The Future of DB2 Connect

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Wednesday, November 19, 2008
Platform: DB2 for z/OS
To understand the future look in the past

- Entire product category created to make mainframe an enterprise data server.
- The same need is there today and will remain for a foreseeable future
- Many products have come but very few remain: MDI Gateway, Oracle Gateway, Sybase Gateway, Attachmate, Rumba, StarQuest, Microsoft Host Integration Server, Neon Shadow Direct, HiT Software, DataDirect, Rumba, EDA, CrossAccess
- DB2 Connect has been there since 1993 and today is stronger than ever
DB2 Connect
In a nutshell

Desktop PCs
Application servers
Web application servers

APIs
Communication
Data

System z or System i

- ADO.NET, ADO
- ODBC, OLE DB
- JDBC, SQLJ
- DB2 CLI
- PHP, Ruby, Python
- Embedded SQL

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DB2 Connect

- Make DB2 for z/OS in to an enterprise database server
- Greatly improve programmer productivity
- Deliver on DB2 for z/OS strengths:
  - Continuous application availability
  - Manage and balance the workload (SYSPLEX)
- Improve mainframe resource utilization
- Provide transparent access via SQL and standard APIs to CICS, IMS, MQ, VSAM and other data sources
- Extend applications and data to mobile devices
- Make DB2 for z/OS a full participant in SOA
- Simplify application deployment
DB2 Connect questions I hear all the time

Is DB2 Connect required if I use JDBC Type 4 driver?

Is DB2 Connect going away?
DB2 Connect PRODUCT is always required!

DB2 Connect PRODUCT is NOT going away!
DB2 Connect PRODUCT:

- A part number you purchase from IBM.
- Four different Editions are available:
  - Personal Edition,
  - Enterprise Edition,
  - Application Server Edition,
  - Unlimited Edition,
  - Unlimited Edition for System i.

DB2 Connect SERVER:

- Component of the DB2 Connect PRODUCT
- You install it on a
  - Linux: Intel/AMD, POWER (System p&i), System z
  - UNIX or
  - Windows server.
- Deploying DB2 Connect SERVER component is optional.
- Can instead deploy one or more of the other components (e.g., JDBC Type 4 driver) that are a part of the DB2 Connect PRODUCT.
DB2 Connect Deployment Models

- **Direct connectivity from each desktop: DB2 Connect Personal Edition**
  - Install DB2 Connect Personal Edition on each desktop for direct connectivity to the mainframe

- **Utility: DB2 Connect server farm:**
  - A cluster of DB2 Connect servers to be used by multiple applications
  - Drivers (ODBC, OLE DB, .NET, JDBC, SQLJ, Embedded SQL etc.) deployed to all desktops and application servers

- **Application server co-location:**
  - DB2 Connect installed on each application server
DB2 Application Development

IMPROVING PROGRAMMER PRODUCTIVITY AND APPLICATION QUALITY
DB2 Application Development

What is about?

- SQL
- APIs and drivers that implement them
- Application Development Tools and Utilities
- Information
- Application deployment
SQL-based DB2 APIs

- **Microsoft environments:**
  - ADO (via ODBC or OLE DB)
  - ADO.NET

- **Java programmers:**
  - JDBC
  - SQLJ

- **UNIX, Windows C programmers**
  - DB2 Call Level Interface (DB2 CLI)
  - ODBC
  - Embedded SQL
Non-SQL based DB2 APIs

- **Microsoft environments:**
  - Web Services: application programmer accessing DB2 as a set of Web Services created by an application DBA

- **Java programmers:**
  - **pureQuery**: you will want your Java programmers use this
  - Java Beans: J2EE programmer accessing DB2 as a set of Java Beans created by an application DBA by wrapping DB2 stored procedures.
  - Web Services: application programmer accessing DB2 as a set of Web Services created by an application DBA
Scripting Languages
The great development shift

- The shift from Desktop to Web applications led to an increase in the adoption of dynamic languages like Ruby, Python, and PHP.
- This trend is coupled with the emerging popularity of Web frameworks for these languages, like Ruby on Rails, Zend Framework, and Django.
- DB2 Connect objective: make DB2 for z/OS premiere data server for applications built using scripting languages.
Ruby

- From 27th in 2004, to 9th most popular language in the world in 2007 (source: TIOBE Index)
- Ruby on Rails is the fastest growing Web framework in the industry
Ruby and IBM Database Servers (DB2 and IDS)

- DB2 Connect provides IBM developed and supported Ruby driver and a Rails adapter.
- 8 releases of the IBM_DB gem in the past year alone. Reached version 1.0 of the IBM_DB gem with major coverage in the Rails community. Shipped 4 releases of Starter Toolkit for DB2 on Rails (v2.1 is the latest).
- Support for the latest (not even released yet) Rails v2.2
- The same driver also supports other IBM databases: DB2 LUW, DB2 for i5/OS, Informix Dynamic Server
- Major improvements in the support of Ruby on Rails compatibility with DB2, including acceptance of patches submitted by IBM into the Rails core.
- Almost complete support for the Migration framework. The single method that is missing is currently being worked on.
- Several applications deployed in production and thousands downloads.
- Active community with more than 500 messages in the support forum.
- Mac OS X support in the working.
- Used Ruby on Rails in DB2 to deploy several applications in the Cloud (Amazon EC2)
From 10th in 2001, to 5th most popular language in the world today (source: TIOBE Index).

Over 2 million Zend Framework downloads.
PHP and DB2 Connect

- **Choice of two PHP extensions:**
  - IBM_DB2: This is the common API for all the dynamic languages
  - PDO_IBM: best for object oriented PHP style of coding
- **Current release of IBM_DB2 is 1.7.1, with 25 releases in between this and the 1.0 release.**
- **Drivers developed and supported by IBM. This is unique in the PHP world**
- **Published scalability case study with 10,000 concurrent database connections.**
- **Zend Core for IBM now ships DB2 Express – C. Great for development and then re-hosting on DB2 for z/OS**
- **Integration with popular PHP build tools (e.g. Zend Studio)**
Python

- From 13th in 2003, to 6th most popular language in the world today (source: TIOBE Index).
- Several frameworks exist, with Django increasingly popular amongst Web developers.
- SQL Alchemy is the most popular ORM in the Python community.
Three modules released:

- `ibm_db`: an extension driver for DB2 and IDS
- `ibm_db_dbi`: a wrapper compliant with the Python DB-API 2.0 specification
- `ibm_db_sa`: a Python adapter implementing the SQLAlchemy 0.4 specification APIs

Current version for the two drivers is 0.4.1, while the SQLAlchemy adapter is 0.1.6. For a total of 21 releases in 2008.

Support for SQLAlchemy allows DB2 to be used with several Python Web frameworks like Pylons, TurboGears and an experimental branch of Django.

Django ORM support is under investigation.
Perl and DB2 Connect

- In slight regression, but still the 9th most popular language in the world today (source: TIOBE Index).
- Released a DBD::DB2 driver module that implements the DBI interface for DB2 on all the supported OS platforms.
- 3 Levels of support provided by IBM.
- Rich API and stable v1.2.
DB2 Development Tools
Key audiences

- **Data Architects**: Rational Data Architect provides complete set of data modeling tools

- **Application DBA**: Data Studio - Integrated Development Environment (IDE) for building server-side objects that does not require knowledge of a programming language

- **Java programmer**: Rational Application Developer – a premiere Java development environment with full support for database development
DB2 Development Tools
Key audiences

- **Microsoft programmer:** DB2 add-ins for Microsoft Visual Studio make building complete DB2 applications a natural experience for .NET programmers.

- **Scripting languages programmers:** use Data Studio plug-ins to extend popular IDEs such as Aptana, Eclipse PDT, Zend Studio, Adobe Flex etc.
Integrated Data Management Core Values

An integrated, modular, data management environment designed to increase organizational productivity and effectiveness while improving the quality of service, cost of ownership, and governance of diverse data, databases, and data-driven applications.

- Providing end-to-end data lifecycle management
- Facilitating cross-organizational collaboration for business alignment
- Flexibility to provide the ease of use small businesses require with the scalability to manage the large enterprises
Core Users of the IBM Data Studio

- **Business Analyst**
  - Business and Process Modeling
  - BMP
  - UML

- **Database Architect**
  - Data Modeling
  - Logical Modeling
  - Physical Modeling
  - DDL

- **Application Developer**
  - Application Development
  - Java
  - .NET
  - Web Services
  - PHP
  - RUBY

- **Database Developer**
  - Database Development
  - Stored Procedures
  - SQL
  - XQuery
  - User Defined Functions

- **Database Administrator**
  - Database Management
  - Administration
  - Configuration
  - Performance
  - Monitor & Tuning
  - Backup & Recovery

- **Security Administrator**
  - Data Governance
  - Data Auditing
  - Data Archiving
  - Data Masking
  - Data Encryption
  - Security Access
  - Vulnerability

- **Patterns**
  - Design
  - Develop
  - Deploy
  - Manage
  - Govern
# Data Studio Packaging

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## Data Studio Base

- **Rational Data Architect**
  - Create logical and physical data models
  - Discover the structure of data sources
  - Discover or identify relationships between data sources
  - Compare and synchronize two data sources

- **Data Studio Developer**
  - Generate a data access layer using Java objects
  - Reduce code to write and maintain to lower complexity and cost
  - Provide a seamless Eclipse-based SQL/Java experience

- **Data Studio pureQuery**
  - Limit user access by granting users execute privileges on the queries
  - Choose between dynamic or static execution at deployment time
  - Capture additional workload information to aid forecasting accuracy

- **Data Studio Administrator**
  - Manages changes while preserving data, privileges, all dependencies, and application binding
  - Migrates objects and dependent objects
  - Compares objects and builds deployment script based on the changes

- **Optimization Expert**
  - Proactive notification
  - Expert analysis
  - Reporting
  - Performance WH
  - Identifies potential bottlenecks
  - Starter set of system tuning tips
  - Buffer pool analysis
  - SQL activity tracing
  - Multi-partition monitoring

- **Performance Expert**
  - Proactive notification
  - Expert analysis
  - Reporting
  - Performance WH
  - Identifies potential bottlenecks
  - Starter set of system tuning tips
  - Buffer pool analysis
  - SQL activity tracing
  - Multi-partition monitoring

## Additional Features

- **High Performance Unload**
- **High Speed Unload**

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IBM DB2 Developer Workbench V9.1
- SQL Query Editor
- SQLJ Editor
- SQL Builder
- XQuery Builder
- SQL Routine Debugger
- Java Routine Debugger
- XML Editor
- XML Schema Editor
- Data Management
- Visual Explain
- Project Management

IBM Data Studio
- Integrated Query Editor – SQL + XQuery
- SQLJ Editor
- SQL Builder
- XQuery Builder
- SQL Routine Debugger
- Java Routine Debugger
- XML Editor
- XML Schema Editor
- Data Management
- Visual Explain
- Project Management
- ER Diagramming
- Data Distribution Viewer
- Object Management
- Browse & Update Statistics
- Security Access Control
- Connection Management integration with Kerberos and LDAP
- Data Web Services
- IDS Server Support
- Health Monitoring DB2 for LUW 9.5 and DB2 z/OS v9

Data Studio is a full replacement of DB2 Developer Workbench plus much more
- DB2 for Linux, Unix, Windows v8.x, v9.1.x, v9.5
- DB2 for z/OS v7, v8, v9
- DB2 for i5/OS v5r2, v5r3, v5r4
- Informix Dynamic Server (IDS) v9.x, v10.x, v11
IBM Data Studio Base Tool for Application DBA

- Rapid, iterative development of DB2 objects: tables, views, indexes, buffer pools etc.
- Complete end-to-end development of DB2 routines (stored procedures, user-defined functions, triggers etc.)
- No need to know programming languages (VB, C#, Java etc.)
- Available as part of DB2 Connect (no extra charges)
Users of the IBM Data Studio

- Business Analyst
  - Business and Process Modeling
  - BMP
  - UML

- Database Architect
  - Data Modeling
  - Logical Modeling
  - Physical Modeling
  - DDL

- Application Developer
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  - Backup & Recovery

- Security Administrator
  - Data Governance
  - Data Auditing
  - Data Archiving
  - Data Masking
  - Data Encryption
  - Security Access
  - Vulnerability

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IBM Data Studio Developer and pureQuery Runtime

IBM Data Studio Developer is an integrated database development environment that speeds application design, development, and deployment while increasing data access performance and manageability.

- **Ease JAVA coding**
  - pureQuery code assistance

- **Improve predictability and manageability with static SQL**
  - Switch dynamic to static SQL without changing a line of code

- **Visualization of JAVA request to SQL code**
  - SQL Outline correlates SQL to JAVA code and the associated objects

- **Impact Analysis**
  - Display lines of code associated to a DB2 object to understand the impact of an object change.
Java Data Access – many forms

Spectrum of choices

POJO | iBatis | Hibernate | EJB 3

Unmanaged Objects

Pro’s:
- Simplicity
- Easy to control SQL
- Good performance
- Good monitoring (SQLJ)

Con’s:
- Not tied to object model
- More work for app pgmr

POJO with inline SQL
JDBC, SQLJ

Managed Objects

Pro’s:
- Less work for app pgmr
- Access via OO business objects

Con’s:
- Complexity
- Less control over SQL issued
- Performance can suffer
- Very difficult to monitor or diagnose problems

POJO with inline SQL
JDBC, SQLJ

Java Persistence Architecture

DB2 for z/OS
IBM pureQuery
Balances Ease of Use and Control

IBM pureQuery
Balances Ease of Use and Control

Full SQL control
Managed objects

JDBC / SQLJ
Code all your SQL

Spring
Use SQL templates, inline only

iBATIS
Use SQL templates, inline only

IBM pureQuery
Add basic OR mapping and annotated-method style

pureQuery Code Assistance available with Data Studio Developer

Hibernate
Complex OR mapping and persistence management

OpenJPA (EJB3)
Adds container management option
pureQuery Improves Java Data Access Performance

- Choose between dynamic or static execution at deployment time, rather than development time
- Deliver static SQL execution value to existing DB2 applications
  - *Make response time predictable and stable* by locking in the SQL access path pre-execution, rather than re-computing at access time
  - *Limit user access* by granting execute privileges on the query packages rather than access privileges on the table
  - *Aid forecasting accuracy and capacity planning* by capturing additional workload information based on package statistics
  - *Increase system capacity* by driving down DB cycles
In-house testing shows double-digit reduction in CPU costs over dynamic JDBC

- IRWW – an OLTP workload, Type 2 driver (local call)
- Cache hit ratio between 70 and 85%
- 42% reduction in CPU per transaction over dynamic JDBC
SQL Insight
Correlate SQL to JAVA

- Correlate the SQL statement back to the originating line of JAVA code
  - Custom-developed, framework-based, or packaged applications

- Impact analysis identifies application code impacted due to database changes
  - Answered “where used” questions like “where is this column used within the applications”
  - Use with modern JAVA frameworks e.g. Hibernate, Spring, iBatis, OpenJPA
pureQuery Outline
Speed up problem isolation for developers – even when using frameworks

Captured SQL

Statement correlation

Table correlation
Integration into Microsoft Visual Studio

- Toolbox
- IBM Explorer
- DB2 Tools Toolbar
- DB2 Projects
- Intellisense
- SQL Editor
- DB2 Output Message Pane
- Properties
- Dynamic Help

Example code:
```csharp
// Create a connection string and a
string connectionString = "Database
DE2Connection myDB2Connection = new
myDB2Connection.ConnectionString = \\
";

// Now create a PreparedStatement to
PreparedStatement ps = con.prepareStatement("Select
DE2SelectCommand, Connection = myDB2
// Create a DataAdapter for executing
DataAdapter ds = new DataAdapter();
// Create a DataSet object and fill it
DataSet ds = new DataSet();
```
Integration: Zend Studio for PHP

Data Perspective
SQL Editor
Debugger
DB2 Output Message Pane
Continuous application availability
Manage and balance the workload (SYSPLEX)

DELIVER ON DB2 FOR Z/OS STRENGTHS
DB2 Connect
3 tiers of a solution

DB2 Run-Time
Client

DB2 Connect
Server

DB2 for zOS

Data

B2 address space

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Continuous application availability

- **DB2 for z/OS** is considered to be a “gold standard” for database availability
  - System z hardware reliability
  - Datasharing

- **For applications running off-mainframe**, the rest of the infrastructure can become the weak link:
  - Failure to exploit datasharing
  - Inability to route around network failures
  - Lack of resilient infrastructure
Continuous application availability
2-tier distributed application

User Interface and biz logic

DB2 Connect Server

DB2

point of failure

point of failure

point of failure

point of failure

point of failure

point of failure

Data
Dealing with failures
2-tier distributed application

- **Database (DB2 for z/OS)**
  - Failure will make DB2 unavailable to all applications
  - Introducing redundancy is the most common way to deal
  - Datasharing is the most common way to introduce redundancy
  - Redundancy must be transparent to the application and DB2 Connect

- **DB2 Connect**
  - Failure will make DB2 unavailable to the application
  - Introducing redundancy is the most common way to deal
  - Redundancy must be transparent to the application

- **Application**
  - Failure results in an outage for a single person
  - Three finger salute (Ctrl-Alt-Del) is the most common way to deal with failures
Continuous application availability
Dealing with DB2 outages
DB2 Datasharing + DB2 Connect Connection Concentrator

- DB2 datasharing: DB2 cluster for high availability
- DB2 Connect Connection Concentrator routes transactions around failed members
- On failures:
  - In-flight transactions get – SQLCODE -30108 that suggests to re-execute transaction
  - New transactions get automatically routed to surviving members
DB2 Connect Connection Concentrator for High Availability

- Fully exploits datasharing
- Transparent routing around failed members. New transactions are routed to (most) available DB2 subsystems regardless of where initial connection was made
- Very fast routing around unavailable subsystems:
  - Informed about unavailable members by the WLM, plus
  - Will notice unavailable members even if WLM does not yet know about an outage
  - Does not wait for DB2 subsystem to restart on another LPAR
- Integrates with Dynamic VIPA but does not require it
Continuous application availability
DB2 Connect outages

User Interface and biz logic

DB2 Connect Server

DB2 Cluster

Data
Continuous application availability
DB2 Connect outages
DB2 Connect Clustering Using Cluster Manager software

- Use cluster managers (HACMP, SUN Cluster, Windows Cluster Server, TSA etc.) to maintain an idle stand-by server

- **Pros:**
  - Same capacity during server outage
  - Full support for DB2 Connect servers that require persistent local data store (e.g., federation, Mobility on Demand etc.)

- **Cons:**
  - Typically only two nodes in a cluster
  - Idle stand-by server is not doing DB2 Connect work
  - Slower take over times
DB2 Connect Clustering Using HADR and Client Reroute

- **Client Reroute and HADR introduced in DB2 Connect V8.2**
- **Pros:**
  - Same capacity during one server outage
  - Full support for DB2 Connect servers that require persistent local data store (e.g., federation, Mobility on Demand etc.)
  - Fast take over time
- **Cons:**
  - Limited to two nodes in a cluster
  - Only one machine is not doing DB2 Connect work
  - Need clustering software to automate takeover
  - Does not support 2-phase commit failover
DB2 Connect Clustering Using Network Equipment for virtual IP

- **Relies on network gear (e.g. CISCO CSS) for creating a single system image**
- **Pros:**
  - Large number of servers can be clustered
  - All servers are active and doing DB2 Connect work
- **Cons:**
  - Extra expense for the network gear
  - Reduced capacity during outages
  - No support for DB2 Connect servers that require persistent local data store (e.g., federation, Mobility on Demand etc.)
DB2 Connect Clustering Using Windows Server NLB facility

- **Relies on Network Load Balancing component of Windows Server OS**
- **Pros:**
  - Large number of servers can be clustered (max 32)
  - All servers are active and doing DB2 Connect work
  - Work balanced across cluster
  - No need to purchase any extra software or hardware
- **Cons:**
  - Reduced capacity during outages
  - No support for DB2 Connect servers that require persistent local data store (e.g., Federation, Mobility on Demand etc.)
  - DB2 Connect server must be on Windows
Continuous application availability
Multi-tier distributed application
Dealing with failures
3-tier distributed application

- **Database (DB2 for z/OS)**
  - Same as in 2-tier

- **DB2 Connect. Two options:**
  - Application Servers and DB2 Connect on separate servers
    - Same considerations and solutions as in 2-tier
  - Co-locate DB2 Connect with application servers
    - Each application server has their own DB2 connectivity i.e. failure of one or more server does not affect application availability
    - Reuses infrastructure that is already in place for application server clustering
Co-locating DB2 Connect and Application Server

- Each application server has its own copy of DB2 Connect
- No difference in DB2 Connect license cost
- DB2 Connect resources usage on each server are marginal
- To exploit DB2 Connect server function set `DB2CONNECT_IN_APP_PROCESS=NO`
A look at how to deploy DB2 Connect to minimize use of mainframe CPU, storage and other resources.

MINIMIZING IMPACT ON MAINFRAME RESOURCES
DB2 Connect Exploiting DRDA (DDF) Advantages

- DDF is built on Enclave SRB architecture i.e. much more scalable than TCB-based approaches
- DDF avoids checking SQLDA data types after prepare (around 20 instructions/column)
- DDF address space uses key 7 for move instructions instead of key 8. Cost depends on number of bytes being moved but it is typically around 1/10th of the key 8 cost
- DB2 for z/OS V8 moved the DRDA data stream generation into the DBM1 address space, so there is no switching from DDF to DBM1 on each FETCH (saves 3K instructions/FETCH)
DB2 Connect Server
Basic Architecture Overview

- `db2start` starts instance
- Multiple instances/machine
- 1-1-1 relationship between applications, coordinating agents and DB2 threads
- Capacity of the server is determined by the MAXAGENTS (64K)
- `LIST DCS APPLICATIONS` display info for all agents
DB2 Connect Server
Connection Pooling Overview

- 1-1-1 relationship between applications, coordinating agents and DB2 threads
- Initial pool size is controlled by NUM_INITAGENTS
- Max pool size is controlled by NUM_POOLAGENTS
- CA and corresponding connection returned to the pool on disconnect

```
C:> db2start
```

```
C:>
```
DB2 Connect Server
Connection Concentrator

- N-1 relationship between applications and threads
- CA and corresponding connection returned to the pool on commit/rollback
- Connection concentrator is activated when MAX_LOCICAGENTS > MAX_COORDAGENTS
- Initial pool size is controlled by NUM_INITAGENTS
Connection Concentrator
Reduce z/OS resource usage

- Connection Concentrator reduces number of DB2 threads
- Saving a thread saves:
  - Active: 250K
  - Inactive: 7K
- You decide how many threads to keep around by setting DB2 Connect parameter MAX_COORDAGENTS
- There is a cost (special registers and user id switching)
ACCESS MORE THAN JUST DB2 DATA
Types of data DB2 Connect can combine with your DB2 for z/OS data

- Other DB2 for z/OS subsystems
- DB2 Family servers:
  - DB2 UDB on UNIX, Windows, Linux
  - DB2 Server for VM and VSE
  - DB2 for System i servers
- Mainframe non-relational data (CICS, IMS, VSAM, MQ etc.)
- Non-DB2 relational databases: Oracle, Sybase, Microsoft, Informix
- Other non-relational data (e.g. XML, MQ etc.)
Methods for accessing non-DB2 data through DB2 Connect

- **Federation**
  - Create federated database on a DB2 Connect server and point application to this database
  - Use IBM Information Server to extend a range of available data sources

- **Stored Procedures**
  - DB2 for z/OS SPs are programs written in 3GL languages (C, C++, Java, Procedural SQL, COBOL). You can access any data source accessible from these languages

- **SQL Functions**
  - OLE DB
  - MQ
  - Web Services
  - XML
IBM Data Management

**DB2 Connect Federation**

- **Informix**
- **DB2 UDB for Linux, UNIX, Windows**
- **DB2 UDB for System i**
- **DB2 for OS/390, DB2 for VSE/VM**

Application sees single database image:

No data, only references (nicknames):

Federated Database

DB2 Connect server (Windows, UNIX, Linux)
Application programmer works with a single database image and is unaware of the physical database location.

- `CONNECT TO DB1` where DB1 is an alias for the federated database.

Programmer is able to join data from multiple locations as if the data was in a single database:

- `SELECT * FROM T1, T2` where T1 and T2 are in different databases potentially on different servers.

Data architect has complete freedom to change data placement strategies without impacting the application.
Broaden the choice of data sources

- IBM Information Server
- DB2 Connect server
- DB2 for System i, DB2 for OS/390, DB2 for VSE/VM
- Oracle, Sybase, Microsoft, Informix, DB2
DB2 Stored Procedures to access to non-DB2 Mainframe Data/Apps

Guaranteed integrity (RRS transaction control)

Standard database APIs (e.g. JDBC, SQLJ, ADO, ADO.NET, ODBC, DB2 CLI, Web Service)
Enabling access to DB2 for z/OS via industry standard Web Services.

SOA ENABLE YOUR DB2 FOR Z/OS
Exposing DB2 objects as Web Services

SQL-based Application
JDBC, ADO.NET, ODBC, CLI etc.

WS Application
SOAP, XML

DB2
data

SELECT * ...

CALL sp_QtyOnHand

CALL sp_ApplyDiscount

getQtyOnHand

sp_QtyOnHand
sp_ApplyDiscount

WS
SELECT
WS
WS
DB2 objects as Web Services
Applies to System z and System i DB2

1. Provides the infrastructure for SOAP and XML messaging
2. Hosts wrappers for the DB2 objects

**SQL-based Application**
- SELECT * ...
- JDBC, ADO.NET etc.
- CALL sp_QtyOnHand
- JDBC, ADO.NET etc.

**WS Application**
- getQtyOnHand
- SOAP, XML

**DB2 Connect**
SOA Enable mainframe non-DB2 data
DB 2 Connect
Web Services Summary

- Encapsulate discrete pieces of business logic
- Implementation is language/technology neutral
- Both RESTfull and SOAP web services are supported
- Provides an excellent structure for both B2B and intranet application integration

**DB2 industry leading support for Web Services:**
- Present Stored Procedures, SQL statements as Web Services
- Given WSDL (Web Service Description Language) DB2 can generate servers side logic (SP, UDF) to implement required service

**Offer flexible deployment models:**
- Using WAS, WAS-CE, Tomcat etc.
- Using Microsoft IIS and .NET architecture
EXTENDING DB2 FOR Z/OS DATA AND APPLICATIONS TO MOBILE DEVICES
Types of mobile applications

- **Occasionally connected:**
  - Device has local data store for data to be used in the application
  - Connectivity to DB2 for z/OS is infrequent (e.g., once a day)
  - Connectivity may take form of sync process once the device is in a cradle or within range of available communication infrastructure (e.g., Wi-Fi, cellular etc.)

- **Always connected:**
  - Device is network enabled and within range of network infrastructure (e.g., Wi-Fi, cellular etc.)
  - Device can be:
    - simply a host for the application user interface. User interface created by an application server such as Websphere Application Server or Microsoft IIS
    - Have local business logic that obtains data from DB2 for z/OS via SQL or Web Services
DB2 Mobility on Demand

- **DB2 database for mobile and embedded platforms**
  - Very small: ~200KB on the device
  - Rich relational capabilities - SQL92/99 compliant subset
  - Per table data encryption
  - Extensive device support
  - Easy Application: .Net, C/C++, VB, Java

- **Synchronization Server:**
  - Multi-platform: Windows, Linux, AIX, Solaris
  - Multi-data source: DB2 Family, MS SQL Server, Oracle, Informix, Sybase, Domino DB
Broad Platform Support

- Windows CE 2.11/3.0, WinCE .Net 4.2
- Windows 95/98/ME/NT/2K/XP/Tablet/Media/Embedded
- Palm OS 3.5+, Palm OS 5.0+
- Symbian V6+
- Linux
- QNX Neutrino
- Sync client for J2ME/RIM
- DB2 Everyplace Sync Server Platforms
  - Windows NT/2000/XP/2003
  - AIX
  - Linux and Solaris

- Replication data sources
  - DB2 UDB for Windows, Linux, UNIX, OS/390 & System z, and AS/400 & System i
  - Oracle, Microsoft SQL Server, Informix, Sybase, Other JDBC-based sources, and Domino Databases
The future of DB2 Connect

- Continue to deliver on the promise of DB2 for z/OS as an enterprise data server
- Deliver on DB2 for z/OS strengths:
  - Continuous application availability
  - Manage and balance the workload (SYSPLEX)
- Continue to enhance flexibility of deployment (server vs. direct)
- Continual improvements in mainframe resource utilization
- Focus on improve programmer productivity and overall information lifecycle management
- Provide transparent access to variety of data sources
- Extend applications and data to mobile devices
- Continue to make DB2 for z/OS a full participant in SOA architectures
NEDB2UG – November 19, 2008
The Future of DB2 Connect

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