

```
point.Snapshot;  
2. Dim srv As PISDK.Server  
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4. Dim srv A PISDK.Server  
5. if (time_to_market > expected)  
{  
    solution = vCampus;}  
6. if (time_to_market > expected)  
{  
    solution = vCampus;}  
}
```

"where PI geeks meet"

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2009

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Palace Hotel, San Francisco, CA ▪ Dec. 1-2, 2009

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Programming through JDBC and OLEDB Data Access

Jay Lakumb, OSIsoft

Bodo Bachmann, OSIsoft

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Data Access via PI OLEDB

- PI OLEDB provider allows applications (OLE DB consumers) working with PI data through SQL queries:



Next Generation – Motivation:

- renew PI OLEDB Architecture
- introduce JDBC and other data provider standards
- support “PI System”

PI OLEDB 64-bit

- ❑ **can coexist with 32bit PI OLEDB version on 64bit Windows (x86-x64)**
- ❑ **transparent to applications if both versions installed**
- ❑ **required for 64bit SQL Server Linked Server**
- ❑ requires 64bit PI SDK
- ❑ comes as separate setup kit

PI OLEDB 64-bit

- **check version via architecture column in piproductversion table**

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows the server 'freitagmb' (SQL Server 9.0.1399). The Query window in the center contains the following SQL query:

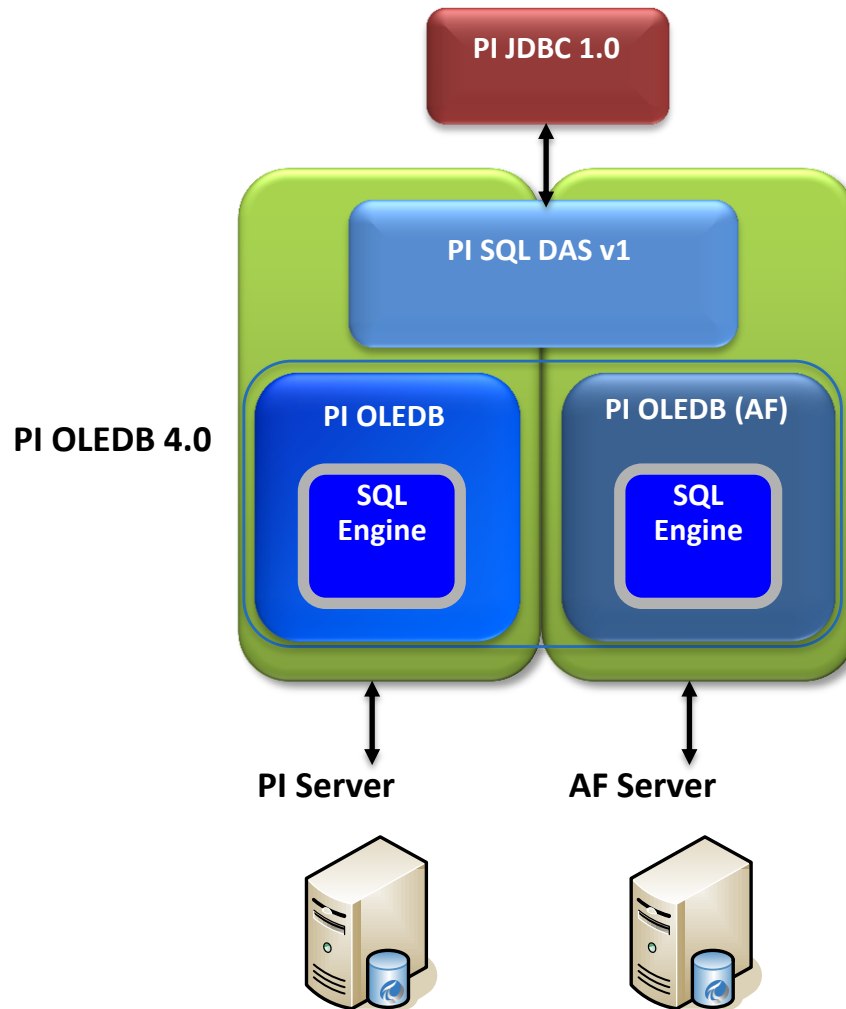
```
select TOP 1000000 * from pi.piarchive..picomp2 where tag like 'floattag1' or tag like  
select * from openquery(pi,'select TOP 1000000 * from piarchive..picomp2 where tag lik  
select * from pi.pisystem..piproductversion
```

The Results pane at the bottom displays the output of the query, showing a table with 10 columns: item, descriptor, version, major, minor, build, revision, architecture, osname, and osversion. The table contains 3 rows of data.

item	descriptor	version	major	minor	build	revision	architecture	osname	osversion
1	PI	PI Server	3.4.375.80	3	4	375	80	Windows NT AMD64	5.2.3790
2	PIOLEDB	PI OLE DB Provider	3.3.0.1	3	3	0	1	64bit	Windows Server 2003
3	PISDK	PI Software Development Kit	1.3.8.380	1	3	8	380	64bit	Windows Server 2003

The status bar at the bottom indicates 'Query executed successfully.' and shows the server name 'freitagmb (9.0 RTM)' and the user 'FREITAGMNB\Administrator (56)'.

Components



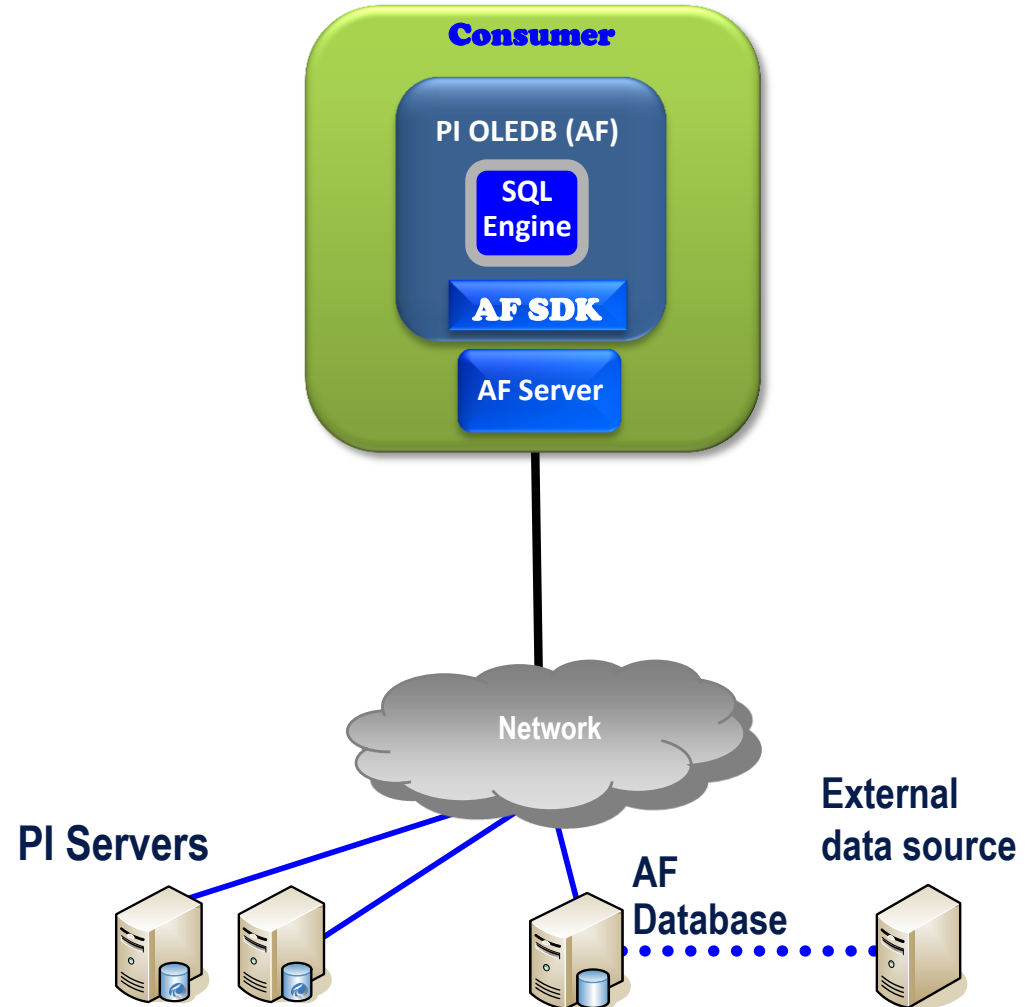
PI OLEDB (AF)

Architecture Details

PI OLEDB (AF) version

1

- **Windows based**
- **Linked to AF SDK (bypass object model)**
- **Access via AF Server**
- **Read-only**



PI SQL Commander

The screenshot displays the PI System SQL Commander application. The interface includes a menu bar (File, Edit, View, Project, Tools, Window, Help), a toolbar, and a main workspace divided into several panes.

Left Pane (PI System Explorer): Shows a hierarchical tree structure of the PI system. The 'Asset' folder is expanded, showing sub-folders like 'Catalogs', 'Configuration', 'Obj', and 'Tables'. The 'Tables' folder is further expanded, listing various tables such as 'Category', 'CurElement', 'CurElementAttribute', etc.

Top Center Pane (Query Editor): Displays a SQL query named 'query2.sql'. The query is a complex JOIN statement filtering data based on element paths, inheritance paths, and time ranges.

Bottom Center Pane (Result Table): Shows the results of the query execution. The table has four columns: 'Element', 'Attribute', 'Time', and 'Value'. It contains 18 rows of data, with the 7th row (Element: VE_1, Attribute: VA_1, Time: 10/13/2008 11:3, Value: 1.023008) highlighted.

Right Pane (Solution Explorer): Shows a 'Solution' named 'Solution1' with 0 projects. Below it, the 'Properties' pane shows details for the 'OSIsoft.PISysSQLPackage.EditorPane+EditorProc'.

Status Bar: At the bottom, it indicates 'Query executed successfully', 'BB2NOTE', '00:00:00', '20 rows', 'Ln 3 Col 52', 'Ln 3', 'Ch 62', and 'IN5'.

	Element	Attribute	Time	Value
01	VE_1	VA_1	10/13/2008 2:00	25.0452
02	VE_1	VA_1	10/13/2008 4:31	85.86578
03	VE_1	VA_1	10/13/2008 5:31	98.47938
04	VE_1	VA_1	10/13/2008 6:31	90.103
05	VE_1	VA_1	10/13/2008 7:40	81.31638
06	VE_1	VA_1	10/13/2008 10:3	13.68138
07	VE_1	VA_1	10/13/2008 11:3	1.023008
08	VE_1	VA_1	10/13/2008 12:3	2.402364
09	VE_1	VA_1	10/13/2008 1:47	20.31715
10	VE_1	VA_1	10/13/2008 2:00	25.41967
11	VE_2	VAT_1	10/13/2008 2:00	73.13161
12	VE_2	VAT_1	10/13/2008 2:33	86.31872
13	VE_2	VAT_1	10/13/2008 3:39	99.17593
14	VE_2	VAT_1	10/13/2008 4:44	96.33193
15	VE_2	VAT_1	10/13/2008 5:57	75.67656
16	VE_2	VAT_1	10/13/2008 6:31	14.20666
17	VE_2	VAT_1	10/13/2008 9:40	0.7470706
18	VE_2	VAT_1	10/13/2008 10:4	5.022014

PI OLEDB (AF) Demo

ElementSearch

The screenshot displays the Microsoft Visual Studio IDE with the 'ElementSearch' project open. The main window shows the code for 'Form1.cs', which implements a search functionality using OLEDB. The code includes a 'button1_Click' method that constructs a SQL query based on user input from text boxes and executes it using 'OleDbCommand' and 'OleDbDataAdapter' to populate a 'DataGridView'.

```
ElementSearch.Form1
button1_Click(object sender, EventArgs e)
{
    InitializeComponent();

    private void button1_Click(object sender, EventArgs e)
    {
        OleDbConnection con = new OleDbConnection(textBox1.Text);

        // string strQuery = "SELECT Path, Name FROM [Process Plant].Asset.ElementHierarchy WHERE name = ?";
        string strQuery = "SELECT Path, Name FROM ["
            + textBox2.Text +
            "].Asset.ElementHierarchy WHERE Name like ?";

        try
        {
            OleDbCommand cmd = new OleDbCommand(strQuery, con);

            cmd.Parameters.Add("@P1", OleDbType.VarChar, 32).Value = textBox3.Text;

            OleDbDataAdapter da = new OleDbDataAdapter();
            da.SelectCommand = cmd;

            DataSet ds = new DataSet();
            da.Fill(ds, "PI");
            dataGridView1.DataSource = ds;
        }
    }
}
```

The 'Form1' window is shown in the foreground, displaying the search results. It includes a text box for the provider, a dropdown for the database ('Process_Plant'), a dropdown for the element ('Unit 20%'), and a 'Search' button. The results are displayed in a table with two columns: 'Path' and 'Name'.

Path	Name
\Process Plant\Process Line 2\	Unit 201
\Process Plant\Process Line 2\	Unit 203
\Process Plant\Process Line 2\	Unit 202

PI OLEDB (AF) Demo

Reporting Services

Report1.rdl - Report Preview

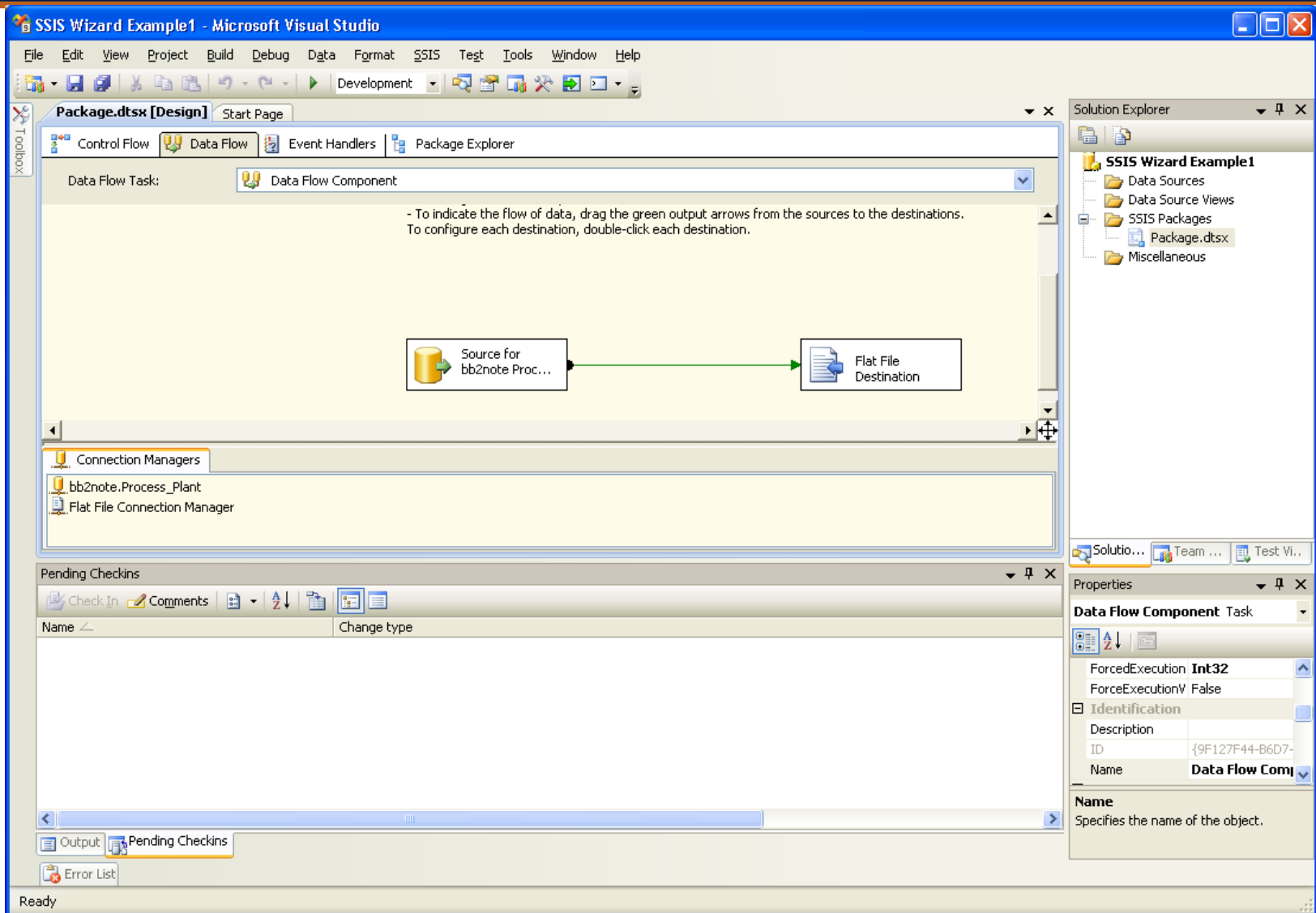
1 of 1 100% Find | Next

Report1

Path	El Name	Att Name	Value
\Process Plant\Process Line 2\Unit 201\			
	Measurements	TempIn2	65
	Measurements	TempIn1	68
	Measurements	TempOut	69
	Sensors	Level	69
	Sensors	pH	64
	Sensors	Temp	63
\Process Plant\Process Line 2\Unit 202\			
	Measurements	TempIn2	65
	Measurements	TempIn1	61
	Measurements	TempOut	64
	Sensors	Level	69
	Sensors	pH	64
	Sensors	Temp	63
\Process Plant\Process Line 2\Unit 203\			
	Measurements	TempIn2	61
	Measurements	TempIn1	64
	Measurements	TempOut	64
	Sensors	Level	69
	Sensors	pH	64
	Sensors	Temp	63
\Process Plant\Process Line 4\Unit 401\			
	Measurements	TempIn2	66
	Measurements	TempIn1	64
	Measurements	TempOut	62
	Sensors	Level	69

PI OLEDB (AF) Demo

Integration Services



PI JDBC

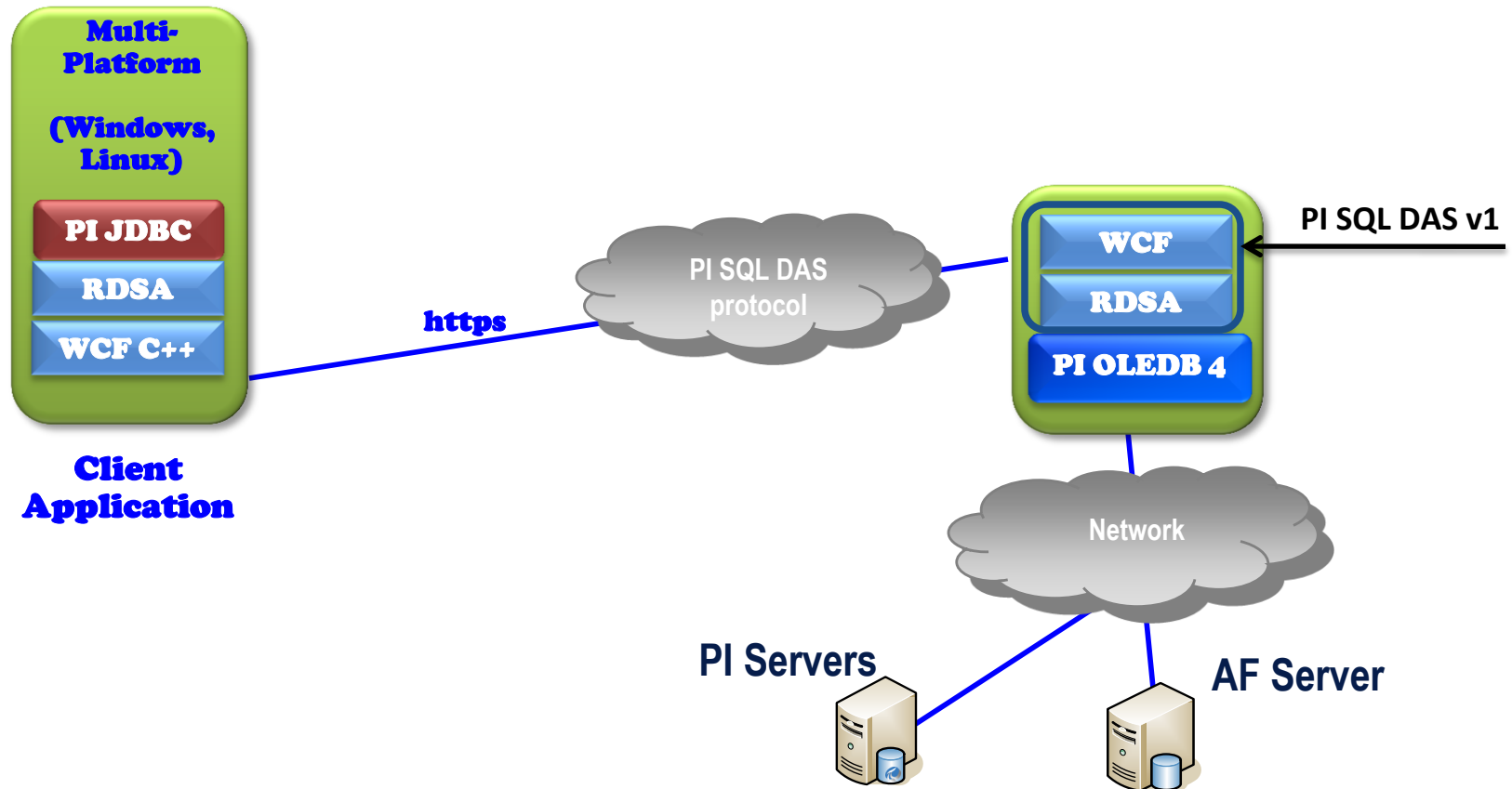
Architecture Details

Middleware using WCF and gSOAP

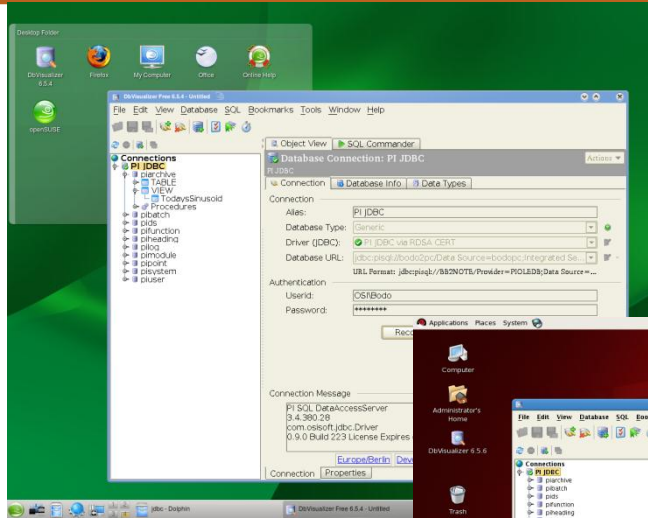
no other PI Software required on client side

32bit and 64bit can be mixed

Multi-Platform (JDBC)

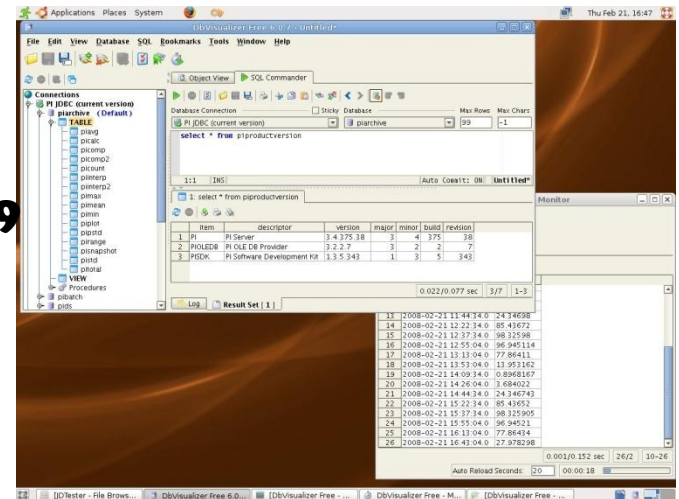


Supported Linux Distributions

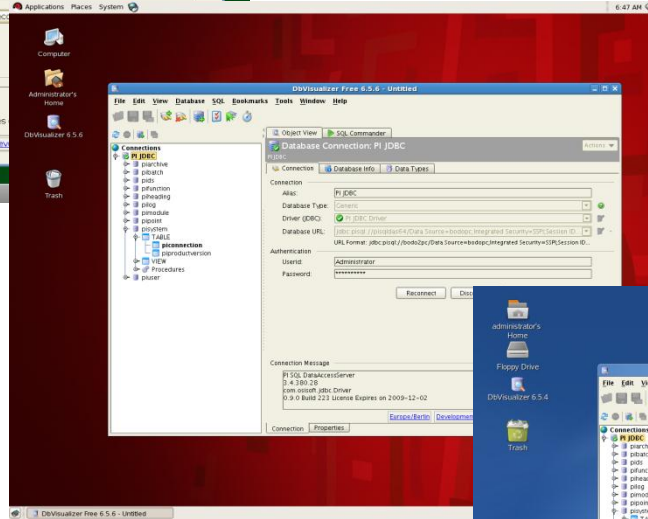


openSUSE 11.1

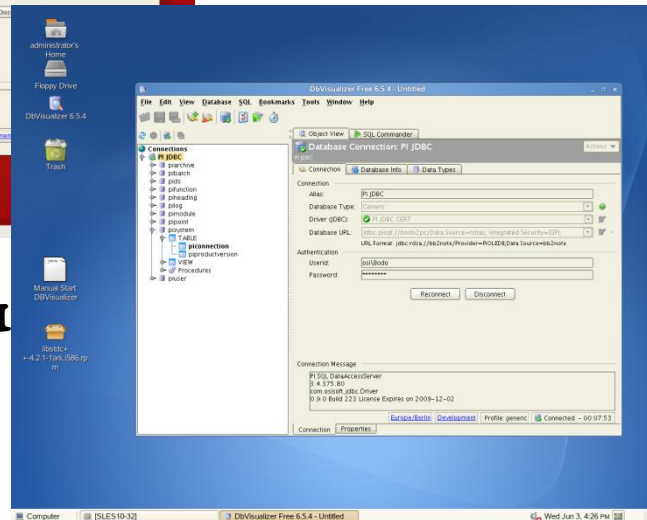
Ubuntu 8, 9



RHEL5

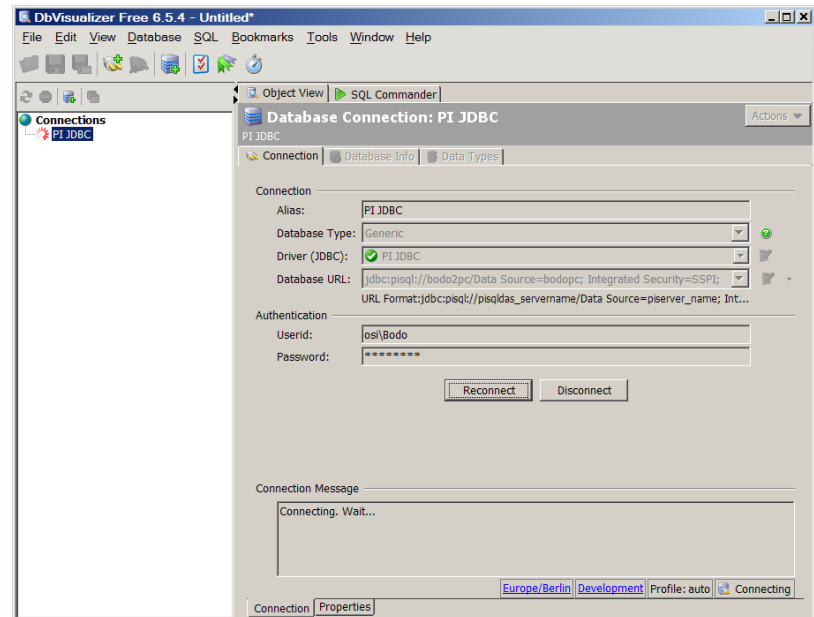


SLES10, 11

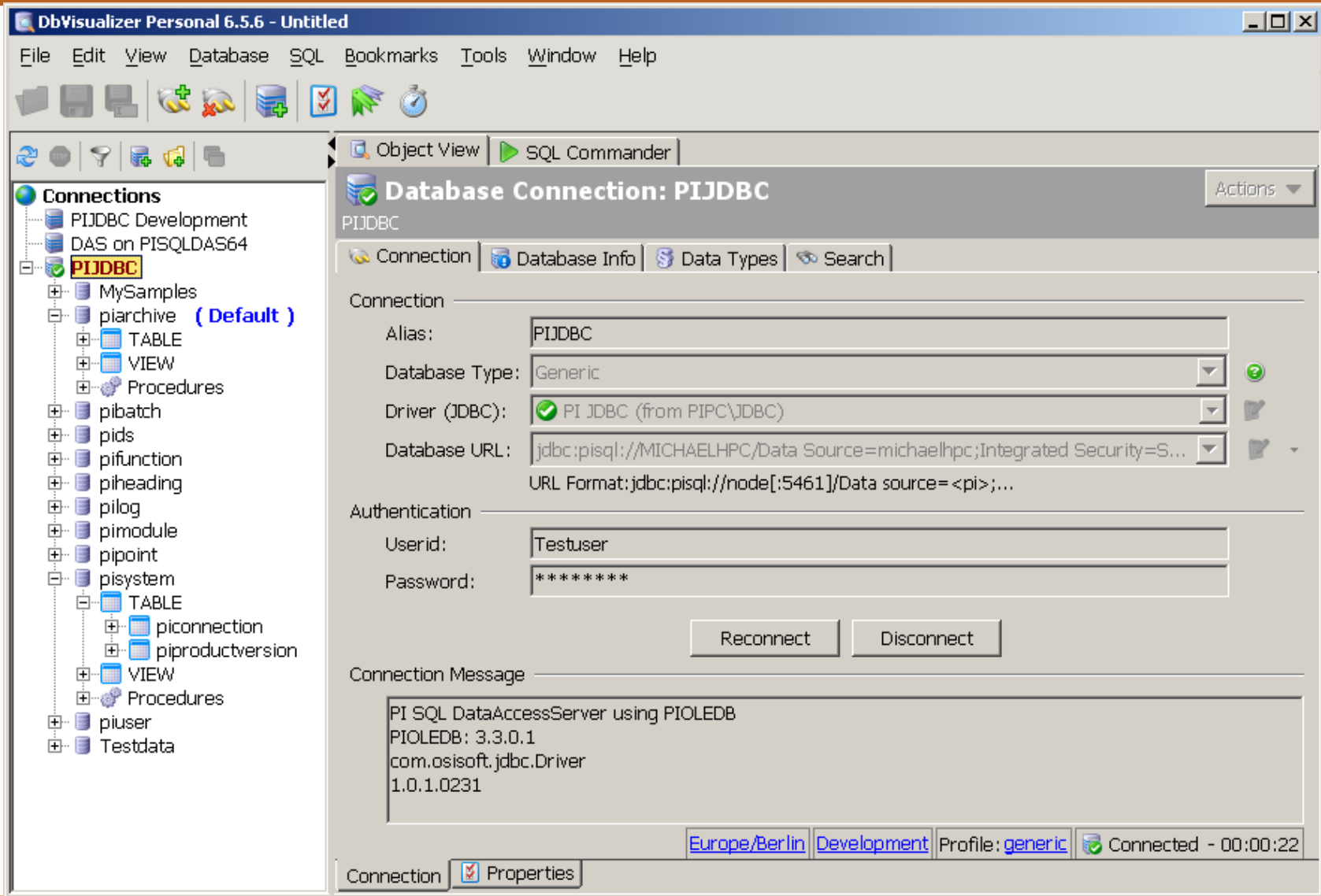


Performance

- ~ Query execution time of PI OLEDB
plus 1 sec per 100,000 rows (DataReader)
- Connection time varies and depends on state of PI SQL DAS
can be between 0 and 5 sec

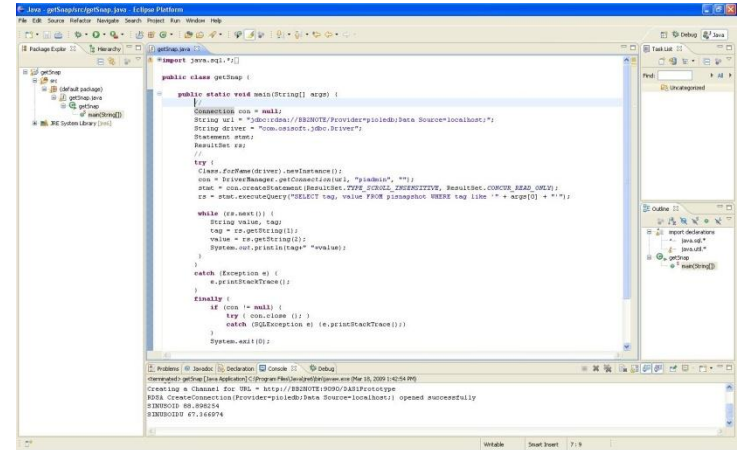


Discover Functionality using DBVisualizer



Utilities and Examples

- getSnap to verify connectivity provided as source code, compiled with <http://www.eclipse.org/downloads/packages/eclipse-ide-java-developers/ganymedesr1>



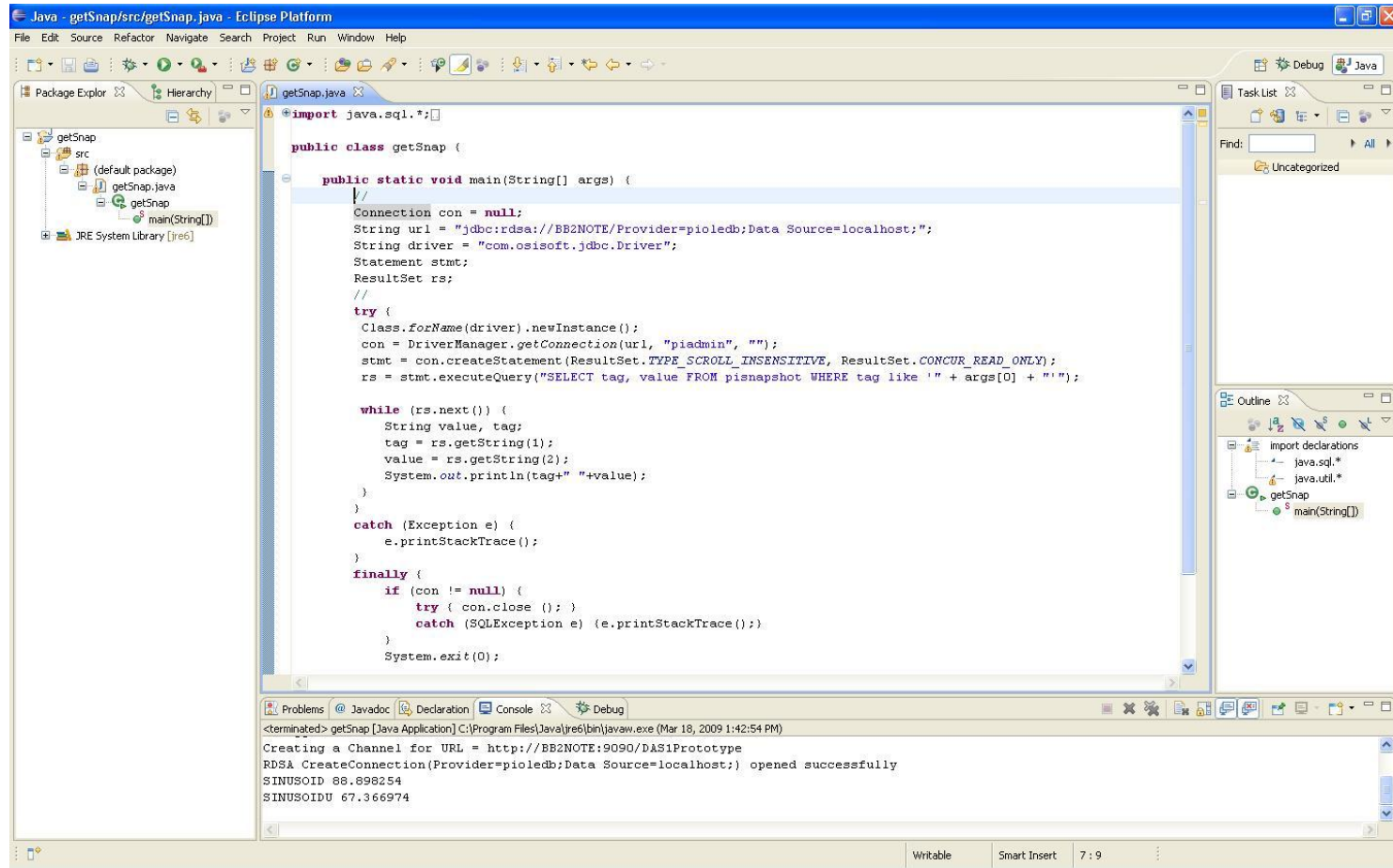
Use DBVisualizer for GUI type experience
<http://www.minq.se/products/dbvis/>

- Try any tool you like and tell us what worked...
E.g. <http://software.informer.com/search/java+sql+editor>

PI JDBC Demo

getSnap → getAFSnap

- **getSnap JDBC application**
- **Compile in Windows version of Eclipse**
- **Run on Windows and Linux without additional work**



The screenshot shows the Eclipse IDE with the following components:

- Package Explorer:** Shows the project structure with 'getSnap' as the main package, containing 'src', 'getSnap.java', and 'main(String[])'.
- Code Editor:** Displays the source code for 'getSnap.java'. The code imports 'java.sql.*' and defines a 'getSnap' class with a 'main' method. The 'main' method establishes a JDBC connection to a database, executes a query to retrieve data from a table named 'pispapshot', and prints the results to the console.
- Task List:** Shows a list of tasks, currently empty.
- Outline:** Shows the class structure, including 'import declarations', 'java.sql.*', 'java.util.*', 'getSnap', and 'main(String[])'.
- Console:** Displays the output of the program, showing the successful execution of the JDBC connection and the retrieval of data from the database.

```
import java.sql.*;

public class getSnap {

    public static void main(String[] args) {
        //
        Connection con = null;
        String url = "jdbc:rds://BB2NOTE/Provider=pioledb;Data Source=localhost;";
        String driver = "com.osisoft.jdbc.Driver";
        Statement stmt;
        ResultSet rs;
        //
        try {
            Class.forName(driver).newInstance();
            con = DriverManager.getConnection(url, "piadmin", "");
            stmt = con.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE, ResultSet.CONCUR_READ_ONLY);
            rs = stmt.executeQuery("SELECT tag, value FROM pispapshot WHERE tag like '" + args[0] + "'");

            while (rs.next()) {
                String value, tag;
                tag = rs.getString(1);
                value = rs.getString(2);
                System.out.println(tag + " " + value);
            }
        } catch (Exception e) {
            e.printStackTrace();
        } finally {
            if (con != null) {
                try { con.close(); }
                catch (SQLException e) { e.printStackTrace(); }
            }
            System.exit(0);
        }
    }
}
```

Console Output:

```
<terminated> getSnap [Java Application] C:\Program Files\Java\jre6\bin\javaw.exe (Mar 18, 2009 1:42:54 PM)
Creating a Channel for URL = http://BB2NOTE:9090/DAS1Prototype
RDSA CreateConnection(Provider=pioledb;Data Source=localhost;) opened successfully
SINUSOID 88.898254
SINUSOIDU 67.366974
```

PI JDBC Demo

getSnap → getAFSnap

The screenshot displays the Eclipse IDE interface. The main editor window shows the `getSnap.java` file with the following code:

```
import java.sql.*;

public class getSnap {

    /**
     * @param args
     */
    public static void main(String[] args) {
        //
        Connection con = null;
        String driver = "com.osisoft.jdbc.Driver";
        String url = "jdbc:piql://BB2NOTE/Provider=pioledb;Data Source=localhost;";
        Statement stmt;
        ResultSet rs;
        //
        try {
            Class.forName(driver);
            con = DriverManager.getConnection(url);
            stmt = con.createStatement();
            rs = stmt.executeQuery("SELECT tag, time, value FROM pishnapshot WHERE tag like '" + args[0] + "'");

            while (rs.next()) {
                String value, tag;
                tag = rs.getString(1);
                Date time = rs.getDate(2);
                value = rs.getString(3);
                System.out.println(tag+" "+value+" at " + time.toString());
            }
        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}
```

The Package Explorer on the left shows the project structure with `getAFSnap` and `getSnap` packages. The Task List and Outline views on the right are empty. The Console view at the bottom shows the execution output:

```
<terminated> getSnap (1) [Java Application] C:\Program Files\Java\jre6\bin\javaw.exe (Dec 1, 2009 1:52:42 AM)
com.osisoft.jdbc.Driver 1.0.0.0230
PI SQL DataAccessServer using PISYSOLEDB
PISYSOLEDB: 0.0.0.0 --- No PIProductVersion ---

A_1 71.37445
AT_1 90.73529
```

PI JDBC Demo

Tomcat Website

Win7Enterprise VMware Player

PI Demo - Windows Internet Explorer

http://localhost:8080/examples/PIJDBC_Demo/

Powered by TOMCAT

Tomcat running PI JDBC

OSIsoft

[Start here](#)
[getSnap Demo](#)
[getSnap\(sinusoid\)](#)
[getSnap.jsp code](#)
[demobeans/pijdbc.java](#)

Any Web Client

Multi-Platform (Windows, Linux)

Apache Tomcat

JSP Web App

PI JDBC

RDSA

WCF C++

Web Server

PI SQL DAS protocol

Windows (x86, x64)

WCF

RDSA

PI OLEDB

PI SQL D

Network

https:

Local intranet | Protected Mode: Off

2:06 AM 12/1/2009

vmware

To direct input to this virtual machine, press Ctrl+G.

PI JDBC Demo

Tomcat Website

Win7Enterprise VMware Player Devices

PI JDBC Demo 1 - Windows Internet Explorer

http://localhost:8080/examples/PIJDBC_Demo/page1.jsp

Powered by  TOMCAT

Tomcat running PI JDBC



State = Execute

Disconnect from 192.168.154.1

SELECT * FROM PIPRODUCTVERSION

Execute

item	descriptor	version	major	minor	build	revision	architecture	osname	osversion
PI	PI Server	3.4.375.38	3	4	375	38		Windows NT x86	5.1.2600
PIOLEDB	PI OLE DB Provider	3.3.0.1	3	3	0	1	32-bit	Windows XP	5.1.2600
PISDK	PI Software Development Kit	1.3.6.363	1	3	6	363	32-bit	Windows XP	5.1.2600

[Back Home](#)

Done

Local intranet | Protected Mode: Off

2:08 AM 12/1/2009

To direct input to this virtual machine, press Ctrl+G.

vmware

Feedback needed:

☐ **What do you need more?**

- ☐ **PI OLEDB (AF) write support (INSERT, UPDATE, DELETE) for Elements, Attributes (no data)**
- ☐ **Support for Event Frames in PI OLEDB (AF)**

Send feedback to betaoledb@osisoft.com

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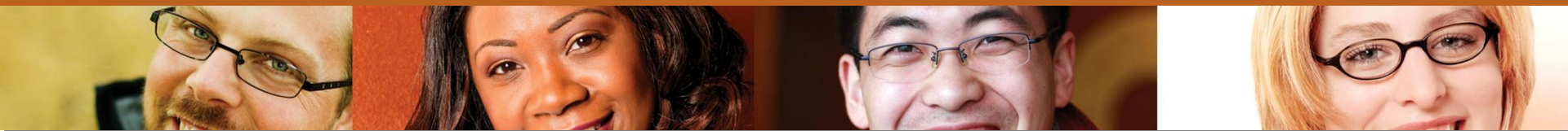
V

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2009

"where
PI geeks
meet"

THANK YOU.



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