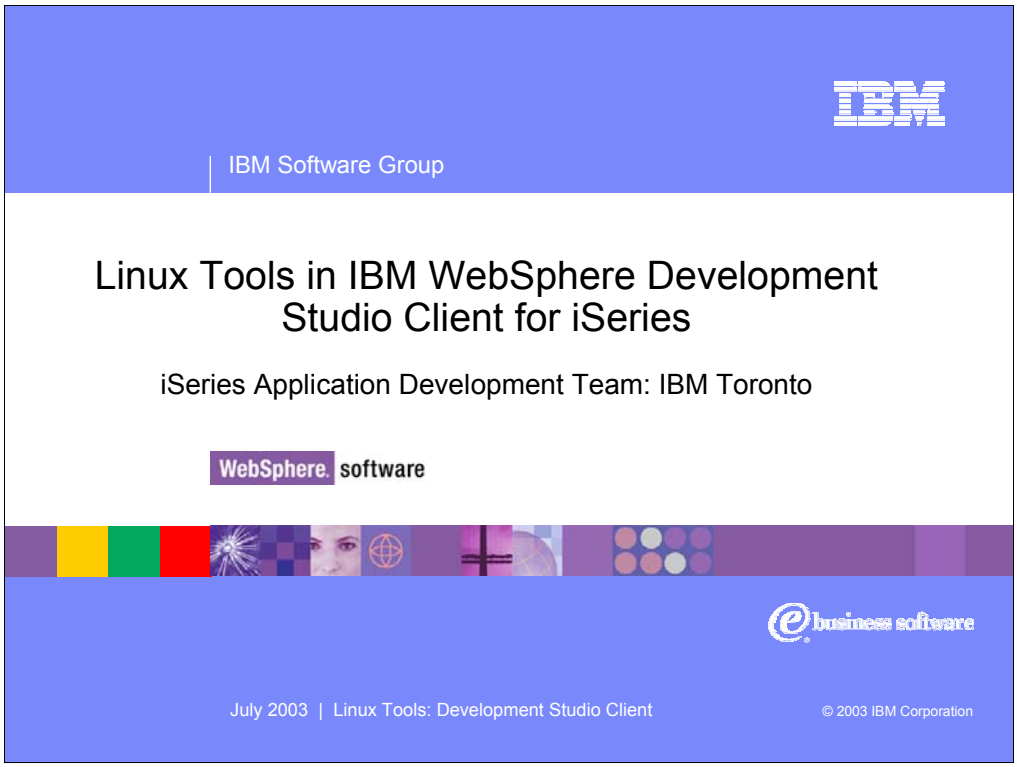
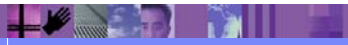


This presentation reviews Linux as a development client for application development using IBM WebSphere Development Studio Client for iSeries.

Agenda

- Quick Introduction to IBM Application Development Tools Platform
  - Eclipse based Tools
  - IBM WebSphere Studio based Tools
- Target Linux as a development server
  - Using Development Studio Client to access a remote Linux server
- Linux as a development client
  - Using the Eclipse Workbench on Linux
  - C/C++ Tools for Linux
  - Other Eclipse tools available for Linux



IBM Software Group

IBM Application Development Tools Platform

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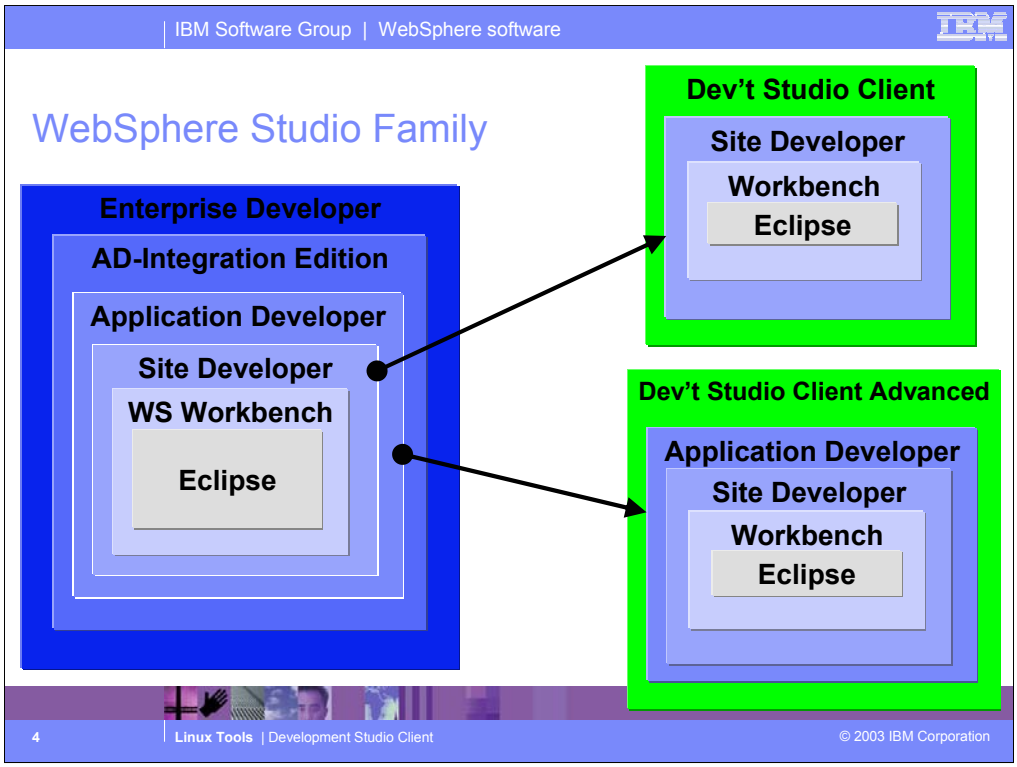
July 2003 | Linux Tools: Development Studio Client



Here you see that Development Studio Client is based on WebSphere Studio Site Developer, while Development Studio Client Advanced is based on WebSphere Studio Application Developer.

The Workbench is based on the open-source Eclipse technology about to be discussed. It is not for sale, but is the basis of all IBM WebSphere Studio products, and is available to business partners.

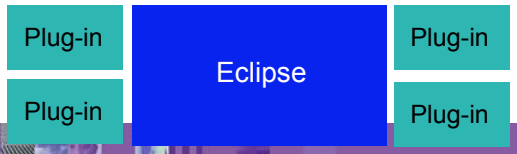
Site Developer is IBM's entry level offering based on eclipse, and it is for building dynamic Web sites out of non-EJB Java. Application Developer extends Site Developer and adds support for EJBs. Application Developer-Integration Edition extends Application Developer and adds support for JCA Connectors and for Workflow. Enterprise Developer extends Application Developer-Integration Edition and adds support for S/390 and Enterprise Generation Language (EGL), the follow-on to VisualAge Generator.

Eclipse was developed by IBM and donated to the open source community. That donation is estimated to be worth $40 million. Anyone can download Eclipse for free, including the source code, from www.eclipse.org. Eclipse has generated extraordinary excitement in the development community and the tools community. It is written in Java, and can be extended by tools that are also written in Java. These tools are known as plug-ins. Out of the box, Eclipse offers an integrated development environment (IDE) that has built-in support for teams and projects and a robust and revolutionary user interface framework. It also has tools built-in to create Eclipse plug-ins. Further, there are extensive and very powerful tools built-in for developing Java applications with Eclipse. So, if all you want is the world's best Java toolset, then all you need is Eclipse. You can't beat the price!

IBM is not alone with Eclipse. The open-source consortium that oversees contributions made to it include a number of large companies, and that list is growing. Note that MKS is an iSeries tool vendor. See www.eclipse.org for the latest list.

What is Eclipse?

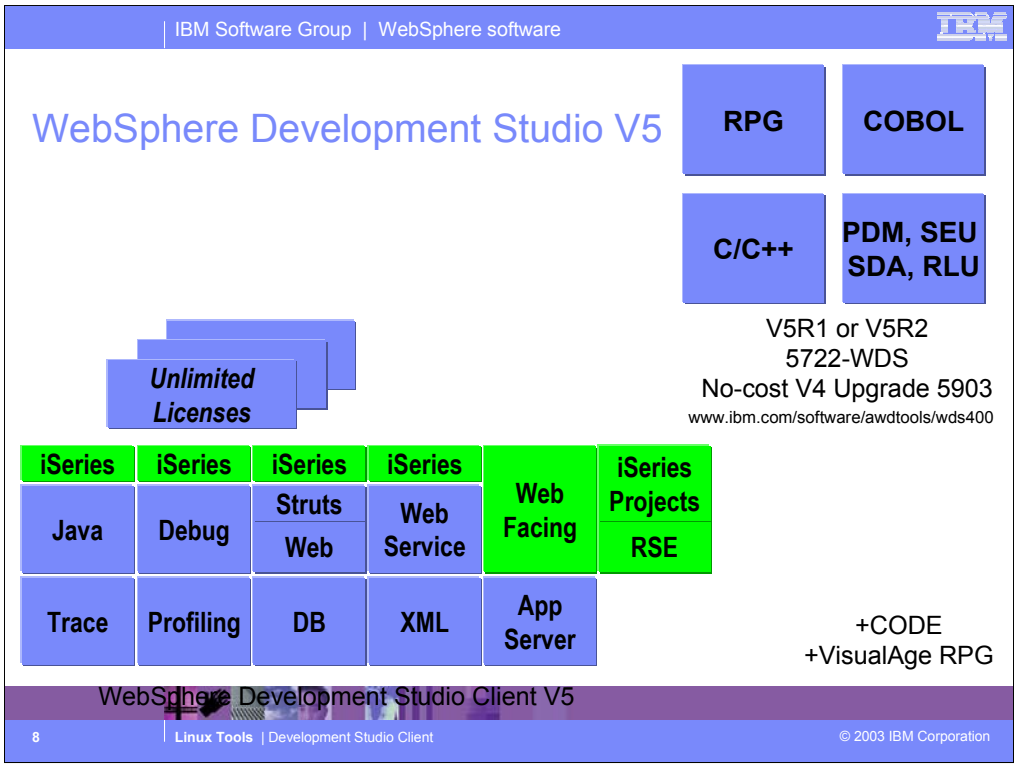
- **Eclipse + plug-ins = product**
  Although it is a great Java IDE out of the box
- **Eclipse is already the basis of many products, and more to come**
  Both from IBM and Business Partners
- **Eclipse is a huge opportunity for ISVs**
  For writing and selling plug-ins



So what is Eclipse? With the exception of the built-in Java tools, Eclipse itself is not that interesting. It only gets interesting when you add to it some plug-ins (for example, tools) that do something interesting.

An Eclipse-based product is Eclipse plus a number of interesting plug-ins. IBM is building numerous such Eclipse-based products, including as we have seen Site Developer and Development Studio Client. Further, because Eclipse is free and business partners are free to include it in their products, there will be many other Eclipse-based products from other companies too, including Rational and TogetherSoft.

For business partners or software developers who write and sell application development tools, Eclipse is a fantastic opportunity. By writing plug-ins for Eclipse, those plug-ins can be sold to any developer using any product based on Eclipse or even just the raw Eclipse as downloaded from www.eclipse.org. This opportunity is not lost on iSeries tool vendors, who are all looking at offering Eclipse plug-ins for their tools. This will result in a rich offering of third party plug-ins for developers to choose from, all of which extend their core Development Studio Client development environment. One community, one core development platform, many IBM and 3rd party tools. This is community and excitement!

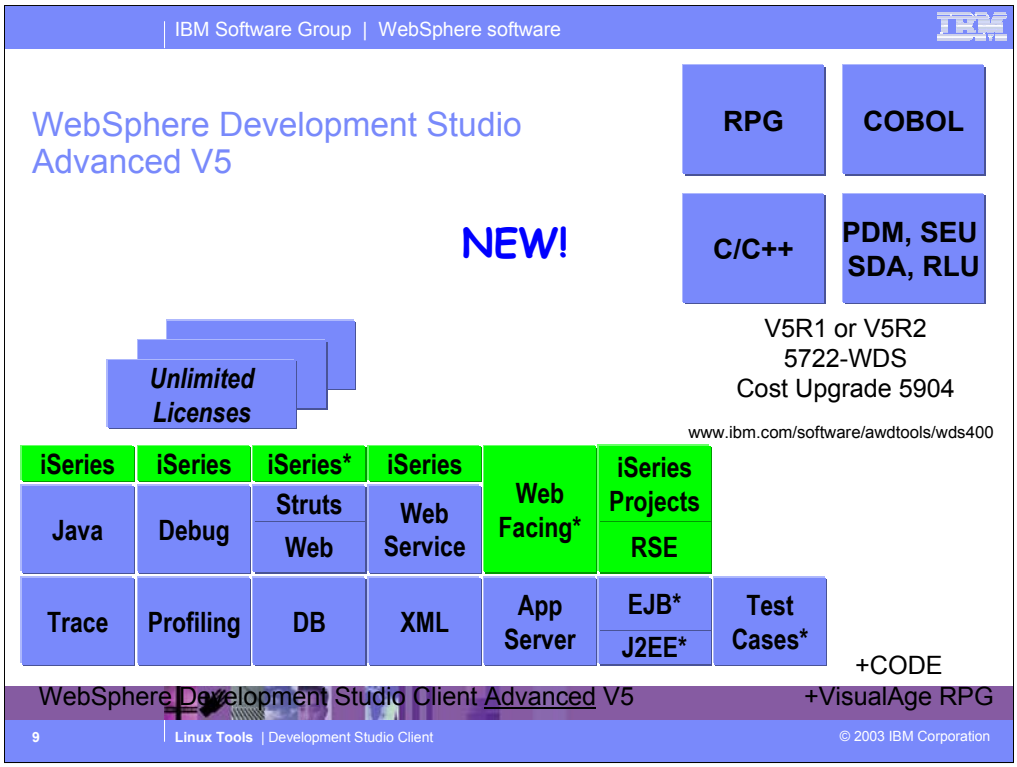


There is now only one application development product sold by IBM, for iSeries, as of V4R5. This is WebSphere Development Studio (Development Studio), which includes all four host compilers, all traditional tools (ADTS = PDM+SEU+SDA+RLU+DFU+AFP+CGU), and unlimited licenses of the workstation-based toolset named WebSphere Development Studio Client (formerly WebSphere Development Tools).

If you are an existing customer who has a subscription, you can upgrade to Development Studio free of charge. Without a Software Subscription, there is an upgrade fee. New licenses of Development Studio are priced very competitive compared to the combined prices of all constituent products. As of V5R1, there is no way to purchase the compilers or tools individually. So if you have RPG at V5R1 or higher, you must have Development Studio and hence are entitled to Development Studio Client.

For consultants who do not have an iSeries of their own, but still wish to have the client tools, Development Studio Client is also made available as a passport advantage product so it can be purchased "off the shelf" from IBM Direct.

Development Studio has been a huge success, with over 80,000 licenses sold. Just as every development machine used to have PDM and SEU, every development machine will now have all the modern Application Development tools from IBM. This ubiquity is especially important for business partners who build and sell software. These Business Partners are now free to build software using any of the technologies or tools in Development Studio, and can assume their customers will have the tools required to tailor everything from RPG to Java and Web user interfaces. This effectively raises the lowest common denominator to a level unparalleled by any other operating system.



The Advanced edition of Development Studio Client, and Development Studio, is new as of April 25th 2003. Development Studio Advanced is currently the same as Development Studio, except the customer is entitled to unlimited licenses of Development Studio Client Advanced versus just Development Studio Client.

The difference of Development Studio Client Advanced over Development Studio Client is that it has additional tools (blue boxes with asterisks) and some enhancements to existing iSeries tools (green boxes with asterisks) which will be discussed later in this presentation. The majority of the new tools are related to Enterprise Java Bean (EJB) development. You'll see later that Development Studio Client Advanced is based on WebSphere Application Developer (Application Developer) versus WebSphere Studio Site Developer (Site Developer).

IBM Software Group

Linux as a Development Server

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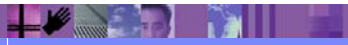
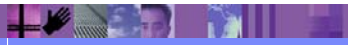
Linux as a Development Server

- Regardless of which type of development client you are using you may be deploying to a remote Linux server
- Or you may be using Linux as an infrastructure server (file, print, DNS, …)
- WebSphere Development Studio Client
  - Use the Remote System Explorer to view, edit, compile, manage and run your remote Linux applications
  - You can use the same tools to view, edit, compile, manage, run and debug your remote iSeries applications
    - No need to learn two different toolsets!
- Does Development Studio Client run on Linux?
  - Not yet, but stay tuned!

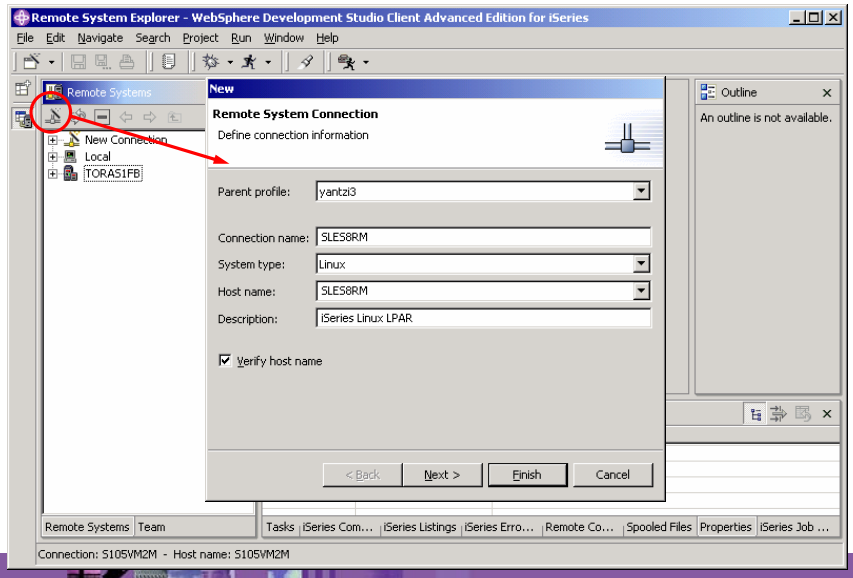


Getting Started with Remote System Explorer

- Use the Remote System Explorer in Development Studio Client to work with your remote Linux server
- First open the Remote System Explorer perspective
- Next create a Linux Connection
  - An RSE connection represents a “connection” to a remote system
  - Specify a Connection name and TCP/IP hostname
  - You can also specify environment variables per connection
  - Create multiple connections to the same host to use different user IDs and environment variables
- Expand your new connection to connect to the Remote System and start working with it



Remote System Explorer

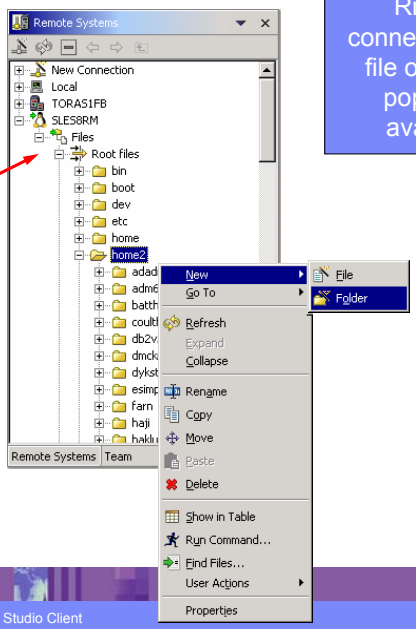


Accessing a Linux Server

Right click on a connection, subsystem, file or folder to see a popup menu with available actions

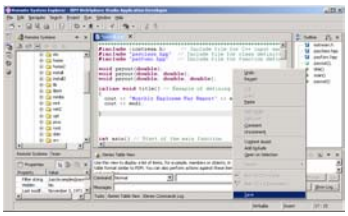
Expand the “Files” subsystem to see your filters.

Two predefined filters:
Root files (/*)
Home (/home/*)



How Does it Work?

RSE Linux connection In Development Studio Client



RSE server running on remote Linux box.

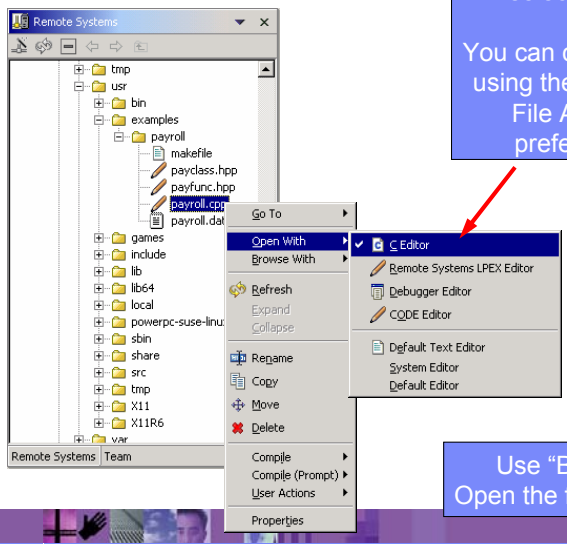
TCP/IP Socket Connection

RSE server must be installed and running on the remote Linux box. RSE server is written in Java and is shipped with WDSc. Check the online help for step by step instructions on setting up the RSE server for Linux.

Remote System Explorer and Linux

- What can you do with a RSE Linux connection?
  - Edit remote files using any of the Workbench editors
  - Open a remote shell for the connection
    - Run interactive shell commands
    - Shell output is parsed to recognize files, folders, output from common Linux compilers and commands like grep, …
  - Define filters to display remote files and folders in the Remote Systems view
  - Search for remote files
  - Compile remote .java, .c and .cpp files
    - Define your own compile commands for these or other file types!
  - Define and run user actions against remote files and folders

Editing Remote Files



All Workbench editors registered for the selected file type.

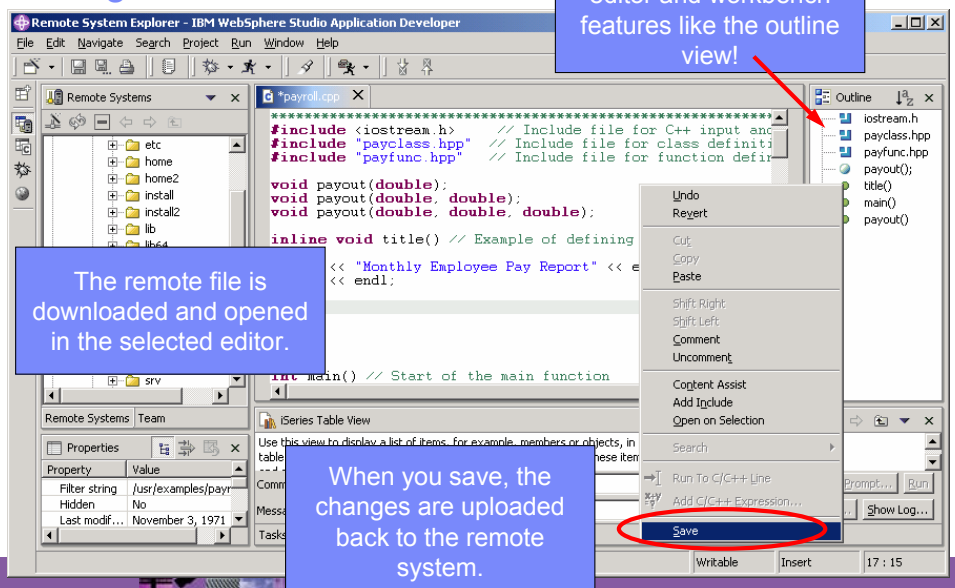
You can configure this list using the Workbench -> File Associations preference page

Remote Systems LPEX Editor is part of WDSc

C Editor is part of CDT (more on this later)

Use “Browse With ->” to Open the file in read-only mode

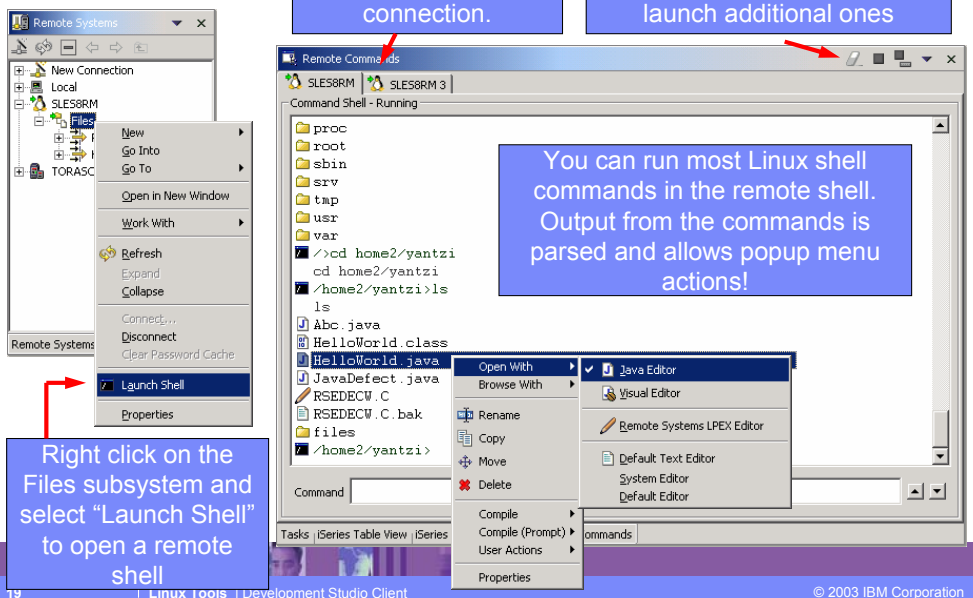
Editing Remote Files



Remote Shell

Multiple shells open for each RSE Linux connection.

Use these controls to terminate and remote shells or launch additional ones

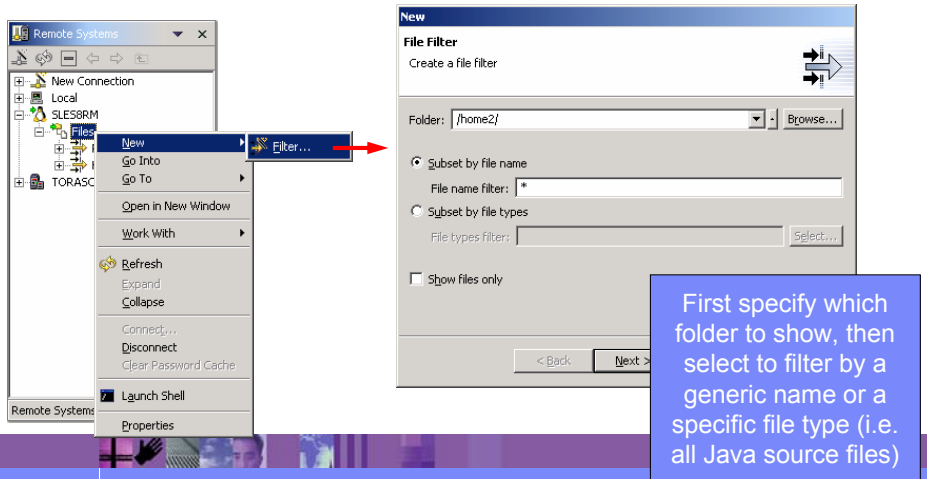


You can run most Linux shell commands in the remote shell. Output from the commands is parsed and allows popup menu actions!

Right click on the Files subsystem and select “Launch Shell” to open a remote shell

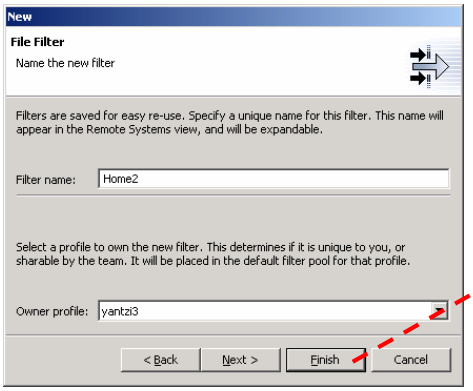
Defining New Filters

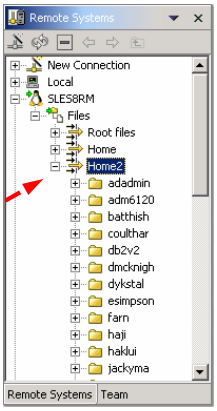
Filters allow you to show specific directories or files in the RSE Systems View under your connection.



First specify which folder to show, then select to filter by a generic name or a specific file type (i.e. all Java source files)

Defining New Filters - 2



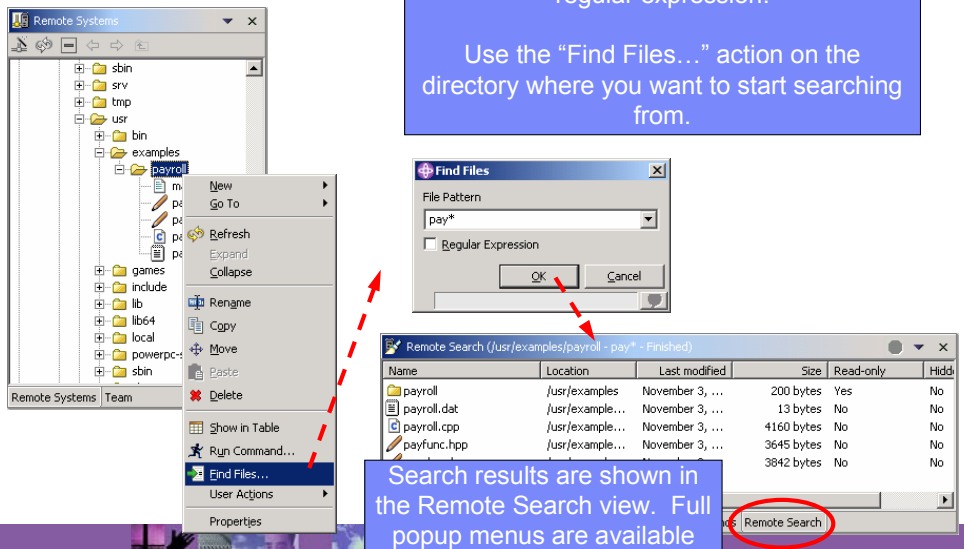


Next enter a meaningful name for your filter. Filters are saved so you can reuse them after shutting down and restarting the Workbench.

Remote Searching

Remote searching allows you to search for files based on either a generic name or regular expression.

Use the “Find Files…” action on the directory where you want to start searching from.

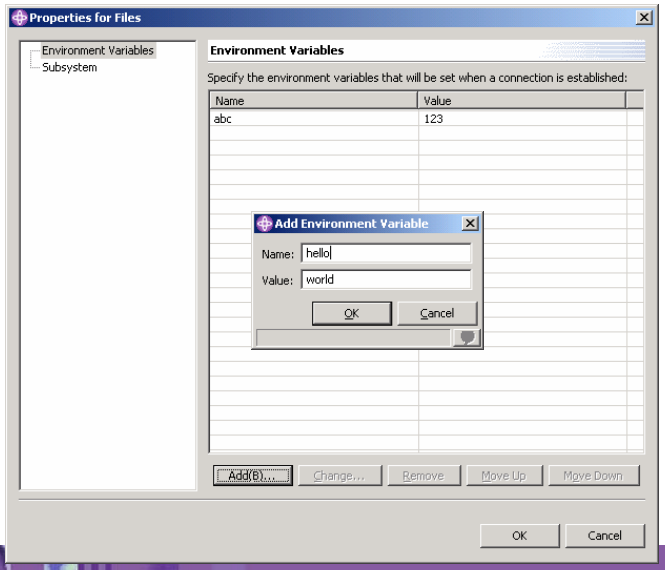


Search results are shown in the Remote Search view. Full popup menus are available on search results.

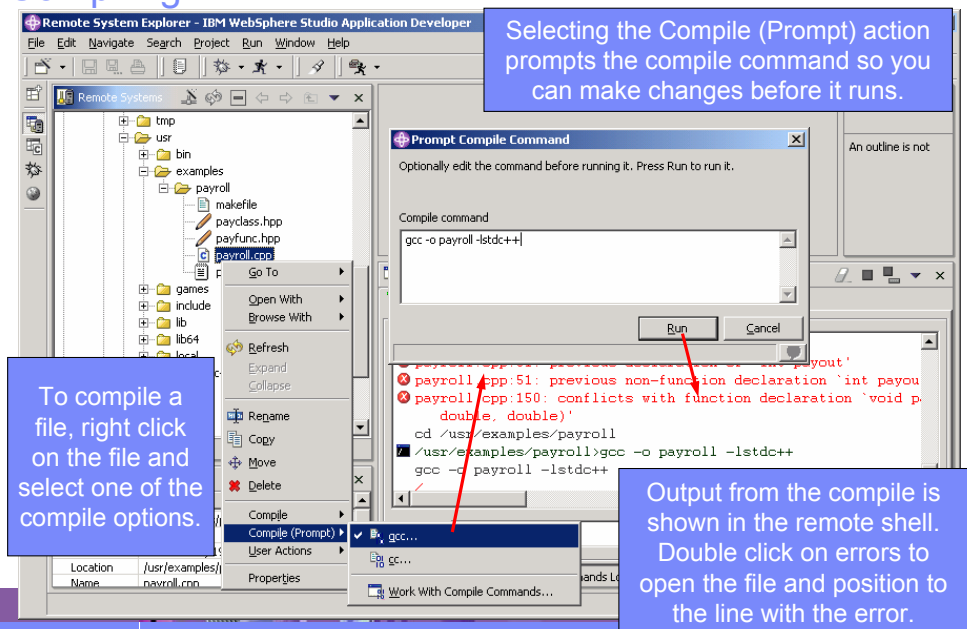
Setting Environment Variables

You can set environment variables for each RSE Linux connection. Each connection can have different environment variables.

Right click on the Files subsystem and select properties to get this dialog.



Compiling



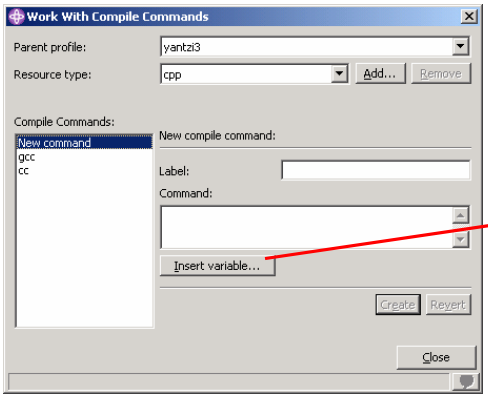
Selecting the Compile (Prompt) action prompts the compile command so you can make changes before it runs.

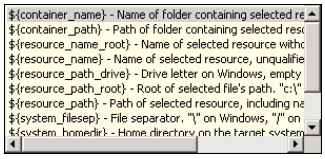
To compile a file, right click on the file and select one of the compile options.

Output from the compile is shown in the remote shell. Double click on errors to open the file and position to the line with the error.

Work With Compile Commands

You can open the “Work With Compile Commands” dialog from the Compile popup menu or the File subsystem’s “Work With -> Compile Commands…” popup menu.



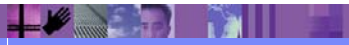


Use substitution variables to file in the resource name, resource type and other information based on the selection.

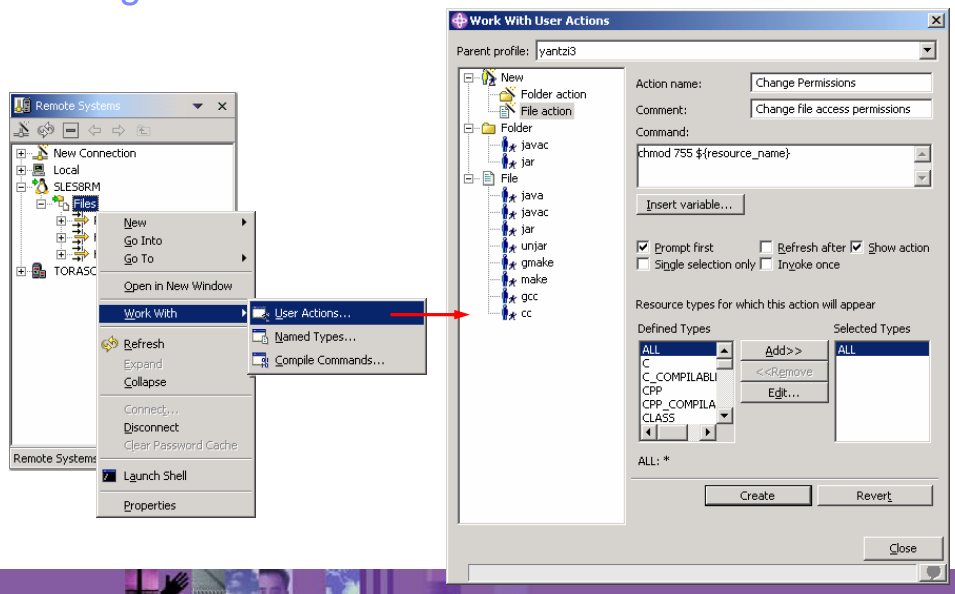
WDSc provides some default compile commands for .java, .c and .cpp files types. You can add your own compile commands for any file type.

User Defined Actions

- You can add your own actions to the popup menus for folders and files in your Linux Connection
- Actions are scoped to a Folder or File
  - File actions can be further scoped to a named types
  - Name types are a collection of file types with a given name
  - For example: The “C” named type could include files of type .cpp, .c, .h and .hpp
- For your action, you can specify:
  - Substitution variables that are filled in at runtime based on the current selection
  - Whether or not to prompt your action first
  - Whether or not to refresh the view where your action was launched from
    - Incase your action creates or deletes resources



Creating User Defined Actions



Invoking a User Defined Action

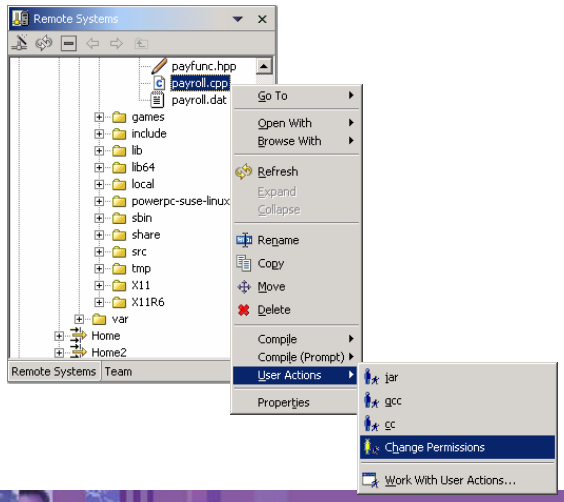
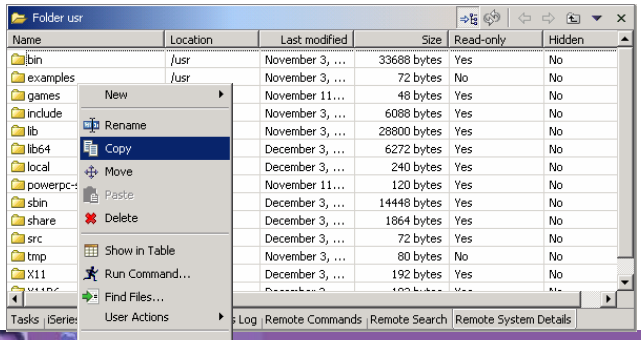


Table View

Instead of using the Remote Systems tree view you may want to use the table view.

The table view displays additional properties for each resource and provides the same actions as the Remote Systems view.

Use these controls to navigate through the table view



You can double click on folders to open the folder in the table view, or double click on files to open them in the editor

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Linux as a Development Client

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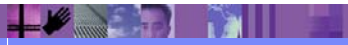
Linux as a Development Client

- So which tools run on Linux?

The base Eclipse Workbench
- Download for free at eclipse.org
  - Available using either Motif or GTK widget toolkits
- Lots of other open source plug-ins for Eclipse
  - CDT: C/C++ Development Tools

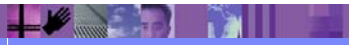
IBM WebSphere Studio Site Developer (WSSD)
- Java development
- Web development
- XML development

IBM WebSphere Studio Application Developer (WSAD)
- WSSD +
- EJB Development
- Profiling Tools



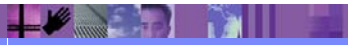
Running WSSD or WSAD on Linux

- First
  - You need to buy and install either WSSD or WSAD for Linux
- Next
  - Running WSSD or WSAD on Linux is the same as running on Windows
  - Java, Web, XML and EJB technologies are cross-platform so it doesn't matter if you develop and test on Windows or Linux



Running the Base Eclipse Workbench

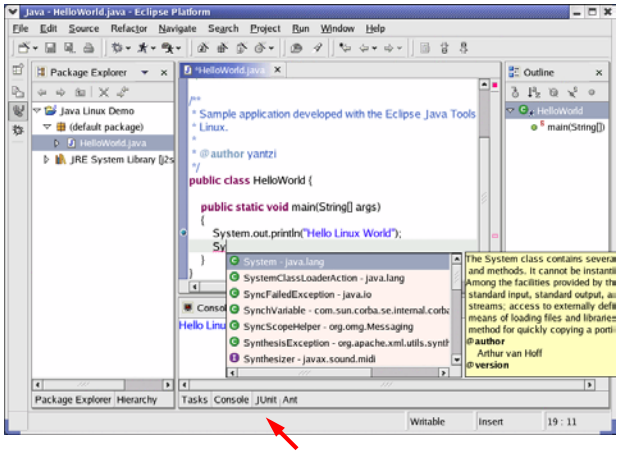
- First:
  - Download and install a Java Development Kit
    - Use JDK 1.3.x or higher
  - http://java.sun.com
- Then
  - Download and install the Eclipse Workbench
  - http://www.eclipse.org
- It's all free!



Base Eclipse Workbench

Workbench running on Linux using GTK

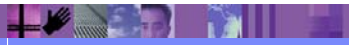
- Base Workbench includes:
  - Java Tooling
    - Editor
      - Syntax checking
      - Content assist
      - Refactoring
    - Debugger
  - Ant support
  - CVS integration
    - Easily share your Workspace resources with other team members
  - JUnit support
    - Automated Java unit test framework and runtime
  - Online help system
  - Plug-in Development
    - Use this to write your own Workbench tools!



Different views to display output for the tools

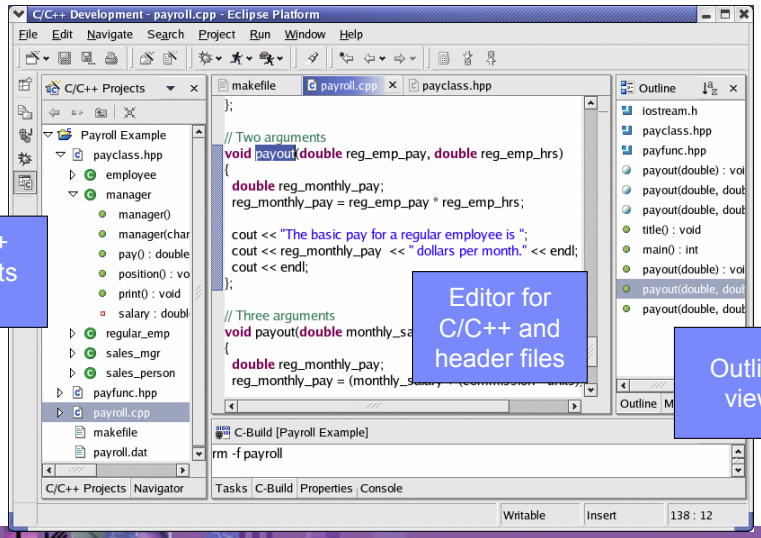
C/C++ Development Tools (CDT)

- Open source project to develop an IDE for C and C++ development on the Eclipse platform
  - Project hosted on eclipse.org
  - Primary focus is Linux as the development client and deployment platform
- CDT Includes:
  - Special C and C++ project types
    - Handle builds
      - Integrated error feedback with tasks view
  - Editor
    - Token highlighting
    - Outline view
    - Content assist
      - Templates
  - Debugger (uses GDB or GDB server if running remotely)
  - Searching



CDT Overview

C/C++ Perspective



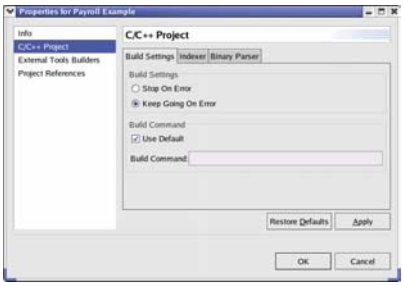
C/C++ Projects view

Editor for C/C++ and header files

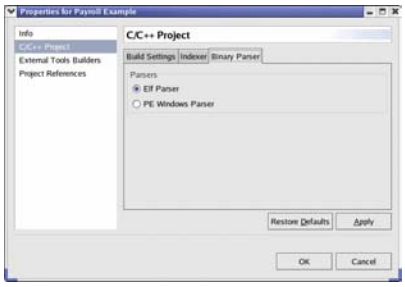
Outline view

CDT: Setting Up Your Project

Setup your project builds, default is to use make



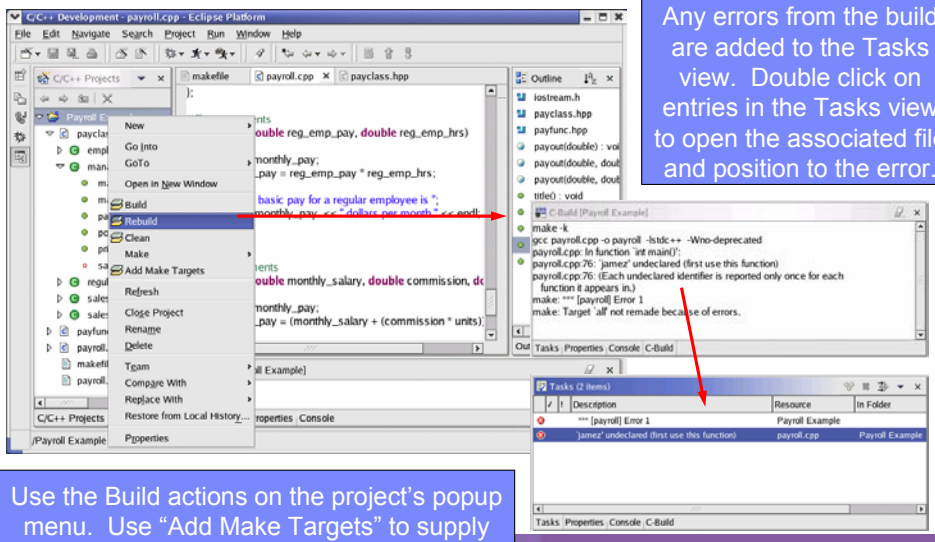
Binary parser allows you to expand binaries in your C / C++ project. Use Elf parser for Linux.



CDT provides a special C/C++ Project for doing C/C++ development. Project handles builds and parsing binary objects.

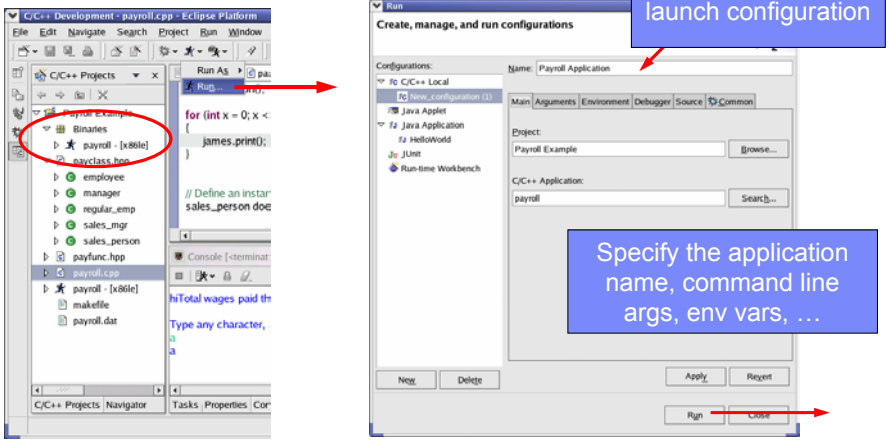
CDT: Building Your Project

Output from the build is shown in the C-Build view. Any errors from the build are added to the Tasks view. Double click on entries in the Tasks view to open the associated file and position to the error.



Use the Build actions on the project's popup menu. Use "Add Make Targets" to supply specific make targets to the Make -> menu

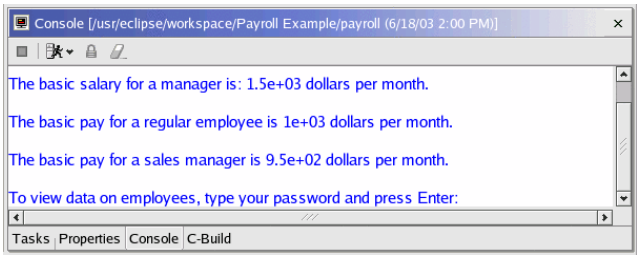
CDT: Running Your Application



CDT uses the launch configurations (Workbench standard) to run and debug C / C++ applications. Launch configurations are saved so you can easily re-run / debug your application.

CDT: Running Your Application

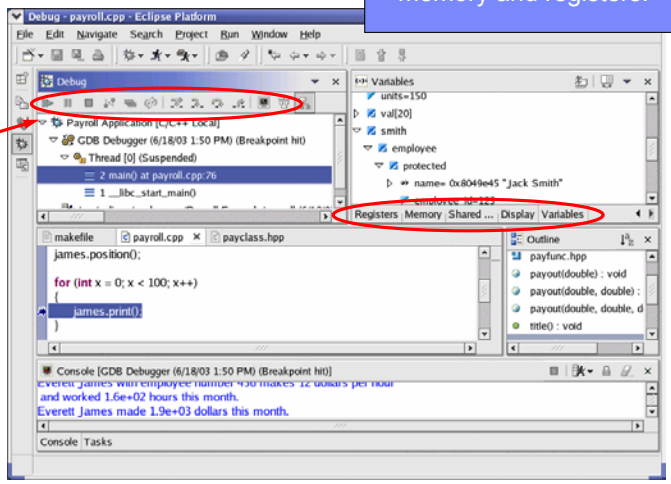
Application runs and all command line input / output is done using the Workbench Console view (same for run and debug)



CDT: Debug

Use these views to examine variables, memory and registers.

Use these controls to resume, pause and stop the debugger, as well as step over, step into, …



Debugger is launched the same way as run, except using the debug menu instead of the run menu

The same debug perspective is used for C/C++, Java, Web, RPG and COBOL!

EPIC Eclipse Perl Integration

Warning:
Currently Under
Development

- Collection of Perl plug-ins for Eclipse
- Currently contains:
  - Perl editor
    - Syntax highlighting
    - Syntax checking
    - Content assist
    - Outline view
  - Perl Debugger
    - Does not seem to be available yet, keep checking EPIC website
  - RegExp view
    - Regular expression evaluator and debugger
- Available from e-p-i-c.sourceforge.net

PHPeclipse

- Other open source projects:

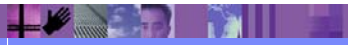
  COBOL Tools
  Available from eclipse.org

  PHPeclipse
  PHP Editor for the Eclipse Workbench
  Available from phpeclipse.org

  Tons of others available!
  Testing, Coding frameworks, …

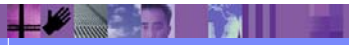
Additional Resources

- Eclipse.org
  http://www.eclipse.org
- IBM DeveloperWorks
  http://www.ibm.com/developer
- EPIC (Eclipse Perl Integration)
  http://e-p-i-c.sourceforge.net
- PHPeclipse
  http://phpeclipse.org



Agenda

- J2EE
  - A deeper look into J2EE
  - JDBC
  - J2EE Connector Architecture
  - Java Naming and Directory Interface
- Web Tooling
  - Web projects
  - J2EE Navigator and Hierarch Views
  - Cascading Style Sheets
  - Struts
- Server Tooling
  - Creating new server configurations in the test environment
  - Configuring the test environment



Introduction

- There are many different technologies at your disposal when creating Web applications (and lots of acronyms to go with them!)
  - J2EE, JDBC, JCA, JMS, CSS, HTML, JSP, WAS, …
  - Each has it's own useful purpose
- However, some are more common than others

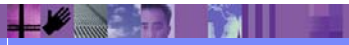
  CSS – Cascading Style Sheets for defining a consistent look and feel across all your web pages

  HTML and JSP – Replace DDS as way to define the user interface

  Struts – Great architecture to follow for your overall Web application

  JDBC – Database access and stored procedure call using SQL

  JCA – Java Connector Architecture for calling iSeries programs and service programs



Purpose of this presentation is to cover the more common Web technologies in greater detail and provide you with a foundation to explore the others.

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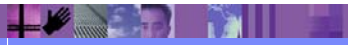
J2EE – The Technologies

WebSphere. software

e business software

J2EE - Components

- There are 4 main pieces to J2EE application model
  - Components
  - Containers
  - Services
  - Connectors
- Components (Modules)
  - You develop your code as components of a J2EE application
  - Many different types of components
    - Applets
    - Application clients (full graphical client)
    - Enterprise JavaBeans components (business logic)
    - Web components

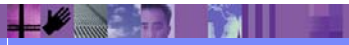


J2EE - Containers

- Components run inside of a container
- Containers are typically provided by system vendors like IBM
  - Web and EJB containers are provided with WebSphere Application Server
- Provide services that can be used by used by the components which run in the container
  - Transaction support
  - Resource pooling
    - database connections
  - Often allow component behavior to be specified at deployment time instead of development time
    - Configuring which database to access
    - Maximum number of database connections

J2EE – Service Technologies

- The J2EE specification defines standard APIs to access many common services
  - JDBC
    - Database-independent method for using SQL
    - Database provides provide JDBC drivers
      - IBM, Microsoft, Oracle, …
  - Java Transaction API
  - Naming Service
    - Java Naming and Directory Interface (more on this later)
  - J2EE Connector Architecture
  - Java Message Service (JMS)
  - There are others, but these are the main ones

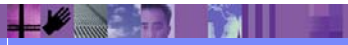


J2EE – Connector Architecture

- Provides a standard / portable API to use in Java components to access Enterprise Information Systems (EIS)
- Typically provided by the EIS vendor
  - IBM provides connectors for
    - Calling an RPG or COBOL program
    - Accessing CICS

Everything is Components, Containers, Services and Connectors

You develop your components using the help of the services and connectors then deploy to a container!



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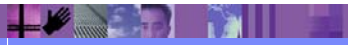
JDBC
J2EE Connector Architecture (JCA)
Java Naming and Directory Interface (JNDI)

WebSphere. software

e business software

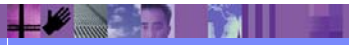
JDBC

- Standard Java interface for running SQL
  - Independent of any single Database vendor
  - Works with DB2 UDB, Cloudscape, Informix, Microsoft SQL Server, Oracle, Sybase, …
  - Lots of JDBC articles, books, web sites, ...
- Development time:
  - You write the code using JDBC and standard SQL
- Deployment time:
  - You specify which Database to use
  - This is configured in the “Web Deployment Descriptor” for you Web project (web.xml)
    - More on this latter!



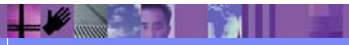
JDBC Java Interfaces

- Use JDBC to:
  - Directly read, write and update DB2 UDB for iSeries using SQL
  - Call stored procedures written using RPG, COBOL or Java
- JDBC Terms
  - Connection (`java.sql.Connection`)
    - Live connection (session) with a specific database
    - Statements are associated with a Connection
  - Statement (`java.sql.Statement`)
    - Java interface used for executing SQL
  - PreparedStatement (`java.sql.PreparedStatement`)
    - Same as Statement, except it is precompiled for performance
    - Use PreparedStatement if you are running the same statement multiple times
  - CallableStatement (`java.sql.CallableStatement`)
    - Java interface used for calling stored procedures



JDBC Connection Pooling

- Problem:
  - In a typical web application there maybe 1000s of requests coming in every minute
  - There is a lot of overhead to create and close a connection to the database for every request
  - But you need a connection to run SQL queries
- Solution:
  - Use Connection pooling
  - Web App container creates JDBC connections in a pool
  - Instead of creating a Connection in your code you:
    - Ask the pool for a connection
    - Use the connection to run SQL statements
    - Return the connection to the pool so it can be reused

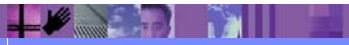


J2EE Connector Architecture (JCA)

- J2EE Connector Architecture provides a standard architecture for accessing various Enterprise Information Systems (EIS) from your Java application
  - RPG and COBOL programs or service programs
  - CICS
  - Enterprise Resource Planning (ERP) systems
- Resource Adapters
  - Provided by each vendor for their EIS system
  - Plugs into the application server and handles things like:
    - Communications
    - Transactions
    - Security

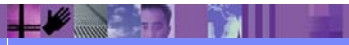
  WDSC provides resource adapter for calling RPG and COBOL programs

  D:\WDSC\iseries\eclipse\plugins\com.ibm.etools.iseries.webtools_5.0.1\lib\iseriespgmcall.rar



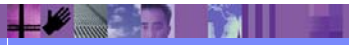
JNDI – How To Find Things

- Problem:
  - Many of the components to a web application are distributed across multiple servers
  - Components need to be dynamically changed or updated without having to modify the code and recompile
    - Changing a JDBC Database connection from the development database to the production database
- This is the domain of enterprise naming and directory servers
- Many different naming and directory server packages available
  - Need a standard way to interface with them so the code is not directly tied to a specific vendor's implementation



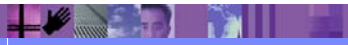
JNDI – How To Find Things

- Solution
  - Java Naming and Directory Interface (JNDI)
  - Allows developer to write programs that can lookup resources dynamically at runtime
    - Can easily change which database is used for JDBC without recompiling
  - Standard extension to the Java platform for connecting to and interfacing with naming and directory servers
- Use JNDI to locate other J2EE resources:
  - Database connections (JDBC)
  - RPG or COBOL program call resource adapters (JCA)
  - Message queue (JMS)
- JNDI is just an interface for locating services / components



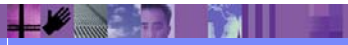
Programming With JNDI – Two steps

- Writing you application using JNDI to locate components
  - Or have one of the wizards generate the code
    - iSeries Program Call wizard
    - Database pages wizard
- Configuring the naming and directory server with the components you need at runtime
  - For example: Define the Database connection and pooling information
  - In a Web application with is done by configuring the properties for the Web application server
    - More on this later…



Code Example: Using JNDI to Lookup JDBC Connection

```
// import JDBC Interfaces
import java.sql.Connection;
import java.sql.ResultSet;
import java.sql.Statement;

// import JNDI classes and interfaces
import javax.naming.Context;
import javax.naming.InitialContext;

...

// Retrieve JNDI context
Context initialContext = new InitialContext();
// Lookup JDBC DataSource using JNDI
DataSource datasource = (DataSource)
  initialContext.lookup("jdbc/customer");

// Use JDBC Data Source to run SQL query
Connection connection = datasource.getConnection();
Statement statement = connection.createStatement();
ResultSet results = statement.executeQuery("SELECT * FROM
  CUSTOMER");

// Do something with the result set
```



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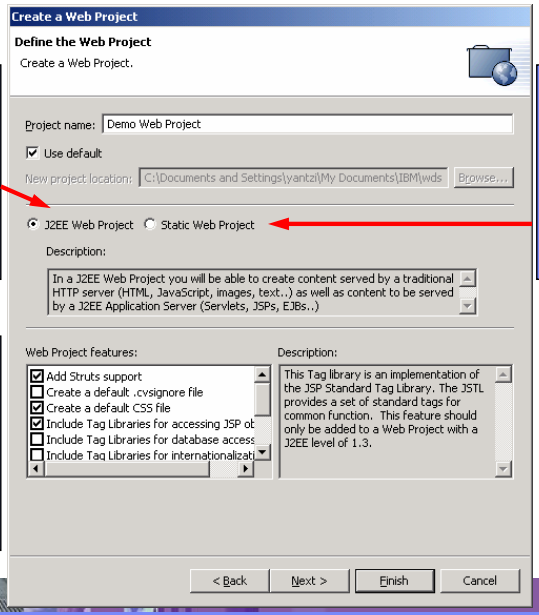
J2EE – The Tools

New Web Project Wizard

Use J2EE Web Project for Web applications with **dynamic content** (servlets and JSPs)



Use "Static Web Project" for Web sites with **no dynamic content** (just HTML and graphics)

Checkboxes to automatically add Struts support and Tag libraries to your new Web Project

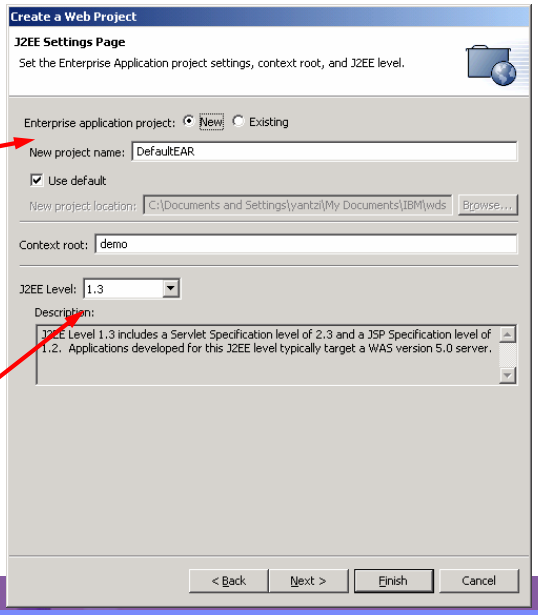
New Web Project Wizard - 2

Each J2EE Web project must be associated with an **Enterprise application project**

Enterprise application projects are associated with test environment server configurations (for testing your Web Application)

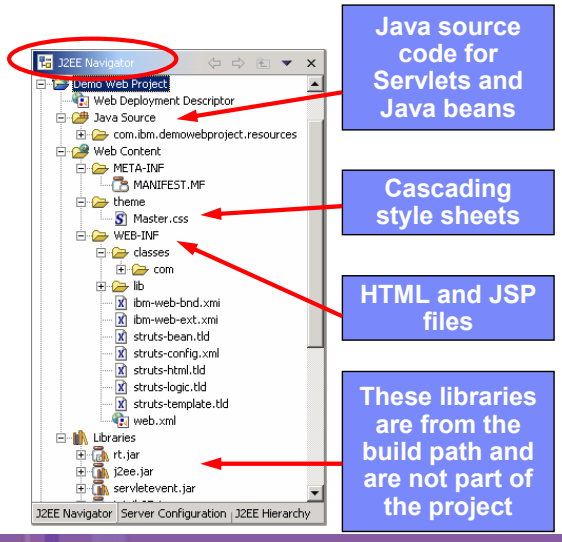
Use J2EE 1.3 with WebSphere Application Server 5.0

Use J2EE 1.2 with WebSphere Application Server 4.0



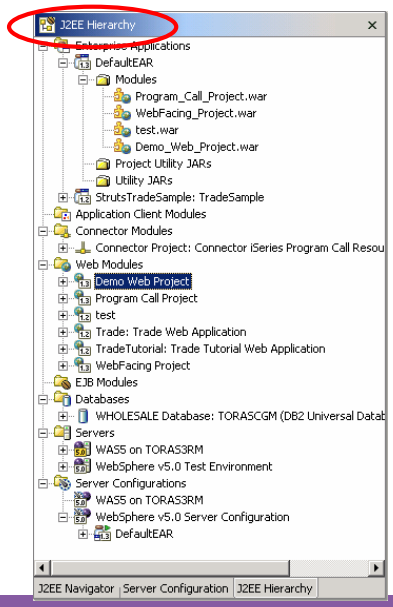
J2EE Navigator View

- The Web project that gets created complies (and enforces) the J2EE standard Web application structure
- J2EE Navigator view
  - Shows all J2EE related projects
    - Web Projects
    - EJB Projects
    - Connector Projects
    - Server Projects
  - Provides an easy way to manage your J2EE projects
    - Edit files
    - Copy, move rename and delete files



J2EE Hierarchy View

- Shows all of your J2EE resources in the workspace
  - Enterprise application projects
  - Web Projects (modules)
  - Enterprise JavaBean projects (modules)
  - Databases
  - Connectors
  - Test environment servers and configurations
- Displays resources in their hierarchy and how they are related
- Does not show projects

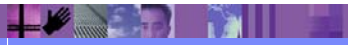


Cascading Style Sheets

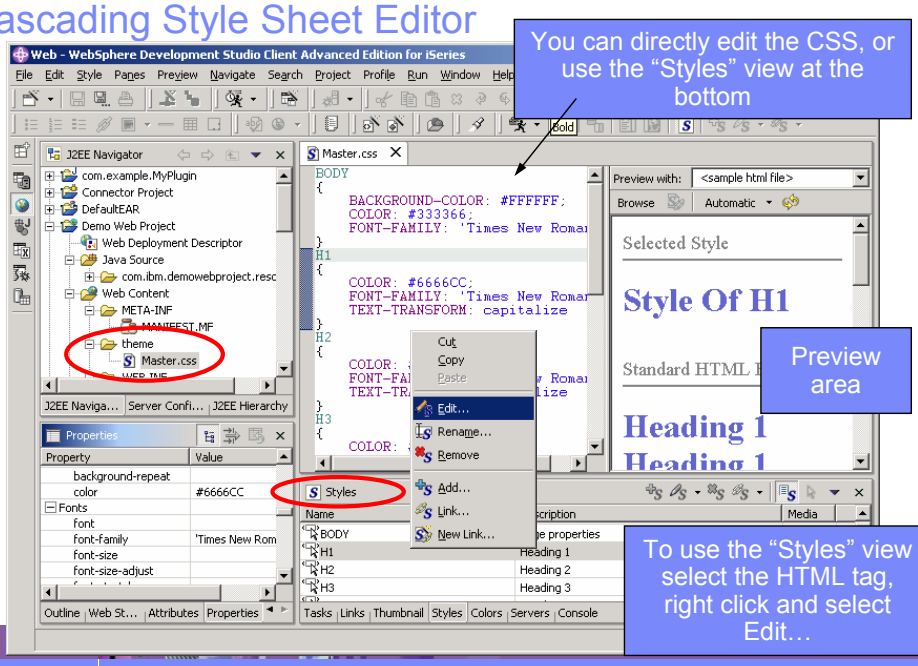
- Cascading Style Sheets (CSS) provide a central place to define the appearance of all HTML and JSP pages in your Web app
  - Properties are specified for the various HTML tags like BODY, H1, H2, TABLE
  - Fonts, colors, spacing, margins, positioning, alignment, …
- Stored in a separate .css file
  - Associated with HTML or JSP file using the HTML link tag

```
<LINK href="theme/Master.css" rel="stylesheet" type="text/css">
```

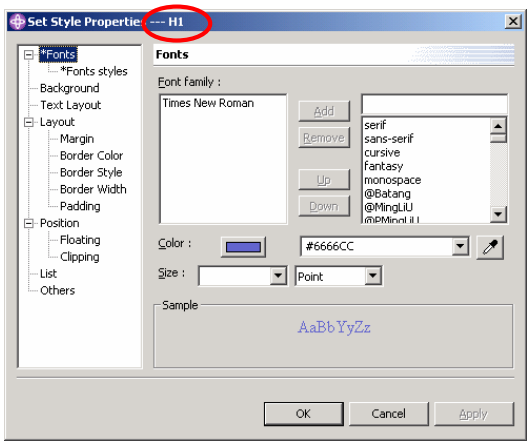
- CSS
  - Specialized graphical editor for working with CSSs
  - New HTML and JSP file wizards ask if you want to associate new file with an existing CSS



Cascading Style Sheet Editor



Cascading Style Sheet Editor



Properties for the H1 (heading 1) HTML tag.

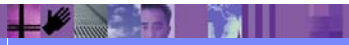
Changing a property here changes the look of all H1 tags in your Web application.

Dialog for graphically editing the properties for an HTML tag.

No need to know or learn the CSS syntax!

Struts

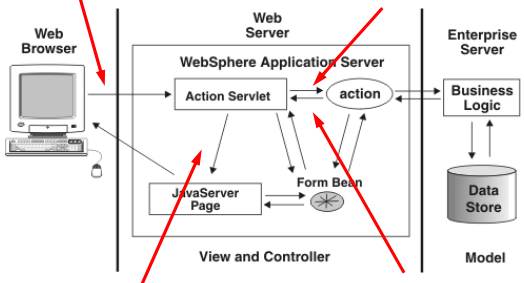
- What is Struts?
  - Open source framework for developing web applications
  - Sponsored by the Apache Software Foundation
  - Supports developing Web based applications that follow the
  - Model-View-Controller design
- How does it work?
  - Struts provides the Controller
    - You provide the Model and the View
  - Struts also provides:
    - Custom tag libraries for:
      - Internationalization
- Struts is supported by the WebSphere Studio development tools and the WebSphere Application Server runtime



Struts Overview

1. Incoming request from Browser

2. Struts ActionServlet looks up the corresponding action class for the request, populates the a form bean with incoming data and passes the request to the action class

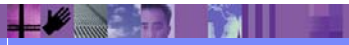


3. Action class processes the request (using OS/400 *PGMs and *SRVPGMs) places results in form bean and returns to ActionServlet

4. ActionServlet forwards the request to the corresponding JSP which sends result to Browser as an HTML page

How Does It Work - Controller

- Struts ActionServlet is the Controller
  - Uses configuration file (struts-config.xml) to determine:
    - ActionFormBeans
      - Uses the <form-bean> tag
    - Global Forwards
      - Uses the <forward> tag
    - ActionMappings
      - Uses the <action> tag
- What do you do?
  - Create an ActionForm to send data between view and model
  - Write an Action class for each request
  - Configure ActionMapping for each request

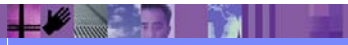


How Does It Work – Controller - ActionForm

- Stores and validates data from incoming HTML pages
- Transfers data between the view and the model
  - Can be stored in either the session or the request
- Upon receiving a request, the controller populates the associated ActionForm with data from the request and forwards the form bean to the Action class
- ActionForm can optionally perform validation on input
  - Override the method:

```
validate(ActionMapping mapping, HttpServletRequest
  request)
```

  - Struts handles redisplaying input page with error messages

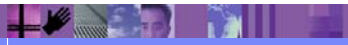


How Does It Work - Model

- Action class
  - Handle error checking and invokes business logic (model)
  - This is the part you have to code!
  - Implement the method:

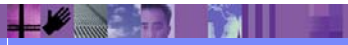
```
public ActionForward execute(ActionMapping mapping,
                             ActionForm form,
                              HttpServletRequest request,
                             HttpServletResponse response
```

  - Return ActionForward instance to specify where control goes next
    - Typically a JSP to return results of Action to browser
    - Maps to an **Global Forward** (defined in struts-config.xml)
- ActionMapping
  - This is how the ActionServlet determines which incoming URL requests get mapped to which Action classes
  - ActionMappings are stored in the struts-config.xml file, requires the following info:
    - Incoming URI
    - Name of Action class
    - Name of the form bean used by this Action



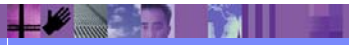
How Does It Work – View

- Struts includes tag libraries to help you
  - Create internationalized applications
    - Load in translated messages
    - Format dates and numbers for different locales
  - Automatically validate user input
    - Automatically redisplay input page with error messages from validation
  - Pre-fill HTML entry fields with data from your application

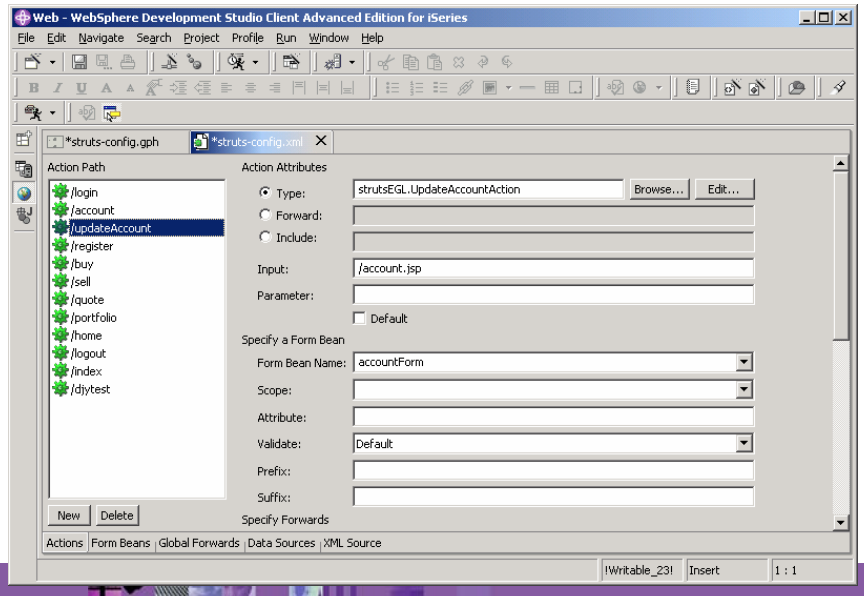


Struts Tools in Development Studio Client

- Enable Web projects for Struts, this automatically:
  - Creates struts-config.xml
  - Adds Struts tag libraries to the project
- Wizards to create
  - Form beans
  - Action classes
- Special Struts Configuration File Editor
  - You don't have to know XML or the XML syntax used in the stuts-config.xml

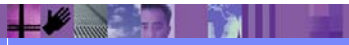


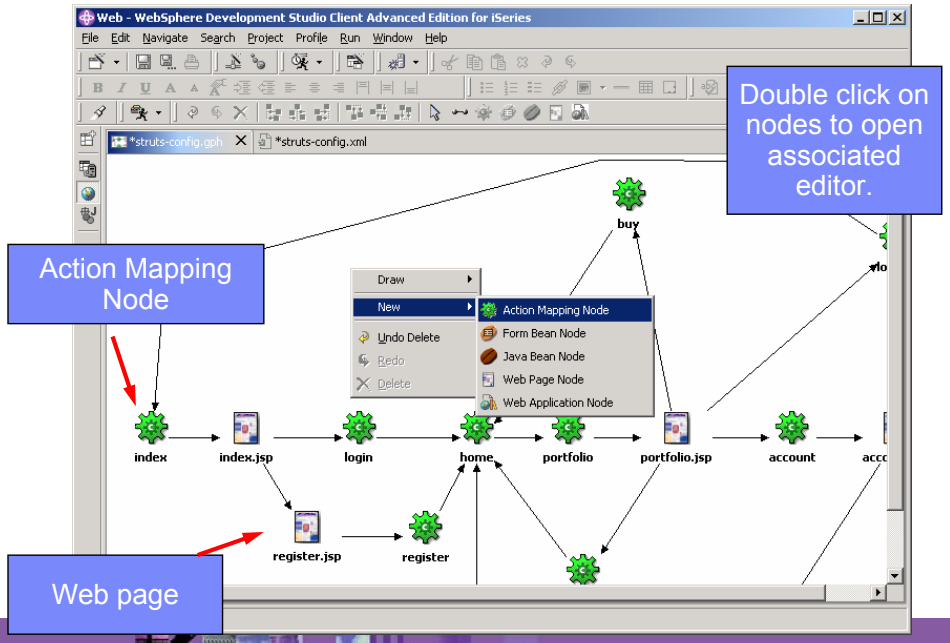
Struts Configuration File Editor



Struts Tools – Web Diagram Editor

- Shows a graph view of your Struts based Web application
- Can be used as a central point for working with the Web app
- Useful for:
  - Adding new actions / form beans / JSPs
  - Editing existing actions / form beans / JSPs
  - Documenting overall architecture of the Web application
- As parts are added, deleted or updated in the Web diagram editor the struts-config.xml file is updated with changes





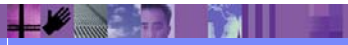
IBM Software Group

Server Tooling

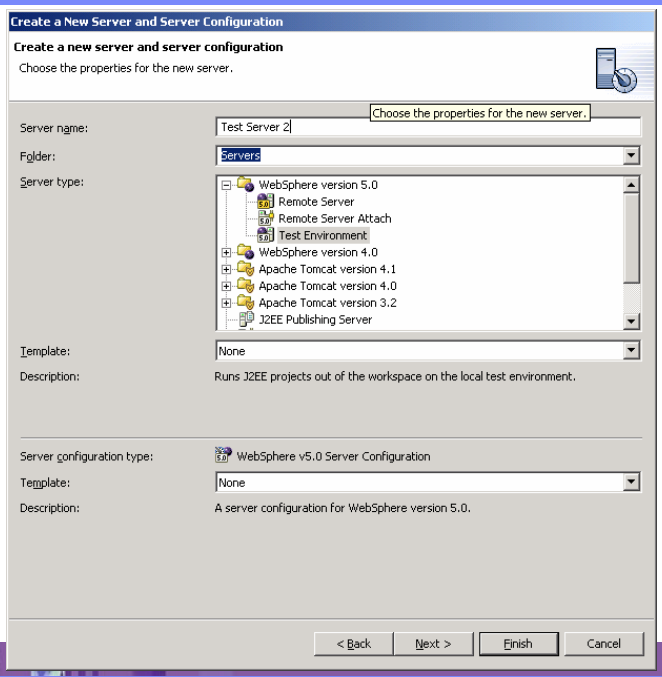
Configuring the Test Environment

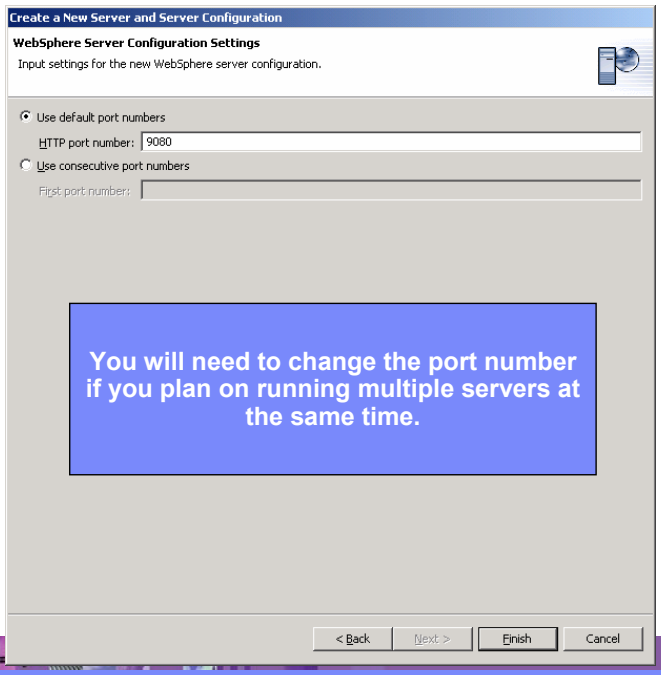
Servers and Server Configurations

- The test environment uses servers and server configurations to run and debug your web projects
  - The first time you test a Web project a server and server configuration is created for you
  - You can create your own, customize them and associate web projects with different servers
- Server Configuration
  - Setup and configuration information for a Server
- Server
  - Instance of a server configuration where you can test your Web applications
- Types of Servers and Server Configurations
  - WebSphere Application Server V5.0 and V4.0
  - Apache Tomcat V4.1, V4.0 and V3.2

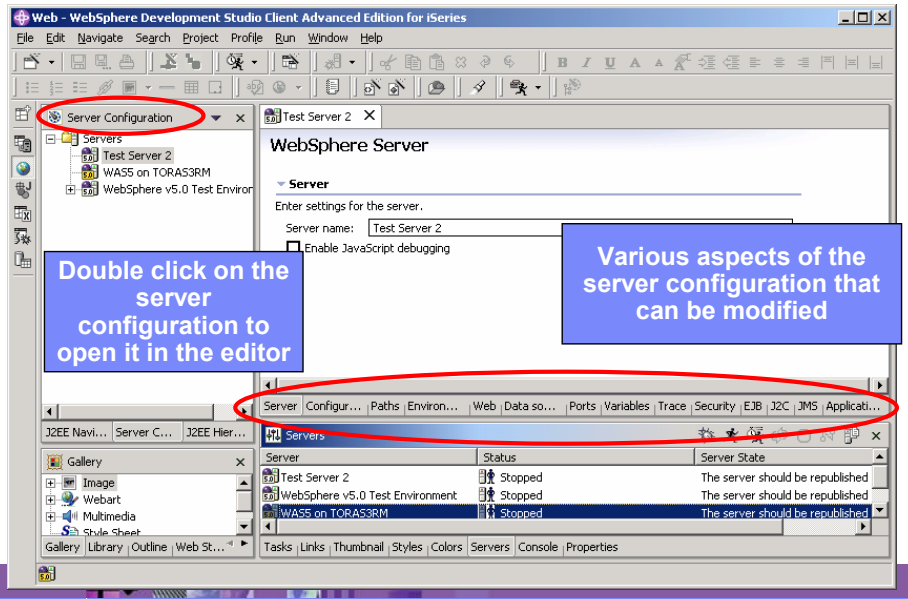


Creating a New Test Environment Configuration



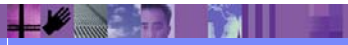


Editing a Server Configuration

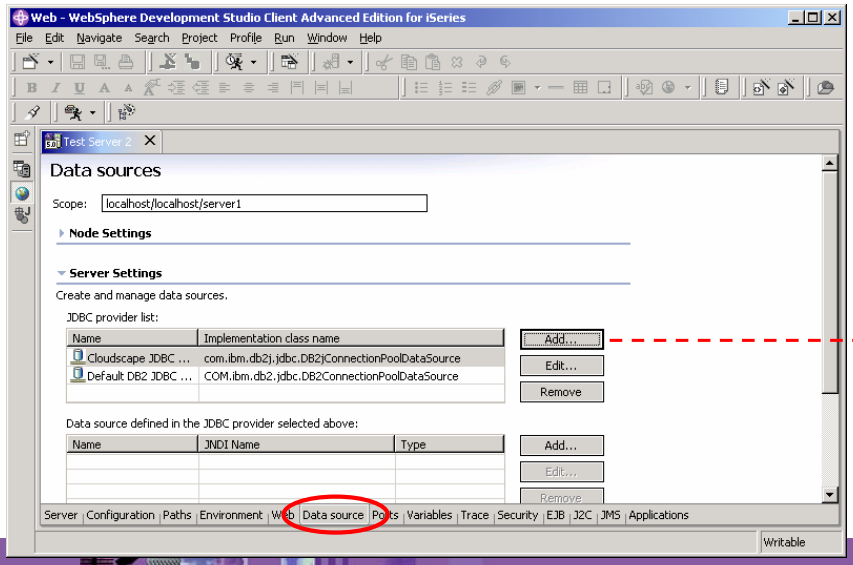


JDBC: Defining Connection Pools in the Test Environment

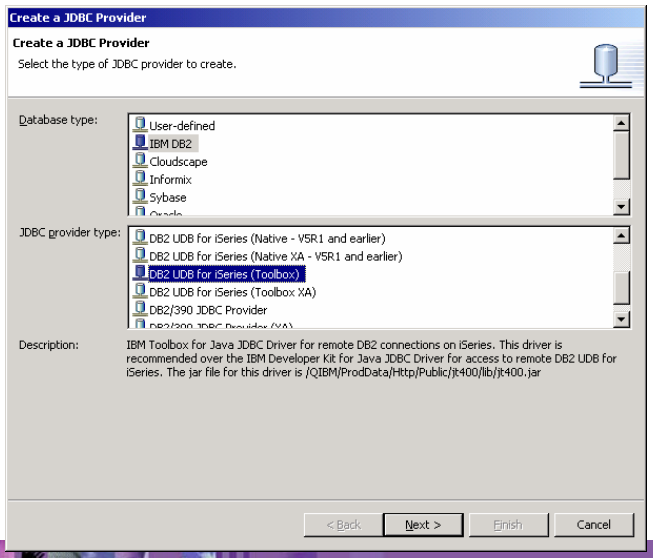
- Earlier we looked at JDBC, what it is and why you would use it
- Now we will look at how to configure JDBC connection pools in the WebSphere test environment
  - First you need to add the required JDBC driver to the **providers list**
  - Then you can define a connection pool for the JDBC driver



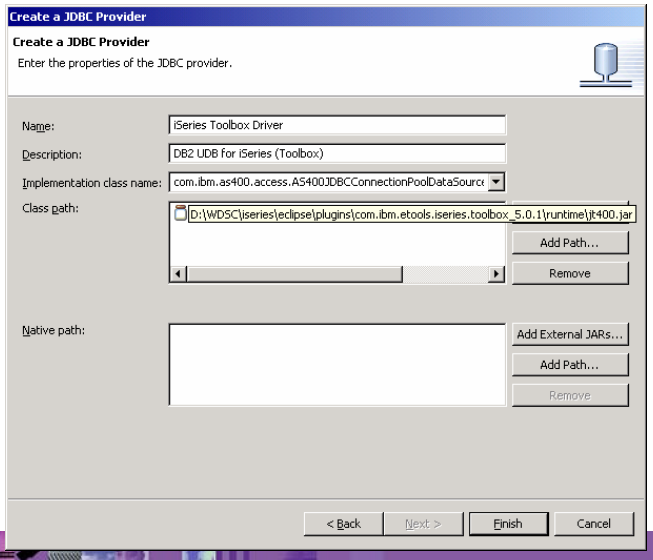
JDBC: Adding a Driver to the Provider List



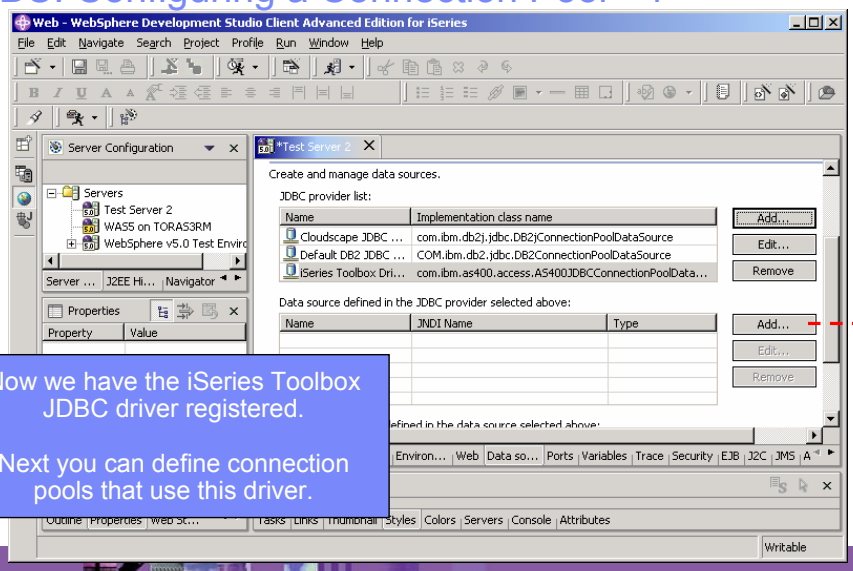
JDBC: Adding a Driver to the Provider List - 2



JDBC: Adding a Driver to the Provider List - 3

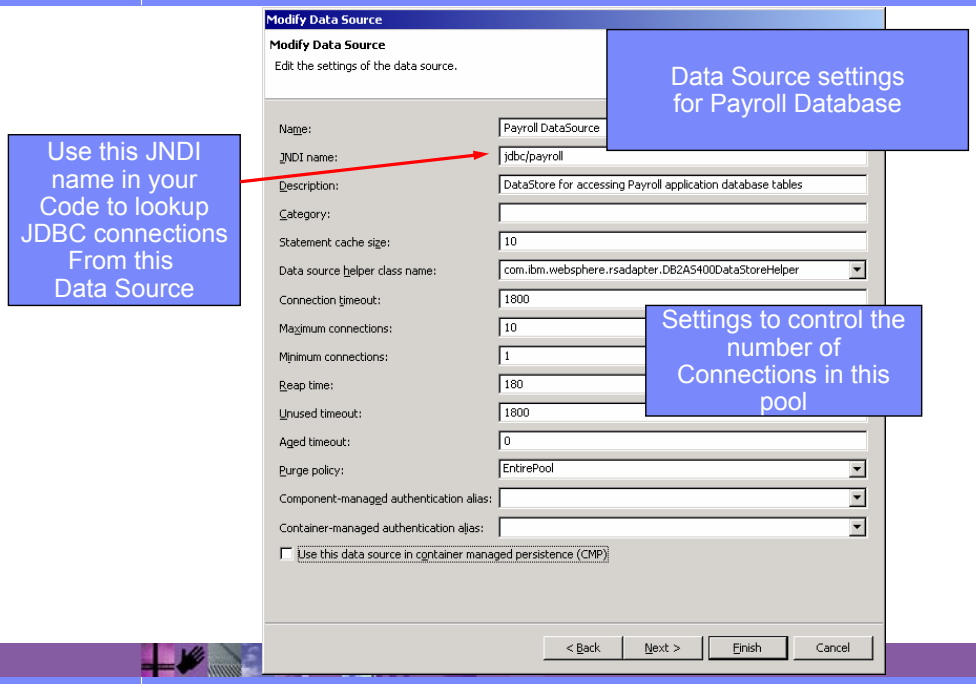


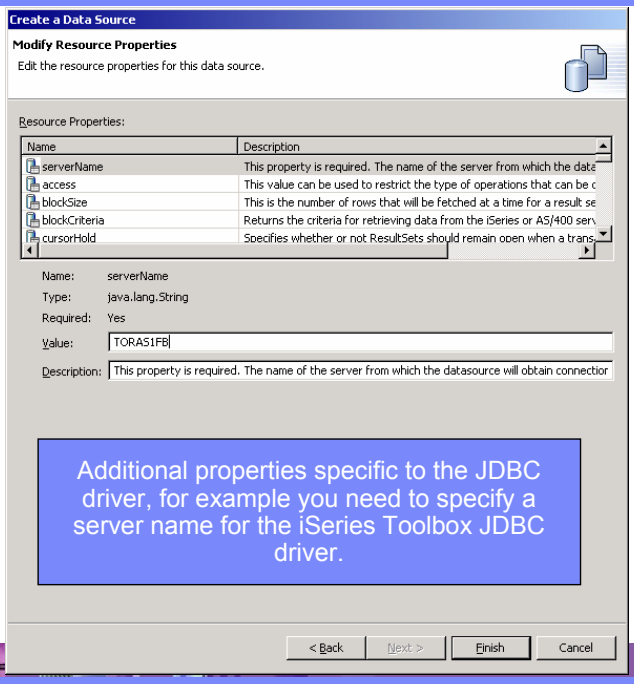
JDBC: Configuring a Connection Pool - 4

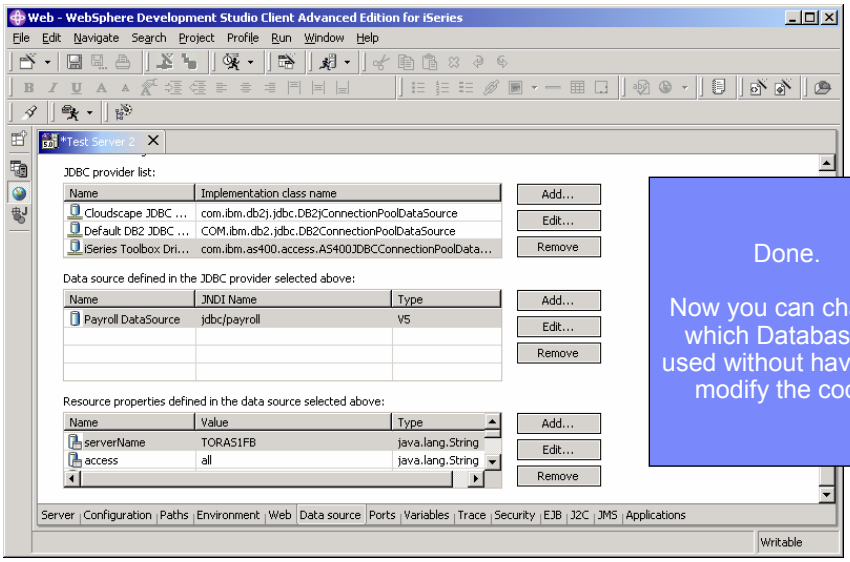


Now we have the iSeries Toolbox JDBC driver registered.

Next you can define connection pools that use this driver.

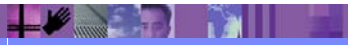




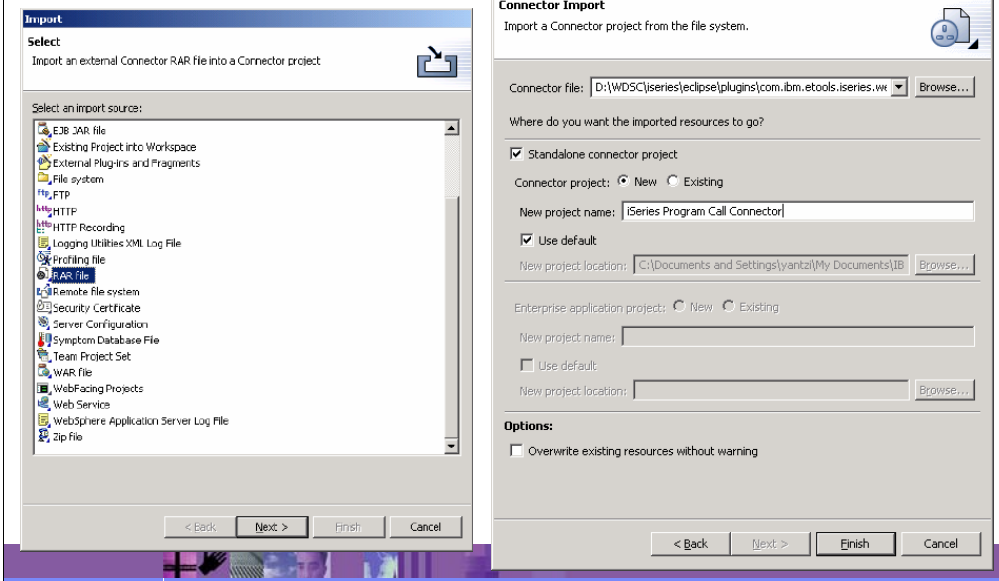


J2EE Connector Architecture

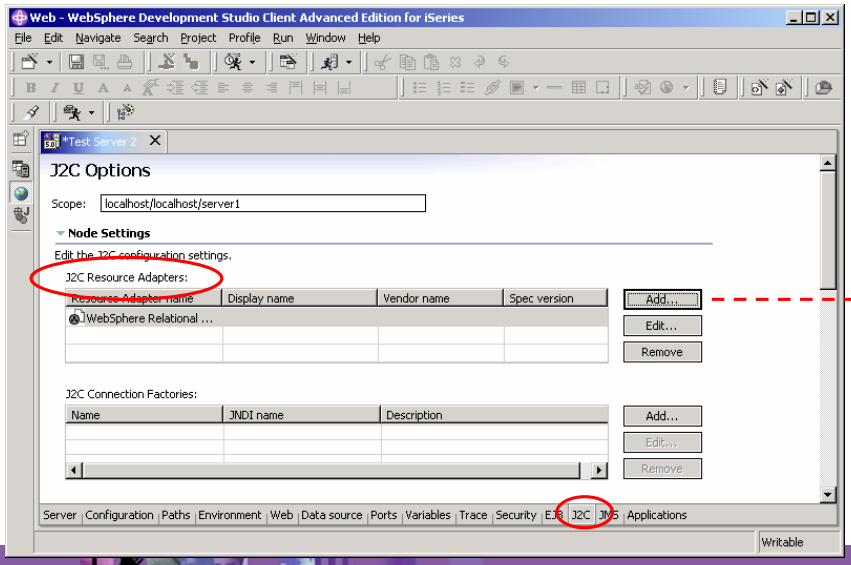
- Earlier we looked at the J2EE Connector Architecture, what it is and why you would use it
- Now we will look at how to configure JCA in the WebSphere test environment
  - First you need to import the required **Resource Adapter** into the Workbench
    - Resource adapters get imported into a special type of project called a Connector Project
  - Then you can define a Connection in the Server Configuration



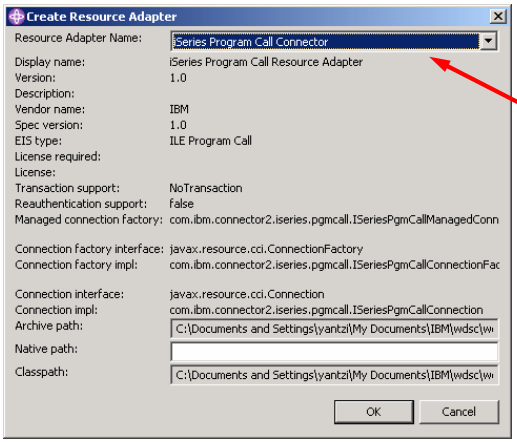
JCA: Importing Resource Adapters into WDSc



Adding Resource Adapters to the Test Environment

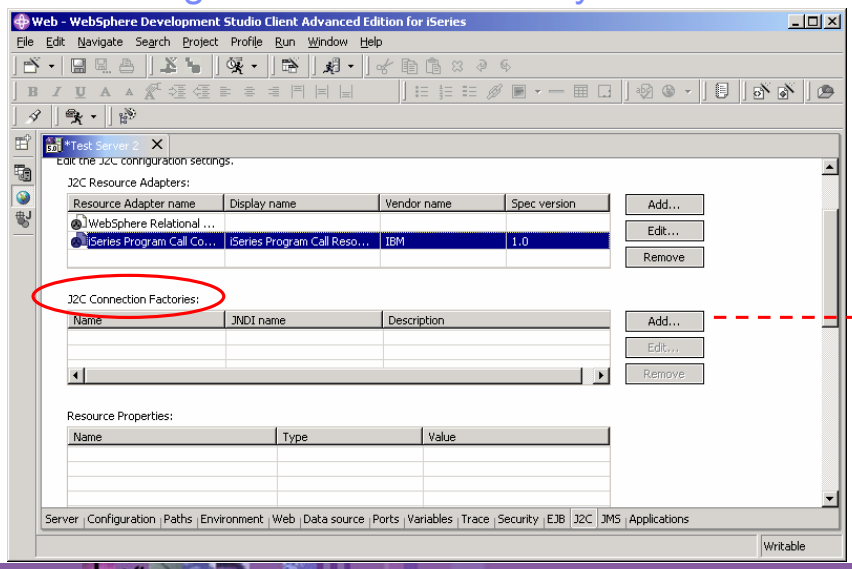


JCA: Configuring Resource Adapters in Servers

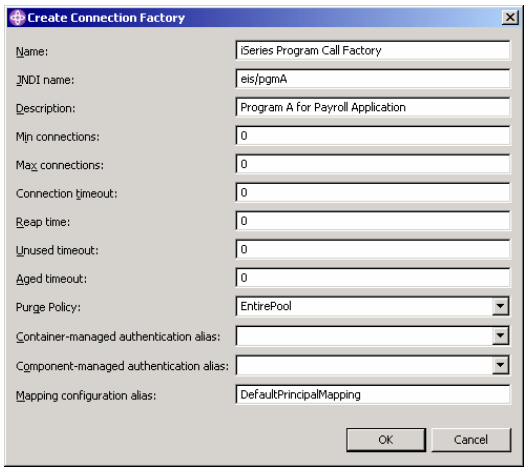


Project where you imported the resource adapter

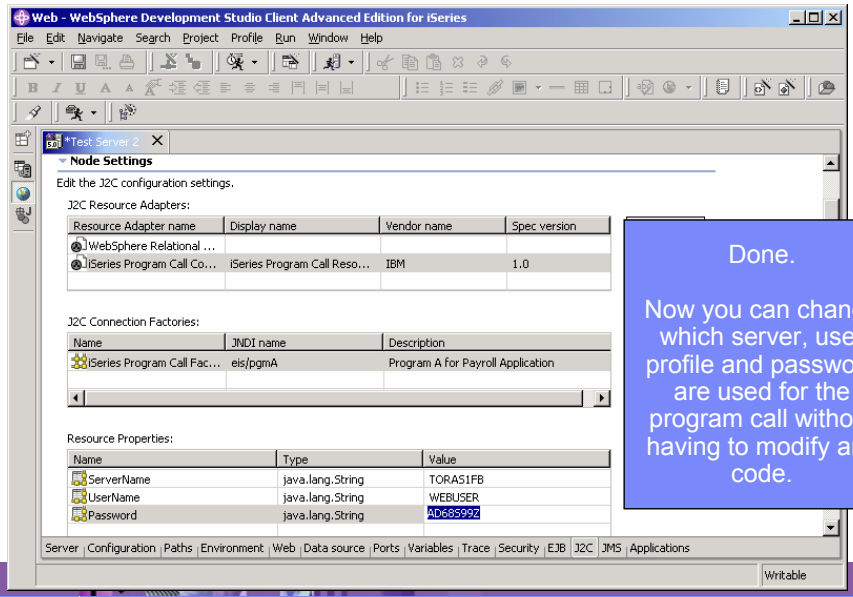
JCA: Creating A Connection Factory



JCA: Creating A Connection Factory



JCA: Creating A Connection Factory



Done.

Now you can change which server, user profile and password are used for the program call without having to modify any code.

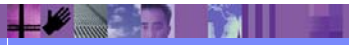
Summary

WebSphere. software

e business software

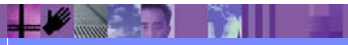
Summary

- Java 2 Enterprise Edition
  - Standards based model for developing applications in Java
    - Web applications
    - Enterprise applications
    - Client / Server applications
  - Supported by major Web Application Server vendors
- WebSphere Development Studio Client
  - Great Web tools to make developing J2EE applications productive and easy
  - Views of your J2EE resources
  - Customized editors for all the various technologies
    - Cascading style sheets, JSPs, HTML, animations, server configurations, Web deployment descriptor, …



Additional Resources

- J2EE Technologies
  http://java.sun.com/j2ee
- Cascading Style Sheets
  http://www.w3c.org/Style/CSS/
- Struts
  http://jakarta.apache.org/struts/
- WebSphere Workbench Tools
  http://www.software.ibm.com/wsdd/zones/studio/
  http://www.ibm.com/developer



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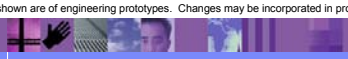

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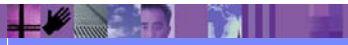

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Linux Tools in IBM WebSphere Development Studio Client for iSeries

WebSphere. software

e business software