

What's New in Informix Application Development

Guy Bowerman
IBM

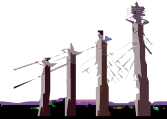
Session B13
Wednesday, April 30, 2008 • 09:30 a.m. – 10:30 a.m.

2008 IIUG Informix Conference



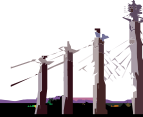
Agenda

- IDS Developer Edition
- Server Side Enhancements
 - SQL
 - XML & XSLT
 - Basic Text Search (BTS)
 - DRDA
- Client Side Enhancements
 - Common Client
 - Data Studio



IDS Developer Edition

- A **FREE** edition of **IDS 11.50** for developers to promote application development and drive market share
- Full functionality - with scalability limits
 - 1 CPU VP (i.e. 1 processor core)
 - 1 GB memory, 8 GB database size
 - 20 connections limit
- All Enterprise Ed. Features
 - Continuous Availability, Advanced Access Control, RSS, SDS, HDR etc
- Includes CSDK, J/Foundation, OAT, AGS Server Studio, DBDK, built-in blades, etc.



Developer Edition 11.50 Platform Availability

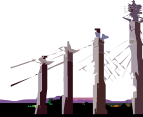
Sun 32 & 64-bit	SPARC	Solaris 9, 10
Sun 64-bit	AMD64	Solaris 10
HP 32 & 64-bit	PA-RISC	HP-UX 11i, 11.23, 11.31
HP 64-bit	Itanium	HP-UX 11.23PI, 11.31
IBM 32 & 64-bit	PowerPC	AIX 5L 5.3, 6.1
Windows 32 & 64-bit	x86	Win 2003, 2008, XP, Vista
Linux 32 & 64-bit	x86	RHEL 4,5, SLES 10, Asianux 2.0, 3.0, Debian 4.0, Ubuntu 6.06 LTS, 7.10
Linux 64-bit	POWER	RHEL 4,5, SLES 10, Asianux 2.0, 3.0
Linux 64-bit	zSeries	RHEL 4, 5, SLES 10
MAC 64-bit	AMD64	OS X Leopard



Sun 32-bit	Solaris	Sparc	Solaris 9	Solaris10
Sun 64-bit	Solaris	Sparc	Solaris 9	Solaris10
Sun 64-bit	Solaris	AMD64 (Opteron)		Solaris 10
HP 32-bit	HP-UX	PA-RISC	HP-UX 11i,	HP-UX 11.23, 11.31
HP 64-bit	HP-UX	PA-RISC	HP-UX 11i,	HP-UX 11.23,11.31
HP 64-bit	HP-UX	Itanium	HP-UX 11.23PI	HP-UX 11.31
IBM 32-bit	AIX	PowerPC	AIX 5L 5.3	AIX 6.1
IBM 64-bit	AIX	PowerPC	AIX 5L 5.3	AIX 6.1
Windows 32-bit	Windows	x86	Windows 2003	Windows XP, Windows Vista, Windows Server 2008 (Longhorn) (32-bit),
Intel 32-bit	Linux	x86	RHEL 4	RHEL 5, SUSE SLES 10,Asianux 2.0, Asianux 3.0, Debian 4.0, Ubuntu 6.06 LTS, Ubuntu 7.10
Intel/AMD 64-bit	Linux	x86_64 (EM64T/AMD64)		
RHEL 4	RHEL 5, SUSE SLES 10,Asianux 2.0, Asianux 3.0, Debian 4.0, Ubuntu 6.06 LTS, Ubuntu 7.10			
IBM 64-bit	Linux	POWER (pSeries/iSeries, OpenPower, JS20 Blades)		
RHEL 4	RHEL 5, SUSE SLES 10,Asianux 2.0, Asianux 3.0			
IBM 64-bit	Linux	zSeries	RHEL 4	RHEL 5, SUSE SLES 10
Windows 64-bit	Windows	x64 (EM64T/AMD64)		Windows 2003 Windows XP,Windows Vista , Windows Server 2008 (Longhorn) (64-bit)
MAC 64-bit	MAC	Intel EM64T/AMD	AMD64	OS X Leopard

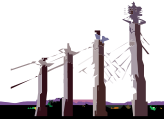
Developer Edition 11.50 DVD Platform Availability

Version	Platform	Processor Model	OS Build	Certifications
Windows 32-bit	Windows	x86	Windows 2003	Windows XP, Vista, Server 2008
Intel 32-bit	Linux	x86	RHEL 4	RHEL 5, SUSE SLES 10, Asianux 2.0, 3.0, Debian 4.0, Ubuntu 6.06 LTS, 7.10
Intel/AMD 64-bit	Linux	x86_64 (EM64T/AMD64)	RHEL 4	RHEL 5, SUSE SLES 10, Asianux 2.0, 3.0, Debian 4.0, Ubuntu 6.06 LTS, 7.10
Windows 64-bit	Windows	x64 (EM64T/AMD64)	Windows 2003	Windows XP, Vista, Server 2008
MAC 64-bit	MAC	Intel EM64T/AMD AMD64	OS X Leopard	

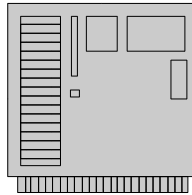


IDS Developer Edition - Notes

- Keep in mind 20 connection limit when working with connection pools and middleware that creates multiple connections (e.g. `php.ini` `ifx.max_persistent`)
- For support, use developerWorks IDS forum - http://www.ibm.com/developerworks/forums/dw_forum.jsp?forum=1071&cat=19

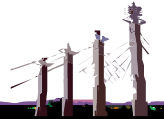


Server-Side Enhancements



SQL Enhancements in IDS 11.10

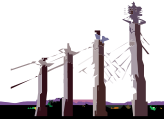
- New Built-In SQL Expressions
 - Additional Date, Numeric, Bit, String functions
- New SPL Looping Syntax
 - GOTO label, LOOP – END LOOP, EXIT WHEN
- Trigger Enhancements
 - Multiple triggers on a table/view, Trigger procedures for processing correlated values



XML Support in IDS 11.x

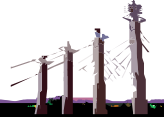
- **IDS 11.10** adds XML publishing functions to produce SQL results as XML and support XPATH queries
- **IDS 11.50** adds XSL Transform (XSLT) Functions for transforming XML documents

`<?xml?>`



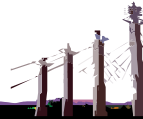
XML Publishing Functions – IDS 11.10

- `genxml()` / `genxmlob()` - SQL results as XML elements
- `genxmlem()` / `genxmlemclob()` - column vals as XML elements
- `genxmlschema()` / `genxmlschemaclob()` - schema as XML
- `genxmlquery()` / `genxmlqueryclob()` - result set as XML
- `genxmlqueryhdr()` / `genxmlqueryhdrclob()` - result set as XML with header
- `extract()` / `extractxmlob()` - evaluate XPATH expression
- `extractvalue()` / `extractxmlobvalue()` - value of XML node
- `existsnode()` - verify whether a node exists in XML doc
- `idxxmlparse()` - parse XML doc to determine if it is well-formed

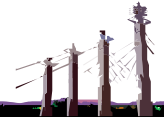
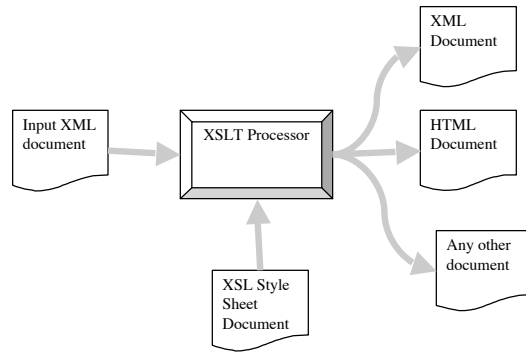


Setting Up XML Publishing

- Start an XML VP
 - XML VP is required if using XPATH functions (and for XSLT)
 - `extract()`, `extractxmlob()`, `extractvalue()`, `extractxmlobvalue()`, `existsnode()`, `idsxmlparse()`
 - XML functions starting with `gen` do not require the XML VP
 - `VPCLASS idsxmlvp,num=1`
Or
`onmode -p +1 idsxmlvp`



XSLT Support in IDS 11.50

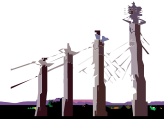


What is XSLT?

- XSLT is a language for transforming XML documents into other XML documents
 - XML to XML (transform to confirm different schema/standard)
 - XML to HTML
 - XML to PDF
- The new XSLT functions are based on the XSLT Datablade
<http://www.alphaworks.ibm.com/tech/xsltblade>

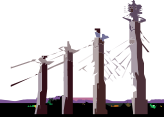


<http://www.w3.org/TR/xslt>



New XSLT Functions in IDS 11.50

- `xslttransform(lvarchar,lvarchar)` returns `lvarchar(32739)`
- `xslttransform(clob,lvarchar)` returns `lvarchar(32739)`
- `xslttransform(clob,clob)` returns `lvarchar(32739)`
- `xslttransform(blob,lvarchar)` returns `lvarchar(32739)`
- `xslttransform(blob,informix.blob)` returns `lvarchar(32739)`
- `xslttransformAsClob(lvarchar,lvarchar)` returns `clob`
- `xslttransformAsClob(clob, lvarchar)` returns `clob`
- `xslttransformAsClob(clob,clob)` returns `clob`
- `xslttransformAsBlob(lvarchar, lvarchar)` returns `blob`
- `xslttransformAsBlob(blob,lvarchar)` returns `blob`
- `xslttransformAsBlob(blob, blob)` returns `blob`
- `ifx_checksum(bigint, integer)` returns `informix.integer`



These functions are defined in `$INFORMIXDIR/etc/boot1150.sql`

XSL Transform Example

Info

```
<?xml version='1.0' encoding='ISO-8859-1' ?><doc>Hello world!</doc>
```

Style

```
<?xml version='1.0'?>  
<xsl:stylesheet xmlns:xsl='http://www.w3.org/1999/XSL/Transform' version='1.0'>  
  <xsl:output encoding='US-ASCII'/>  
  <xsl:template match='doc'>  
    <out><xsl:value-of select='.'/></out>  
  </xsl:template>  
</xsl:stylesheet>
```

```
select xsltransform(info, style) from t
```

```
<?xml version="1.0" encoding="US-ASCII"?><out>Hello world!</out>
```



XSLT – Initial Platform Restrictions

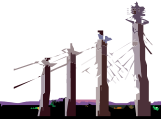
Version	Platform	Processor Model	OS Build	Certifications	xml4c and xslt4c Supported?
Sun 64-bit	Solaris	AMD64 (Opteron)	Solaris 10	Solaris10	No
IBM 64-bit	Linux	POWER (pSeries/iSeries, OpenPower, JS20 Blades)	RHEL 4	SUSE SLES 10, Asianux 2.05	No
Intel 64-bit	Linux	Itanium	RHEL 4	SUSE SLES 10	No



What is BTS?



- Basic Text Search is a datablade module which supports searching for words and phrases within unstructured text
- The BTS module uses the open source **CLucene** text search package
 - CLucene is a C++ port of Apache **Lucene**: the high-performance text search engine written in Java
- 2 main components:
 - The **bts_contains()** search predicate for queries
 - The **BTS DataBlade functions** for compacting indexes and tracing



Why BTS?

- Basic Text Search is **FREE** - supplied with IDS
- Simple to set up and use
- A **case insensitive** search syntax common across all Lucene open source implementations
- Developed and supported in-house



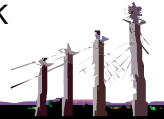
Setting up BTS

- Register the blade for your database using BladeManager

```
bash-2.03$ blademgr
myserver>register bts.1.10 mydb
Register module bts.1.10 into database mydb? [Y/n]y
Registering DataBlade module... (may take a while).
DataBlade bts.1.10 was successfully registered in
database mydb.
myserver>quit
Disconnecting...
```

Note: Run as [informix](#), or set IFX_EXTEND_ROLE to 0

Note: On Windows use Blade Manager supplied with DBDK

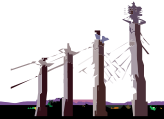


Preparing BTS

- Define a bts Extension Virtual Processor Class
 - **VPCLASS bts,noyield,num=1**
 - Only 1 bts EVP supported
- Create an **extspace** for the bts Index

```
mkdir /work/bts_extspace  
onspaces -c -x bts_extspace -l  
/work/bts_extspace
```

- Create an index by specifying the bts access method..

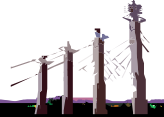


Creating a BTS Index

- Example BTS CREATE INDEX statement

```
CREATE INDEX cust_bts  
  ON work_items(notes bts_varchar_ops)  
  USING bts(delete='immediate')  
  IN bts_extspace;
```

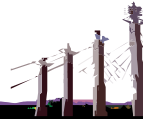
- **bts_varchar_ops** is an "Operator Class" to support the VARCHAR data type
- **delete='immediate'** - optional parameter indicating delete index information when row is deleted. The default is **'deferred'** which marks docs as deleted until the **bts_index_compact()** UDR is run.



Example BTS Query

```
SELECT work_idx, notes
FROM work_items
WHERE
bts_contains(notes, "(win* OR nt) AND hang~")
```

- In this example *win** means any word beginning with "win"
- *AND/OR* are logical predicates (not search words)
- *hang~* means a fuzzy search for words like "hang"



BTS – New Features in IDS 11.50 / BTS 1.10

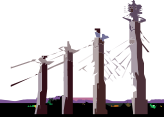
- Configurable stopword support. E.g.

```
create index test1_bts  
on test1(text_data bts_lvarchar_ops)  
using bts(stopwords="(a,an,for,the,then,their)")  
in bts_extspace;
```

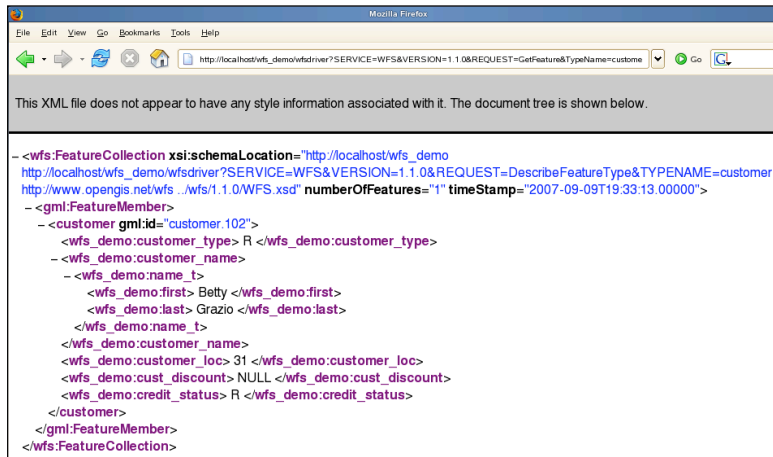
Alternatively:

```
stopwords="file:/mydir/myfilename"  
stopwords="table:swtable.swcolumn"
```

- XML Document Support – search XML docs, and define XML tags to search on

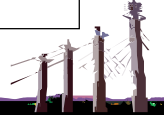


Web Feature Service (WFS) - IDS 11.10



This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<?xml version="1.0" encoding="UTF-8"?>
<wfs:FeatureCollection xmlns:wfs="http://www.opengis.net/wfs" xsi:schemaLocation="http://localhost/wfs_demo
http://localhost/wfs_demo/wfsdriver?SERVICE=WFS&VERSION=1.1.0&REQUEST=DescribeFeatureType&TYPENAME=customer
http://www.opengis.net/wfs http://www.opengis.net/wfs/1.1.0/WFS.xsd" numberOfFeatures="1" timeStamp="2007-09-09T19:33:13.000000">
  <gml:FeatureMember>
    <customer gml:id="customer.102">
      <wfs_demo:customer_type> R </wfs_demo:customer_type>
      <wfs_demo:customer_name>
        <wfs_demo:name_t>
          <wfs_demo:first> Betty </wfs_demo:first>
          <wfs_demo:last> Grazio </wfs_demo:last>
        </wfs_demo:name_t>
      </wfs_demo:customer_name>
      <wfs_demo:customer_loc> 31 </wfs_demo:customer_loc>
      <wfs_demo:cust_discount> NULL </wfs_demo:cust_discount>
      <wfs_demo:credit_status> R </wfs_demo:credit_status>
    </customer>
  </gml:FeatureMember>
</wfs:FeatureCollection>
```



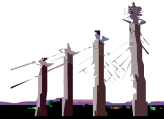
WFS - Web Feature Service



- Provides a generic way to access raw geographic data over the web
- Based on the Transactional WFS (WFS-T) specification from the Open Geospatial Consortium (OGC)
- An interface for web-based requests using platform-independent calls
- Uses HTTP GET or POST methods encoded as key-value-pairs (KVP) or XML for requests and responses

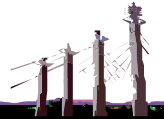


DRDA – Supporting a Common Client



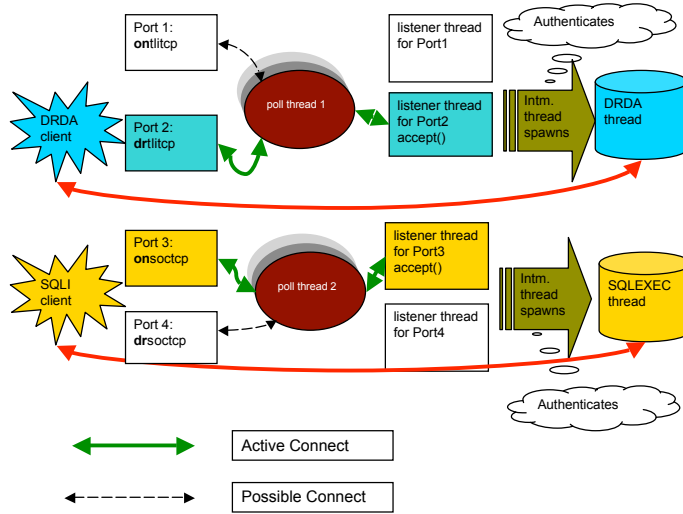
DRDA – Supporting a Common Client

- **Distributed Relational Database Architecture** -
A database interoperability standard from [The Open Group](#)
- Analogous to the SQLI protocol used by Informix clients
- Supported by Derby, Java DB, Oracle Transparent Gateway for IBM DRDA, and... **IDS 11.10+**



The Open Group is the industry standards consortium who certify the UNIX trademark.

IDS DRDA Support - Net Architecture



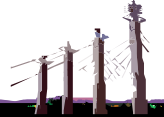
IDS Support for DRDA

- IDS can listen simultaneously on separate ports for SQLI and DRDA clients and spawn **DRDAEXEC** threads after validating DRDA connections

e.g. onstat -g ath:

```
*41 f7d2920 ec166d8 1 cond wait netnorm 1cpu drdaexec
```

- SQL Layer: Alternative to sqmain() implemented
- DRDA clients can use DBSERVERALISES
- DRDA has a separate protocol **drsoctcp** / **drtlitcp** - equivalent to **onsoctcp** / **ontlitcp**



For a simple introduction to DRDA refer to DBAZine
<http://www.dbazine.com/db2/db2-mfarticles/mullins-drda>

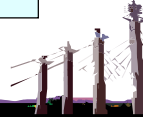
Setting up DRDA is Easy

Example onconfig file:

```
DBSERVERNAME      marsh_1110
DBSERVERALIASES    marsh_1110_drda
NETTYPE            onsoctcp,1,,NET # sqli
```

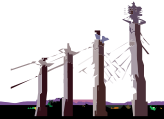
Example SQLHOSTS entry:

```
marsh_1110_drda
  HOST      localhost
  OPTIONS
  PROTOCOL   drsoctcp
  PORT       1529
```



DRDA Features in IDS 11.10

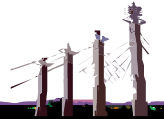
- Variable fetch buffer size `ResultSet.SetFetchSize()`
- Comm buffer size – [DRDA_COMMBUFFSIZE](#)
- BLOB/CLOB, INTERVAL and other built-in data types
- Callable statements
- Support for built-in data types
- Xtrace support
- XA Support (tightly coupled transaction)
- DRDA connections to ER nodes
- FORWARD ONLY updateable cursors
- Database metadata



DRDA_COMMBUFFSIZE can be 4K to 2Mb

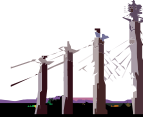
New DRDA Functionality in IDS 11.50

- Secure Socket Layer (SSL) Support for DRDA Clients (JCC and CLI)
 - SSL uses encryption to provide reliable end-to-end secure and authenticated TCP/IP connection between two points over a network
 - SSL is also be implemented for CSDK enabling SSL communication between SQLI clients and IDS
 - IBM Global Security Kit (GSKit) is be used to provide SSL support

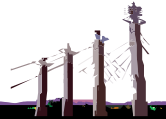


DRDA Features Planned..

- Complete DRDA Feature Support Level AM7->AM9
- Client Re-route functionality to support MACH11
- Informix Complex, Opaque types
- Extend Decimal and BLOB types for Informix users
-



Client-Side Enhancements



IBM Common Client

- A set of Development tools which use the DRDA protocol to communicate with IBM Data Servers
 - IBM® Data Server Driver for JDBC and SQLJ
 - IBM® Data Server Provider for .NET for Informix Dynamic Server
 - IBM® Data Server Client & Runtime Client
 - PDO_IBM
 - Ruby: Version IBM_DB-0.8

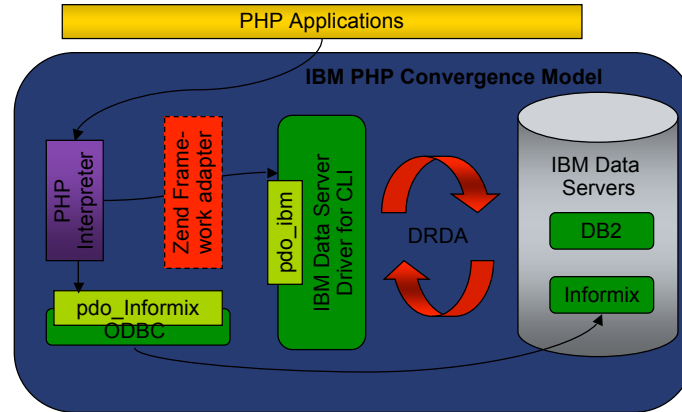
- developerWorks Forum:

Unleash the new Java, .NET, PHP and Ruby client and Developer solutions for IDS 11

- http://www.ibm.com/developerworks/forums/dw_thread.jsp?forum=1137&thread=170325&cat=19



IBM API Architecture for Data Servers



Java/PHP/RUBY/PYTHON/<insert_next_hot_technology> all follow the same model

When DRDA is in use, the network listener thread (NETTYPE tlitcp or soctcp) will typically have at least two sockets open and listening for connections – one for SQLI connections and another for DRDA connections. There could be more than that if there are many separate server aliases configured. ASF spawns SQLEXEC threads for SQLI clients and DRDAEXEC threads for DRDA clients

Java Common Client (JCC)



- AKA IBM Data Server Driver for JDBC and SQLJ
- Integrated type 4 JDBC driver for all IDS and DB2
- Communicates with data server via the DRDA protocol
- Current version 3.50. Support for JDBC 4.0 specification planned
- Look for IBM Data Server Administrator Standard Edition based on JCC in 2008
- http://publib.boulder.ibm.com/infocenter/idshelp/v111/index.jsp?topic=/com.ibm.jccids.doc/ids_jp_000.html



Java Common Client Example

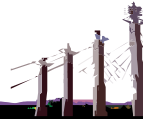
```
import java.sql.*;
public class jcctest {
    public static void main() {
        try {
            // Initialize JCC driver
            Class.forName("com.ibm.db2.jcc.DB2Driver");
        }
        catch (Exception e) {
            System.out.println("driver err: " + e.getMessage());
        }
        String url = "jdbc:ifx://localhost:1529/stores_demo";
        Connection conn = null;
        try {
            // get database connection
            conn = DriverManager.getConnection(url, "user", "pass");
            ...
            conn.close();
        }
        catch(SQLException e) {
            System.out.println("SQL Error: " + e.getMessage());
        }
    }
}
```

Note that the INFORMIXSERVER value is not required.

PHP Common Client



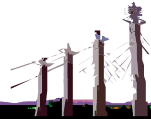
- PDO_IBM
 - Common PHP driver using DRDA protocol, supporting IDS, DB2 UDB, Cloudscape/Derby
 - http://pecl.php.net/package/PDO_IBM/
- PDO_INFORMIX
 - Informix specific PHP driver using SQLI protocol
 - http://pecl.php.net/package/PDO_INFORMIX/
 - Example application: Open Admin Tool (OAT)
- Zend Framework
 - Supports IDS through DRDA Protocol
 - <http://framework.zend.com/>



Ruby / Rails Common Client



- IBM_DB-0.9.3 gem enables full support for Informix Dynamic Server (IDS) 11.10 and beyond through [IBM_DB Rails adapter](#) and [ibm_db Ruby driver](#)
- Connects to IDS 11.10+ via DRDA protocol
- <http://rubyforge.org/projects/rubyibm/>
- IBM Ruby adaptor (IBM_DB-0.9.3) passed the Rails compliancy test suite
- Ruby on Rails support on Mac/OS
- See also the open source [ruby-informix](#) driver developed by Gerardo Santana which supports all recent IDS versions via the SQLI protocol
 - <http://rubyforge.org/projects/ruby-informix/>



Perl / Python



- Community Supported Perl Drivers
 - DBD::Informix
 - DBD::ODBC
- IBM Supported Drivers
 - DBD::DB2 (based on CLI)
 - Common Driver Plans underway
- Python InformixDB driver for IDS
 - DB-API 2.0 compliant
 - Requires Python 2.2 or better and Informix CSDK
- IBM adaptor/driver development
 - Python driver supporting IDS is available at:
 - Latest Python Driver: http://pypi.python.org/pypi/ibm_db/0.2.7
 - Python driver via Google Code: <http://code.google.com/p/ibm-db/downloads/list>
 - Django support plans in the future



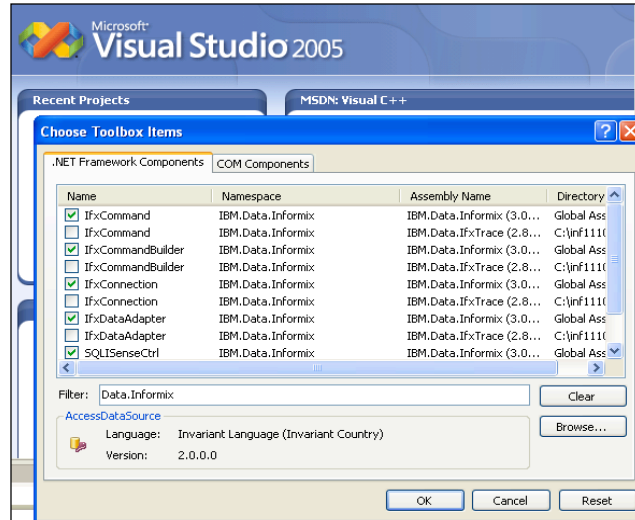
Common IDS .Net Provider

- .NET provider for IDS
 - Connection using DRDA protocol
 - Support for IDS basic data types
 - VS2008 Support
 - Provides a dedicated IDS namespace that will enable legacy IDS .NET applications to move to the common .NET provider without any changes
 - Includes the .NET 2.0 framework elements like Base class model and factory support
 - Why move from CSDK .NET to Common IDS .NET?

<http://www.ibm.com/developerworks/wikis/display/DB2/IDS+and+.NET+FAQ>



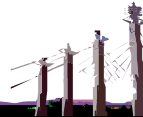
.NET - Visual Studio Add-Ins



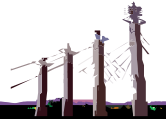
.NET - Visual Studio Add-Ins



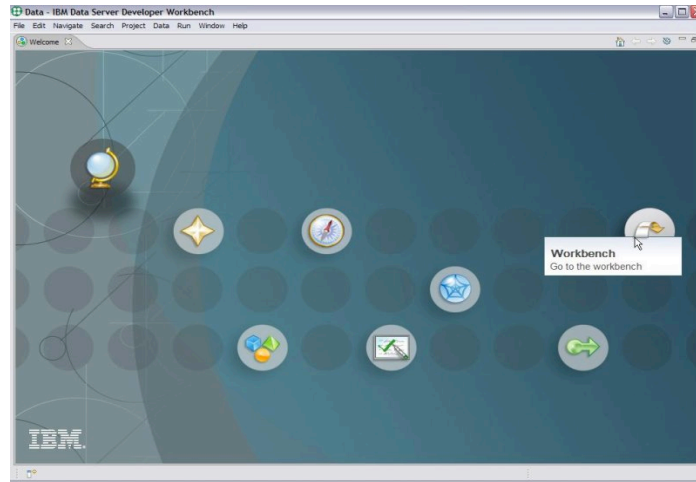
- Connect, Create and drop databases from Server Explorer
- View existing objects (Tables, Views, Procedures, Functions) – drop existing objects
- Retrieve and update data for tables
- Show create script (DDL) for existing objects (tables, views, procedures, functions)
- Run existing procedures and functions from Server Explorer
- Build Windows/web applications using existing objects in the tree (except UDFs).
- SQL Editor that supports intellisense
- Now available as a standalone download:
<https://www14.software.ibm.com/webapp/iwm/web/preLogin.do?source=swg-vsai>



IBM Data Studio



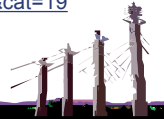
IBM Data Studio



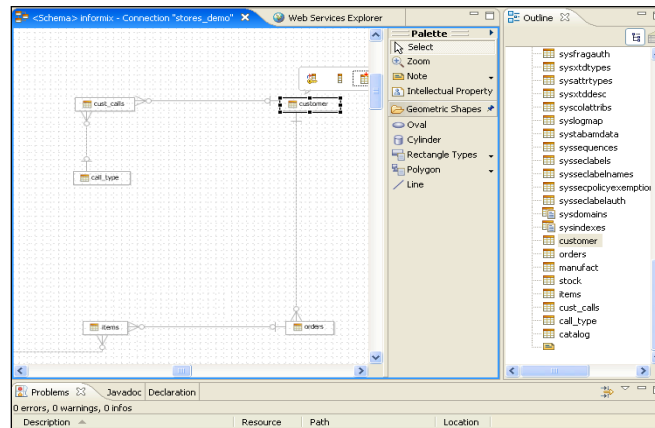
IBM Data Studio 1.1.2

- A complete Eclipse based platform for developing database applications
 - Database Explorer
 - Web Services Explorer
 - Entity Relationship diagrams
 - SQL Builder, XML tools
 - **PureQuery** - automatic transformation of relational data into Java objects - access relational databases and in-memory Java collections with a single interface: standard SQL
- Developer Solutions for IBM DB2 and Informix Dynamic Server (IDS) forum:

http://www.ibm.com/developerworks/forums/dw_forum.jsp?forum=1086&cat=19



IBM Data Studio ER Diagram



Session B13

What's New in Informix Application Development

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