DB2 9
A hybrid data server for SOA

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Information Integration & SOA Solutions
Information Management
What is Service-Oriented Architecture (SOA)?

**Business Definition**

A SOA is a framework that provides the **flexibility** to treat elements of business processes and the underlying IT infrastructure as secure, **standardized components** – services – that can be **reused** and combined to address changing business priorities.

**Technical Definition**

A SOA is an IT architecture in which application functions are built as components – services – that are **loosely coupled** and well **defined** to support **interoperability**, and to improve **flexibility** and **reuse**.
What are the business drivers for SOA?

- Economics: globalization demands flexibility
- Business processes: changing quickly and sometimes outsourced
- Growth: at the top of the CEO agenda
- Reusable assets: can cut costs
- Information: greater availability
- Crucial for flexibility and becoming an On Demand Business

*Sources: CBDi*
XML is the Fabric of Services Oriented Architectures

What’s in this box?
XML is Central to Delivering Information as a Service

**Business Standards**
- HL7, DICOM, SNOMED, HIPPA (HealthCare)
- IXRetail, UCCNET, RFID / EPC (Retail)
- ACORD, XML for P&C (Insurance)
- IFX, OFX, SWIFT, Basel II (Banking)

**Master Data**
- XML Master Data
- Web Services
- Search
- Metadata

**Analysis**
- XML formats…PMML
- Metadata
- Reporting formats
- Search, UIMA

**Information Integration**
- Data Transformation
- Data Interchange
- Metadata Interchange
- Publishing

**Data Services**
- XQuery and SQL XML
- Web Services

**Content Mgmt.**
- XML documents
- XPath in JSR 170
- Text Search
- Web Services
- Metadata

**Information Services**
- Analysis & Discovery Services
- Content Management Services
- Information Integration Services
- Data Services
- Master Data Services
DB2 9 - A New Generation Data Server for A New Generation of Applications

Data Server
Services that manage, secure and provide access to the database.

Database
Logical View of storage
- Tables
- Views

Physical Storage
Database Files

Relational Storage
Data stored in a row and column format

pureXML™ Storage
Data stored in a pre-parsed hierarchical format, not as a single text object (CLOB)

Hybrid Data Server
DB2 supports both relational and pureXML™ storage and provides all the necessary services to support both data structures.

Hybrid Data Server Diagram:
- Physical storage
- Relational Storage
- pureXML™ Storage

Created using BCL easyPDF Printer Driver
DB2 9 Hybrid Data Server

XML Developer
“I see a sophisticated XML repository that also supports SQL.”

SQL Developer
"I see a sophisticated RDBMS that also supports XML."

Familiar Programming Models

Mature Services

Optimized Storage Models

Familiar Tooling

Optimized Performance & Scale

Integrated Information

XQuery

SQL

Language Flexibility

Optimized Storage

<xml>

/rdb

</xml>
DB2 9
Accelerates XML and SOA applications

Results using DB2 9 based SOA solution

- Fast, easy access to richer product & client information
- Quickly create customized products that customers want
- Expected to process five times more business

<table>
<thead>
<tr>
<th>Development and app. performance re: XML data</th>
<th>with relational data server</th>
<th>with DB2 9 hybrid data server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of search &amp; retrieval business processes</td>
<td>CLOB: 8 hrs Shred: 2 hrs</td>
<td>30 min.</td>
</tr>
<tr>
<td>Add field to schema</td>
<td>1 week</td>
<td>5 min.</td>
</tr>
<tr>
<td>Relative lines of I/O code (65% reduction)</td>
<td>100</td>
<td>35</td>
</tr>
<tr>
<td>Queries</td>
<td>24 - 36 hrs</td>
<td>20 sec - 10 min</td>
</tr>
<tr>
<td>Query non-shredded XML element</td>
<td>1 week</td>
<td>½ day</td>
</tr>
</tbody>
</table>
Reduce Code Complexity with DB2 9

```php
<?php
$conn = db2_connect($dbname, $dbuser, $dbpass);

/* Insert Customer Documents */

$stm = db2_prepare($conn, "VALUES (NEXT VALUE FOR Cid)"");
$execute($stmt);
list($Cid) = db2_fetch_array($stmt);

/* Insert Product Documents */

$fileContents = file_get_contents("products/p1.xml");
$dom = simplexml_load_string($fileContents);

$prodID = (string) $dom["pid"];

$stm = db2_prepare($conn, "INSERT INTO xmlproduct (Pid, Description) VALUES (?, ?)"");
if (!$execute($stm, array($prodID)));
```

LOWER DEVELOPMENT COSTS
Make Changes Easily with DB2 9

Requires:
- Normalization of existing data!
- Modification of the mapping
- Change of applications

Costly!

Department

<table>
<thead>
<tr>
<th>DEPTID</th>
<th>DEPTNAME</th>
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<tbody>
<tr>
<td>15</td>
<td>Sales</td>
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</table>

Employee

<table>
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<tr>
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<th>EMPNO</th>
<th>FIRSTNAME</th>
<th>LASTNAME</th>
<th>PHONE</th>
<th>SALARY</th>
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<td>15</td>
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<td>CHRISTINE</td>
<td>SMITH</td>
<td>408-463-4963</td>
<td>52750</td>
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</table>

Phone

<table>
<thead>
<tr>
<th>EMPNO</th>
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<tbody>
<tr>
<td>10</td>
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<td>406-463-1234</td>
</tr>
<tr>
<td>10</td>
<td>408-463-4963</td>
</tr>
</tbody>
</table>

IMPROVE BUSINESS AGILITY
DB2 Developer Workbench

Multi-platform development

- Eclipse based tool
- Available with DB2 9, also included in Rational v7 product line
- Database explorer, connections, edit tables
- SQL – edit/build, Stored Procedures (SQL/Java), SQLJ, Debug
- XML – edit/build, XML schema repository, annotated XML schemas
- Create a routine for DB2 on one platform, deploy it to another
- Stored procedure debugger
- Many other features to enhance deployment, packaging and Java support
DB2 Developer Workbench

- Built on Eclipse
- Unified tooling across offerings (Developer Workbench, RAD,..)
The IBM Software Development Platform
Where DB2 Developer Workbench Fits
Related Rational and WebSphere tools

- **Rational Data Architect – RDA**
  - *Logical and physical data modeling, transformation*

- **Rational Software Architect - RSA/RSM**
  - *UML modeling and transformation*

- **WebSphere Integration Developer - WID**
  - *integrate / orchestrate multiple web services, including those built on DB2*

- **WebSphere Application Server Toolkit - AST**
  - *J2EE development, EJB-data mapping*

- **WebSphere Developer for zSeries - WDZ**
  - *application development using host languages (cobol, pl/i, etc.)*
DB2 Skills
Industry standard, non-proprietary, common SQL

“We were surprised at how quickly we got a grasp of DB2. This was thanks to both the simple DB2 user interface and the excellent support we received from the DB2/SAP Support Team at IBM.”

- Manfred Leistner, Data Center Manager, E.G.O. Group

- Industry standard SQL
  - Easy transfer of skills from other vendors
  - Large pool of available talent
  - Familiar common SQL
More than 100 IBM Products Embed DB2

- Content Delivery Service
- DB2 Alphablox for Linux, Unix and Windows
- DB2 Content Manager Enterprise Edition for z/OS
- DB2 Content Manager Express
- DB2 DataPropagator for iSeries
- DB2 Everyplace Enterprise Edition
- DB2 Everyplace Express Edition
- DB2 Information Integrator
- DB2 Information Integrator OmniFind Edition
- DB2 Records Manager
- DB2 Warehouse Manager for z/OS
- Global Data Synchronization for WebSphere Product Center
- HPSS with IGS
- IBM Infoprint Next
- IBM Infoprint Workflow
- IBM Integrated Runtime
- IBM Integrated Runtime Express
- IBM OMEGAMON z/OS Management Console
- IBM Tivoli Change and Configuration Management Database
- IBM Tivoli Common Auditing and Reporting Service
- IBM Tivoli Composite Application Manager Basic for WebSphere
- IBM Tivoli Composite Application Manager for CICS Transactions
- IBM Tivoli Composite Application Manager for IMS Transactions
- IBM Tivoli Composite Application Manager for J2EE (Multiphases)
- IBM Tivoli Composite Application Manager for J2EE (z/OS) - Beta
- IBM Tivoli Composite Application Manager for WebSphere
- IBM Tivoli Composite Application Manager for Websphere (z/OS)
- IBM Tivoli NetView for z/OS V5R2
- IBM Tivoli OMEGAMON XE for CICS on z/OS
- IBM Tivoli OMEGAMON XE for IMS on z/OS
- IBM Tivoli OMEGAMON XE for Mainframe Networks
- IBM Tivoli OMEGAMON XE for Storage on z/OS
- IBM Tivoli OMEGAMON XE for z/OS
- IBM Virtualization Engine

- IBM WebSphere Application Server Network Deployment
- IBM WebSphere Application Server Express
- IT Service Management
- ITCAM for SOA
- Middleware Solution for Financial Services Real Time Market Data
- OpenPower
- Rational Application Developer for Linux and Windows
- Rational ClearQuest
- Rational Project Console (PjC)
- Rational ReqPro
- Rational TestManager
- Rational Web Developer for Linux and Windows

- Tivoli Composite Application Manager for Response Time Tracking
- Tivoli Configuration Manager
- Tivoli Directory Server
- Tivoli Identity Manager
- Tivoli Intelligent Orchestrator
- Tivoli Monitoring
- Tivoli Monitoring Express
- Tivoli Monitoring for Databases
- Tivoli Monitoring for Messaging and Collaboration
- Tivoli Monitoring for Virtual Servers
- Tivoli NetView
- Tivoli Oemagmon XE for Messaging
- Tivoli OMEGAMON XE for Microsoft .NET
- Tivoli OMEGAMON XE for WebSphere Business Integration
- Tivoli Provisioning Manager
- Tivoli Service Level Advisor
- Tivoli System Automation for Multiplatforms
- Tivoli Workload Scheduler
- TotalStorage Productivity Center for Data
- TotalStorage Productivity Center for Disk
- TotalStorage Productivity Center for Fabric
- TotalStorage Productivity Center for Replication
- TotalStorage SAN Volume Controller
- TotalStorage Virtualization Engine for Tape
- WebSphere Application Server
- WebSphere Application Server Express
- WebSphere Application Server - Express
- WebSphere Application Server for Developers
- WebSphere Application Server Network Deployment
- WebSphere Business Integration Event Broker
- WebSphere Business Integration Message Broker
- WebSphere Business Integration Message Broker with Rules & Formatter
- WebSphere Business Integration Server Express
- WebSphere Business Monitor
- WebSphere Commerce - Express
- WebSphere Commerce - Express Developer Edition
- WebSphere Commerce Business Edition
- WebSphere Commerce Developer Business Edition
- WebSphere Commerce Developer Professional Edition
- WebSphere Commerce Professional Edition
- WebSphere Data Integration Suite
- WebSphere Developer for zSeries
- WebSphere Development Studio Client Advanced Edition for iSeries
- WebSphere Development Studio Client for iSeries
- WebSphere Enterprise Service Bus
- WebSphere Everyplace Device Manager
- WebSphere Information Integrator OmniFind Edition
- WebSphere MQ Workflow
- WebSphere Partner Gateway Advanced Edition
- WebSphere Partner Gateway Enterprise Edition
- WebSphere Process Server
- WebSphere Product Center
- WebSphere Remote Server
- WebSphere Voice Response
- WebSphere "Keel"
- WebSphere Everyplace Server for Telecom

...and in over 450,000 System i5 servers
“First, I think this leaves Oracle and Sybase well behind the curve, with Microsoft and the others more or less out of sight.

What this release will allow you to do is to build applications that handle both XML and relational data much more easily, without losing any of the richness that this implies, and without degrading performance.”

- Philip Howard, Bloor Research, The Register

“When people go back and check their assumptions, they will see an expansion of what you can do with DBMS because of XML and standards like XML Schema and XQuery …”

"You want to be able to take those data-centric things in XML and put them into a database without a loss of fidelity, and this is one area where IBM is going further than Oracle and Microsoft.”

- Peter O’Kelley Burton Group, Internet News
DB2 9
A journey of technical innovation

Dr. C Mohan
IBM Fellow
Chief Scientist, IBM India
IBM Leads in Data Server Innovation
68 patents in DB2 9 alone

Innovation Milestones

1968
First Hierarchical Data Server
• IBM designs IMS starting in 1966 for the Apollo space program

1980
First IBM Relational Data Server
• IBM releases RDBMS implementing the Relational model first published by Dr. Codd

2006
First Multi-Structured Data Server
• DB2 9 first to support both relational and XML structures managed by single data server

Over 3,000 data management patents

Continuous IBM innovation
Native XML Storage and Indexing

- DB2 will store XML in **parsed hierarchical format** (similar to the DOM representation)

  ```sql
  create table dept (deptID char(8),..., deptdoc xml);
  ```

- Relational columns are stored in relational format
- XML columns are stored **natively**
- XML stored in UTF8
- XML index, including support for efficient text search
XML – A First Class Citizen

- **Data Definition**
  
  ```
  create table dept(deptID int, deptdoc xml);
  ```

- **Insert**
  
  ```
  insert into dept(deptID, deptdoc) values (?,?)
  ```

- **Retrieve**
  
  ```
  select deptdoc from dept where deptID = ?
  ```

- **Query**
  
  ```
  select deptID, xmlquery(''$d/dept/name' passing
  deptdoc as "d") from dept where deptID <> "PR27";
  ```
How to use XML in DB2?

create table T (i int, doc xml)
insert into T values (22, ?)
insert into T values (22, xmlvalidate(?))
select i, doc from T

select i, xmlquery(''$d//address' passing doc as "d") from T

xquery for $d in db2-fn:xmlcolumn('T.DOC')//address return $d

XQuery as the primary language

SQL as the primary language
Based on Customer Feedback and Experience

Multiple Touchpoints

Products

- Customer Advisory Board
- Technical Advisory Boards
- Centers Of Excellence

- Customer Support
- Developer Works
- Account Teams

Services

- Newsletters
- Conferences: IOD
- User Groups

Relentless Focus on Quality
Summary

- XML is key for SOA
- DB2 9 has **native** XML support
- Seamless integration with the relational world
- Hybrid approach means reduced development effort
- Strong customer and analyst endorsement
- IBM continues to be the lead technical innovator in this area
Resources

- 12:00 - 13:15 Track 6
  Deep Dive session: “DB2 9 - XML & Autonomic features”

- Webcast: “Migrating to DB2 9 - Advice from the Pros”

- Developer Resources – IBM India
  http://www.ibm.com/software/in/data

- All about DB2 9 – Downloads
  http://www.ibm.com/software/data/db2/9/
  http://www.ibm.com/db2/viper
IBM Information On Demand 2006

ibm.com/events/InformationOnDemand

Why attend:

- Participate in the PREMIER discussion on the future of Information Management
- Learn how the transformation to Information as a Service will help you unlock business value and drive competitive advantage
- Hear how your peers are realizing ROI
- Understand the roadmap to long term strategic advantage
- Learn best practices in your industry
- Receive the best in technical education and free certification
- Extensive opportunities for networking with both your peers and industry experts

The premier information management event for business and IT executives, managers, professionals, DBA’s and developers.

Select from over 800 sessions: a 2 1/2 day business leadership track with 180 sessions and a 5 day technical track with 650 sessions.

Exclusive Business Partner Development Day
Latest strategy and product announcements
Large Expo Center
Hands on labs
One on ones with executives and specialists
Birds of a Feather roundtables
Questions