Moving Oracle applications to Firebird

Firebird Conference 2006

Agenda

- **Why Oracle-mode?**
- Oracle-mode: the issues
- What is Fyracle?
- Example real-world application: Compiere ERP/CRM
- Fyracle roadmap

The world according to Microsoft

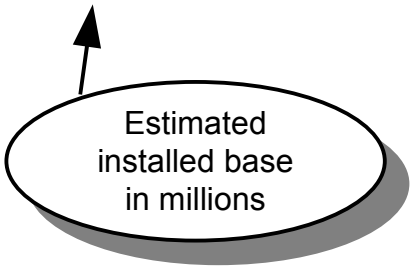
Characteristics				
No. of entities				
No. of servers	7M	7M	2M	1M
No. of PC's	200M	200M	15M	10M

A view of the database market

	Small Business	Midmarket	Corporate	Enterprise
No. of servers	7	7	2	1

Some examples

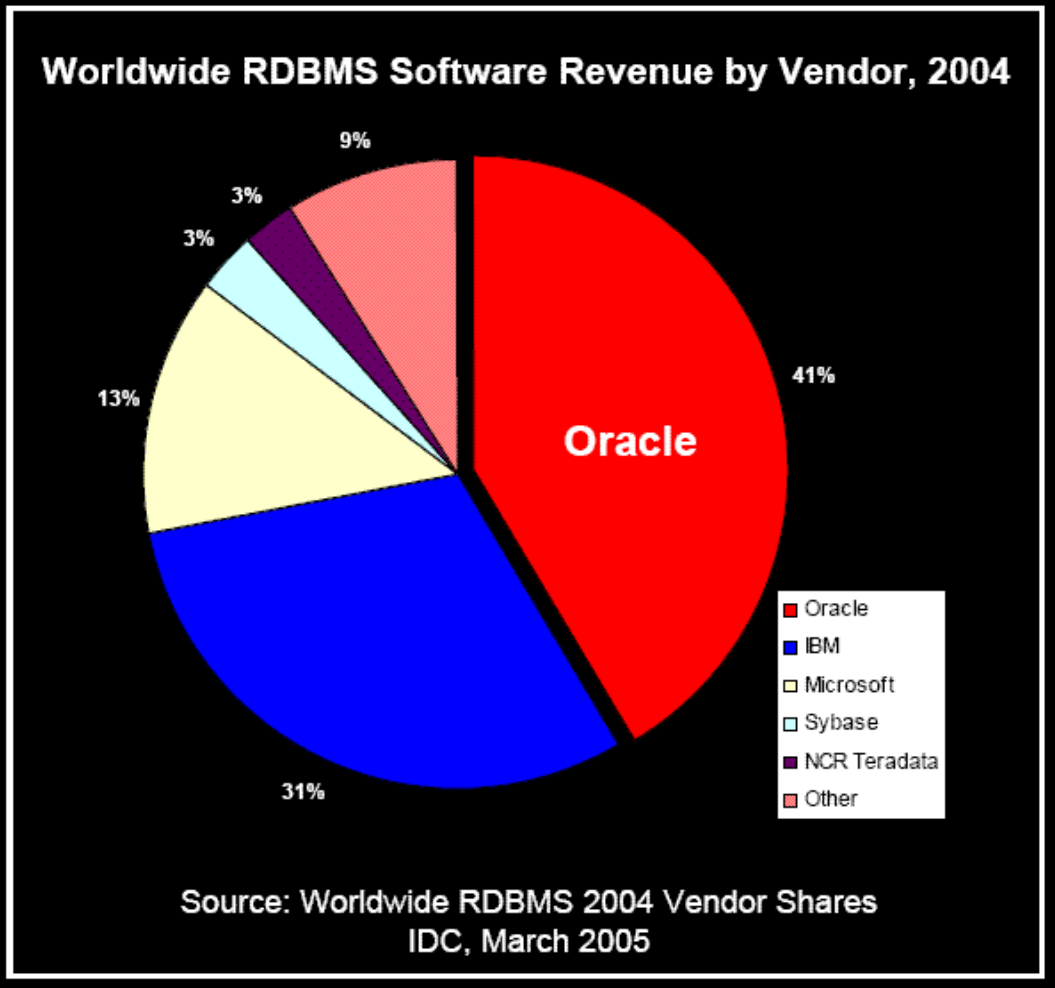
Access (desktop)	40
Firebird/Interbase	3
SQLServer/MSDE	4
DB2 (DB/400)	1
Oracle	1



Oracle's share of the RDBMS market continues to grow

Market Facts[1]

- Oracle has a 41.3% market share
- Oracle outpaced the industry for the second year in a row
- Oracle experienced 14.5% growth as compared to 12% for the industry as a whole
- Oracle increased its lead over its largest competitor, IBM



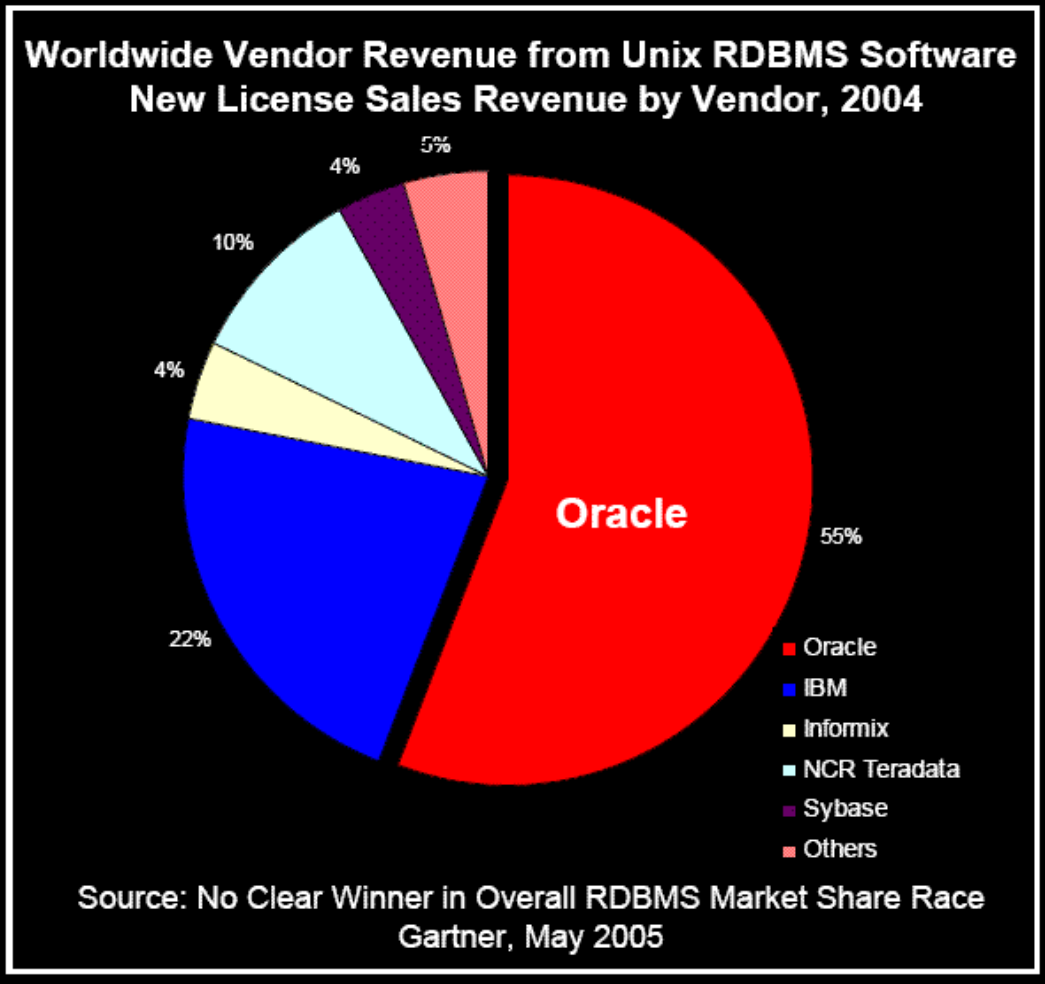
ORACLE

1. Based on Worldwide RDBMS 2004 Vendor Shares, IDC Corporation, March 2005

Oracle maintains it leading position in the Unix RDBMS software space

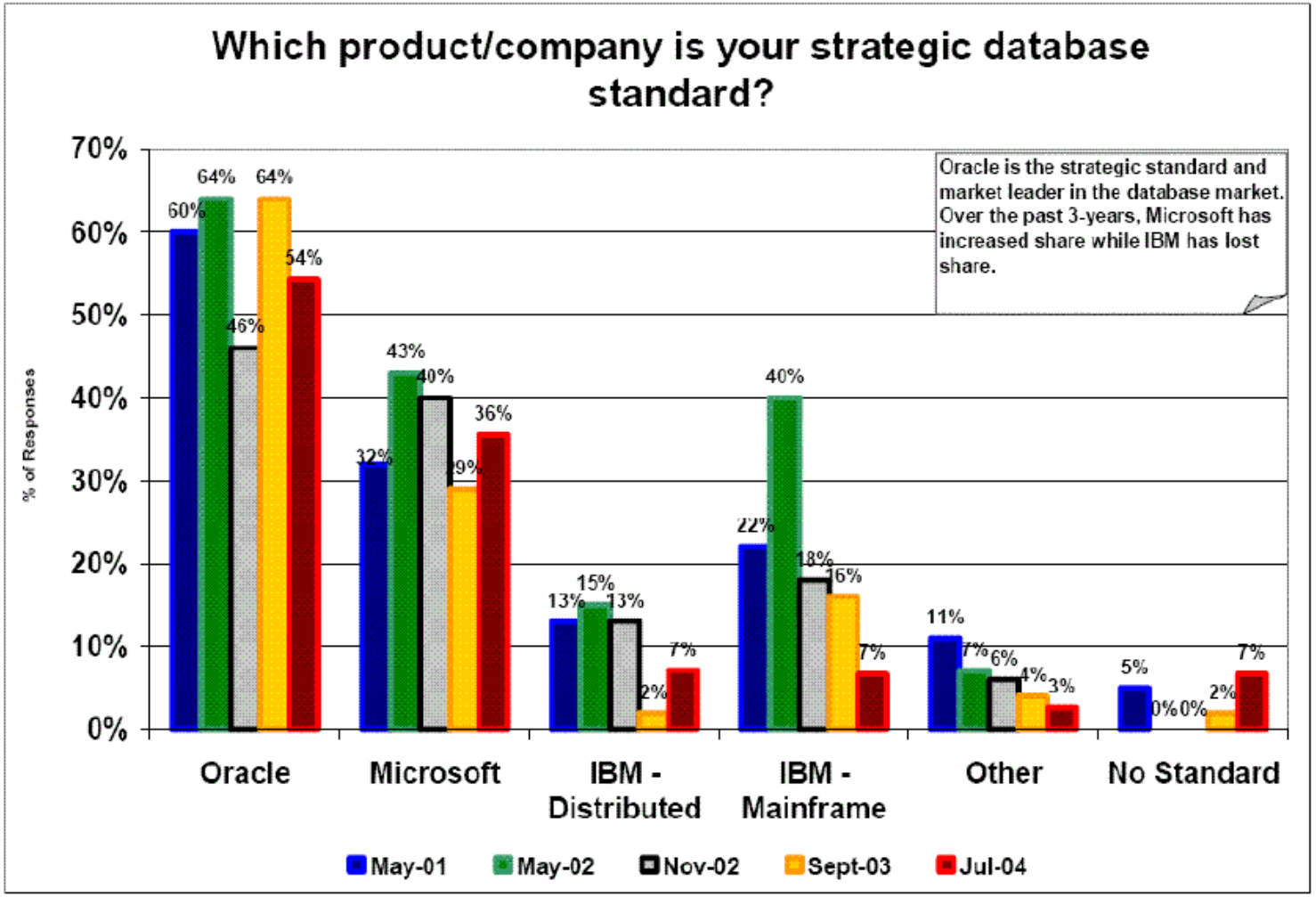
Market Facts[1]

- Oracle continues to earn more than half of all new license sales
- Oracle maintains a 2:1 share over IBM and Informix combined



1. Vendor shares based on Worldwide Linux RDBMS New License Revenues for 2004, Gartner, May 2005

Oracle is the strategic database of choice



Source: Morgan Stanley CIO Survey, July 2004.

Enterprise Technology – August 11, 2004

The Oracle-mode opportunity

Firebird

Oracle

- Oracle perceived as the “gold standard” of high end needs
- Through oracle-mode, FB can show how capable it really is
- Good opportunities:
  - Upgrade from 8i
  - Demo disks
  - Mid-market app's

- Oracle pushing into the mid-market
- Oracle SE1, XE show that there is no 'magic' in Oracle
- ISV network pushed to follow move into the midmarket
- Good opportunities:
  - 'Uncrippled' XE
  - Easy to use, deploy

Oracle-mode databases

- SapDB: 1995, special purpose to run SAP R3
- Fyracle: 2003, generic
- Ingres: 2004, “million dollar contest” – now abandoned
- Postgres EDB: 2005, generic – aims for MySQL market ?
- Oracle XE: 2005, restricted functionality (“crippleware”)

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- **Oracle-mode: the issues**
- What is Fyracle?
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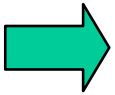
Oracle-mode issues



- **The relational engine:** **“SQL issues”**
- Stored procedures: PL/SQL, Java, dotNet, C/C++
- Packages: user packages, standard packages
- Connectivity: OCI, ODBC, JDBC, dotNET
- Tools: SQL*Loader, SQL*Plus, ...

SQL issues: Datatypes

- **How are numbers supported?**
  - (Maximum) number of bits
  - NUMERIC datatype available?

- **How are strings supported?**
  - CHAR/VARCHAR maximum size
  - NCHAR/NVARCHAR available?
  - Transliteration between compatible character sets

- **Are BLOB's supported?**
  - Binary BLOB's
  - (N)CHAR BLOB's
  - Integration of BLOB's into the SQL language

- **Are user-defined types supported?**
  - Type synonyms
  - Record types

- **Are array-columns supported?**

SQL issues: Views

- **Are views supported?**
  - Can views be on joined tables?
  - Can views have computed columns?
  - Are views-on-views supported?

- **Do views have own access control settings?**
  - At all?
  - On a per-user or per-role basis?

- **Are views based on set operations allowed?**
  - UNION, UNION ALL
  - MINUS, INTERSECT

- **Are views updateable?**
  - Single table views?
  - Multiple table views?
  - Joined table views?
  - Can updateable views enforce selection criteria (WITH CHECK OPTION)?

SQL issues: Triggers

- **Are triggers on tables supported?**
  - At all? Multiple triggers per table?
  - Both BEFORE and AFTER?
  - On all events?

- **Are triggers on views supported?**
  - At all? Multiple triggers per view? Also on nested views?
  - Proper INSTEAD OF semantics (i.e. store-through disabled)?
  - On all events?

- **How well are trigger-related features supported?**
  - Check constraints
  - Foreign keys
  - Column default values

- **How powerful is the trigger body language?**
  - Which languages are supported?
  - Access to OLD and NEW column values?
  - Acces to trigger predicates (UPDATING, DELETING, INSERTING)?
  - Rollback on raised exception in trigger body?

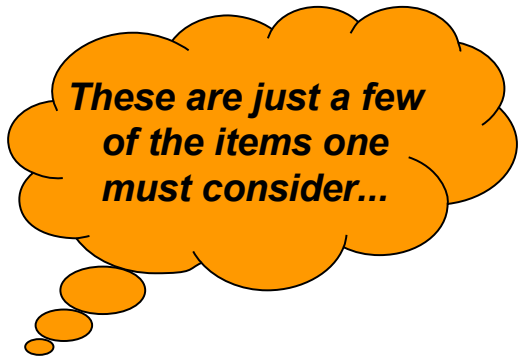
SQL issues: DML functionality

- **How advanced is the SELECT statement?**
  - Sub-selects in the select list possible?
  - Sub-selects in the from list possible?
  - Full ORDER BY / GROUP BY / HAVING functionality?
  - Hierarchical queries? (= CONNECT BY or WITH RECURSIVE)
  - Proper handling of parameters from enclosing queries?
  - Singleton SELECT's anywhere an expression is valid?

- **Which pseudo-column types are supported?**
  - ROWID
  - ROWNUM, LEVEL

- **Multiple named cursors?**
  - Can a single client have more than one cursor open?
  - Is the WHERE CURRENT OF syntax supported?

- **How advanced are built-in functions?**
  - E.g. TO_CHAR(<date>, <format>, <language>)



SQL issues: Transactions

- **How well are transactions supported?**
  - A tomicity
  - C onsistency
  - I solation
  - D urability

- **How strong is the implementation?**
  - Is it lock-based or multi-generational?
  - If lock-based, is the performance acceptable?
    - Granularity (table, page, row, etc.)?
    - Lock escalation behaviour?

- **Are user savepoints supported?**
  - In client SQL?
  - In stored procedures?

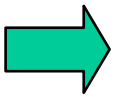
- **Is two-phase commit supported?**

Overview of oracle-match at the basic relational level

Match with Oracle's way of doing things

	Firebird 1.5 native	Firebird Fyracle	Postgres EDB	SapDB Oracle mode	Ingres Oracle mode
Datatypes					
Views					
Triggers					
DML functionality					
Transactions					
Overall fit:					

Oracle-mode issues



- The relational engine: “SQL issues”
- **Connectivity: OCI, ODBC, JDBC, dotNET, PHP**
- **Stored procedures: PL/SQL, Java, dotNet, C/C++**
- **Packages: user packages, standard packages**
- **Tools: SQL*Loader, SQL*Plus, ...**

The issues: Connectivity

Which of the following are supported?

- **OCI**
  The OCI library is the native C/C++ call interface for Oracle. Its function is similar to the function of the 'fbclient' library for Firebird. **X**

- **ODBC**
  Like it or not, ODBC is still the workhorse of DB connectivity. Most VB/Delphi applications that were written for Oracle connect using ODBC.

- **Java**
  In the last five years Java has become the centerpiece of enterprise class application servers. Oracle even bundles its own J2EE app server.

- **dotNET**
  dotNET usage has now surpassed J2EE usage. Oracle is supporting it and more and more applications will require a dotNET driver.

- **PHP**
  PHP has about 20% of the (new) application stack market. Oracle is bundling a special build of PHP with its latest releases.

The issues: Stored Procedures

Which of the following are supported?

- **PL/SQL**
  PL/SQL is the core stored procedure language of Oracle databases. It is estimated that there are >250K PL/SQL developers in the world.

- **Java**
  Increasingly stored procedures are shifting from PL/SQL to Java, tapping into the large pool of J2EE java programmers.

- **dotNET**
  With Microsoft making a major push for the enterprise customer using dotNET integration as its lever, Oracle has pre-empted and added dotNET support.

- **C/C++**
  Despite having been around for over 25 years, C/C++ is still the most popular language on the planet and used in Oracle for fancy custom interaction with the environment.

The issues: PL/SQL

- **Language design**
  PL/SQL is a language from the Algol-family and uses lexical scoping:
  - Are block level variables supported?
  - Are local procedure definitions allowed?
  - Can cursor definitions be parameterised?

- **Complex datatypes**
  PL/SQL has become ever more object oriented:
  - Are collections supported?
  - Are (ref) cursors supported?

X
Planned for Fyracle 0.8.12

- **Interaction with the relational engine**
  PL/SQL is tightly integrated, yet separate from the relational engine
  - Can cursors be passed between procedures?
  - Can procedures operate under an autonomous transaction?

X
Planned for Fyracle 0.8.12

The issues: Packages

- **Support for packages**
  PL/SQL can be organised in compilation units, called packages.
  - Are packages supported?
  - Are package local, global variables implemented?

- **Support for built-in pacakges**
  Oracle comes with a library of about 50 pre-defined packages, handling all sorts of common tasks. Which ones are supported?
  - DBMS_OUTPUT (handles 'printing' from within SP's)
  - UTL_FILE (handles file access)
  - HTP/OWA (handles call interface to Apache)
  - ...

The issues: Tools

- Oracle comes with a large bundle of management tools. Most of these tools are 'automatic management' tools for the zillions of configuration settings and DBA tasks. Equivalents are unnecessary for Firebird, because it was designed to be self-managing.

- Two tools are of wider importance though:
  - **SQL*Plus** is a utility like Firebird's ISQL. However, it is far more programmable, a bit like our QLI, and is often used for all sorts of scripts that automate tasks.
  - **SQL*Loader** is a programmable bulk loader tool. There is no direct Firebird equivalent. Like Plus, Loader is used often in scripts.

X

- Oracle has recently introduced its own IDE tool. A good IDE is a must have for every developer and DBA.

Firebird Fyracle is the best oracle-mode database

	Firebird Fyracle	Postgres EDB	SapDB Oracle mode	Ingres Oracle mode
"SQL"				
Connectivity				
Stored procedures				
Packages				
Tools			?	X
Overall fit:				

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- Oracle-mode: the issues
- **What is Fyracle?**
- Example real-world application: Compiere ERP/CRM
- Fyracle roadmap
- Conclusions

What is Fyracle?

All of the following:

- **Firebird 1.5 with enhancements**
  Fyracle is currently based on Firebird 1.5.2 and makes a number of enhancements to it. Some things are backported from FB2, but most enhancements are new functionality

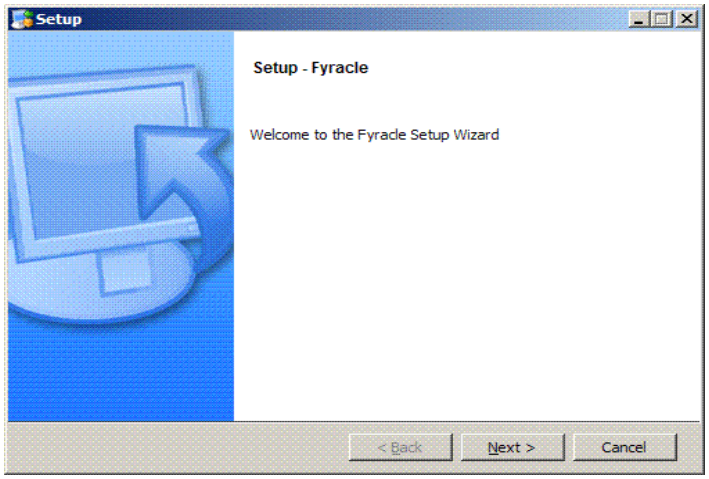
- **A Firebird distribution**
  Fyracle is a '4-click' GUI installer for both Windows and Linux, which installs Firebird, ODBC drivers, Java drivers, documentation and a GUI admin tool. Once the installer completes, Firebird is up and running without further admin.

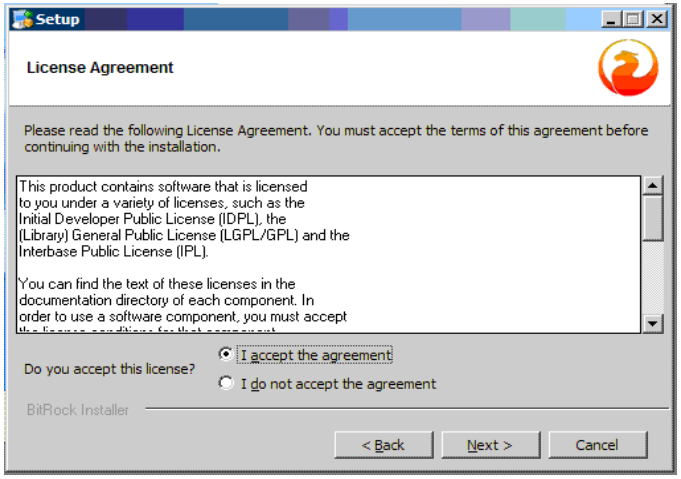
- **Oracle-mode Firebird**
  Fyracle includes all the components to run applications written for Oracle against Firebird. This includes a special translation library and a PL/SQL compiler.

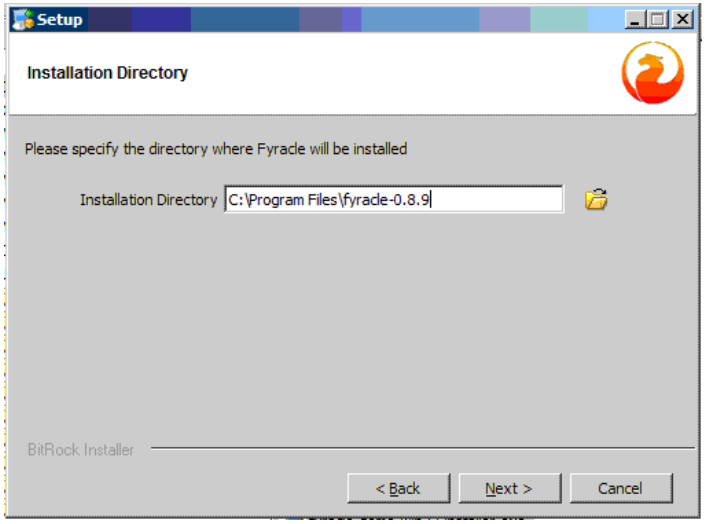
Enhancements to Firebird 1.5

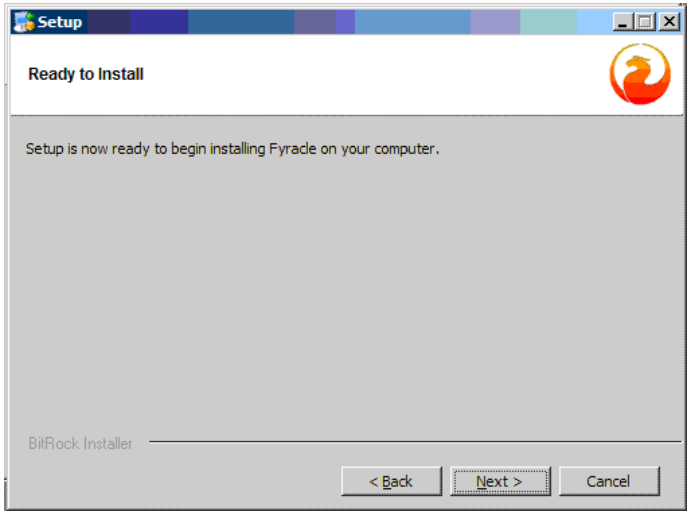
- Derived tables (“select in from list”): backported from FB2
- Common sub-expressions (“with ... select”): new feature, part of FB2.1
- Hierarchical queries (“with recursive ... select”): new feature, needed to implement Oracle's “connect by” syntax, part of FB3
- Global temporary tables: developed for FB2, backported
- External stored procedures (Java, dotNET, Delphi): developed for Fyracle, part of FB3
- ROWNUM: basic implementation, needs improvement
- Built-in function library: to_char, to_date, add_months, lpad, rpad, round, trunc, etc.
- PL/SQL byte code engine: needed to run compiled PL/SQL stored procedures
- “Dialect 4”: adds autocasting between string and numbers, dates; empty string matches Null; etc.

A 'distribution' with a four click install



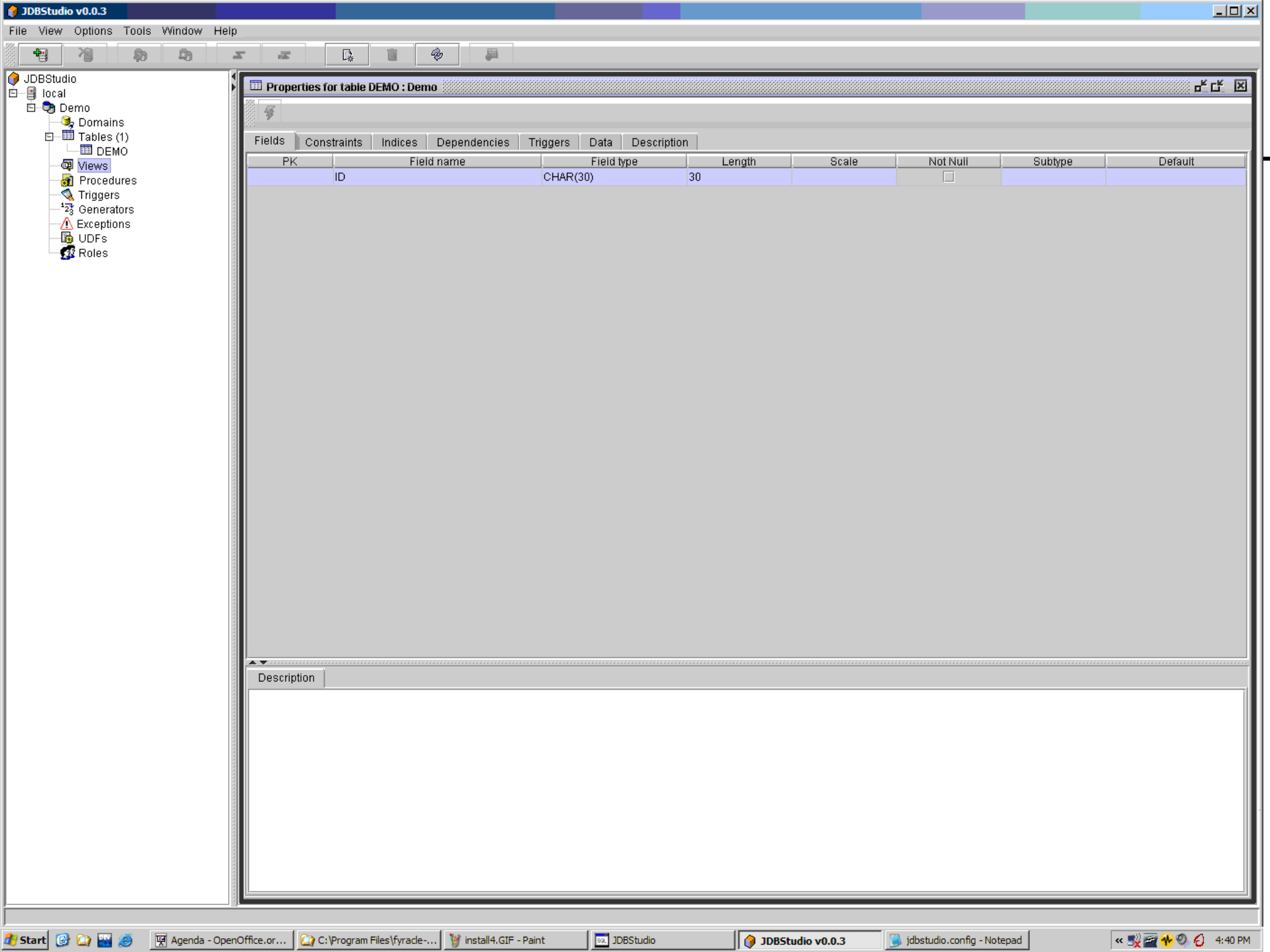






Oracle-mode

- **PL/SQL procedures and trigger bodies**
  - PL/SQL compiler
  - VM to execute compiled bytecode
  - Mechanisms to switch between relational and procedural VM's
- **Components to connect Oracle apps to the Firebird Engine**
  - Smoothes over syntax differences (such as "(+)" join sytax)
  - Works with Delphi, JDBC, ODBC and dotNET
  - "SQL*Plus"-like scripting tool
- **JDBStudio**
  - Java-based GUI admin tool
  - Two operating modes:
    - Firebird
    - Oracle-mode


JDBStudio v0.0.3
File View Options Tools Window Help
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local
Demo
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DEMO
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Triggers
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UDFs
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Properties for table DEMO : Demo
Fields Constraints Indices Dependencies Triggers Data Description
PK Field name Field type Length Scale Not Null Subtype Default
ID CHAR(30) 30
Description
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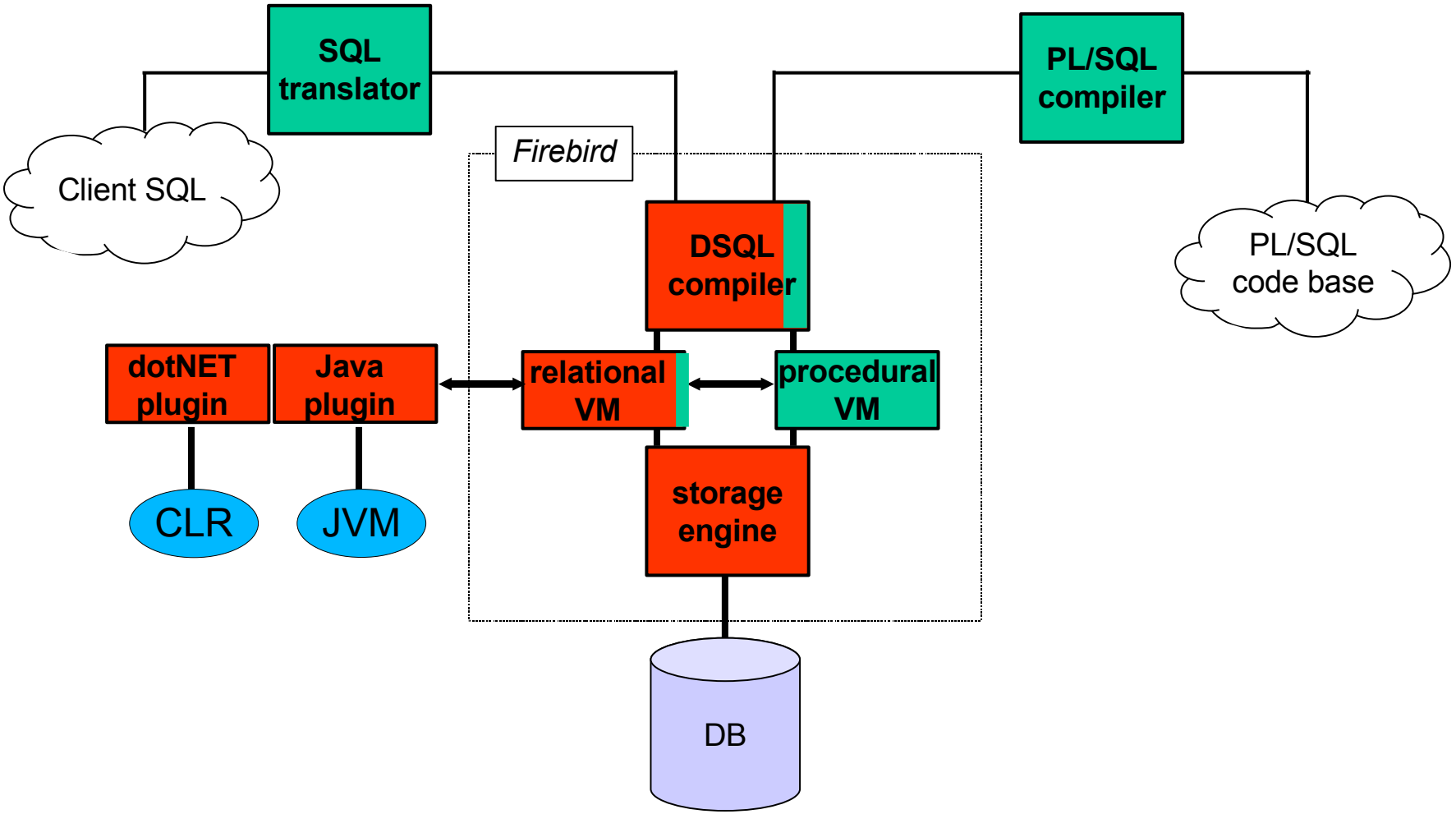
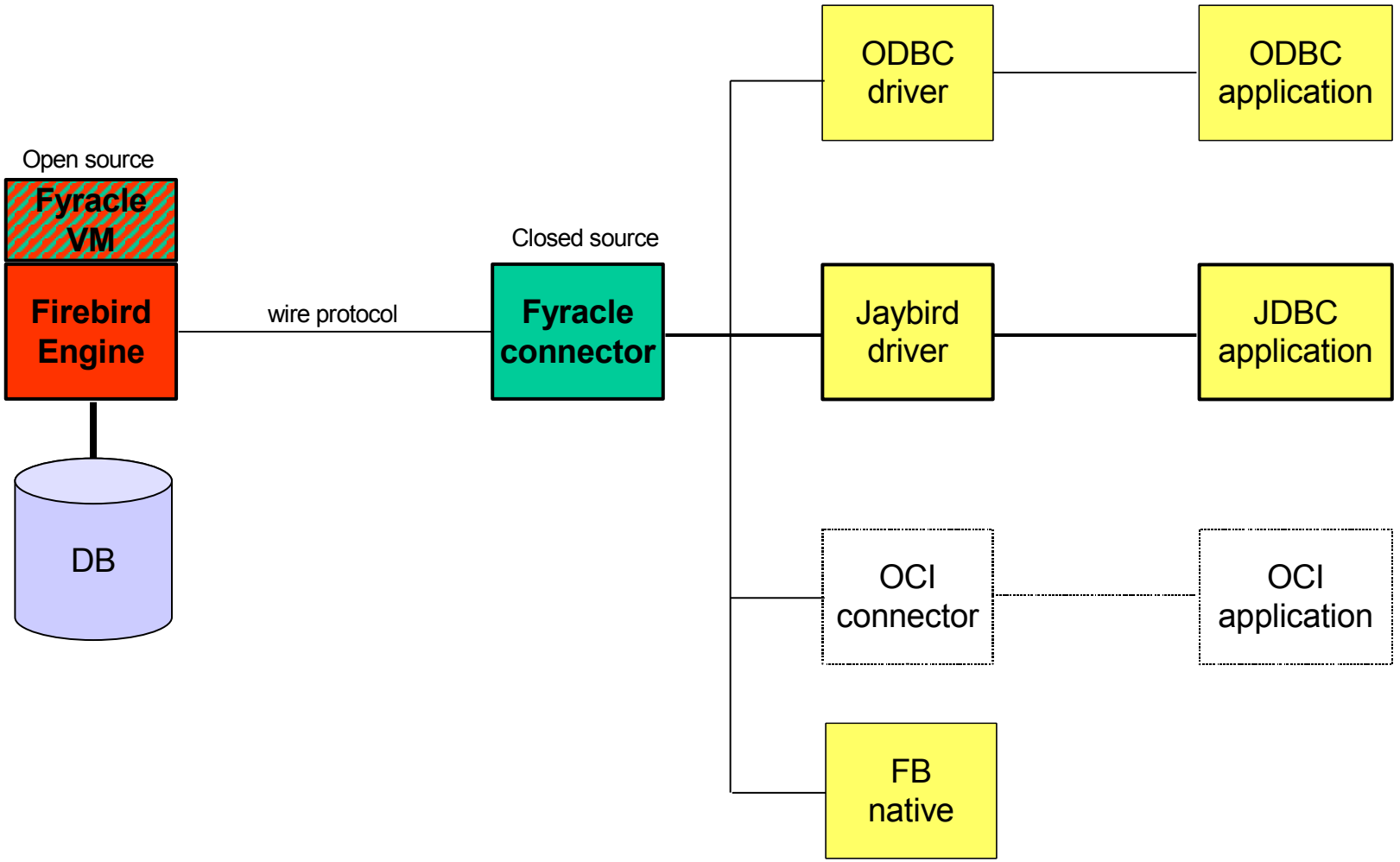
How does work?



Connection options



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Example non-trivial Oracle application: Compiere

- **"Compiere" is an open-source ERP+CRM package**
  - ERP = Enterprise Resource Planning
  - CRM = Customer Relation Management

- **Currently one of the most popular open-source packages of this kind**
  - > 300 active production installations (~30 use Fyracle)
  - Recently received $7 mln in venture capital
  - > 10 implementation partners (VAR's)

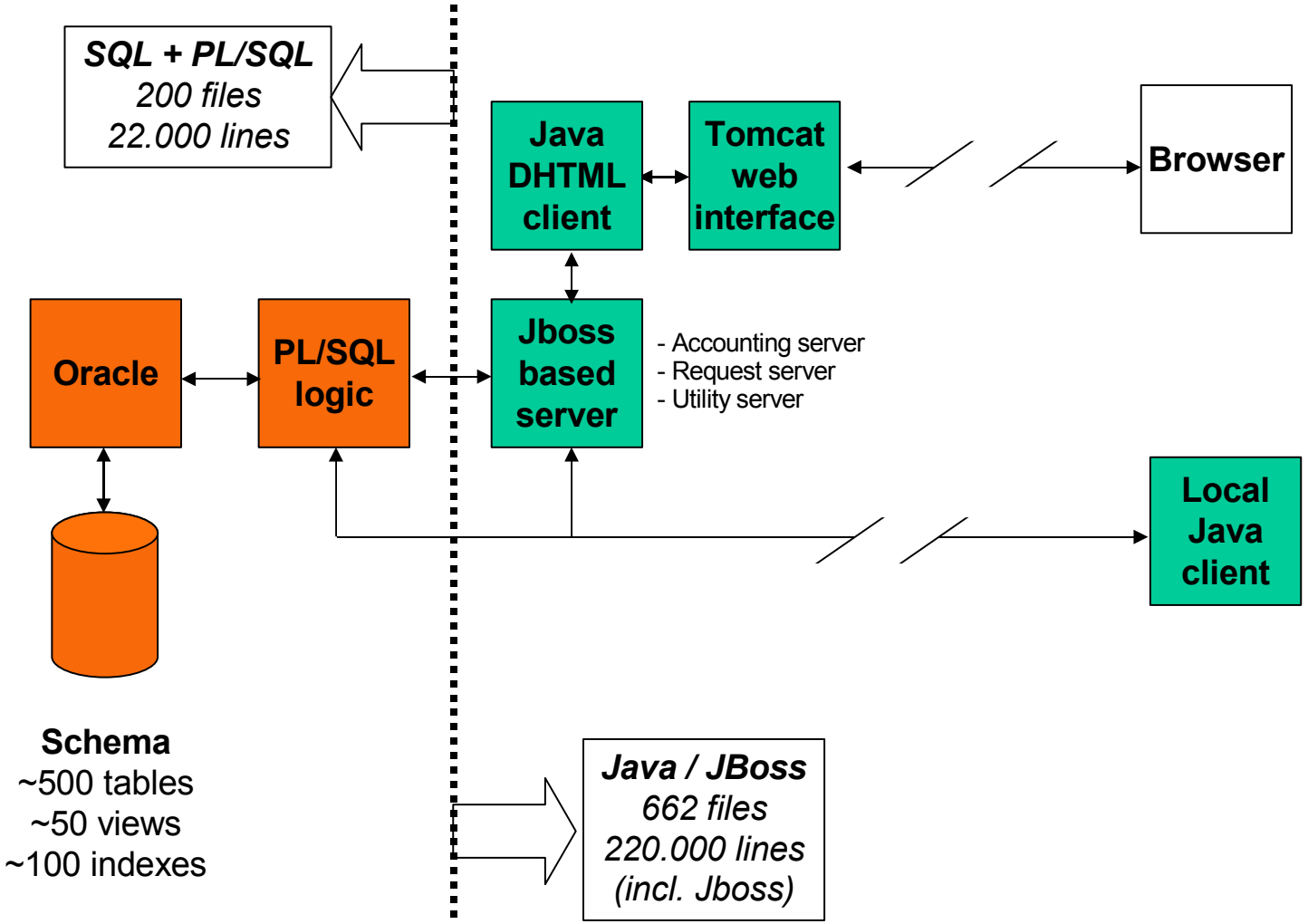
- **Built using the following 'technology stack'**
  - Custom java code
  - Java Swing GUI library
  - Jboss/Tomcat application server
  - Oracle DBMS

Installed base >300; some examples are

Compiere ERP & CRM

Company	Industry	Details
Tire Distributior, Germany	Tire Retail, $20M	Implementation 2 months; In production since 5/2000; Paid by Goodyear, Germany;
ComPiere, Inc. Monroe, CT	Software Development and Support	In production since October 2002 (were too busy to switch earlier)
Pharma Trade Healthcare EURL, France	Distribution of Pharmaceuticals	In production since January 2003. Server & clients running Linux; Implementation time: less than 1 month
Nisshinbo Automotive Inc. Covington, GA	Auto Parts Manufacturer, 100 Mill.	In Production Since December 2002. Using Compiere for Purchasing and Inventory Control
LHI Technology: Singapore	Cable Manufacturing, Size (confidential, medium sized, 2 factories)	Full-scope implementation ongoing. Chinese & English language Processes cover accounting according to 2 legal environments. Make to order logistics.
Donau Verlag, Münster, Germany	Book and Journal Publisher	Compiere is used for selling books and paying commissions to authors Online Store in development; Implementation 1 month, Production since 01/2003, Sun Solaris Environment

Compiere 2.5.0 basic design



Some observations

- **Fyracle is the only database that can run Compiere 2.5.0 virtually unchanged**
  There is a port to Postgres and a port to DaffodilDB. Both required heavy modification to the Compiere codebase. Postgres EDB cannot handle Compiere 2.5.0 unmodified.

- **Fyracle is only database that can run Compiere 2.5.2 virtually unchanged**
  Version 2.5.2 moved all PL/SQL to either the client or to Java stored procedures in an effort to become database independent.
  - This change was paid for by Sybase. Still, Sybase cannot run Compiere 2.5.2 reliably!
  - Postgres EDB cannot handle Compiere 2.5.2 (no java SP support)
  - Even Oracle XE cannot handle Compiere 2.5.2 for the same reason

- Only a minority of Fyracle users use it to run Compiere, the other half use it to run other applications once developed for Oracle. Typical development environments are:
  - VB
  - Delphi
  - Dev/2000

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- **Fyracle roadmap**

Outlook: Fyracle 1.0

- **Further development in 0.8.x series to include**
  - Documentation! (has been top focus during 2006)
    - Now about 300 pages, will be 1000 pages by March
  - Table functions
  - PL/SQL enhancements (collections, ref cursors, ...)
  - Better ROWNUM and NUMBER emulation
  - System catalog views
- **Series 0.9.x will move to FB2.0**
- **Fyracle 1.0 still 12 months away**

Outlook: beyond Fyracle 1.0

- **Add features**
  - 128-bit data types, object types
  - Two-tier name space
  - Deferred triggers / constraints, statement & db level triggers
  - Materialised views

- **Shift the code base from FB2.0 to FB3**
  - Fyracle currently 'proof of concept' based on FB1.5
  - Rewritten, refactored code
    - In some cases added to FB main tree (admins decide)
    - In some cases only in Fyracle (the other code)

Outlook: high level roadmap