

**F17 Getting Started with WSAD to DB2 on Distributed and z/OS Platforms**  
*Peggy Rader, Sr. Software Engineer, IBM*

WebSphere Studio Application Developer, WSAD, is the follow-on technology to VisualAge for Java and WebSphere Studio. It consists of a common workbench and integrated set of tools that support end-to-end development, testing, and deployment of e-business applications. This presentation will describe some of the tool's functions including the Java, Data and Web perspectives to DB2 data on Windows, Linux and z/OS platforms. Demonstrations will be shown in the Expo area.

F17

# Getting Started with WSAD to DB2 on Distributed and z/OS Platforms

Peggy Rader - [peggyr@us.ibm.com](mailto:peggyr@us.ibm.com)



Anaheim, CA

Sept 9 - 13, 2002

© IBM Corporation 2002

- ▶ WebSphere Studio Application Developer, WSAD, is the follow-on technology to VisualAge for Java and WebSphere Studio. It consists of a common workbench and integrated set of tools that support end-to-end development, testing, and deployment of e-business applications. This presentation will describe some of the tool's functions including the Java, Data, Web and Debug perspectives to DB2 data on Windows, Linux and z/OS platforms.

# Trademarks

The following are trademarks of the International Business Machines Corporation in the United States and/or other countries.

AIX*	IBM logo*	RACF
CICS*	IMS	WebSphere*
DB2*	Language Environment	VisualAge*
e-business logo*	OS/390*	z/OS
ESCON*	S/390*	zSeries
IBM*	Parallel Sysplex*	

\* Registered trademarks of IBM Corporation

The following are trademarks or registered trademarks of other companies.

Lotus, Notes, and Domino are trademarks or registered trademarks of Lotus Development Corporation  
LINUX is a registered trademark of Linus Torvalds  
Penguin (Tux) complements of Larry Ewing  
Tivoli is a trademark of Tivoli Systems Inc.  
Java and all Java-related trademarks and logos are trademarks of Sun Microsystems, Inc., in the United States and other countries  
UNIX is a registered trademark of The Open Group in the United States and other countries.  
Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation.  
SET and Secure Electronic Transaction are trademarks owned by SET Secure Electronic Transaction LLC.

\* All other products may be trademarks or registered trademarks of their respective companies.

## Notes

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.

This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

IBM considers a product "Year 2000 ready" if the product, when used in accordance with its associated documentation, is capable of correctly processing, providing and/or receiving date data within and between the 20th and 21st centuries, provided that all products (for example, hardware, software and firmware) used with the product properly exchange accurate date data with it. Any statements concerning the Year 2000 readiness of any IBM products contained in this presentation are Year 2000 Readiness Disclosures, subject to the Year 2000 Information and Readiness Disclosure Act of 1996.

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

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the 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 and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Prices subject to change without notice. Contract your IBM representative or Business Partner for the most current pricing in your geography.

**DB2** Data Management Software



## Reference

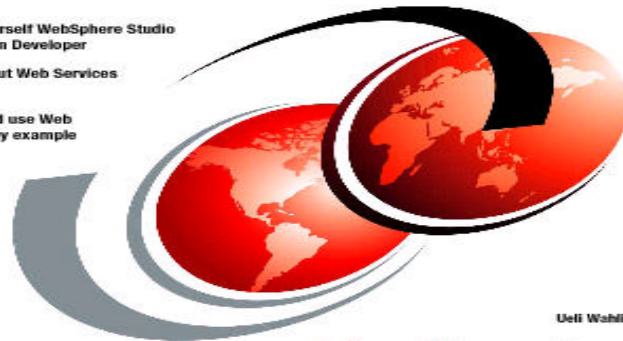
- SG24-6407 by Ueli Wahli used Extensively

### **Self-Study Guide: WebSphere Studio Application Developer and Web Services**

Teach yourself WebSphere Studio  
Application Developer

Learn about Web Services

Create and use Web  
Services by example



Ueli Wahli

**Redbooks**

[ibm.com/redbooks](http://ibm.com/redbooks)

**DB2** Data Management Software

**IBM**

- ▶ The Redbook, SG24-6407, by Ueli Wahli, has been used extensively in creating this presentation. The Redbook, includes both presentations, and corresponding exercises using WSAD V4.02 and DB2 UDB for Windows on V7.
- ▶ Corresponding equivalent schema have been created on DB2 for z/OS on V7 and on DB2 on Linux for z/OS V7, which are used in this presentation. The schema DDL for z/OS can be found at in the Appendix at the end of this presentation. The schema used to generate the Windows DDL is found in the appendix of the Redbook and also used to create the Linux DDL.
- ▶ Additional material, including the DDL and Data used in the exercises, code snippets for the exercises, solutions and minor corrections can be found at:
  - ▶ <ftp://www.redbooks.ibm.com/redbooks/SG246407>



## Topics

---

- WSAD - What is it?
- WSAD Perspectives
  - ▶ Java
  - ▶ Data
  - ▶ Web
  - ▶ Server
- Testing
- Debugging
- Miscellaneous

 Data Management Software



- ▶ The topics that will be covered are listed on this slide.
- ▶ Focus will include accessing DB2 data on Windows, z/OS and on Linux on z/OS, and how to switch the application to access one platform, and easily change to a different platform which could be used during development stages.

## WSAD - What is it?

- **WebSphere Studio Application Developer (WSAD)**
  - ▶ Comprehensive Development Environment
  - ▶ Follow-on technology for WebSphere Studio and VisualAge for Java
- Based on Eclipse Workbench ([www.eclipse.org](http://www.eclipse.org))
- Part of WebSphere Studio Application Family
  1. WebSphere Studio Site Developer (WSSD)
  2. **WebSphere Studio Application Developer (WSAD)**
  3. WebSphere Studio Application Developer Integration Edition (WSADIE)
  4. WebSphere Studio Enterprise Developer (WSED)
- One tool designed with multiple perspectives, views and editors to work with resources

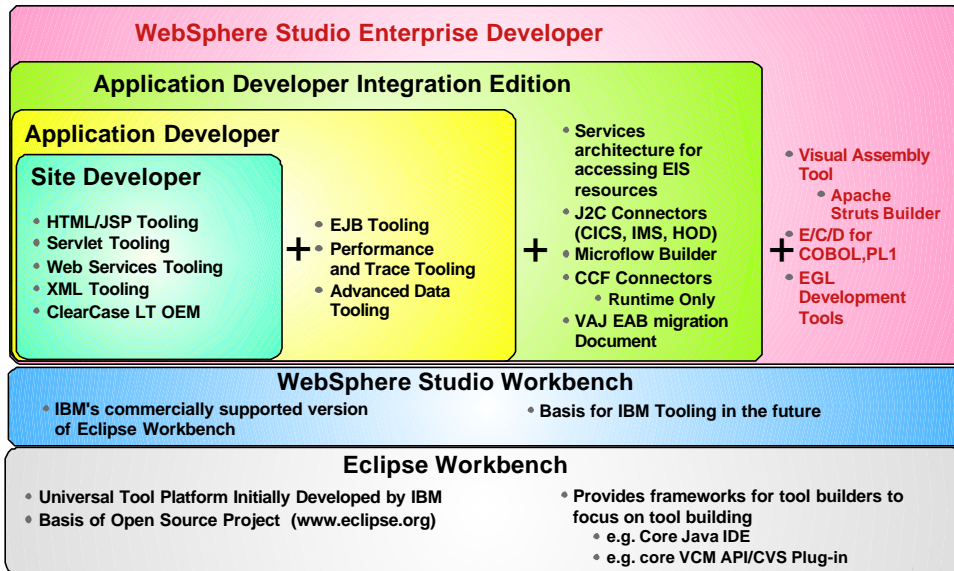
DB2 Data Management Software



- ▶ WebSphere Studio comes in multiple configurations to best meet your Web development needs. The configuration being covered today is WSAD. It is a comprehensive development environment based on the Eclipse workbench. It is part of the WebSphere Studio Application family, where each configuration includes the predecessor one. WSAD, includes the functions of WSSD plus the following::
  - ▶ In addition to including features in the Site Developer, WSAD provides:
    - ▶ Full EJB 1.1 support
    - ▶ J2EE 1.2 support
    - ▶ Profiling (performance analysis tools)
    - ▶ EJB deployment
    - ▶ Migration and interoperation with VisualAge for Java
    - ▶ Full database support for many platforms and database vendors
- ▶ The product is one tool that provides many different perspectives, or views for the function being performed by the developer.

# WSAD - What is it? ...

## ■ WebSphere Studio Tooling Platform



- ▶ This chart shows how the different products build on each other starting with WSSD and ending with WSED.
- ▶ The URL, <http://www7b.boulder.ibm.com/wsdd/zones/newcomers/> includes detailed information on all of the different products described on this slide.



## WSAD - What is it? ...

---

- End-to-end support for application development:
  - ▶ Java/J2EE
  - ▶ Relational Data
  - ▶ Web Applications
  - ▶ XML
  - ▶ Web Services
  - ▶ Debugging & Profiling
  - ▶ Team support
  - ▶ Server configuration
  - ▶ Unit testing
  - ▶ Plug-in development
- Highly customizable
- Extensible

 Data Management Software



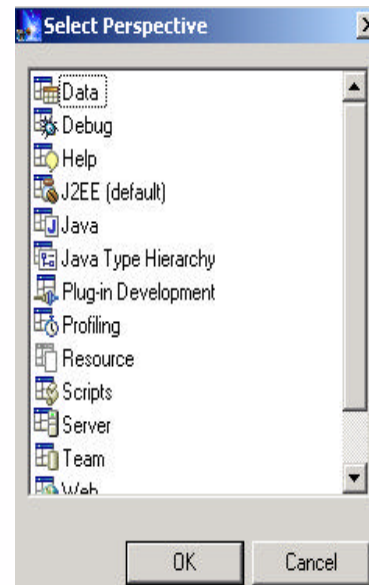
- ▶ WSAD is an open-standard J2EE application development product that represents the next step in an evolutionary path that began with VisualAge for Java Enterprise Edition and WebSphere Studio Advanced Edition. It is a member of the new WebSphere Studio family of application development products that also includes WebSphere Studio Homepage Builder, WebSphere Studio Site Developer, and WebSphere Studio Enterprise Developer.
- ▶ The items listed on this slide are included. The environment, including panels, is highly customizable and can have plug-ins added (vendor or user written).



## WSAD Perspectives

### What are they?

- Perspectives provide role based views of panels based on tasks
  - ▶ Perspectives can be customized by developer
  - ▶ Multiple perspectives can be opened at a time
- Provides different look and feel for different functions
  - ▶ Menus, toolbars, icons
- Editors - source and design
- Many wizards included



DB2 Data Management Software



- ▶ The WSAD tooling operates using perspectives, which are:
  - ▶ "canned", where you select from a list of predefined views, or they can be "customized", where you create your own set of views
- ▶ Multiple perspectives can be opened at a time, and are easy to switch between. Each perspective affects the toolbar and menu bar.
- ▶ A different look and feel is presented with each perspective with the supported options related to the task being performed. Different views have different purposes which allow you to browse or edit a set of information in a particular way. E.g. from the Java Perspective, there is a Tasks view, Java Hierarchy/Packages views, and an editor view
- ▶ The Navigator view shows all the files and resources in your workspace in a project/folder hierarchy, and many of the perspectives include a 'Navigator' view.
- ▶ Different editors are provided for source and design of the different resources.
- ▶ Many wizards are included to help create new resources and generate code.
- ▶ The graph on the right shows how you select a perspective to operate in.

## Perspectives Covered

- Java
- Data
- Web
- Server
- Debug
  
- Comparable DDL and SQL files created on
  - ▶ DB2 on Windows V7
    - Updated data in SQL file to include "Windows"
  - ▶ DB2 on Linux on z/OS V7 (no changes needed to DDL)
    - Updated data in SQL file to include "Linux390"
  - ▶ DB2 on z/OS V7 (minor changes needed to DDL)
    - Updated data in SQL file to include "DB2V7390"
    - See Appendix at end of presentation

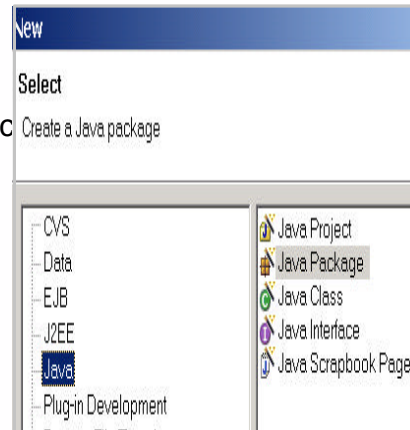
 DB2 Data Management Software



- ▶ The perspectives covered in this presentation are listed on this slide. The examples used in these perspectives will access DB2 data on multiple platforms, including Windows, Linux and z/OS. The same DDL was used on the Windows and Linux platforms. Minor changes, included in the Appendix at the end of this presentation, were made to create the DDL on z/OS. Significance was placed in the data of each platform tables, as described on the slide to show which platform is being accessed in the examples.
- ▶ The initial DDL and Data used can be found in the additional materials for the Redbook at:
  - ▶ <ftp://www.redbooks.ibm.com/redbooks/SG246407>

## Java Perspective

- Functions included
  - ▶ Class navigation
  - ▶ Editor content assist & syntax highlighting
  - ▶ Incremental build - manual or automatic
  - ▶ Tight integration with Tasks view
- Tools
  - ▶ Wizards - packages, classes, interfaces, methods, source folder
  - ▶ Browsing support
  - ▶ Debugger & profiler
  - ▶ Project properties - define source folders, build path and output
- Packages, Hierarchy & Java Beans views and Java editor



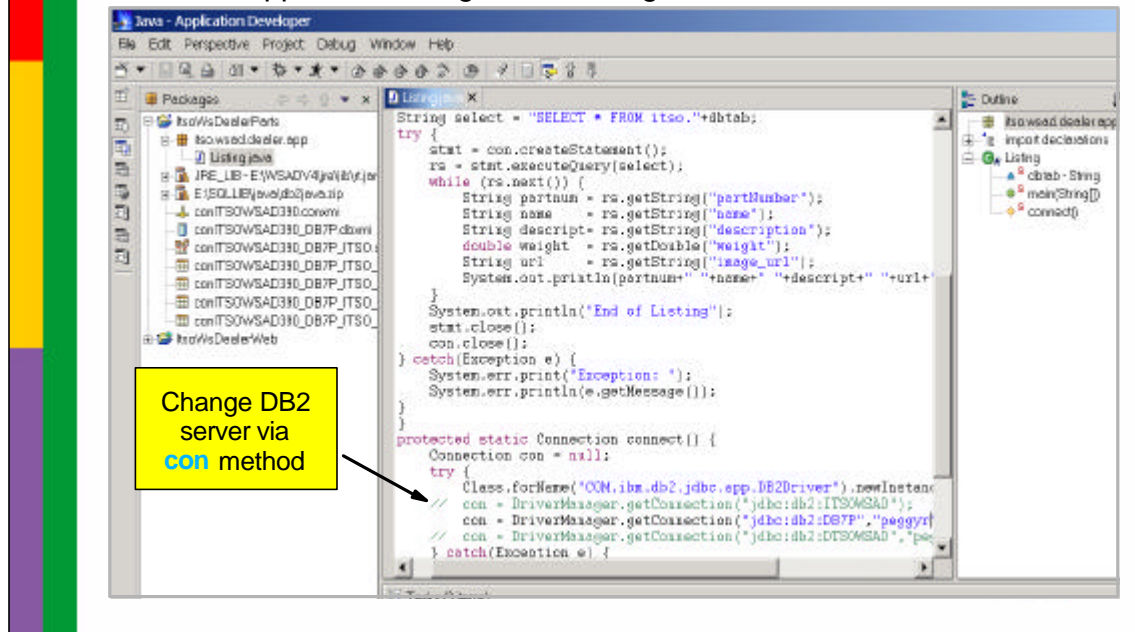
DB2 Data Management Software



- ▶ Functions supported in this perspective are listed on the slide. Syntax errors are highlighted in the Tasks view to assist for easy identification and correction.
- ▶ The tools include many wizards to help develop your code. Editors exist that allow you to easily modify any generated code. Debugging support is described in more detail later in the presentation.
- ▶ When viewing the properties of the project, you can define source folders and identify any needed files (jars/zips) to build the application.
- ▶ The Java perspective includes views for Packages, Hierarchies, creating Java Beans as well as a Java editor.
- ▶ The picture on the right shows the choices of what can be created from the Java Perspective.

## Java Perspective ...

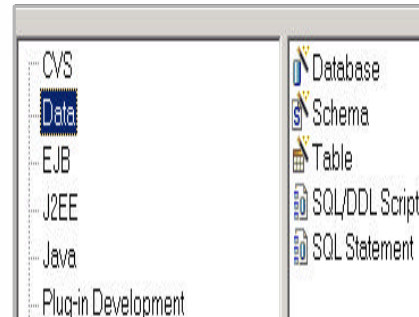
- Redbook Exercise 1
  - ▶ Java application using DriverManager



- ▶ Functions supported in the Java perspective can be seen when following the steps in Exercise 1 of the Redbook which creates a Java application, Listing, that displays a parts listing.
- ▶ The application is easily tested by clicking on the 'Runner' icon on the toolbar.
- ▶ This examples uses DriverManager to connect to the database, which includes hardcoded connection information in the application. Since we created comparable DDL on Linux and z/OS DB2 systems, switching to different DB2 servers, only requires changing the connection information.
- ▶ The DB2 Client Configuration Assistant (CCA) is used to define access to the different DB2 servers by an alias name. To change access to the different platforms, only requires changing the connection alias and userid/password, then recompiling and running the Java application.
  - ▶ Tests were run against each DB2 platform - changing the following line of code
    - ▶ DB2 V7 on Windows (alias ITSOWSAD)
      - ▶ con =  
DriverManager.getConnection("jdbc:db2:ITSOWSAD","peggyr","mypwd");
    - ▶ DB2 V7 on Linux on z/OS (alias DTSOWSAD)
      - ▶ con = DriverManager.getConnection("jdbc:db2:DTSOWSAD","peggyr","mypwd");
    - ▶ DB2 V7 on z/OS (alias DB7P)

## Data Perspective

- Functions and Tools included
  - ▶ Database connection
  - ▶ Work online or off-line
  - ▶ Browse or edit database schema
  - ▶ Create Databases
  - ▶ Create Tables
  - ▶ Generate DDL
  - ▶ SQL Builder to create SQL statements
- DB Explorer, Data, Navigator & Tasks views and editors



DB2 Data Management Software



- ▶ The Data Perspective provides views and tools for definition and maintenance of descriptors for database, schema, and table definitions.
- ▶ This perspective supports a Server view or Local view of database schema, which allows database information to be imported to a 'local' mode to allow development without being connected to the server.
- ▶ Wizards exist to help create databases, tables and SQL statements
- ▶ The operating views related to this perspective are described at the bottom of this slide.
- ▶ The picture on the right shows the choices of what can be created from the Data Perspective.

## Data Perspective ...

- Connecting to a server uses the - Connection Wizard
  - ▶ Defined in Data Perspective, DB Explorer View

DB7P is  
DB2 V7  
on z/OS

Connection name: ConIT80W5AD390  
Database: DB7P  
User ID: peggyr  
Password:   
Database vendor type: DB2 UDB for OS/390, V7  
JDBC driver: IBM DB2 APP DRIVER  
Host:   
(Optional) Port number:   
Server name:   
JDBC driver class: COM.ibm.db2.jcc.app.DB2Driver  
Class location: E:\SOLUB\java\db2jcc.zip Browse...  
Connection URL: jdbc:db2:DB7P  
Filters...

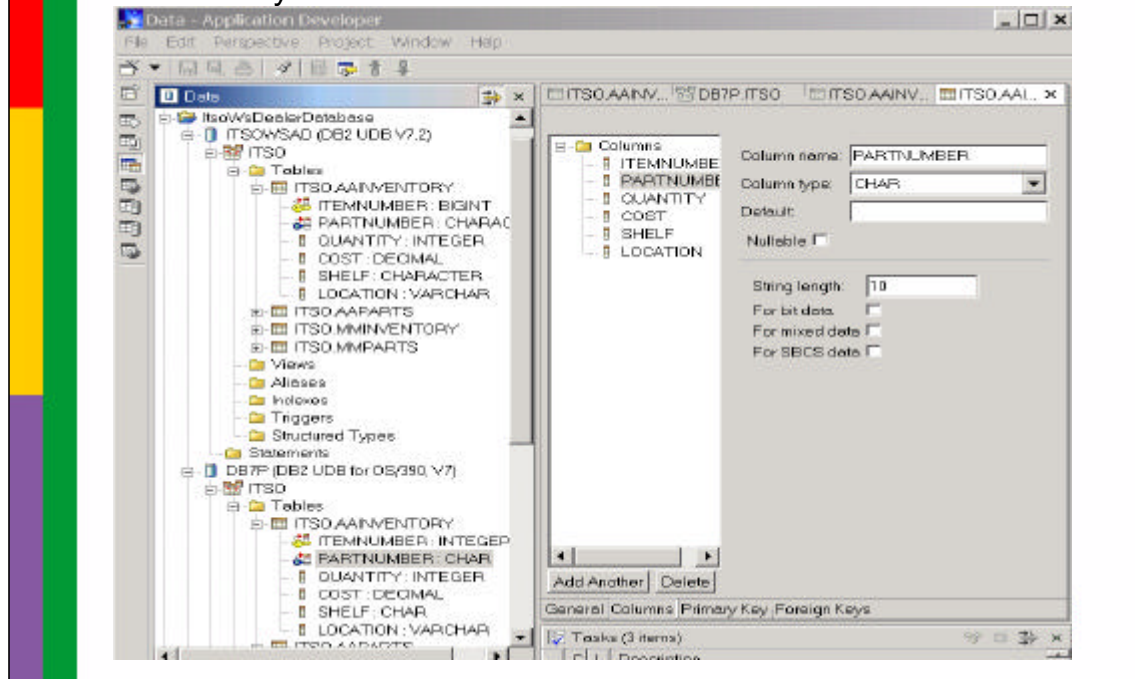
DB2 Data Management Software

IBM

- ▶ To connect to a DB2 server uses the connection wizard which is accessed from the Data Perspective, in the DB Explorer view.
- ▶ The example on this slide shows connecting to a DB2 on z/OS V7, using the previously defined, CCA alias, DB7P. The Database Vendor type of DB2 UDB for OS/390 V7 is selected.

## Data Perspective ...

- Previously created Table



- ▶ Using the Data view, you see the previously defined table, ITSO.AAINVENTORY, expanded for DB2 on Windows and for DB2 on z/OS. Selecting 'PARTNUMBER' from our z/OS version of the table opens up the table in the right hand window where we can view information related to 'General, Columns, Primary Key and Foreign Keys' Schema changes can be made, and DDL can be generated. Since you are operating in Local mode at this point, switching between systems and viewing table definitions is very quick.



## Data Perspective ...

---

- Create New SQL Statements
  - Select, Select Distinct, Insert, Update, Delete
- Create from
  - ▶ Wizard - SQL Assistant
  - ▶ Resource and invoke SQL Query Builder
  - ▶ Manually
- Use existing database model
- Connect to database and import new database model

DB2 Data Management Software



- ▶ From the Data Perspective, you can create new SQL statements, query, update and delete. The panel, shown on the next slide, provides selection of the DB2 table, and input for a name, and manner in which you wish to create your statement, using:
  - ▶ A wizard, that drives the SQL Assistant code
  - ▶ A resource, that invokes the SQL Query Builder, which provides drag and drop to build the statement
  - ▶ Manually, where you write your SQL statement.
- ▶ When creating a new SQL statement from this option uses a database model that has previously been created or imported to WSAD, or you can connect to a remote server and import the model you wish to use.



## Data Perspective ...

- Create a New SQL Statement
  - ▶ Identify type
  - ▶ Statement create
  - ▶ Choose database
  - ▶ Name statement

**Create a New SQL Statement**

**Specify SQL statement information**  
Specify the type of SQL statement, how you want to construct it, the database model to use and a name statement.

What SQL statement do you want to create?

SQL statement:

How would you like to create your SQL statement?

Be guided through creating an SQL statement  
 Create an SQL resource and invoke the SQL Builder  
 Manually type an SQL statement

Choose a database model for the SQL statement. The SQL statement will be saved in the same folder.

Use existing database model  
 Connect to a database and import a new database model

Database Model:

Folder:

Specify the name of the SQL statement. It must be unique within the database model's folder.

Folder:

SQL Statement Name:

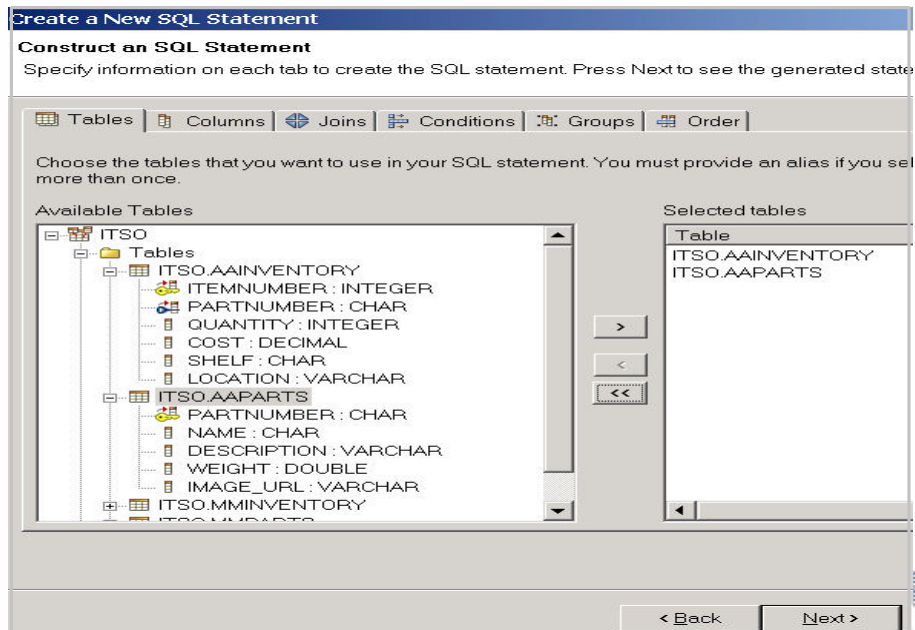
DB2 Data Management Software



- ▶ This slide shows the "Create a New SQL Statement" panel.
- ▶ First, we'll create SQL Statement for 'SELECT' and use the SQL Assistant wizard against our DB2 on z/OS V7 database.

## Data Perspective ...

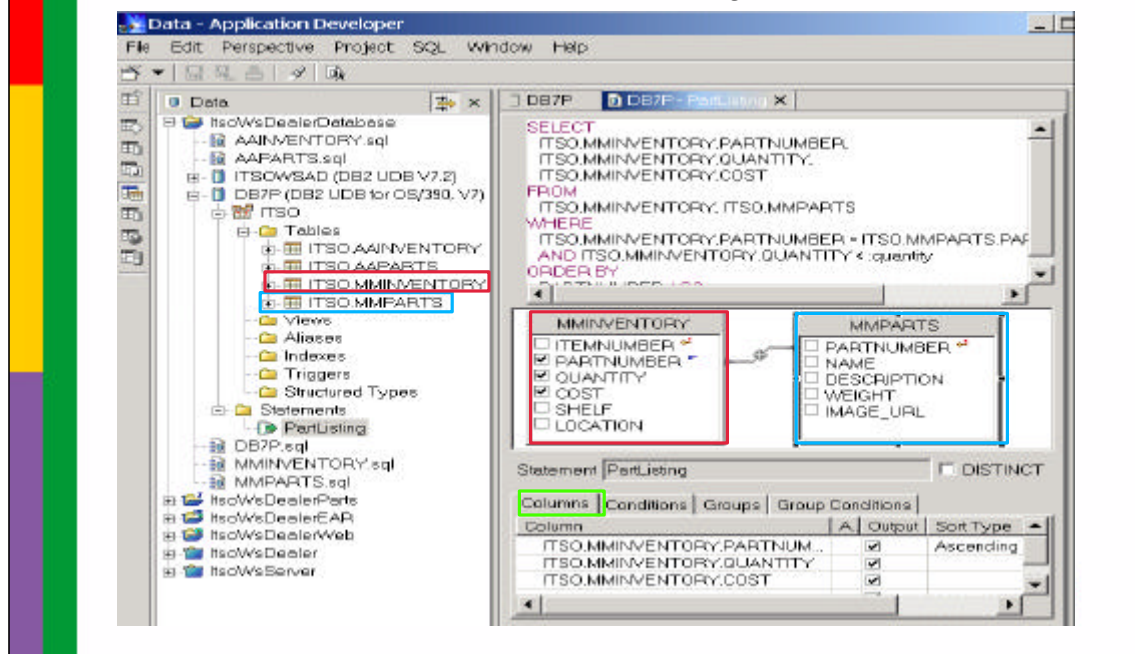
- Be guided through creating an SQL statement



- ▶ This slide shows the panels in the SQL Assistant. From this wizard, you can
  - ▶ Select one or more tables
  - ▶ Select the columns of each table to be included
  - ▶ Identify how the Join is constructed between the tables
  - ▶ Specify any Conditions for invoking this statement
  - ▶ Identify any Grouping or Order for the output of the statement
- ▶ When you have completed creating the SQL statement, you can execute it to see if the results are what you expect before continuing further, and modify the SQL statement in the wizard if your results are incorrect.

## Data Perspective ...

- Create an SQL Statement from invoking the SQL Builder

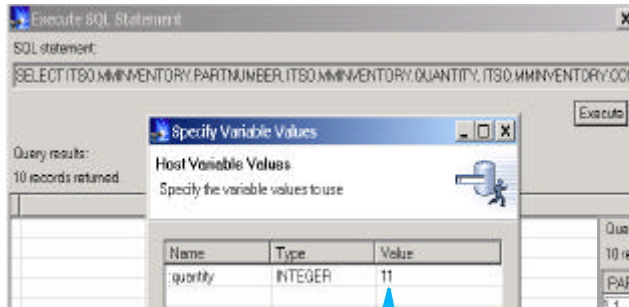


- ▶ This next example shows creating the "PartListing" SQL statement using the SQL Builder. This example uses Exercise 2 in the Redbook.
- ▶ Two tables have been selected, MMINVENTORY and MMPARTS
- ▶ The query builder is used to 'check' the columns, establish the join, and specify the order for this statement. Upon completion, the SQL statement can be executed.
- ▶ The SQL Query Builder uses drag and drop and point and click to create the statement.

## Data Perspective ...

- SQL Query Builder - Test Query

- ▶ Click on "execute the SQL statement" icon



③ Enter Input Parm

④ View Results

Query results:  
10 records returned

PARTNUMBER	QUANTITY	COST
L1	1	30.00
M10010003	10	59.99
T0	1	99.00
T1	1	11.00
T2	1	22.00
T3	1	33.00
T4	1	44.00
T5	1	55.00
W111111111	2	12.34
X333333333	7	12.34

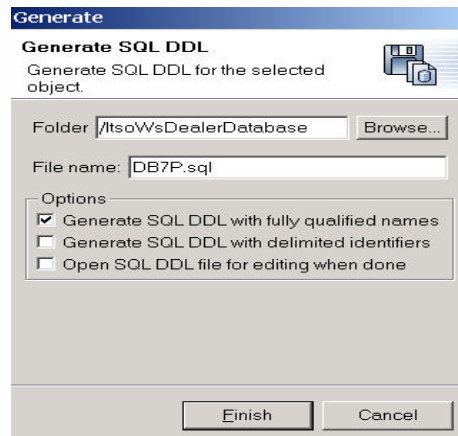
DB2 Data Management Software



- ▶ This slide shows how the execution of the statement is made. When positioned on a SQL Statement from the Data Perspective, select the "execute the SQL Statement" icon from the toolbar.
- ▶ This displays the "Execute SQL Statement" panel, where you see your statement, and can click on "Execute".
- ▶ If host variables are used, a panel will appear where those can be entered. Hitting the "Enter" key causes the SQL statement to execute and the results returned.

## Data Perspective ...

- Generate DDL
  - ▶ Generate with full qualified names
  - ▶ Generate with delimiters



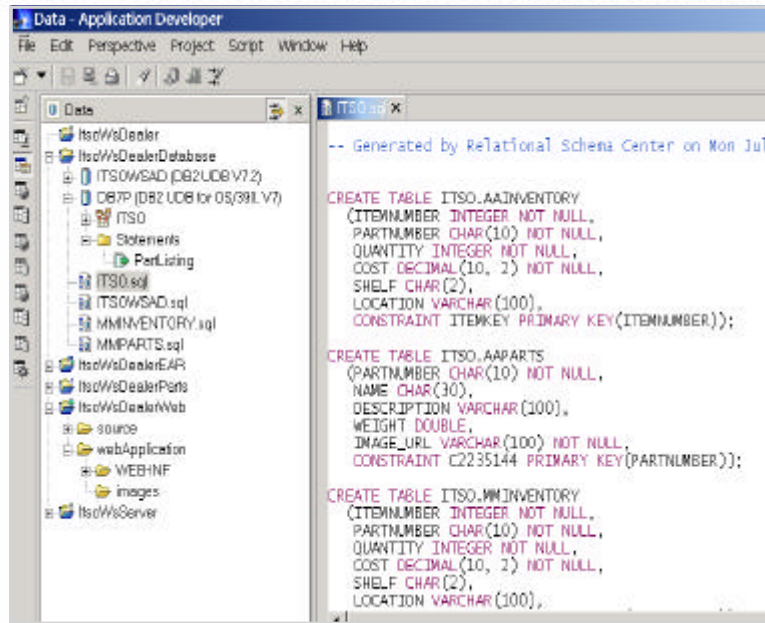
DB2 Data Management Software



- ▶ Also from the Data Perspective, you can generate DDL for any database or table and other resources. You can select to have the generated DDL include fully qualified names, as well as include delimiters.

## Data Perspective ...

- Generated DDL
  - ▶ Can be edited



```
-- Generated by Relational Schema Center on Mon Jul
CREATE TABLE ITSO.AAINVENTORY
  (ITEMNUMBER INTEGER NOT NULL,
  PARTNUMBER CHAR(10) NOT NULL,
  QUANTITY INTEGER NOT NULL,
  COST DECIMAL(10, 2) NOT NULL,
  SHELF CHAR(2),
  LOCATION VARCHAR(100),
  CONSTRAINT ITEMKEY PRIMARY KEY(ITEMNUMBER));

CREATE TABLE ITSO.AAPARTS
  (PARTNUMBER CHAR(10) NOT NULL,
  NAME CHAR(30),
  DESCRIPTION VARCHAR(100),
  WEIGHT DOUBLE,
  IMAGE_URL VARCHAR(100) NOT NULL,
  CONSTRAINT C2235144 PRIMARY KEY(PARTNUMBER));

CREATE TABLE ITSO.MMInventory
  (ITEMNUMBER INTEGER NOT NULL,
  PARTNUMBER CHAR(10) NOT NULL,
  QUANTITY INTEGER NOT NULL,
  COST DECIMAL(10, 2) NOT NULL,
  SHELF CHAR(2),
  LOCATION VARCHAR(100),
```

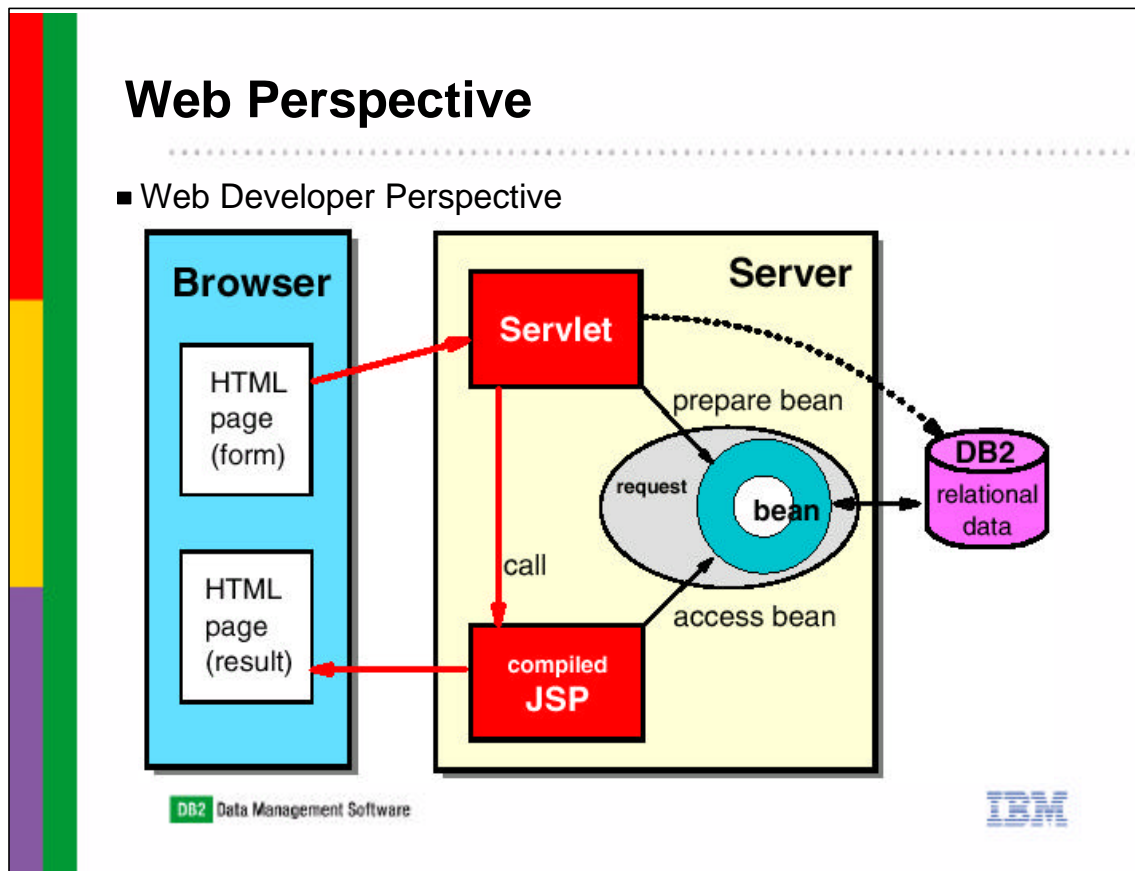
DB2 Data Management Software



- ▶ This slide shows the example of the DDL for creating our DB2 on z/OS V7 tables used in this presentation. The generated DDL creates a 'sql' extension file, and can be edited.
- ▶ This can be useful when migrating databases and tables between DB2 subsystems.

# Web Perspective

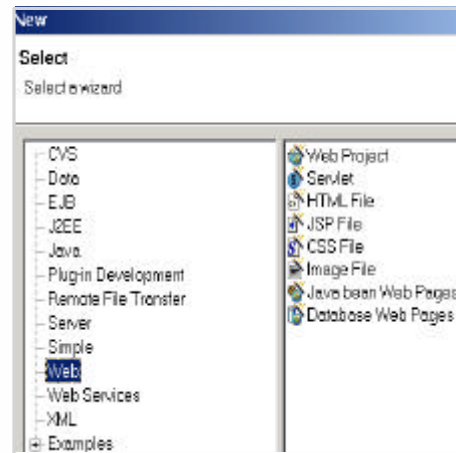
## ■ Web Developer Perspective



- ▶ We'll now look at the Web Perspective. First, a quick review of what's included when creating a Web application.
  - ▶ An HTML page is displayed in a browser. The HTML page contains a form where the user can enter data and submit the form for processing.
  - ▶ The Web server passes the request to an application server that schedules a servlet to process the form.
  - ▶ In the model-view-controller (MVC) design pattern, the servlet is the controller. The servlet uses a JavaBean (the model) for the business logic. The JavaBean performs the requested tasks, for example, by accessing a relational database.
  - ▶ The servlet then invokes a JSP (the view) to format the HTML result page. The JSP accesses the JavaBean to retrieve the result data of the processing task.

## Web Perspective ...

- Many features from WebSphere Studio 4.0
  - ▶ HTML and JSP editing
    - Includes Page Designer
  - ▶ WAR import/export
  - ▶ Links view
    - Shows relations between linked files
  - ▶ Wizards to generate servlets and JSPs for database and JavaBean applications
  - ▶ Debugger for JSPs at source code level



DB2 Data Management Software

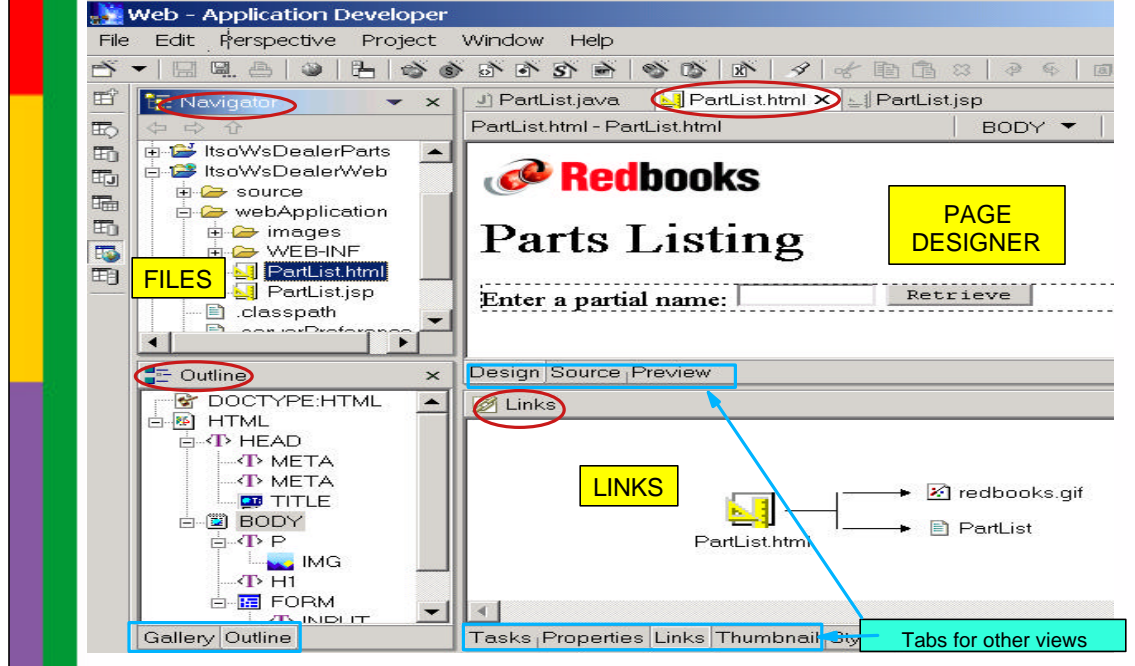


- ▶ Many features from WebSphere Studio 4.0 are included in the Web Perspective as described on this slide.
- ▶ WAR (Web ARchive) files can be imported and exported.
- ▶ Wizards are included to generate servlets and JSPs. The debugger can be used to process a JSP at the source code level (described later in this presentation).
- ▶ The picture on the right shows the choices of what can be created from the Web Perspective.



# Web Perspective ...

## ■ Example 4 in the Redbook



- ▶ This slide is an example of the output from Exercise 4 in the Redbook which creates an HTML, JSP and Servlet using the wizards.
- ▶ The Web Perspective contains four panes:
  - ▶ Top Left —Navigator view (displays the folders and files of the projects)
  - ▶ Top right reserved for editors
  - ▶ Bottom left Outline view (of current editor) or Gallery (for HTML/JSP files)
  - ▶ Bottom right Tasks (errors), Properties (of selected resource), Links (of Web resources), Thumbnail, Styles, Color, Palette (Web resources)
- ▶ One of the supported editors is the Page Designer for HTML and JSP files. The Page Designer itself has three tabs to display the Design (WYSIWYG), Source (HTML source code) or Preview (browser) view.
- ▶ Selecting the 'PartList.html' in the Navigator view causes the other panels to be populated. Clicking on the different views in each panel, shows different information.

## Web Perspective ...

- Using Database wizard
  - ▶ Click "Create Web Pages that access and display database fields" icon
  - ▶ Check
    - Create Input Form
    - Create Details Form
  - ▶ Select Model of View Bean
    - Generates JSP
  - ▶ Store results in request

**Create Database Web Pages**

**Create Web Pages to Access a Database**  
Create web pages that access and display database fields.

Destination folder: /ItsOWsDealerWeb/webApplication

Java package:

Use Style Sheet:

Use Error Page:

Web Pages

Create Input Form

Create Details Form

Model: View Bean

Store results in

Request

Session

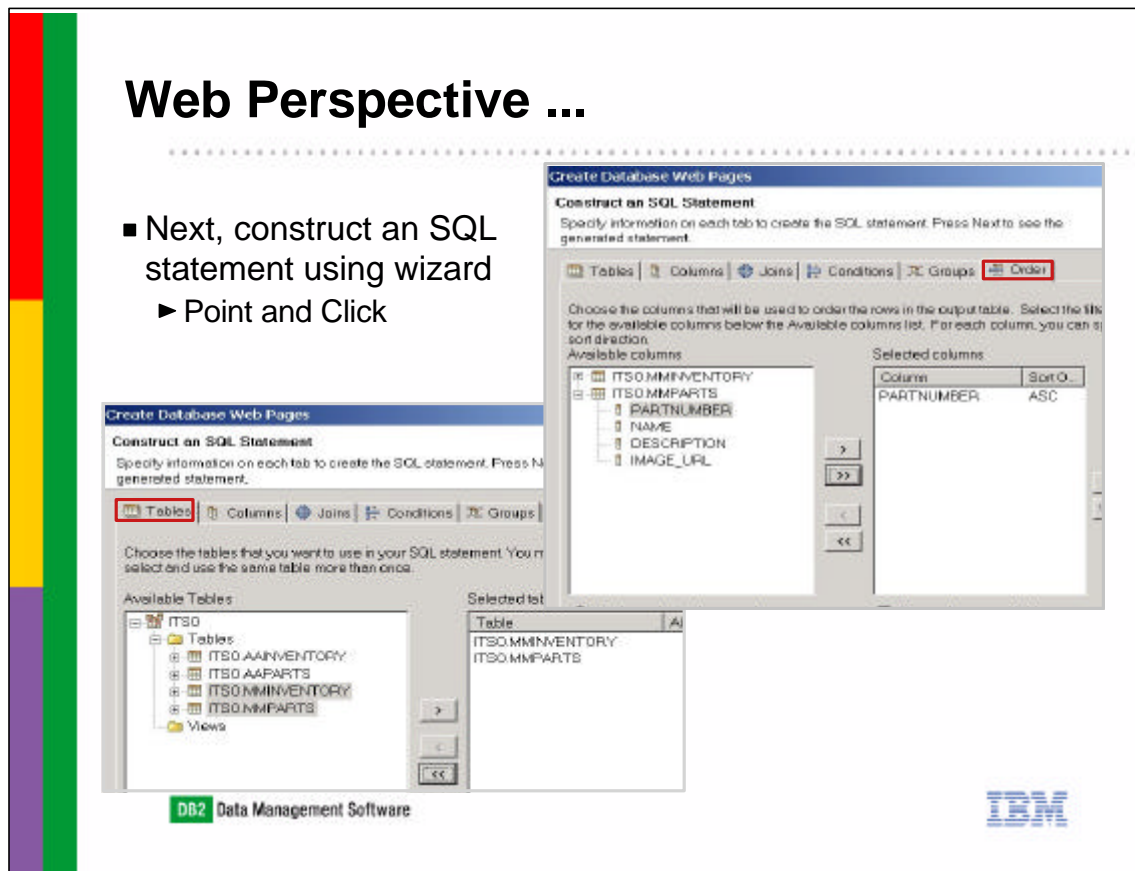
DB2 Data Management Software



- ▶ The next few slides, take you through creating a Web Project, e.g., HTML, JSPs, and Servlet code following the steps in Exercise 4 in the Redbook.
- ▶ From the "Web Perspective" we select the "Create Database Web Pages that access and display database fields" icon from the toolbar.

## Web Perspective ...

- Next, construct an SQL statement using wizard
  - ▶ Point and Click



- ▶ The Create Database Web Pages starts by constructing a SQL Statement using the same SQL Assistant wizards described previously.

## Web Perspective ...

- Execute SQL statement during creation

The screenshot displays the IBM DB2 Data Management Software interface. On the left, a 'navigator' pane shows a tree view of a database structure. Below it, an 'Outline' pane shows a table named 'PartUnits' with a context menu open, highlighting the 'Execute...' option. In the center, a 'Create Database Web Pages' dialog box is open, showing a SQL query in a text area. The query is: 

```
SELECT  
  ITSO.MMPARTS.PARTNUMBER,  
  ITSO.MMPARTS.NAME,  
  ITSO.MMPARTS.DESCRPTION,  
  ITSO.MMPARTS.IMAGE_URL,  
  ITSO.MMINVENTORY.ITEMNUMBER,  
  ITSO.MMINVENTORY.QUANTITY,  
  ITSO.MMINVENTORY.COST,  
  ITSO.MMINVENTORY.SHELF,  
  ITSO.MMINVENTORY.LOCATION  
FROM  
  ITSO.MMINVENTORY,ITSO.MMPARTS  
WHERE  
  ITSO.MMINVENTORY.PARTNUMBER = ITSO.MMPARTS.PARTNUMBER  
  AND ITSO.MMINVENTORY.QUANTITY < QUANTITY  
ORDER BY  
  PARTNUMBER ASC
```

 To the right of the text area are three buttons: 'Execute', 'Parse', and 'Reset'. A red arrow points from the 'Execute' button in the dialog to the 'Execute...' option in the Outline context menu. Another red arrow points from the 'Execute' button in the dialog to the 'Execute SQL statement during creation' bullet point. A third red arrow points from the 'Execute...' option in the Outline context menu to the 'Execute SQL statement from Outline' bullet point. The IBM logo is visible in the bottom right corner of the screenshot.

- Execute SQL statement from Outline

- As was shown previously, the SQL Statement can be executed during creation of the statement from the SQL Assistant panels. Additionally, selecting the SQL Statement can be executed after creation from the Outline view.

## Web Perspective ...

- When SQL Statement is complete, click Next
  - ▶ Design Input Form (HTML)

- Change Properties
  - ▶ Label
  - ▶ Initial Value
  - ▶ Size

Property	Value
ID	QUANTITY
Label	QUANTITY
Initial Value	
Input Type	text
Size	4
Max Length	4

DB2 Data Management Software



- ▶ When the SQL Statement creation is complete, click 'Next' which takes you to a panel to design an Input HTML form, if a 'Host Variable' was included on the SQL Statement creation.
- ▶ From this panel, you can change the properties of any of the input variables, e.g., the label or size.

## Web Perspective ...

- When Input Form complete, click Next
  - ▶ Specify Runtime Database Connection

- Choose connection type
  - ▶ DataSource
  - ▶ DriverManager

The screenshot shows a dialog box titled "Create Database Web Pages" with a sub-tab "Specify Runtime Database Connection Information". The dialog prompts the user to "Enter information for establishing a database connection at runtime." There are two radio buttons: "Use data source connection" (which is selected) and "Use driver manager connection". Under "Use data source connection", there is a text field for "Data source/JNDI name:" containing the value "jdbc/ITSOWSAD". Under "Use driver manager connection", there are text fields for "Driver name:" containing "COM.ibm.db2.jdbc.app.DB2Driver" and "URL:" containing "jdbc:db2:DB7P". At the bottom, there are three text fields for "User ID:", "Password:", and "Re-enter password:".

DB2 Data Management Software



- ▶ Clicking 'Next' takes you to the panel where you specify your database connection information used at Run time. You can select DataSource or DriverManager.
- ▶ While our Java Application created earlier in the presentation used DriverManager, and required changing the Java Code to select a different DB2 Server, our servlet will be created using DataSource.
  - ▶ We enter a DataSource/JNDI name of: `jdbc/ITSOWSAD`
    - ▶ The JNDI information for connecting to the specific DB2 server will be configured later

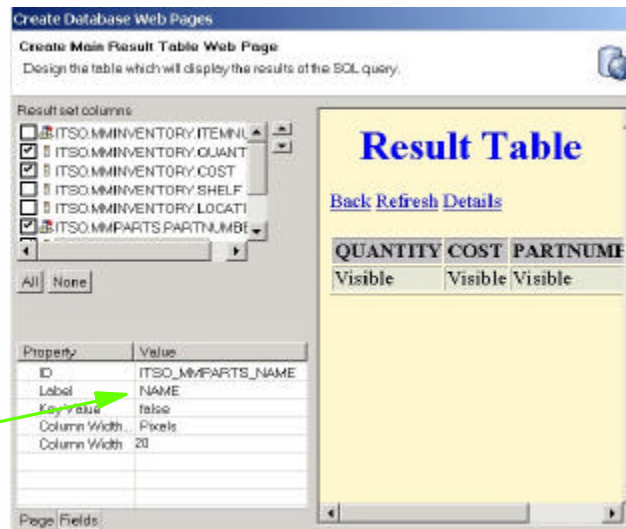
## Web Perspective ...

- Create Main Result Table (JSP)

- Select columns to be displayed

- ▶ Optionally, change any column properties

Label changed



DB2 Data Management Software

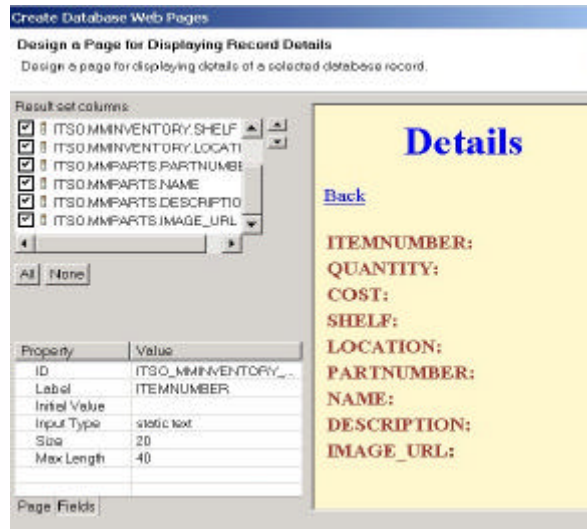


- ▶ Two JSPs are created by this servlet. The first JSP, is a Main result table, where one to many entries could be returned. You can select all or just specific columns to include in the JSP. Additionally, you can change properties, such as the label that gets displayed.

## Web Perspective ...

- Create Details Result Table (JSP)

- Select columns to be displayed
  - ▶ Optionally, change any column properties



DB2 Data Management Software



- ▶ This is the 'Details', the second JSP for this servlet. Again, you can select all or specific columns to display, and change the properties listed at the bottom.
- ▶ Only one database record is returned on the details JSP.



## Web Perspective ...

- Create Servlet

- ▶ Select "Create a Java Servlet Class" icon

1

Name Servlet

3

Save servlet in web.xml

2

Select Methods

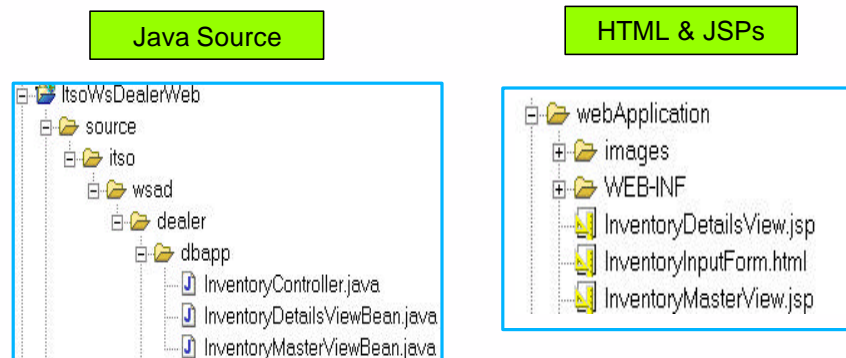
- init
- doPost
- doGet

IBM

- ▶ The Input HTML and output JSP Web Pages have been created. Now, we'll create the servlet code using the "Create a Java Servlet Class" icon.
- ▶ The first thing you do is name the servlet and select the `init()`, `doPost()` and `doGet()` methods.
- ▶ Clicking 'Next' returns the "Define the Servlet in the Deployment Descriptor (web.xml) file, which we want for our servlet.

## Web Perspective ...

- Create Servlet ...
  - ▶ Output creates
    - 3 servlet files in source package folder
    - One HTML
    - Two JSPs



DB2 Data Management Software



- ▶ Clicking 'Finish' completes the servlet creation which creates 3 servlet '.java' files in the source package folder in addition to compiling those into '.class' files in the WEB-INF folder.
- ▶ The bottom left side of this slide shows the Source folder of the 3 servlet files while the right side of the slide shows the name of the JSPs and HTML files.

# Server Perspective

## ■ Create Server Instance

**Create a New Server Instance and Configuration**

Create a new server instance and configuration  
Choose the properties for the new server

Server name: lts0WsDealer

Folder: lts0WsServer

Server instance type:

- WebSphere Servers
  - WebSphere v4.0 Remote Server
  - webSphere v4.0 Test Environment**
- Apache Tomcat
- TCP/IP Monitoring Server

Template: None

Description: Runs all J2EE projects directly out of...

Server configuration type: WebSphere v4.0 Configuration

Template: None

**WebSphere Server Configuration Settings**  
Input settings for the new WebSphere server configuration

HTTP port number: 8080

**Default port 8080**

**Select WebSphere Test Environment**

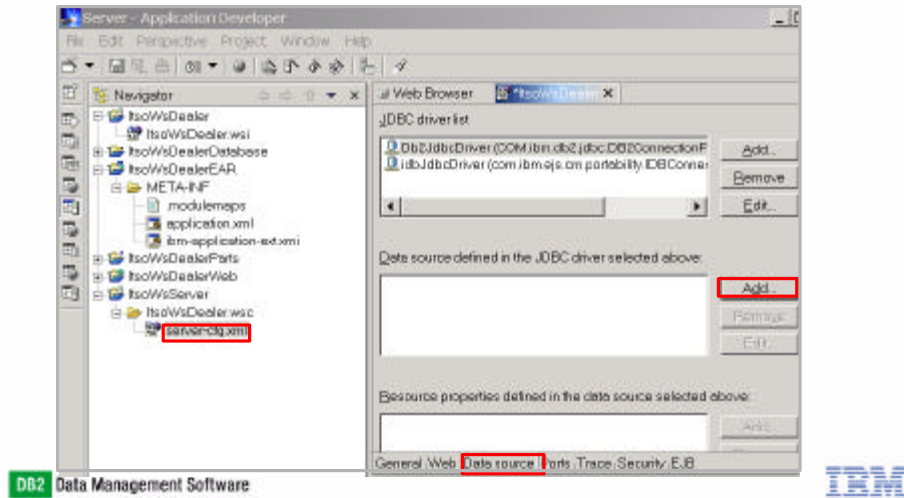
DB2 Data Management Software

IBM

- ▶ To test a servlet requires a Server Instance to be started. This slide shows creating a new Server Instance that will appear in the Server Perspective
- ▶ Start by naming the server, then select the type of Server instance that will be used. We select the WebSphere Test Environment which listens on the default port 8080.

# Test Servlet

- From Server Perspective
  - ▶ Configure DataSource
    - select **server-cfg.xml**
    - select Data source and click Add



- ▶ Now we are ready to test our servlet. Before we do, though we need to configure our DataSource in this server. This is done in from the Navigator view. Select the server-cfg.xml file for the server instance we defined.
- ▶ Click on the Data Source panel in the right window.
- ▶ Positioned on the Db2JdbcDriver in the top part of the right panel, click 'Add' for the Data source defined in the JDBC driver selected above.

## Test Servlet ...

- Configure DataSource ...
  - ▶ Complete with DB2 Server info
    - Specify JNDI name used when creating servlet
    - Database name is the CCA Alias used by DB2 Connect

Access different DB2 Servers by specifying CCA Alias

The screenshot shows the 'Edit a Data Source' dialog box with the following values:

Field	Value
Name	ITSOWSAD
JNDI name	jdbc/ITSOWSAD
Description	DB2 390 V7
Category	
Database name	DB7P
Default user ID	peggyr
Default user password	*****
Minimum pool size	1
Maximum pool size	10
Connection timeout	180
Idle timeout	1800
Cipher timeout	1800
Statement cache size	100

Additional options at the bottom include checkboxes for 'Disable auto connection cleanup' and 'Enable JTA', and a note '\* Required field'.

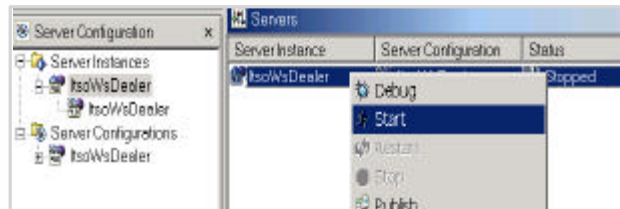
DB2 Data Management Software



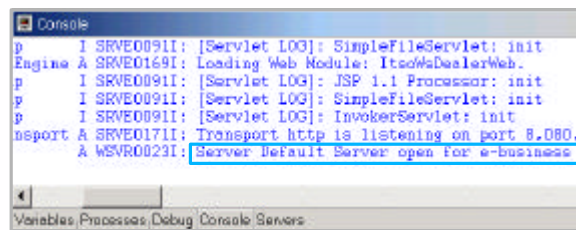
- ▶ This panel is where you enter your DataSource information.
- ▶ Enter ITSOWSAD for the name and jdbc/ITSOWSAD for the JNDI name. Enter any description you wish.
- ▶ For the database name, enter the CCA Alias for the DB2 Server you want to connect to, along with the userid and password for this DB2 Server, since our example didn't include externalizing panels to enter and pass this information.
- ▶ This is the only panel that needs to be changed to run our servlet and obtain data from different DB2 servers, provided all DB2 servers have same SCHEMA names.

## Test Servlet ...

- From Server Perspective
  - ▶ Start Server in regular (non-debug) mode



- Startup Complete with ".. open for e-business" message



```
p I SRVE0091I: [Servlet LOG]: SimpleFileServlet: init
Engine A SRVE0169I: Loading Web Module: ItsoWsDealerWeb.
p I SRVE0091I: [Servlet LOG]: JSP 1.1 Processor: init
p I SRVE0091I: [Servlet LOG]: SimpleFileServlet: init
p I SRVE0091I: [Servlet LOG]: InvokerServlet: init
nsport A SRVE0171I: Transport http is listening on port 8.080.
A WSVR0023I: Server Default Server open for e-business
```

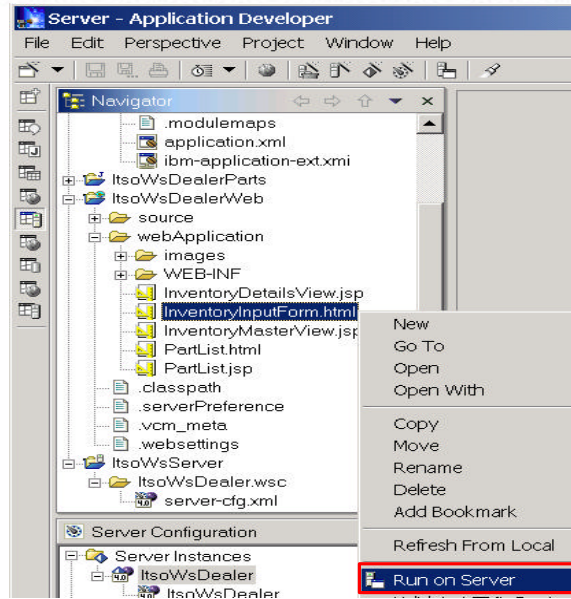
DB2 Data Management Software



- ▶ From the Server Perspective, we select the ItsoWsDealer Server Instance we created and 'Start' the server. At this point we are not starting in 'debug' mode.
- ▶ The server is started and ready to execute our servlet when you see the 'Server.. open for e-business' message on the console.

## Test Servlet ...

- From Server or Web Perspective
  - ▶ Select HTML
    - Run on Server



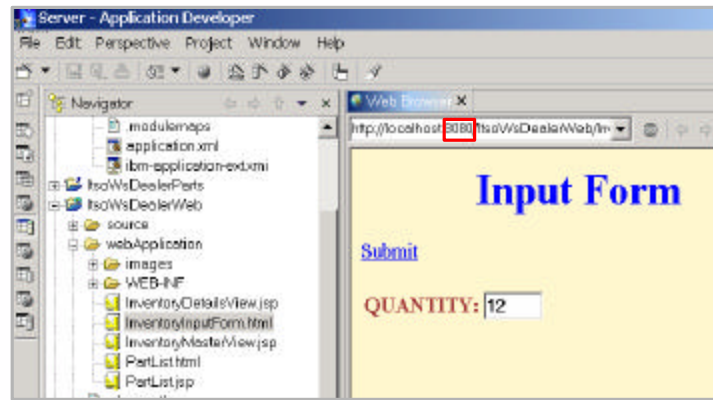
DB2 Data Management Software



- ▶ From the Navigator view in any of the perspectives that support Navigator, we select the InventoryInputForm.html that we created, right click to get the pop-down menu, and select 'Run on Server'.

## Test Servlet ...

- WebSphere Test Environment started - Port "8080"
- Enter "12" for the QUANTITY
  - ▶ Click Submit



DB2 Data Management Software

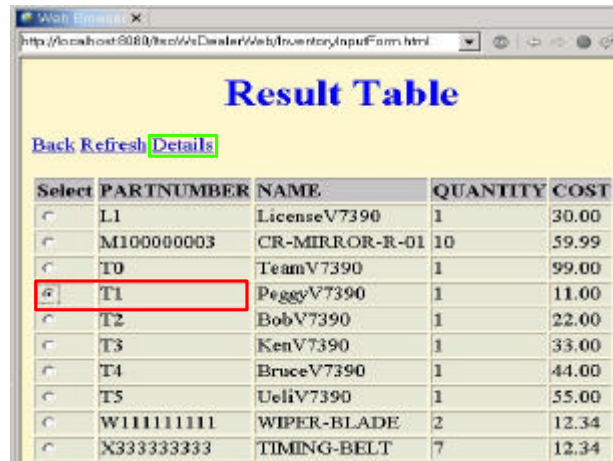


- ▶ Our server is started using the WebSphere Test Environment that we defined, since we are listening on Port "8080".
- ▶ Entering a quantity of 12 and clicking Submit, will search for any parts that have an inventory 'less than' 12, since our SQL Statement was created with an operator of '<' (less than) the number entered.



## Test Servlet ...

- Select a **PARTNUMBER**
  - ▶ Click **Details**



Web Browser x  
http://localhost:8080/ibm/WebDealerWeb/Inventory/asp/Form.html

**Result Table**

[Back](#) [Refresh](#) [Details](#)

Select	PARTNUMBER	NAME	QUANTITY	COST
<input type="radio"/>	L1	LicenseV7390	1	30.00
<input type="radio"/>	M100000003	CR-MIRROR-R-01	10	59.99
<input type="radio"/>	T0	TeamV7390	1	99.00
<input checked="" type="radio"/>	T1	PeggyV7390	1	11.00
<input type="radio"/>	T2	BobV7390	1	22.00
<input type="radio"/>	T3	KenV7390	1	33.00
<input type="radio"/>	T4	BruceV7390	1	44.00
<input type="radio"/>	T5	UeliV7390	1	55.00
<input type="radio"/>	W111111111	WIPER-BLADE	2	12.34
<input type="radio"/>	X333333333	TIMING-BELT	7	12.34

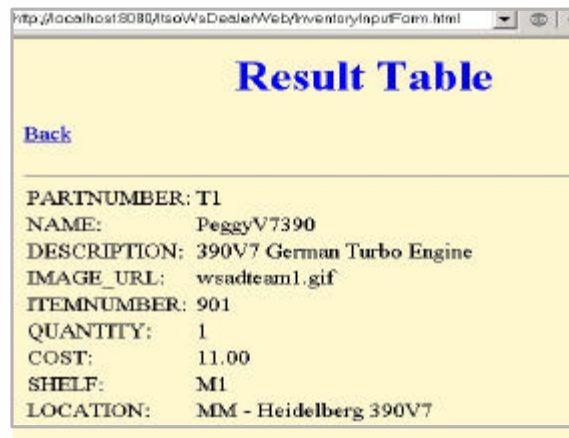
DB2 Data Management Software



- ▶ The Main JSP results are returned, which is a 'result set'.
- ▶ Selecting Partnumber 'T1' and clicking 'Details' returns detailed information about this part on the next slide.

## Test Servlet ...

- Part number Details returned



The screenshot shows a web browser window with the address bar containing the URL: http://localhost:8080/itsaWwDealerWeb/InventoryInputForm.html. The main content area has a yellow background and is titled "Result Table" in blue. Below the title is a blue link labeled "Back". A horizontal line separates the header from the data. The data is presented as a list of key-value pairs:

PARTNUMBER:	T1
NAME:	PeggyV7390
DESCRIPTION:	390V7 German Turbo Engine
IMAGE_URL:	wsadteam1.gif
ITEMNUMBER:	901
QUANTITY:	1
COST:	11.00
SHELF:	M1
LOCATION:	MM - Heidelberg 390V7

DB2 Data Management Software



- The Details of Partnumber T1 are returned.



## Debug Perspective

---

- Enables debugging of Java code
- Views display source code
  - ▶ Breakpoints can be set
- Running processes are shown
- Variables displayed
  - ▶ Values at current breakpoint
- Evaluated expressions
- Inspector for in-depth data analysis

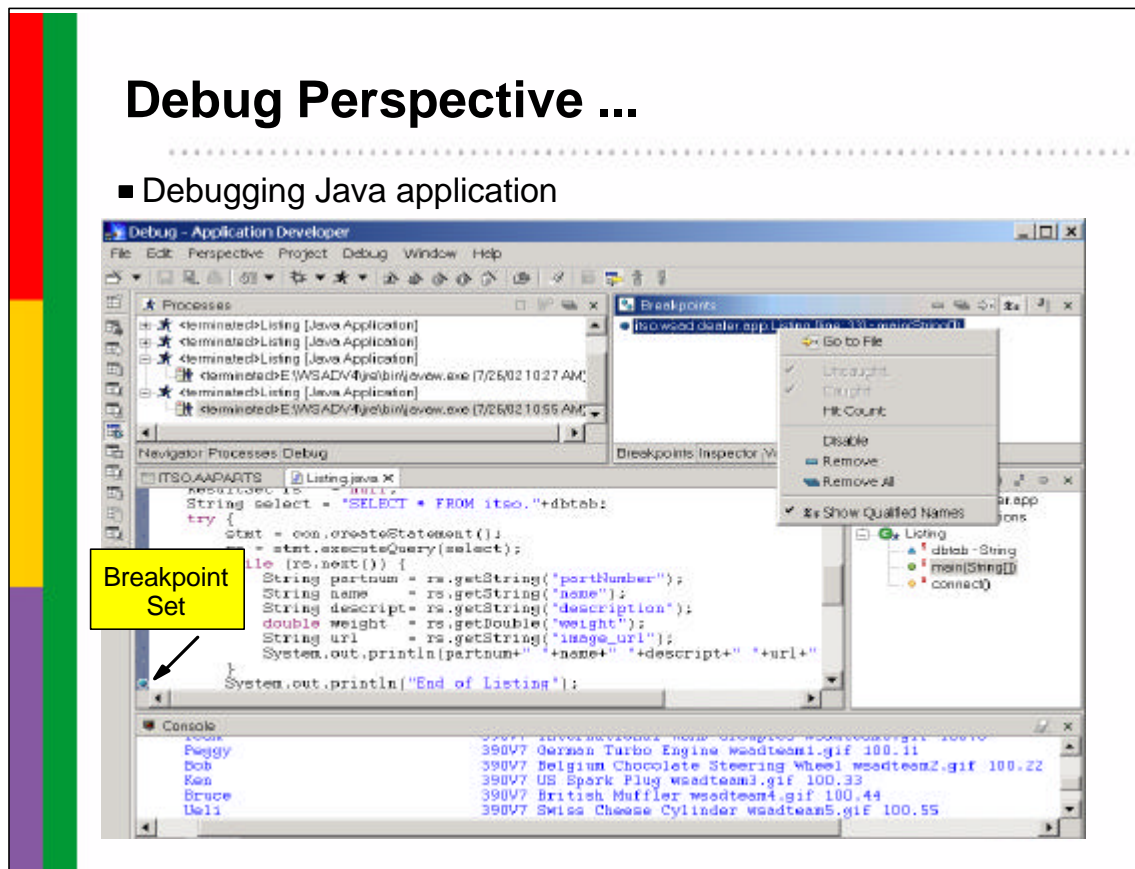
DB2 Data Management Software



- ▶ The last perspective discussed in this presentation is the Debug Perspective.
- ▶ You can debug Java programs or JSPs. You set breakpoints in the source code of both. When the debugger is invoked, you see the processes that are running. Variables are displayed and values are shown for the current breakpoint.
- ▶ Any expressions are evaluated and the resulting values are shown.
- ▶ Select the 'Inspector' option provides in-depth data analysis.

# Debug Perspective ...

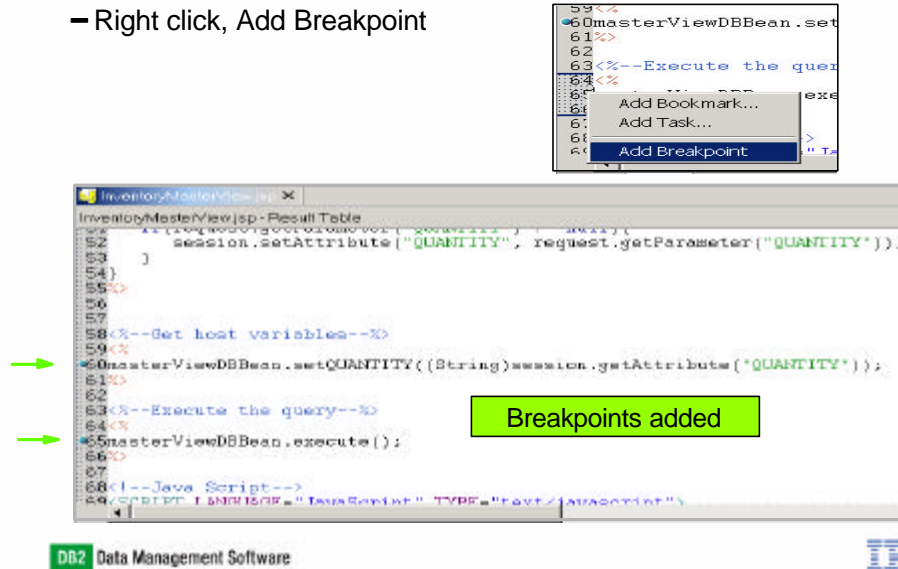
## ■ Debugging Java application



- ▶ This slide shows an example of debugging our Java application used in the Java Perspective earlier in the presentation.
- ▶ In the Listing.java source, we have set a 'breakpoint' on the System.out.println. When we run the Java Application, the debugger is started.
- ▶ At the top left portion of the slide displays the processes that are occurring. The top right portion, you see the breakpoint and the options you can perform at this point.
- ▶ The middle left portion displays the Java source, with the outline view being displayed on the middle right.
- ▶ The console output is displayed at the bottom of the slide.

# Debugging

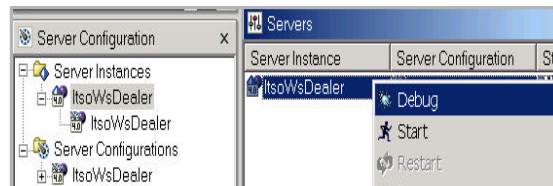
- Set breakpoints in JSP or Java source
  - ▶ Locate line in code
    - Right click, Add Breakpoint



- ▶ To set a breakpoint in either JSP or Java source, you first locate the line you want to stop on in your code.
- ▶ When you right click, you get the popdown where you can request, 'Add Breakpoint'.
- ▶ In this example, two breakpoints have been added to the JSP.

## Debugging ...

- Servlet Debugging
  - ▶ Start Server in 'Debug' mode



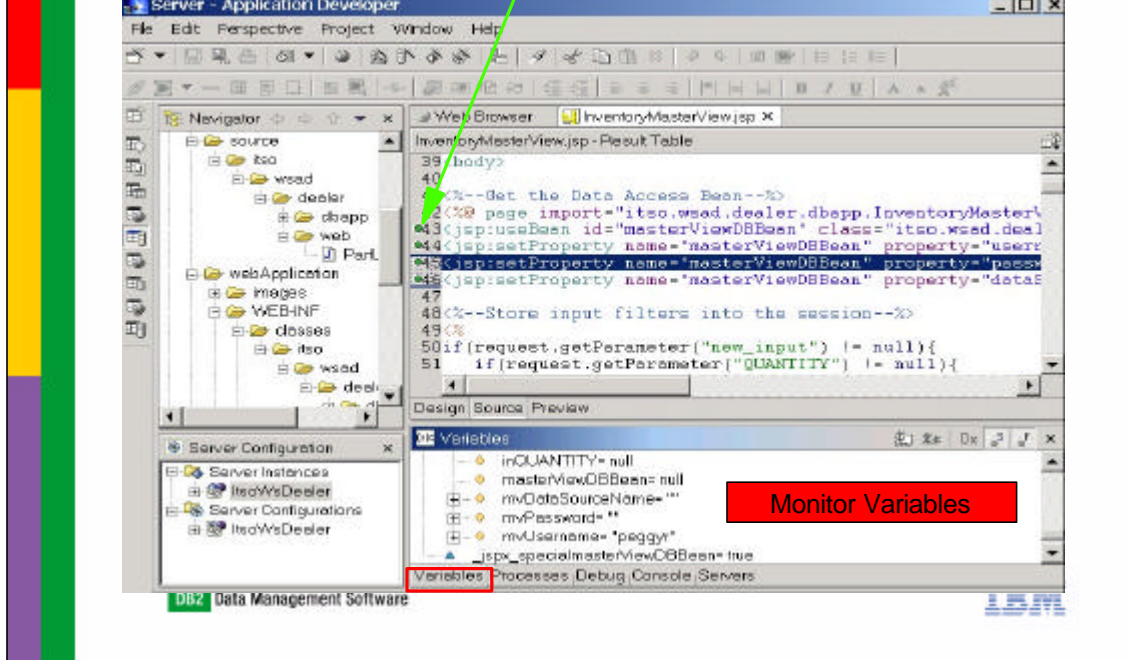
DB2 Data Management Software



- ▶ The debugger is launched automatically when breakpoints have been set, and running against a Java application in the Java Perspective.
- ▶ To enable debugging for Servlets, requires the Server to be started in 'Debug' mode.
- ▶ As before, you start the server from the Server Perspective. Select the server instance to start, right click, and select 'Debug'. This causes the server to be started in Debug mode.

# Debugging ...

## ■ Step through breakpoints



- ▶ From the Navigator view, locate your Input HTML, right click and select 'Run on Server'.
- ▶ The servlet will be started and executed up to the first breakpoint.
- ▶ At this point, you can select the Variable view and monitor variables, or the Process view and monitor processes or remain in the Debug mode and step through your breakpoints.

# Accessing Different DB2 Servers when using DataSource

## ■ In Server Perspective

### ▶ Change server-cfg.xml

#### – Edit DataSource to match CCA

- Database alias
- Userid
- Password

DB2 CCA Database alias used to access different DB2 Servers

DTSOWSAD DTSOWSAD

Database Properties

Target database: ITSOWSAD Protocol: TCP/IP  
System: DEMOLINX Host name: zserverlx.demopkg.ibm.com  
Instance: [Unknown] Port number: 50004

DB2 Data Management Software

Edit a Data Source

Name: \* ITSOWSAD  
JNDI name: \* jdbc/ITSOWSAD  
Description: DB2 390 Linux  
Category:   
Database name: DTSOWSAD  
Default user ID: peggyr  
Default user password:   
Minimum pool size: 1  
Maximum pool size: 10  
Connection timeout: 180  
Idle timeout: 1800  
Orphan timeout: 1800  
Statement cache size: 100  
 Disable auto connection cleanup  
 Enable JTA  
\* Required field.

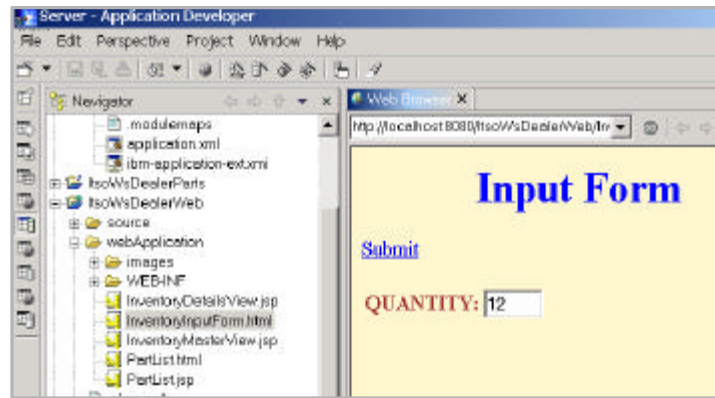
OK Cancel

- ▶ When using DataSource, and the same schema exists on different DB2 servers, changing your servlet only requires changing the server-cfg.xml file of your Server Instance.
- ▶ To change to a different DB2 server, change the Database name to the DB2 alias of the system you want to connect to, as defined in CCA. Additionally include your userid/password for this DB2 server, since we didn't create panels to allow entering this information in our examples.
- ▶ We change our Database name to DTSOWSAD which is our Linux on z/OS DB2 V7 system.



## Test Servlet ...

- From the Navigator view,
  - ▶ Select the input HTML, Run on Server
- Enter '12' for QUANTITY
  - ▶ Click Submit



- ▶ To test access to our Linux DB2 server, we launch the HTML as before. Enter '12' for a quantity and click Submit.

## Test Servlet ...

- Data now comes from DB2 V7 Linux on z/OS
  - ▶ Server significance was included in the data



http://localhost:8080/itso/AsDealerWeb/inventoryInputForm.html

**Result Table**

[Back](#) [Refresh](#) [Details](#)

Select	PARTNUMBER	NAME	QUANTITY	COST
<input type="radio"/>	L1	LicenseLinux	1	30.00
<input type="radio"/>	M100000003	CR-MIRROR-R-01	10	59.99
<input type="radio"/>	T0	TeamLinux	1	99.00
<input type="radio"/>	T1	PeggyLinux	1	11.00
<input type="radio"/>	T2	BobLinux	1	22.00
<input type="radio"/>	T3	KenLinux	1	33.00
<input type="radio"/>	T4	BruceLinux	1	44.00
<input type="radio"/>	T5	UeliLinux	1	55.00
<input type="radio"/>	W111111111	WIPER-BLADE	2	12.34
<input type="radio"/>	X333333333	TIMING-BELT	7	12.34

DB2 Data Management Software 

- ▶ The results set JSP table is returned with all parts that have a quantity of less than 12 in stock.
- ▶ Since we included significance in our data by adding Linux in the name column, we can see we have now accessed our Linux DB2 server

## Repository Support

---

- Team Development support
  - ▶ Uses repository
    - Concurrent Version System (CVS) or Clear Case Light are freeware
  - ▶ Can compare different versions
    - Replace with prior version if needed
  - ▶ Conflicts are shown
- CVS URL
  - ▶ [www.cvs.org](http://www.cvs.org)
- Clear Case Light URL
  - ▶ [www.rational.com](http://www.rational.com)

 Data Management Software



- ▶ WSAD supports team development and provides repository support. No repository comes with WSAD. Instead you install your repository of choice. CVS and Clear Case Light are two optional freeware repositories.
- ▶ A repository allows you to compare different versions, replace with a prior version during code development as well as identify any conflicts.
- ▶ The URLs for CVS and Clear Case Light are listed.
- ▶ Development of this presentation installed and used CVS. Directions for setting this up and using with WSAD can be found in the article:
  - ▶ Team Development with WebSphere Studio Application Developer 4.0 -- Part 2: Installing and Configuring CVS as an SCM Repository
  - ▶ [www7b.boulder.ibm.com/wsdd/library/techarticles/0202\\_yu/you2.html](http://www7b.boulder.ibm.com/wsdd/library/techarticles/0202_yu/you2.html)



## Summary

---

- One tool, WSAD includes comprehensive IDE for multiple job functions and tasks
- Tailor by needs
- Many wizards for helping create access to DB2 Data
  - ▶ Switching platforms can be done using DataSource or DriverManager
- Best way to learn is to try examples and get first hand experience

 Data Management Software



- ▶ In Summary, WSAD provides a comprehensive development platform that addresses multiple job functions and tasks in a single tool.
- ▶ You can tailor the different perspectives according to user preference.
- ▶ Many wizards are included to help create Java related components. Today's presentation focused on describing some of the ways WSAD can be used to create Java applications and servlets to access DB2 Data on multiple platforms using both DataSource and DriverManager connection support.
- ▶ The best way to learn more about WSAD is get first hand experience using the product and the Redbook, SG24-6407.



## Additional Information

---

- Other related DB2 Technical Conference presentations
  - ▶ B05 An Introduction to XML for Database Specialists - Susan Malaika
    - Tuesday 10:15, Thursday 2:15
  - ▶ B06 Web Services (SOAP) for DB2 - Susan Malaika
    - Wednesday 2:15, Friday 10:15
  - ▶ B07 Web Services and How DB2 Plays - George Zagelow
    - Tuesday 8:30, Thursday 10:15
  - ▶ B08 XML and DB2 - George Zagelow
    - Wednesday 10:15, Friday 8:30
  - ▶ F07 Developing DB2 Applications using Web Services and Messaging - Connie Nelin
    - Tuesday 8:30, Friday 8:30

 Data Management Software



- ▶ Other related presentations being given at this conference are listed here.

## Additional Information ...

---

- Updates for this presentation found at
  - ▶ [www.ibm.com/software/data/db2/os390/support.html](http://www.ibm.com/software/data/db2/os390/support.html)
    - Product Information -> Technical Presentations
- WebSphere Developer Domain
  - ▶ [www7b.software.ibm.com/wsdd](http://www7b.software.ibm.com/wsdd)
- IBM Redbooks ([www.redbooks.ibm.com](http://www.redbooks.ibm.com))
  - ▶ SG24-6585: WebSphere Studio Application Developer Programming Guide
  - ▶ SG24-6817: Websphere Application Server: Test Environment Guide
  - ▶ SG24-6176: IBM WebSphere V4.0 Advanced Edition Handbook
  - ▶ SG24-6219: Connecting WebSphere to DB2 UDB Server
  - ▶ SG24-6176: IBM WebSphere V4.0 Advanced Edition Handbook,
  - ▶ SG24-6134: WebSphere Version 4 Application Development Handbook
  - ▶ SG24-6292: Web Services Wizardry with WebSphere Studio Application Developer
  - ▶ **SG24-6407: Self-Study Guide: WebSphere Studio Application Developer and Web Services** <== used extensively in developing this presentation

**MY THANKS to UELI WAHLI!**

 Data Management Software



- ▶ Additional information can be found on these websites and in the IBM Redbooks listed here.
- ▶ My thanks again, to the wonderful work by Ueli Wahli and his ITSO residency team indevelopint SG24-6407.



## Product Levels

---

- WSAD 4.02
- DB2
  - ▶ Windows V7 at FP7
  - ▶ Linux for z/OS V7 at FP5
  - ▶ z/OS V7

 Data Management Software



- ▶ The product levels used when creating this presentation are listed here.

# Appendix

## ■ 390 DDL for Examples

```
CREATE DATABASE ITSOWSAD;
COMMIT;
CREATE TABLE ITSO.AAPARTS
(PARTNUMBER CHARACTER(10) NOT NULL,
 NAME CHARACTER(30),
 DESCRIPTION VARCHAR(100),
 WEIGHT DOUBLE,
 IMAGE_URL VARCHAR(100) NOT NULL) IN DATABASE ITSOWSAD;
COMMIT;
ALTER TABLE ITSO.AAPARTS
ADD CONSTRAINT PARTKEY PRIMARY KEY (PARTNUMBER);
COMMIT;
CREATE TABLE ITSO.AAINVENTORY
(ITEMNUMBER INTEGER NOT NULL,
 PARTNUMBER CHARACTER(10) NOT NULL,
 QUANTITY INTEGER NOT NULL,
 COST DECIMAL(10, 2) NOT NULL,
 SHELF CHARACTER(2),
 LOCATION VARCHAR(100)) IN DATABASE ITSOWSAD;
COMMIT;
ALTER TABLE ITSO.AAINVENTORY
ADD CONSTRAINT ITEMKEY PRIMARY KEY (ITEMNUMBER);
COMMIT;
ALTER TABLE ITSO.AAINVENTORY
ADD CONSTRAINT ITEMPART FOREIGN KEY (PARTNUMBER)
REFERENCES ITSO.AAPARTS(PARTNUMBER)
ON DELETE NO ACTION
ON UPDATE NO ACTION;
COMMIT;

CREATE TABLE ITSO.MMPARTS
(PARTNUMBER CHARACTER(10) NOT NULL,
 NAME CHARACTER(30),
 DESCRIPTION VARCHAR(100),
 WEIGHT DOUBLE,
 IMAGE_URL VARCHAR(100) NOT NULL) IN DATABASE ITSOWSAD;;
ALTER TABLE ITSO.MMPARTS
ADD CONSTRAINT PARTKEY PRIMARY KEY (PARTNUMBER);
COMMIT;
CREATE TABLE ITSO.MMINVENTORY
(ITEMNUMBER INTEGER NOT NULL,
 PARTNUMBER CHARACTER(10) NOT NULL,
 QUANTITY INTEGER NOT NULL,
 COST DECIMAL(10, 2) NOT NULL,
 SHELF CHARACTER(2),
 LOCATION VARCHAR(100)) IN DATABASE ITSOWSAD;
COMMIT;
ALTER TABLE ITSO.MMINVENTORY
ADD CONSTRAINT ITEMKEY PRIMARY KEY (ITEMNUMBER);
COMMIT;
ALTER TABLE ITSO.MMINVENTORY
ADD CONSTRAINT ITEMPART FOREIGN KEY (PARTNUMBER)
REFERENCES ITSO.MMPARTS(PARTNUMBER)
ON DELETE NO ACTION
ON UPDATE NO ACTION;
COMMIT;
```

 Data Management Software



- The DDL on this slide was used to create comparable Schema for DB2 on z/OS V7.