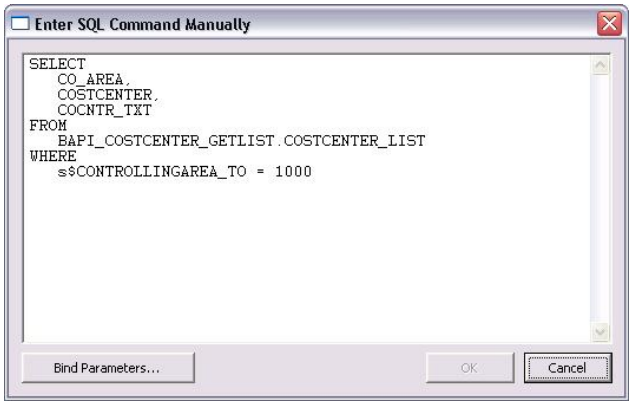


Figure 18: SQL Query in ReportWorX

Note: You can use the Simple query first to create the SQL query and then edit it by clicking on Edit -> Custom Query. The ICONICS SAP BAPI Connector does NOT support aliasing in the SQL query – see BridgeWorX note on queries in paragraph 6.2 for more details.

12. After finishing the SQL query, click on “OK”. You can test the query by clicking on the “Test” button.

13. Click on “Next” and “Finish”.

14. The Layout editor will be started. In this editor, you can select where and how you want the information to be placed in Excel. You can change the settings but, in this example, the standard layout is OK. Click on “OK” to close the Layout Editor.

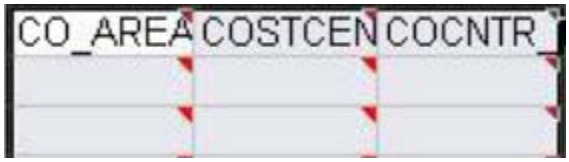


Figure 19

15. The excel sheet will change and will have red triangles in the right upper corner where there is ReportWorX Data and it will contain the Column Header. See Figure 19 (above).

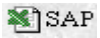
16. Close the Excel document and save it by selecting “Commit Changes”. Click on “OK” again to return to the ReportWorX Configurator

17. Enable the SAP report by checking “Enable” in the Report Configuration.

18. You can execute the report now by clicking on “Execute Report Now”.

19. Open the Monitor View by clicking on the Sun Glasses 

20. The monitor view will appear in the bottom of the screen. Select the view “All Reports”.

21. Click on the refresh button:  to update the list. The report should be ready in 10 seconds (depending on time needed to connect to and transfer the data from the SAP application). Click on the Excel icon in front of the report name:  to open the report.

22. An Excel report will appear with the selected SAP data. See Figure 20 (below).

AREA	COST CENTER ID	DESCRIPTION
1000	1000	Corporate Services
1000	1110	Executive Board
1000	1200	Cafeteria
1000	1210	Telephone
1000	1220	Motor Pool
1000	1230	Power
1000	2100	Finance & Admin.
1000	2200	Human Resources
1000	2300	Procurement
1000	2410	RE Vacanct apartment
1000	2420	RE Vacanct office
1000	2430	RE Vacant, others
1000	3100	Motorcycle Sales
1000	3105	Automotive Sales
1000	3110	Pump Sales
1000	3120	Sales Paint/Solvents
1000	3125	Sales Pharma/Cosmet.
1000	3130	Light Bulb Sales
1000	3135	Sales Foodstuffs
1000	3140	High-Tech Sales
1000	3150	Elevator Sales
1000	3200	Marketing
1000	4100	Technical Service I
1000	4110	Technical Facilities
1000	4120	IT Service
1000	4130	Warehouse
1000	4200	Motorcycle Prod.
1000	4205	Work Scheduling
1000	4210	Motorcycle Assembly

Figure 20: SAP Data in Excel

About ICONICS

ICONICS is a leading provider of award-winning enterprise manufacturing intelligence and automation software solutions.

ICONICS' solutions deliver real-time visibility into all enterprise operations and systems, helping companies to be more profitable, more agile, and more efficient. As a Microsoft Gold Certified Partner, ICONICS designs its solutions from the ground up to take maximum advantage of Microsoft .NET and SharePoint Portal Server technology, offering an unprecedented level of performance and ease of use.

Our award-winning GENESIS32 and new GENESIS64 automation software solutions can improve productivity, reduce integration and operating costs, and optimize your asset utilization, giving your organization a competitive edge. All ICONICS products are based on "open standards," using OPC-to-the-Core technology leveraging proven architecture and lower TCO of mainstream Microsoft platform, and connect to your existing infrastructure. We have more than 225,000 applications running worldwide serving top manufacturing companies.

ICONICS' BizViz suite of products provides real-time manufacturing intelligence from the production floor to the boardroom, turning real-time information into your competitive advantage.

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