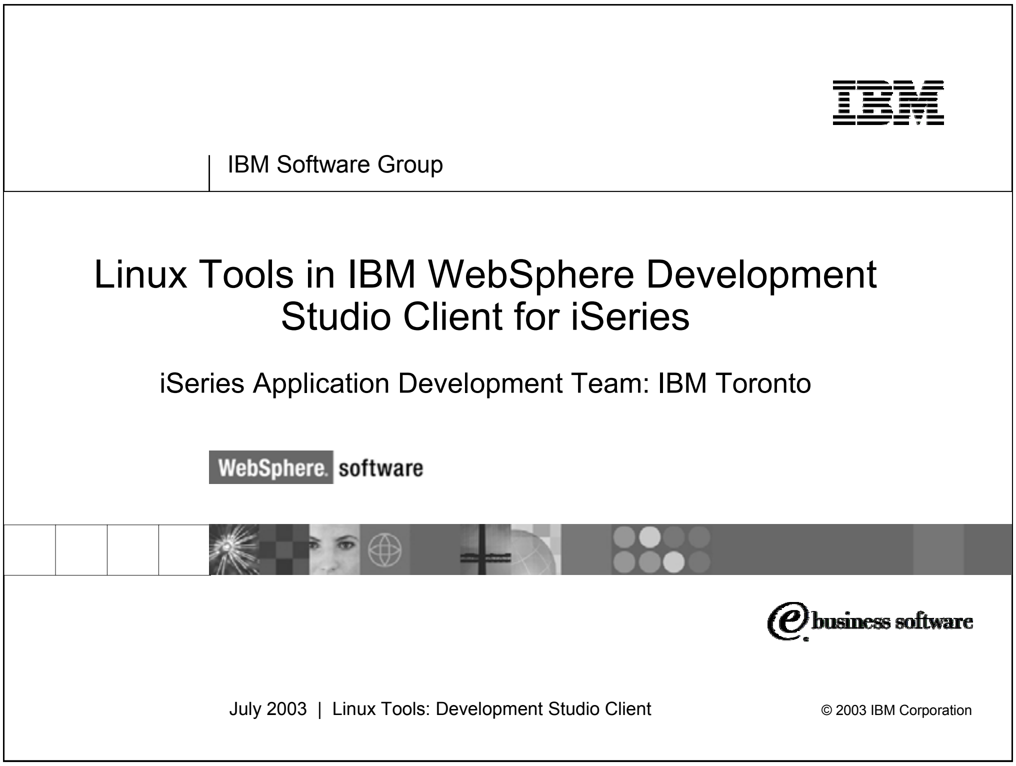

IBM Software Group

Linux Tools in IBM WebSphere Development Studio Client for iSeries

iSeries Application Development Team: IBM Toronto

WebSphere. software
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July 2003 | Linux Tools: Development Studio Client

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

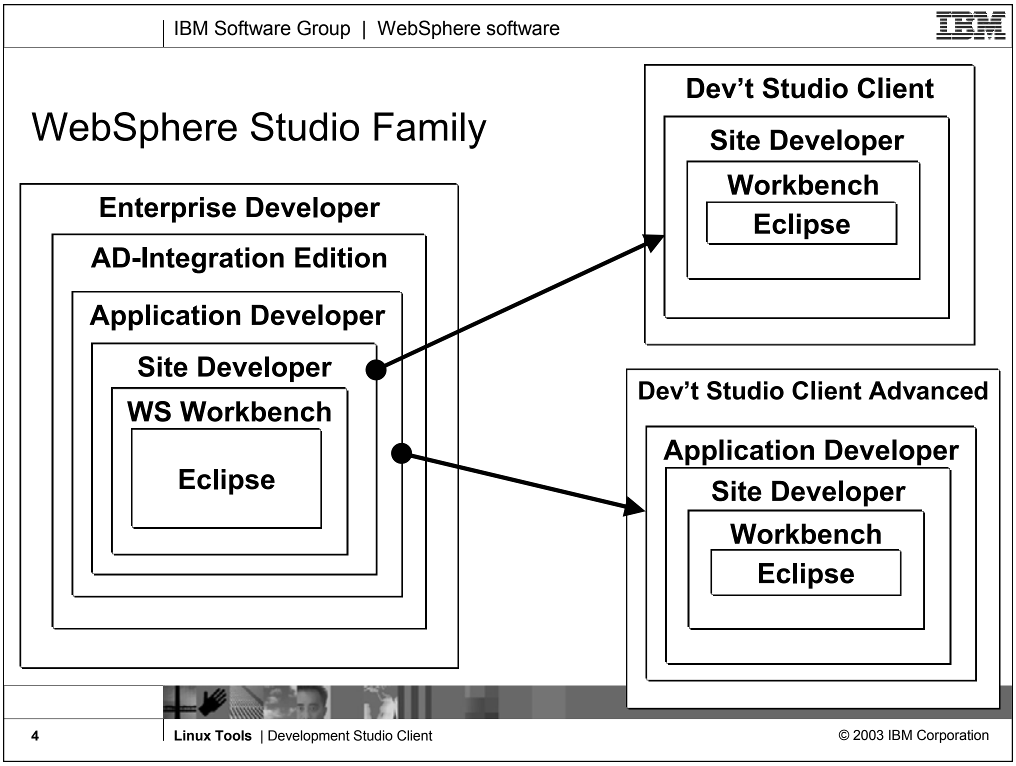
Agenda

- 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 Application Development Tools Platform

WebSphere software

e business software

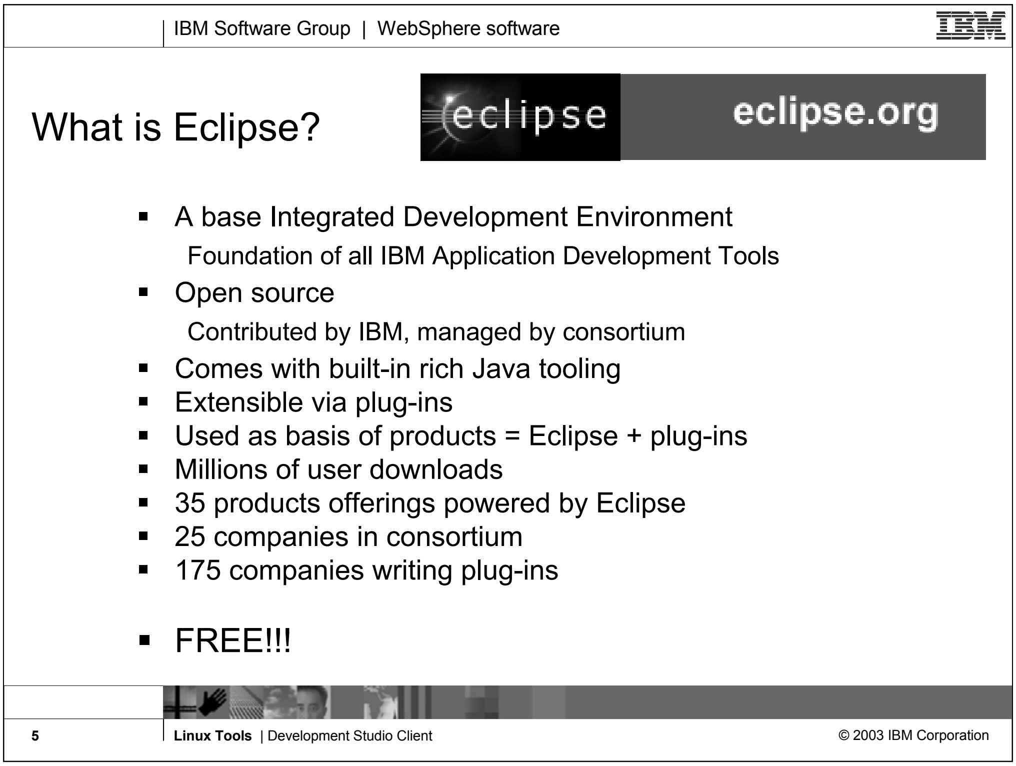


WebSphere Studio Family

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.



What is Eclipse?

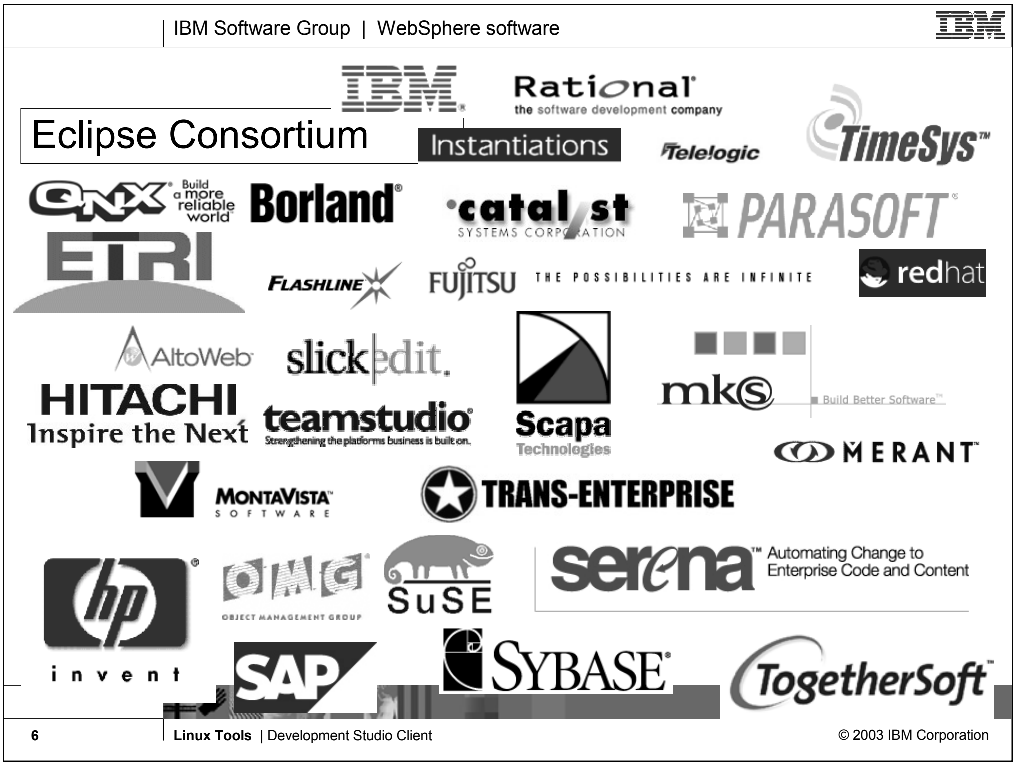
eclipse
eclipse.org

- A base Integrated Development Environment

  Foundation of all IBM Application Development Tools
- Open source

  Contributed by IBM, managed by consortium
- Comes with built-in rich Java tooling
- Extensible via plug-ins
- Used as basis of products = Eclipse + plug-ins
- Millions of user downloads
- 35 products offerings powered by Eclipse
- 25 companies in consortium
- 175 companies writing plug-ins
- FREE!!!

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!



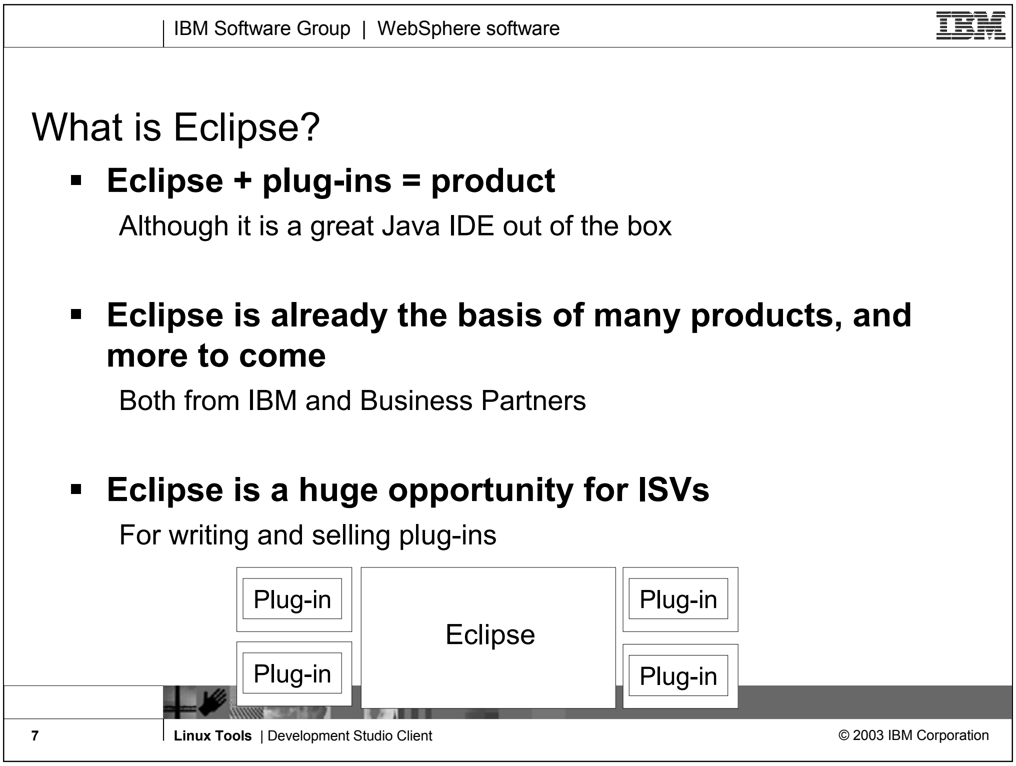
IBM Software Group | WebSphere software

Eclipse Consortium

IBM
Rational the software development company
Instantiations
Telelogic
TimeSys
QNX Build a more reliable world
Borland
catalyst SYSTEMS CORPORATION
PARASOFT
ETRI
FLASHLINE
FUJITSU THE POSSIBILITIES ARE INFINITE
redhat
AltoWeb
slickedit.
Scapa Technologies
mks Build Better Software
HITACHI Inspire the Next
teamstudio Strengthening the platforms business is built on.
MERANT
MONTAVISTA SOFTWARE
TRANS-ENTERPRISE
hp invent
OMG OBJECT MANAGEMENT GROUP
SuSE
serena Automating Change to Enterprise Code and Content
SAP
SYBASE
TogetherSoft

6 Linux Tools | Development Studio Client © 2003 IBM Corporation

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**

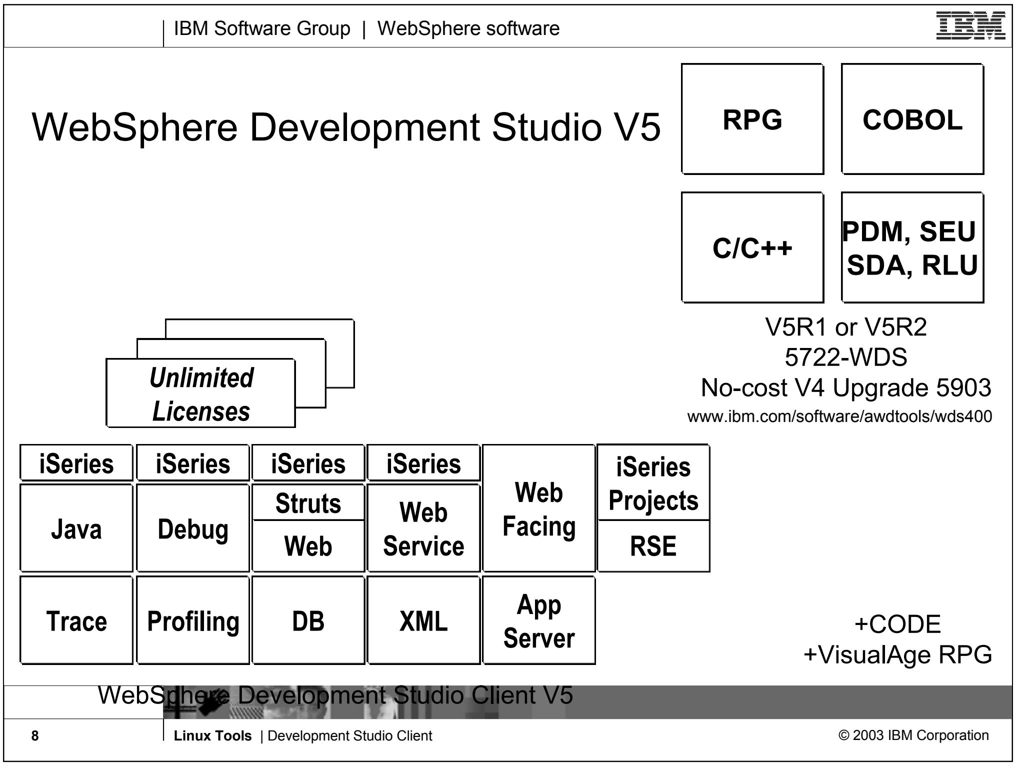
  For writing and selling plug-ins

Plug-in
Plug-in
Eclipse
Plug-in
Plug-in

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!



WebSphere Development Studio V5

RPG

COBOL

C/C++

PDM, SEU SDA, RLU

V5R1 or V5R2
5722-WDS
No-cost V4 Upgrade 5903
www.ibm.com/software/awdtools/wds400

Unlimited Licenses

iSeries Java

iSeries Debug

iSeries Struts Web

iSeries Web Service

Web Facing

iSeries Projects RSE

Trace

Profiling

DB

XML

App Server

+CODE
+VisualAge RPG

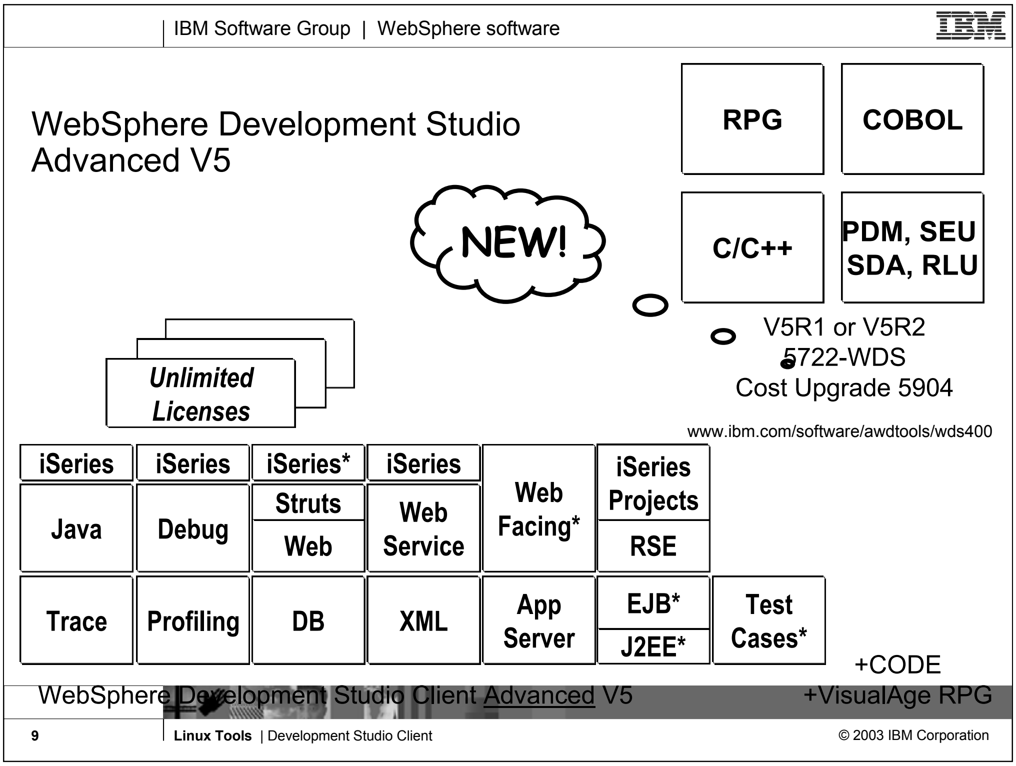
WebSphere Development Studio Client V5

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.



WebSphere Development Studio Advanced V5

V5R1 or V5R2
5722-WDS
Cost Upgrade 5904

www.ibm.com/software/awdtools/wds400

+CODE

WebSphere Development Studio Client Advanced V5 +VisualAge RPG

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).

Linux as a Development Server

WebSphere. software

e business software

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

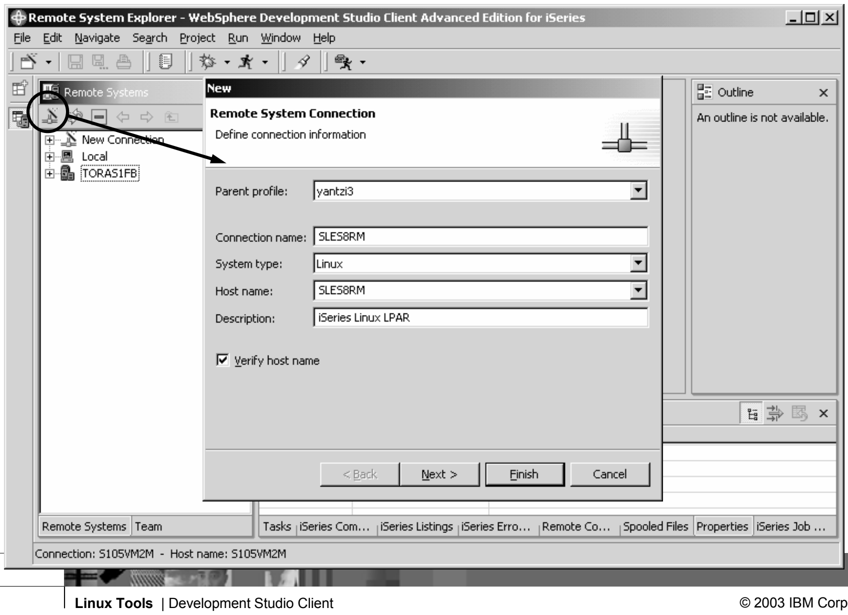
- Use the Remote System Explorer in Development Studio Client to work with your remote Linux server

- 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



Remote System Explorer - WebSphere Development Studio Client Advanced Edition for iSeries
File Edit Navigate Search Project Run Window Help
Remote Systems
New Connection
Local
TORAS1FB
Outline
An outline is not available.
Remote Systems Team
Tasks iSeries Com… iSeries Listings iSeries Erro… Remote Co… Spooled Files Properties iSeries Job …

New

Remote System Connection

Define connection information

Parent profile: yantzi3

Connection name: SLES8RM

System type: Linux

Host name: SLES8RM

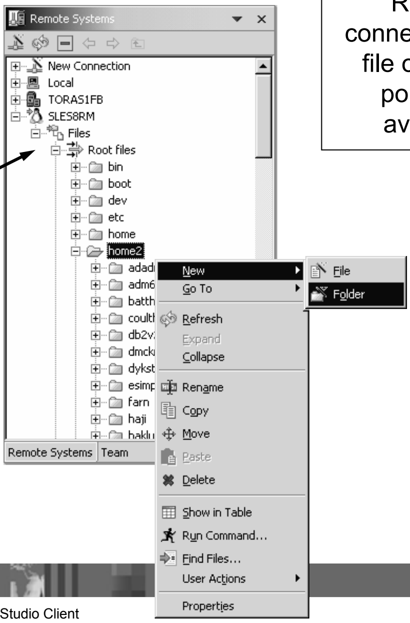
Description: iSeries Linux LPAR

☑ Verify host name

< Back | Next > | Finish | Cancel

Connection: S105VM2M - Host name: S105VM2M

Accessing a Linux Server



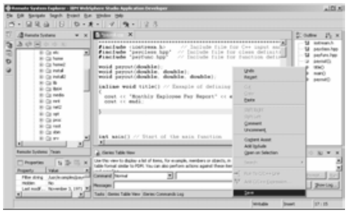
Right click on a connection, subsystem, file or folder to see a popup menu with available actions

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.

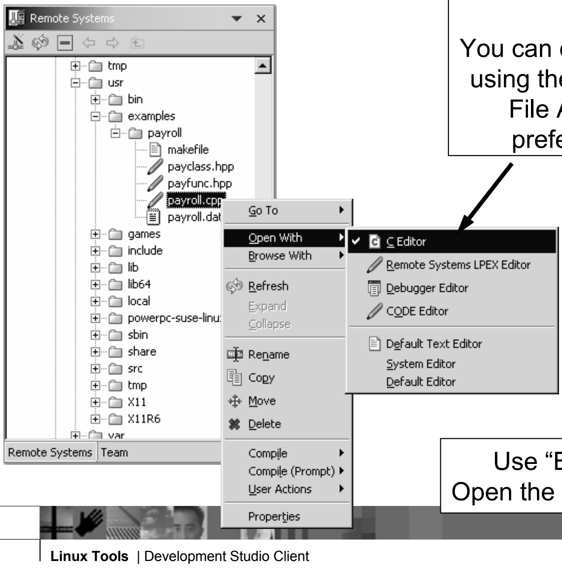
◄······························► TCP/IP Socket Connection

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.

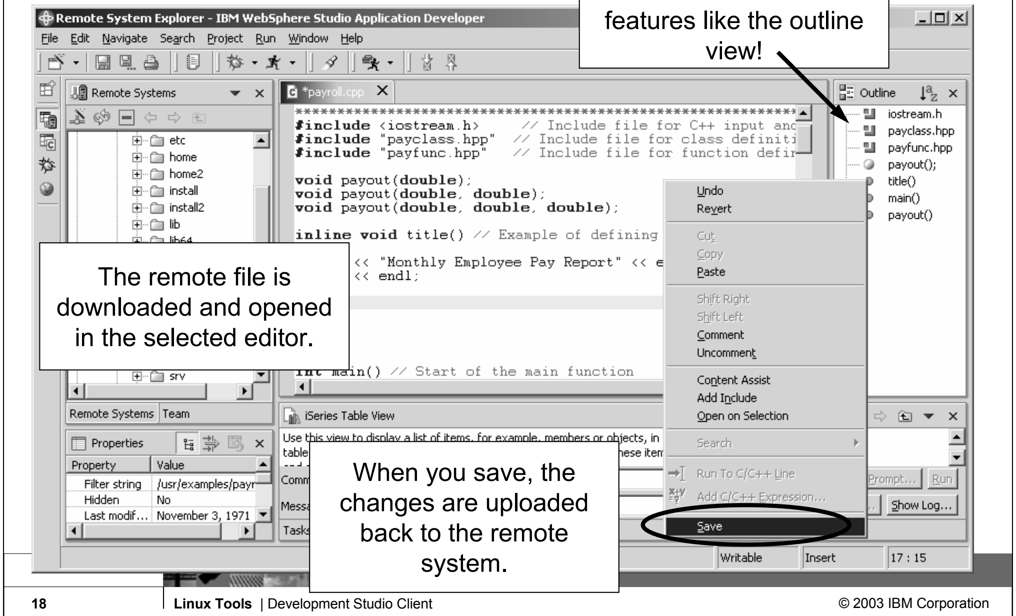
You can configure this list using the Workbench -> File Associations preference page

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



```
****************************************************************
#include <iostream.h>      // Include file for C++ input anc
#include "payclass.hpp"  // Include file for class definiti
#include "payfunc.hpp"   // Include file for function defir

void payout(double);
void payout(double, double);
void payout(double, double, double);

inline void title() // Example of defining
          << "Monthly Employee Pay Report" << e
          << endl;

int main() // Start of the main function
```

Use this view to display a list of items, for example, members or objects, in table ... hese item

Properties

Property	Value
Filter string	/usr/examples/payr
Hidden	No
Last modif...	November 3, 1971

You get full use of the editor and workbench features like the outline view!

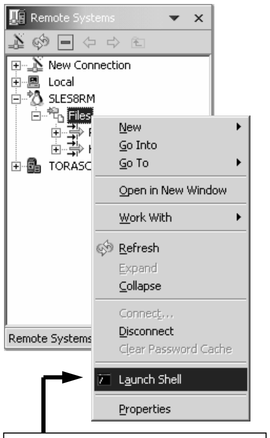
The remote file is downloaded and opened in the selected editor.

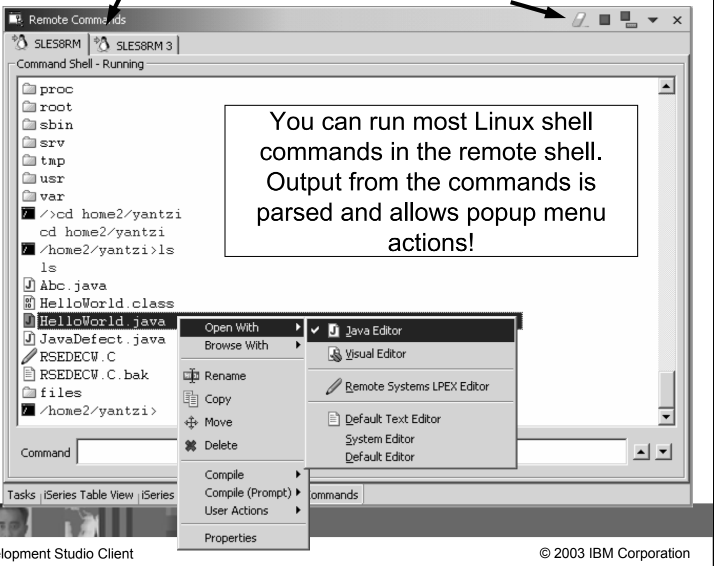
When you save, the changes are uploaded back to the remote system.

Remote Shell

Multiple shells open for each RSE Linux connection.

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





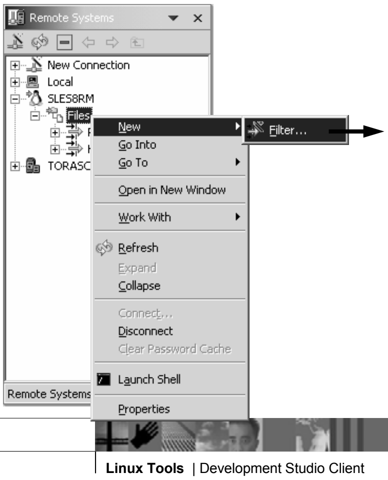
```
proc
root
sbin
srv
tmp
usr
var
/>cd home2/yantzi
cd home2/yantzi
/home2/yantzi>ls
ls
Abc.java
HelloWorld.class
HelloWorld.java
JavaDefect.java
RSEDECW.C
RSEDECW.C.bak
files
/home2/yantzi>
```

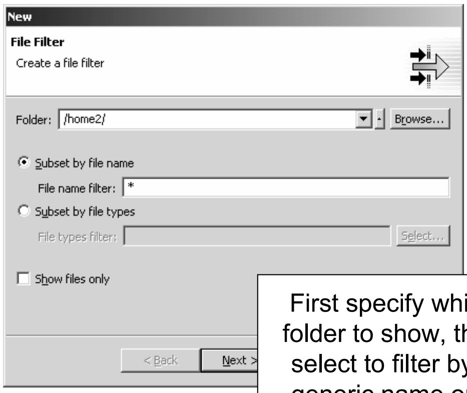
You can run most Linux shell commands in the remote shell. Output from the commands is parsed and allows popup menu actions!

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.





File Filter

Create a file filter

Folder: /home2/

● Subset by file name

File name filter: *

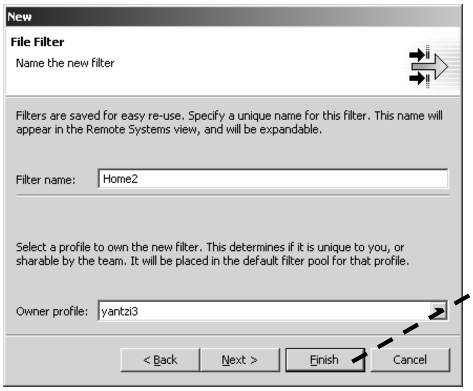
○ Subset by file types

File types filter:

□ Show files only

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



File Filter

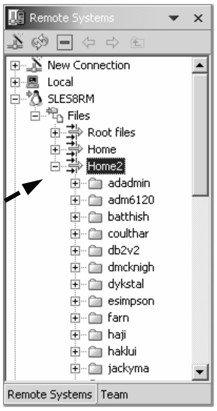
Name the new filter

Filters are saved for easy re-use. Specify a unique name for this filter. This name will appear in the Remote Systems view, and will be expandable.

Filter name: Home2

Select a profile to own the new filter. This determines if it is unique to you, or sharable by the team. It will be placed in the default filter pool for that profile.

Owner profile: yantzi3

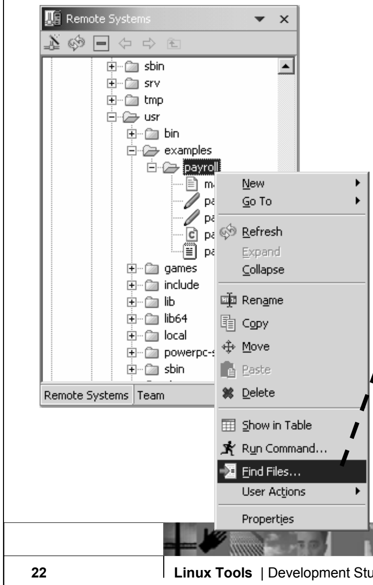


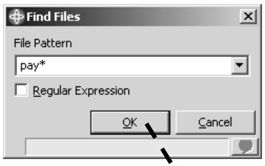
Next enter a meaningful name for your filter. Filters are saved so you can reuse them after shutting down and restarting the Workbench.

Remote Searching

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

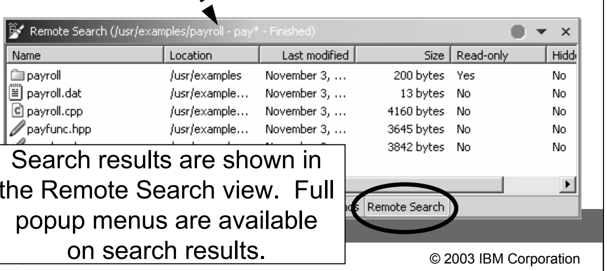
Use the “Find Files…” action on the directory where you want to start searching from.





File Pattern: pay*

☐ Regular Expression



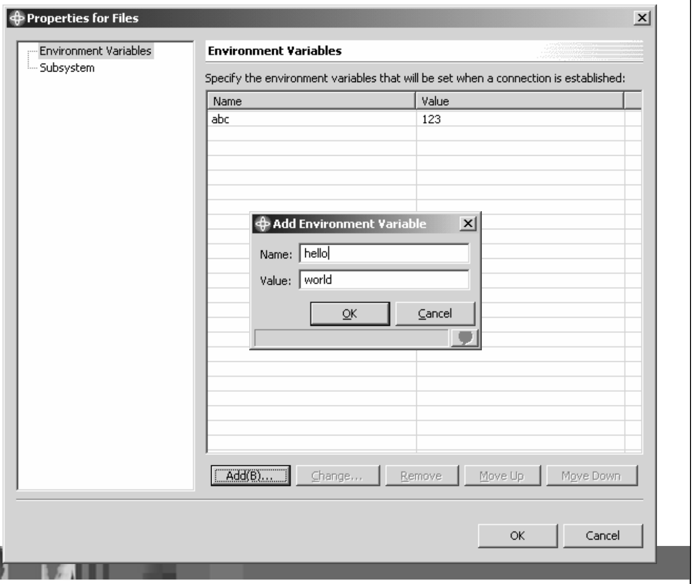
Name	Location	Last modified	Size	Read-only	Hidd
payroll	/usr/examples	November 3, …	200 bytes	Yes	No
payroll.dat	/usr/example…	November 3, …	13 bytes	No	No
payroll.cpp	/usr/example…	November 3, …	4160 bytes	No	No
payfunc.hpp	/usr/example…	November 3, …	3645 bytes	No	No
			3842 bytes	No	No

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.


Properties for Files

Environment Variables

Specify the environment variables that will be set when a connection is established:

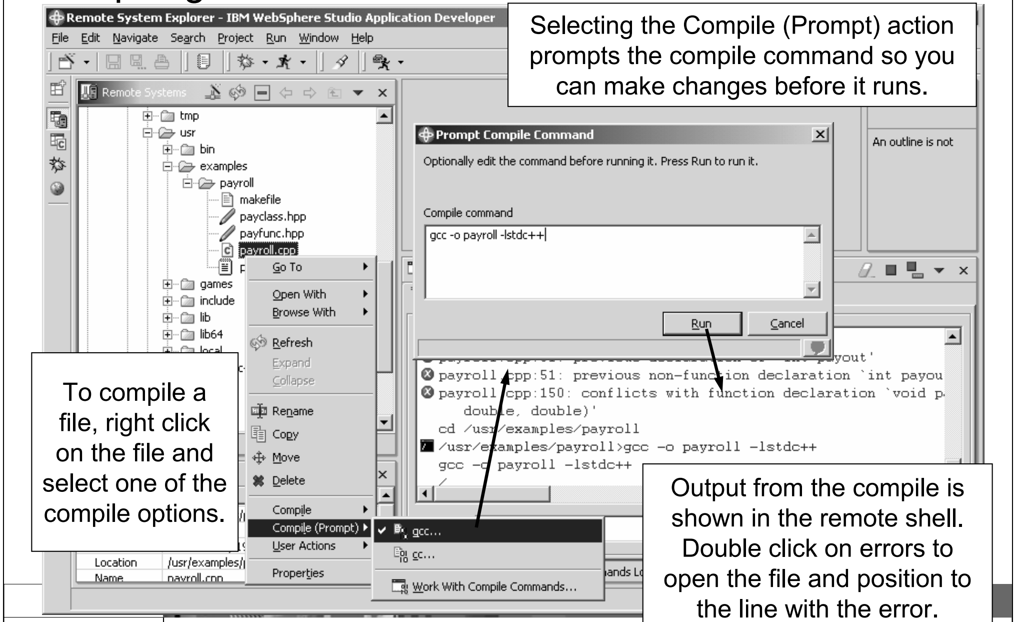
Name	Value
abc	123

Add Environment Variable

Name: hello

Value: world

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.

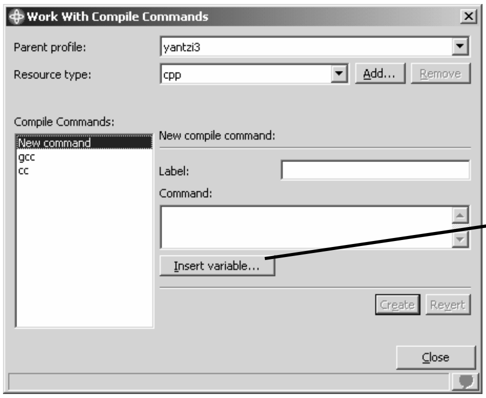
Optionally edit the command before running it. Press Run to run it.

Compile command: gcc -o payroll -lstdc++

```
payroll.cpp:51: previous non-function declaration `int payou
payroll.cpp:150: conflicts with function declaration `void p
    double, double)'
cd /usr/examples/payroll
/usr/examples/payroll>gcc -o payroll -lstdc++
gcc -o payroll -lstdc++
/
```

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.

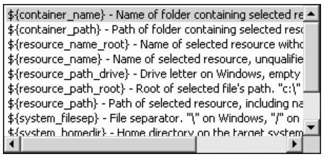


Parent profile: yantzi3

Resource type: cpp

Compile Commands:

- New command
- gcc
- cc



```
${container_name} - Name of folder containing selected re
${container_path} - Path of folder containing selected reso
${resource_name_root} - Name of selected resource withc
${resource_name} - Name of selected resource, unqualifie
${resource_path_drive} - Drive letter on Windows, empty
${resource_path_root} - Root of selected file's path. "c:\"
${resource_path} - Path of selected resource, including na
${system_filesep} - File separator. "\" on Windows, "/" on
${system_homedir} - Home directory on the target system
```

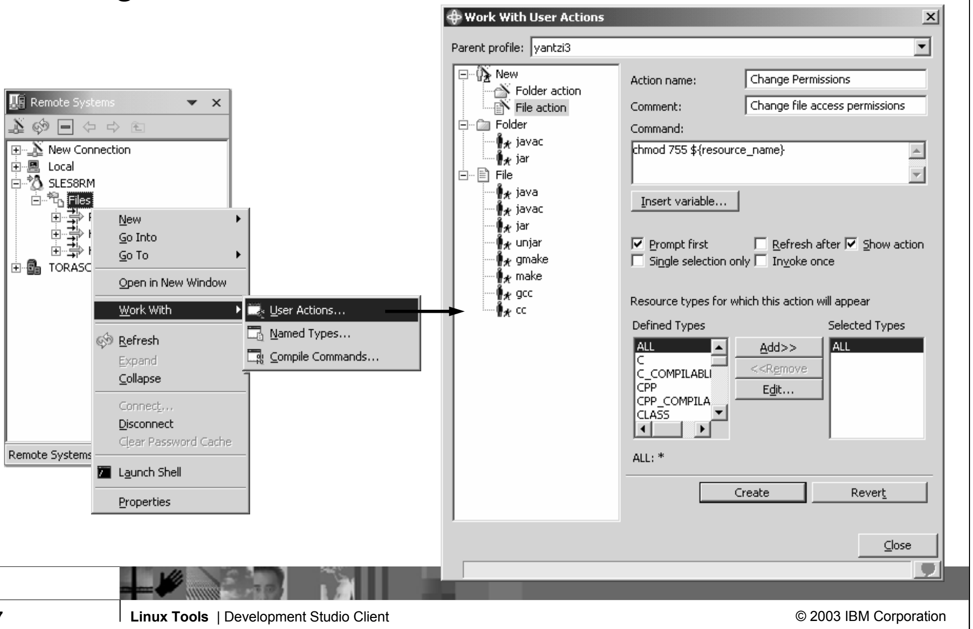
Use substitution variables to file in the resource name, resource type and other information based on the selection.

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



Parent profile: yantzi3

Action name: Change Permissions

Comment: Change file access permissions

Command:

```
chmod 755 ${resource_name}
```

☑ Prompt first ☐ Refresh after ☑ Show action

☐ Single selection only ☐ Invoke once

Resource types for which this action will appear

Defined Types	Selected Types
ALL C C_COMPILABLI CPP CPP_COMPILA CLASS	ALL

ALL: *

Invoking a User Defined Action

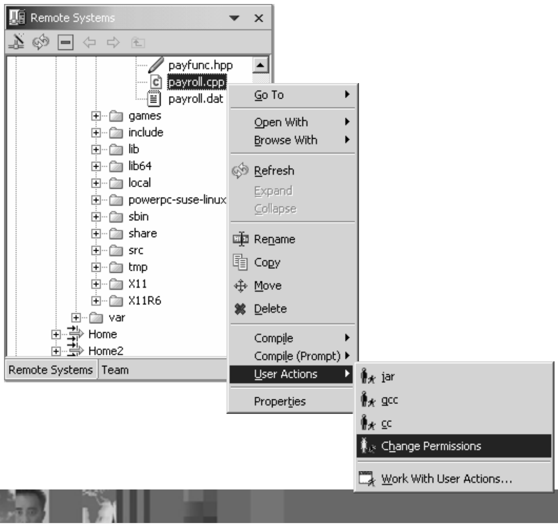


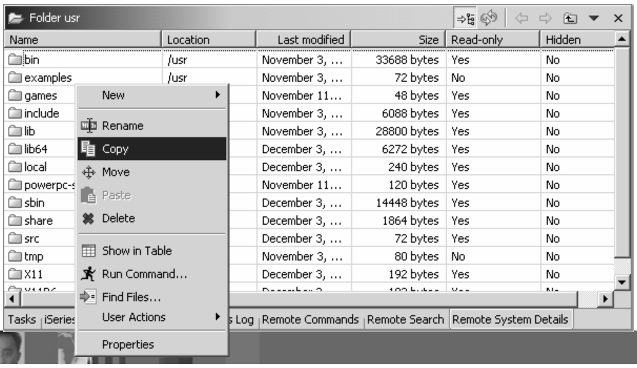
Table View

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



Name	Location	Last modified	Size	Read-only	Hidden
bin	/usr	November 3, ...	33688 bytes	Yes	No
examples	/usr	November 3, ...	72 bytes	No	No
games		November 11...	48 bytes	Yes	No
include		November 3, ...	6088 bytes	Yes	No
lib		November 3, ...	28800 bytes	Yes	No
lib64		December 3, ...	6272 bytes	Yes	No
local		December 3, ...	240 bytes	Yes	No
powerpc-s		November 11...	120 bytes	Yes	No
sbin		December 3, ...	14448 bytes	Yes	No
share		December 3, ...	1864 bytes	Yes	No
src		December 3, ...	72 bytes	Yes	No
tmp		November 3, ...	80 bytes	No	No
X11		December 3, ...	192 bytes	Yes	No

Linux as a Development Client

WebSphere. software

e business software

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

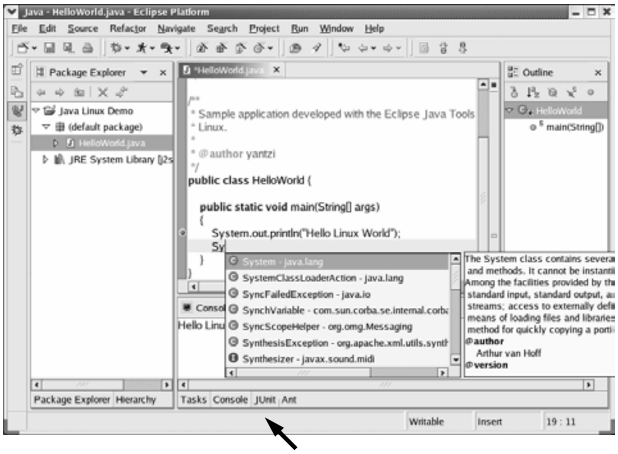
Running the Base Eclipse Workbench

- 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!



```
/**
 * Sample application developed with the Eclipse Java Tools
 * Linux.
 *
 * @author yantzi
 */
public class HelloWorld {

   public static void main(String[] args)
   {
      System.out.println("Hello Linux World");
      Sy
   }
}
```

```
System - java.lang
SystemClassLoaderAction - java.lang
SyncFailedException - java.io
SynchVariable - com.sun.corba.se.internal.corba
SyncScopeHelper - org.omg.Messaging
SynthesisException - org.apache.xml.utils.synth
Synthesizer - javax.sound.midi
```

The System class contains severa
and methods. It cannot be instanti
Among the facilities provided by th
standard input, standard output, a
streams; access to externally defi
means of loading files and librarie
method for quickly copying a porti
@author
Arthur van Hoff
@version

Hello Linu

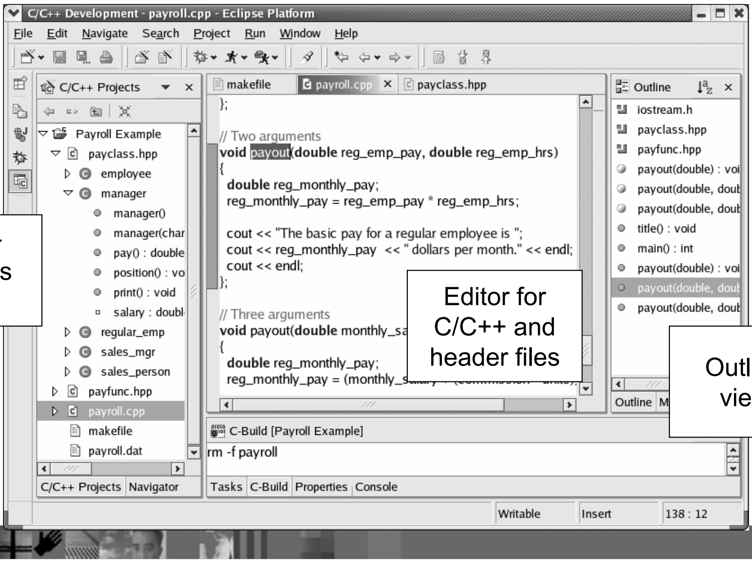
Different views to display output for the tools

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



```
};

// Two arguments
void payout(double reg_emp_pay, double reg_emp_hrs)
{
 double reg_monthly_pay;
 reg_monthly_pay = reg_emp_pay * reg_emp_hrs;

 cout << "The basic pay for a regular employee is ";
 cout << reg_monthly_pay  << " dollars per month." << endl;
 cout << endl;
};

// Three arguments
void payout(double monthly_sa
{
 double reg_monthly_pay;
 reg_monthly_pay = (monthly_s
```

```
rm -f payroll
```

C/C++ Projects view

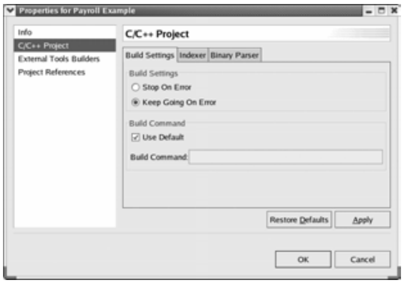
Editor for C/C++ and header files

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.



Build Settings

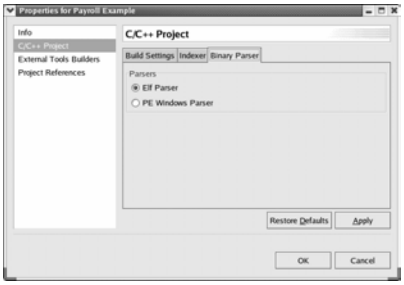
○ Stop On Error

● Keep Going On Error

Build Command

☑ Use Default

Build Command:



Parsers

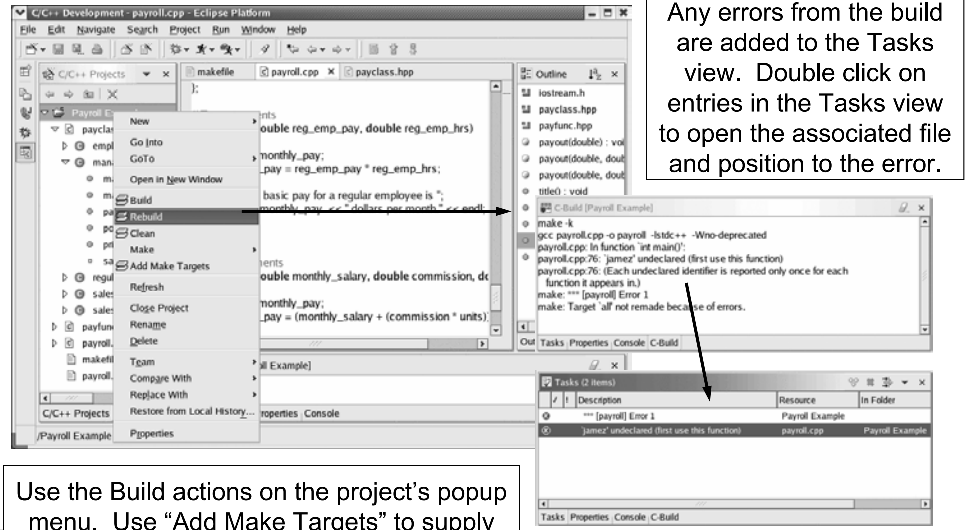
● Elf Parser

○ PE Windows Parser

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.

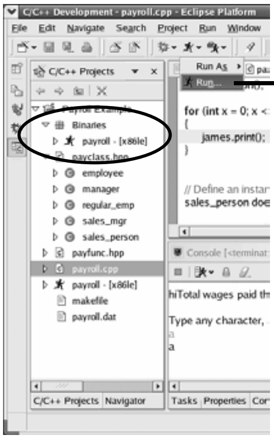


```
make -k
gcc payroll.cpp -o payroll  -lstdc++  -Wno-deprecated
payroll.cpp: In function `int main()':
payroll.cpp:76: `jamez' undeclared (first use this function)
payroll.cpp:76: (Each undeclared identifier is reported only once for each
  function it appears in.)
make: *** [payroll] Error 1
make: Target `all' not remade because of errors.
```

✓	!	Description	Resource	In Folder
		*** [payroll] Error 1	Payroll Example	
		'jamez' undeclared (first use this function)	payroll.cpp	Payroll Example

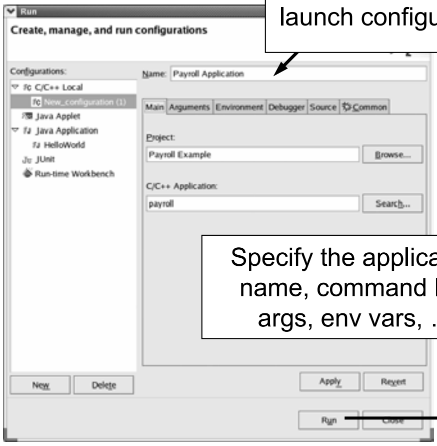
Use the Build actions on the project's popup menu. Use "Add Make Targets" to supply specific make targets to the Make -> menu

CDT: Running Your Application



```
for (int x = 0; x <
{
    james.print();
}

// Define an instar
sales_person doe
```

```
hiTotal wages paid th

Type any character,
a
a
```



Name: Payroll Application

Project: Payroll Example

C/C++ Application: payroll

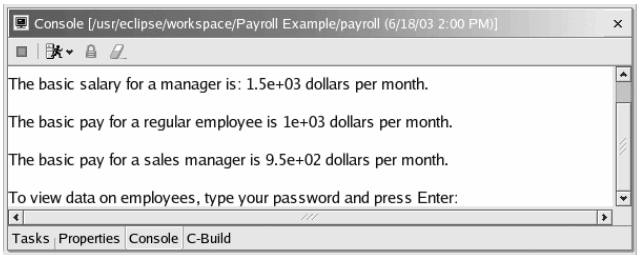
Enter a name for the launch configuration

Specify the application name, command line args, env vars, …

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)



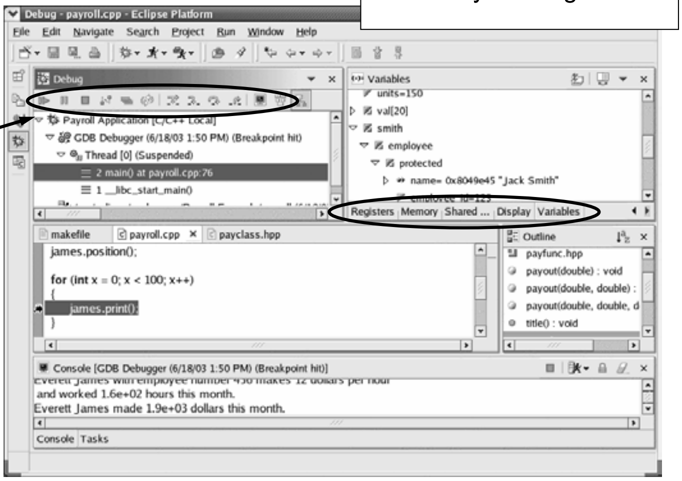
Console [/usr/eclipse/workspace/Payroll Example/payroll (6/18/03 2:00 PM)]

```
The basic salary for a manager is: 1.5e+03 dollars per month.

The basic pay for a regular employee is 1e+03 dollars per month.

The basic pay for a sales manager is 9.5e+02 dollars per month.

To view data on employees, type your password and press Enter:
```

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, …


Debug - payroll.cpp - Eclipse Platform
File Edit Navigate Search Project Run Window Help
Debug
Payroll Application [C/C++ Local]
GDB Debugger (6/18/03 1:50 PM) (Breakpoint hit)
Thread [0] (Suspended)
2 main() at payroll.cpp:76
1 __libc_start_main()
Variables
units=150
val[20]
smith
employee
protected
name= 0x8049e45 "Jack Smith"
employee_id=123
Registers Memory Shared ... Display Variables
makefile payroll.cpp payclass.hpp
Outline
payfunc.hpp
payout(double) : void
payout(double, double) :
payout(double, double, d
title() : void
Console [GDB Debugger (6/18/03 1:50 PM) (Breakpoint hit)]
Console Tasks

```
james.position();

for (int x = 0; x < 100; x++)
{
    james.print();
}
```

```
Everett James with employee number 456 makes 12 dollars per hour
and worked 1.6e+02 hours this month.
Everett James made 1.9e+03 dollars this month.
```

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!

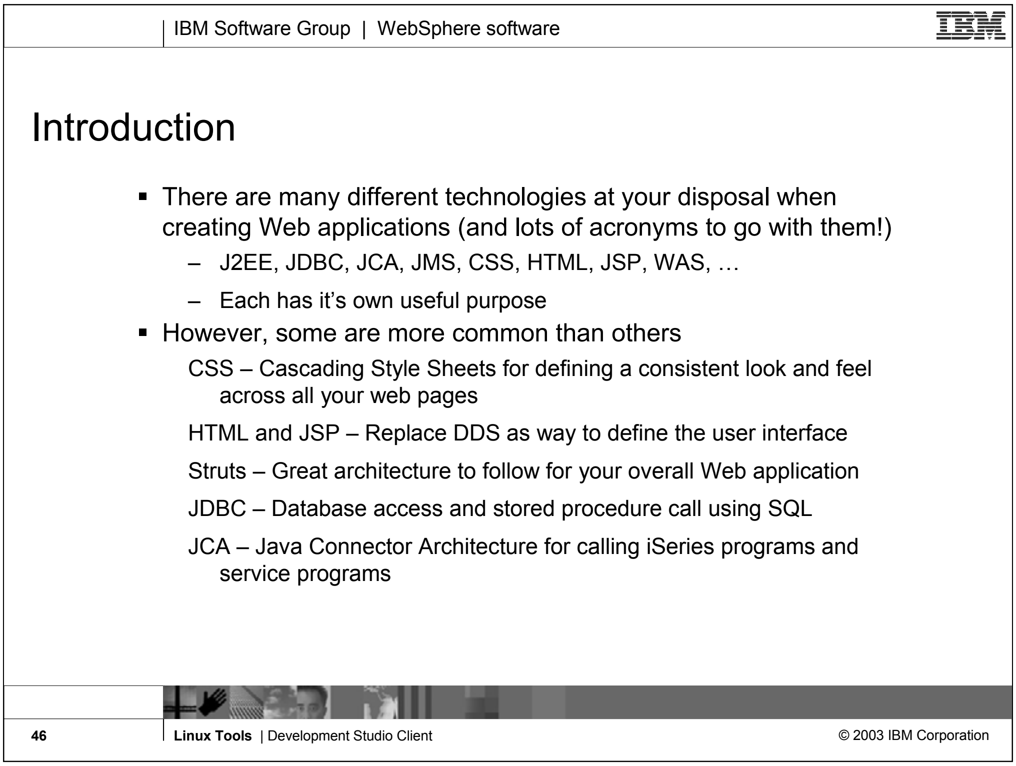
  Testing, Coding frameworks, …

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.

J2EE – The Technologies

WebSphere. 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!

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
```

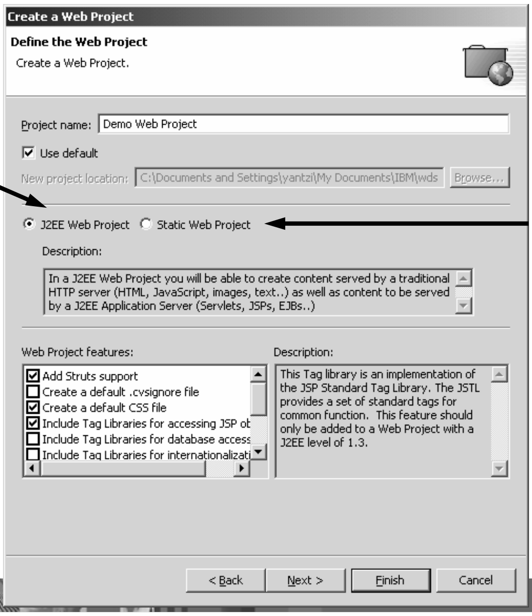
J2EE – The Tools

WebSphere. software

New Web Project Wizard

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

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



Create a Web Project

Define the Web Project

Create a Web Project.

Project name: Demo Web Project

☑ Use default

New project location: C:\Documents and Settings\yantzi\My Documents\IBM\wds Browse...

● J2EE Web Project ○ Static Web Project

Description:

In a J2EE Web Project you will be able to create content served by a traditional HTTP server (HTML, JavaScript, images, text..) as well as content to be served by a J2EE Application Server (Servlets, JSPs, EJBs..)

Web Project features:

- ☑ Add Struts support
- □ Create a default .cvsignore file
- ☑ Create a default CSS file
- ☑ Include Tag Libraries for accessing JSP ob
- □ Include Tag Libraries for database access
- □ Include Tag Libraries for internationalizati

Description:

This Tag library is an implementation of the JSP Standard Tag Library. The JSTL provides a set of standard tags for common function. This feature should only be added to a Web Project with a J2EE level of 1.3.

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

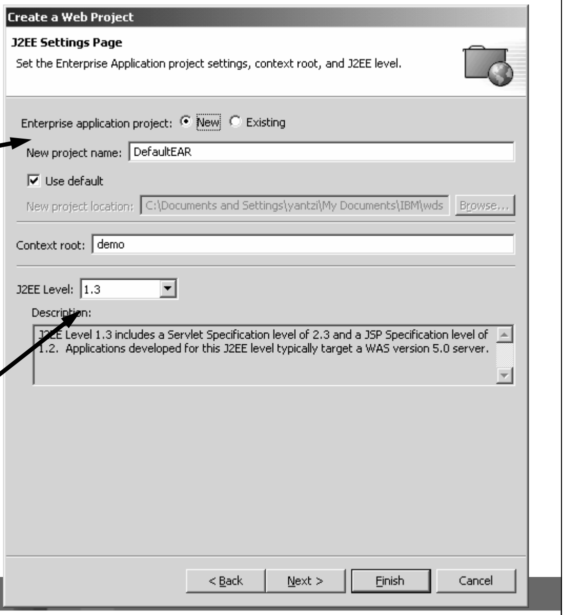
New Web Project Wizard - 2

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



Create a Web Project

J2EE Settings Page

Set the Enterprise Application project settings, context root, and J2EE level.

Enterprise application project: ● New ○ Existing

New project name: DefaultEAR

☑ Use default

New project location: C:\Documents and Settings\yantzi\My Documents\IBM\wds

Context root: demo

J2EE Level: 1.3

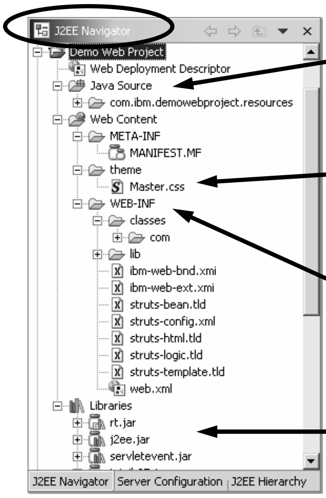
Description:

J2EE Level 1.3 includes a Servlet Specification level of 2.3 and a JSP Specification level of 1.2. Applications developed for this J2EE level typically target a WAS version 5.0 server.

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 Navigator
Demo Web Project
    Web Deployment Descriptor
    Java Source
        com.ibm.demowebproject.resources
    Web Content
        META-INF
            MANIFEST.MF
        theme
            Master.css
        WEB-INF
            classes
                com
            lib
            ibm-web-bnd.xmi
            ibm-web-ext.xmi
            struts-bean.tld
            struts-config.xml
            struts-html.tld
            struts-logic.tld
            struts-template.tld
            web.xml
    Libraries
        rt.jar
        j2ee.jar
        servletevent.jar
J2EE Navigator | Server Configuration | J2EE Hierarchy
```

Java source code for Servlets and Java beans

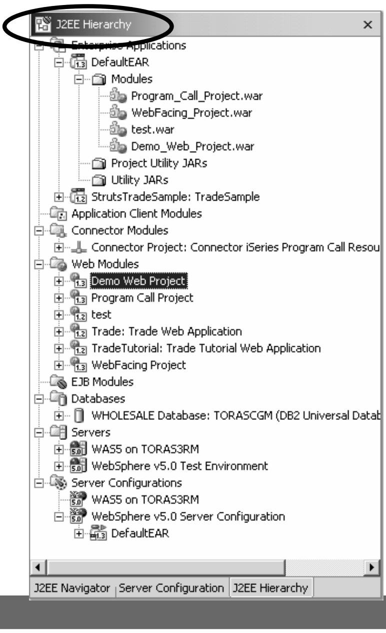
Cascading style sheets

HTML and JSP files

These libraries are from the build path and are not part of the project

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



- Enterprise Applications
  - DefaultEAR
    - Modules
      - Program_Call_Project.war
      - WebFacing_Project.war
      - test.war
      - Demo_Web_Project.war
    - Project Utility JARs
    - Utility JARs
  - StrutsTradeSample: TradeSample
- Application Client Modules
- Connector Modules
  - Connector Project: Connector iSeries Program Call Resou
- Web Modules
  - Demo Web Project
  - Program Call Project
  - test
  - Trade: Trade Web Application
  - TradeTutorial: Trade Tutorial Web Application
  - WebFacing Project
- EJB Modules
- Databases
  - WHOLESALE Database: TORASCGM (DB2 Universal Datab
- Servers
  - WAS5 on TORAS3RM
  - WebSphere v5.0 Test Environment
- Server Configurations
  - WAS5 on TORAS3RM
  - WebSphere v5.0 Server Configuration
    - DefaultEAR

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

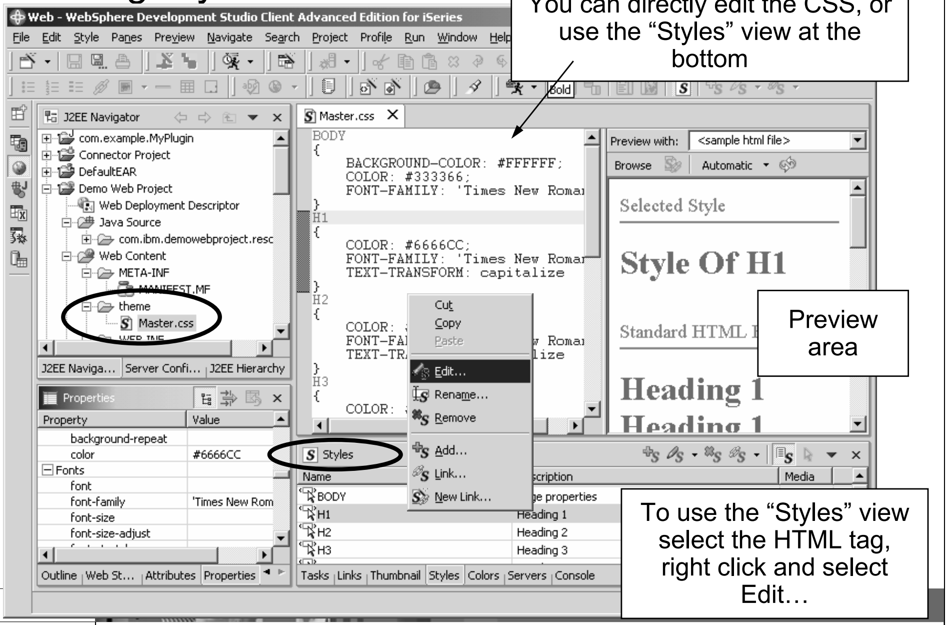
```
<LINK href="theme/Master.css" rel="stylesheet" type="text/css">
```

- 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


Web - WebSphere Development Studio Client Advanced Edition for iSeries
File Edit Style Panes Preview Navigate Search Project Profile Run Window Help
J2EE Navigator
com.example.MyPlugin
Connector Project
DefaultEAR
Demo Web Project
Web Deployment Descriptor
Java Source
com.ibm.demowebproject.resc
Web Content
META-INF
MANIFEST.MF
theme
Master.css
J2EE Naviga... Server Confi... J2EE Hierarchy
Properties
Master.css
Preview with: <sample html file>
Browse Automatic
Selected Style
Style Of H1
Standard HTML
Heading 1
Heading 1
Cut
Copy
Paste
Edit...
Rename...
Remove
Add...
Link...
New Link...
Styles
Outline Web St... Attributes Properties
Tasks Links Thumbnail Styles Colors Servers Console

```
BODY
{
    BACKGROUND-COLOR: #FFFFFF;
    COLOR: #333366;
    FONT-FAMILY: 'Times New Romai
}
H1
{
    COLOR: #6666CC;
    FONT-FAMILY: 'Times New Romai
    TEXT-TRANSFORM: capitalize
}
H2
{
    COLOR: :
    FONT-FAI                    v Romai
    TEXT-TR                     lize
}
H3
{
    COLOR: :
```

Property	Value
background-repeat	
color	#6666CC
Fonts	
font	
font-family	'Times New Rom
font-size	
font-size-adjust	

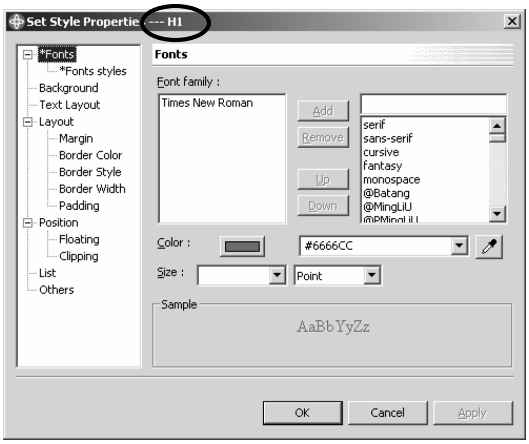
Name	Description	Media
BODY	...e properties	
H1	Heading 1	
H2	Heading 2	
H3	Heading 3	

You can directly edit the CSS, or use the "Styles" view at the bottom

Preview area

To use the "Styles" view select the HTML tag, right click and select Edit…

Cascading Style Sheet Editor



Font family : Times New Roman

Color : #6666CC

Size : Point

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

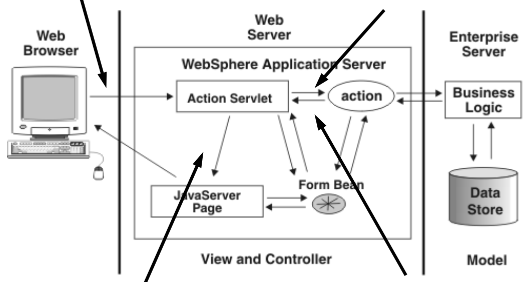
- How does it work?
  - Struts provides the Controller
    - You provide the Model and the View
  - Struts also provides:
    - Custom tag libraries for:
      - Internationalization

- 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



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

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

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

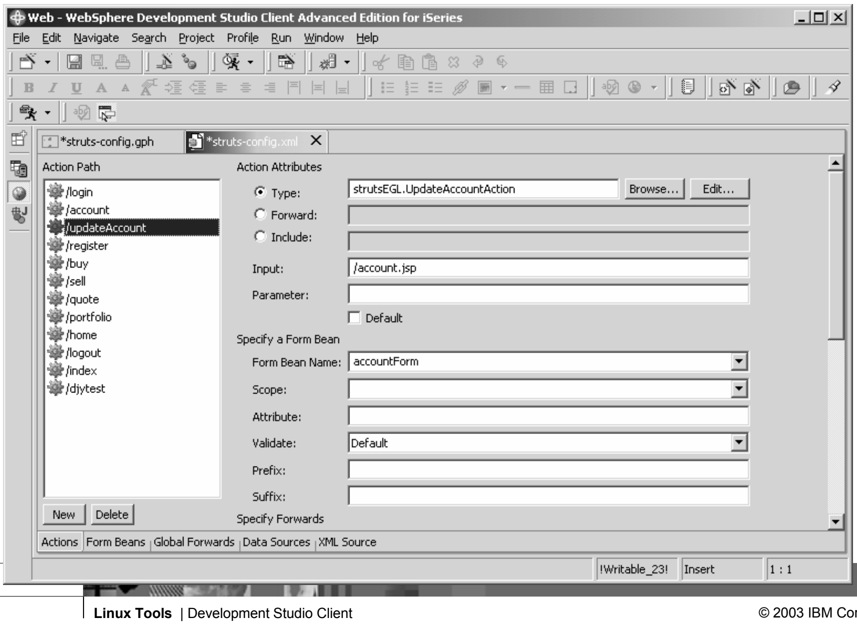
How Does It Work – View

- 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



Action Path
- /login
- /account
- /updateAccount
- /register
- /buy
- /sell
- /quote
- /portfolio
- /home
- /logout
- /index
- /djytest

Action Attributes

● Type: strutsEGL.UpdateAccountAction
○ Forward:
○ Include:

Input: /account.jsp
Parameter:
□ Default

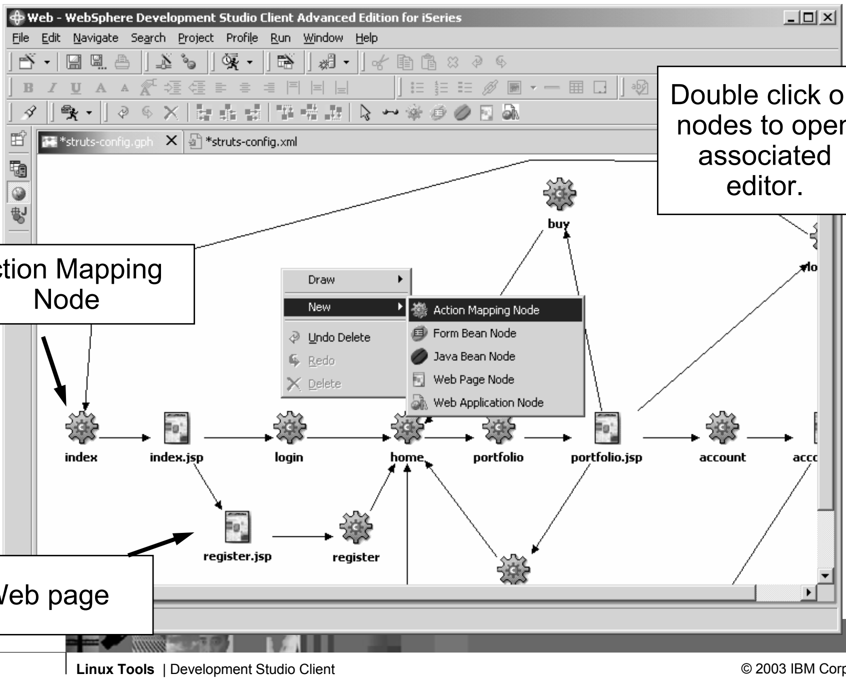
Specify a Form Bean

Form Bean Name: accountForm
Scope:
Attribute:
Validate: Default
Prefix:
Suffix:

Specify Forwards

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



Double click on nodes to open associated editor.

Action Mapping Node

Web page

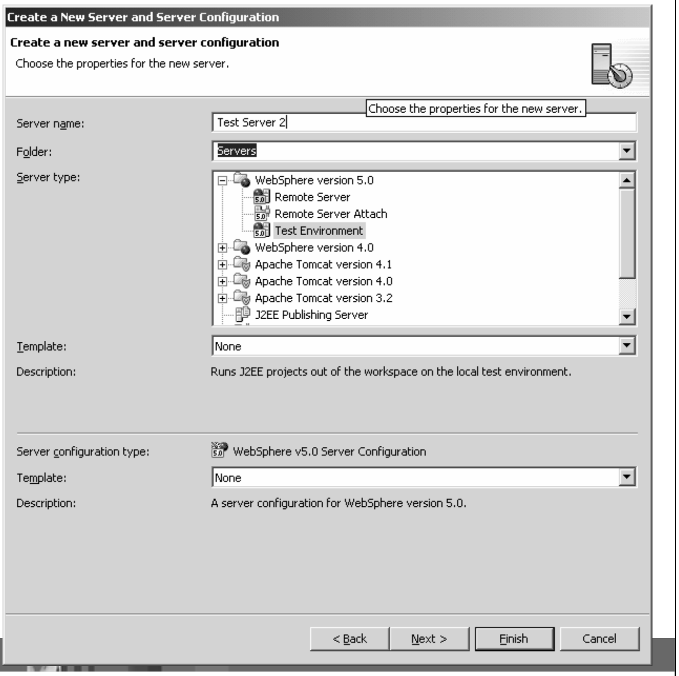
Server Tooling

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



Create a New Server and Server Configuration

Create a new server and server configuration

Choose the properties for the new server.

Server name: Test Server 2

Folder: Servers

Server type:
- WebSphere version 5.0
  - Remote Server
  - Remote Server Attach
  - Test Environment
- WebSphere version 4.0
- Apache Tomcat version 4.1
- Apache Tomcat version 4.0
- Apache Tomcat version 3.2
- J2EE Publishing Server

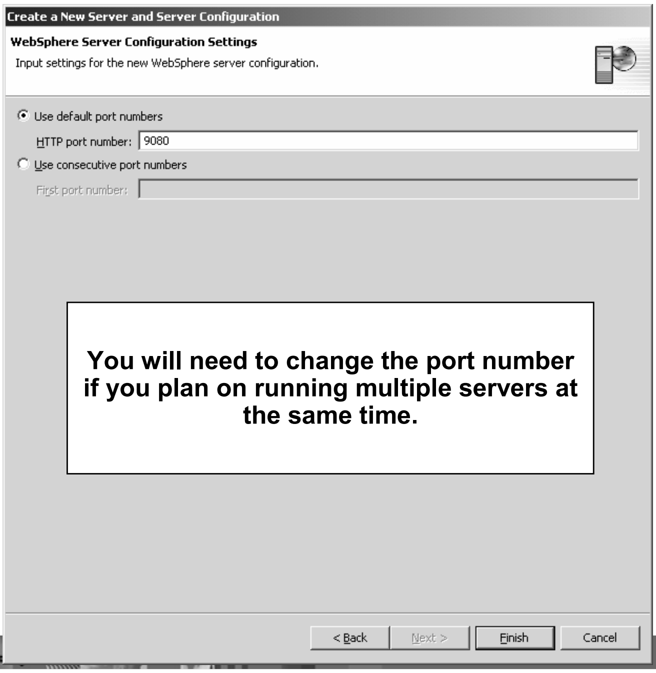
Template: None

Description: Runs J2EE projects out of the workspace on the local test environment.

Server configuration type: WebSphere v5.0 Server Configuration

Template: None

Description: A server configuration for WebSphere version 5.0.



Create a New Server and Server Configuration

WebSphere Server Configuration Settings

Input settings for the new WebSphere server configuration.

● Use default port numbers

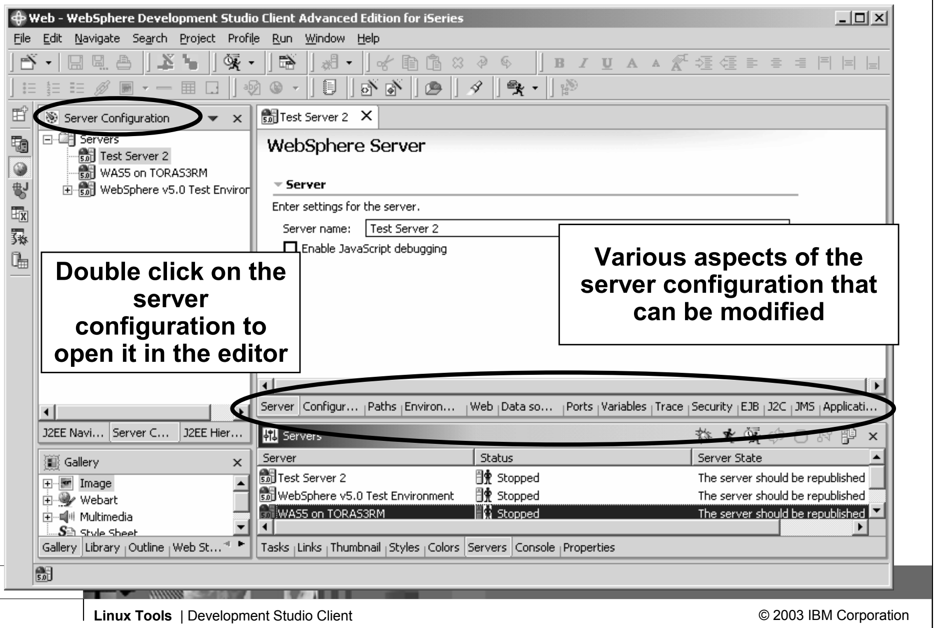
HTTP port number: 9080

○ Use consecutive port numbers

First port number:

You will need to change the port number if you plan on running multiple servers at the same time.

Editing a Server Configuration


Web - WebSphere Development Studio Client Advanced Edition for iSeries
File Edit Navigate Search Project Profile Run Window Help
Server Configuration
Servers
Test Server 2
WAS5 on TORAS3RM
WebSphere v5.0 Test Enviror
J2EE Navi… Server C… J2EE Hier…
Gallery
Image
Webart
Multimedia
Style Sheet
Gallery Library Outline Web St…
Test Server 2
WebSphere Server
Server
Server Configur… Paths Environ… Web Data so… Ports Variables Trace Security EJB J2C JMS Applicati…
Servers
Tasks Links Thumbnail Styles Colors Servers Console Properties

Enter settings for the server.

Server name: Test Server 2

□ Enable JavaScript debugging

Server	Status	Server State
Test Server 2	Stopped	The server should be republished
WebSphere v5.0 Test Environment	Stopped	The server should be republished
WAS5 on TORAS3RM	Stopped	The server should be republished

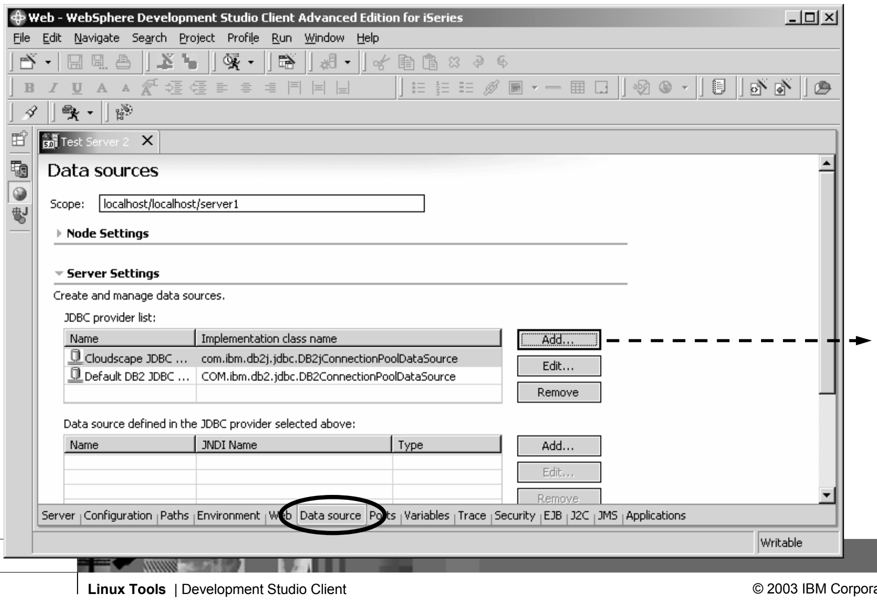
Double click on the server configuration to open it in the editor

Various aspects of the server configuration that can be modified

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


Web - WebSphere Development Studio Client Advanced Edition for iSeries
File Edit Navigate Search Project Profile Run Window Help
Test Server 2
Server | Configuration | Paths | Environment | Web | Data source | Ports | Variables | Trace | Security | EJB | J2C | JMS | Applications
Writable

Data sources

Scope: localhost/localhost/server1

Node Settings

Server Settings

Create and manage data sources.

JDBC provider list:

Name	Implementation class name
Cloudscape JDBC ...	com.ibm.db2j.jdbc.DB2jConnectionPoolDataSource
Default DB2 JDBC ...	COM.ibm.db2.jdbc.DB2ConnectionPoolDataSource

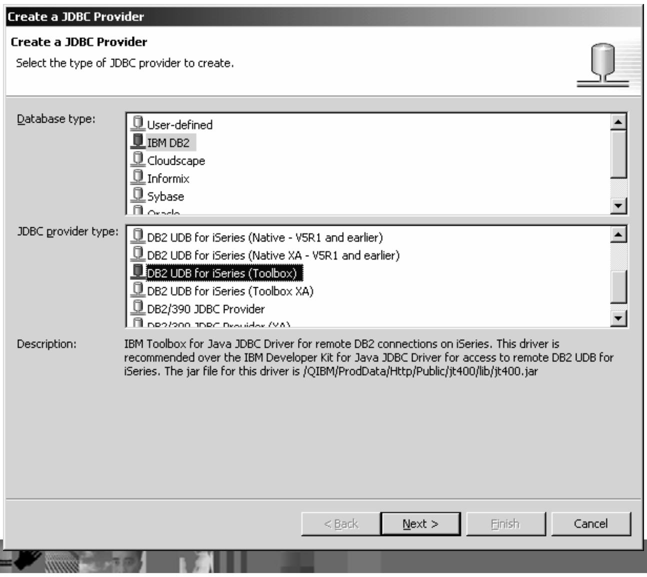
Add... Edit... Remove

Data source defined in the JDBC provider selected above:

Name	JNDI Name	Type

Add... Edit... Remove

JDBC: Adding a Driver to the Provider List - 2



Create a JDBC Provider

Create a JDBC Provider

Select the type of JDBC provider to create.

Database type:

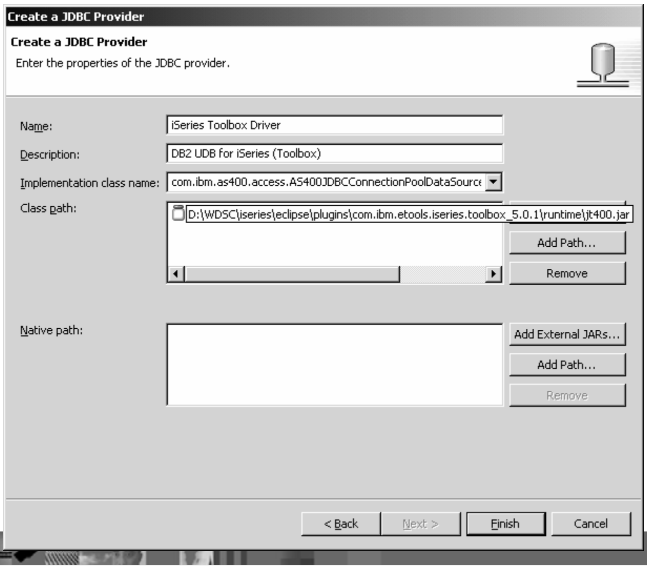
- User-defined
- IBM DB2
- Cloudscape
- Informix
- Sybase
- Oracle

JDBC provider type:

- DB2 UDB for iSeries (Native - V5R1 and earlier)
- DB2 UDB for iSeries (Native XA - V5R1 and earlier)
- DB2 UDB for iSeries (Toolbox)
- DB2 UDB for iSeries (Toolbox XA)
- DB2/390 JDBC Provider
- DB2/390 JDBC Provider (XA)

Description: IBM Toolbox for Java JDBC Driver for remote DB2 connections on iSeries. This driver is recommended over the IBM Developer Kit for Java JDBC Driver for access to remote DB2 UDB for iSeries. The jar file for this driver is /QIBM/ProdData/Http/Public/jt400/lib/jt400.jar

JDBC: Adding a Driver to the Provider List - 3



Create a JDBC Provider

Enter the properties of the JDBC provider.

Name: iSeries Toolbox Driver

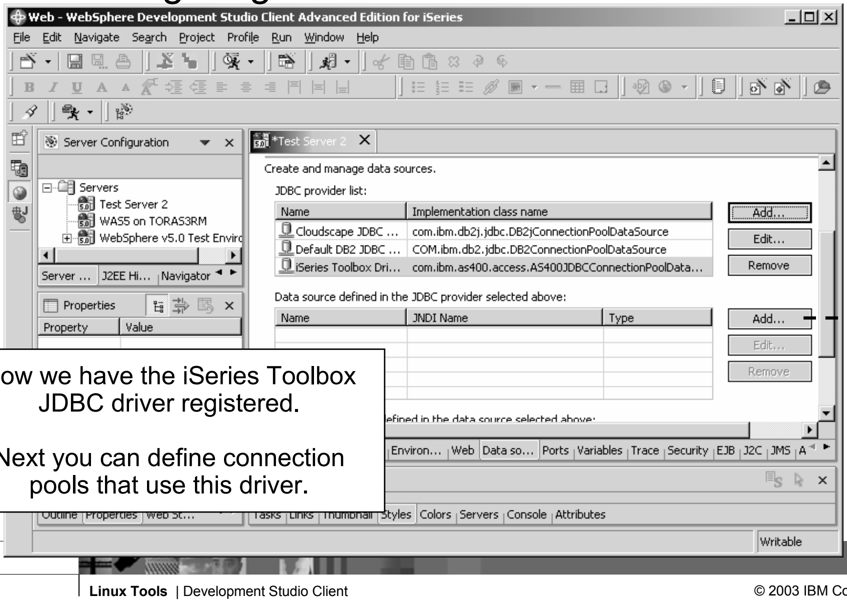
Description: DB2 UDB for iSeries (Toolbox)

Implementation class name: com.ibm.as400.access.AS400JDBCConnectionPoolDataSource

Class path: D:\WDSC\iseries\eclipse\plugins\com.ibm.etools.iseries.toolbox_5.0.1\runtime\jt400.jar

Native path:

JDBC: Configuring a Connection Pool - 4



Web - WebSphere Development Studio Client Advanced Edition for iSeries
File Edit Navigate Search Project Profile Run Window Help
Server Configuration
Servers
Test Server 2
WAS5 on TORAS3RM
WebSphere v5.0 Test Envirc
Server ... J2EE Hi... Navigator
Properties
Property Value
*Test Server 2
Environ... Web Data so... Ports Variables Trace Security EJB J2C JMS A
Outline Properties Web St...
Tasks Links Thumbnail Styles Colors Servers Console Attributes
Writable

Create and manage data sources.

JDBC provider list:

Name	Implementation class name
Cloudscape JDBC ...	com.ibm.db2j.jdbc.DB2jConnectionPoolDataSource
Default DB2 JDBC ...	COM.ibm.db2.jdbc.DB2ConnectionPoolDataSource
iSeries Toolbox Dri...	com.ibm.as400.access.AS400JDBCConnectionPoolData...

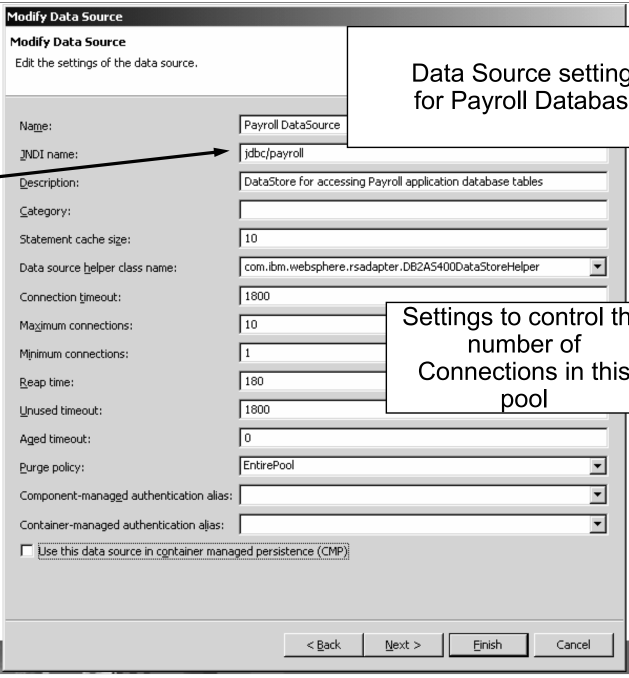
Data source defined in the JDBC provider selected above:

Name	JNDI Name	Type

efined in the data source selected above:

Now we have the iSeries Toolbox JDBC driver registered.

Next you can define connection pools that use this driver.



Modify Data Source

Modify Data Source

Edit the settings of the data source.

Name: Payroll DataSource

JNDI name: jdbc/payroll

Description: DataStore for accessing Payroll application database tables

Category:

Statement cache size: 10

Data source helper class name: com.ibm.websphere.rsadapter.DB2AS400DataStoreHelper

Connection timeout: 1800

Maximum connections: 10

Minimum connections: 1

Reap time: 180

Unused timeout: 1800

Aged timeout: 0

Purge policy: EntirePool

Component-managed authentication alias:

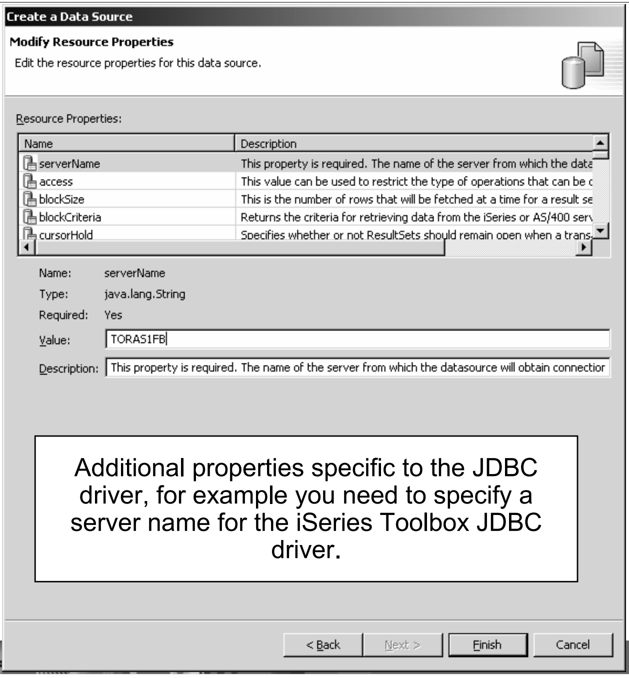
Container-managed authentication alias:

☐ Use this data source in container managed persistence (CMP)

Data Source settings for Payroll Database

Use this JNDI name in your Code to lookup JDBC connections From this Data Source

Settings to control the number of Connections in this pool



Create a Data Source

Modify Resource Properties

Edit the resource properties for this data source.

Resource Properties:

Name	Description
serverName	This property is required. The name of the server from which the data
access	This value can be used to restrict the type of operations that can be c
blockSize	This is the number of rows that will be fetched at a time for a result se
blockCriteria	Returns the criteria for retrieving data from the iSeries or AS/400 serv
cursorHold	Specifies whether or not ResultSets should remain open when a trans

Name: serverName

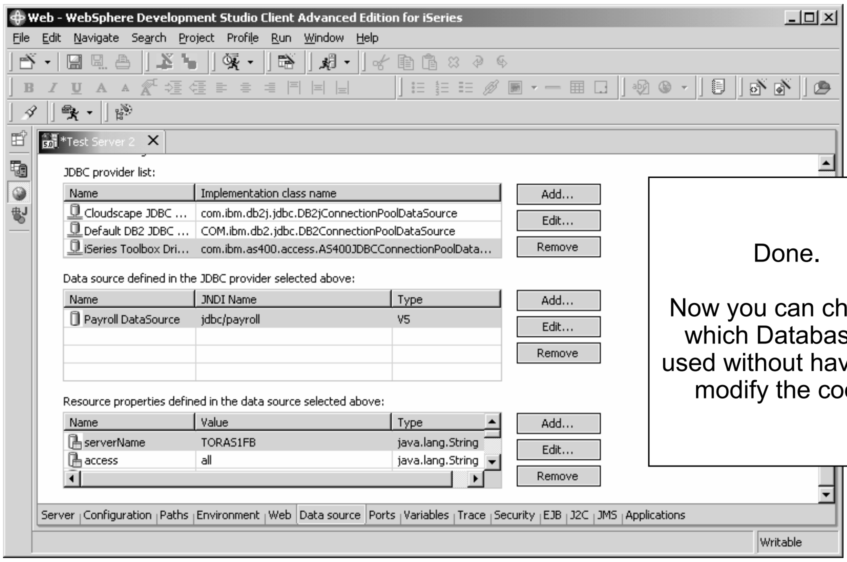
Type: java.lang.String

Required: Yes

Value: TORAS1FB

Description: This property is required. The name of the server from which the datasource will obtain connectior

Additional properties specific to the JDBC driver, for example you need to specify a server name for the iSeries Toolbox JDBC driver.


Web - WebSphere Development Studio Client Advanced Edition for iSeries
File Edit Navigate Search Project Profile Run Window Help
*Test Server 2
Add...
Edit...
Remove
Server Configuration Paths Environment Web Data source Ports Variables Trace Security EJB J2C JMS Applications
Writable

JDBC provider list:

Name	Implementation class name
Cloudscape JDBC ...	com.ibm.db2j.jdbc.DB2jConnectionPoolDataSource
Default DB2 JDBC ...	COM.ibm.db2.jdbc.DB2ConnectionPoolDataSource
iSeries Toolbox Dri...	com.ibm.as400.access.AS400JDBCConnectionPoolData...

Data source defined in the JDBC provider selected above:

Name	JNDI Name	Type
Payroll DataSource	jdbc/payroll	V5

Resource properties defined in the data source selected above:

Name	Value	Type
serverName	TORAS1FB	java.lang.String
access	all	java.lang.String

Done.

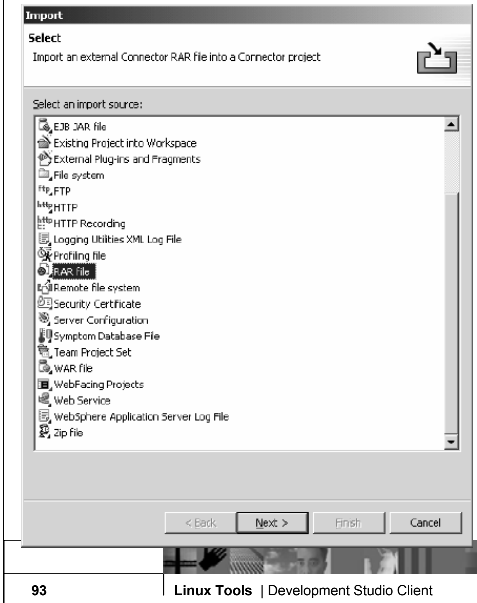
Now you can change which Database is used without having to modify the code.

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



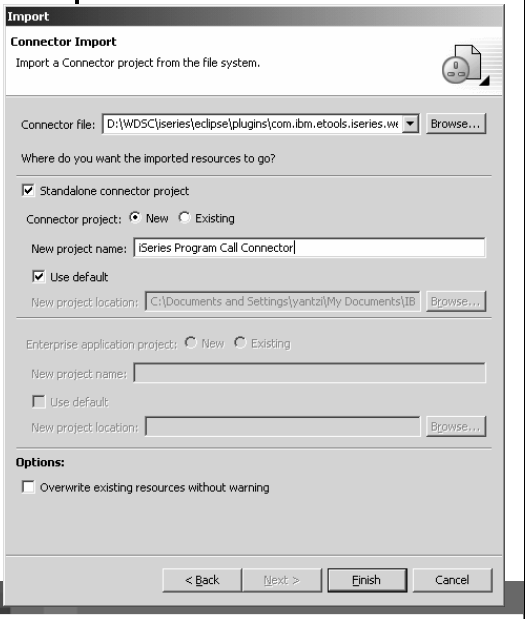
Import

Select

Import an external Connector RAR file into a Connector project

Select an import source:

- EJB JAR file
- Existing Project into Workspace
- External Plug-ins and Fragments
- File system
- FTP
- HTTP
- HTTP Recording
- Logging Utilities XML Log File
- Profiling file
- RAR file
- Remote file system
- Security Certficate
- Server Configuration
- Symptom Database File
- Team Project Set
- WAR file
- WebFacing Projects
- Web Service
- WebSphere Application Server Log File
- Zip file



Import

Connector Import

Import a Connector project from the file system.

Connector file: D:\WDSC\iseries\eclipse\plugins\com.ibm.etools.iseries.we

Where do you want the imported resources to go?

☑ Standalone connector project

Connector project: ● New ○ Existing

New project name: iSeries Program Call Connector

☑ Use default

New project location: C:\Documents and Settings\yantzi\My Documents\IB

Enterprise application project: ○ New ○ Existing

New project name:

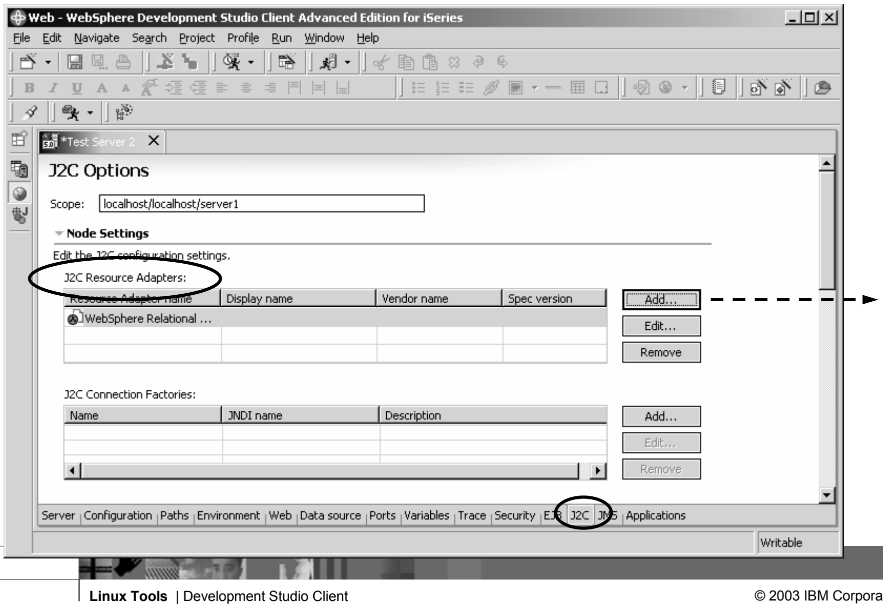
☐ Use default

New project location:

Options:

☐ Overwrite existing resources without warning

Adding Resource Adapters to the Test Environment



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File Edit Navigate Search Project Profile Run Window Help
*Test Server 2

J2C Options

Scope: localhost/localhost/server1

Node Settings

Edit the J2C configuration settings.

J2C Resource Adapters:

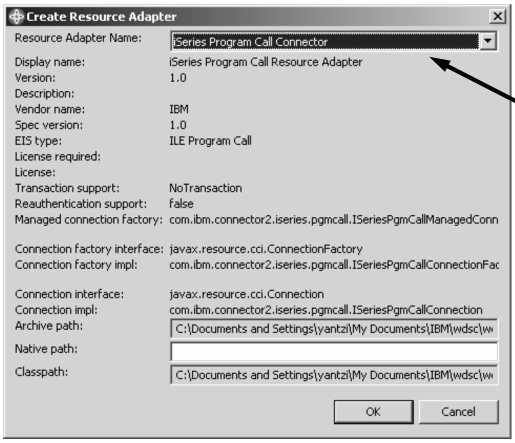
Resource Adapter name	Display name	Vendor name	Spec version
WebSphere Relational ...			

J2C Connection Factories:

Name	JNDI name	Description

Add...
Edit...
Remove
Server Configuration Paths Environment Web Data source Ports Variables Trace Security EJB J2C JMS Applications
Writable

JCA: Configuring Resource Adapters in Servers

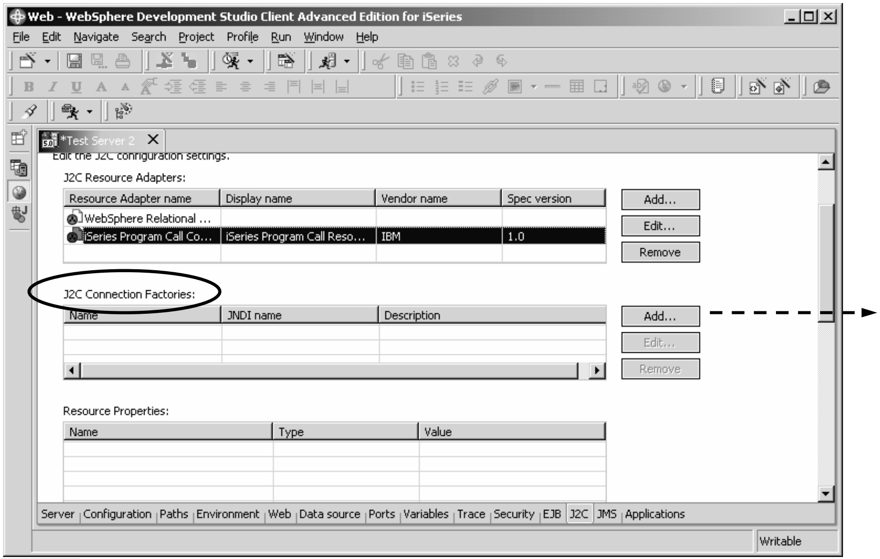


Create Resource Adapter

Resource Adapter Name:	iSeries Program Call Connector
Display name:	iSeries Program Call Resource Adapter
Version:	1.0
Description:	
Vendor name:	IBM
Spec version:	1.0
EIS type:	ILE Program Call
License required:	
License:	
Transaction support:	NoTransaction
Reauthentication support:	false
Managed connection factory:	com.ibm.connector2.iseries.pgmcall.ISeriesPgmCallManagedConn
Connection factory interface:	javax.resource.cci.ConnectionFactory
Connection factory impl:	com.ibm.connector2.iseries.pgmcall.ISeriesPgmCallConnectionFac
Connection interface:	javax.resource.cci.Connection
Connection impl:	com.ibm.connector2.iseries.pgmcall.ISeriesPgmCallConnection
Archive path:	C:\Documents and Settings\yantzi\My Documents\IBM\wdsc\w
Native path:	
Classpath:	C:\Documents and Settings\yantzi\My Documents\IBM\wdsc\w

Project where you imported the resource adapter

JCA: Creating A Connection Factory


Web - WebSphere Development Studio Client Advanced Edition for iSeries
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*Test Server 2
Add...
Edit...
Remove
Add...
Edit...
Remove
Server Configuration Paths Environment Web Data source Ports Variables Trace Security EJB J2C JMS Applications
Writable

Edit the J2C configuration settings.

J2C Resource Adapters:

Resource Adapter name	Display name	Vendor name	Spec version
WebSphere Relational ...			
iSeries Program Call Co...	iSeries Program Call Reso...	IBM	1.0

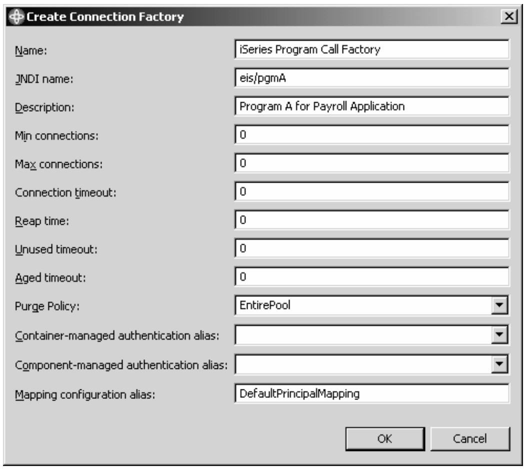
J2C Connection Factories:

Name	JNDI name	Description

Resource Properties:

Name	Type	Value

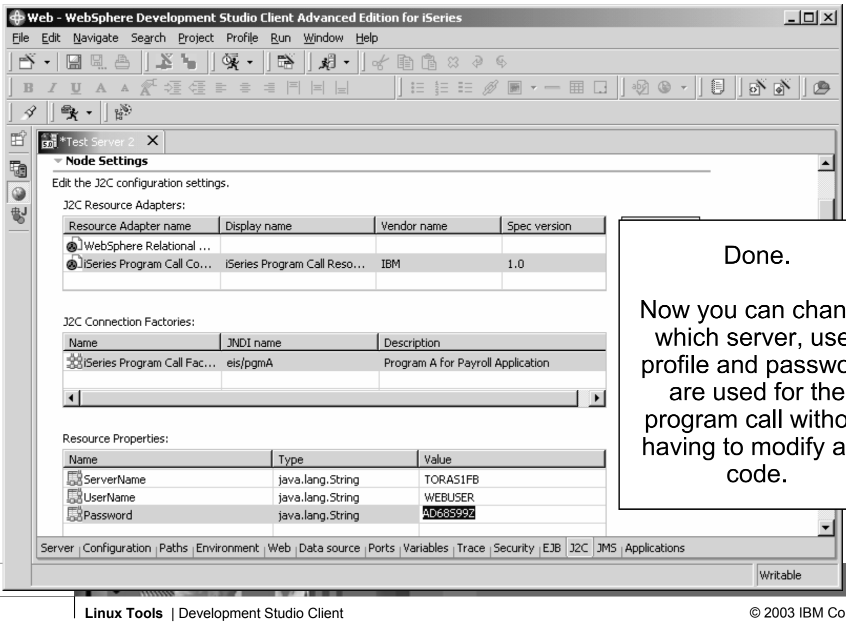
JCA: Creating A Connection Factory



Create Connection Factory

Name:	iSeries Program Call Factory
JNDI name:	eis/pgmA
Description:	Program A for Payroll Application
Min connections:	0
Max connections:	0
Connection timeout:	0
Reap time:	0
Unused timeout:	0
Aged timeout:	0
Purge Policy:	EntirePool
Container-managed authentication alias:	
Component-managed authentication alias:	
Mapping configuration alias:	DefaultPrincipalMapping

JCA: Creating A Connection Factory


Web - WebSphere Development Studio Client Advanced Edition for iSeries
File Edit Navigate Search Project Profile Run Window Help
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Server Configuration Paths Environment Web Data source Ports Variables Trace Security EJB J2C JMS Applications
Writable

Node Settings

Edit the J2C configuration settings.

J2C Resource Adapters:

Resource Adapter name	Display name	Vendor name	Spec version
WebSphere Relational ...			
iSeries Program Call Co...	iSeries Program Call Reso...	IBM	1.0

J2C Connection Factories:

Name	JNDI name	Description
iSeries Program Call Fac...	eis/pgmA	Program A for Payroll Application

Resource Properties:

Name	Type	Value
ServerName	java.lang.String	TORAS1FB
UserName	java.lang.String	WEBUSER
Password	java.lang.String	AD68599Z

Done.

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

Summary

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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OS/400

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