PI JDBC Basics, Learn How to Query PI

OSIsoft.

1.1 PI JDBC Basics, Learn How to Query PI

1.1.1 Description

The objective of this lab is to explore the PI server by using an already installed PI JDBC driver and DBVisualizer (free version).

1.1.2 Objectives

- Check installation of JDBC and PI SQL DAS
- Start DBVisualizer and add the PI JDBC Driver
- Open the connection and discover schema information
- Use the SQL Commander
- Explore the functions provided by Personal Edition of DbVisualizer
- More features related to PI JDBC

1.1.3 Problem Description

You have just installed the new PI JDBC driver and would like to explore your PI server with the free tool DBVisualizer and become acquainted with the functionality of the PI JDBC driver.

1.1.4 Suggested Approach

(Optional) Check the installation of JDBC and PI SQL DAS by locating the PIPC directory and verifying there is a folder JDBC containing the file PIJDBCDriver.jar (platform independent). Also verify the file RDSAWrapper.dll (native code library) is installed.

Note1: On a Linux System this shared library would be called libRDSAWrapper.so

Note2: If used with a 64 bit Java VM the names were RDSAWrapper64.dll
or libRDSAWrapper64.so

Verify the environment variable PI_RDSA_LIB is defined and refers to the shared library.
Verify PI SQL Data Access Server service is installed and running

Start the DBVisualizer and add PI JDBC Driver. On DBVisualizer's first startup, use Tools - Driver Manager and add a new Driver, referring to pipc\jdbc\PIJDBCDriver.jar
The URL format is jdbc:pisql://<das_node>/<oledb_provider_string>. For the Virtual Machine used at the Learning Labs this is:

jdbc:pisql://osisoft-trng/Data Source=osisoft-trng; Integrated Security=SSPI;

Create a new Database Connection by choosing the defined PI JDBC Driver and adapting the actual Database URL.

Note: the UserId and Password refer to the PI SQL Data Access Server,
not to the PI server.

Once connected, you can browse the different levels of connection, catalogs and tables/views and see how the PIOLEDB information is mapped to JDBC.

Using the SQL Commander tab instead of the Object View, try some sample queries provided by PIOLEDB Tester, or see the samples in the Solution section.

Notice the DbVisualizer's Bookmark Editor to organize your favorite queries.
Another nice feature is the Monitor window, where you can run several queries marked in the Bookmark in parallel and repeatedly.

The PI JDBC Driver can by controlled by some properties. User / Password , which is used to control connection to the PI SQL DAS, and the Provider string as part of the Database URL, are available on the Connection tab. Others are shown on the Properties tab of the Connection level dialog.

Another feature is to control logging by level and location (file and/or console)

If you prefer not to store the connection credentials in a third party app or in plain text even, and you want or need to avoid entering these credentials manually for every connection, PIJDBC provides the feature to store and reuse authentication information in encrypted files. This is controlled by the DCA property, which can be set to the keywords REUSE or INIT (or can refer to a specific file, created earlier by the INIT option).

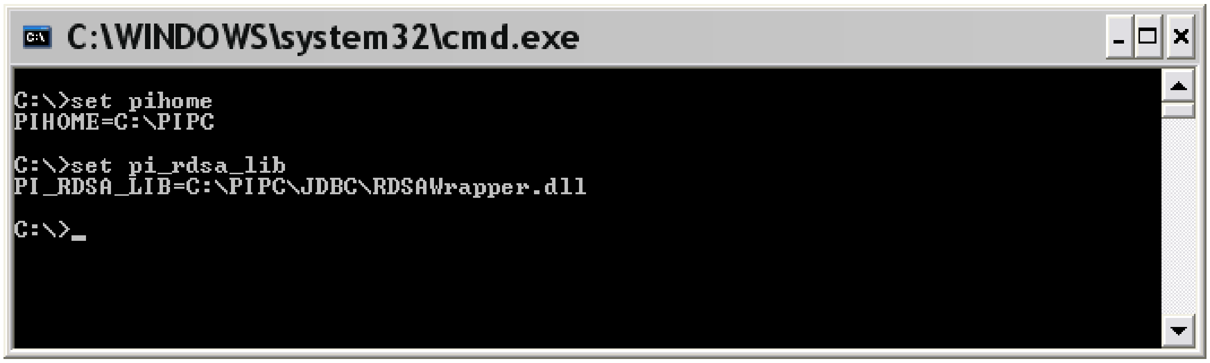
This tutorial machine has the Free version of DBVisualizer installed. The Personal Edition demonstrates additional features: The most interesting one is to automatically generate queries reflecting data changes, inserts and deletes in a result grid. This of course requires to have all primary keys contained in the grid, and to work on an updatable table. See a screenshot in the Solutions section or contact www.dbvis.com for your own Personal edition of DbVisualizer.

Try to do this exercise on your own before proceeding to the Step-by-Step Instructions.

1.1.5 Step-by-Step instructions

Check installation of JDBC

1. PIPC directory is by default in `c:\Program Files`. This location can be modified with the installation of the first PI Client application. Open a Console and enter the command `set PIHOME.` This should show the actual value.
2. In this Console we can as well check for the existence of the environment variable PI_RDSA_LIB by entering `set PI_RDSA_LIB.`

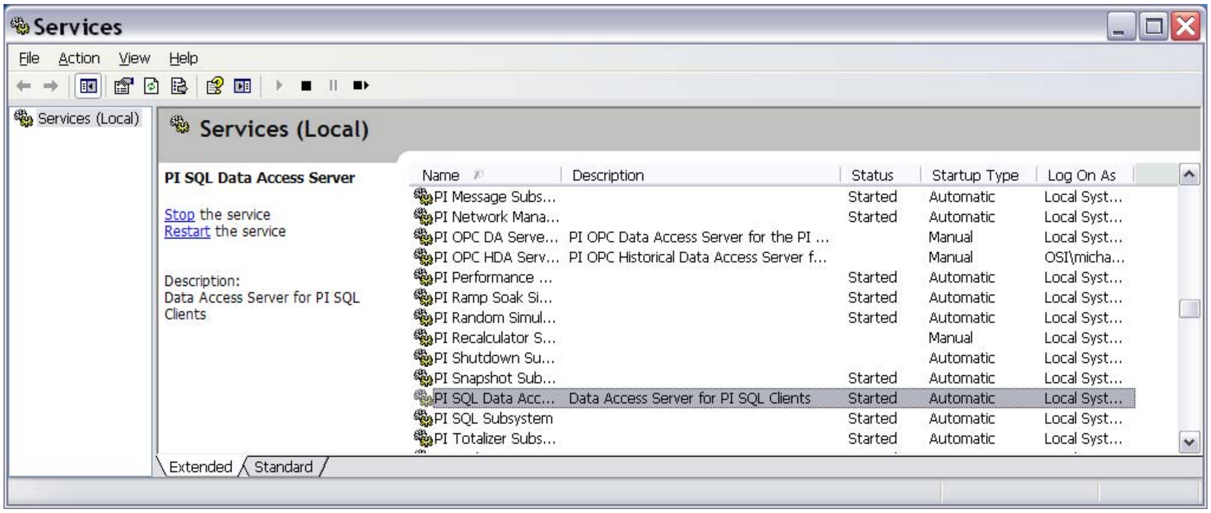


```
C:\>set pihome
PIHOME=C:\PIPC

C:\>set pi_rdsa_lib
PI_RDSA_LIB=C:\PIPC\JDBC\RDSAWrapper.dll

C:\>_
```

3. Navigate to the PIPC\JDBC folder and verify that it contains the file PIJDBCDriver.jar.
4. Verify PI SQL Data Access Server service is installed and running by browsing the list of services (Start > Administrative Tools > Services):



PI SQL Data Access Server

Stop the service
Restart the service

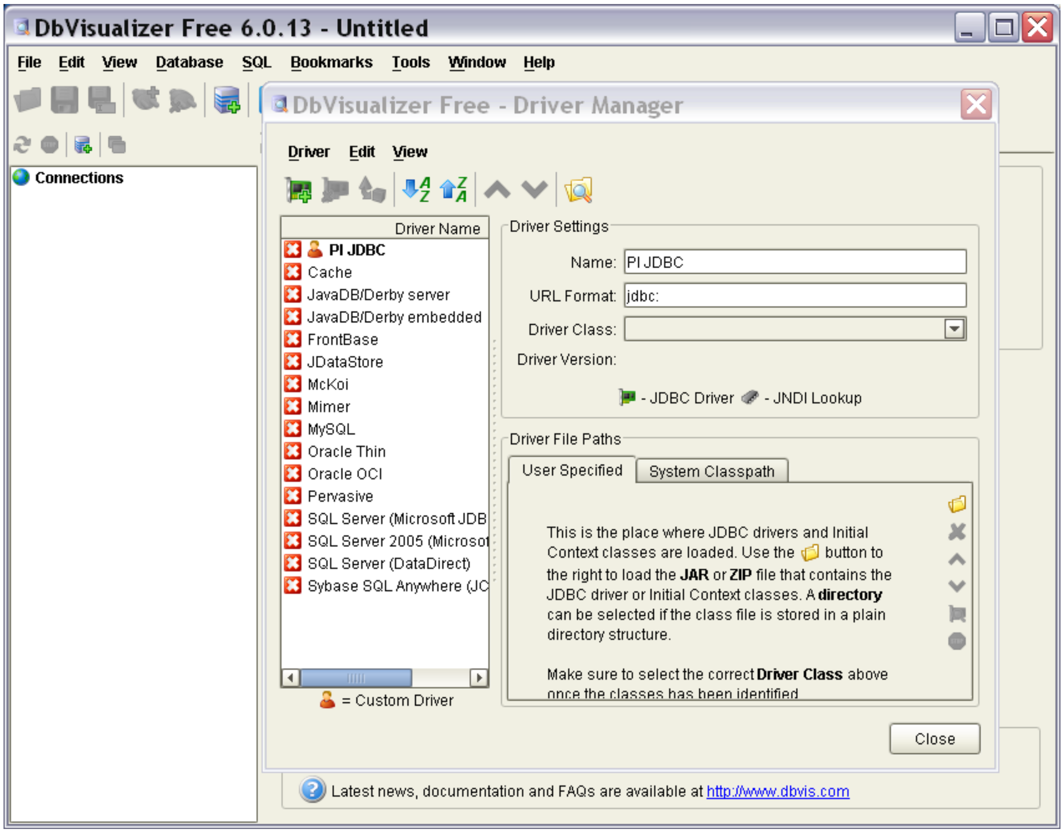
Description:
Data Access Server for PI SQL Clients

Name	Description	Status	Startup Type	Log On As
PI Message Subs...		Started	Automatic	Local Syst...
PI Network Mana...		Started	Automatic	Local Syst...
PI OPC DA Serve...	PI OPC Data Access Server for the PI ...		Manual	Local Syst...
PI OPC HDA Serv...	PI OPC Historical Data Access Server f...		Manual	OSI\micha...
PI Performance ...		Started	Automatic	Local Syst...
PI Ramp Soak Si...		Started	Automatic	Local Syst...
PI Random Simul...		Started	Automatic	Local Syst...
PI Recalculator S...			Manual	Local Syst...
PI Shutdown Su...			Automatic	Local Syst...
PI Snapshot Sub...		Started	Automatic	Local Syst...
PI SQL Data Acc...	Data Access Server for PI SQL Clients	Started	Automatic	Local Syst...
PI SQL Subsystem		Started	Automatic	Local Syst...
PI Totalizer Subs...		Started	Automatic	Local Syst...

Note: In general, PI SQL DataAccessServer can run on a different machine than the JDBC client.

Start DBVisualizer and add PI JDBC Driver

1. Start DBVisualizer by going to Start > All Programs > DbVisualizer 7.0.5 > DbVisualizer
2. After a first start of DBVisualizer and to be able to create a Connection you have to add PI JDBC to the list of known drivers. This is done by running
   Tools – Driver Manager from the main menu. You will see a big list of predefined drivers and add another one by specifying a new name and clicking the 📂 symbol.



Name: PI JDBC

URL Format: jdbc:

Driver Class:

Driver Version:

This is the place where JDBC drivers and Initial Context classes are loaded. Use the 📂 button to the right to load the **JAR** or **ZIP** file that contains the JDBC driver or Initial Context classes. A **directory** can be selected if the class file is stored in a plain directory structure.

Make sure to select the correct **Driver Class** above once the classes has been identified

Latest news, documentation and FAQs are available at http://www.dbvis.com

3. Select PIPC\JDBC\JDBCDriver.jar and click Open. Your new driver should be usable now, indicated by ✅👤 in the driver list.
   It is recommended to enter additional information into the URL format field. The URL for our driver is jdbc:pisql://<das_node>/<provider_string>

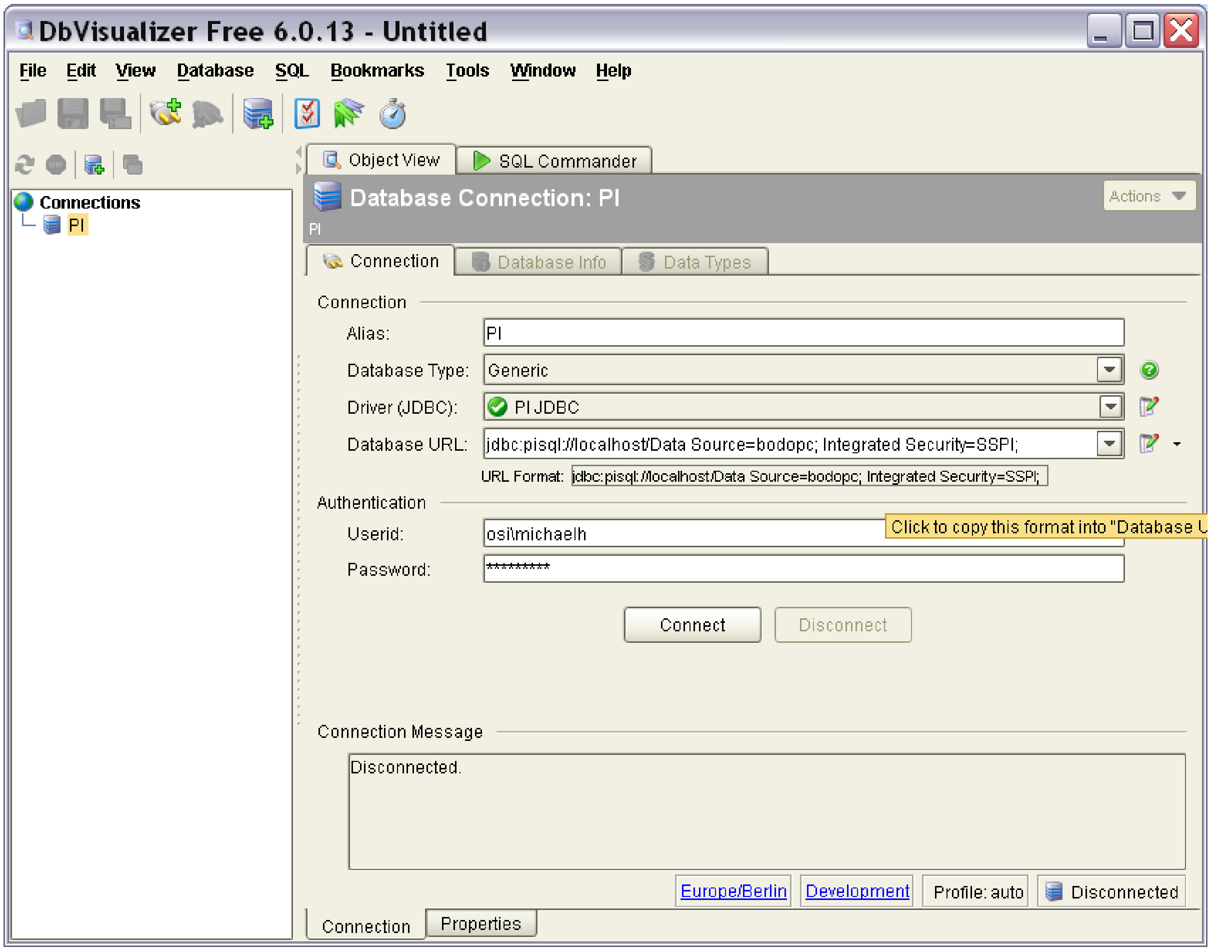
As there's typically not much to change for every connection individually, you can enter this information here, already:

jdbc:pisql://osisoft-trng/Data Source=osisoft-trng; Integrated Security=SSPI;

4. Finally, close the Driver Manager.

Open the connection and discover schema information

1. Use either Database – Create Database Connection in the main menu or click the symbol in the toolbar to create a connection based on our PI JDBC Driver.
   Supply any Alias name, choose the only available generic driver, which was created in the previous step.



Connection

Alias: PI

Database Type: Generic

Driver (JDBC): PI JDBC

Database URL: jdbc:pisql://localhost/Data Source=bodopc; Integrated Security=SSPI;

URL Format: jdbc:pisql://localhost/Data Source=bodopc; Integrated Security=SSPI;

Click to copy this format into "Database U

Authentication

Userid: osi\michaelh

Password: **********

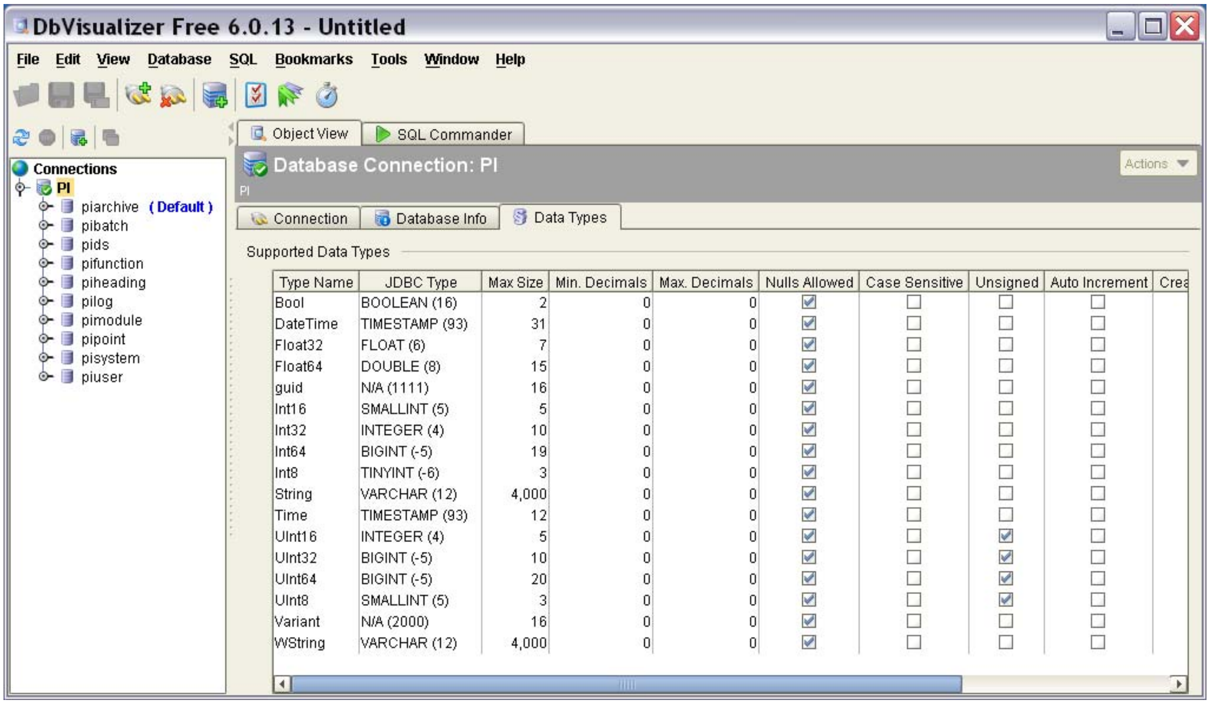
Connection Message

Disconnected.

2. Select the URL format to be copied into the Database URL line and edit as necessary.
3. Now supply UserId and Password to connect to the PI SQL Data Access Server. In our case, running

locally, you should supply the same credentials that you needed to log in. In general, the Java client can run on any machine, non-windows and outside a windows domain. UserId can be domain\username or be a local user on the DAS node.

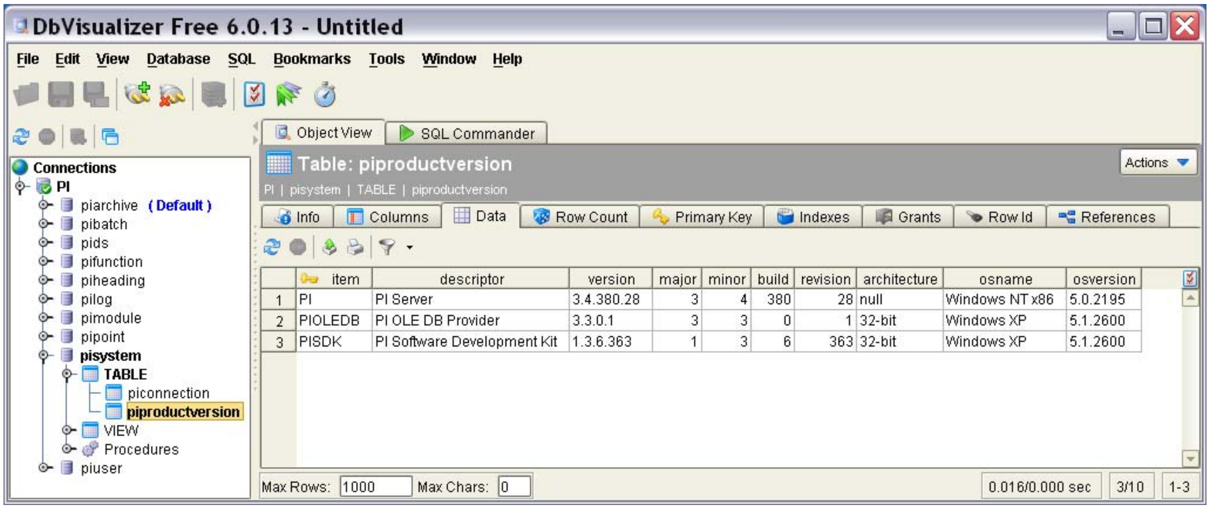
4. Click Connect.
5. The Connection Message box should display information about versions of the driver and PIOLEDB, which is used by PI SQL DataAccessServer.
   The Connections tree view on the left should expand and show all catalogs of the PIOLEDB provider, indicating piarchive as the default catalog.
   Double-click opens lower levels of the schema information, and the Object View on the right displays information corresponding to the selected element.
   Every catalog can contain tables and views defined on the PI server level. Procedures are not supported by PIOLEDB.
   Depending on the selection level, there are different information types visible:
    Here, on the top level, you see the mapping of PIOLEDB data types to JDBC Data types as an example.



Supported Data Types

Type Name	JDBC Type	Max Size	Min. Decimals	Max. Decimals	Nulls Allowed	Case Sensitive	Unsigned	Auto Increment	Crea
Bool	BOOLEAN (16)	2	0	0	☑	□	□	□	
DateTime	TIMESTAMP (93)	31	0	0	☑	□	□	□	
Float32	FLOAT (6)	7	0	0	☑	□	□	□	
Float64	DOUBLE (8)	15	0	0	☑	□	□	□	
guid	N/A (1111)	16	0	0	☑	□	□	□	
Int16	SMALLINT (5)	5	0	0	☑	□	□	□	
Int32	INTEGER (4)	10	0	0	☑	□	□	□	
Int64	BIGINT (-5)	19	0	0	☑	□	□	□	
Int8	TINYINT (-6)	3	0	0	☑	□	□	□	
String	VARCHAR (12)	4,000	0	0	☑	□	□	□	
Time	TIMESTAMP (93)	12	0	0	☑	□	□	□	
UInt16	INTEGER (4)	5	0	0	☑	□	☑	□	
UInt32	BIGINT (-5)	10	0	0	☑	□	☑	□	
UInt64	BIGINT (-5)	20	0	0	☑	□	☑	□	
UInt8	SMALLINT (5)	3	0	0	☑	□	☑	□	
Variant	N/A (2000)	16	0	0	☑	□	□	□	
WString	VARCHAR (12)	4,000	0	0	☑	□	□	□	

6. When regarding a single table, the tabs Info, Columns, Row Count, Primary Key show useful information. Indexes, Grants, Row Id and References do not have a meaning for the PIJDBC driver. The Data tab can only be used for small tables, of course.

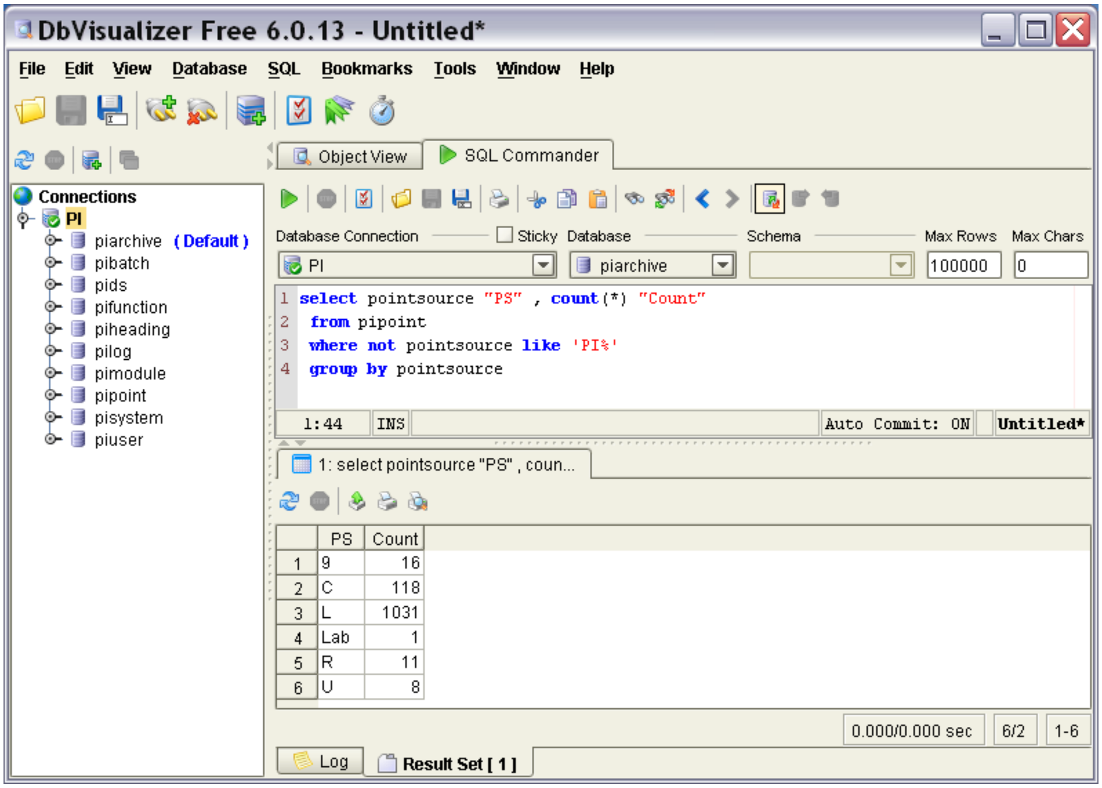

DbVisualizer Free 6.0.13 - Untitled
File Edit View Database SQL Bookmarks Tools Window Help
Object View
SQL Commander
Table: piproductversion
PI | pisystem | TABLE | piproductversion
Info Columns Data Row Count Primary Key Indexes Grants Row Id References
Actions
Connections
PI
piarchive (Default)
pibatch
pids
pifunction
piheading
pilog
pimodule
pipoint
pisystem
TABLE
piconnection
piproductversion
VIEW
Procedures
piuser

	item	descriptor	version	major	minor	build	revision	architecture	osname	osversion
1	PI	PI Server	3.4.380.28	3	4	380	28	null	Windows NT x86	5.0.2195
2	PIOLEDB	PI OLE DB Provider	3.3.0.1	3	3	0	1	32-bit	Windows XP	5.1.2600
3	PISDK	PI Software Development Kit	1.3.6.363	1	3	6	363	32-bit	Windows XP	5.1.2600

Max Rows: 1000 Max Chars: 0 0.016/0.000 sec 3/10 1-3

Using the SQL Commander

1. Switching from the Object View tab to SQL Commander, allows to execute any query which can be executed by the underlying PIOLEDB provider.



Database Connection: PI □ Sticky Database: piarchive Schema: Max Rows: 100000 Max Chars: 0

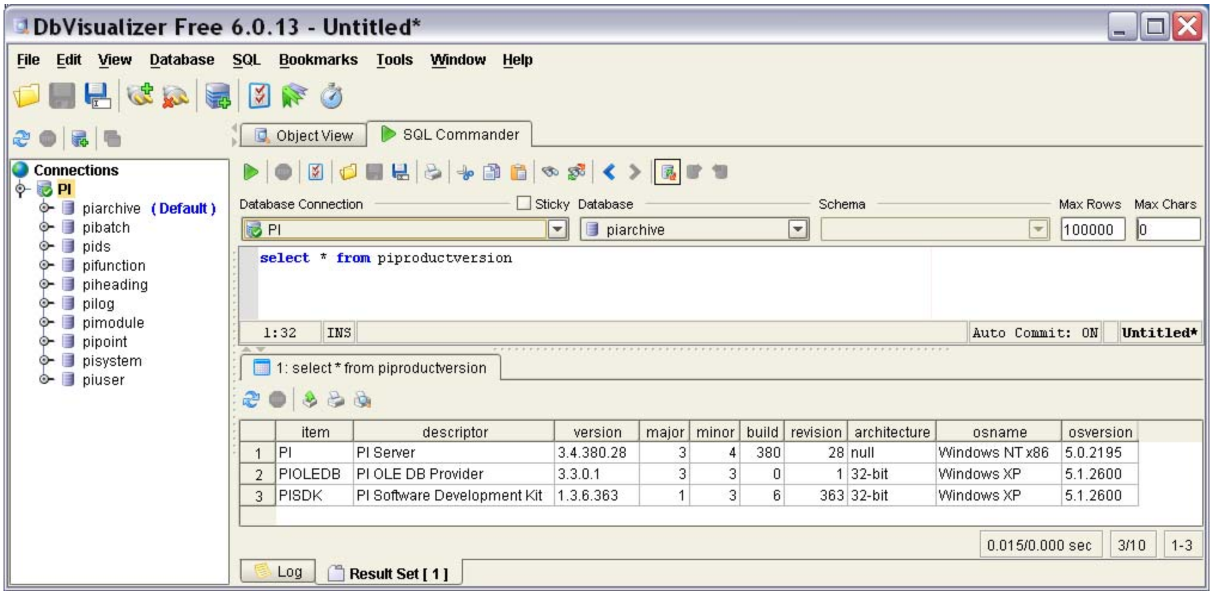
```
select pointsource "PS" , count(*) "Count"
 from pipoint
 where not pointsource like 'PI%'
 group by pointsource
```

1:44 INS Auto Commit: ON Untitled*

1: select pointsource "PS" , coun...

	PS	Count
1	9	16
2	C	118
3	L	1031
4	Lab	1
5	R	11
6	U	8

0.000/0.000 sec 6/2 1-6



Database Connection: PI □ Sticky Database: piarchive Schema: Max Rows: 100000 Max Chars: 0

```
select * from piproductversion
```

1:32 INS Auto Commit: ON Untitled*

	item	descriptor	version	major	minor	build	revision	architecture	osname	osversion
1	PI	PI Server	3.4.380.28	3	4	380	28	null	Windows NT x86	5.0.2195
2	PIOLEDB	PI OLE DB Provider	3.3.0.1	3	3	0	1	32-bit	Windows XP	5.1.2600
3	PISDK	PI Software Development Kit	1.3.6.363	1	3	6	363	32-bit	Windows XP	5.1.2600

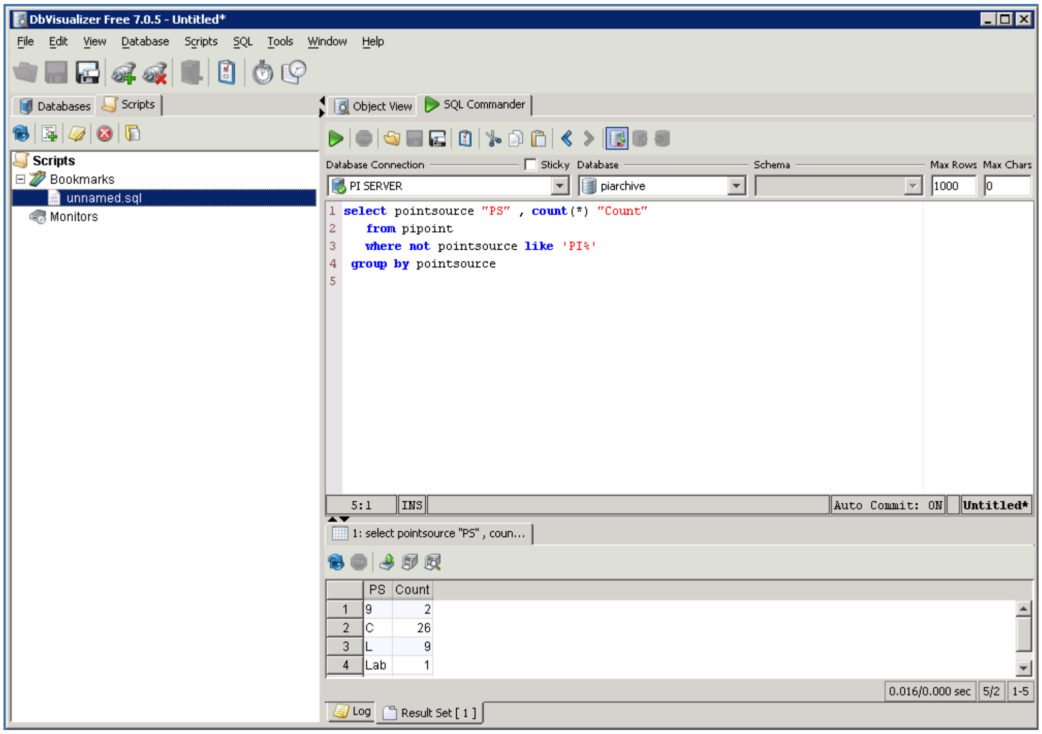
0.015/0.000 sec 3/10 1-3

2. Some interesting queries to verify connectivity:

```
select * from piproductversion
```

```
select pointsource "PS" , count(*) "Count"
   from pipoint
   where not pointsource like 'PI%'
 group by pointsource
```

3. Notice the DbVisualizer's Bookmark Editor to organize your favorite queries found on the tab right next to the Databases tab.



Database Connection: PI SERVER

Database: piarchive

Schema:

Max Rows: 1000

Max Chars: 0

```
select pointsource "PS" , count(*) "Count"
   from pipoint
   where not pointsource like 'PI%'
 group by pointsource
```

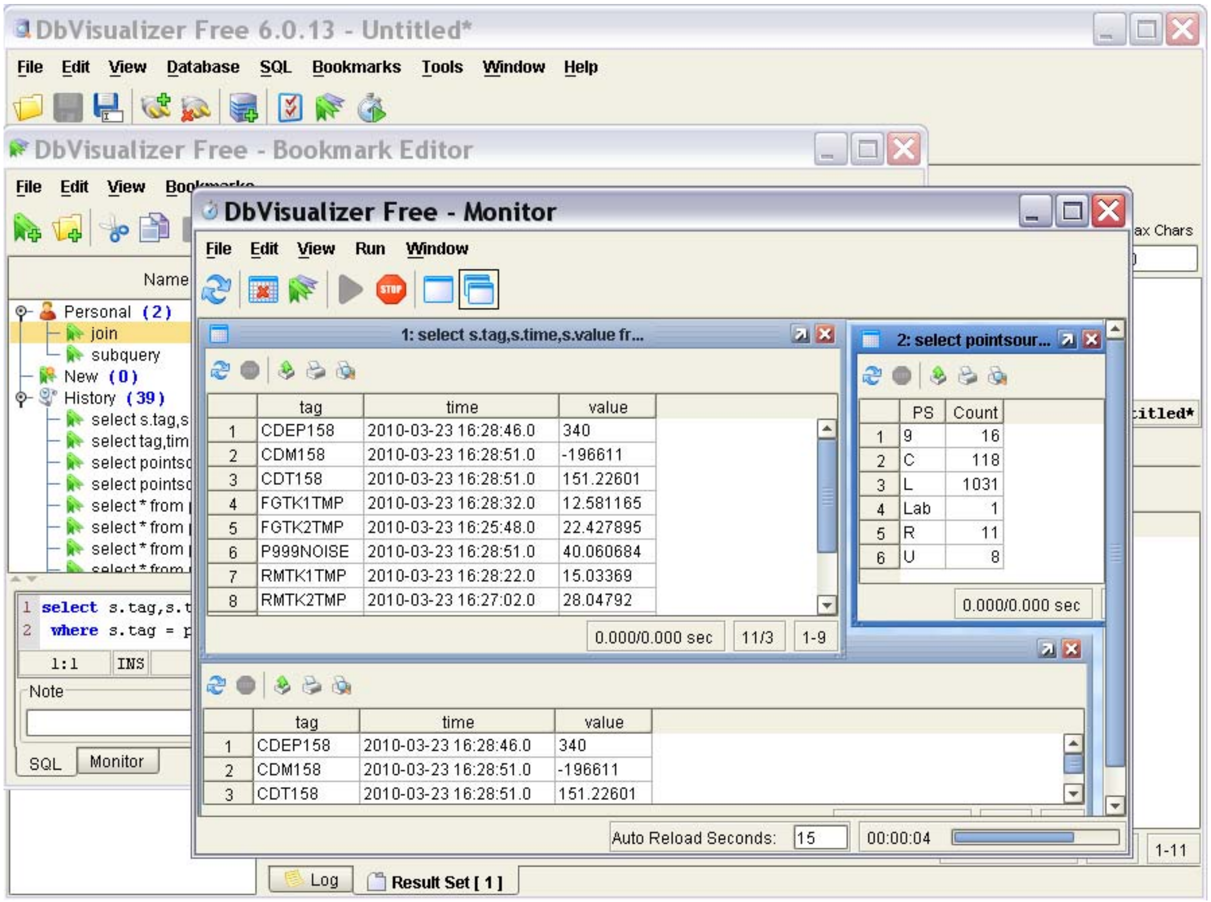
5:1 INS Auto Commit: ON Untitled*

1: select pointsource "PS" , coun...

	PS	Count
1	9	2
2	C	26
3	L	9
4	Lab	1

0.016/0.000 sec 5/2 1-5

4. You have access to previous queries, can create folders, rename queries and add comments. Monitor allows to run multiple queries in parallel and repeatedly.



```
select s.tag,s.t
where s.tag = p
```

1: select s.tag,s.time,s.value fr...

	tag	time	value
1	CDEP158	2010-03-23 16:28:46.0	340
2	CDM158	2010-03-23 16:28:51.0	-196611
3	CDT158	2010-03-23 16:28:51.0	151.22601
4	FGTK1TMP	2010-03-23 16:28:32.0	12.581165
5	FGTK2TMP	2010-03-23 16:25:48.0	22.427895
6	P999NOISE	2010-03-23 16:28:51.0	40.060684
7	RMTK1TMP	2010-03-23 16:28:22.0	15.03369
8	RMTK2TMP	2010-03-23 16:27:02.0	28.04792

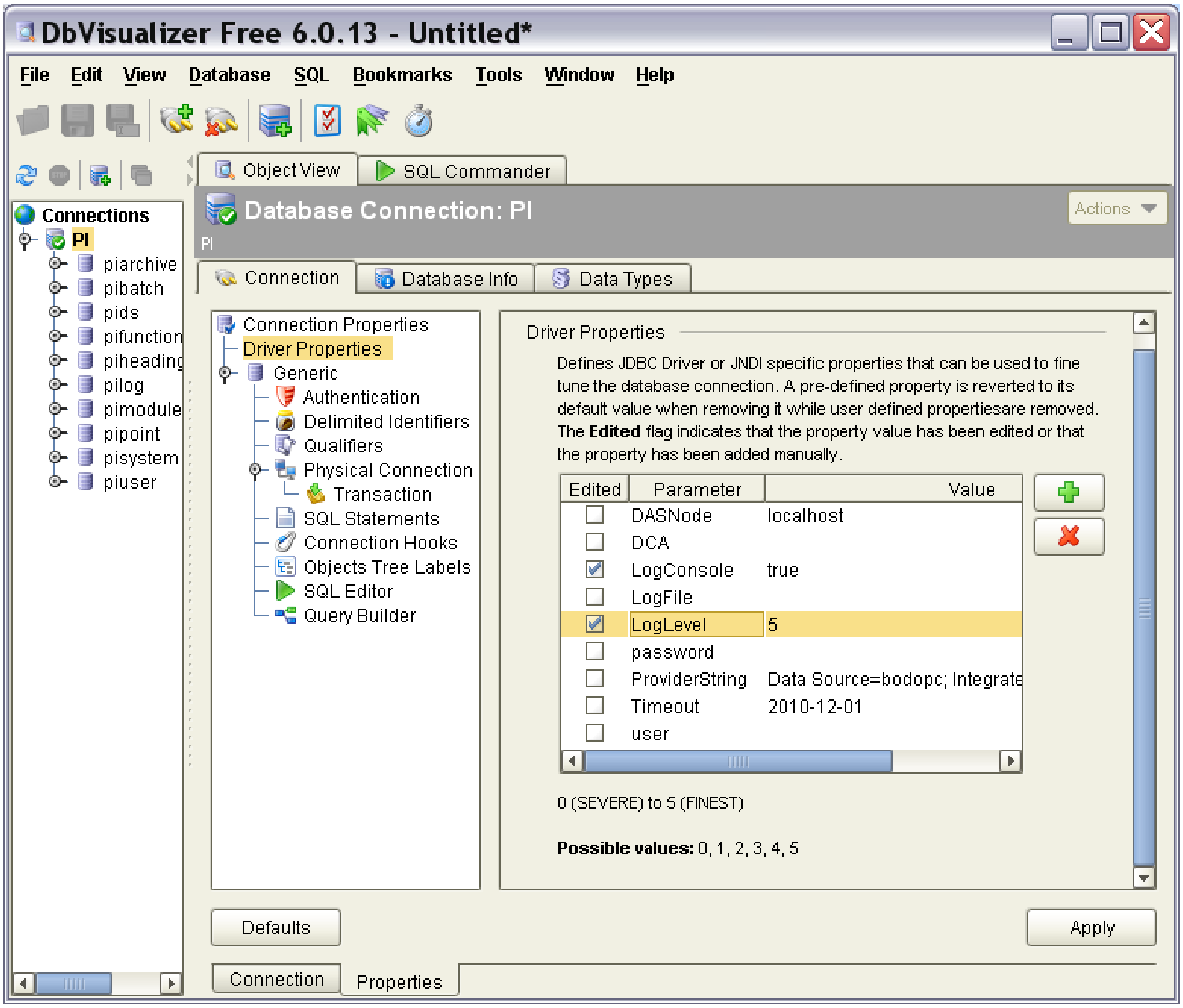
2: select pointsour...

	PS	Count
1	9	16
2	C	118
3	L	1031
4	Lab	1
5	R	11
6	U	8

	tag	time	value
1	CDEP158	2010-03-23 16:28:46.0	340
2	CDM158	2010-03-23 16:28:51.0	-196611
3	CDT158	2010-03-23 16:28:51.0	151.22601

More features related to PI JDBC

1. Additionally to options in the Provider String, which are passed through to the PIOleDB Provider, the PI JDBC Driver itself can by controlled by some optional properties



Driver Properties

Defines JDBC Driver or JNDI specific properties that can be used to fine tune the database connection. A pre-defined property is reverted to its default value when removing it while user defined propertiesare removed. The **Edited** flag indicates that the property value has been edited or that the property has been added manually.

Edited	Parameter	Value
☐	DASNode	localhost
☐	DCA	
☑	LogConsole	true
☐	LogFile	
☑	LogLevel	5
☐	password	
☐	ProviderString	Data Source=bodopc; Integrate
☐	Timeout	2010-12-01
☐	user	

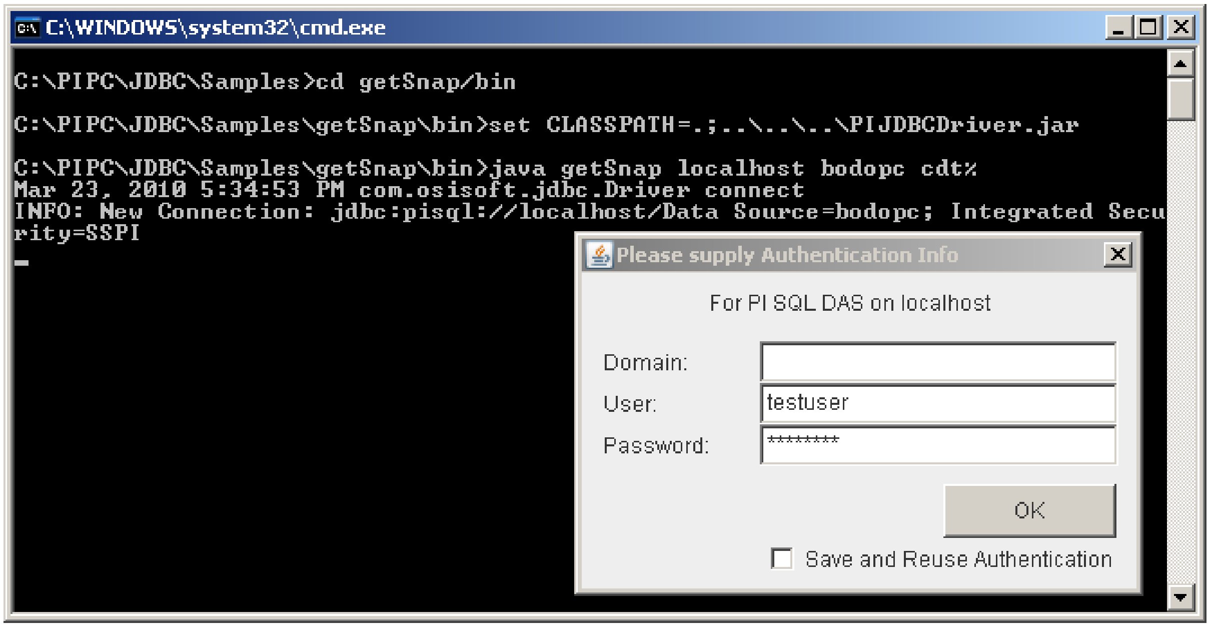
0 (SEVERE) to 5 (FINEST)

Possible values: 0, 1, 2, 3, 4, 5

2. The Properties tab on the connection level shows all, together with some explanatory text. All properties are displayed in the dialog, some of these properties are editable.
3. User / Password , which is used to control connection to the PI SQL DAS, and the Provider string as part of the Database URL, are editable on the Connection tab.
4. You may control logging by setting level and location (file and/or console)
5. If you prefer not to store the connection credentials in a third party app or in plain text even, and you want or need to avoid entering these credentials manually for every connection, PIJDBC provides the feature to store and reuse authentication information in encrypted files. This is controlled by the DCA property, which can be set to the keywords REUSE or INIT (or can refer to a specific file, created earlier by the INIT option). DBVisualizer always provides user and password, but you may use the getSnap sample provided with PIJDBC to see this feature.

6. Open a cmd window and enter

```
cd %PIHOME%\JDBC\Samples
cd getSnap\bin
set CLASSPATH=.;..\..\..\PIJDBCDriver.jar
java getSnap <das_node> <PI> <pattern>
```



```
C:\PIPC\JDBC\Samples>cd getSnap/bin

C:\PIPC\JDBC\Samples\getSnap\bin>set CLASSPATH=.;..\..\..\PIJDBCDriver.jar

C:\PIPC\JDBC\Samples\getSnap\bin>java getSnap localhost bodopc cdt%
Mar 23, 2010 5:34:53 PM com.osisoft.jdbc.Driver connect
INFO: New Connection: jdbc:pisql://localhost/Data Source=bodopc; Integrated Secu
rity=SSPI
```

Please supply Authentication Info

For PI SQL DAS on localhost

Domain:

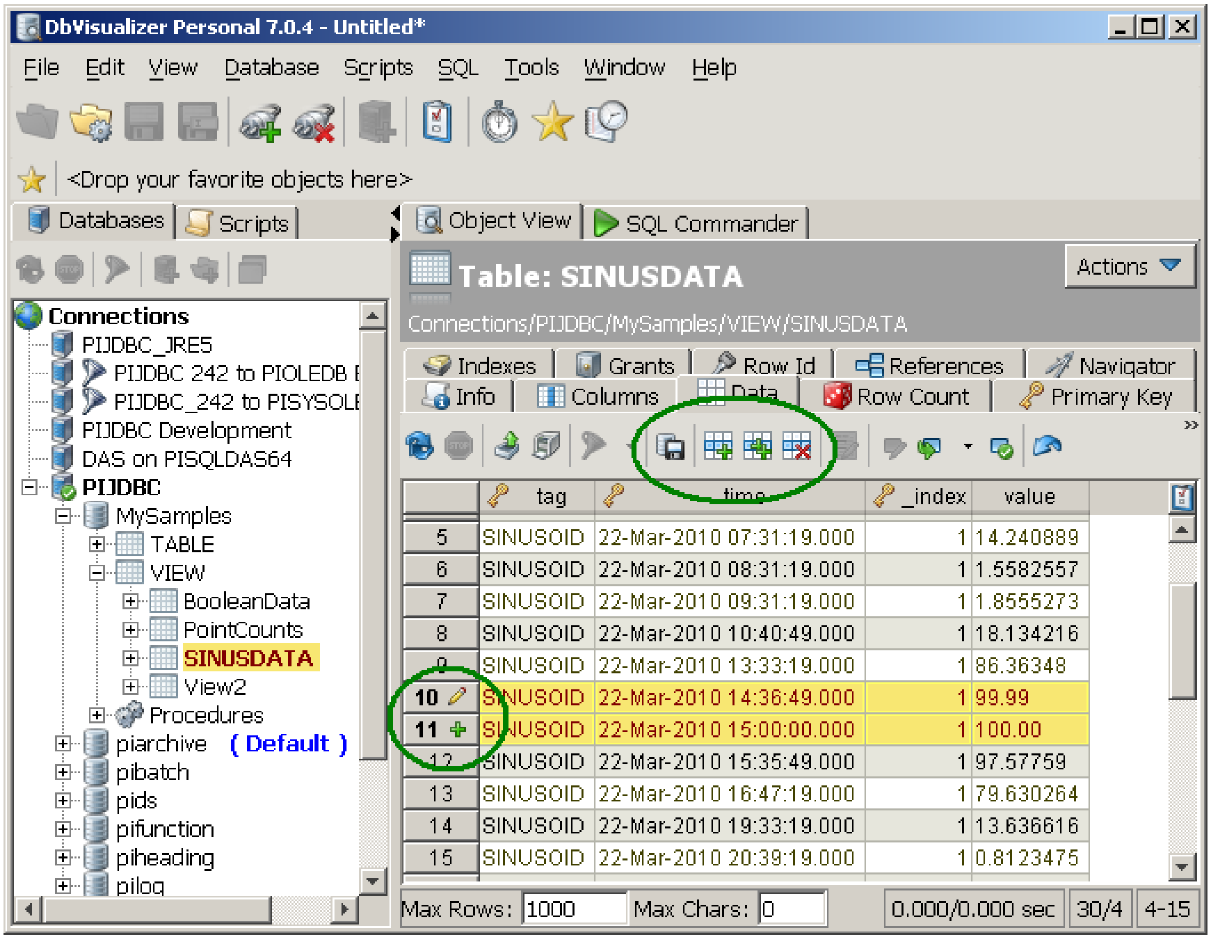
User: testuser

Password: ********

7. Without setting the checkbox, you will be asked again, once you check it, the dialog won’t pop up again for the same DAS node

Functions provided in enhanced version of DbVisualizer

1. There are lots of features provided by DBVisualizer not mentioned here.
However, there’s a DbVisualizer version which requires purchasing a license by dbvis.com. This Personal Edition is not installed on these tutorial machines. For your information here’s a screenshot of one of the functions not available in the Free version.



	tag	time	_index	value
5	SINUSOID	22-Mar-2010 07:31:19.000	1	14.240889
6	SINUSOID	22-Mar-2010 08:31:19.000	1	1.5582557
7	SINUSOID	22-Mar-2010 09:31:19.000	1	1.8555273
8	SINUSOID	22-Mar-2010 10:40:49.000	1	18.134216
9	SINUSOID	22-Mar-2010 13:33:19.000	1	86.36348
10	SINUSOID	22-Mar-2010 14:36:49.000	1	99.99
11	SINUSOID	22-Mar-2010 15:00:00.000	1	100.00
12	SINUSOID	22-Mar-2010 15:35:49.000	1	97.57759
13	SINUSOID	22-Mar-2010 16:47:19.000	1	79.630264
14	SINUSOID	22-Mar-2010 19:33:19.000	1	13.636616
15	SINUSOID	22-Mar-2010 20:39:19.000	1	0.8123475

Max Rows: 1000 Max Chars: 0 0.000/0.000 sec 30/4 4-15

2. Sample: Editing Data, Deleting and Inserting Rows in a grid. Writing it back to the database. This is possible if all primary keys are provided, even when editing data from a view.