



The role of DB2 Express-C in the information on demand world



Raul F. Chong
DB2 Express Community Facilitator
IBM Toronto Laboratory
Email: rfchong@ca.ibm.com



Disclaimer/Trademarks

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements, or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information may contain examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious, and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Trademarks

The following terms are trademarks or registered trademarks of other companies and have been used in at least one of the pages of the presentation:

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both: AIX, AS/400, DataJoiner, DataPropagator, DB2, DB2 Connect, DB2 Extenders, DB2 OLAP Server, DB2 Universal Database, Distributed Relational Database Architecture, DRDA, eServer, IBM, IMS, iSeries, MVS, Net.Data, OS/390, OS/400, PowerPC, pSeries, RS/6000, SQL/400, SQL/DS, Tivoli, VisualAge, VM/ESA, VSE/ESA, WebSphere, z/OS, zSeries

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Intel and Pentium are trademarks of Intel Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

Agenda



- Introduction
- IBM's direction
- DB2 Express-C
- Your opportunity
- Contact us!

Introduction

■ IBM Toronto Laboratory

- Largest software facility in Canada
- 2,500 developers, engineers, architects
- 3rd largest in IBM Software Group
- Founder of CAS – CASCON
- Products:
 - DB2 (Distributed platforms)
 - Websphere tools
 - Rational Developer for Web/Java
 - Tivoli Intelligent Orchestrator



IBM Toronto Lab - From 55 people in 1967 to 2500 professionals with international mandates today

IBM's Direction

IBM's direction

- Innovation
- On demand business
- Information on demand (IOD)
- Service Oriented Architecture (SOA)
- Web services
- XML

IBM's direction



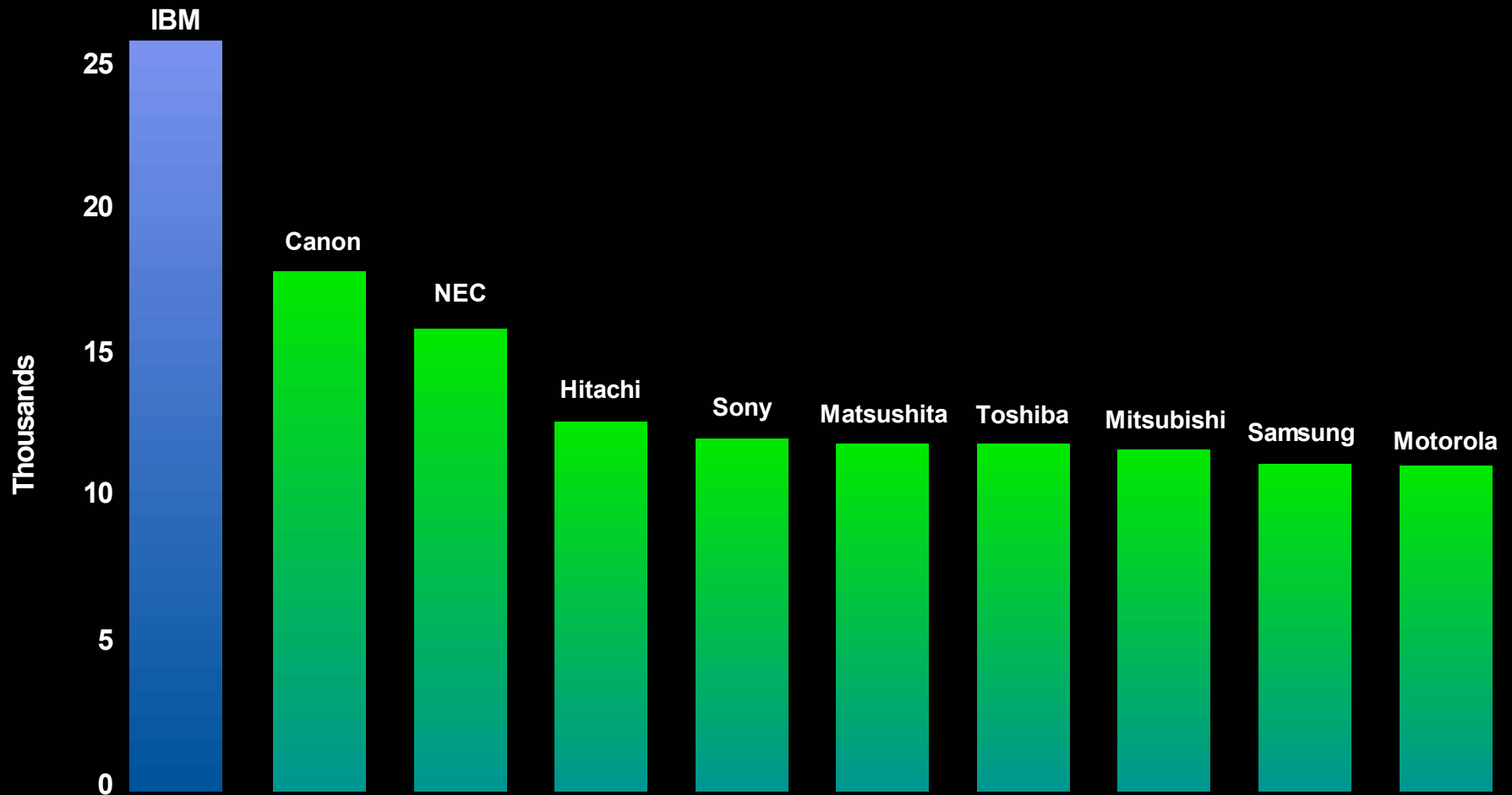
- **Innovation**
- On demand business
- Information on demand (IOD)
- Service Oriented Architecture (SOA)
- Web services
- XML

Do you know which company is the leader in patents?

- a) Microsoft
- b) Motorola
- c) IBM

IBM intellectual property

Submitted patents between 1993 and 2003



IBM innovation in data servers

Innovative Milestones

1968

First Hierarchical Database

- IBM designs IMS starting in 1966 for the Apollo space program.

1981

First IBM Relational Database

- IBM releases DB2 database following the System R proto-type.

2006

First Multi-Structured (hybrid) Database

- DB2 9 first to support both relational and XML structures managed by single data server.

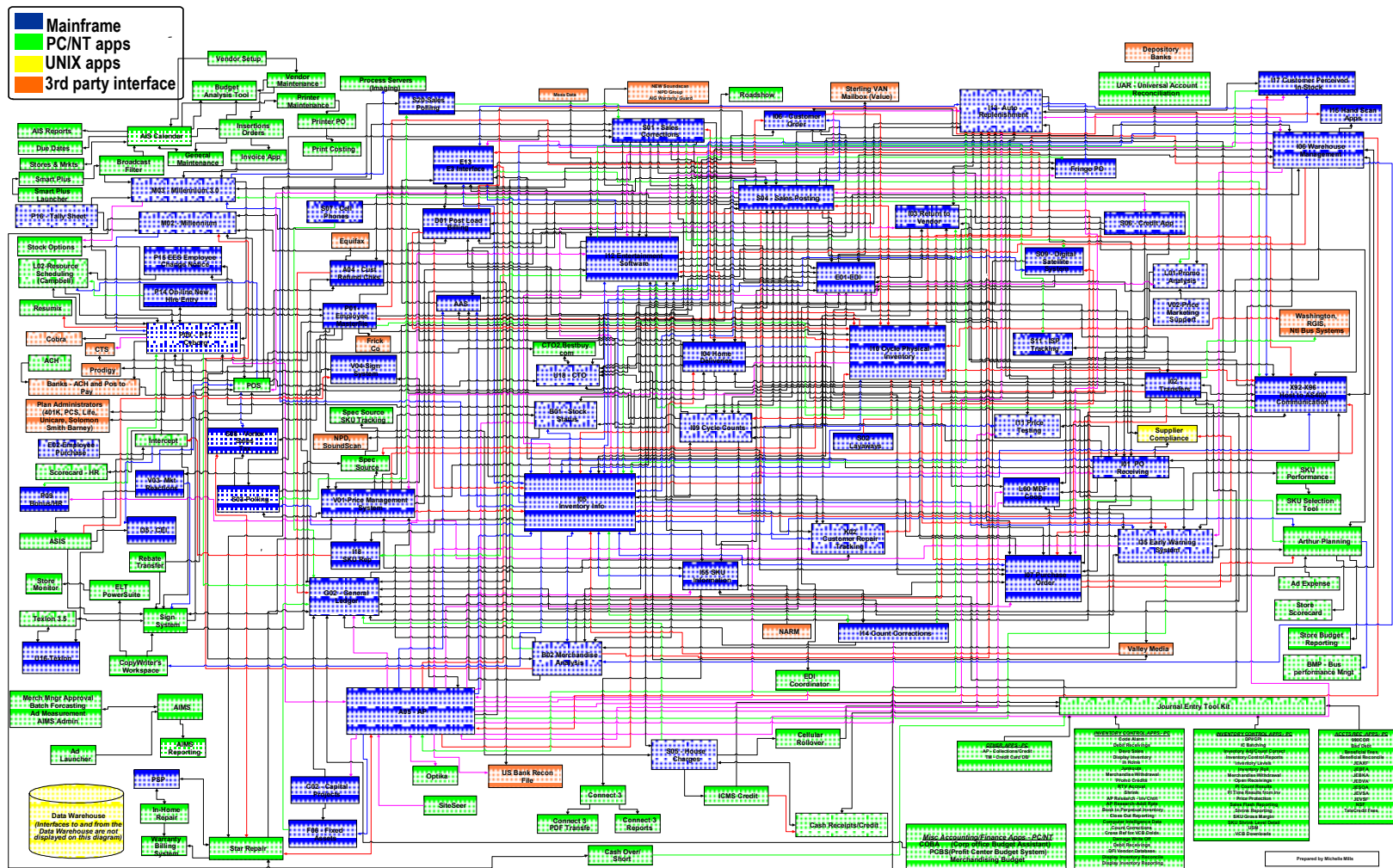
Continuous IBM innovation

IBM's direction – Key concepts

- Innovation
- On demand business
- Information on demand (IOD)
- Service Oriented Architecture (SOA)
- Web services
- XML

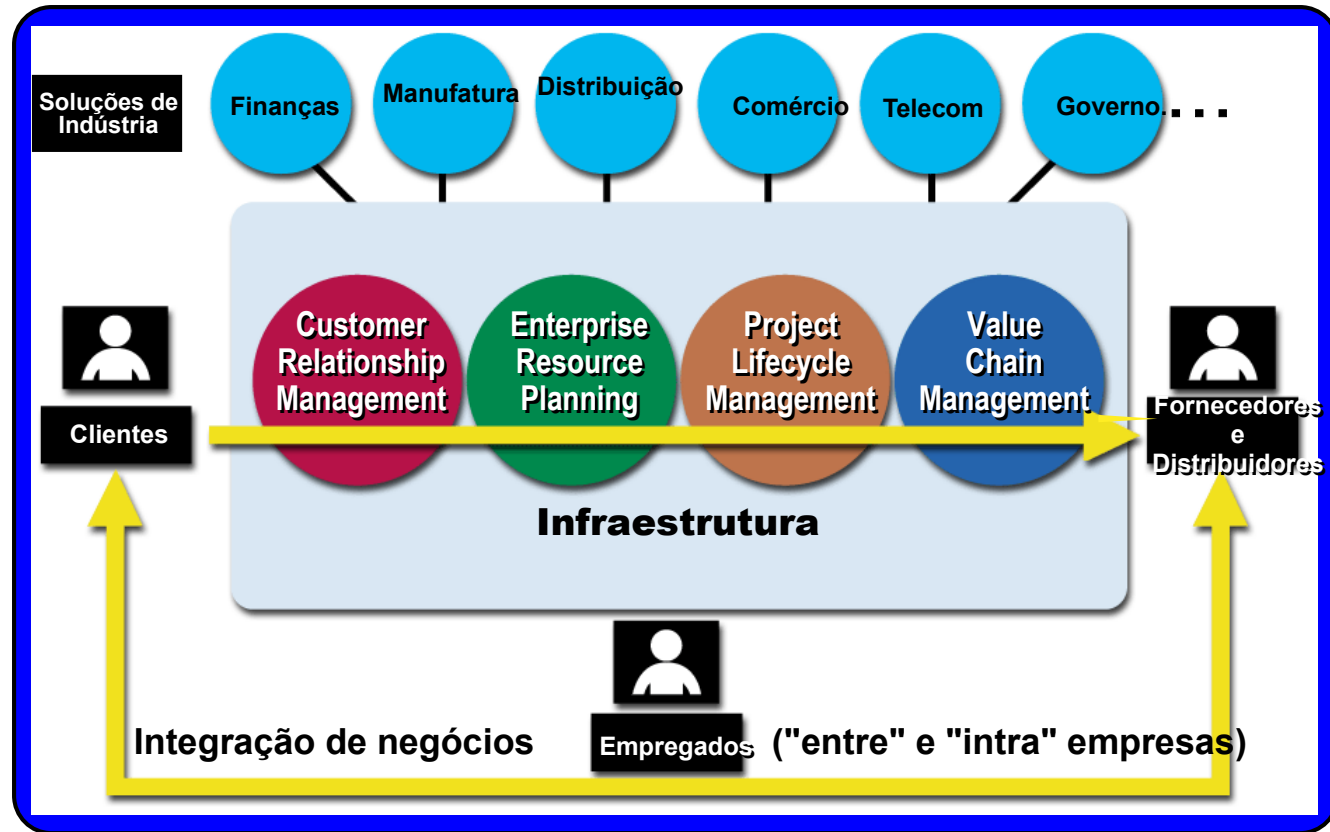


Today's reality: Complexity




An example of a real architecture in an industry

Integrated enterprises

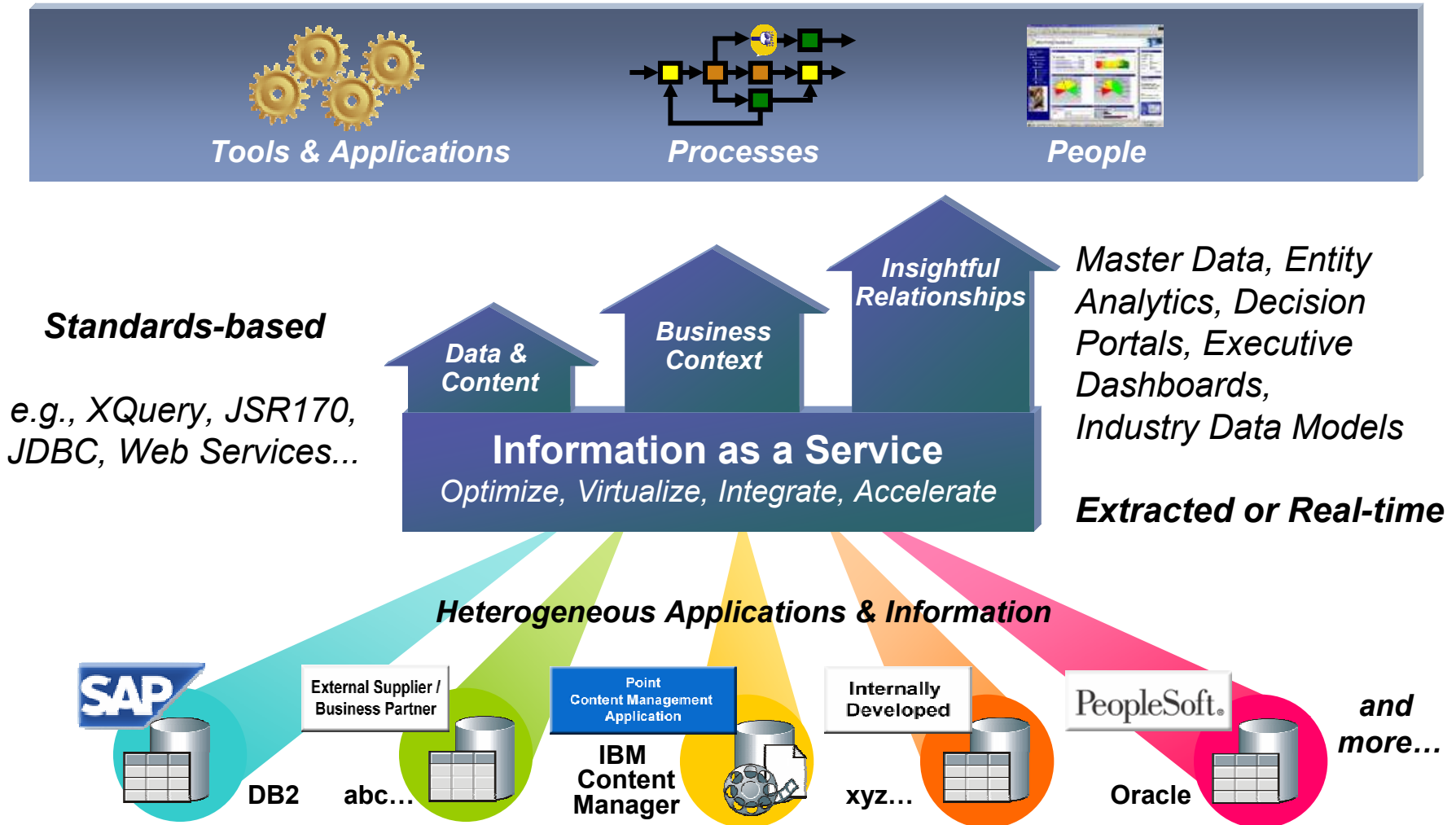


IBM's direction – Key concepts


- Innovation
- On demand business
-  ■ **Information on demand (IOD)**
- Service Oriented Architecture (SOA)
- Web services
- XML

IBM's direction: Information as a Service

Moving From a Project-Based to a Flexible Architecture (SOA)



IBM's direction – Key concepts

- Innovation
- On demand business
- Information on demand (IOD)
-  ■ **Service Oriented Architecture (SOA)**
- Web services
- XML

Why is SOA different?

- Loose coupling
- Platform and language independent
- Reuses existing technology infrastructure
- Easy, inexpensive
- Industry momentum: IBM, Microsoft, SAP, Oracle ...
- Everything is based on Web services/XML and other **industry standards**

IBM is serious about open source...

**Open Integrated
development
environment**

Eclipse

IBM donated \$40M of initial technology

**Open integration
of applications**

Web Services

IBM led or co-led the creation of SOAP, WSDL, UDDI, WS-Security, BPEL4WS ...

**Open application
server**

**J2EE and Apache
Derby**

IBM contributed significantly to the J2EE specification. IBM donated Cloudscape = Apache Derby

**Open operating
system**

Linux

IBM is the main commercial contributor of Linux and donated 500 software patents

IBM's direction – Key concepts

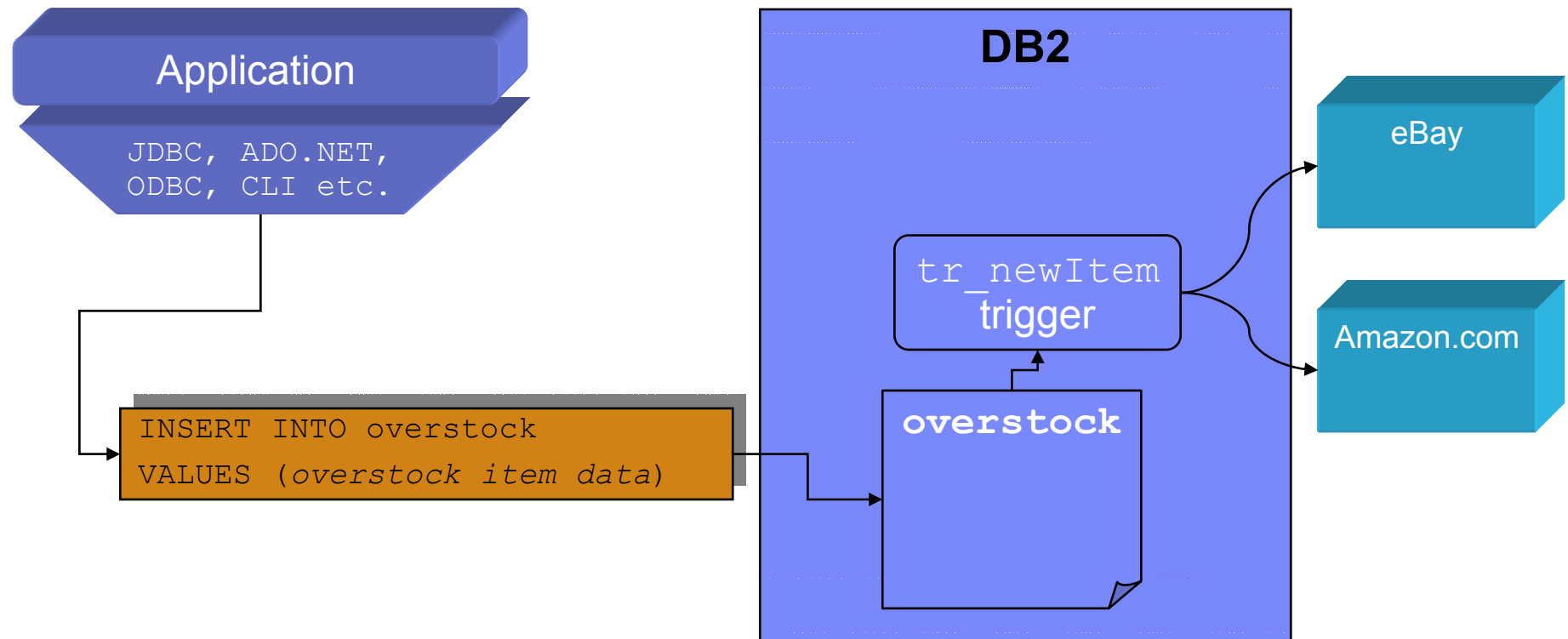
- Innovation
- On demand business
- Information on demand (IOD)
- Service Oriented Architecture (SOA)
- **Web services**
- XML



What is a Web Service?

- A standard way for an application to call a function over a network.
- There is NO need to know:
 - The **location** where the function will be executed,
 - The **platform** where the function will be run,
 - The **programming language** it is written in, or even who built it.
- Most important: Web Services are Easy!

DB2 as a Web services consumer: Developing new sales channel



IBM's direction – Key concepts

- Innovation
- On demand business
- Information on demand (IOD)
- Service Oriented Architecture (SOA)
- Web services
- XML



What is XML?

- XML = eXtensible Markup Language
- HTML: Describes display
 Raul
- XML: Describes data
 <name> Raul </name>

Why XML?

- Flexibility
- Easy to extend
- XML is self-describing
- Easy to transform XML docs into other formats (HTML, etc.)
- Vendor and platform independent
- Easy to **share** XML between applications, businesses, processes ...

Who uses XML? Everybody!

Financial		
ACORD	XML for Insurances	http://www.acord.org/standards/lifexml.aspx
FIXML	Financial Information eXchange protocol	http://www.fixprotocol.org/cgi-bin/Spec.cgi?menu=4
FPML	Financial Product ML	http://www.fpml.org/spec/index.asp
FUNDSML	Funds Markup Language	http://www.funds-xml.org/html/download.htm
XBRL	eXtensible Business Markup Language	http://www.xbrl.org/r
Life Sciences		
AGAVE	Architecture for Genomic Annotation, Visualization and Exchange	http://www.lifecde.com/products/agave/
BSML	Bioinformatic Sequence Markup Language	http://www.bsml.org/resources/default.asp
CML	Chemical Markup Language	http://www.xml-cml.org/
Publication etc.		
SportML	Sport Markup Language	http://www.sportsml.com/specifications.php
NewsML	News Markup Language	http://www.newsml.org/pages/spec_main.php
XBITS	XML Book Industry Transaction Standards	http://www.xmlbits.org/docs.asp
XPRL	eXtensible Public Relations Language	http://www.xprl.org/
Other		
LandML	Land Development Markup Language	http://www.landxml.org/spec.htm
MODA-ML	Middleware tOols and Documents to Enhance the textile/clothing supply chain through xML	http://www.moda-ml.net/moda-ml/repository/schema/V2003-1/default.asp?lingua=en
MatML	Materials Property Data Markup Language	http://www.matml.org/schema.htm
JXDM	Global Justice XML Data Model	http://it.ojp.gov/jxdm/3.0/index.html
ebXML	Electronic Business using eXtensible Markup Language	http://www.ebxml.org/specs/
...

XML Market Projections

- XML Storage is a high growth

Figure VI.2: Market Size by XML Data Store Solution Type

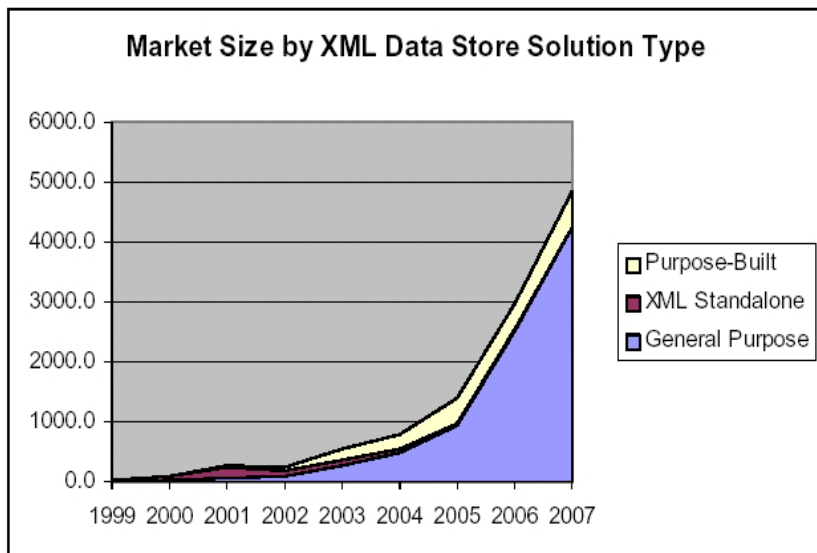
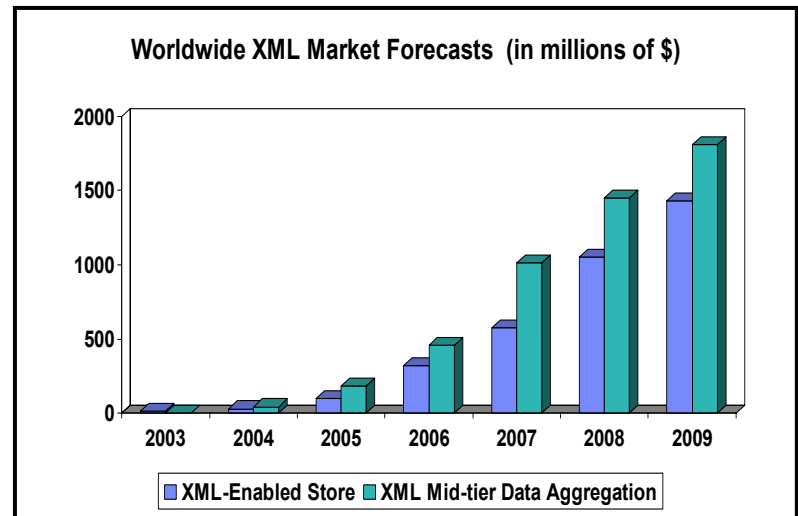


Chart Sources: XML Market Opportunities, Forecasts and Strategies, 2004-2009
 Wintergreen Research Inc. ZapThink



- XML database revenue to grow at **twice** the rate of the total database market

- IDC

Worldwide Enterprise Database Management Systems
 Software Forecast Update, 2003-2007

XML vs. Relational

```
<DEPARTMENT deptid="15" deptname="Sales">
  <EMPLOYEE>
    <EMPNO>10</EMPNO>
    <FIRSTNAME>CHRISTINE</FIRSTNAME>
    <LASTNAME>SMITH</LASTNAME>
    <PHONE>408-463-4963</PHONE>
    <SALARY>52750.00</SALARY>
  </EMPLOYEE>
  <EMPLOYEE>
    <EMPNO>27</EMPNO>
    <FIRSTNAME>MICHAEL</FIRSTNAME>
    <LASTNAME>THOMPSON</LASTNAME>
    <SALARY>41250.00</SALARY>
  </EMPLOYEE>
</DEPARTMENT>
```

Relational

Set oriented
Structure
Strong schema
Strongly typed
Tabular data model
Flat
3 value logic
"Null"
ANSI/ISO

XML

Sequences (*ordered!*)
Semi-structured
Schema-chaos
Optionally typed
XML data model
Nested, hierarchical
2 value logic
Not there at all
W3C

Department

DEPTID	DEPTNAME
15	Sales

Employee

DEPTID	EMPNO	FIRSTNAME	LASTNAME	PHONE	SALARY
15	27	MICHAEL	THOMPSON	NULL	41250
15	10	CHRISTINE	SMITH	408-463-4963	52750

XML vs Relational: A schema change made easier...

```

<DEPARTMENT deptid="15" deptname="Sales">
  <EMPLOYEE>
    <EMPNO>10</EMPNO>
    <FIRSTNAME>CHRISTINE</FIRSTNAME>
    <LASTNAME>SMITH</LASTNAME>
    <PHONE>408-463-4963</PHONE>
    <PHONE>415-010-1234</PHONE>
    <SALARY>52750.00</SALARY>
  </EMPLOYEE>
  <EMPLOYEE>
    <EMPNO>27</EMPNO>
    <FIRSTNAME>MICHAEL</FIRSTNAME>
    <LASTNAME>THOMPSON</LASTNAME>
    <PHONE>406-463-1234</PHONE>
    <SALARY>41250.00</SALARY>
  </EMPLOYEE>
</DEPARTMENT>
  
```

Requires:

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

Phone

EMPNO	PHONE
27	406-463-1234
10	415-010-1234
10	408-463-4963

Department

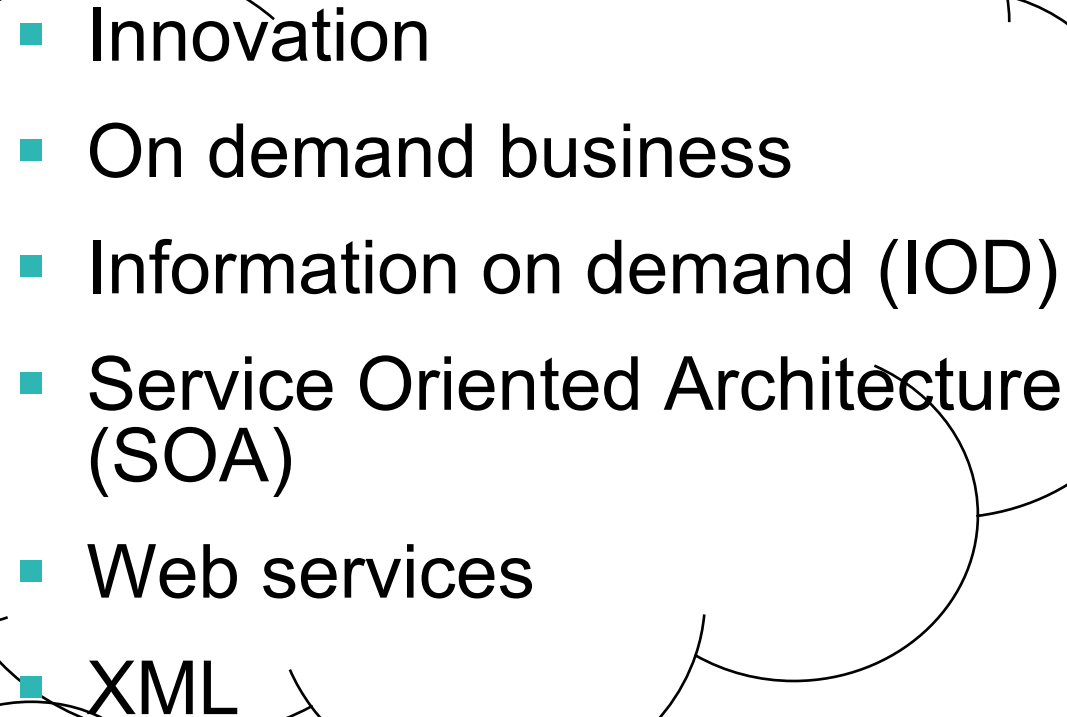
DEPTID	DEPTNAME
15	Sales

Employee

DEPTID	EMPNO	FIRSTNAME	LASTNAME	PHONE	SALARY
15	27	MICHAEL	THOMPSON	406-463-1234	41250
15	10	CHRISTINE	SMITH	408-463-4963	52750

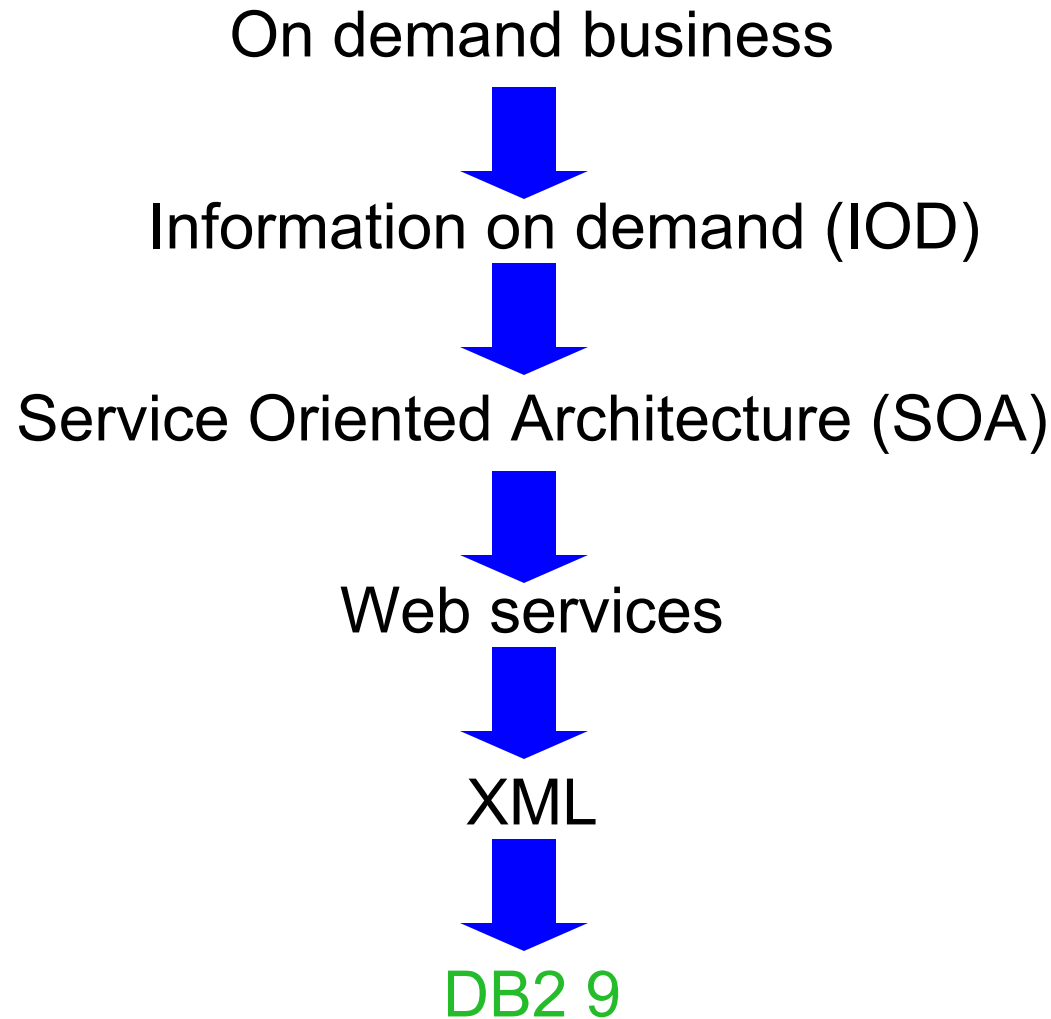
Costly!

IBM's direction

- 
- Innovation
 - On demand business
 - Information on demand (IOD)
 - Service Oriented Architecture (SOA)
 - Web services
 - XML

Where does DB2 fit in this picture?

The role of DB2 in the Information on Demand world



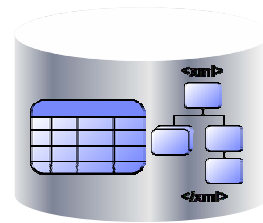
What did you just say???

I know DB2 is a relational data server...
How can I store XML documents?

DB2 9 is a HYBRID data server: SQL & XML



SQL Person... "I see a world class RDBMS that also supports XML"



**DB2 with
XML Support**



XML Person... "I see a world class XML repository that also supports SQL"

XML integrated in all facets of DB2!

Why use XML with Databases?

- Managing large volumes of XML data is a DB problem!
 - Efficient Search & Retrieval of XML
 - Persistency, Recovery, Transactions, ACID
 - Performance, Scalability
 - *...all the same reasons as for relational data!*
- Integration
 - Integrate new XML data with existing relational data
 - Publish (relational) data as XML
 - Database support for web applications, SOA, web services (SOAP)

Demo (XML)

*Taken from the Understanding DB2 book V9

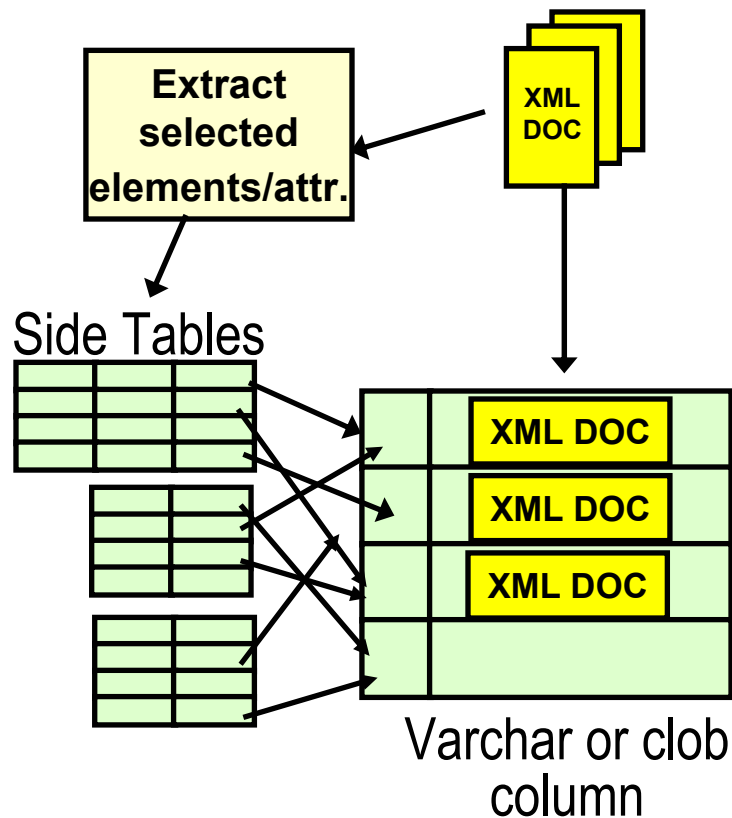
XML Databases

- 1) XML-enabled Databases
 - The core data model is not XML (but e.g. relational)
 - Mapping between XML data model and DB's data model is required, or XML is stored as text/CLOB
 - E.g.: DB2 XML Extender (V7, V8)

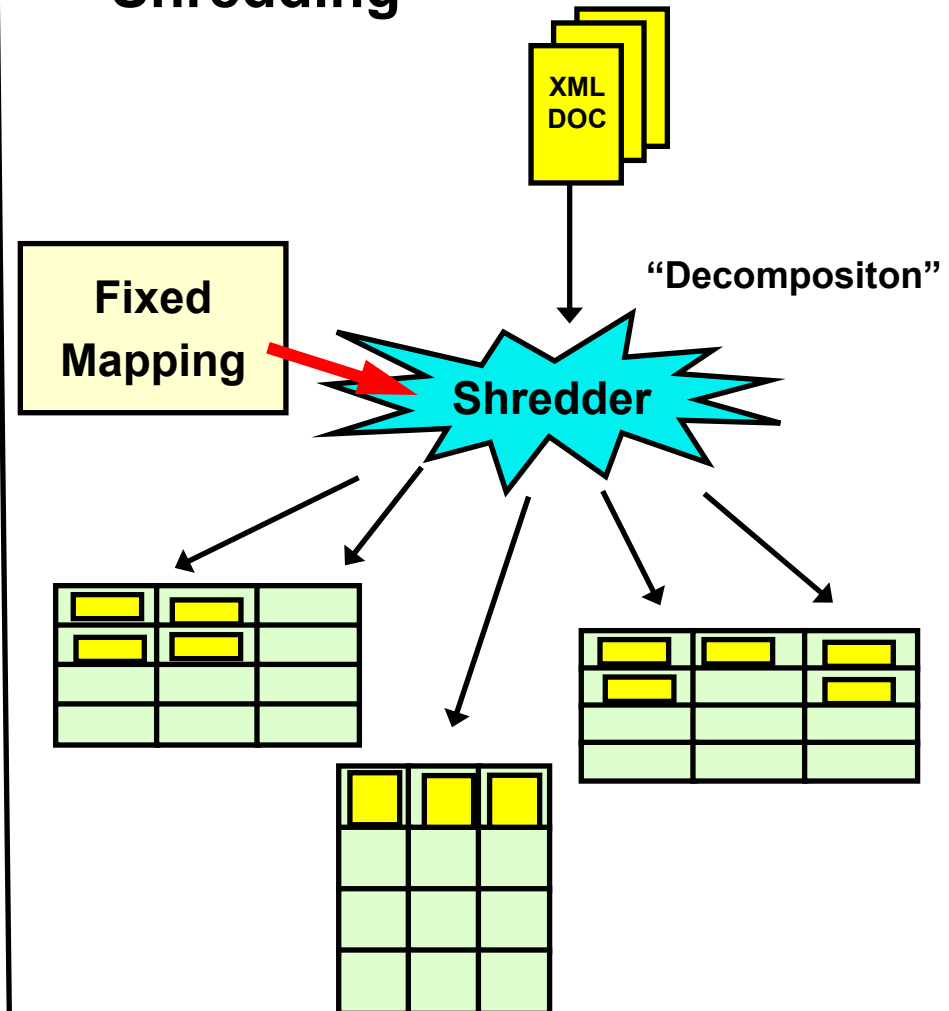
- 2) Native XML Databases = DB2 9
 - Use the hierarchical XML data model to store and process XML internally
 - No mapping, no storage as text/CLOB
 - Storage format = processing format

1) XML-Enabled Databases: Two Main Options

CLOB/Varchar



Shredding

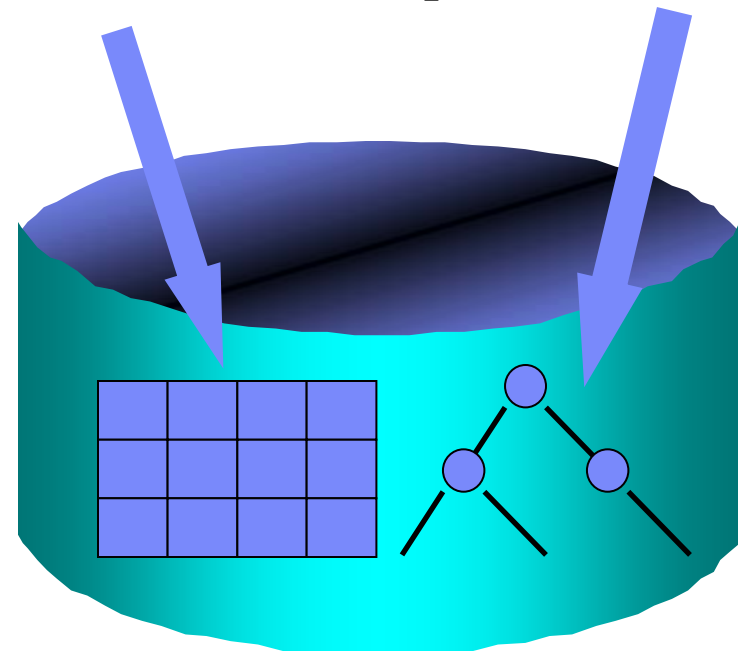


2) Native XML Databases

- Must store XML in parsed hierarchical format (similar to the DOM representation of the XML infoset)

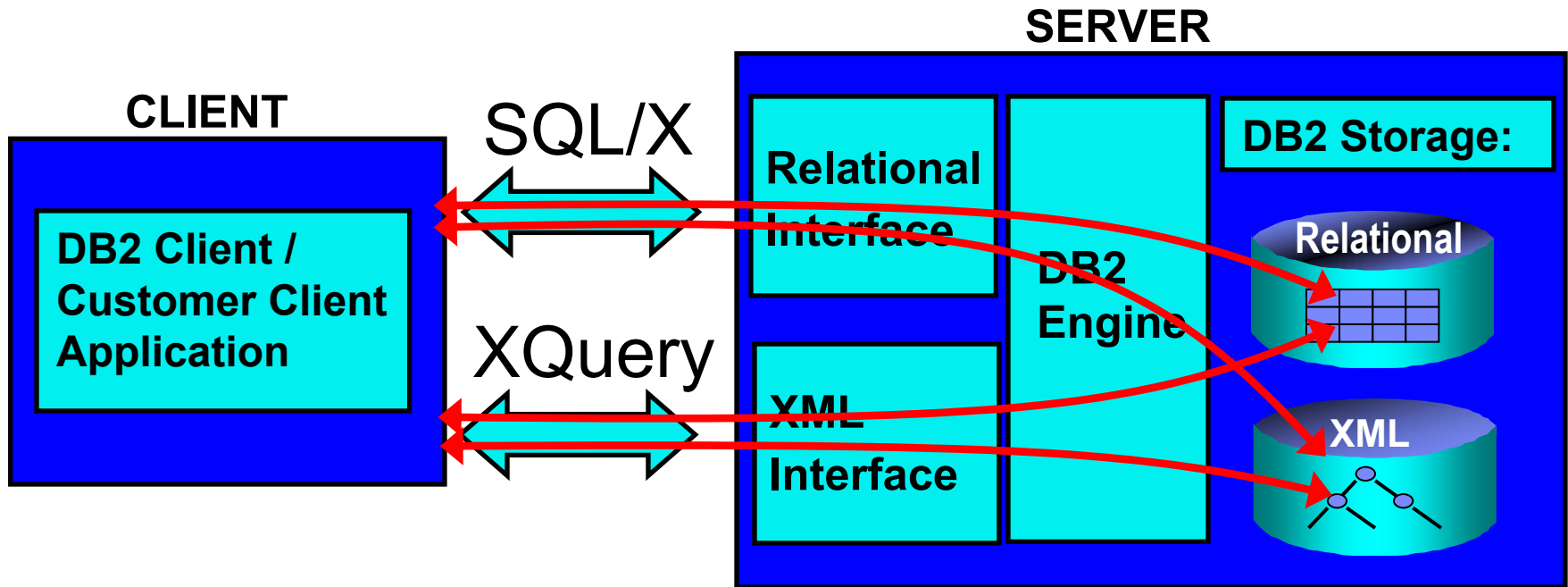
```
create table dept (deptID char(8), ..., deptdoc xml);
```

- Relational columns are stored in relational format (tables)
- XML columns are stored natively
- XML stored in UTF8



XML in DB2

- "Feels" relational and/or XML
- Both SQL flavor and fully XML flavor



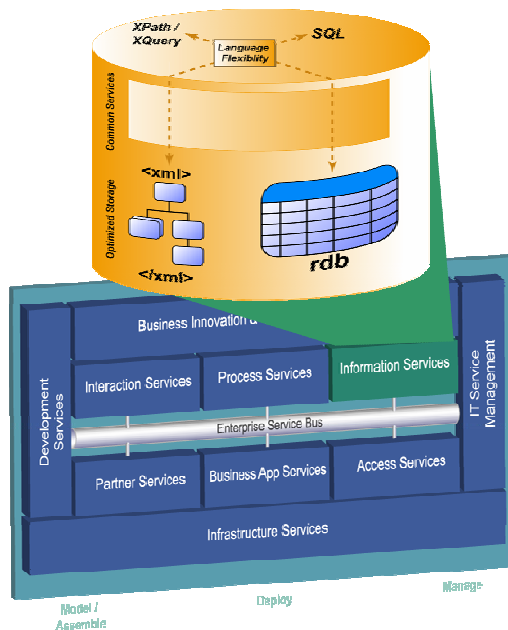
pureXML Support... More details

- **pureXML vs. Native XML**
- **XML data type for columns**
 - create s1.t1 (c1 int, c2 xml)
- **Language bindings for XML type in programming languages**
 - cobol, c, java, etc..
- **XML indexes**
 - create ix1 on s1.t1(c2) generate keys using pattern '/dept/emp/@empno'
- **An XML schema/DTD repository**
- **Performance, scale, and everything else they expect from a DBMS**

DB2 9: Early adopter feedback



Proto-type results using DB2 9 based SOA solution



Task	With relational DB	With DB2 9
Development of search & retrieval business processes	CLOB: 8 hrs Shred: 2 hrs	30 min.
Relative lines of I/O code (65% reduction)	100	35
Add field to schema	1 week	5 min.
Queries	24 - 36 hrs	20 sec - 10 min

XPath

- ❑ XML Query Language
- ❑ Subset of XQuery & SQL/XML

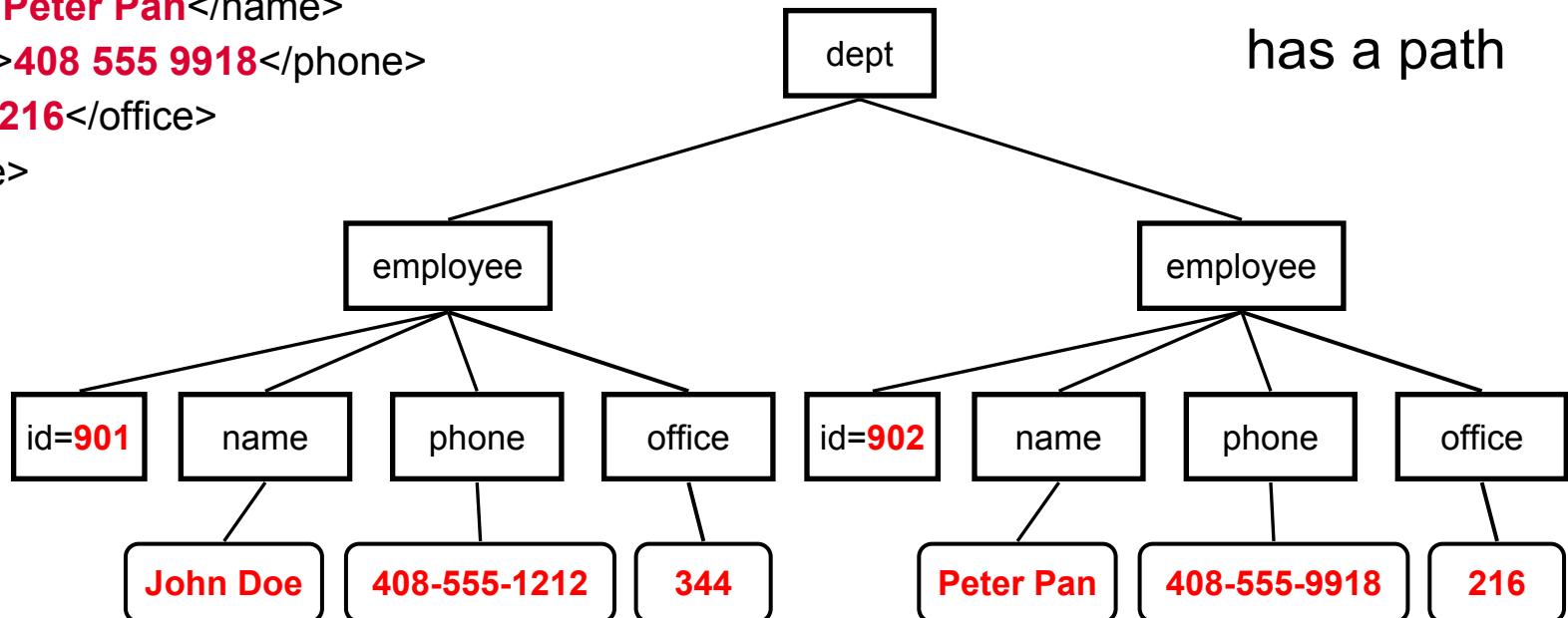
```

<dept bldg="101">
  <employee id="901">
    <name>John Doe</name>
    <phone>408 555 1212</phone>
    <office>344</office>
  </employee>
  <employee id="902">
    <name>Peter Pan</name>
    <phone>408 555 9918</phone>
    <office>216</office>
  </employee>
</dept>

```

/
/dept
/dept/employee
/dept/employee/@id
/dept/employee/name
/dept/employee/phone
/dept/employee/office
(...)

Each node
has a path



XQuery: The FLWOR Expression

- **FOR**: iterates through a sequence, bind variable to items
- **LET**: binds a variable to a sequence
- **WHERE**: eliminates items of the iteration
- **ORDER**: reorders items of the iteration
- **RETURN**: constructs query results



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

```
for $d in db2-fn:xmlcolumn('dept.deptdoc')/dept
let $emp := $d//employee/name
where $d/@bldg > 95
order by $d/@bldg
return <EmpList>
      {$emp}
    </EmpList>
```

```
<dept bldg=101>
  <employee id=901>
    <name>John Doe</name>
    <phone>408 555 1212</phone>
    <office>344</office>
  </employee>
  <employee id=902>
    <name>Peter Pan</name>
    <phone>408 555 9918</phone>
    <office>216</office>
  </employee>
</dept>
```

XQuery embedded in SQL

```
select deptID,  
       xmlquery('for $i in $d/dept  
                let $j := $i//name  
                return $j' passing deptdoc as "d")  
from dept  
where deptID LIKE "PR%"  
and   xmlexists('$d/dept[@bldg = 101]' passing deptdoc as "d")
```

SQL embedded in XQuery

```
xquery
for $y in
db2-fn:sqlquery
  ('select comments from items where srp > 100')/Comments/Comment
where $y/ResponseRequested='Yes'
return (
  <action>
    {$y/ProductID
      $y/CustomerID
      $y/Message}
  </action>
)
```

Besides XML?

IBM DB2 Developer Workbench

The screenshot displays the IBM DB2 Developer Workbench interface within the Eclipse Platform. The main window is titled "Data - My_XQuery.xqm - Eclipse Platform". The interface is divided into several panes:

- Left Pane (Data Project Explorer):** Shows a project named "Project1 (mysample:)" containing folders for "Stored Procedures", "User-Defined Functions", "XML Queries", "XML Schema Documents", and "SQL Scripts". Below this is a "Database Connections" section showing "mysample" and "SAMPLE [Derby]".
- Documents Pane:** Displays the XML structure of the XQuery. It shows a root element "#document" containing an "items" element, which is a sequence of "item_tuple" elements. Each "item_tuple" has attributes "itemno", "descriptio", "offered_", "start_date", "end_date", and "reserve_".
- XQuery Editor (Center):** Contains the XQuery code with the following sections:
 - For each Iterate over each item in sequence:** A table with columns "Item-variable-n..." and "Sequence- node, expression, function, variable or literal". It contains one row: "item_tuple" and "/items/item_tuple".
 - Let Build a sequence:** A table with columns "Item-variable-n..." and "Sequence- node, expression, function, variable or literal". It contains one row: "ifvar" and "If ...".
 - Where:** A table with columns "Operand 1", "Operator", "Operand 2", and "C...". It contains two rows:

Operand 1	Operator	Operand 2	C...
/items/item_tuple/end_...	>	"2005-08-26"	a...
/items/item_tuple/offer...	=	"Karl"	
 - Order By:** A table with columns "Value" and "Direction". It contains one row:

Value	Direction
/items/item_tuple/itemno	ascending
 - Return Build an XML fragment to be returned with each qualified iteration:** A table with columns "Value" and "Direction". It contains three rows:

Value	Direction
/items/item_tuple	
new_element	
concat(...)	
- Outline Pane (Right):** Shows a hierarchical view of the XQuery structure. It starts with "/items/item_tuple", followed by "For Logic", "For", "Let", "Conditional", "If", "where", "Condition>", "Condition=", "Order By", "Return", "new_element", and "concat()".
- Bottom Pane:** Contains tabs for "Properties", "Tasks", "Problems", "Error Log", "Model Report", "Data Output", and "Bookmarks". The "Properties" tab is currently selected.

Autonomic Manageability

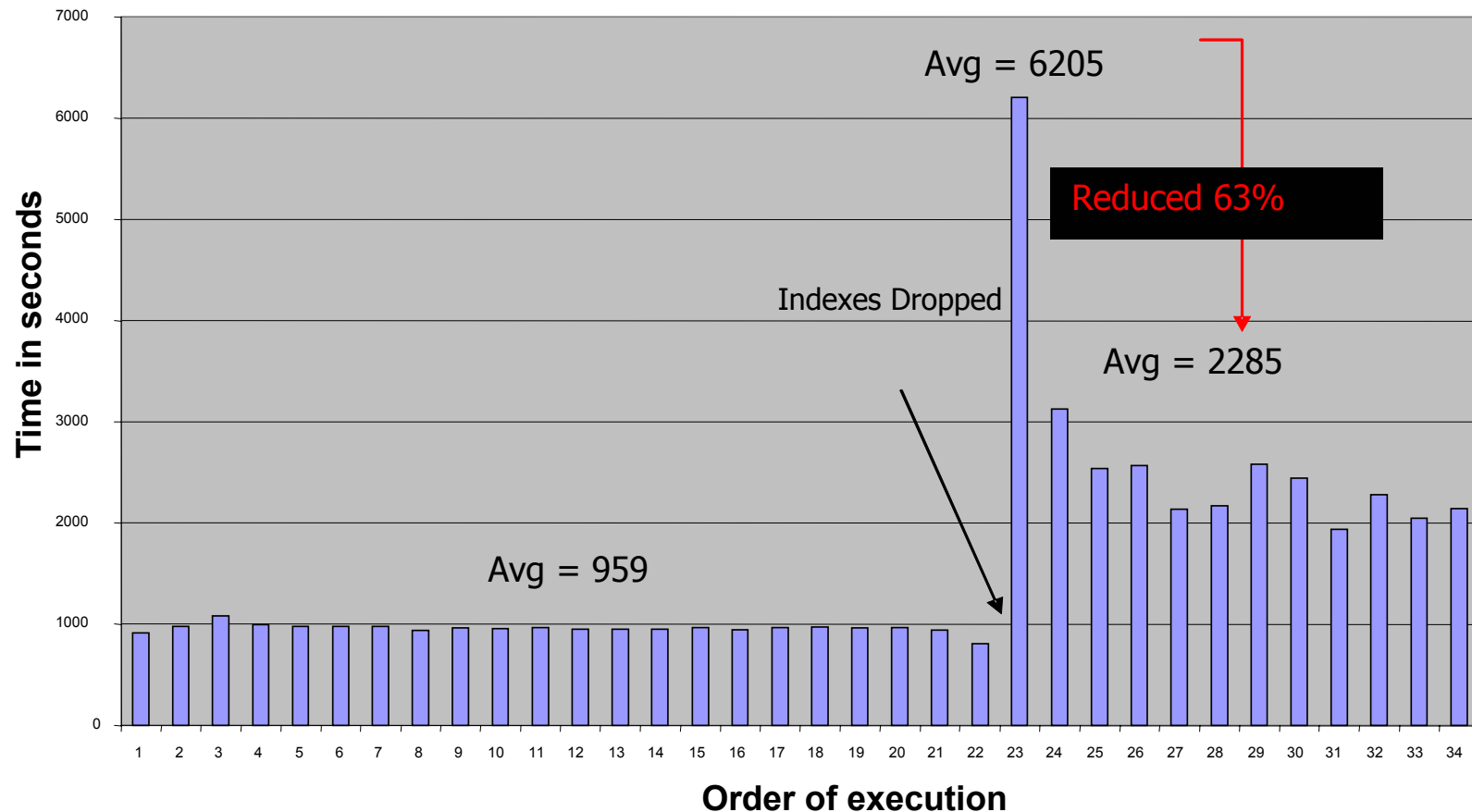
Less Skill, Less Resource, Better System Utilization

- Provide Automated Expert Advice
 - ▶ Configuration and Design Advisor
 - ▶ Health Monitor
- “Built-in” Automation
 - ▶ On-demand Storage
 - ▶ Automated Maintenance
 - ▶ Optimization, Parallelism and More
- Setup and Configuration
 - ▶ Configuration Assistant
 - ▶ Numerous Wizards



STMM in Action – Dropping an Important Index

TPCH Query 21 - After drop index - Average times for the 10 streams



And much more...

DB2 Express-C

DB2 Data Serving Solutions

DB2 Enterprise Server Edition

DB2 Workgroup Server Edition

DB2 Express Edition

DB2 Express-C

**DB2 Personal
Edition**

+ Extra
functionality

+ Extra
functionality

+ Extra
functionality

+ Extra
functionality

DB2 Express-C

- DB2 Express-C V8.2.4
- DB2 Express-C 9



Announcing DB2 Express-C – Jan 30, 2006



DB2 Express-C is:

- A version of DB2 Express for the community.
- **Free to build, deploy, distribute*...no limits!**

Production Ready

- No database size limit
- No limit on number of instances per server
- No user limit

Innovative Technology

- Same data server technology and programming support as DB2 Express in a smaller package
- DB2 Express-C 9 is available now and pureXML is included!

Developer Community

- Dedicated DB2 Express-C community team
- Free online community support
- Skills and applications applicable to all editions of DB2

* Free registration required

Application Development Freedom

- C/C++ (ODBC and Static SQL)
- JDBC and SQLJ
- Borland
- PHP
- Perl
- .Net languages
- OLE-DB
- ADO
- Web Services
- SQL
- MS Office: Excel, Access, Word
















IBM® DB2 Universal Database™
SQL Reference  
for Cross-Platform Development

<http://www7b.software.ibm.com/dmdd/library/techarticle/0206sqlref/0206sqlref.html>

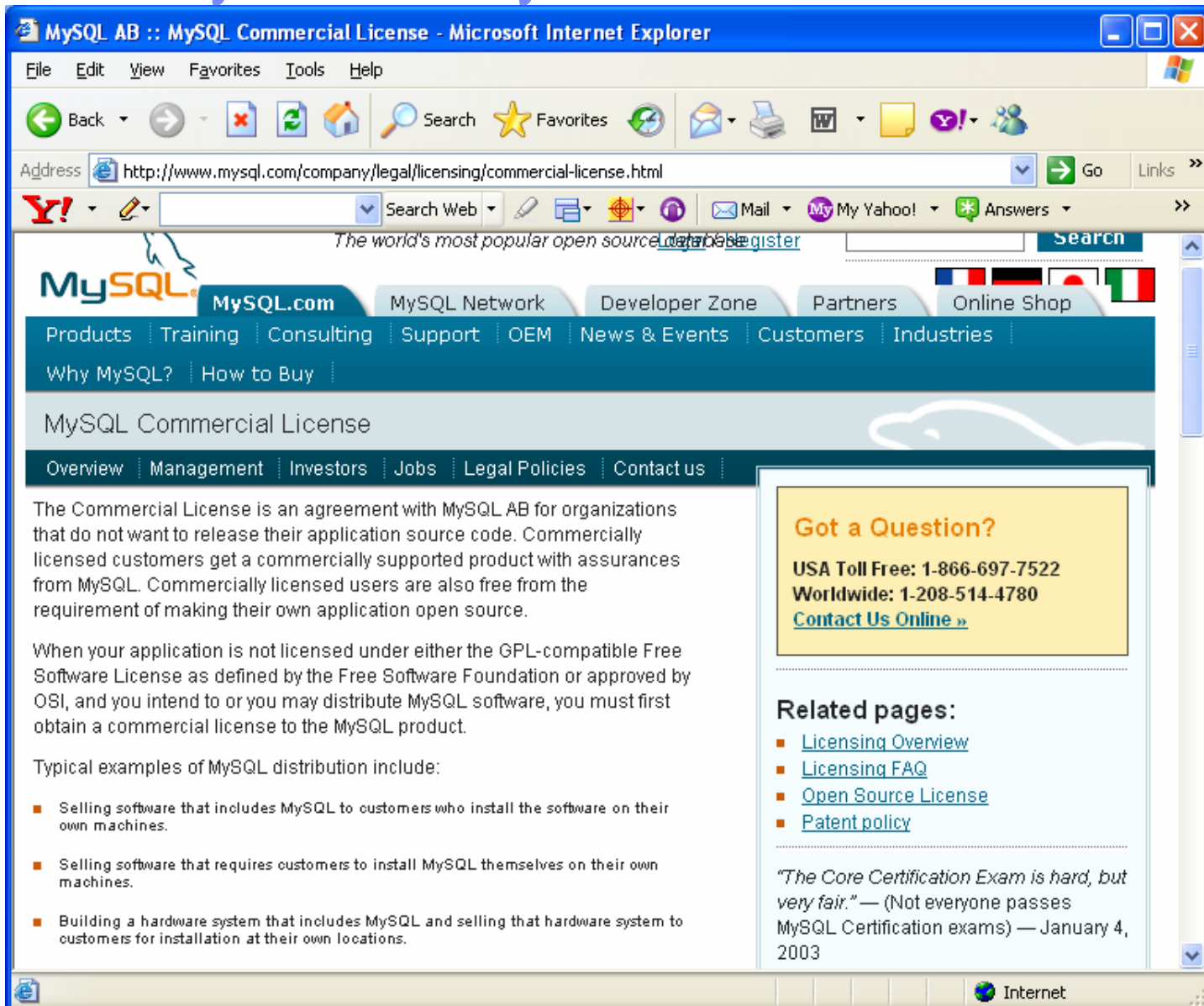
DB2 Express vs. DB2 Express-C: The choice is yours

DB2 Express	DB2 Express-C
Aligned to mid-market needs	Aligned to mid-market needs and developers, partners, academic communities considering or using open source databases
Per processor or Per server/users licenses orderable in Passport Advantage	Free
12mo 24x7 support	Free online community support
Download footprint ~400 MB	Download footprint ~300 MB
Features include (for extra charge): pureXML, MQT, MDC, query parallelism, HADR, TSA, Online Reorg	Features include: pureXML

DB2 Express-C vs. other data servers

	DB2 Express-C	MySQL Pro	Oracle XE	SQL Server Express
Platforms	Linux, Windows	Linux, Windows and selected UNIX	Linux, Windows	Windows only
Download	390MB	35MB (no tools)	150-190MB	64MB (no tools)
Memory limit	4GB	None	1GB	1GB
32/64 bit	32/64 bit	32	32	32
CPU limit	2 CPU dual core	None	1	1
DB size limit	None	None	4GB	4GB
APIs	C, JDBC, .NET, XML, PHP, Python, etc	C, JDBC, .NET, PHP, Python	C, JDBC, .NET, PHP, XML	.NET
Development Tools	Eclipse, VS .Net, Toad, DB2 DC, ...	None	HTML DB	VS .NET
Management	Extensive DB2 Suite (Control Center, Information Center, dozens of wizards, autonomic tools, ...)	NONE (tools can be found in online repositories but no INTEGRATION provided by mySQL)	Custom Web Based Tools	SQL Express Manager
Replication	Yes	Yes	Yes	Yes
Free Production / Redistribution	YES / YES	NO / NO (commercial grade version)	YES / YES	YES / YES
License Fee	None	None for OSS (but mandatory for commercial grade version)	None	None
Support	Forum only	Forum and fee-based	Forum only	Only with upgrade

Check it out yourself: MySQL GPL license




Your opportunity

Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
3. Learn DB2 Express-C
4. Participate in the DB2 Express-C forum
5. Write cool applications with DB2 Express-C
6. Become a business partner with IBM
7. Write articles/tutorials/white papers/books
8. Become a DB2 student ambassador
9. Establish a DB2 User's group in your university

Your opportunity: 9 steps to career success!

- 
1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
 2. Download & Install DB2 Express-C 9
 3. Learn DB2 Express-C
 4. Participate in the DB2 Express-C forum
 5. Write cool applications with DB2 Express-C
 6. Become a business partner with IBM
 7. Write articles/tutorials/white papers/books
 8. Become a DB2 student ambassador
 9. Establish a DB2 User's group in your university

DB2 Express-C Home page

www.ibm.com/db2/express

Step 1:

Visit the
DB2 Express-C
Home Page

www.ibm.com/db2/express

The screenshot shows a web browser window with the title "DB2 Express-C Overview: Free to build, deploy, distribute ... No limits. - Microsoft I...". The address bar shows the URL "http://www-306.ibm.com/software/data/db2/udb/db2express/". The page features a navigation bar with links for "Country/region [select]", "Terms of use", and a "Search" button. Below this, there are tabs for "Services & industry solutions", "Support & downloads", and "My account". The main content area is titled "DB2 Express-C" and includes the tagline "Free to build, deploy, distribute ... No limits.". A sidebar on the right contains links for "Information Management software", "Download DB2 Express-C", "DB2 Express Online Forum", "Sign Up for Our Mailing List", and "Upgrade to DB2 Express". The main content area also includes a "Home" tab, a "Get started" tab, and a "Learn" tab. A section titled "DO WHAT NO OTHER DATA SERVER HAS DONE BEFORE" features a woman's portrait and a "Download now" link. A "News" section at the bottom lists recent updates and awards.

DB2 Express-C Overview: Free to build, deploy, distribute ... No limits. - Microsoft I...

File Edit View Favorites Tools Help

Address <http://www-306.ibm.com/software/data/db2/udb/db2express/> Go

Country/region [select] Terms of use

Search

Services & industry solutions | Support & downloads | My account

Software > Information Management > DB2 Product Family

DB2 Express-C

Free to build, deploy, distribute ... No limits.

Home | Get started | Learn | Migrate | Partners | Contact us

- News & Events
- You asked?
- Looking for DB2 Express?
- Your DB2 solutions
- Featured community contributor

DO WHAT NO OTHER DATA SERVER HAS DONE BEFORE
with pureXML™ & DB2 Express-C 9
→ [Download now](#)

Free to develop, deploy, distribute: no limits, just data
Take control of your XML
Application development has never been this easy

News

- DB2 Express C on CNET - "IBM discovers free-as-in-beer software" (August 17, 2006)
- DB2 Express-C recognized with "2006 Best of the Midmarket" VARBusiness award (August 17, 2006)
- DB2 9 is now available! Download DB2 Express C 9 now. (July 28, 2006)
- Justsystems has joined the list of our partners and released native XML solution "xfy" for DB2 9 Express-C (July 28, 2006)

Information Management software

DB2 Express-C NO LIMITS

Download DB2 Express-C

DB2 Express Online Forum

Sign Up for Our Mailing List

Upgrade to DB2 Express

Buy online

- [DB2 UDB Express Edition Details](#)
- [DB2 UDB Express Edition V8.2 Spec Sheet](#)

Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express



2. **Download & Install DB2 Express-C 9**

3. Learn DB2 Express-C

4. Participate in the DB2 Express-C forum

5. Write cool applications with DB2 Express-C

6. Become a business partner with IBM

7. Write articles/tutorials/white papers/books

8. Become a DB2 student ambassador

9. Establish a DB2 User's group in your university

Step 2:

Download & Install
DB2 Express-C 9

DB2 Express-C Download - Microsoft Internet Explorer

Address <http://www-306.ibm.com/software/data/db2/udb/db2express/download.html>

services & industry solutions | support & downloads | my account

Software > Information Management > DB2 Product Family

DB2 Express-C

Free to build, deploy, distribute ... No limits.

Home | **Get started** | Learn | Migrate | Partners | Contact us

- What is DB2 Express-C?
- Frequently Asked Questions (FAQs)
- Download DB2 Express-C**
- Free Demo Discovery DVD

Download DB2 Express-C

DB2 9 images | V8.2.4 images

Download DB2 9 images

DB2 9 (formerly known as Viper) is a leading edge hybrid data server capable of supporting both relational and pure XML storage. It also has tons of new features that increase performance and scalability for both XML and relational data.

Attention: Please [register](#) if you plan to redistribute DB2 Express-C with your products and applications.

md5 checksums provide a way for you to confirm the integrity of the files you download. For a detailed explanation please click [here](#).

Linux Platforms	Size	DB2 Express-C Download
32-bit AMD and Intel systems (x86), 2.6 kernel md5: 8e40503b5aac96f7456a9be3689bf317	258MB	Download
AMD64 and Intel® EM64T systems (x86_64), 2.6 kernel md5: 3f9800add1827f5bc3f87f37d416672c	262MB	Download
POWER™ (iSeries™ and pSeries®) systems md5: 1b73de324beedc36d7ac511703a4bd28	258MB	Download
Microsoft Windows Platforms	Size	DB2 Express-C Download
32-bit AMD and Intel systems (x86) md5: 8e40503b5aac96f7456a9be3689bf317	337MB	Download

Information Management software

FREE TO BUILD, DEPLOY, DISTRIBUTE

DB2 Express-C

NO LIMITS

Download DB2 Express-C

DB2 Express Online Forum

Sign Up for Our Mailing List

Upgrade to DB2 Express

[Buy online](#)


→ DB2 UDB Express Edition Details

DB2 UDB Express Edition V8.2 Spec Sheet

→ Ask Me about DB2 Express

Featured items

Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
-  3. **Learn DB2 Express-C**
4. Participate in the DB2 Express-C forum
5. Write cool applications with DB2 Express-C
6. Become a business partner with IBM
7. Write articles/tutorials/white papers/books
8. Become a DB2 student ambassador
9. Establish a DB2 User's group in your university

Step 3: Learn DB2 Express-C

1) Free Tutorials:

<http://www-128.ibm.com/developerworks/db2/newto/new-to-db2udb.html>

<http://www-304.ibm.com/jct09002c/us/en/university/scholars/products/data/tutorials.html>

2) Free book for developers

<http://www.redbooks.ibm.com/abstracts/sg247301.html>

3) Free book - DB2 9: pureXML Overview and Fast Start

<http://www.redbooks.ibm.com/abstracts/sg247298.html?Open>


4) Recommended reading list for DB2 application development

<http://www-128.ibm.com/developerworks/db2/library/techarticle/dm-0509poon2/index.html>

5) Recommended reading list for DB2 database administration

<http://www-128.ibm.com/developerworks/db2/library/techarticle/dm-0509poon/index.html>

Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
3. Learn DB2 Express-C
-  4. **Participate in the DB2 Express-C forum**
5. Write cool applications with DB2 Express-C
6. Become a business partner with IBM
7. Write articles/tutorials/white papers/books
8. Become a DB2 student ambassador
9. Establish a DB2 User's group in your university

IBM DB2 Express Forum RSSSearch for within IBM DB2 Express Forum Go

My developerWorks

Welcome, **Guest**[→ Sign in or register](#)

This forum is a place to exchange ideas and share solutions with your peers in the IBM DB2 Express community. Active participation in the forum will allow all the participants to get the maximum return. All information is for community discussion and should not be considered IBM support.

Please note that the existing [DB2 UDB Express newsgroup](#) will be phased out in the near future. You are encouraged to participate in this new forum instead.

Please familiarize yourself with the [developerWorks Community Guidelines](#) before posting to the forum.

[Post new topic](#) [Watch forum](#) [Watch list](#) [Forum settings](#) [Help](#)

Page 1 | [2](#) | [3](#) | [4](#) | [5](#) | [6](#) | 358 topics with 1,060 replies, 24 pages total

Topic	Author	Views	Replies	Last post
Using DB2 Express via ADO	flozzv1234	6	1	2006 May 22 09:04 AM
Error Running Batch Script	Anacron	16	0	2006 May 22 12:25 AM
error about the jdbc type 4 driver for DB 2 v8.2 when I created a new datapool in websphere	cs213044	53	3	2006 May 21 02:32 PM
db2 Control Center won't load on SuSE 10.0....	UTiunkie	127	3	2006 May 21 01:47 PM
Upgrade instructions to DB2 Workgroup from DB2 Express-C	AldonPM	71	2	2006 May 21 01:33 PM
Problems setting up TCP/IP with DB2 Express-C	philip.weinke@ddd.de	275	11	2006 May 20 09:36 AM
Ruby on Rails	chris.astall	1,309	5	2006 May 19 10:36 AM
SQL1092N When trying to create sample database in windows	skhusal	52	1	2006 May 18 07:54 PM

[DB2 Express-C: How to install and configure the database](#) [274](#) [1](#) [2006 May 18 10:11 AM](#)



Step 4:

Participate in the Forum

Click on this icon from the home page



Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
3. Learn DB2 Express-C
4. Participate in the DB2 Express-C forum
-  5. **Write cool applications with DB2 Express-C**
6. Become a business partner with IBM
7. Write articles/tutorials/white papers/books
8. Become a DB2 student ambassador
9. Establish a DB2 User's group in your university

Step 5:

Write cool applications with DB2 Express-C

Why wait?
Become the next Google now!

Hosting with DB2 Express-C?

http://www.xfy.com - xfy.com - The Home of xfy Technology - Microsoft I...

File Edit View Favorites Tools Help Links >>

Why xfy? Products Support News & Events

xfy
The Native XML Application Platform

ERP Package

Service Oriented Architecture

Reliability XML

Why xfy?

Unique User Application Office Suite Extension WEB Base Application

Office Suite

←Replay

Featuring Products

DB2 Solution

► xfy Enterprise Solution Plus for DB2 Viper

Every business is unique.

Do you treat each customer uniquely?


They are unique because their products and services are unique

Done Internet

A cool application: <http://www.taikodom.com/>



Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
3. Learn DB2 Express-C
4. Participate in the DB2 Express-C forum
5. Write cool applications with DB2 Express-C
-  6. **Become a business partner with IBM**
7. Write articles/tutorials/white papers/books
8. Become a DB2 student ambassador
9. Establish a DB2 User's group in your university

Step 6:

Become a Business Partner with IBM

http://www-306.ibm.com - DB2 Express-C: Partners List by category - Microsoft Int...

File Edit View Favorites Tools Help Links »

DB2 Express-C

Free to Develop, Deploy, Distribute

Home Get started Learn Migrate **Partners** Contact us

- Partners by category
 - Partners A-Z
 - Partner solutions
- FAQs for partners
- Supported Linux distros

Partners List

Welcome to the DB2 Express Partner page.

Many third-party companies provide services and applications that compliment and expand the benefits of DB2 UDB Express. Here you'll find more about these providers and their solutions and how they can help you meet client needs, shape a more profitable business and achieve your goals.

 Business partners must register for free redistribution of DB2 Express-C with their products and applications.

What Business Partners say about DB2 Express


Platform Providers	Development Tools
Industry Solutions	Consulting
Tools	SOA

Show descriptions | Hide descriptions

Platform Providers

→	AMD
→	Intel
→	Mandriva
→	Nitix

Information Management software



Download DB2 Express-C

DB2 Express Online Forum

Sign Up for Our Mailing List

Upgrade to DB2 Express

→ Buy online

→ DB2 UDB Express Edition Details

 DB2 UDB Express Edition V8.2 Spec Sheet

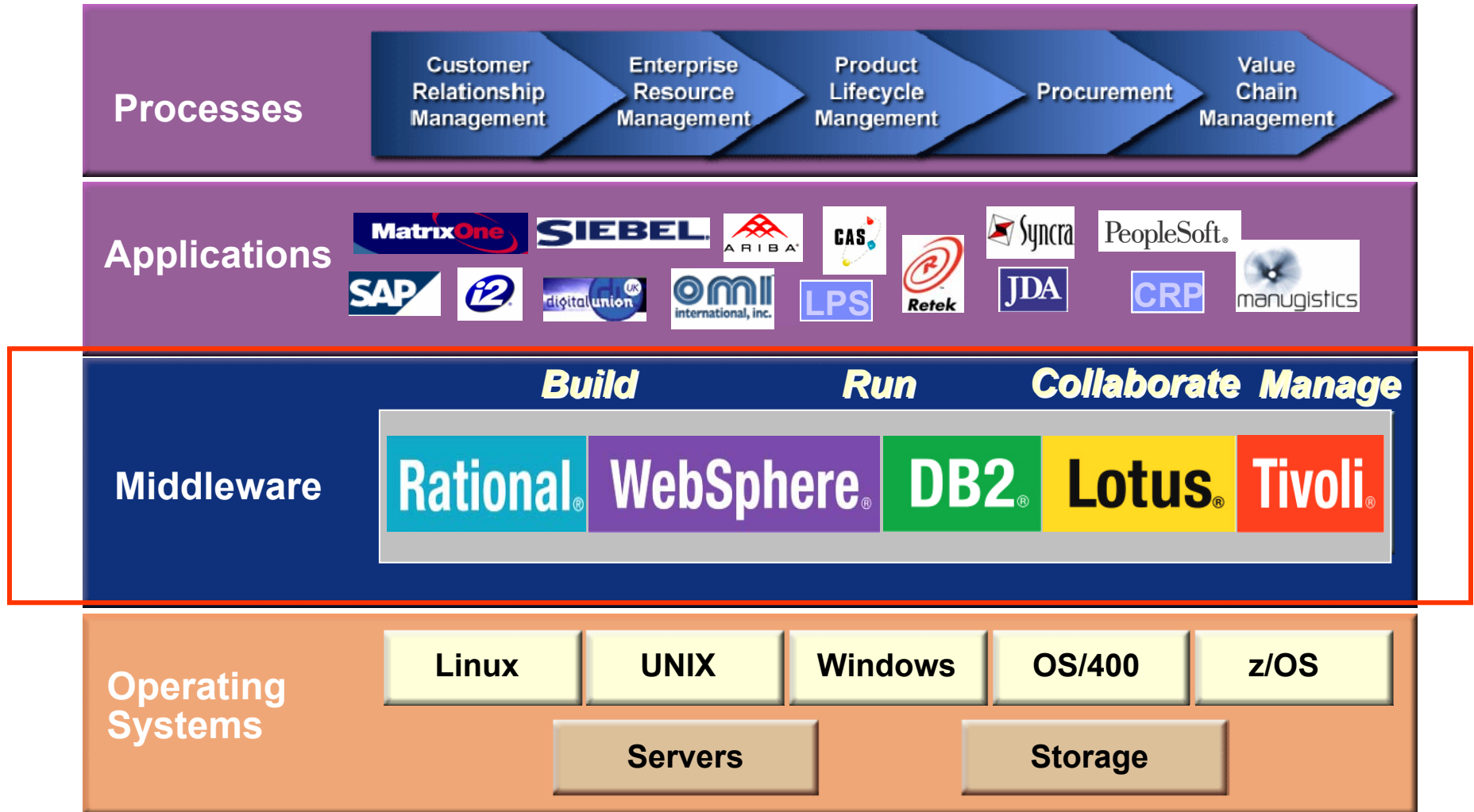
→ Ask Me about DB2 Express

Featured items

→ Replay Webcast: Unleashing Information On Demand using XML

Internet

Middleware: Our business in software



A Growing Community of Partners



"We are looking forward to embedding the no-license DB2 Express-C in our applications for small retail operations. This will help us keep our costs down and compete more effectively in the SMB market. We can apply the same database technology across our whole platform at no cost, which will lead to new opportunities for selling support

-- Janez Uplaznik, General Manager of Mikropis

"At Quest we believe in the value of building a strong, vibrant community around database technologies. By delivering a free version of DB2 Express-C, IBM is ensuring a rapid adoption of the DB2 technologies and further expanding the DB2 application development and database administration communities. As a leading provider of development and administration tools for DB2 databases, Quest is delighted to have an opportunity to distribute DB2 Express-C as part of Quest Database Solution offerings. We believe, by providing DB2 product as an integral part of the Quest solutions for DB2, our customers will enjoy a greatly simplified evaluation and deployment process"

-- **Billy Bosworth, Director Product Management, Database Solutions of Quest Software**



"By delivering DB2 Express-C, IBM is making it easy for ActiveGrid customers building service-oriented applications on the LAMP stack to take advantage of the enterprise-level performance, reliability and support of DB2 with no license fee."

-- **Peter Yared, Founder and CEO of ActiveGrid, Inc**

A Growing Community of Partners



"The launch of IBM's DB2 Express-C under a free licence is a bold positive move. It brings a proven, rock solid , and flexible database to the Ubuntu, and hence to the Debian ecosystem. With no restrictive licencing to cause concern, it further strengthens DB2's proposition to businesses choosing Ubuntu."

- Mark Shuttleworth, Ubuntu Linux founder

"Zend Technologies creates application development and deployment products. We have tightly integrated the no-cost DB2 Express server into our popular Zend Core for IBM product for the PHP community. The new optional support offering available for DB2 Express closely aligns with many of our customers' needs to have access to powerful database features available in DB2 Express. In addition, our PHP-based solutions efficiently leverage the native XML functionality of DB2 Express."



- Mark de Visser, Chief Marketing Officer, Zend Technologies, Inc.

A Growing Community of Partners

"Power, flexibility, and openness are some of the best qualities that Linux has to offer. We at Mandriva are very excited about DB2 Express-C being offered for free on a Mandriva Linux distribution. With DB2 Express-C, IBM brings a full-function and enterprise-ready relational database on our Linux platform at no charge."

- Klara Mika , ISV Manager, Mandriva S.A.



Novell

"We at Novell are excited about the launch of IBM's no license DB2 Express-C. It brings a powerful, flexible, and proven production ready database to our Linux platform - with no artificial limitations or license fees to worry about. IBM has always been a big supporter of Linux and open source developer community - and this release of a no-license DB2 Express is further proof in this regard."

- Hal Bennet, Vice President, Business Development, Novell

+ Many Independent Developers, and hopefully you also !!

A Growing Community of Partners

"We at AISA have been using DB2 databases for the last seven years. As a provider of Dealer Automation Systems to leading automotive manufacturers AISA relies demands the highest level of availability, scalability and performance from the relational databases. And this is what DB2 products deliver. With the DB2 systems AISA is able to accommodate the needs of smallest automotive dealers on a very strict budget, larger dealers with unique performance requirements and the needs of national and international distributors whose systems span national borders and need to accommodate multiple national languages, operating system and hardware platforms. We are delighted that IBM is realising the new free version of DB2 Express - C. We believe that this will greatly accelerate adoption of the DB2 technologies in emerging markets and will allow AISA to bring our products to new markets beyond the borders of Russia."

- Ivan Shelkovy, CEO AISA



"The newly launched DB2 Express-C from IBM is an ideal complement to the AMD Opteron™ processor family and is designed to take advantage of AMD's dual-core and AMD PowerNow!™ technologies, helping provide small and medium-size businesses with a production-ready database solution that is scalable on demand. IBM's DB2 Express-C offering complements the AMD Opteron processor value proposition of industry-leading price-to-performance within a total solution package. AMD welcomes the launch of DB2 Express-C and looks forward to developing joint solutions for our customers on this platform."

- Terri Hall, Vice President, Software Alliances, Microprocessor Solutions Sector, AMD

A Growing Community of Partners



"Business Objects and IBM have worked closely to develop effective business intelligence (BI) solutions that offer maximum scalability and reliability for information on demand. This new release of IBM DB2 Express-C continues our strong relationship by providing organizations the power of DB2 in a flexible, free package that is ideal for our enterprise customers looking to develop BI proof of concepts that will smoothly transition to enterprise deployments. It will also be a compelling choice for our mid-market customers looking for a solution that will scale with their business needs."

- Jon Dorrington, VP Alliances, Business Objects

"I believe that DB2 Express-C offering provides huge value to our customers. It makes available at no cost, IBM's leading edge information management tool, DB2 Universal Database on Linux and Windows. DB2 Express-c is a great solution for development, academic, ISVs and small production environments. Also, for anyone considering an open source database, DB2 Express-c is a much more attractive solution, offering more feature and function than any other database. As an IBM Business Partner with very strong skills in DB2 and Data Management, we are excited about the fact that we can now provide our customers with DB2 Express-C and then guide them on their implementation and exploitation efforts."

- James Sobiesky, CEO Fourth Millennium Technologies



DB2 Express runs across multiple platforms, and is optimized to run on the latest Intel® architecture-based platforms, including dual core platforms. DB2 Express will leverage this new technology without any technical or licensing changes.

A Growing Community of Partners

"Working with IBM and IBM DB2 application developers, we can create a value proposition where there is no rationale reason for any SMB customer that needs to run an application that can use DB2 for its database not to run DB2. Supported by IBM, DB2 Express-C is everything the SMB customer needs: easily deployable, affordable, scalable, stable, and untouchable with respect to price performance."

- Ozzy Papic, President and CEO of Net Integration Technologies



NET INTEGRATION TECHNOLOGIES INC.



"As a provider of supply chain optimization solutions to the leading retailers, we at Retalon know a value of a "good deal". IBM DB2 Express-C is a great deal! As an integrated database in the Retalon Fortune supply chain analytical platform, IBM DB2 Express-C provides us with an opportunity to quickly demonstrate the value of the Retalon solution to our customers. It greatly simplifies our "Proof of Value" program by removing any need for procuring software. At the same time it responds to our customers' demands for a highly scalable, high performing database platform from IBM, the leader in the industry."

- Serge Savchenko, Vice President Sales, Retalon Inc.


A Growing Community of Partners

Integrated Stack for Linux (by Novell)

Includes:

- DB2 Express-C
- WAS CE
- Novell SLES

Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
3. Learn DB2 Express-C
4. Participate in the DB2 Express-C forum
5. Write cool applications with DB2 Express-C
6. Become a business partner with IBM
-  7. **Write articles/tutorials/white papers/books**
8. Become a DB2 student ambassador
9. Establish a DB2 User's group in your university

Step 7:

Write articles,
tutorials,
books

It's not hard to start:

1. Find a need: Forum
2. Write an article for that need
3. Repeat this process
4. Compile articles into a book

DB2 Version 8 Connectivity Cheat Sheet - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://www-128.ibm.com/developerworks/db2/library/techarticle/0301chong/0301chong2.html> Go Links

Country/region [select] Terms of use

All of dW Search

Services & solutions Support & downloads My account

developerWorks > Information Management > **DB2 Version 8 Connectivity Cheat Sheet**

Level: Introductory

[Raul Chong](#) (rfchong@ca.ibm.com), Database consultant, IBM

23 Jan 2003

Newly updated with iSeries connectivity information! For those who like to use commands instead of GUI tools, this article tells you how to get your clients connected to DB2 servers, either on distributed systems or OS/390, using DB2 commands. It includes a cheat sheet that you can print off and keep handy to make the process a breeze.

© 2003 International Business Machines Corporation. All rights reserved.

Introduction

The purpose of this article is to provide quick and easy instructions for setting up connectivity between IBM ® DB2 ® Universal Database™ for Linux, UNIX ® and Windows ® V8 clients and DB2 servers using DB2 commands. The DB2 servers can be -- for this article -- DB2 UDB for Linux, UNIX and Windows version 8, DB2 UDB for z/OS™ version 8 or DB2 for iSeries ® 5.2. Note that though we are using the latest versions of DB2 UDB in the different platforms, the same instructions can apply to other DB2 UDB versions.

In case you've followed all the instructions and the connection isn't working, I've included some things to check to help you determine what the problem is as well as typical error messages.

The Configuration Assistant (CA) GUI tool, formerly known as the Client Configuration Assistant (CCA), can be used on either Windows or UNIX platforms as an easy graphical interface for establishing connectivity. However, if you know the actual DB2 commands that are executed under the covers by the CA Tool, you will have a better understanding of what is required when connecting DB2 clients to DB2 servers. Moreover, the commands can always be saved in a script that can be easily distributed to any DB2 client that requires the same connectivity setup. For completeness, however, I will include the steps to follow using the Configuration Assistant in the last section of this article.

Document options

- Print this page
- E-mail this page

Free software for rapid results

- Kick-start your Java apps

Rate this page

- Help us improve this content

<http://www.ibm.com/legal/>

Step 7:

Write articles,
tutorials,
books

- Self-publishing (lulu.com)
- Co-authoring

Amazon.com: Understanding DB2(R) : Learning Visually with ...

File Edit View Favorites Tools Help Links

amazon.com Your Store Books See All 33 Product Categories Your Account

Advanced Search Browse Subjects Bestsellers The New York Times® Best Sellers Magazines Corporate Accounts

Search Books GO

Join [Amazon Prime](#) and ship Two-Day for free and Overnight for \$3.99. Already a member? [Sign in](#).

Understanding DB2[®] Learning Visually with Examples

by [Raul F. Chong](#), [Clara Liu](#), [Sylvia F. Qi](#), [Dwayne R. Snow](#)


List Price: \$59.99
Price: **\$37.79** & this item ships for **FREE** with **Super Saver Shipping**. [Details](#)

You Save: **\$22.20 (37%)**

Availability: Usually ships within 24 hours. Ships from and sold by Amazon.com.

84

Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
3. Learn DB2 Express-C
4. Participate in the DB2 Express-C forum
5. Write cool applications with DB2 Express-C
6. Become a business partner with IBM
7. Write articles/tutorials/white papers/books
-  8. **Become a DB2 student ambassador**
9. Establish a DB2 User's group in your university

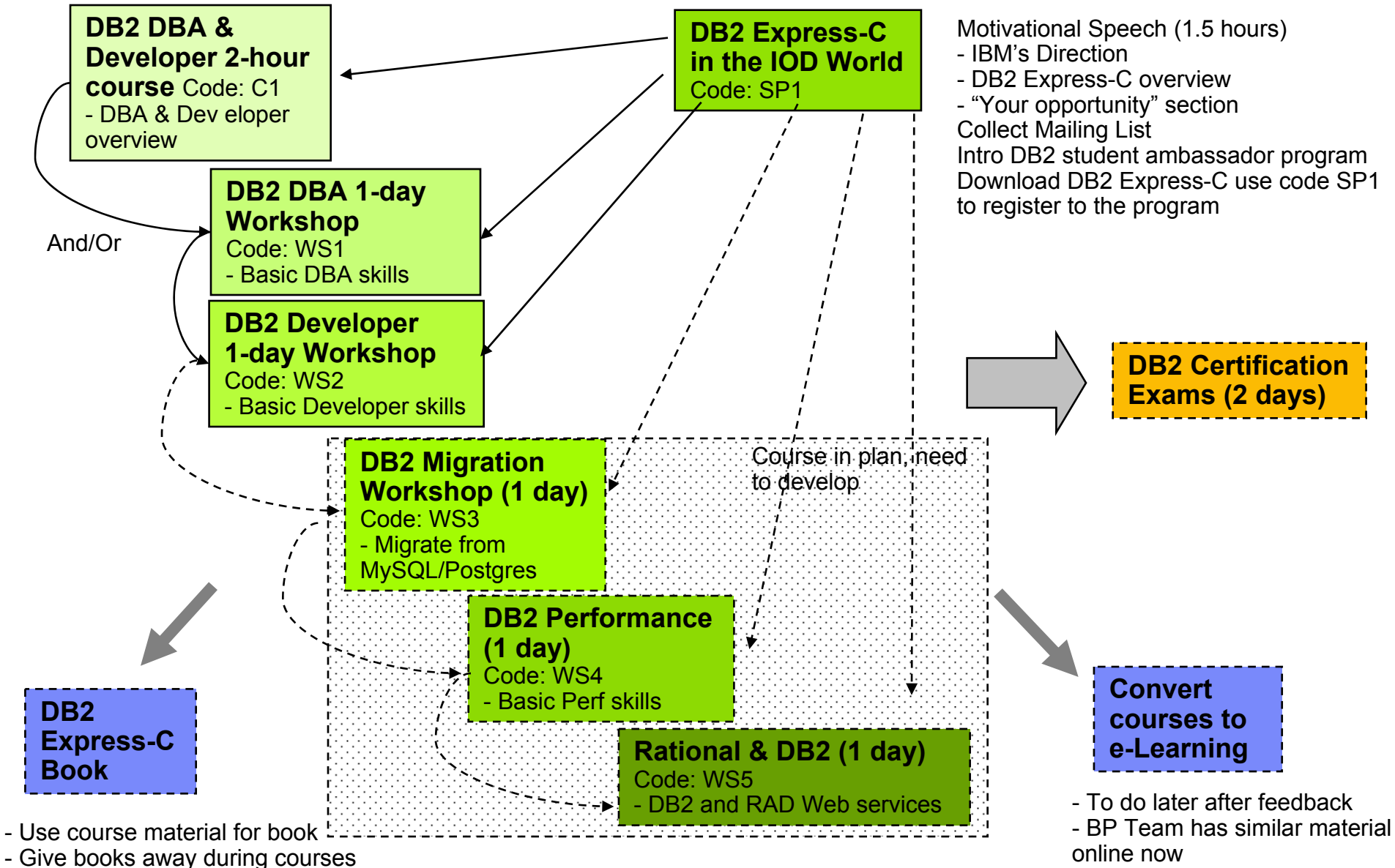


DB2 Express – C University Program

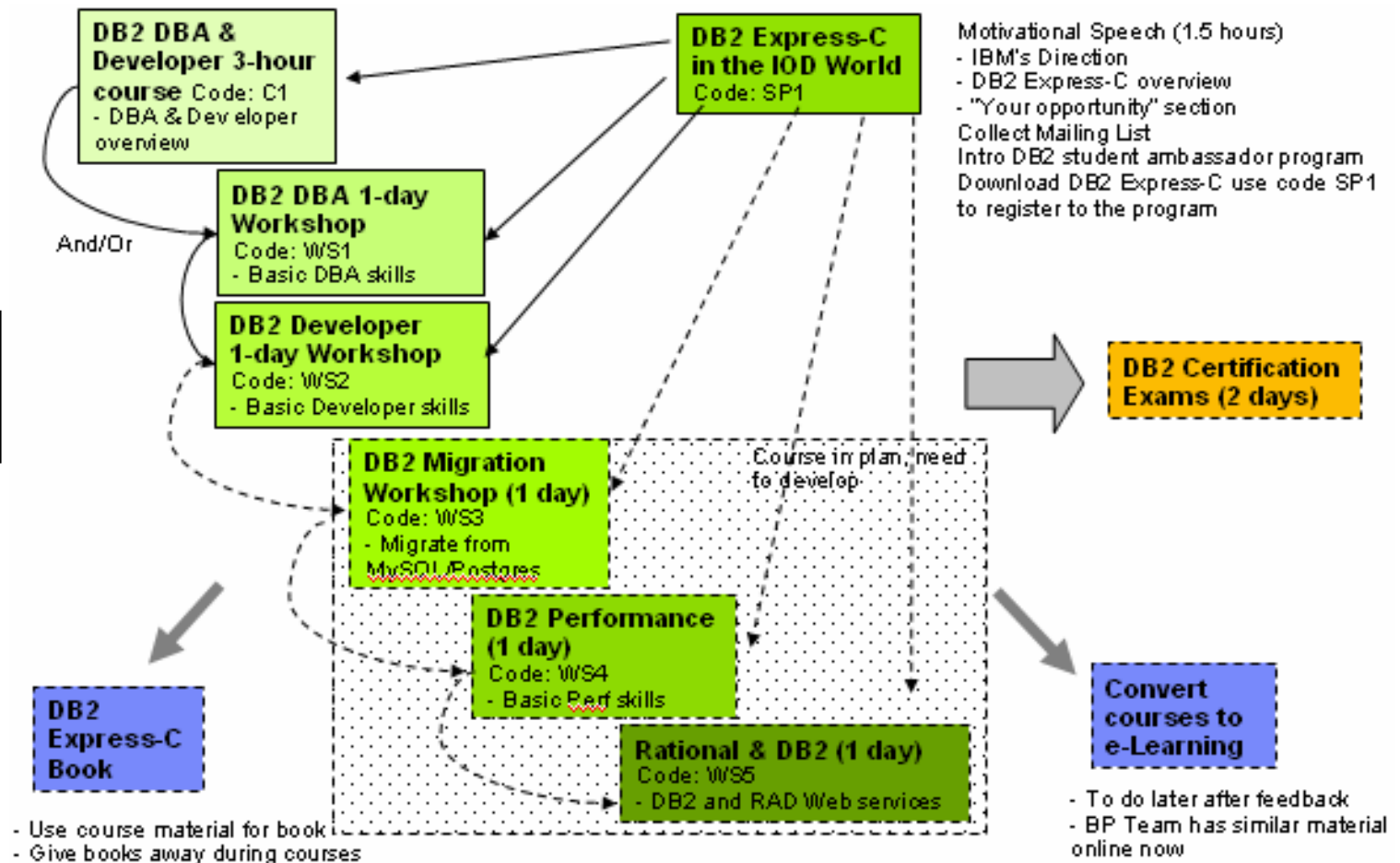
Raul F. Chong
DB2 Express Community Facilitator
Email: rfchong@ca.ibm.com



Step 8: University Program

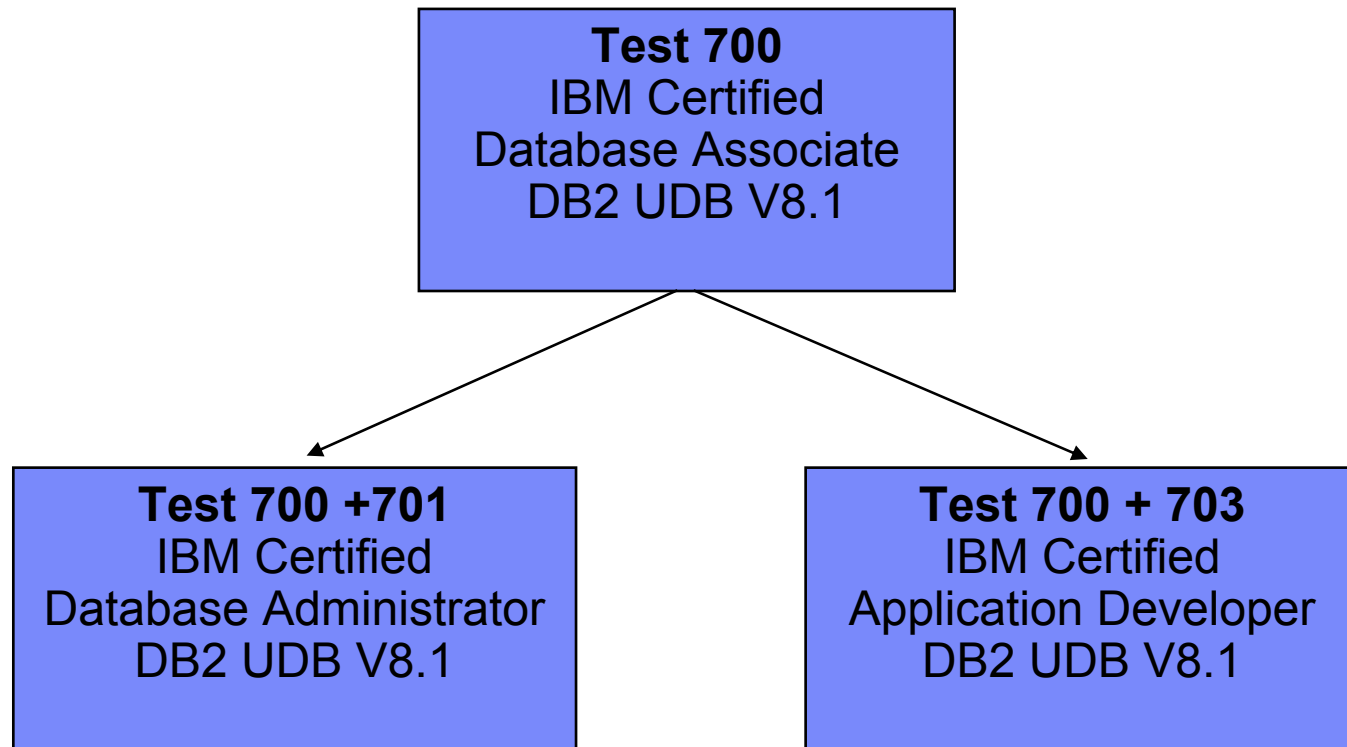


Local Replication of University Program



DB2 Student Ambassador Program

DB2 Certification Path



Exams you can write for free through this program (choose only 2) :
700, 701, 703

Substantial savings:

Without this program, exam costs ranges from US\$60 to US\$150 depending on the location

Books to donate to the university
library:
Depends on the interest in the
program (downloads)

To donate: For exam 701 preparation (DBA)

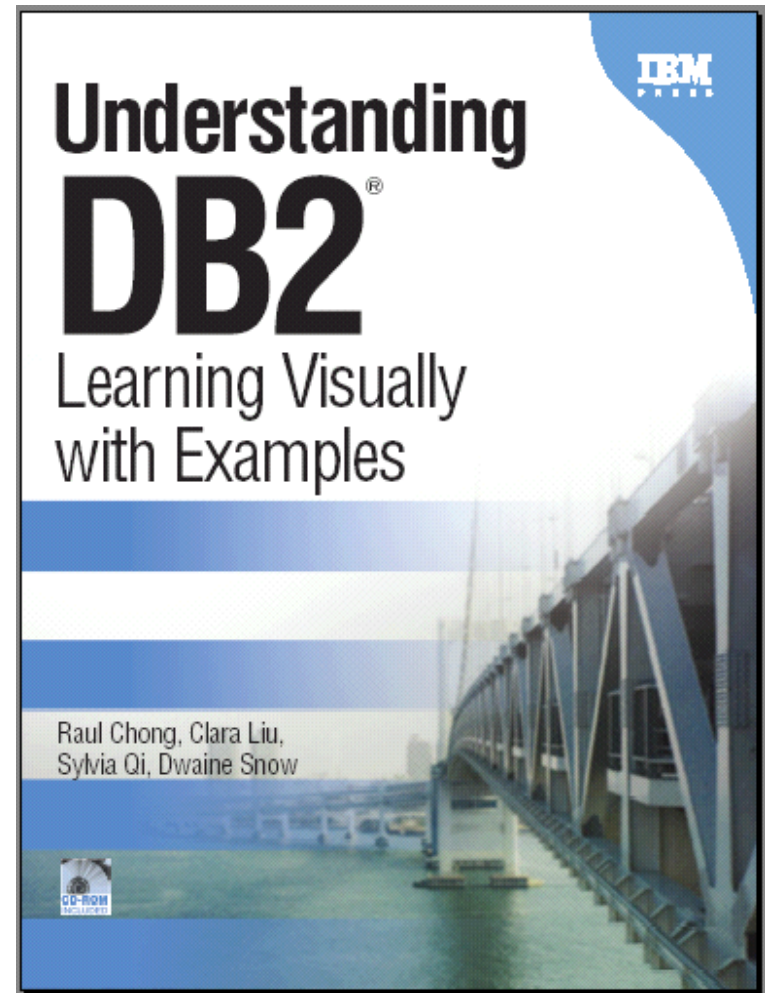
Understanding DB2 Learning Visually with Examples

Raul F. Chong, Clara Liu,
Sylvia F. Qi, Dwaine R. Snow

IBM Press

ISBN: 0-13-185916-1

- ➔ This book is for version 8.2.
Version 9 will be available in May
2007



To donate: For exam 703 preparation (App Dev)

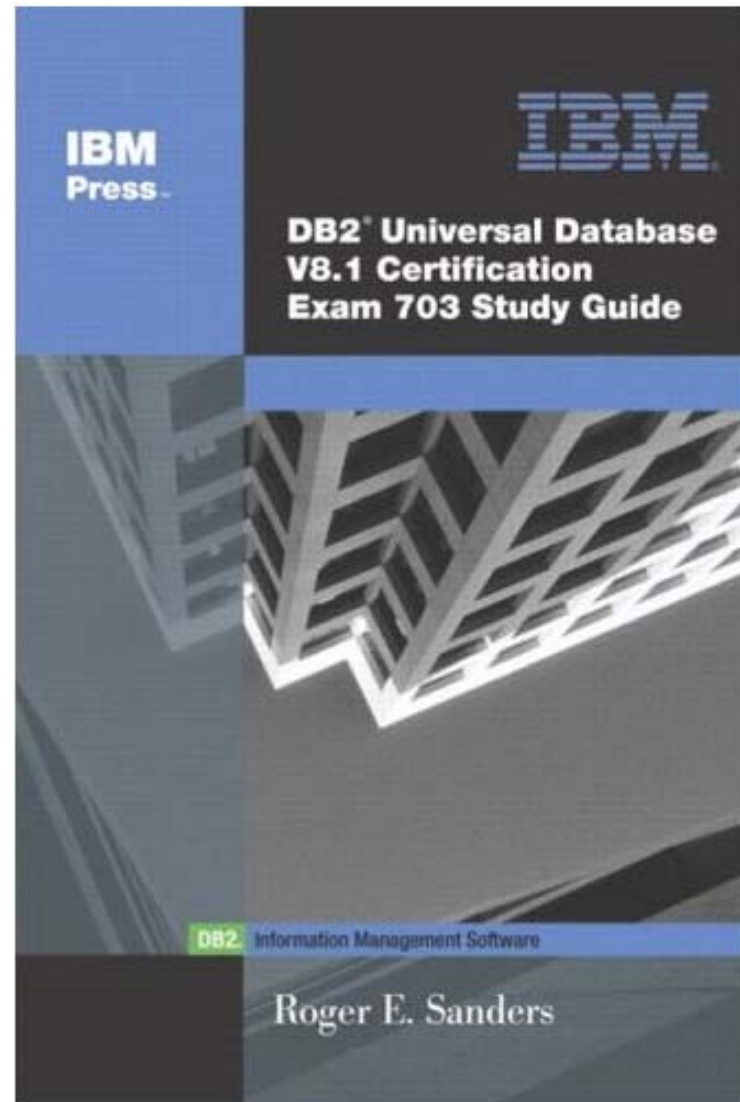
DB2 UDB V8.1

Certification Exam 703

Study Guide

Roger Sanders

[ISBN#: 0131840495]



Preparing to write the certification exams

1. For DB2 Family Fundamentals certification (exam 700)

- DB2 V8 Family Fundamentals certification prep tutorials
www.ibm.com/developerworks/db2/library/tutorials/db2cert/db2cert_V8_tut.html
- Free book: http://mysite.verizon.net/Graeme_Birchall/id1.html

2. For DB2 DBA Certification (exam 701)

- DB2 V8 DBA Certification prep tutorials
www.ibm.com/developerworks/db2/library/tutorials/db2cert/701_prep.html
- **Book to be donated to university library:**
Understanding DB2 - Learning Visually with Examples v8.2

3. For DB2 Application Development Certification (exam 703)

- DB2 V8 Application Development Certification prep tutorials
www.ibm.com/developerworks/offers/lp/db2cert/
- **Book to be donated to university library:**
DB2 UDB V8.1 Certification Exam 703 Study Guide

- All the books to be donated cover version 8.2 and all DB2 editions.
- The certification exams for 2006 will be for version 8.2 and cover all DB2 editions.

How can I participate in the University Program?

To register to the university program:

2 steps which must be completed within **1 week** after this speech:

1. a) **Download DB2 Express-C 9:**
www.ibm.com/db2/express

Or

- b) **Request the DVD for DB2 Express-C V9:**
https://www14.software.ibm.com/webapp/iwm/web/preLogin.do?lang=en_US&source=swg-db2kit

- In either of the above, use the code: **<code to be provided>** in the field ***company name*** when registering from any of the two web sites mentioned above.

2. Complete the paper evaluation form at the end of this speech

- It will be used to match who attended this presentation with the download registration information

Keeping informed about the university program

IBM DB2 → ... → Information → Check for Updates

http://updates.installshield.com - DB2 UDB and DB2 Connect - Microsoft Internet Explorer

Update Manager

Updates About

IBM

DB2 9 and DB2 Connect 9

Updates -- (0)
Critical -- (0)
Important -- (0)

Messages -- (2)
Critical -- (0)
Important -- (2)

New updates & messages


Check for Updates

DB2 9 and DB2 Connect 9

Important Messages	Date	Size
Learn about new features in DB2 Viper	2006-06-02	
You have the latest version of DB2 9 installed!	2006-07-26	

Internet

Your opportunity: 9 steps to career success!

1. Visit frequently the DB2 Express-C Home page:
www.ibm.com/db2/express
2. Download & Install DB2 Express-C 9
3. Learn DB2 Express-C
4. Participate in the DB2 Express-C forum
5. Write cool applications with DB2 Express-C
6. Become a business partner with IBM
7. Write articles/tutorials/white papers/books
8. Become a DB2 student ambassador
-  9. Establish a DB2 User's group in your university

Step 9: Establish a DB2 User's group in your university

- Informal Support Group (run it as you wish)
- Like a university club
- Shows initiative
- Grow it and organize events country-wise!
- Full support from DB2 Express-C team
- Send me email if interested to start it



<http://db2ug.byethost7.com>

Plans for the future?

- Text books in your language
- Applications
- More participation, more activities!

Contact Us!

Useful URLs

- **DB2 Express (FAQs, Downloads, Forum, Partner Solutions, ...)**
 - <http://www.ibm.com/db2/express>
- **DB2 product information and version specific details**
 - <http://www.ibm.com/software/data/db2/udb/>
- **IBM developerWorks DB2 zone (Technical articles and tutorials)**
 - <http://www.ibm.com/developerworks/db2>
- **DB2 Express-C free downloadable redbook for developers:**
 - <http://www.redbooks.ibm.com/abstracts/sg247301.html>

Contacts

IBM Academic Initiative Representative

~~Ms. Hylin Liu - liutt@cn.ibm.com~~



DB2 Express-C Community Team

General mailbox – db2x@ca.ibm.com

Raul Chong – rfchong@ca.ibm.com

Obrigado!, Gracias!, Thank you!

Questions?