

# E83

## IMS Web Connectivity - Ready, Set, Go!

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# Terminology

Applet	Java program stored on a webserver, that runs inside a Java-compatible browser such as Netscape Navigator
AER	Application Execution Region
DDF	Distributed Data Facility
DRDA	Distributed Relational Database Architecture
IDE	Integrated development environment
IMS Connect	IMS TCP/IP OTMA Connection, previously known as ITOC
JAR	Java Archive: aggregates many files into one
JDK	Java Development Kit
JVM	Java Virtual Machine
ODBA	Open Database Access
OTMA	Open Transaction Manager Access
RRS	Resource Recovery Services
SDK	Software Development Kit
Servlet	Java program that resides on and executes on a Web server
Stored Procedure (SP)	A user-written application program, that can be invoked through the use of the SQL CALL statement
XCF	Cross System Coupling Facility (MVS)

# Agenda

- Java Terminology & WebSphere Level Set
- What are the Pieces?
- Why VisualAge for Java?
- Why Stored Procedures?
- How Do You Connect to the Data?
- Sample Servlet Development Review

# A Picture Says a '1000' Words

Bookmarks Location: <http://wtsc47oe.itso.ibm.com:98/servlet/imsservletbuilder.IMSAccountServlet>

Enter Customer ID:

Name:

Address:

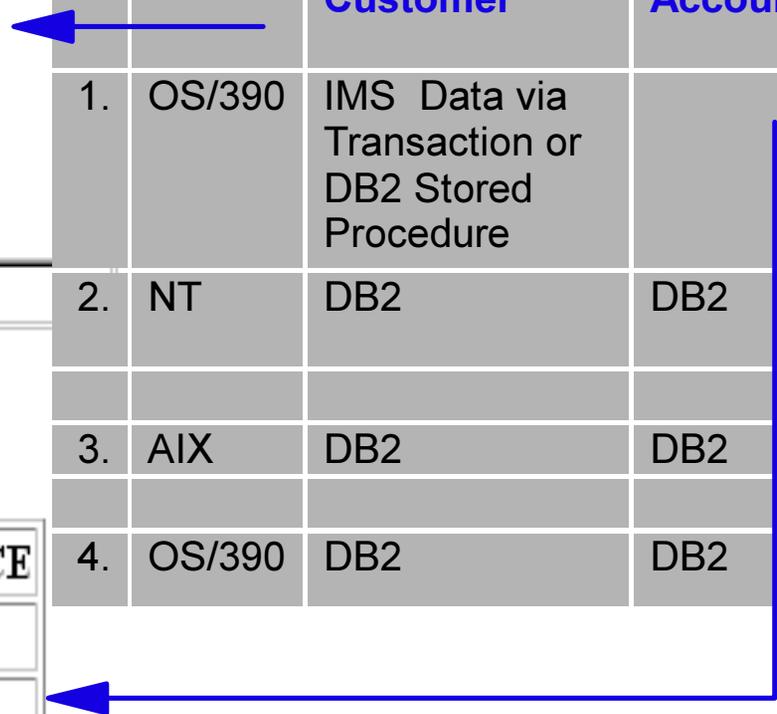
City, State:

Country:

Email:

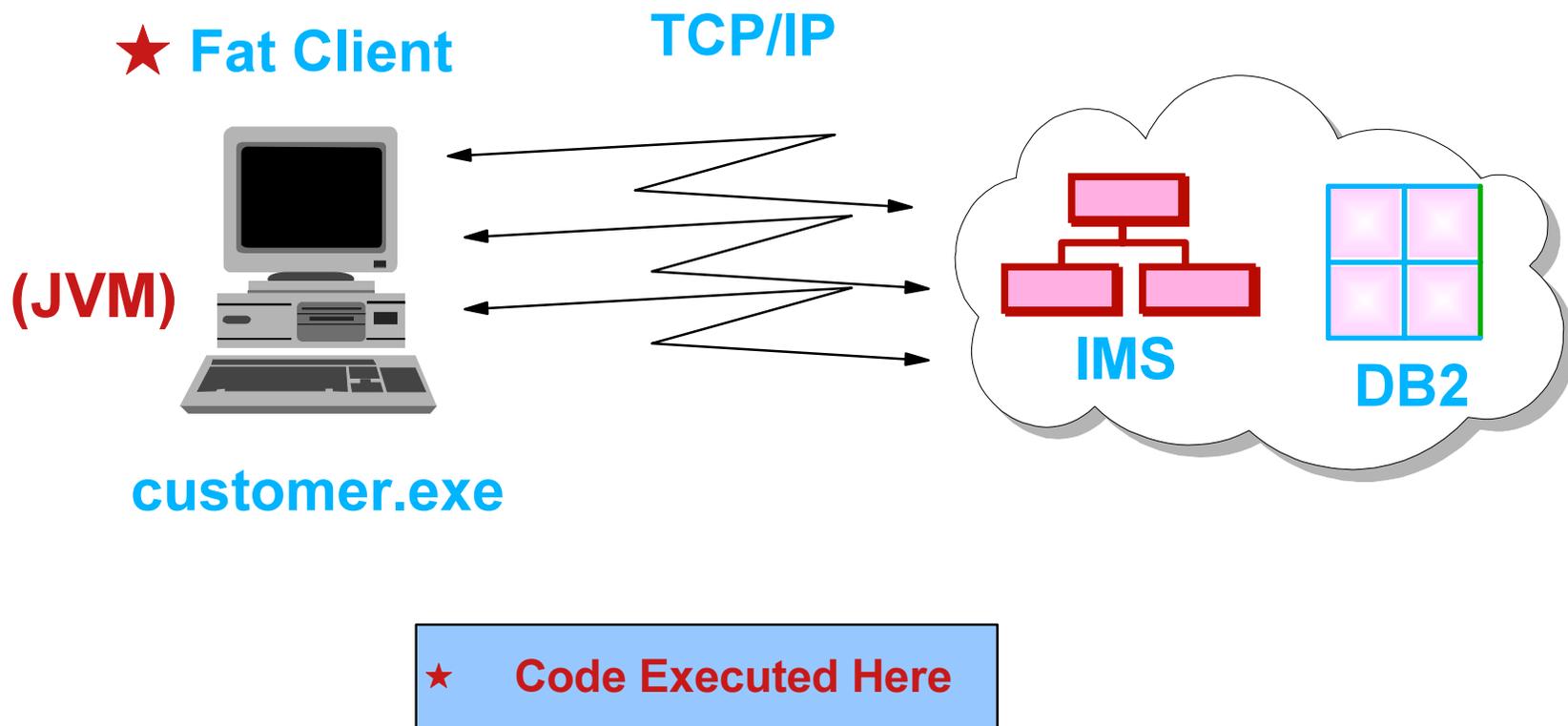
		Customer	Account
1.	OS/390	IMS Data via Transaction or DB2 Stored Procedure	
2.	NT	DB2	DB2
3.	AIX	DB2	DB2
4.	OS/390	DB2	DB2

ACCOUNT.ACCT_NUMBER	ACCOUNT.BALANCE
3	700.00
14	10000.00
15	10000.00



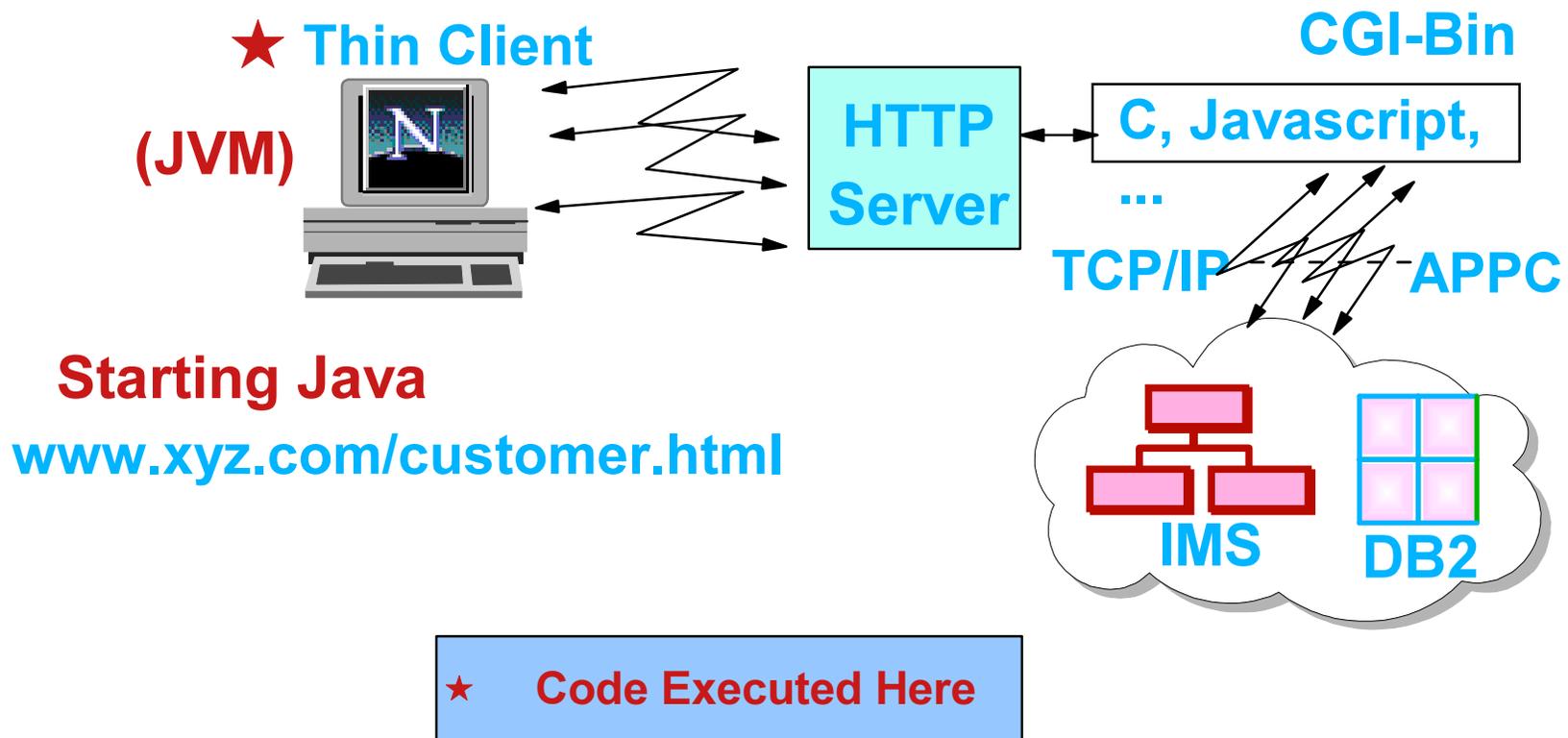
# Java Application

- Stored and executed in the same location



# Java Applet

- Stored in a Web Server, executed in a Web Browser
- Requires a browser Java Virtual Machine (JVM)

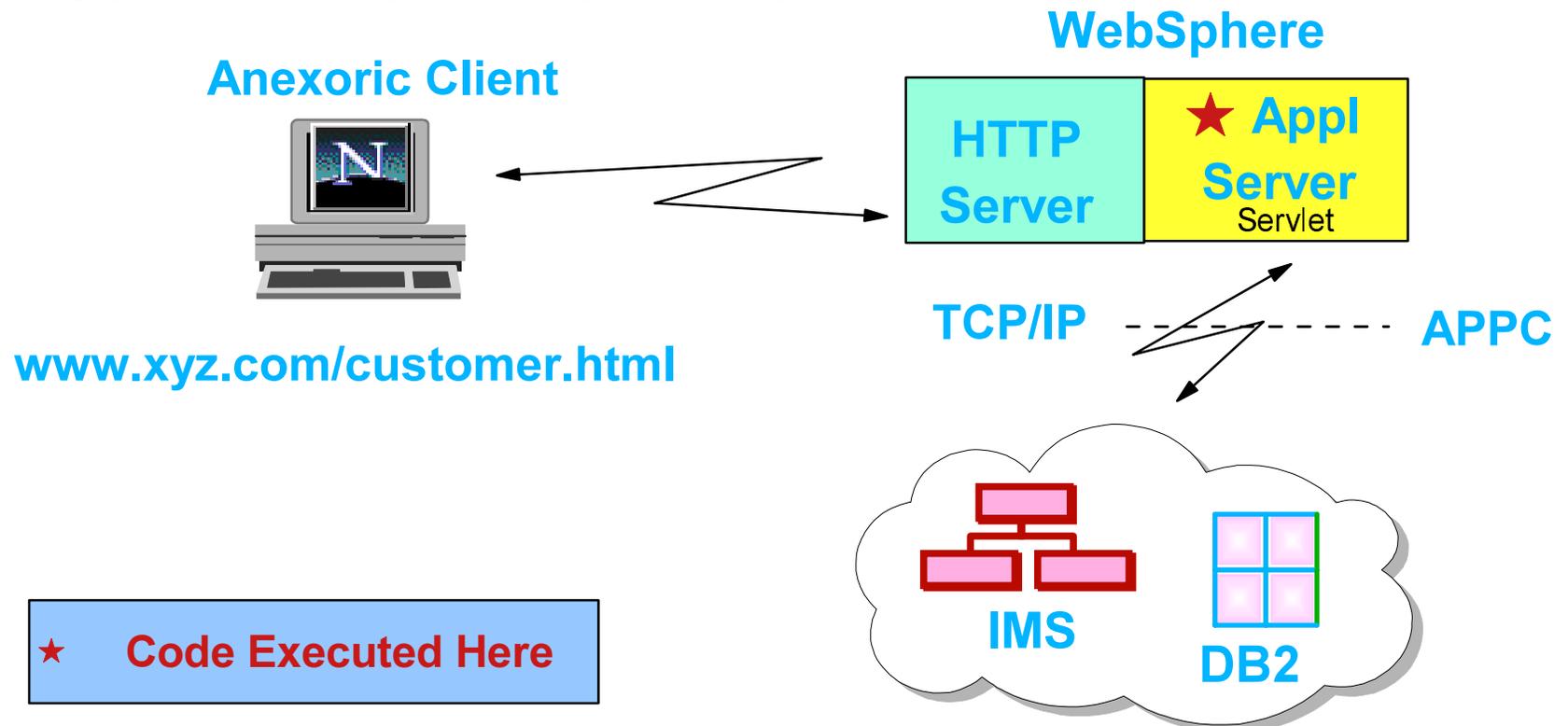


**Starting Java**  
[www.xyz.com/customer.html](http://www.xyz.com/customer.html)

★ Code Executed Here

# Java Servlet

- Stored in and executed in an Application Server, launched from the Web Server
  - ▶ Code resides near the data
- Uses any browser
  - ▶ No Java Virtual Machine

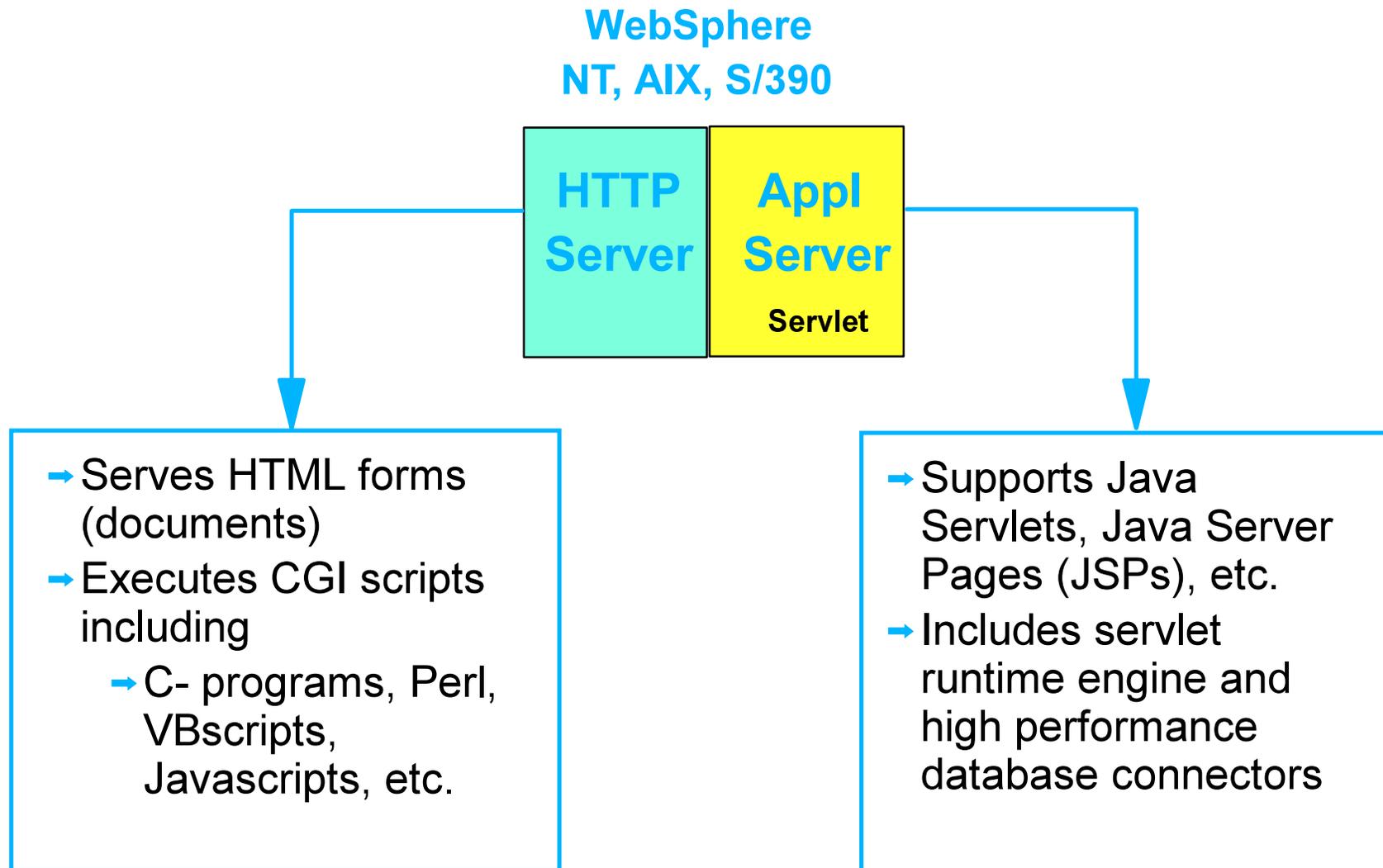


# What is WebSphere?

- Products for deploying and managing high performance web sites
  - ▶ HTTP Web Server
  - ▶ WebSphere Application Server
  - ▶ WebSphere Studio
  - ▶ WebSphere Commerce Suite
  - ▶ WebSphere Performance Pack
  - ▶ WebSphere Catalog Architect
  - ▶ WebSphere Cache Manager

# What is WebSphere? ...

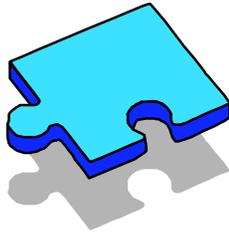
- Scalable and runs on multiple platforms



# What are the Pieces?

## *Development*

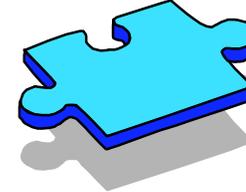
VisualAge  
for Java



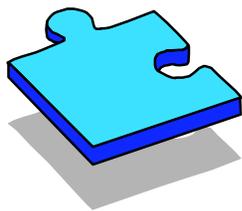
DB2 Stored  
Procedure  
Builder

## *Deployment*

WebSphere  
S/390 NT



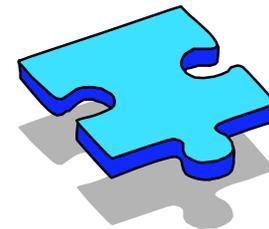
DB2  
NT



DB2  
OS/390

DB2  
AIX

*Data*



IMS  
Transaction

IMS Data  
via  
ODBA

# The Pieces Are

- Development

- ▶ VisualAge for Java

- GUI Development tool

- ▶ DB2 Stored Procedure Builder

- Stored Procedure Builder for SQL Procedure Language and Java Stored Procedures

# The Pieces Are ...

## ■ Data

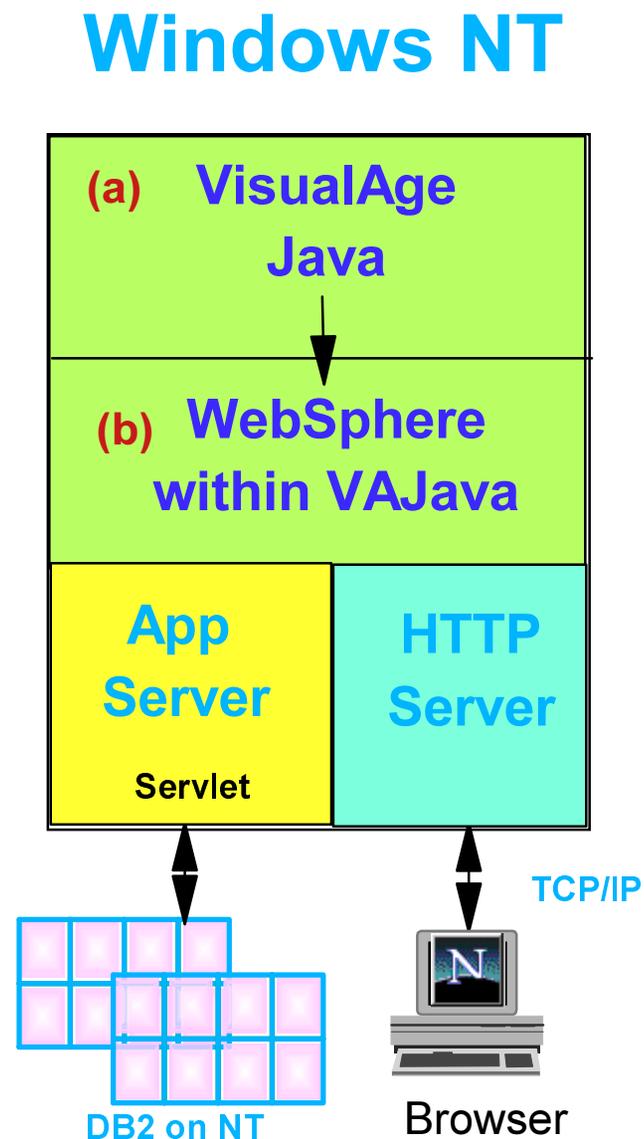
- ▶ IMS Connectivity
  - IMS Connect for transactions
  - DB2 Stored Procedure to IMS via ODBA
- ▶ DB2 Connectivity
  - DB2 Client Configuration Assistant

# The Pieces Are ...

- Deployment
  - ▶ WebSphere
    - HTTP (Web) Server and Application Server
    - NT, AIX, and S/390

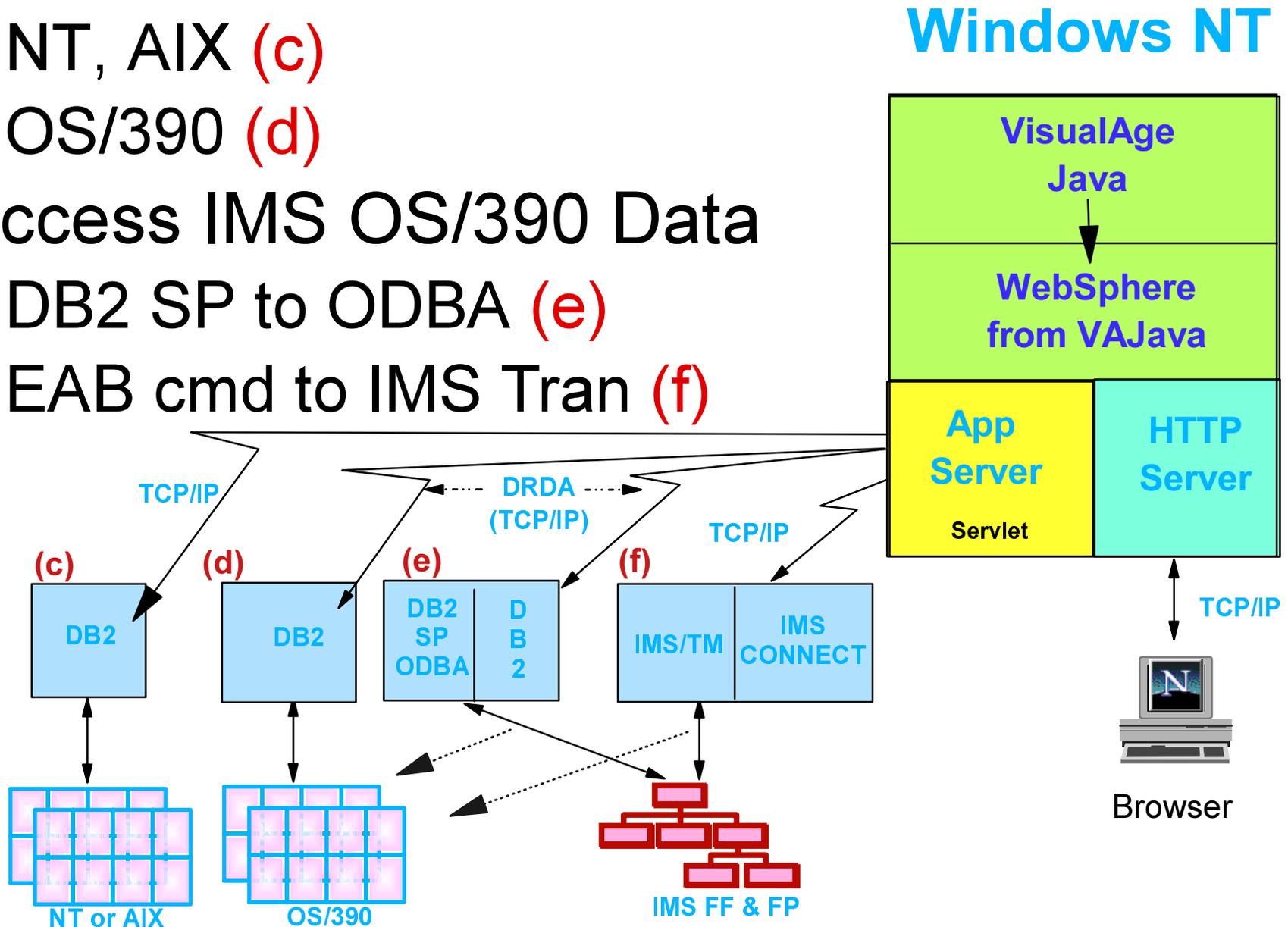
# How the Pieces Fit - Step 1

- VisualAge for Java to create servlet (a)
  - ▶ Initial access to DB2 on local NT
- VisualAge for Java WebSphere Test Environment (b)
  - ▶ First level tests for Steps 1 and 2



# How the Pieces Fit - Step 2

- Access DB2 Data
  - ▶ NT, AIX (c)
  - ▶ OS/390 (d)
- Access IMS OS/390 Data
  - ▶ DB2 SP to ODBA (e)
  - ▶ EAB cmd to IMS Tran (f)



# How the Pieces Fit - Step 3

- Deploy on WebSphere
  - ▶ Export files to WebSphere on NT, AIX, or S/390 (g)

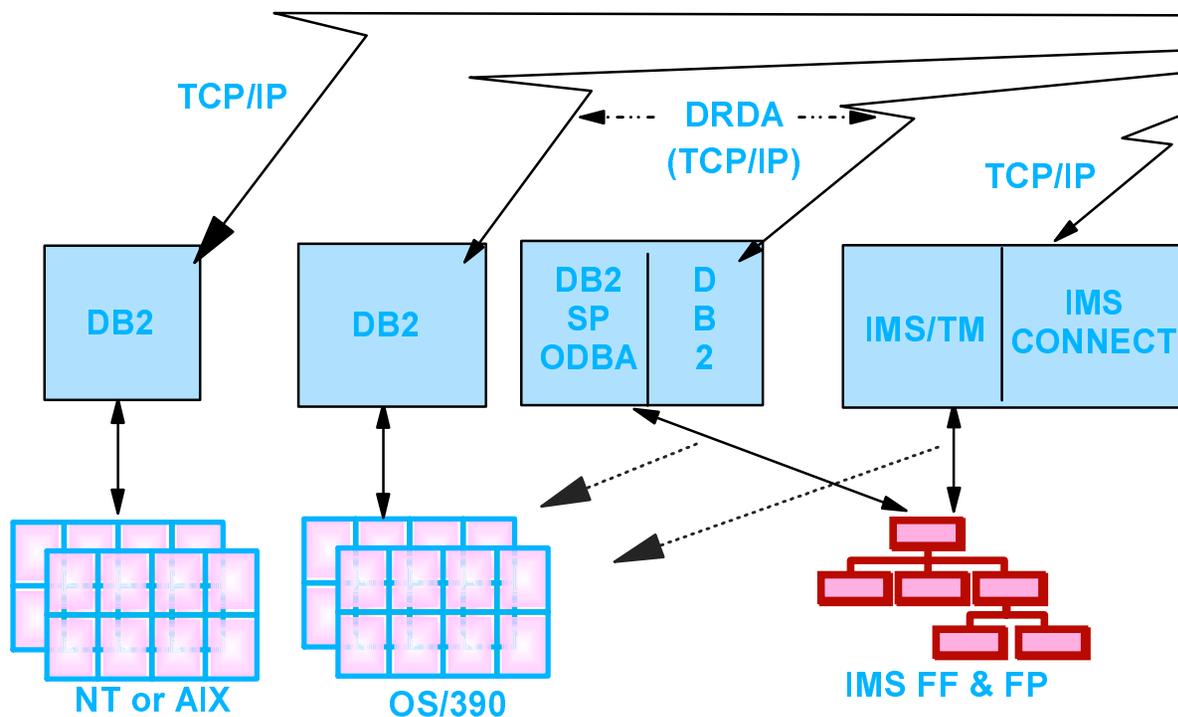
End User



TCP/IP



WebSphere (g)  
NT, AIX, S/390



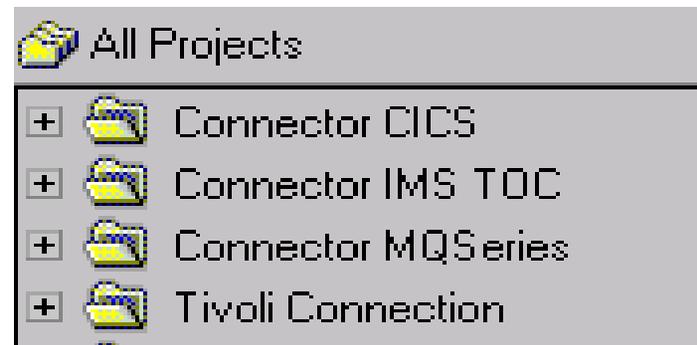
# Why VisualAge for Java?

- Portable and Scalable

- ▶ NT, AIX, and S/390

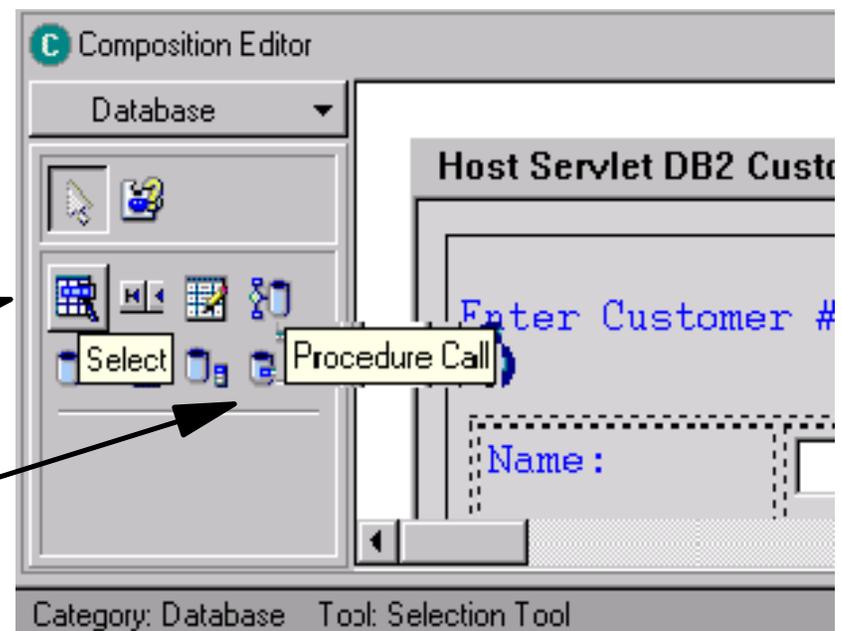
- Includes Connectors

- ▶ IMS, CICS, MQSeries, Tivoli, etc.



- Includes Beans

- ▶ Select - Access DB2
- ▶ Procedure Call - Access DB2, IMS, etc.
- ▶ Modify - Update data



# Why VisualAge for Java? ...

- WebSphere Test Environ - Click 'Run'



Bookmarks Location: <http://127.0.0.1:8080/servlet/HostServlet.HostAccountServlet>

Enter Customer #:

Name:

Address:

City/State:

Country:

Email:

ACCOUNT.ACCT_NUMBER	ACCOUNT.BALANCE
16	500.50
17	20000.00

Port "8080" indicates Test Environment

# Why Stored Procedures?

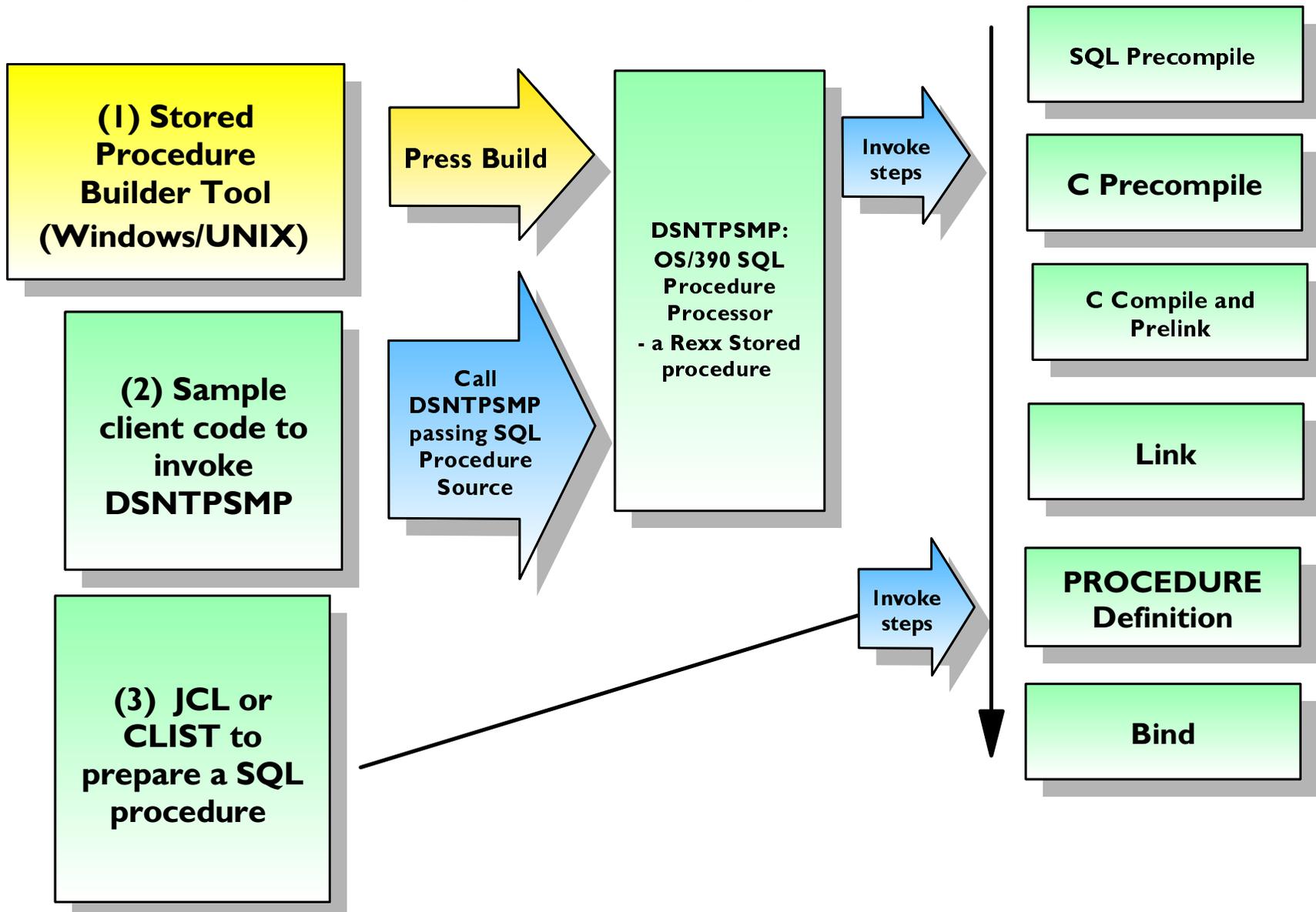
- Improved Application Security
  - ▶ Sensitive processing moved to server
  - ▶ End users do not need table privileges
- Simplified Application Maintenance
  - ▶ Business logic centralized at server
- Performance
  - ▶ Network traffic reduced
  - ▶ Lock contention easier to control

# Why Stored Procedures? ...

- Tight Integration with Desktop Tools
  - ▶ Fully supported by JDBC, ODBC, SQLJ, etc.
- Java and SQL Procedure Language SPs supported by Stored Procedure Builder
  - ▶ Portable across platforms

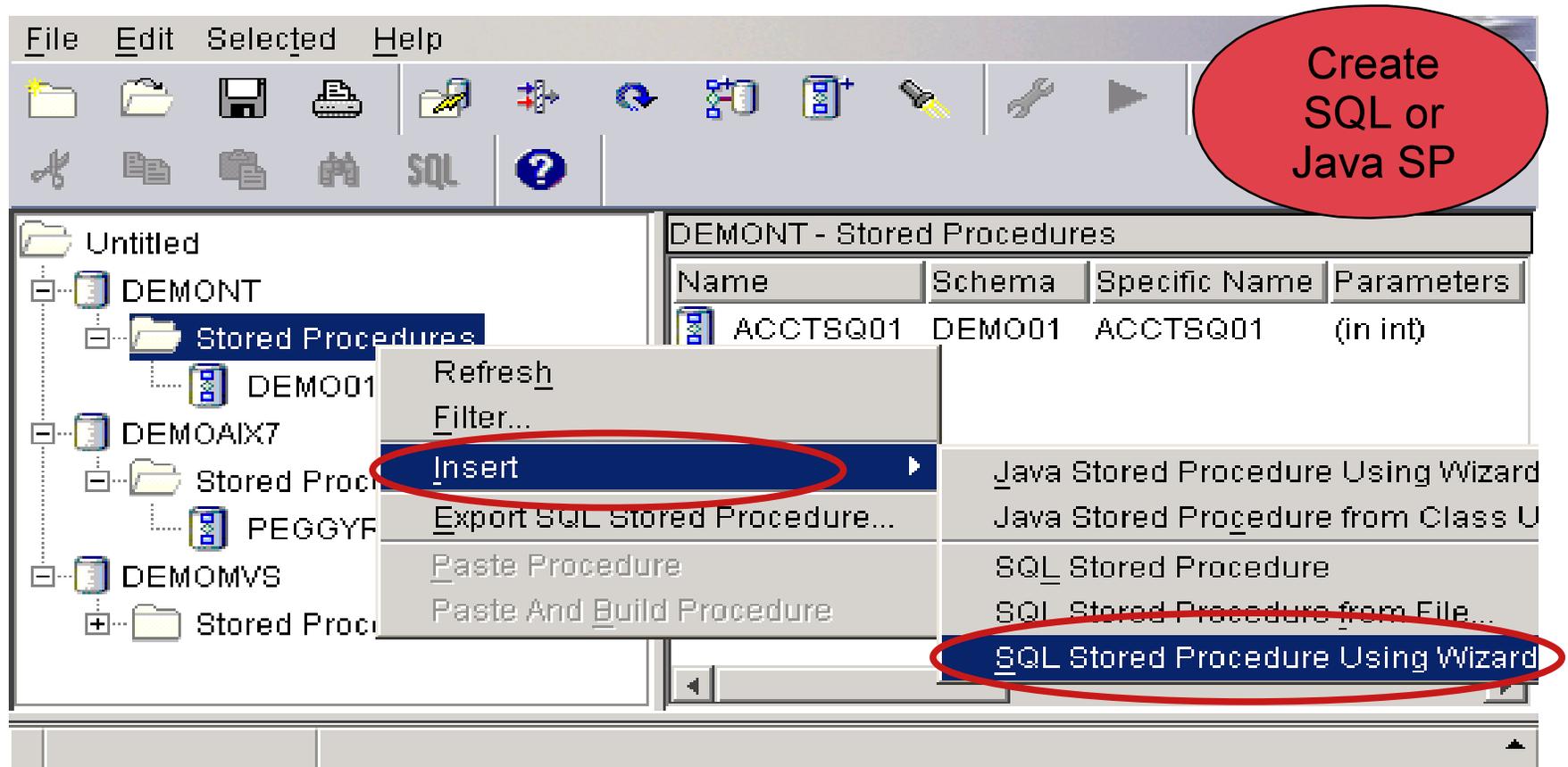
# Why DB2 Stored Proc Builder?

- Simplified Programming and Build Process



# Why DB2 Stored Proc Builder?...

- Creates, Builds, Debugs DB2 UDB SPs
- Launches from Multiple Tools
- Uses Wizards to create Java or SQL PL SPs

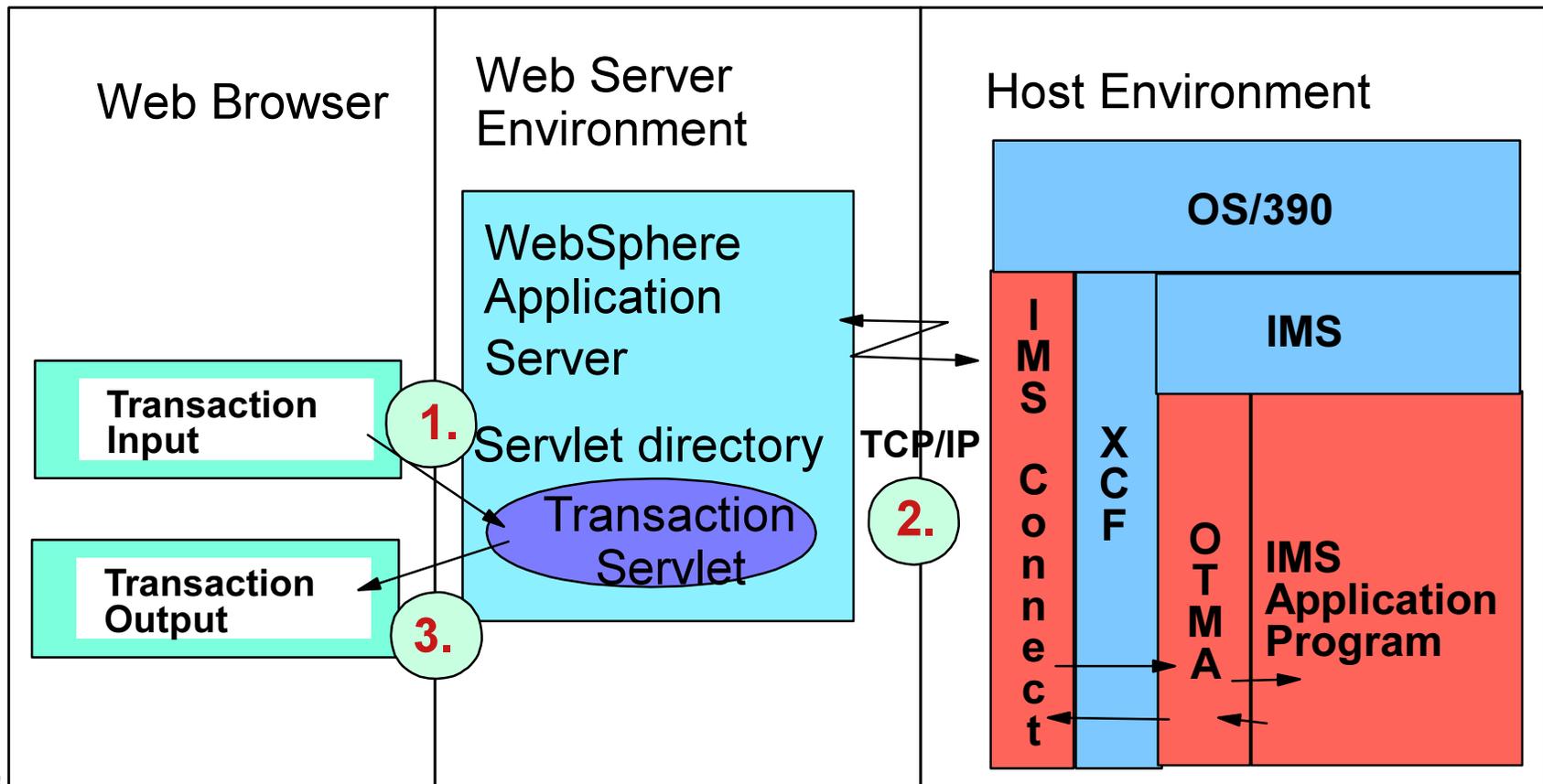


# How Do You Connect to the Data?

- Access IMS data via:
  - ▶ VAJava Procedure Call Bean
    - DB2 Stored Procedure to ODBA to IMS
  - ▶ VAJava IMS Bean
    - IMS TM via IMS Connect and OTMA
  
- Access DB2 data via:
  - ▶ VAJava Data Access Bean
  - ▶ VAJava Procedure Call Bean
    - SQL Procedure Language or Java SP created with Stored Procedure Builder

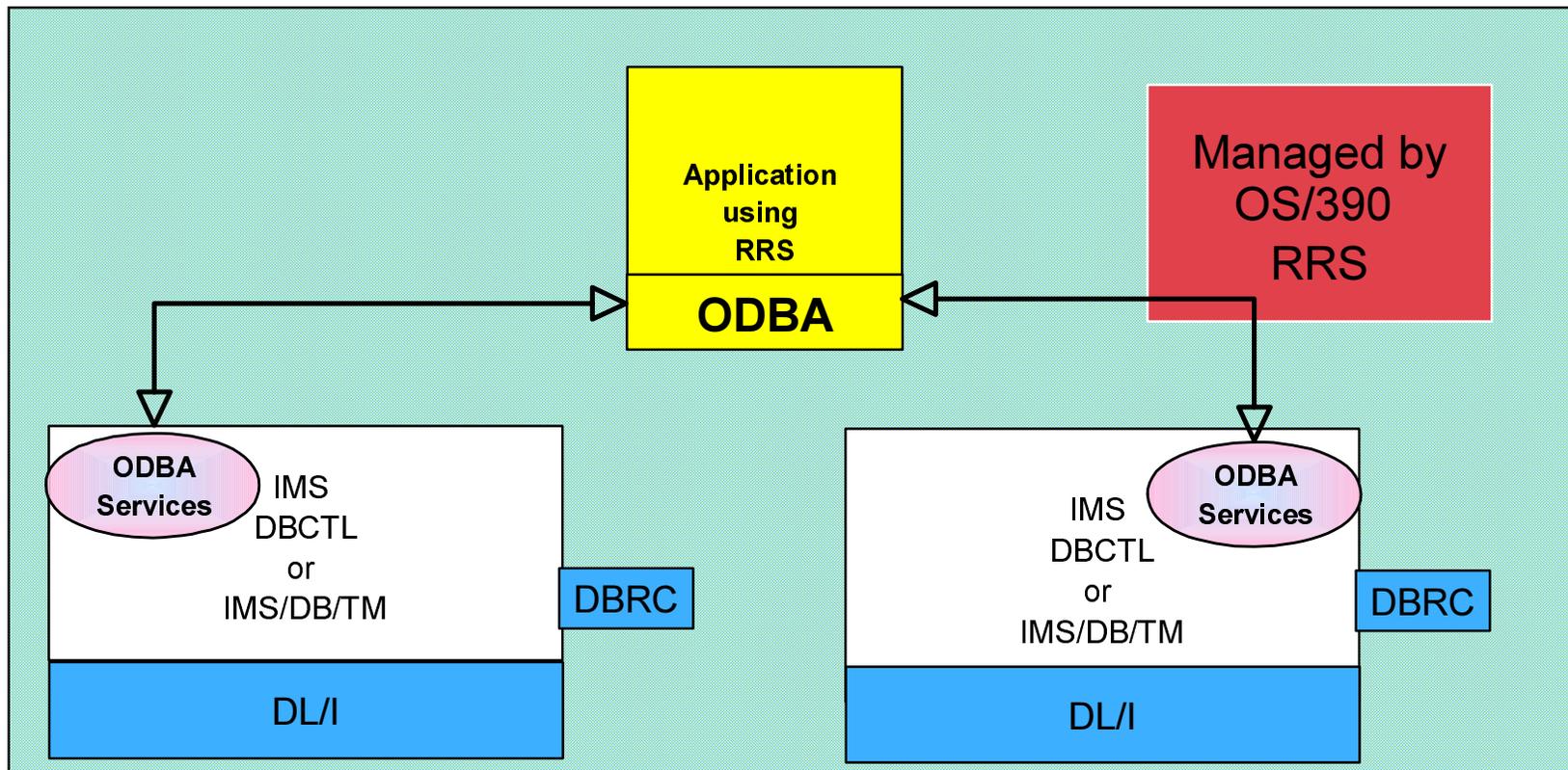
# IMS Connectivity - IMS Connect

- Previously IMS TCP/IP Connector (ITOC)
- MVS Address Space:
  - ▶ Listening port to Client via TCP/IP
  - ▶ XCF services to IMS via OTMA



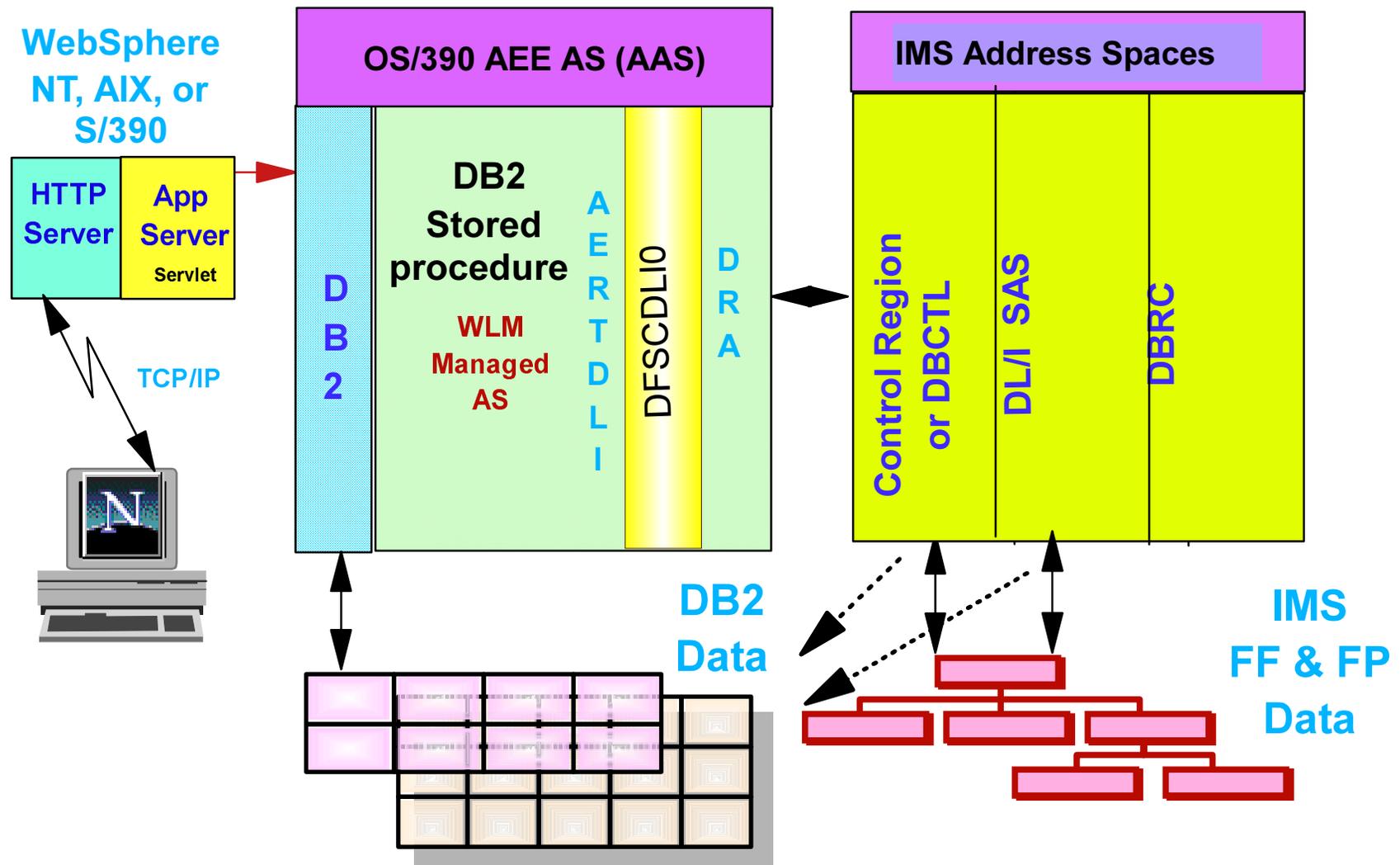
# IMS Connectivity - ODBA

- ODBA Callable DL/I Interface Outside IMS/TM or CICS
  - ▶ RRS/MVS is required
  - ▶ Any Address Space using RRS can use ODBA



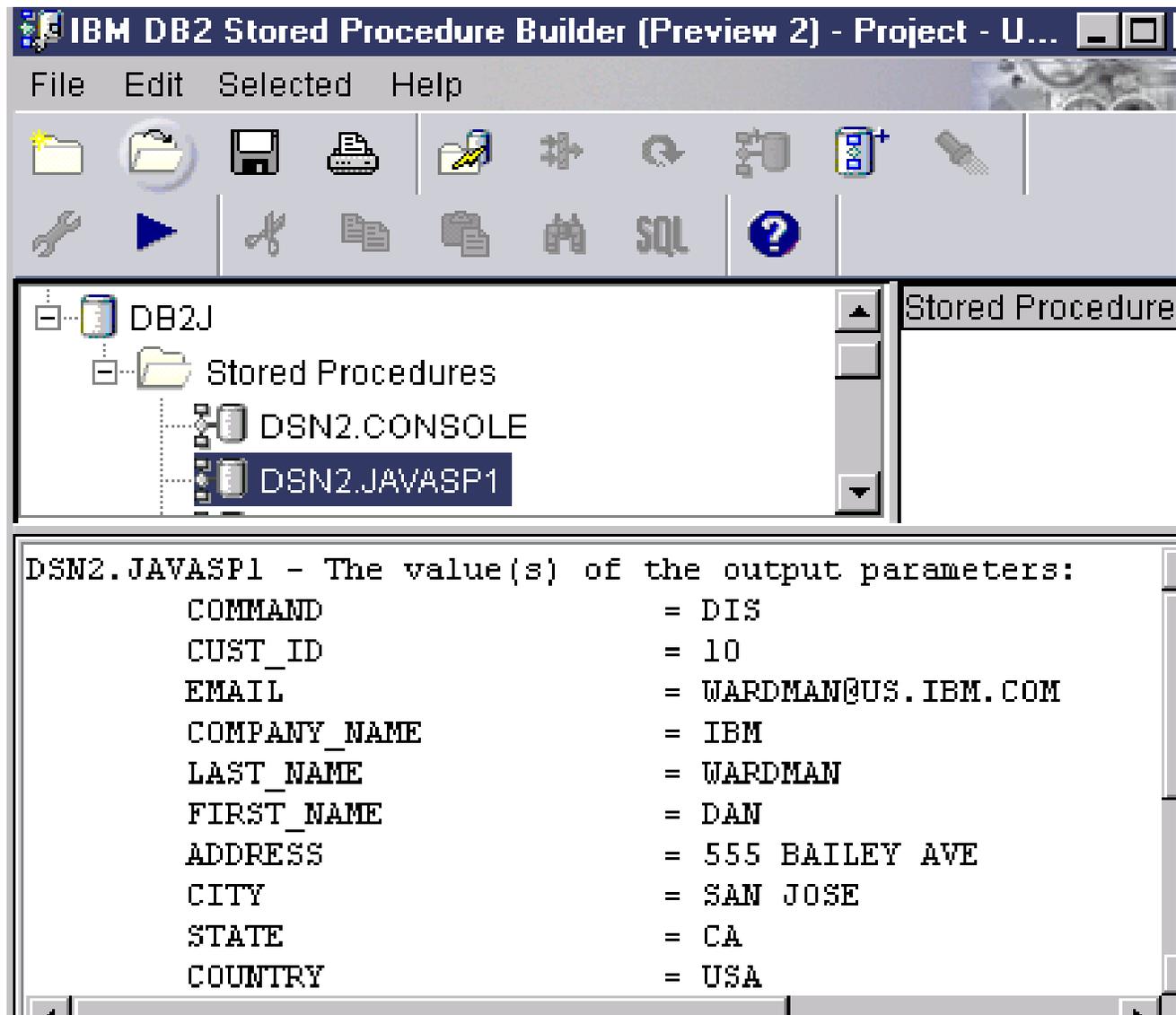
# IMS Connectivity - DB2 SP

- DB2 Stored Procedure to ODBA to IMS Database



# IMS Connectivity - DB2 SP ...

- SPB used to test DB2 COBOL Stored Procedure to IMS Data



# DB2 Connectivity

- TCP/IP
  - ▶ DRDA - OS/390 Connection
    - DB2 Connect or similar product
  - ▶ Private Protocol - AIX, WIN, OS/2 Connection
  
- DB2 Connection Definition
  - ▶ DB2 Catalog statements from a DB2 Command Line Processor (CLP) window
  - ▶ DB2 Client Configuration Assistant
  - ▶ Information - DNS Host Name, TCP Listening Port, and Database Name

# DB2 Connectivity - OS/390

- Information from OS/390 Console during DB2 Startup, **DSNL004I** Message:

DB2J DDF START COMPLETE

LOCATION DB2J  
LU USIBMSC.SCPDB2J  
GENERIC LU -NONE  
DOMAIN WTSC47.ITSO.IBM.COM  
TCPPOINT 33322  
RESPORT 33323

From DB2  
CLP  
Window

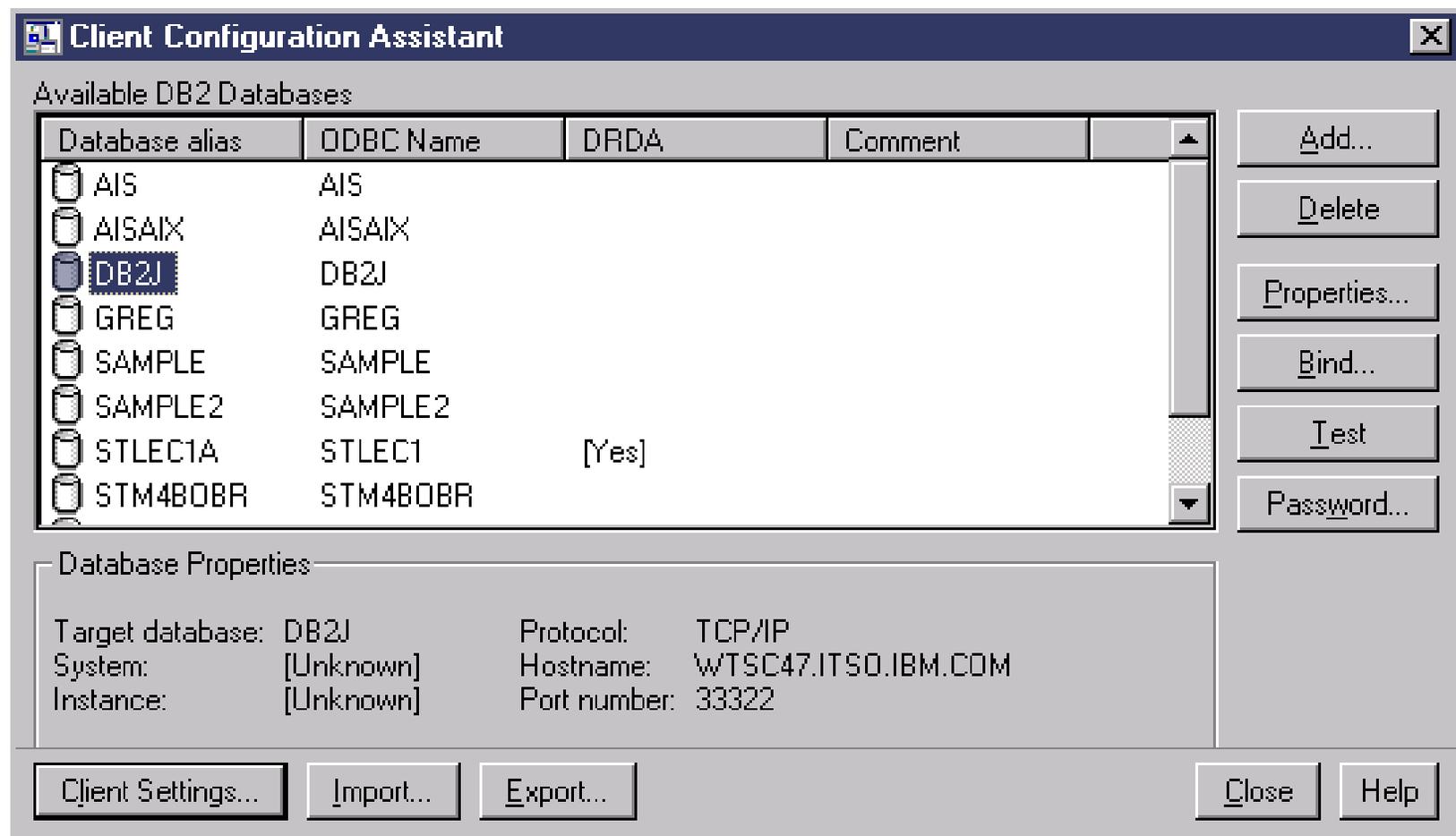
db2 catalog tcpip node TCP0000 remote WTSC47.ITSO.IBM.COM server 33322 ostype MVS  
db2 catalog database DB2J at node TCP0000 AUTHENTICATION DCS  
db2 catalog DCS database DB2J

NODENAME unique for each 390 system  
connection in the DB2 directory



# DB2 Connectivity

- Use Client Configuration Assistant
  - ▶ From DB2 Program Window
  - ▶ C:\SQLLIB\bin\db2cca.exe



# Connectivity Background

- Objective
  - ▶ Demonstrate connectivity with an 'e-business Test Drive'
  - ▶ Mix and Match pieces - databases and platforms
  
- Skill Level
  - ▶ Non Programmer
  - ▶ Limited DB2 experience
  - ▶ Limited to extensive Windows NT, IMS/TM and IMS/DB experience

# Query Servlet to IMS and DB2

1. Customer -DB2 NT  
Account - DB2 NT  
- WebSphere Test

2. Customer -DB2 390  
Account - DB2 AIX  
- WebSphere Test

3. Customer -DB2 390  
Account - DB2 AIX  
- WebSphere NT

4. Create Account NT SP  
Copy to AIX  
Access AIX SP  
- WebSphere Test

5. Customer DB2 SP/ODBA IMS 390  
Account DB2 390  
- WebSphere NT

6. Customer - IMS Tran 390  
Account DB2 AIX  
- WebSphere Test

9. Customer -IMS Tran 390  
Account - DB2 390  
- WebSphere 390

8. Customer -DB2 390  
Account - DB2 390  
- WebSphere 390

7. Customer -DB2 390  
Account - DB2 390  
- WebSphere NT

Enter Customer #:

Name:

Address:

City/State:

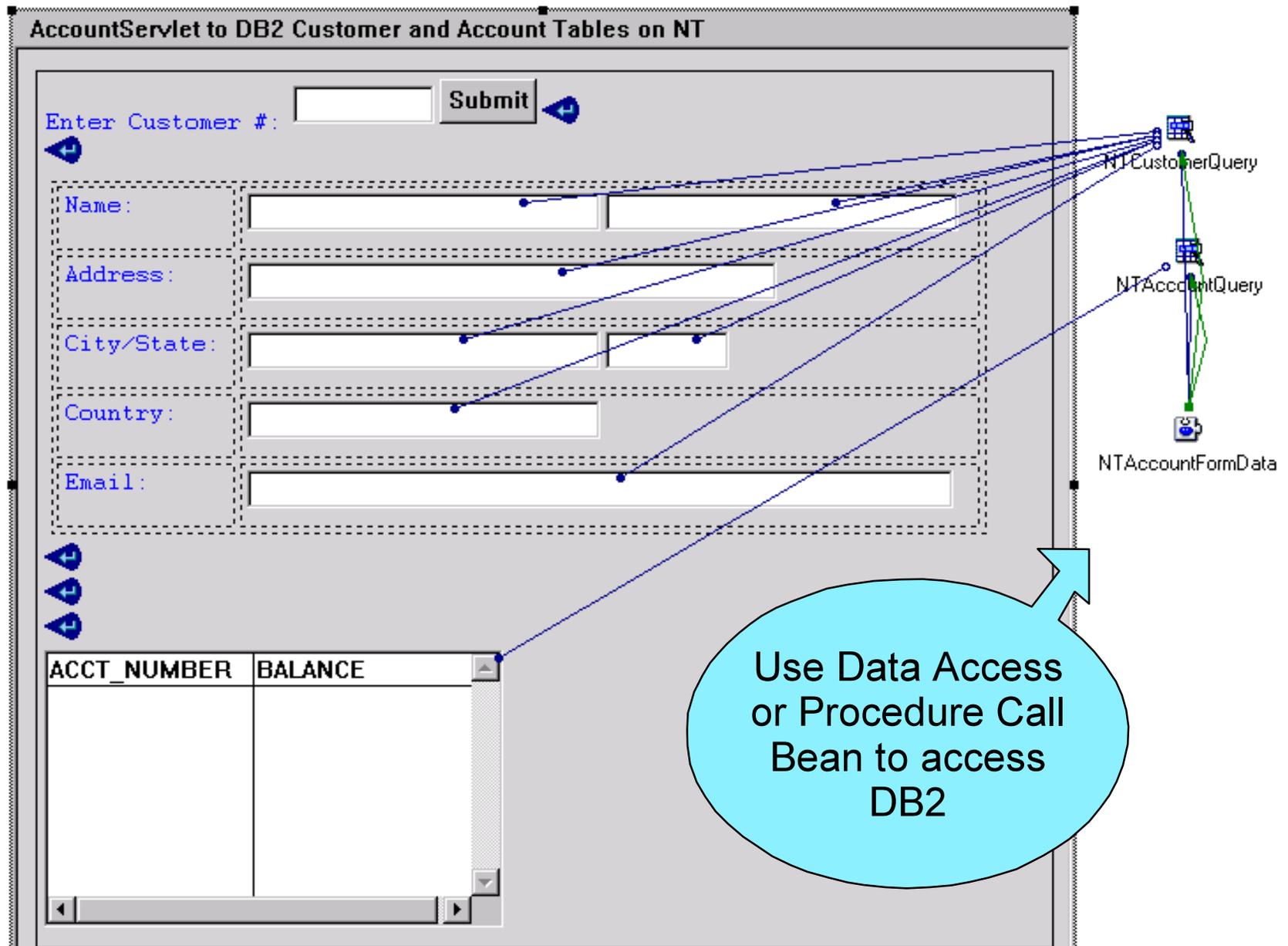
Country:

Email:

ACCOUNT.ACCT_NUMBER	ACCOUNT.BALANCE
20	500.50
21	500000.00

# VJava Developed Servlets

- DB2 Customer & Account Tables - NT

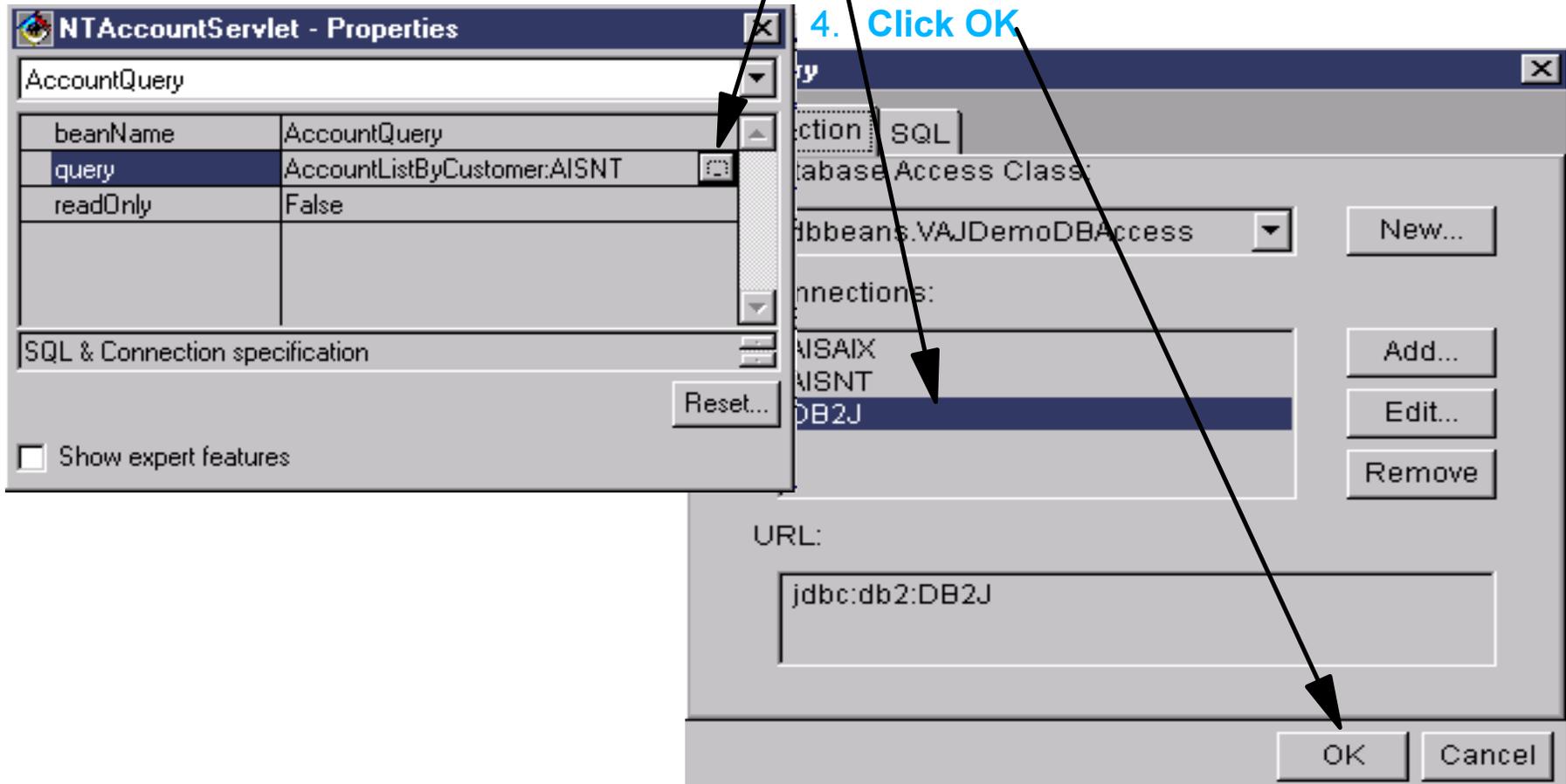


# Changing DB2 Platforms

- Once defined and added - just a few clicks



1. Click on AccountQuery bean
2. Click on query popdown
3. Select Connection, DB2J for OS/390
4. Click OK



The screenshot shows the 'NTAccountServlet - Properties' dialog box. The 'AccountQuery' bean is selected. The 'query' property is set to 'AccountListByCustomer:AISNT'. The 'readOnly' property is set to 'False'. The 'SQL & Connection specification' section is expanded, showing a list of connections. The 'DB2J' connection is selected. The 'URL' field contains 'jdbc:db2:DB2J'. The 'OK' button is highlighted.

beanName	AccountQuery
query	AccountListByCustomer:AISNT
readOnly	False

SQL & Connection specification

Reset...

Show expert features

Database Access Class: dbbeans.VAJDemoDBAccess

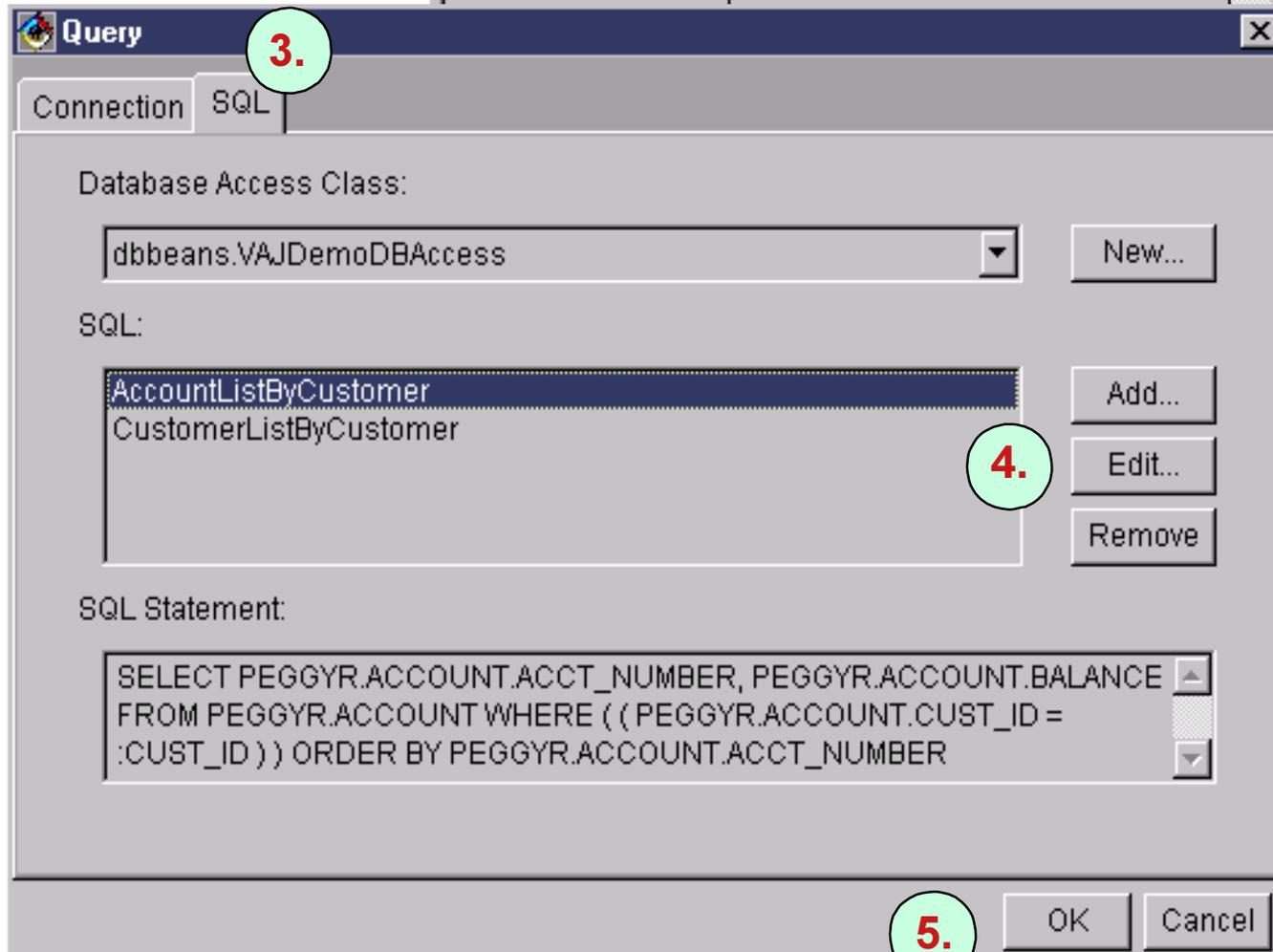
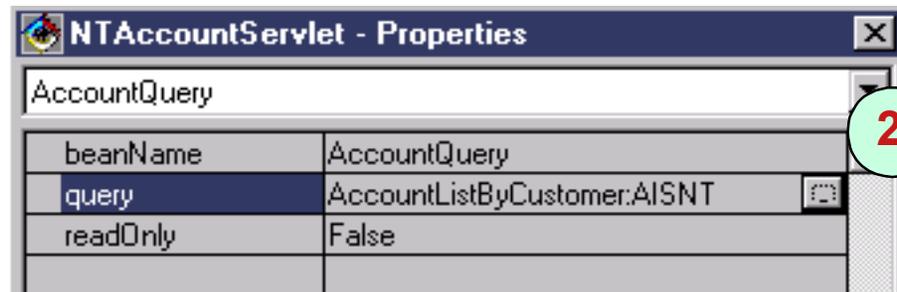
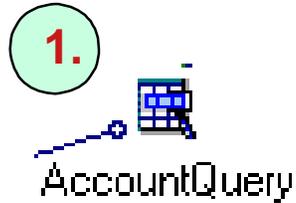
Connections:

- AISAIX
- AISNT
- DB2J**

URL: jdbc:db2:DB2J

OK Cancel

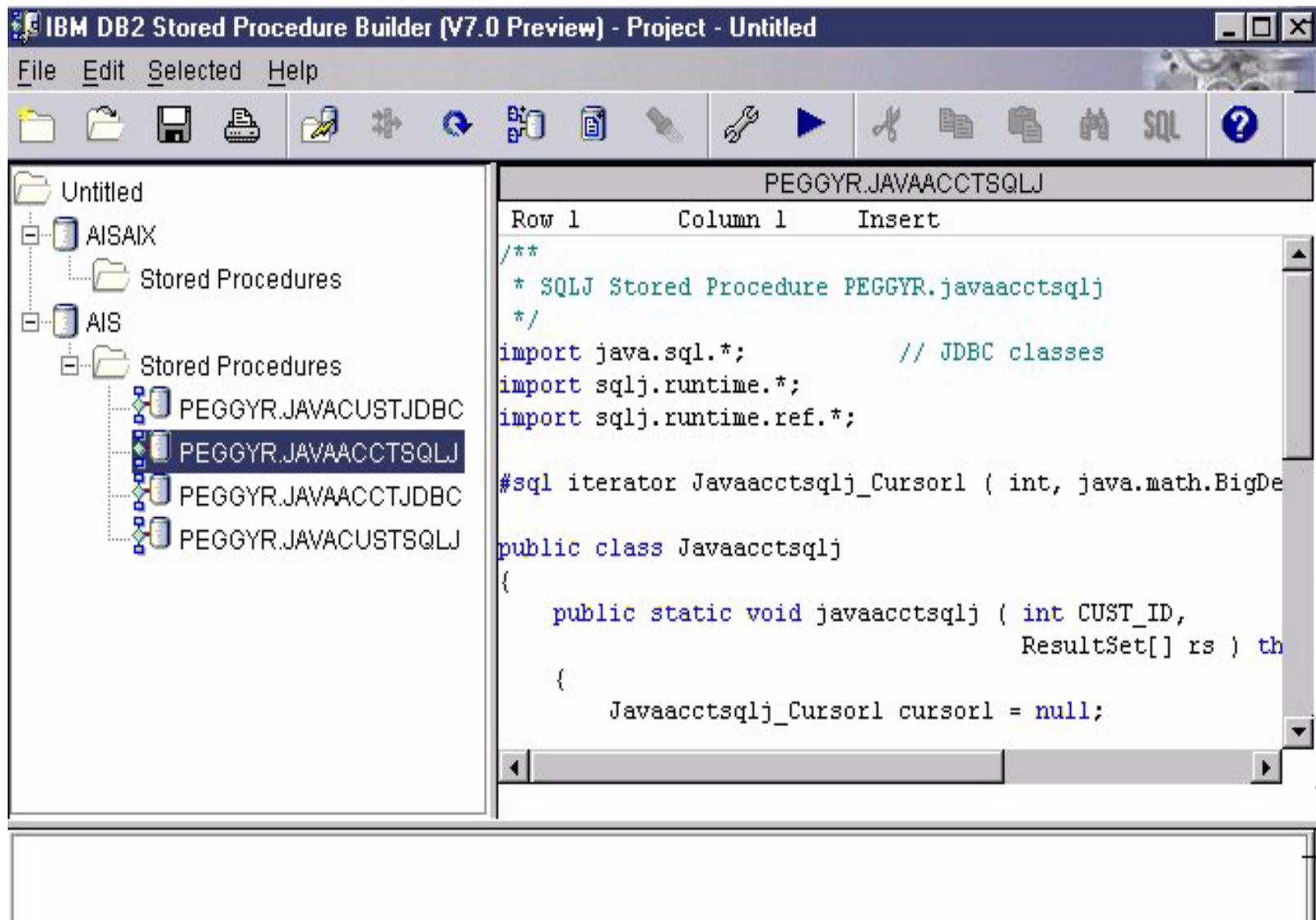
# Changing DB2 Query



1. Click on AccountQuery bean
2. Click on query popdown
3. Select SQL tab
4. Add, Edit or Remove SQL statement
5. Click OK

# Create an NT Java SP with SPB

- Copy NT SP and Paste and Build on AIX



# Use AIX Java SP for DB2 Access

1. Add a Procedure Call Bean from Database Palette

2. Name the Bean

3. Select DB2 system

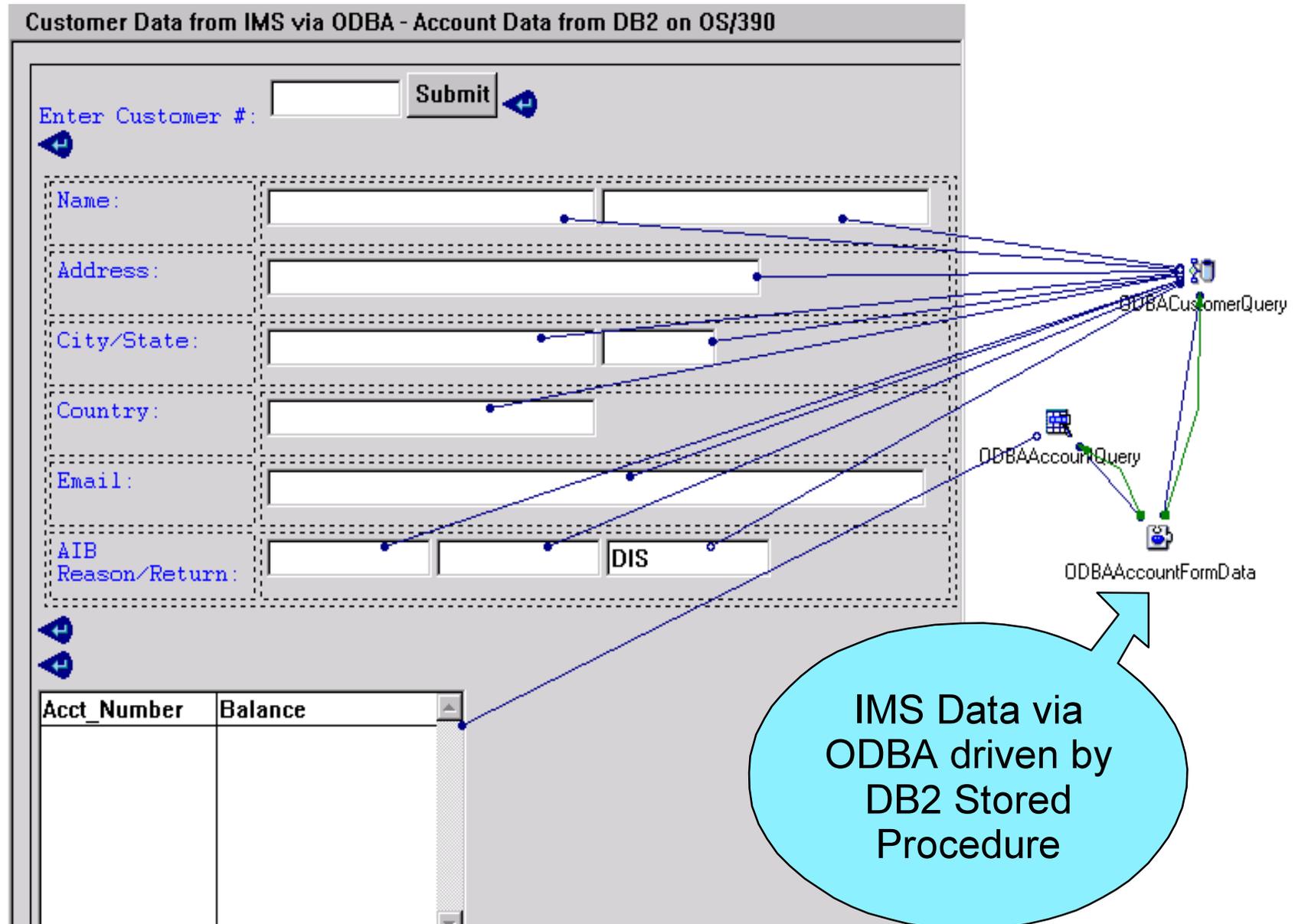
4. Select Query

The screenshot displays the following configuration details:

- Procedure Bean Configuration:**
  - Database Access Class: `dbbeans.VAJDemoDBAccess`
  - SQL: `javaacctjdbc` (selected)
  - SQL Statement: `{ CALL PEGGYR.JAVAACCTJDBC(CUST_`
- NTAccountServlet - Properties:**
  - Bean Name: `AccountQuerySP`
  - Procedure: `javaacctjdbc:AISAIX`
  - readOnly:
- Procedure (Connection) Configuration:**
  - Database Access Class: `dbbeans.VAJDemoDBAccess`
  - Connections: `AISAIX` (selected), `AISNT`, `DB2J`
  - URL: `jdbc:db2:aisaix`

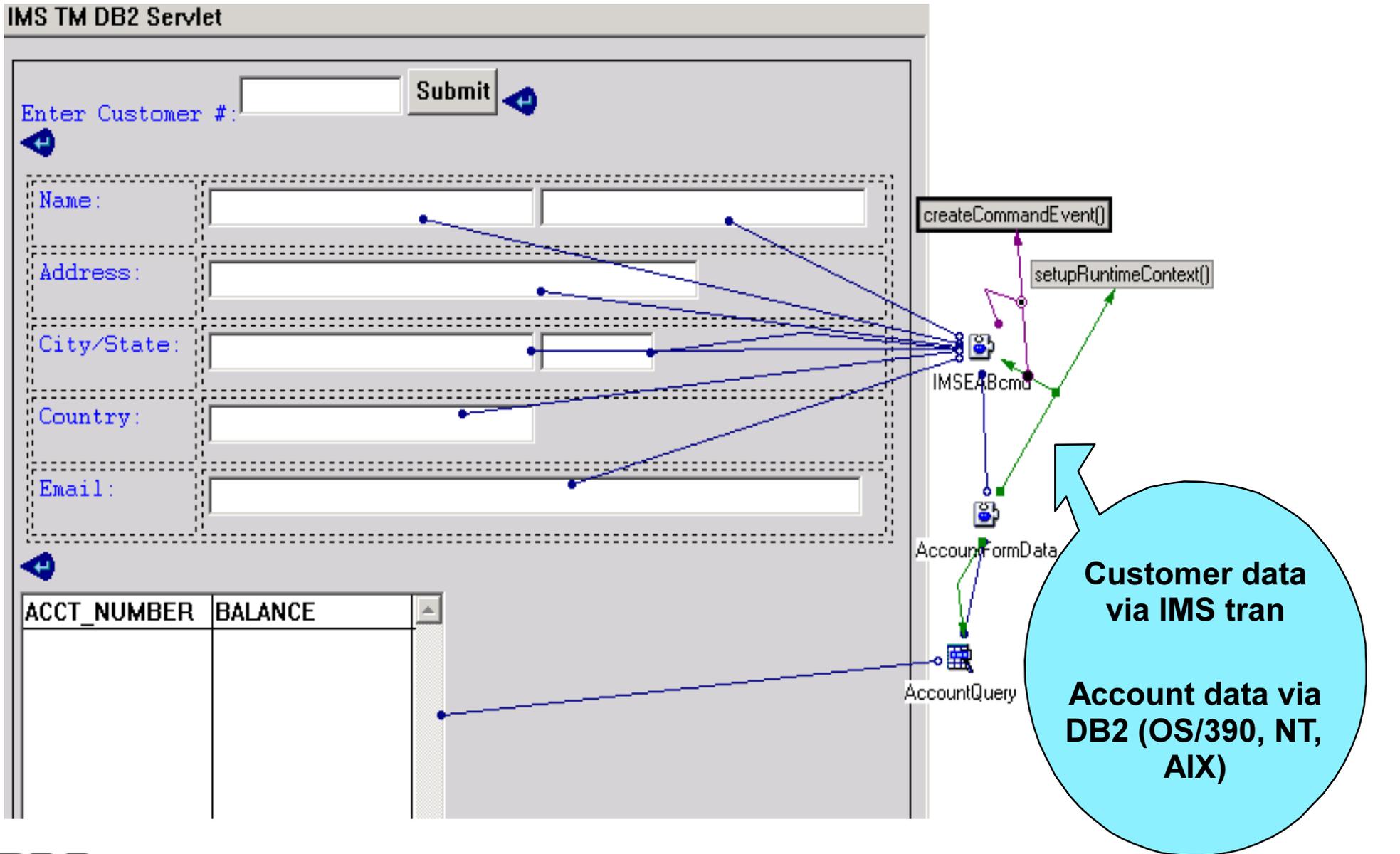
# VJava Developed Servlets ...

- MS Customer DB and DB2 Account Table



# VJava Developed Servlets ...

- IMS Customer DB and DB2 Account Table



# Summary

- Similar Development GUI 'Look and Feel'
  - ▶ Wizards and SQL Assist
    - VisualAge for Java
    - DB2 Stored Procedure Builder
    - DB2 Control Center
- Datastore Easily Changed
  - ▶ Connect with Procedure Calls or Data Access Beans

# Summary ...

- Platform Easily Changed
  - ▶ Good for development, scalability, availability, and performance
- Business Logic is the Focus for Programmers
  - Not how I get to my data

# Reference Material

## ■ Manuals:

- ▶ **SG24-5471**: IBM WebSphere and VisualAge for Java Database Integration with DB2, Oracle, and SQL Server
- ▶ **SG24-5142**: Integrating Java with Existing Data and Applications on OS/390
- ▶ **SG24-5081**: Application Development with VisualAge for Java Enterprise
- ▶ **SG24-5759**: DB2 UDB for OS/390 Version 6 Management Tools Package
- ▶ **SG24-5485**: Developing Cross-Platform DB2 Stored Procedures: SQL Procedures and the DB2 Stored Procedure Builder

# Reference Material...

## ■ Documents:

### ▶ **WebSphere Application Server**

– <http://www.ibm.com/software/webservers/appserv/library.html>

### ▶ **SQL Stored Procedures PDF**

– <http://www.ibm.com/software/data/db2/os390/sqlproc>

### ▶ **IMS TOC Connector for Java User's Guide**

– <http://www.ibm.com/software/data/ims/about/imstoc/document/index.html>

### ▶ **IMS Open Database Access (ODBA)**

– <http://www.ibm.com/software/data/ims/about/odba/odba.pdf>

# Reference Material...

- IBM Learning Services Courses:
  - ▶ **CM750 - 3 days**
    - IMS Data Access Workshop for e-business
  - ▶ **CF750 - 3 days**
    - DB2 UDB Workshop for e-business
  - ▶ **B3106 - 5 days**
    - Application Framework for e-business  
Technology Workshop