IBM Software Group Hong Kong
07 Jan 2012

IBM Inter-University Programming Contest 2011 Training

Chapter 0: Contest Briefing

IBM Inter-University
Programming Contest 2012
February 11, 2012 (Saturday)
Cliftons, Hong Kong

Agenda

- Contest Rundown
- Overview of the contest technical scope
- Description on the contest PC setup and contest workflow
- Overview of the contest questions
- How to answer the questions

Contest Rundown

Date :	Feb 11, 2012 (Saturday)
Time :	2:00 p.m. - 5:30 p.m. (registration starts at 1:30 p.m.)
Venue :	Cliftons Central Training Centre, Level 33, 9 Queen's Road Central, Hong Kong

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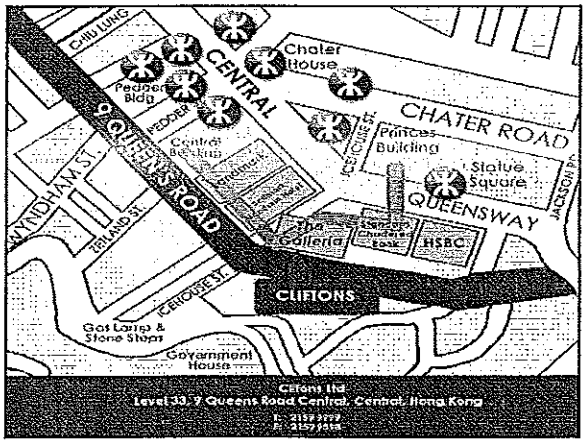

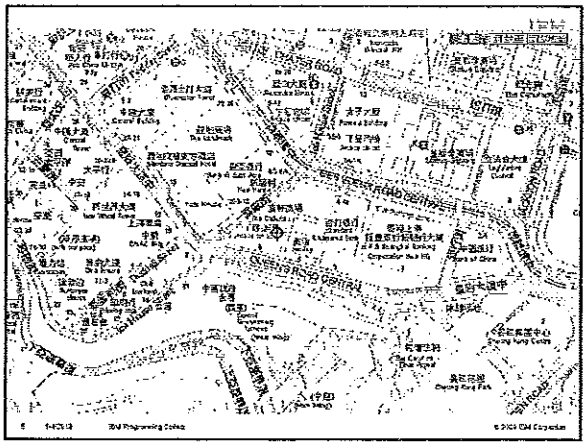

Contest Rundown

1:30 - 2:00pm	Registration
2:00 - 2:15pm	Welcome Speech
2:15 – 4:15pm	Competition takes place
4:15 – 4:45pm	Marking
4:45 – 5:30pm	Award Presentation

Prize

Champions	•HK$30,000# Cash Award •Champion Trophy •Three-month Summer Internship Program at IBM@
First runner ups	•HK$15,000# Cash Award •1st runner up Trophy
Second runner ups	•HK$ 9,000# Cash Award •2nd runner up Trophy
All Contestants	•IBM Trendy Backpack •IBM Participation Certificate
The Champion University*	•Champion Trophy

The Cash Award is for the whole team.
[illegible]
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Contest Rules (1)

- The contest has a duration of 2 hours.
- One PC and one terminal will be provided for each team.
- A set of questions will be given to each team to be completed within 2 hours.
- The contest is an open book contest. Contestants could bring in their reference books for the contest.
- Internet Browsing NOT allowed.
- Inter-Team Communication NOT allowed.
- ONLY Intra-Team Communication allowed.
- All the questions and related schema are provided to the students at the beginning of the contest. Question sheet is provided in hardcopy form.
- Once a team completes a question, the result is submitted to the judge. A time is recorded as the submission time. Then the judge will evaluate the submitted answer. In case the validation fails, the team will be notified and feedback will be provided to the team.

Contest Rules (2)

- For programming questions only, each team can have THREE chances to submit the answer of each question:
  - Each time the team submits an answer, the judge records the submission time and runs a stored procedure to check the answer. If the answer is correct, they will be awarded points for the question. If the answer is incorrect, the contest system will send the answer back to the team and the team can then re-submit again up to three times.
  - Full points will be provided if the answer is correct.
  - Partial points might be given on programming questions
  - For each question, the highest point obtained will be recorded as its final point.
- After the contest is over, the team which gets the most points wins. If several teams get the same number of points, the one with the earliest last submission time wins.
- The decisions of the judges will be final.
- IBM reserves the right to publish the photographs and/or names of all or any prize winners in any of its promotional materials and/or advertisements as it sees fit.

Outline

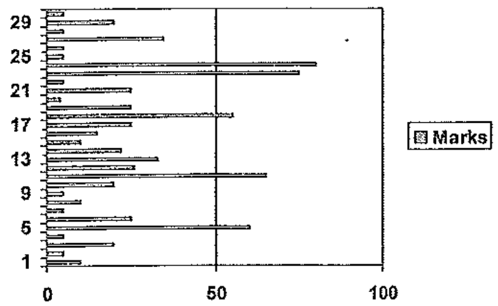
Technical Scope

- Overview on IBM middleware
- DB2 basic operations on distributed platform. For example:
  - How to submit DDL and DML commands
  - How to interpret error messages
  - How to save results
- Overview on graphical interfaces
- Overview on web programming using Java, DB2, WebSphere Application Server, Rational Application Developer and WebSphere Portal Server
- Overview on Tivoli Netcool Omnibus
- Overview on IBM Cloud Solution
- Overview on Cognos Business Intelligence
- Overview on Infosphere BigInsight

Contest PC Setup

- Networked student PC and Instructor PC
- 3GB RAM
- P4 2.0GHz
- 40GB hard disk with free space
- One set of keyboard, mouse and a 17" TFT flat screen

Team Scoreboard (will be refreshed every 15 mins)



Announcement

- Announcement will be published to the projector and by voice.

Question Overview

IBM Inter-University
Programming Contest 2012

February 11, 2012 (Saturday)
Options, Hong Kong

Two Types of Questions

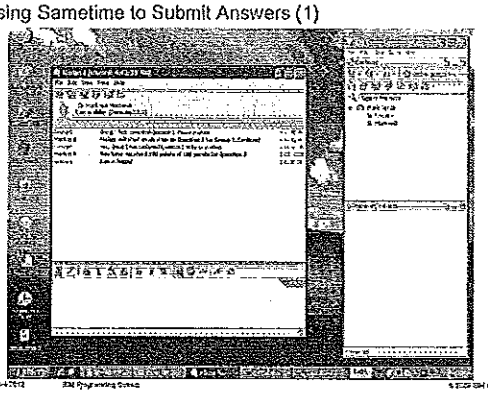
- Section 1 : Multiple Choices
  - Choices of A, B, C and D
  - Can only submit all the answers ONCE
- Section 2 : Programming Questions
  - Need to perform programming work
  - Answer will be submit to judge in the format according to the question instructions
  - Judge will check the correctness of the answer by running your program
  - Can submit answers up to three times

Distribution of Points

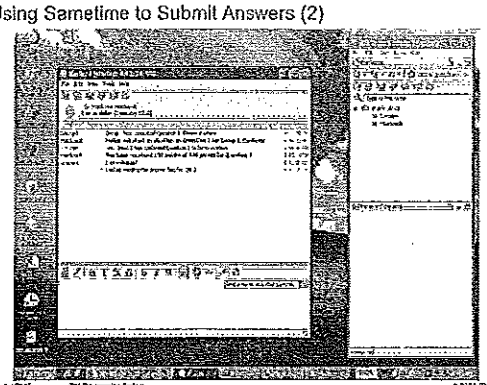
Question Number	Difficulty (* to *****)	Point
1.1	*	10
1.2	*	10
1.5	*	10
1.4	*	10
1.5	*	10
1.6	**	20
1.7	**	20
1.8	**	20
1.9	**	20
1.10	**	20
Section 1 Total		150
2.1	***	80
2.2	****	300
2.3	***	80
2.4	****	110
2.5	***	80
2.6	***	80
2.7	*****	200
Section 2 Total		850
Grant Total		1000

Sample Points

Using Sametime to Submit Answers (1)



Using Sametime to Submit Answers (2)



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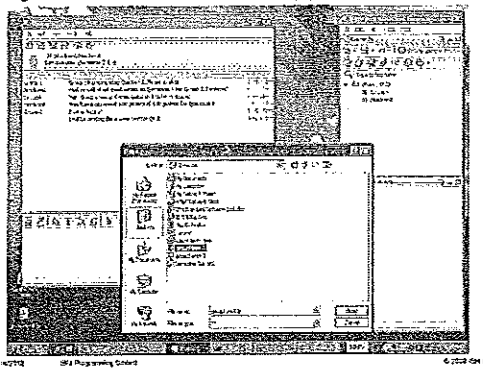
Using Sametime to Submit Answers (3)



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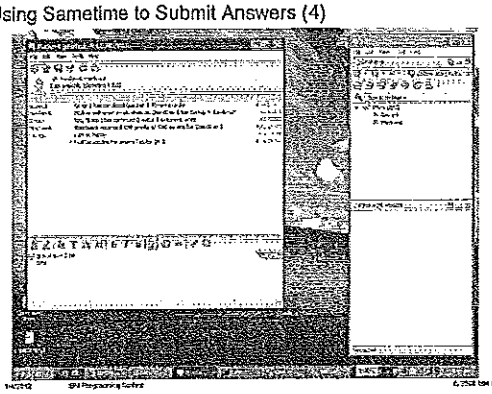
Using Sametime to Submit Answers (4)



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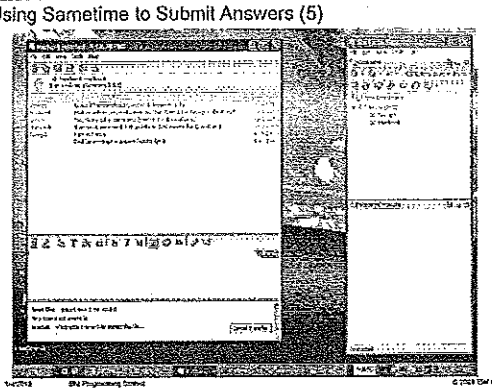
Using Sametime to Submit Answers (5)



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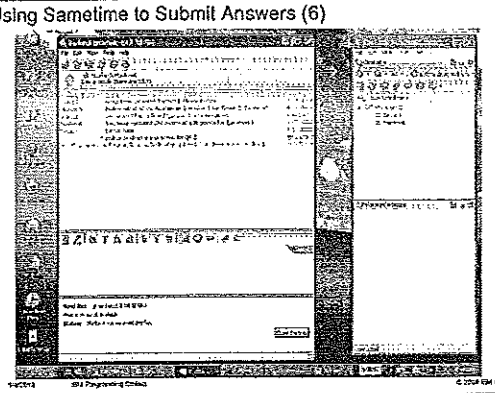
Using Sametime to Submit Answers (6)



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Agenda

- 9:15am - 9:30am: Introduction, contest environment walkthrough
- 9:30am – 10:30am: DB2 with LAB
- 10:30am - 11:30am: Tivoli with LAB
- 11:30am - 12:30pm: WAS
- 12:30pm - 1:30pm: Lunch
- 1:30pm - 2:30pm: RAD with LAB
- 2:30pm - 3: 30pm: Portal with LAB
- 3:30pm - 4:30pm: Cognos with LAB
- 4:30pm - 6:30pm: Big Insight with LAB

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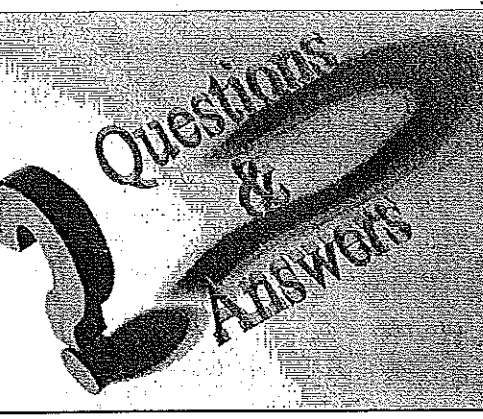


IBM Software Group Hong Kong
07 Jan 2012

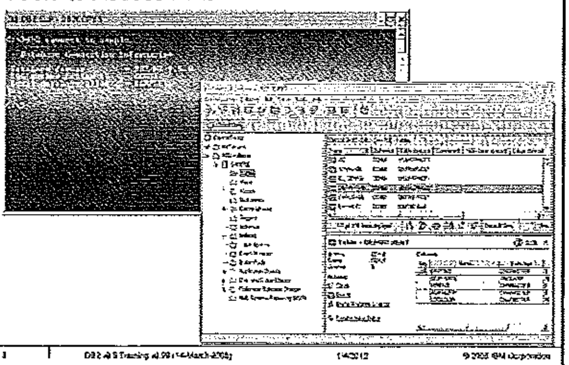
IBM Inter-University Programming Contest 2011 Training

Chapter 1: DB2

IBM Inter-University
Programming Contest 2012
February 11, 2012 (Saturday)
Cyberport, Hong Kong

Chapter Outline

Tools to Access DB2



Command Line Access

- DB2 Command Line Processor (CLP)
  - click on the DB2 Command Line Processor icon or enter db2 at a command prompt
  - an interactive input prompt appears:
    - db2 =>
  - no need to prefix commands with 'db2'
    - e.g. db2 => connect to sample
  - to end the interactive mode, enter quit
  - to disconnect from the database and terminate the DB2 backend process (db2bp), enter terminate
  - to execute OS commands, enter !<OS command>
- DB2 Command Line Window
  - click on the DB2 Command Window icon or from MS-DOS prompt, enter db2cmd
    - The command db2cmd is valid for Windows only
  - invoke the interpreter by prefacing commands and SQL with 'db2'
    - e.g. db2 connect to sample
    - e.g. db2 "select * from employee"
    - e.g. db2 -tvf createtab.db2
  - to end command line mode and terminate the DB2 backend process (db2bp), enter db2 terminate
  - all OS commands can be issued from the DB2 Command Window

Getting Help

- Obtain syntax and information for DB2 commands from the command line
  - db2 "?" list of all DB2 commands
  - db2 "? <db2-command>" get syntax help for a specific command
  - db2 "? sqlnnnn" get message and brief description of a specific SQLCODE
  - db2 "? db2nnnn" get message and brief description of a DB2 error code
- For example:
  - db2 "? catalog tcpip"

    CATALOG [ADMIN] TCPIP NODE node-name REMOTE hostname
    [SERVER service-name] [SECURITY {SOCKS}]
    [REMOTE_INSTANCE instance-name] [SYSTEM system-name]
    [OSTYPE os-type] [WITH "comment string"]

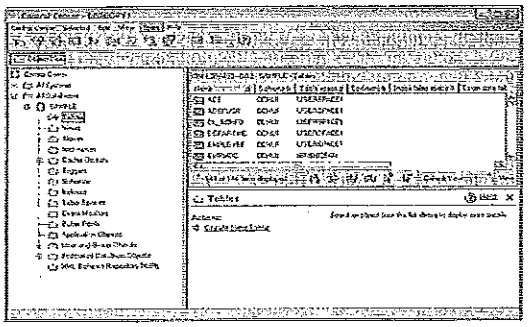
Command Line Options

- To list default command options
  - LIST COMMAND OPTIONS

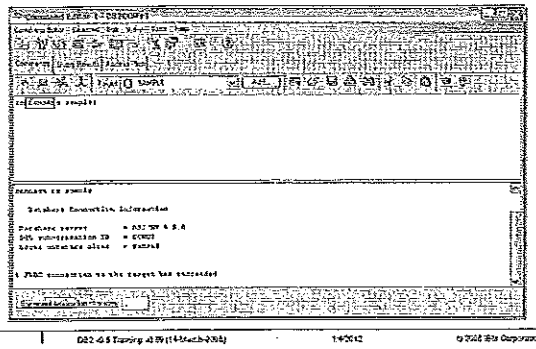
```
 No. of retries to connect to backend        (DB2BQTRY) = 60
 Request queue wait time (seconds)           (DB2RQTIME) = 5
 Input queue wait time (seconds)             (DB2IQTIME) = 5
 Command options                             (DB2OPTIONS) =

 Option  Description                                Current Setting
 ------  ----------------------------------------  ---------------
   -a    Display SQLCA                              OFF
   -c    Auto-Commit                                ON
   -e    Display SQLCODE/SQLSTATE                   OFF
   -f    Read from input file                       OFF
   -l    Log commands in history file               OFF
   -n    Remove new line character                  OFF
   -o    Display output                             ON
   -p    Display interactive input prompt           ON
   -r    Save output to report file                 OFF
   -s    Stop execution on command error            OFF
   -t    Set statement termination character        OFF
   -v    Echo current command                       OFF
   -w    Display FETCH/SELECT warning messages      ON
   -x    Suppress printing of column headings       OFF
   -z    Save all output to output file             OFF
```

- To change default command options.
  - For example, to turn auto-commit off: set db2options=+c
- To change command option for the current session
  - For example, to save output to file: UPDATE COMMAND OPTIONS USING z ON output.txt

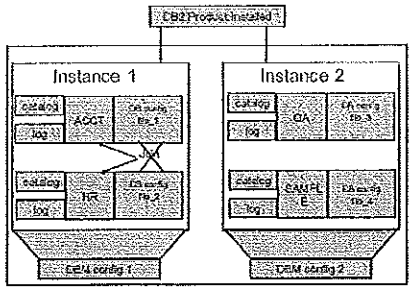
Control Center



Command Center



DB2 Instances and Databases



DB2 Instances

- A DB2 instance is a logical context in which DB2 commands and functions are executed
- An instance manages access to database files
- More than one instance can be defined on a server machine
- Each instance is independent of the others
- An instance is created on install by default
  - db2inst1 (UNIX)
  - DB2 (Windows)
- To start an instance
  - db2start
- Starts a remote instance
  - db2start REMOTE <instance name>
- Start the instance in quiesced mode for administration purposes
  - db2start ADMIN MODE
- Terminate all database connections and stop an instance
  - db2stop force

Managing DB2 Instances

- To create additional instances
  - db2icrt -u <fenced user ID> <instance name>
    - must specify fenced user ID for UNIX platforms
  - db2icrt <instance name>
    - for Windows platforms
- Terminate all database connections and drop an instance
  - db2idrop -f <instance name>
- To list existing instances defined in a server
  - db2ilist
- To update a DB2 instance for access to functions associated with installation or removal of certain product options or fix patches
  - db2iupdt <instance name>
- To migrates an existing instance, for UNIX platforms only
  - db2imigr <instance name>
- To create, drop, update, or migrate an instance, root or administrative access is required

Create a Database

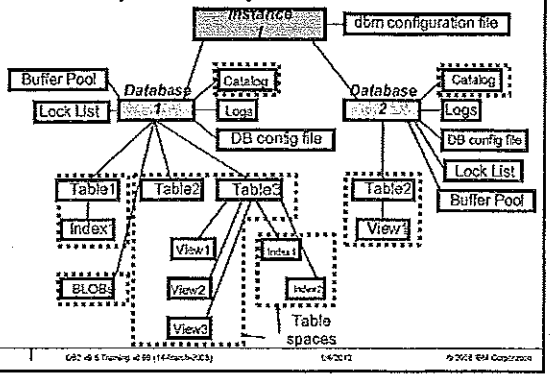
- Simplest format

```
CREATE DATABASE database-name
```

- More options:

```
CREATE DATABASE database-name
  [AUTOMATIC STORAGE {NO | YES}]
  [ON drive[,drive]...][DBPATH ON drive]
  [ALIAS database-alias]
  [USING CODESET codeset TERRITORY territory]
  [PAGESIZE integer [K]]
  [CATALOG TABLESPACE tbspace-defn]
  [USER TABLESPACE tbspace-defn]
  [TEMPORARY TABLESPACE tbspace-defn]
  [AUTOCONFIGURE [USING config-keyword value [,config-keyword value] ...]]
```

Database Object Hierarchy



Bufferpool

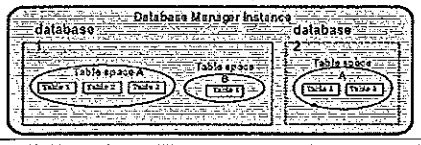
- Used to buffer data in memory to reduce the number of I/O operations to the physical database
- Keep often requested data/index pages in memory
- Keep infrequently accessed tables (e.g. random access into very large table) out of main memory
- Most data manipulation takes place in buffer pools, except for large objects and long field data
- IBMDEFAULTBP is the default bufferpool created with every database

Bufferpool Management

- Memory for the buffer pool is allocated when the database is activated or when the first application connects to the database
- Command to create buffer pool
  - CREATE BUFFERPOOL bpname IMMEDIATE SIZE xx PAGESIZE ppp
  - CREATE BUFFERPOOL bpname DEFERRED SIZE xx PAGESIZE ppp
- IMMEDIATE
  - Bufferpool be created immediately
- DEFERRED
  - Bufferpool be created when the database is reactivated
- Information stored in SYSIBM.SYSBUFFERPOOLS
- Alter size of a bufferpool
  - ALTER BUFFERPOOL bpname IMMEDIATE SIZE xx
  - ALTER BUFFERPOOL bpname DEFERRED SIZE xx
- Memory is allocated as soon as if the memory is available.
- If the memory is not available, the changed occurs when the database is reactivated
- If the size of the bufferpool is decreased, memory is deallocated at commit time

Tablespaces

- Table space is a logical grouping of tables and other objects in a database
- All database objects are stored within table spaces
- Two types of storage:
  - System Managed Space (SMS)
  - Database Managed Space (DMS)
- A table space is composed of one or more containers
- Data allocated by extents within containers
- Table spaces are either 4K, 8K, 16K or 32K pages
  - 4K is default size
  - Must be associated with a buffer pool with same page size



Default Tablespaces in a Database

- With a simple CREATE DATABASE command:
  - CREATE DATABASE sample
- Three SMS table spaces are created automatically in default locations:
  - SYSCATSPACE - system catalog tables
  - USERSPACE1 - default user data
  - TEMPSPACE1 - temporary data
- Can change table space storage type and explicitly specify the locations of the containers:

```
CREATE DATABASE sample
  CATALOG TABLESPACE
    MANAGED BY SYSTEM
    USING ( 'c:\catdir1' )
  USER TABLESPACE
    MANAGED BY DATABASE
    USING ( FILE 'e:\db2files\userdbsp1 100, FILE 'e:\db2files\userdbsp2 100 )
  TEMP TABLESPACE
    MANAGED BY SYSTEM
    USING ( 'c:\tempspace' );
```


Schema

- A schema is a collection of database objects such as tables, views, indexes, or triggers. It provides a logical classification of database objects
- How is a Schema name used?
  - Fully-qualified object name: "schemaname.tablename"
  - Can have multiple tables with the same name, but different schema names
    - syerman.staff != jones.staff
- Reserved schema names
  - SYSCAT, SYSIBM, SYSSTAT, SYSFUN
  - Avoid schema names beginning with SYS
- If database object does not specify a schema name, table qualified with current authorization ID
- Alternate schema names can be specified using
  - SET CURRENT SCHEMA or SET CURRENT SQLID command
  - CREATE ALIAS <aliasname> FOR <tab/view name>
  - CREATE VIEW

System Schemas

- Created with every database and placed into the SYSCATSPACE table space
- SYSIBM
  - Base catalogs
  - Access not recommended
- SYSCAT
  - SELECT authority GRANTed to PUBLIC
  - Catalog Read-only Views
  - Recommended way to obtain catalog information
- SYSSTAT
  - Updateable Catalog Views - Influence the Optimizer
- SYSFUN
  - User-Defined Functions

System Catalog Tables and Views

Schema: Table = SYSIBM View = SYSCAT

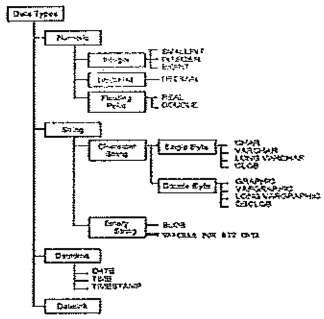
TABLE	VIEW	DESCRIPTION
SYSDBAUTH	DBAUTH	Authorities on database
SYSCHECKS	CHECKS	Check constraints
SYSCOLUMNS	COLUMNS	Column definitions
SYSCOLCHECKS	COLCHECKS	Columns referenced by check constraints
SYSCOLDIST	COLDIST	Detailed column statistics
SYSKEYCOLUSE	KEYCOLUSE	Columns used in keys
SYSCONSTDEP	CONSTDEP	Constraint dependencies
SYSDATATYPES	DATATYPES	Datatype definitions (built-in & UDT)
SYSEVENTMONITORS	EVENTMONITORS	Event Monitor Definitions
SYSEVENTS	EVENTS	Events currently monitored
SYSFUNCPARMS	FUNCPARMS	Definitions of Parameters/Result of UDFs
SYSFUNCTIONS	FUNCTIONS	UDF definitions
SYSINDEXAUTH	INDEXAUTH	Index privileges
SYSINDEXES	INDEXES	Index definitions

System Catalog Tables and Views

Schema: Table = SYSIBM View = SYSCAT

TABLE	VIEW	DESCRIPTION
SYSPACKAGEAUTH	PACKAGEAUTH	Authorities on packages
SYSPACKAGEDEP	PACKAGEDEP	Package dependencies
SYSPACKAGES	PACKAGES	Package definitions
SYSREFERENCES	REFERENCES	Referential constraints definitions
SYSSTATEMENTS	STATEMENTS	Details of package SQL Statements
SYSTABAUTH	TABAUTH	Table Authorities
SYSTABCONST	TABCONST	Table constraint definitions
SYSTABLES	TABLES	Table definitions
SYSTABLESPACES	TABLESPACES	Table Space Definitions
SYSTRIGDEP	TRIGDEPEVENTS	Trigger dependencies
SYSTRIGGERS	TRIGGERS	Definitions of triggers
SYSVIEWDEP	VIEWDEP	View dependencies
SYSVIEWS	VIEWS	View definitions

Data Types



CREATE TABLE Command

- You must have SYSADM or DBADM authority or CREATETAB privilege on the database
- Example:

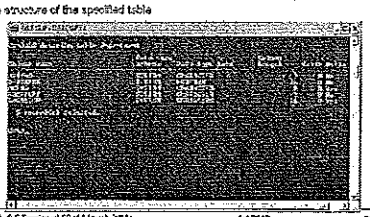
```
connect to [illegible]
create table artists
( artno            SMALLINT NOT NULL
, name             VARCHAR(50) WITH DEFAULT 'abc'
, classification   CHAR(1) NOT NULL
, bio              CLOB(100K) LOGGED
, artwork          DATALINK LINKTYPE URL FILE
                   LINK CONTROL MODE DB2OPTIONS
, picture          BLOB(2M) NOT LOGGED COMPACT)
INDEX IN indxtsp
LONG IN longtsp
IN datatsp
```


Table

- If a table is created without the IN clause, it will be placed:
  - In the IBMDEFAULTGROUP table space (if it exists and if the page size is sufficient)
  - In a user created table space which is of the smallest pagesize that is sufficient for the table
  - Then it will go in USERSPACE1 (if it exists and has a sufficient page size)
- Use IN, INDEX IN, and LONG IN clauses to specify the tablespaces to stored related information
- To duplicate a table:
  - CREATE TABLE tab1new LIKE tab1;
- No constraints, triggers, or indexes copied, and data not copied
- May specify table or view
- To define a table using SQL statement
  - CREATE TABLE t1new
    AS (SELECT c1, c8, c10 FROM t1)
    DEFINITION ONLY;
- Column attributes of defined table based upon referenced table
- Data not populated

Other Useful Table Commands

- LIST TABLES
  - List tables for the current user
- LIST TABLES FOR ALL
  - List all tables defined in the database
- LIST TABLES FOR SCHEMA <schema>
  - List tables for the specified schema
- DESCRIBE TABLE <tablename>
  - Show the structure of the specified table



Insert Statement

- You need to have appropriate table or view privilege
- Can insert one or more rows at a time

```
INSERT INTO department (deptno, deptname, admindept)
    VALUES ('E31', 'ARCHITECTURE', 'E01' ),
           ('E32', 'INFRASTRUCTURE', 'E02')
```

- You can use subselect to determine values

```
INSERT INTO department (deptno, deptname)
    SELECT deptno, deptname FROM sales_depts
```

- May also be done to a subset of columns provided:
  - A column not specified accepts NULLs or
  - Columns defined WITH DEFAULT
- Large amounts of data? Look at using LOAD instead

Update Statement

- UPDATES come in 3 main varieties :
  - Full table

```
UPDATE employee SET salary = NULL
UPDATE employee SET (dept) = (
        SELECT deptname FROM department WHERE deptno = 1)
```

  - Searched with a WHERE clause

```
UPDATE employee SET salary = salary * 1.10 WHERE title = 'DBA'
```

  - Positioned using a CURSOR in a program

```
EXEC SQL DECLARE C1 CURSOR FOR
      SELECT * FROM EMPLOYEE FOR UPDATE OF JOB;
EXEC SQL OPEN C1;
EXEC SQL FETCH C1 INTO ... ;
if ( strcmp (change, "YES") == 0 )
  EXEC SQL UPDATE EMPLOYEE
      SET JOB = 'newjob'
      WHERE CURRENT OF C1;
EXEC SQL CLOSE C1;
end if
```


Delete Statement

- DELETES can apply to single or multiple rows
  - You can also use subselect to determine values
- Two forms of statement :
  - Searched DELETE form is used to delete one or more rows
    - Optionally determined by a search condition
  - Positioned DELETE form is used to delete exactly one row
    - Determined by the current position of a cursor
- Deleted rows not removed from table
  - Space is marked as unused
  - Reclaim space using the REORG command
- Example:

```
DELETE FROM DEPARTMENT WHERE DEPTNO = 'D11'
```


Select Statement

- SELECT is the QUERY element of the language
- Queries come in many styles:
  - Retrieving all table data
  - Limiting Columns or Rows retrieved
  - Cartesian Product
  - Inner Join
  - Set operators
  - Common table expressions
  - Other options:
    - derived columns
    - sub-query etc.
    - sorting
    - using functions
    - grouping values

ORDER BY Clauses

- ORDER BY clause
  - The ORDER BY clause specifies an ordering of the rows of the result table
  - If a single sort specification (one sort-key with associated direction) is identified, the rows are ordered by the values of that sort specification
  - If more than one sort specification is identified, the rows are ordered by the values of the first identified sort specification, then by the values of the second identified sort specification, and so on
  - Example:

```
SELECT c1, c2 FROM t1 ORDER BY c1;
```

GROUP BY, HAVING Clauses

- GROUP BY … <grouping expression>
  - A GROUP BY clause contains a grouping expression. It specifies an intermediate result table that consists of a grouping of the rows of R. R is the result of the previous clause of the subselect.

```
SELECT workdept, MAX ( salary ) FROM employee GROUP BY workdept ;
```

- HAVING clause
  - The HAVING clause specifies an intermediate result table that consists of the groups of R for which the search-condition is true. R is the result of the previous clause of the subselect

```
SELECT workdept, MAX ( salary ) FROM employee GROUP BY workdept
        HAVING MAX ( salary ) < ( SELECT avg ( salary FROM employee ) ;
```

- Obtain distinct value from a table

```
SELECT DISTINCT ( position ) FROM employee ;
```

- Use of LIKE

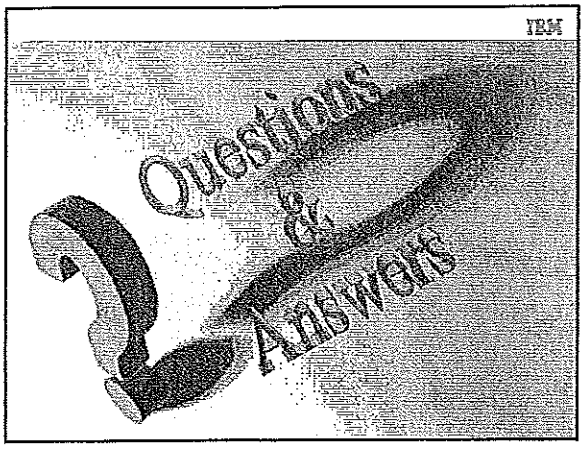
```
SELECT DISTINCT WORKDEPT FROM employee WHERE WORKDEPT LIKE 'A%';
```

- Use of EXISTS

```
SELECT empno, salary FROM employee
  WHERE NOT EXISTS ( SELECT empno FROM manager ) ;
```

- Use of IN, NOT IN clauses

```
SELECT empno, salary FROM employee
  WHERE department IN ('A00', 'E01', 'C01' ) ;
```

IBM Inter-University
Programming Contest 2012

Chapter 1: Contest Environment Walkthrough

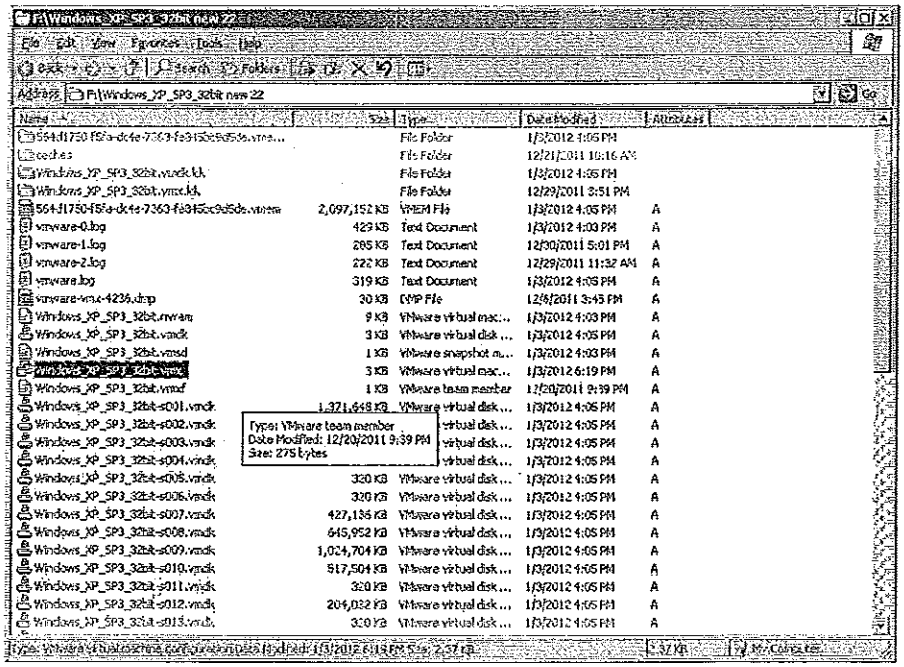
Objectives

In this exercise, we will learn:

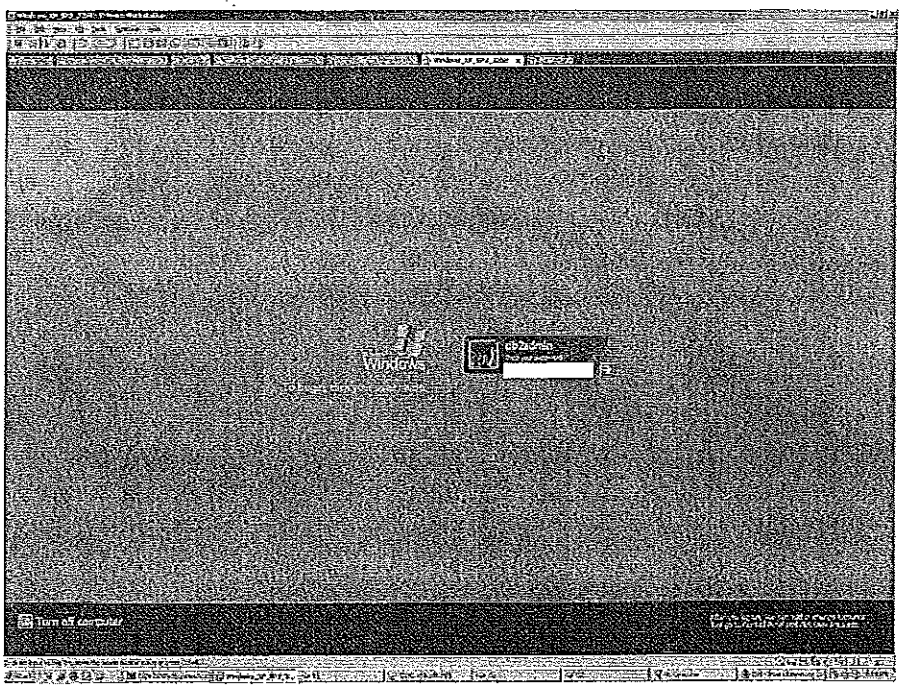
- How to boot up the programming environment using VMware
- How to log in and start up necessary services and system software
- Examine the sample application which will be used in the programming contest
- How to perform programming using the GUI environment
- How to use DB2 in command line mode and GUI mode

Exercises

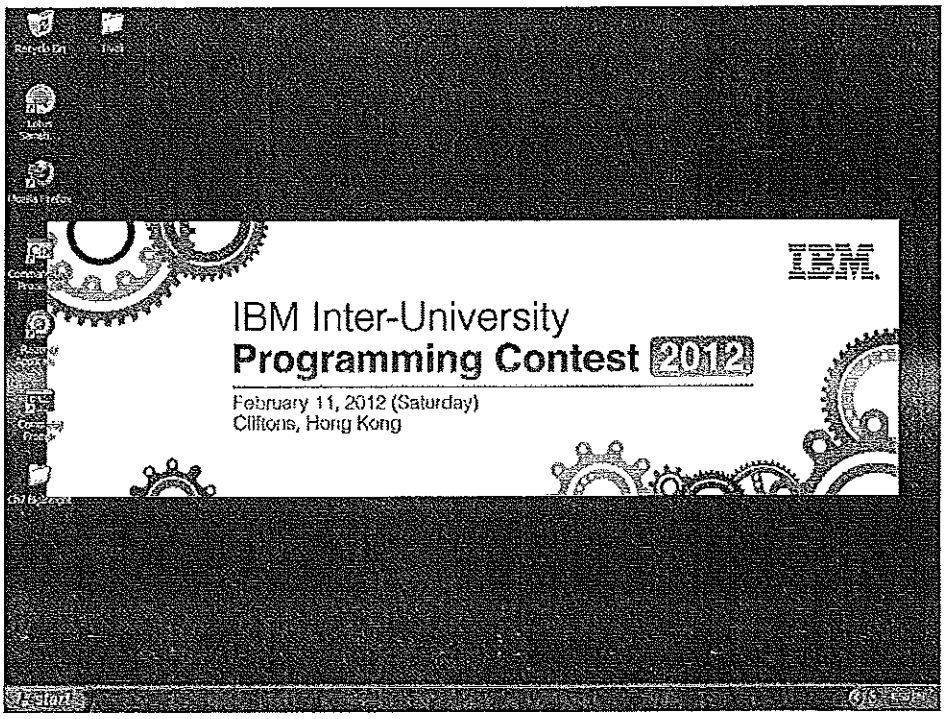
1. Using the Explorer, navigate to the **VM folder** and the double click the VMware virtual machine configuration file with name **"Windows_XP_SP3_32bit.vmx"** and then boot up the VMware.



2. When the Windows XP is booted up, the following login screen appears:

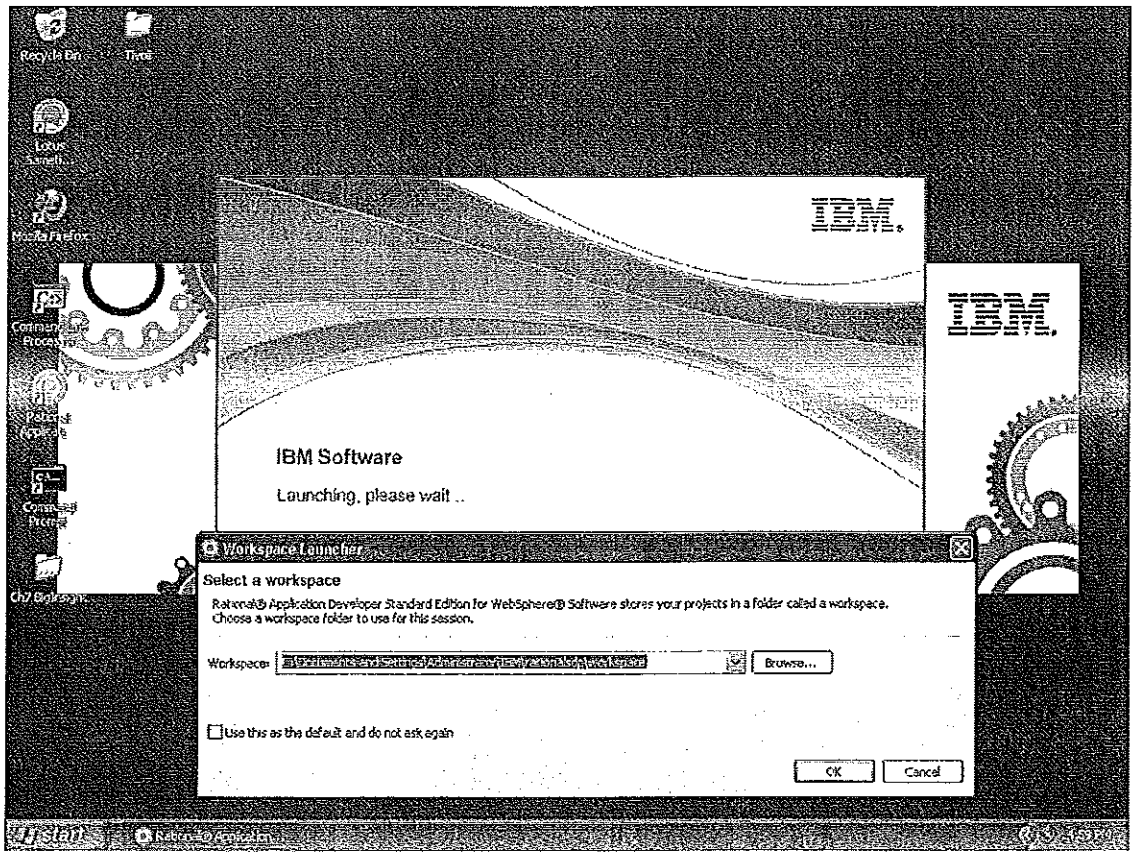


3. Click "**db2admin**" and enter the password "**password**" to log into the programming contest environment. The following screen is displayed:



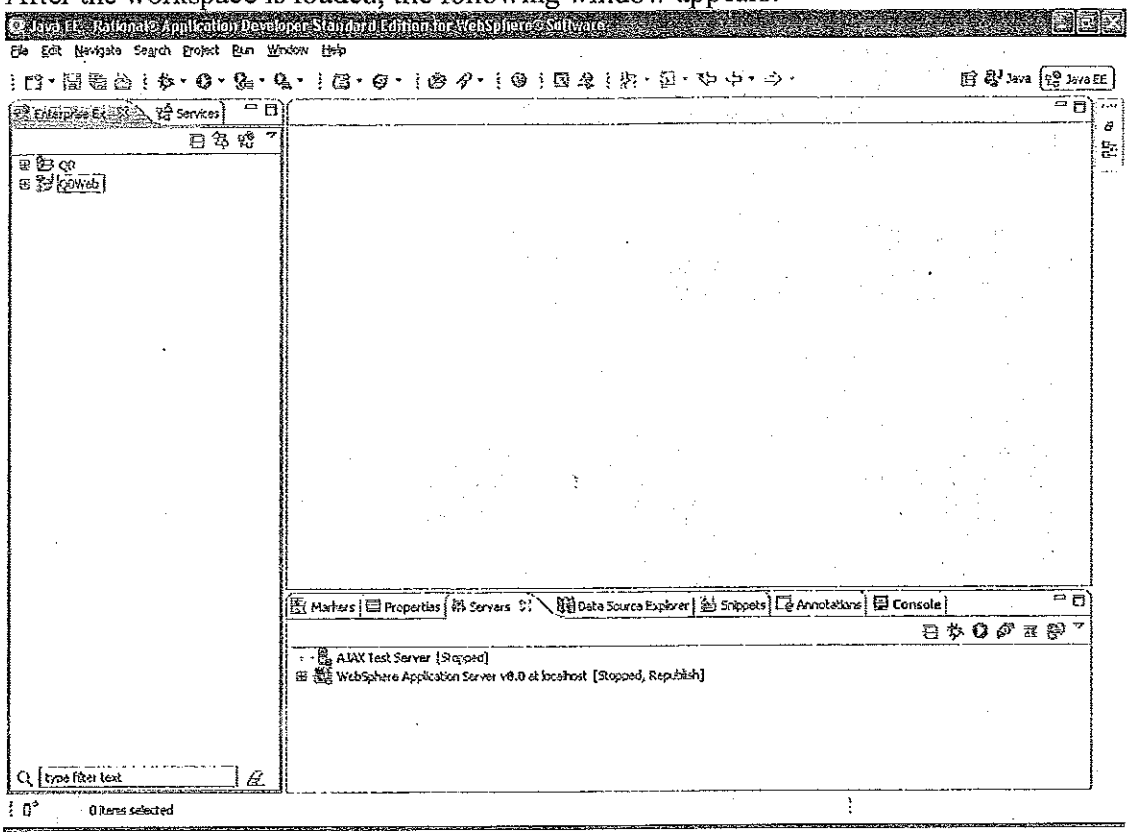
4. The next task we should perform is to can start the RAD (i.e., Rational Application Developer) to look at a J2EE application which will be used during the programming contest. RAD is a GUI development environment which is used to perform J2EE programming. The resultant programs will be published to WAS (WebSphere Application Server) so that it can be executed in the web environment.

   Double clicked the icon "IBM Rational Application Developer" to start RAD. A banner will appear and a Workspace Launcher window will appear which allows you to choose the base location of the workspace:



   Click the "OK" button to adopt the default value which is "**C:\Documents and Settings\Administrator\IBM\rationalsdp\workspace**".

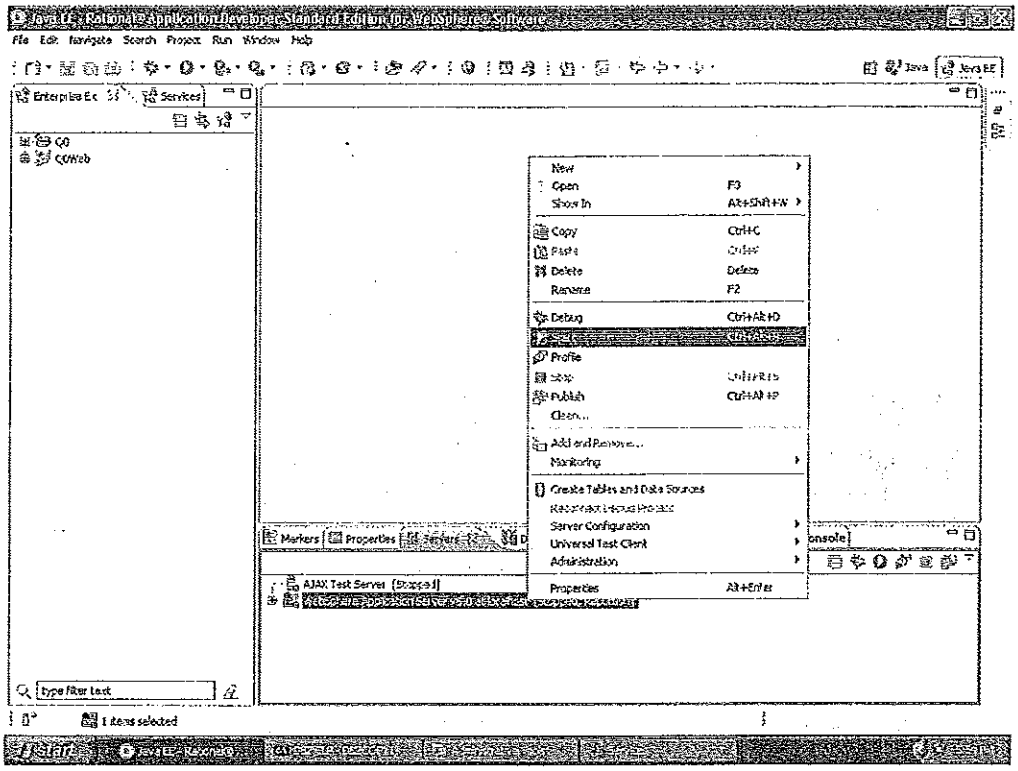
5. After the workspace is loaded, the following window appears:



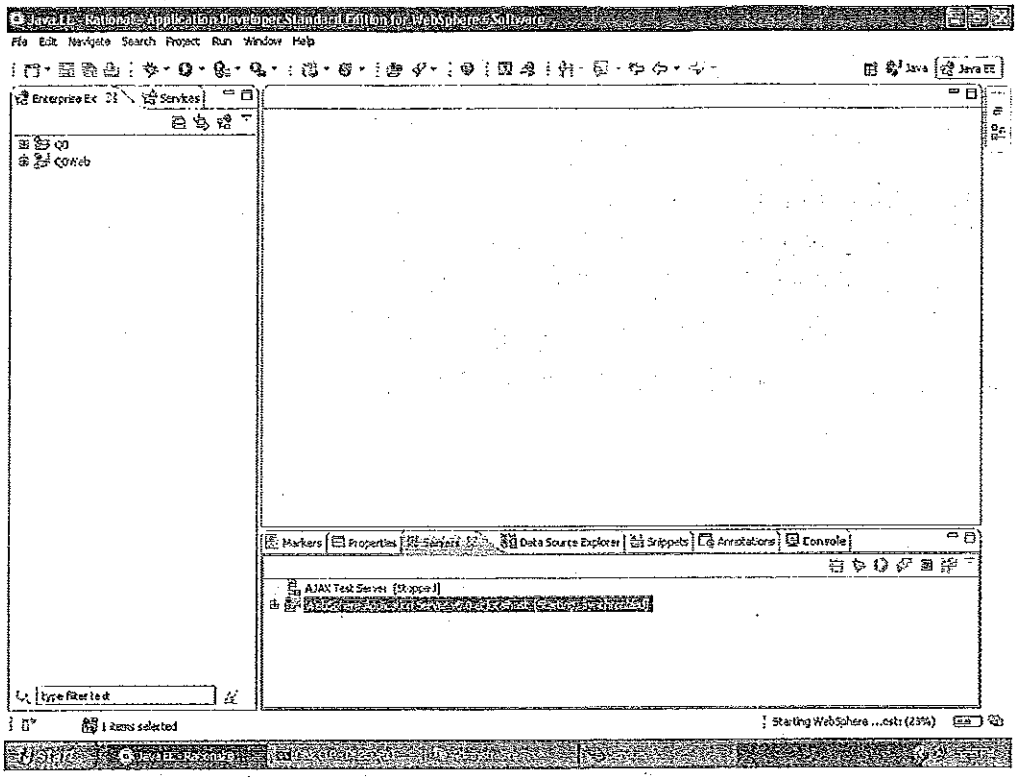
On the left side is the "Project Explorer" folder which contains a list of all available projects. In the above window, there are two available projects (i.e., Q0, Q0Web). Q0 is an application which is **"Login Page"** for user to access the administration page.

6. Before we start to review the program, we should start WAS (i.e., WebSphere Application Server) such that the program can be run via a web browser (i.e., Internet Explorer in our case).

   Click on the 'Server' tab in the middle-bottom view. You see the **'WebSphere Application Server v8.0 at localhost'** is stopped at the moment. First click on the server, then right click to show the command manual, then choose **'Start'** to start WAS:

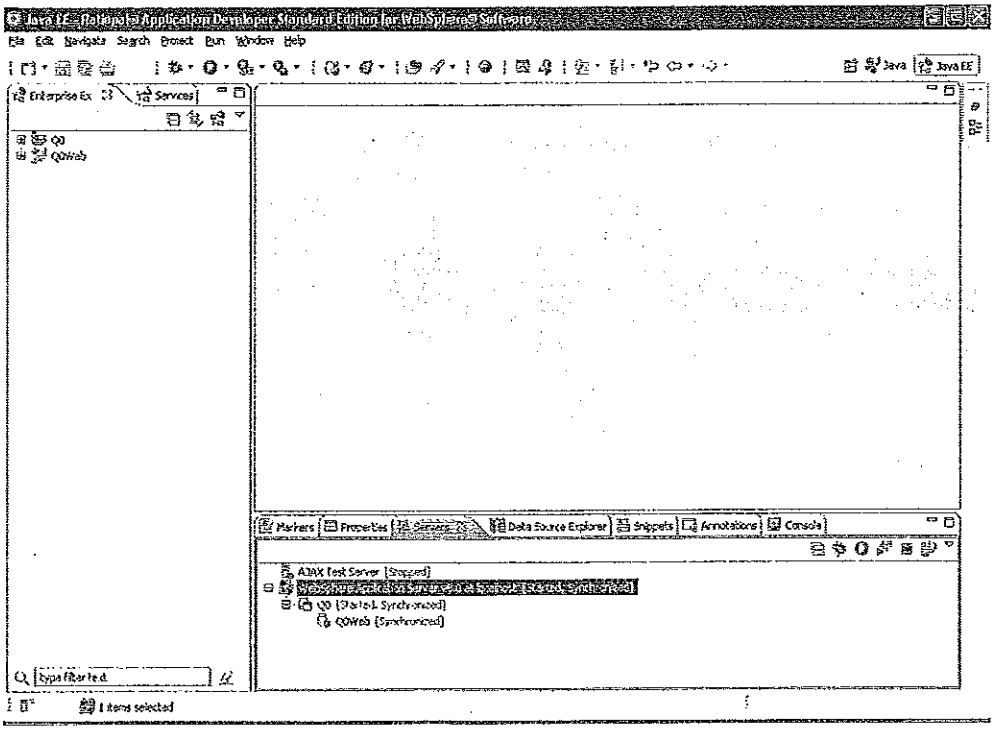


Then you will see the state of the server changing from **'Stopped'** to **'Starting'**:

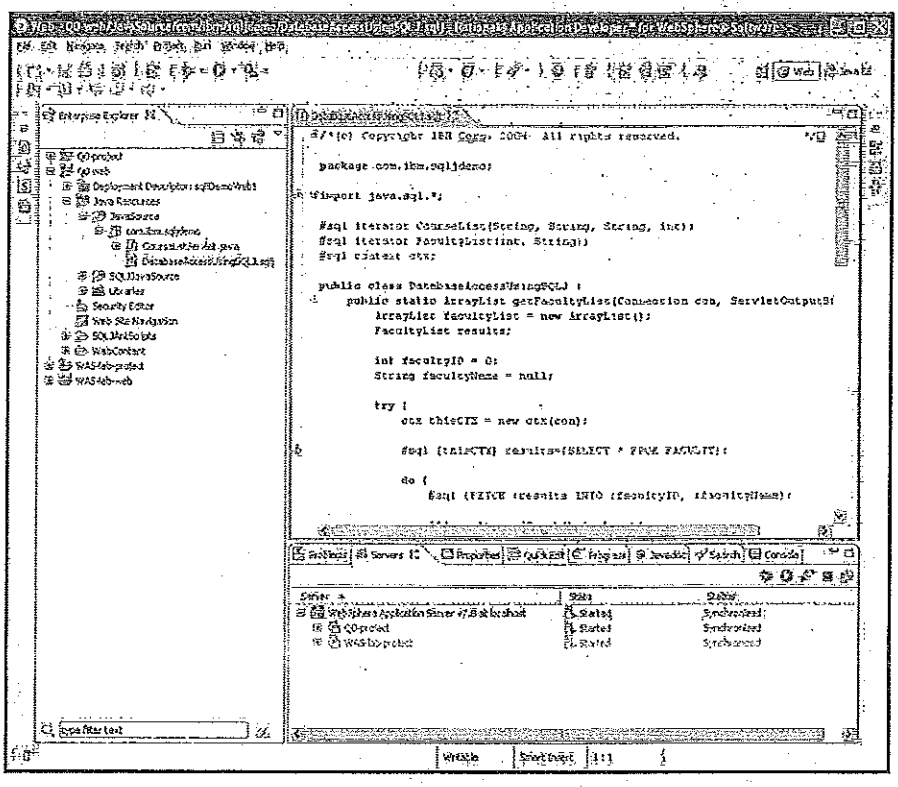


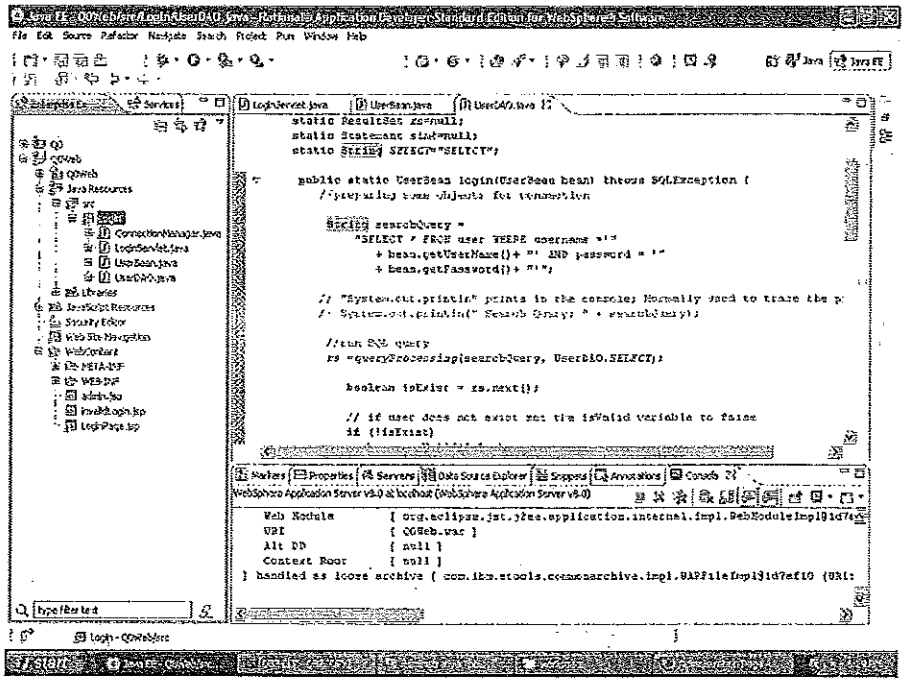
If you click on the tab **'Console'**, you might be able to see the system messages generated during startup:

After a while, WAS is booted up and the state of the server is changed to **'Started'**:



7. Now, we can continue to explore the project. Click the "+" signs of **Q0** and **Q0web** to view the content of the projects:

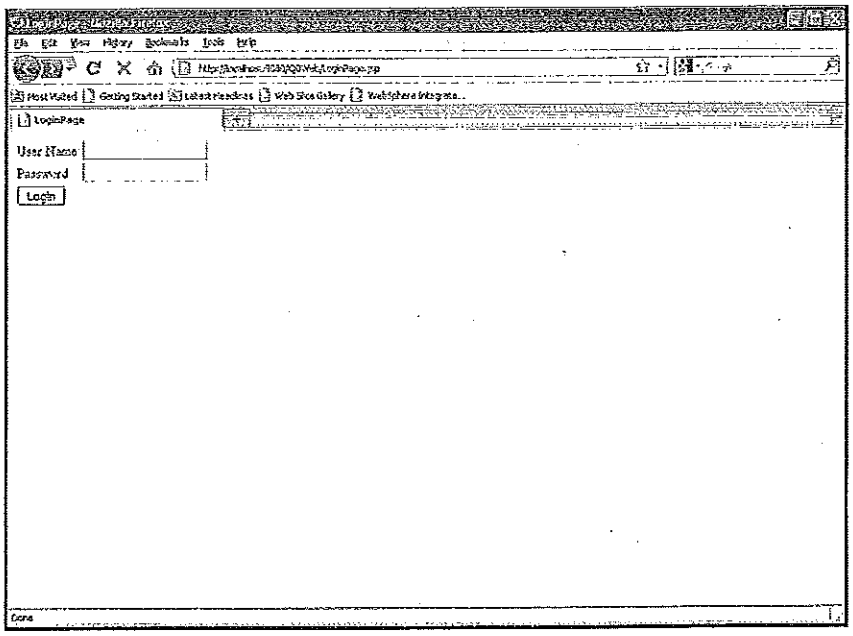




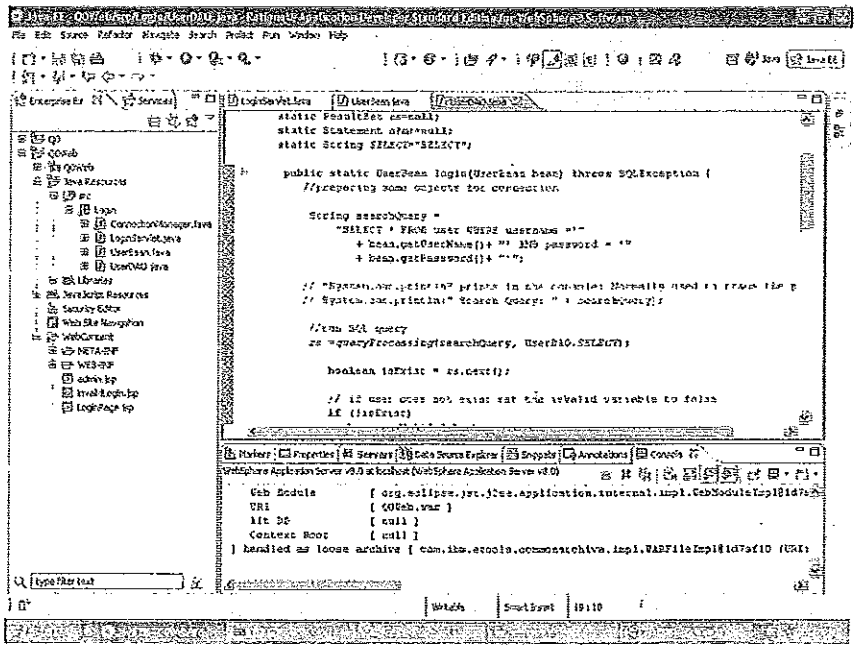
Further expand **Q0Web** by clicking the "+" signs of "Java Resources", "JavaSource", and

"scr→Login package" until you see the 4 programs of the application (i.e., ConnectionManager.java, LoginServlet.java, UserBean.java and UserDAO.java). You can run this program now.

8. Now, let's see the output of this program. Open a Mozilla Firefox browser, and then select **'Bookmarks -> Q0 – Login Page'** to run the program Q0. The following screen is generated:



9. Let's make some changes to the application(e.g. Modify the SQL statement, etc). First of all, click the "Project" item under the manual. It can be seen that there is a tick beside the item "Build Automatically":

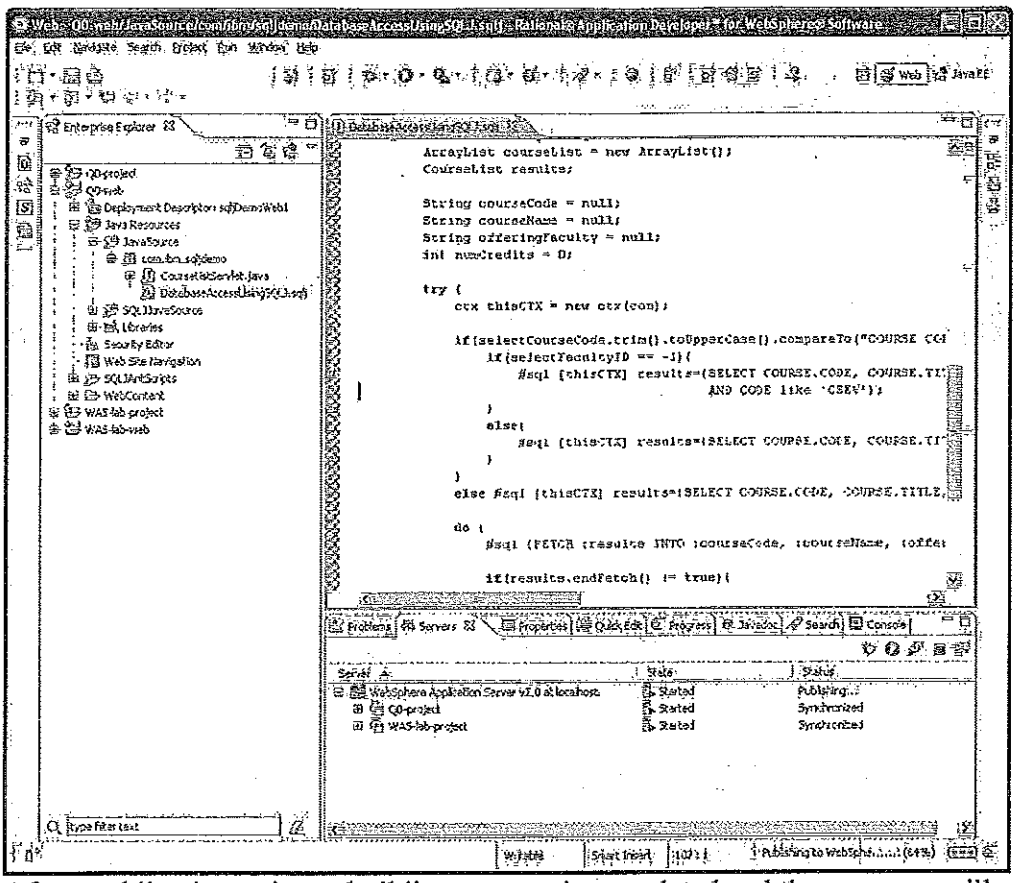


This means that after you modify something in the program and issue the save command, the project will be rebuilt automatically and the change will be deployed to WAS automatically.

10. Press **"Control-S"** to save the edited content. At the same time, please note that in the bottom-right corner of the screen the following message is displayed

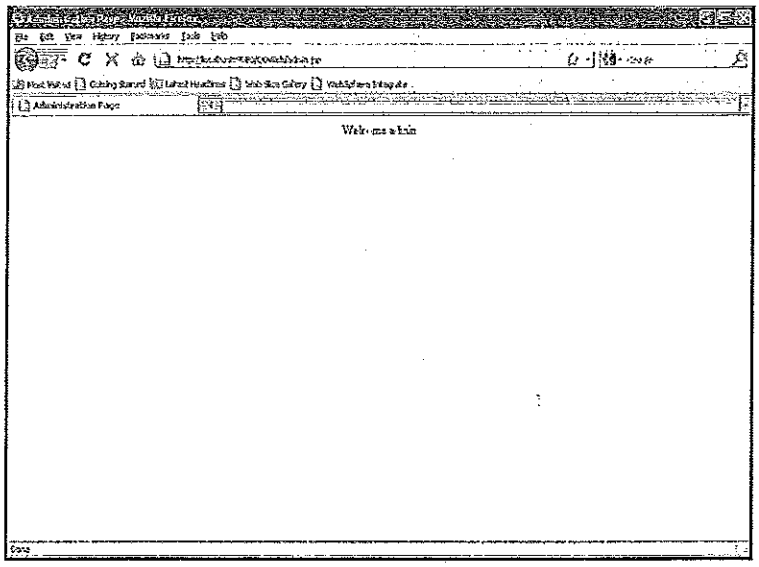
    Building workspace (0%)

    Please refer to the following window for an illustration. Please take attention to the circle on the bottom-right corner which shows the message:

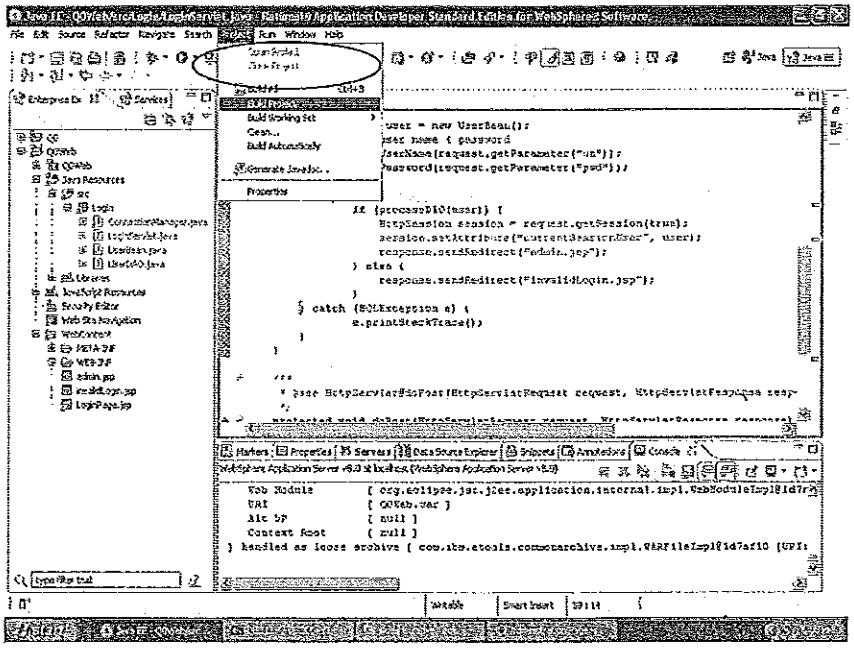


After a while, the project rebuilding process is completed and the message will disappear.

11. Open the Firefox browser, and run the application again. Enter **User name:** admin & **Password:** password. You can see the administration page.

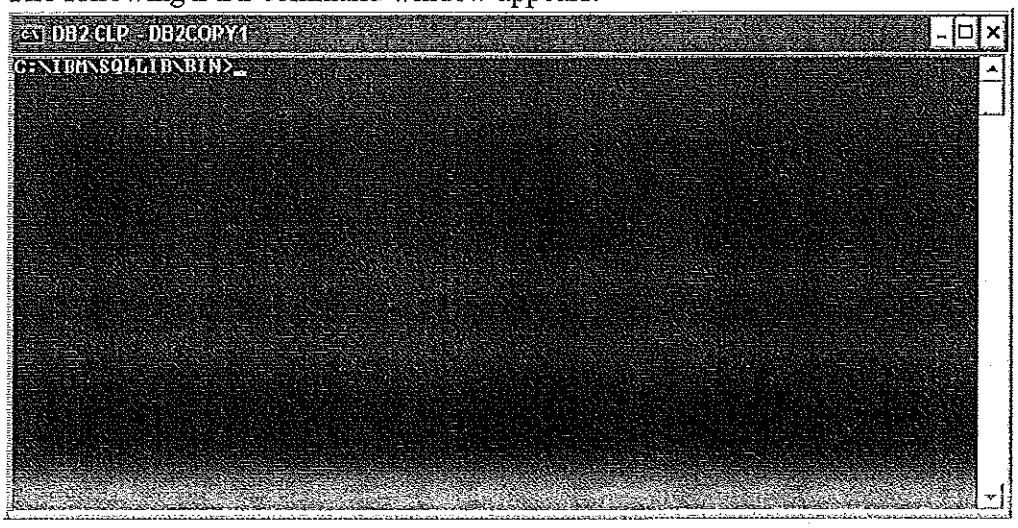


12. Since there is a tick beside the menu item "Build Automatically", the project will be rebuilt and redeployed automatically for every change to the project. If you want to perform multiple changes to the project before you rebuild the project. **You can turn off the tick of the menu item "Build Automatically".** In this case, you have to select either **"Build All" or "Build Project"** to manually start the project rebuild process.



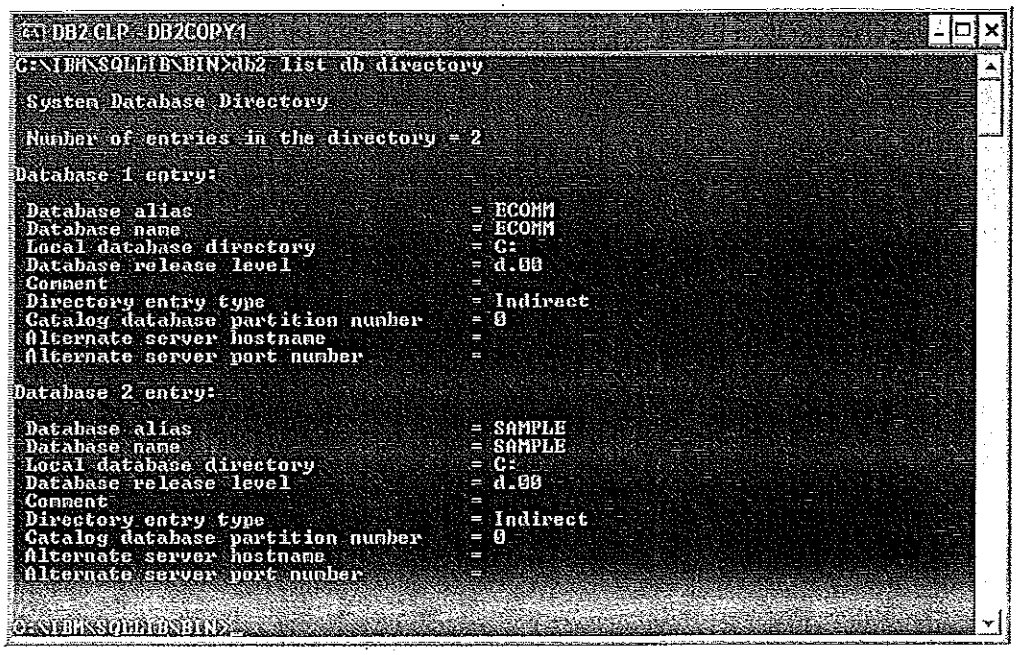
13. To review the DB2 database environment, open a DB2 Command Window by clicking the following Windows menu button: **Start -> Programs -> IBM DB2 -> DB2COPY1 (default) -> Command Line Tools -> Command Window.**

14. The following DB2 command window appears:



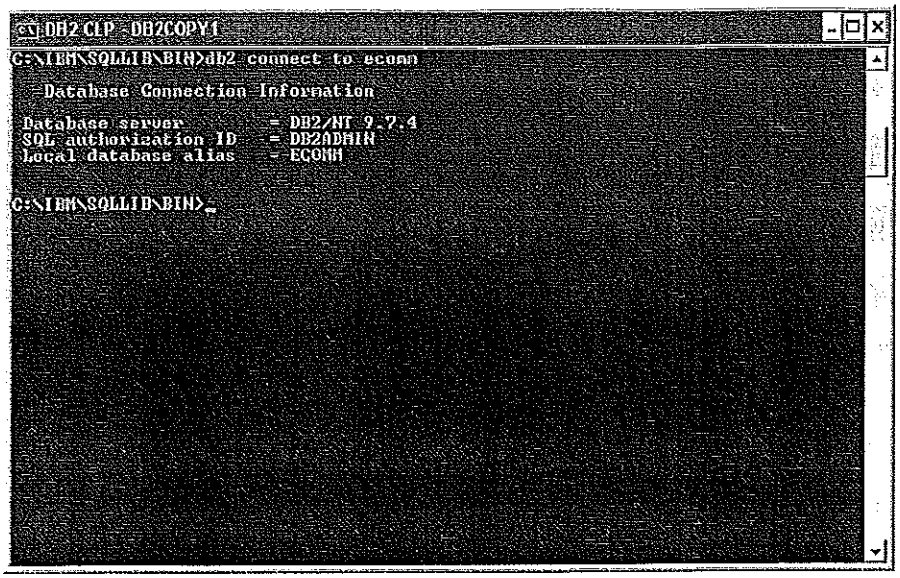
Please note that all DB2 SQL statements and commands must be entered to the DB2 command windows before they can be interpreted by DB2 properly (i.e., normal Windows command window does not work).

15. Execute the command **"db2 list db directory"** in the DB2 command window and you will see there are two databases (i.e., SAMPLE and ECOMM) defined in the system:

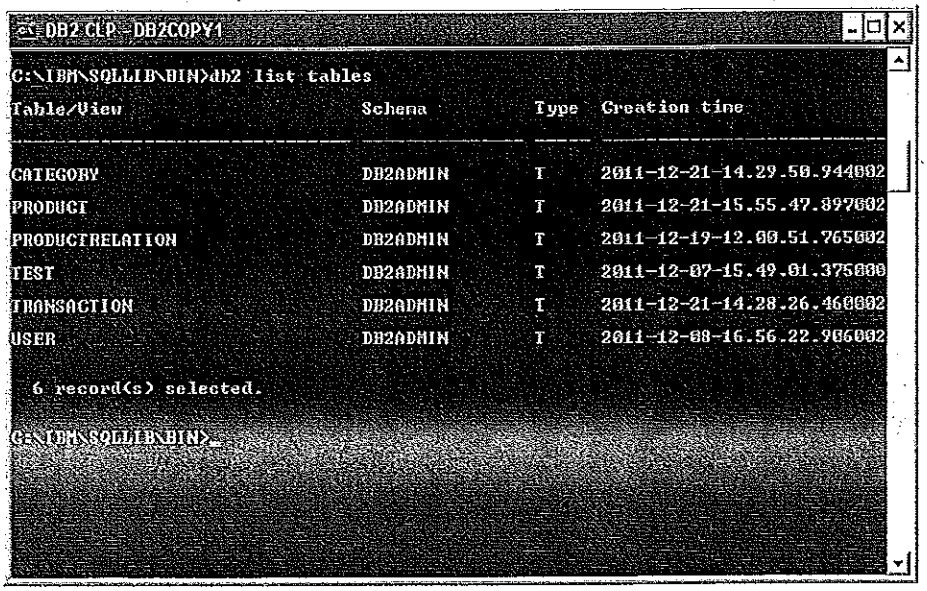


The database **ECOMM & SAMPLE** is a database defined in the primary instance (DB2) in the local PC. We will access **ECOMM** database in the later chapters.

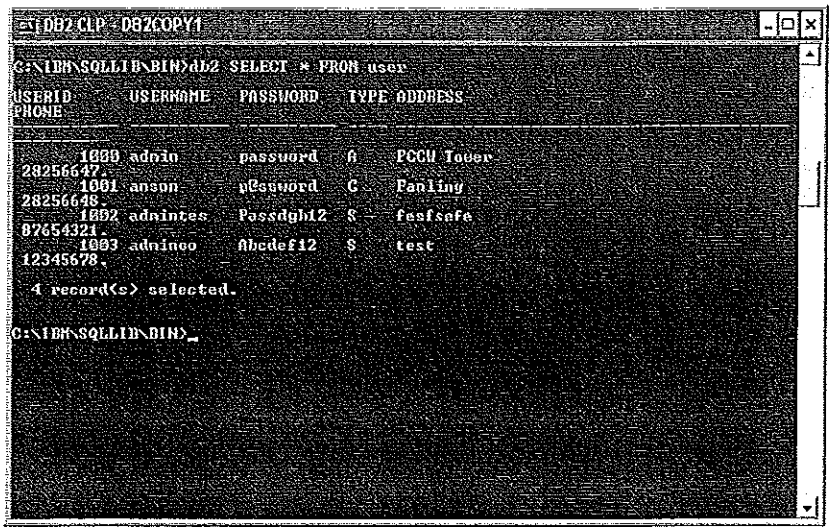
16. Enter the command **"db2 connect to ~~sample~~ ecomm"** to connect to the **ECOMM** database. The **Q0-project** application is configured to query the **ECOMM** database:



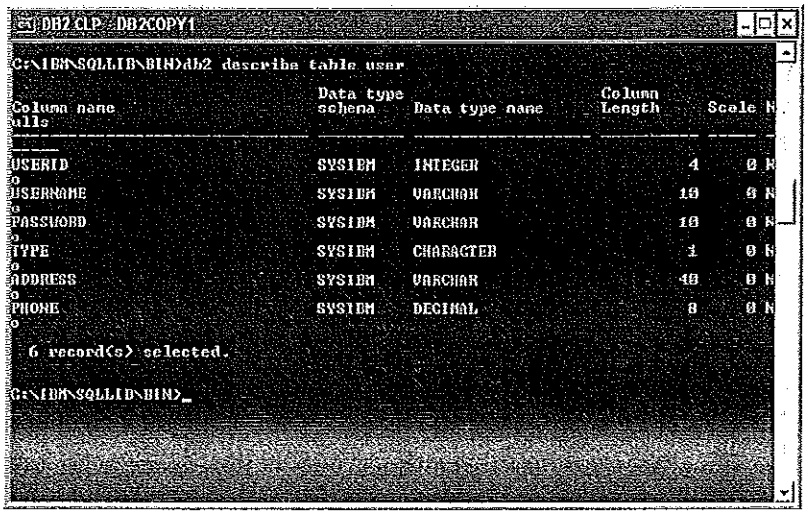
17. Enter the command **"db2 list tables"** to display the list of major database objects created by the user **"db2admin"**:



18. Enter the command **"db2 SELECT * FROM User".** Refer to the following screen for the results:

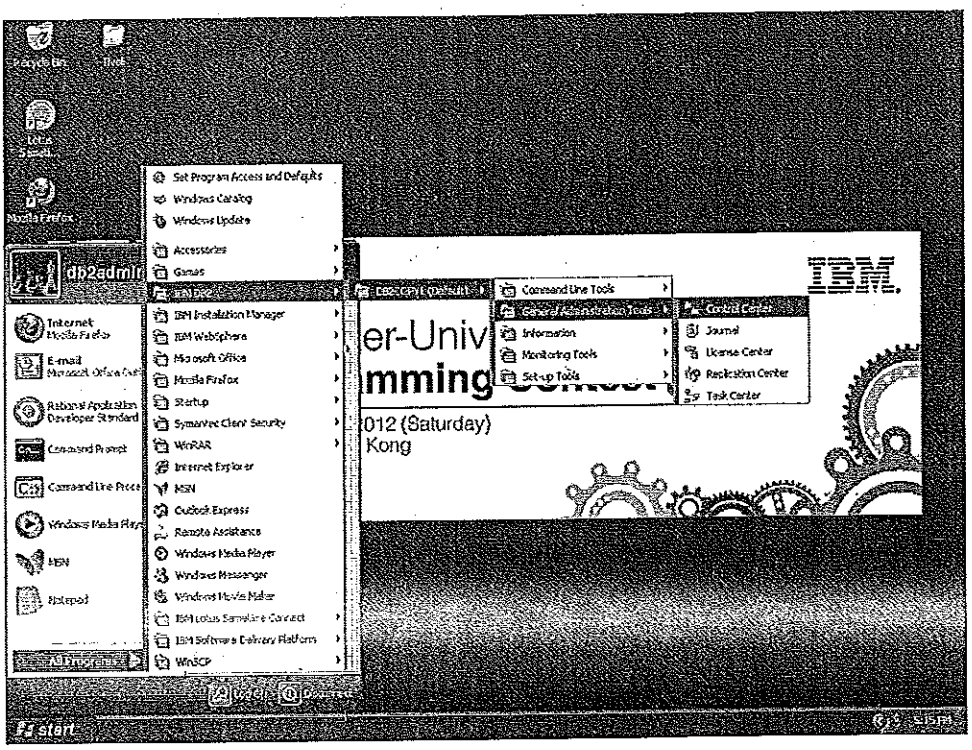


19. Finally, enter the following command **"db2 describe table user"** to display the column definition of the table USER:

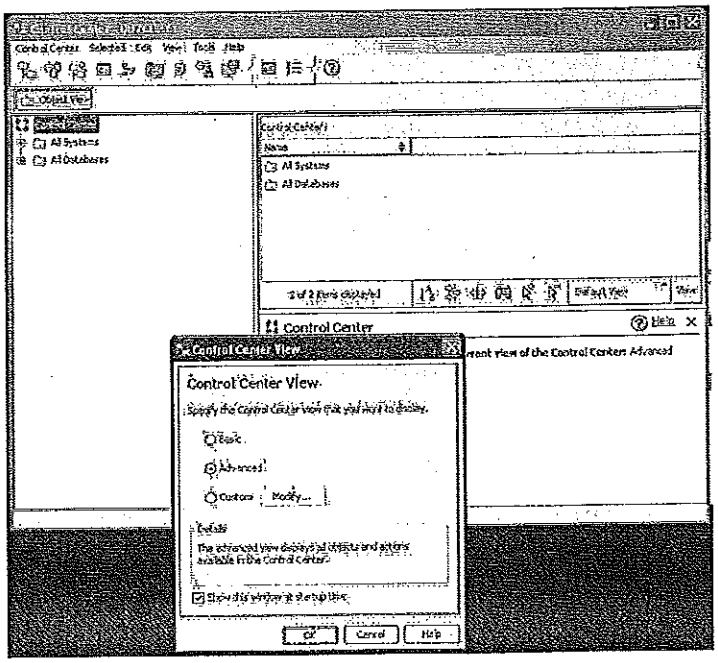


20. In general you can run SQL statements by putting each statement after the command "db2". You need to double quote the command in case it contains wildcard characters.

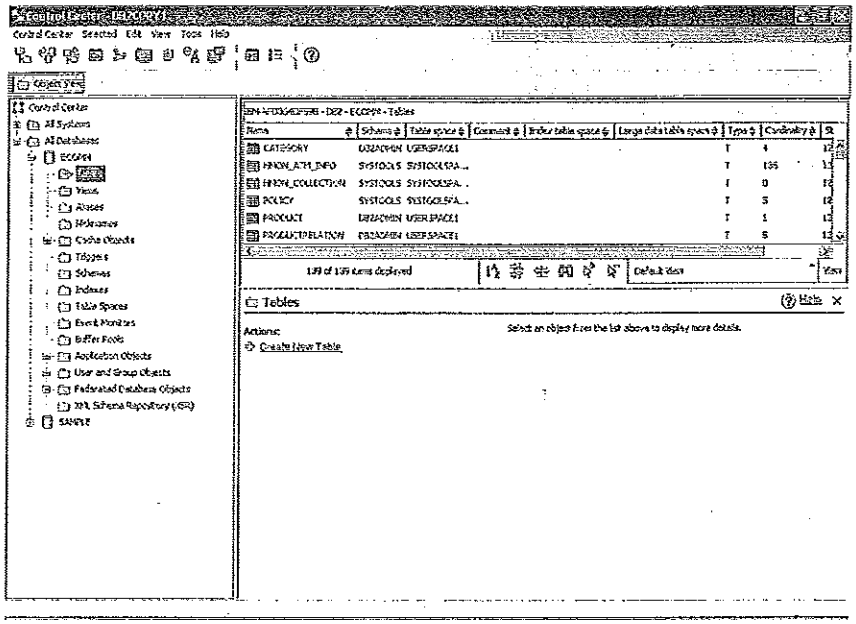
21. Now we will try to use the graphical interface of DB2. Run the DB2 control center from **"Start"->"All Programs"->"IBM DB2"->"DB2COPY1 (Default)"->"General Administration Tools"->"Control Center"**:



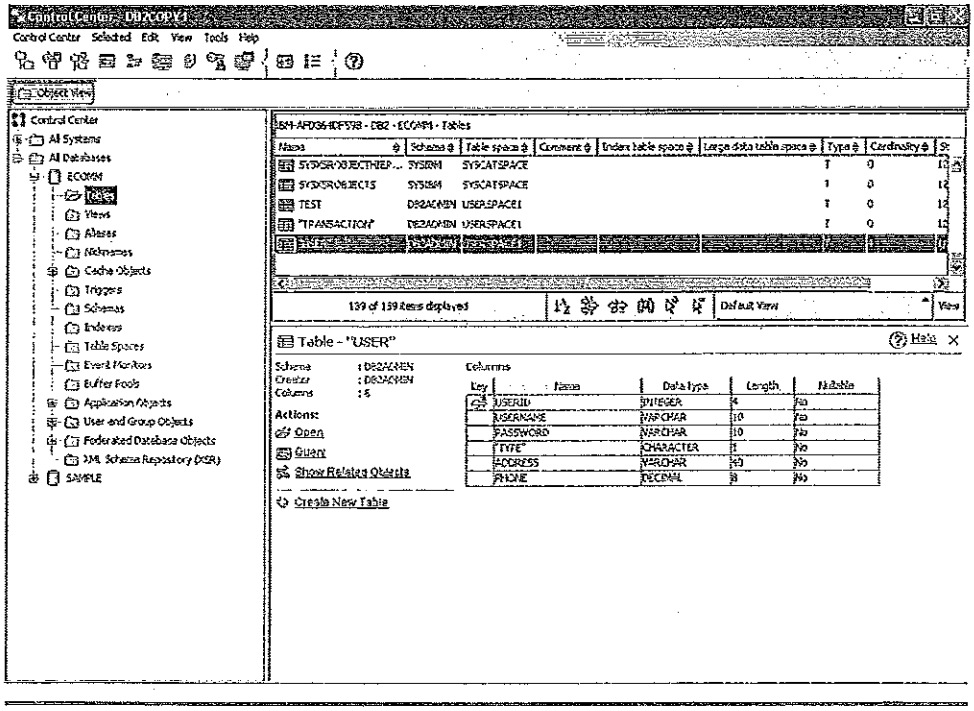
22. The DB2 control center is displayed. Press **"OK"** on the Control Center View to accept the default view:



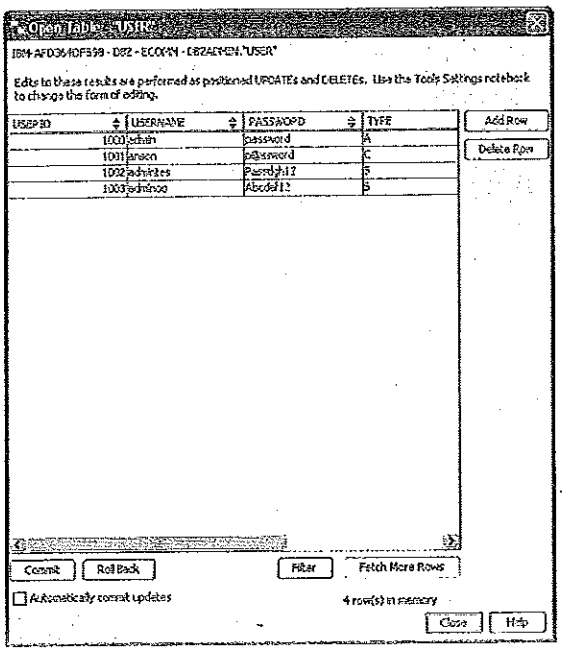
23. In the Control Center screen, navigate to **"All Databases"->"ECOMM"->"Tables"** on the left pane and then the list of tables will be displayed on the top right pane:



24. Click on the table **USER** and the field definition of the table will be displayed on the lower right pane:



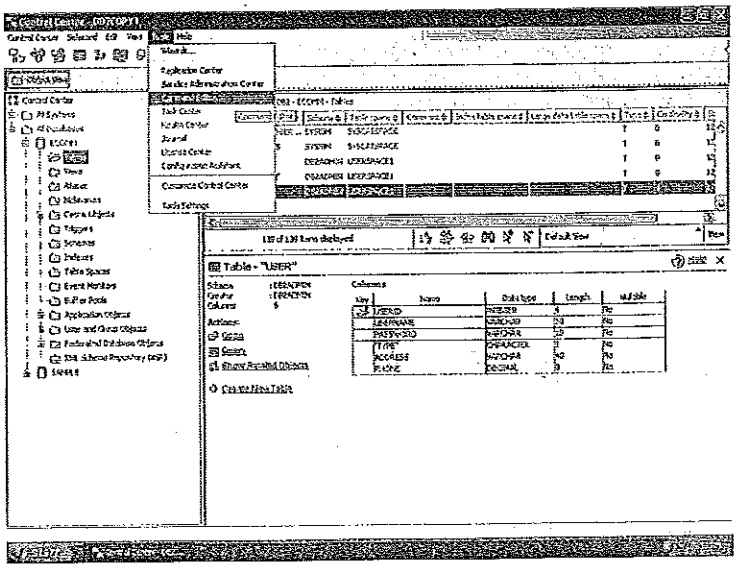
25. Double click on the table **USER** and then a new window is popped up to display the content of the table:



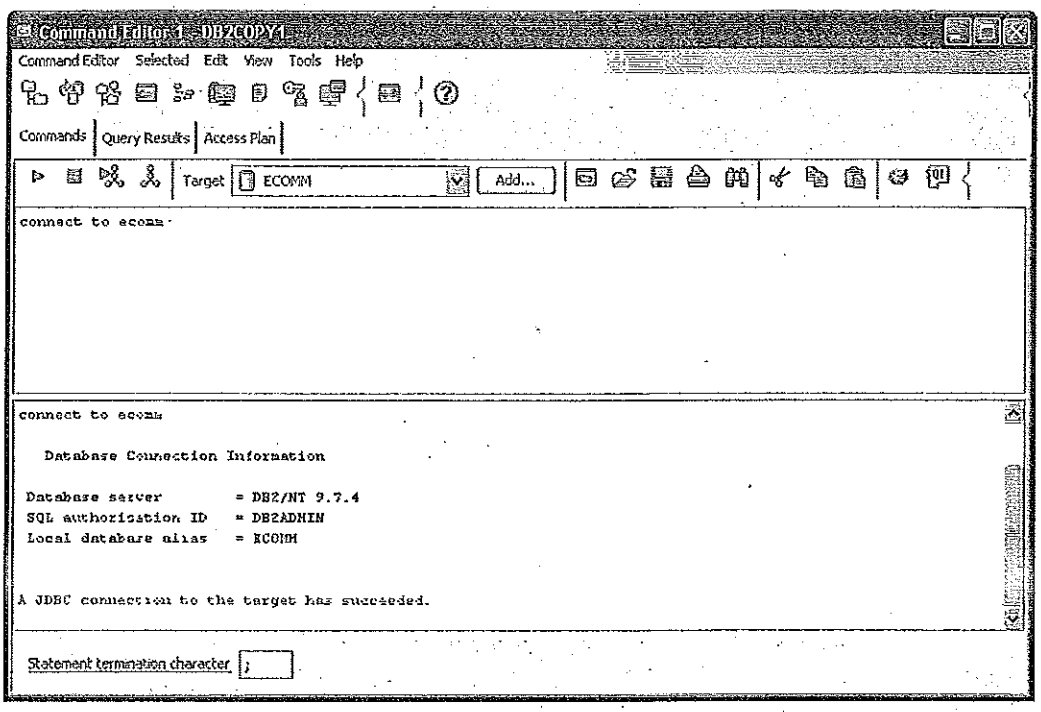
Spend some time on reviewing the functions of this window. Press the button **"Close"** to close the window.

26. Spend some more time to understand the other objects (e.g., indexes) in the database and functions of Control Center.

27. Then we will review the DB2 Command Editor. Execute the Command Editor through **"Tools"->"Command Editor"** from the manual bar of the Control Center:



28. The Command Editor screen is displayed. You can type the commands in the top pane and then the result will be displayed in the bottom pane. Type the command "connect to ecomm" in the top pane and then press the run button (i.e., the green triangle button) just above the top pane:



29. The Command Editor will then log into the database **ecomm**:

    You can run SQL statements just like what you did in the command window. But you do not need to prefix each command by **"db2"**.

    Now please try the Command Editor out by entering more commands and see how it responds.

30. This is the end of this exercise.

IBM Software Group Hong Kong
07 Jan 2012

IBM Inter-University Programming Contest 2011 Training

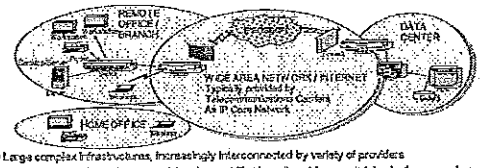
Chapter 2:Tivoli Netcool/OMNIbus

IBM Inter-University
Programming Contest 2012

February 11, 2012 (Saturday)
Cathay, Hong Kong

IBM

What is Event Management? – Extended into Complex Networked Environments



- Large complex infrastructures, increasingly interconnected by variety of providers
- Ever increasing dependency on higher bandwidth / broadband for new "triple play" services (e.g., Voice, Video, and Data)
- Maintaining High Quality of Service (QoS) is key for multiple services sharing the same network
- Increased range and reach of networks leads to reliance on skilled operators when solving problems
- Determining the actual cause of certain problems requires understanding events across IT and Network disciplines

The goal of End-to-End Event Management is to consolidate events, to focus on "root causes" (and identify related "symptoms"), and – where possible – to automate the resolution in response to any problem in the entire environment reducing MTTR (Mean time to Repair) and maintaining QoS within the network.

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Tivoli Netcool/OMNIbus

Market Leading
Event Consolidation, Correlation & Automation

Meeting the challenges of Dynamic Infrastructure Management

- **Maximize Service Availability.** Leverage hundreds of out-of-the-box integrations, with included domain intelligent event reduction rules, to monitor end-to-end infrastructure status and health.
- **Reduce Operational Costs.** Consolidate NOCs, tools and management science into a single pane-of-glass and integrated management infrastructure.
- **Improve Staff Productivity.** Utilize normalization, de-duplication, aggregation, correlation capabilities, as well as time, device, and service based event reductions.

  Seamless UI navigation based on common Tivoli GUI architecture delivers task-based workflows that represent common operations used to perform operations and service management actions
- **Minimize human intervention.** Exchange information between peer systems and automate maintenance actions and procedures
- **Increase Confidence.** Leverage proven availability and reliability, with huge event throughput capability, trusted system redundancy, failover and security.

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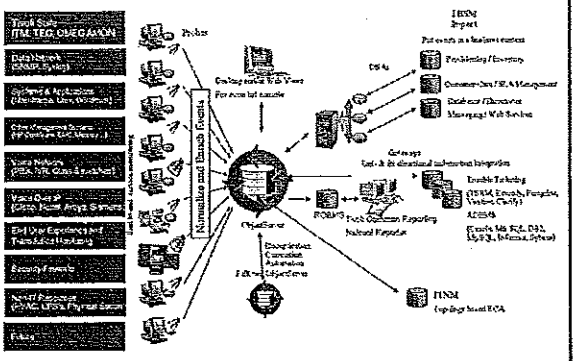
IBM Tivoli Netcool OMNIbus

Tivoli software

IBM

Tivoli Netcool/OMNIbus Solution



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Netcool/OMNIbus Integrations (250+)

Netcool Knowledge Library SNMP support (>175 MIBs), including:

New and updated versions are developed and deployed on a quarterly basis.

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IBM Tivoli Netcool OMNIbus Probe

tivoli software

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What are Probes?

- **Probes are software components used to collect event information and send it to the ObjectServer.**
- **Probes enable the ObjectServer to be independent of the systems or devices being monitored.**
  - Over 300 types of probe
  - Both generic and vendor-specific probes exist
- **Probes can modify and enrich event information**
  - Use additional information from lookup tables
  - Perform arithmetic functions
- **Probes are resilient**
  - Reliable TCP connection
  - Store and forward functionality (SAF)
  - Automatic fail-over to alternate ObjectServer

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What are Probes? (continued)

- **The ObjectServer obtains most of its event data via the probes**
  - Event data may be also obtained via Automations, Tools, Gateways or SQL
- **Every probe comprises a binary, a rules file and a properties file:**
  - *Probe binary* retrieves and tokenises event streams, and sends the event to the ObjectServer.
  - *Interpreted rules file* used to populate the field values within alerts.status
  - *Properties files* determine the run-time settings of the probe.

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Netcool Omnibus Probes

- Collection
  - Source-specific code for integrating with 3rd party systems and event synchronisation
    - Standard protocol's: SNMP, Syslog, ODBC, 3GPP,...
    - Custom message formats: Socket, Logfile
    - Proprietary/API: Many Vendors
- Normalisation
  - Common code for rules-based event processing:
    - Normalisation
    - Enrichment
    - Human Readability
    - Pre-classification for ObjectServer Correlation and Netcool processing

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Types of Probes

- Device
- Log file
- Database
- API
- CORBA
- Miscellaneous
- Security

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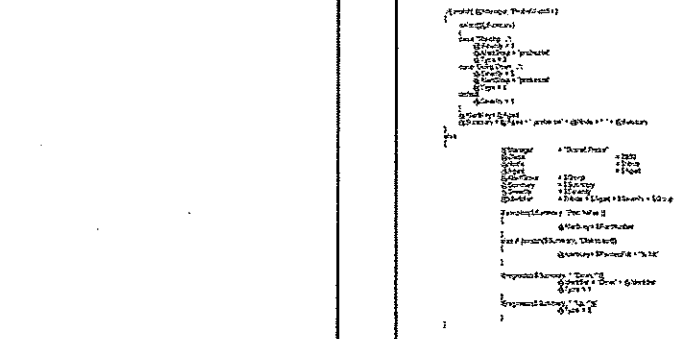
Netcool Omnibus Probes – Rules File Example



- Base Fields
  - Identifier
  - Severity
  - Node
  - AlertGroup
  - AlertKey
  - Summary
  - Agent
  - Type

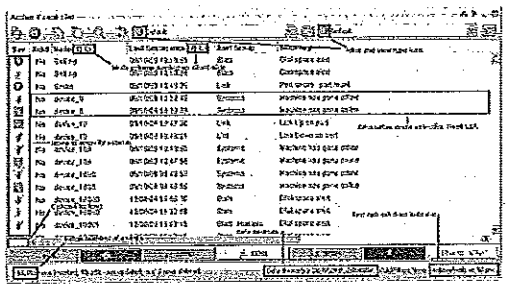
IBM

IBM Tivoli Netcool/OMNIbus Web GUI

Tivoli software

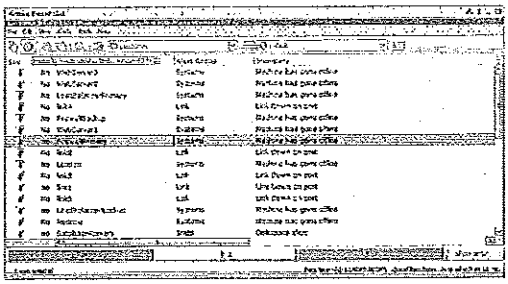
IBM

AEL Features



IBM

Active Event List – 'Tivoli Enterprise Console' Style Look and Feel



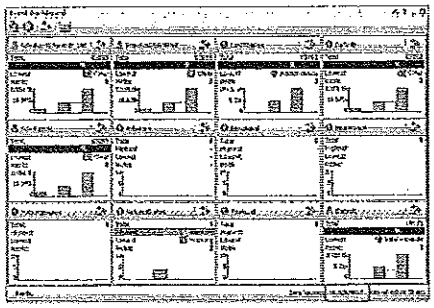
IBM

Event Dashboard

Tivoli software

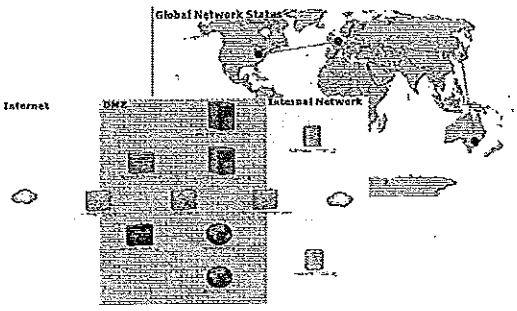
IBM

Event Dashboard



IBM

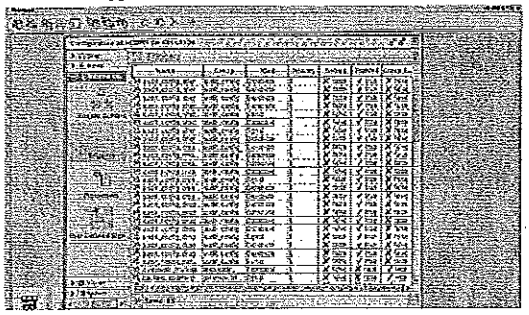
Map Refresh



Event Triggers for Automation

tivoli software

Clear Event Trigger



Trigger Language

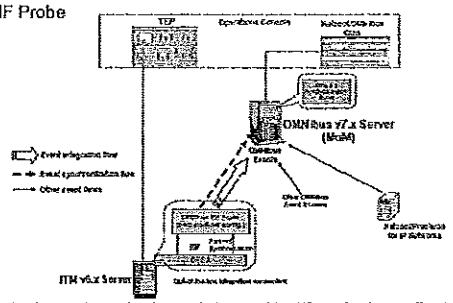
Settings | When | Evaluate | Action | Comment |

```
begin
  -- Populate a table with ITM Type 20 events corresponding to un
  -- acknowledged Type 21 events
  for each row problem in alerts.status where
      problem.ITMStatus != '' and problem.Type = 20 and
      problem.Severity > 0 and
      (problem.Manager) in
                  ( select Manager from alerts.status where Severity >
0 and Type = 21 )
  begin
    insert into alerts.itm_problem_events values (
        problem.Identifier, problem.LastOccurrence,
        problem.ITMHostname, problem.ITMStatus, problem.ITMTime,
problem.ITMEventData, problem.ITMResetFlag, problem.ITMThruNode,
problem.ITMApplLabel,
```


Event Clear Trigger and Dashboard Status Update Demonstration

tivoli software

Tivoli EIF Probe



- Sends Event Integration Facility (EIF) events (Tivoli Enterprise Console Events) to OMNIbus
- Maps TEC event fields to OMNIbus fields.

What we need for sending EIF events

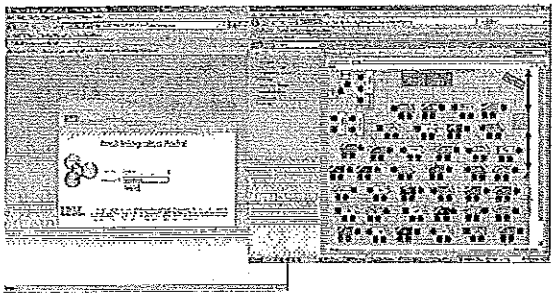
- Postzmsg
- Omnibus IP and receive ports and put it into a config file with the below contents

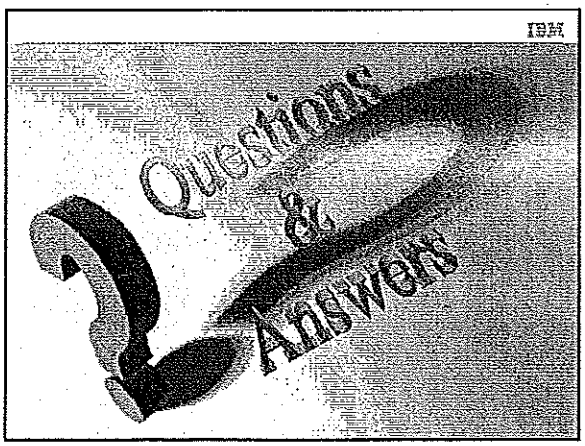
```
#
#-------------------------------------------------------------------
# Licensed Materials - Property of IBM
# "Restricted Materials of IBM"
#
# Sample program file showing updates for omnibus to allow error
#     events to be sent to EIF probe
#
# (C) Copyright IBM Corp. 2007 All Rights Reserved.
#-------------------------------------------------------------------
#
#
ServerLocation=192.168.10.3
ServerPort=9998
BufferEvents=NO
BufEvtPath=/var/tec_sync_error.cache
BufEvtMaxSize=4096
```

Syntax for postzmsg

- Create a RED color event:
  - postzmsg.exe –f my.conf –r CRITICAL –m contest EventID=101 situation_name="team1" satuation_status="Y" integration_type="U" situation_origin=team1 situation_displayItem='team1' team1 ITM
- Create a GREEN color for clear event:
  - postzmsg.exe –f my.conf –r CRITICAL –m contest EventID=101 situation_name="team1" satuation_status="N" integration_type="U" situation_origin=team1 situation_displayItem='team1' team1 ITM

Access to Omnibus Web GUI





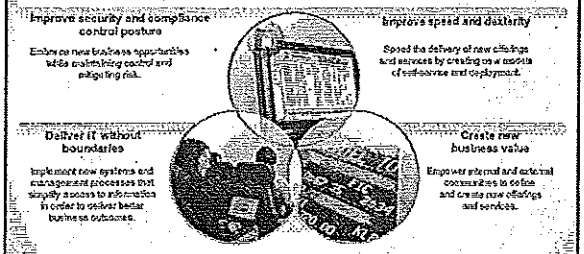
IBM

Rethink IT. Reinvent Business.

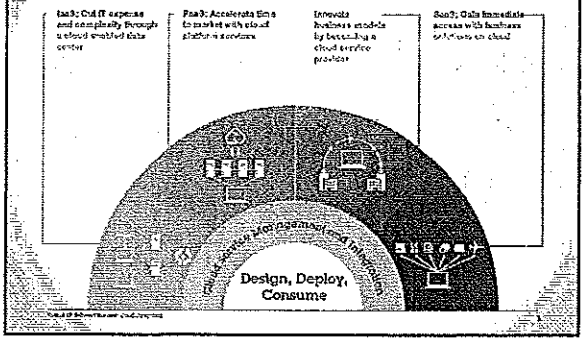
Cloud Computing

Build a low-touch, highly scalable cloud with IBM SmartCloud Provisioning

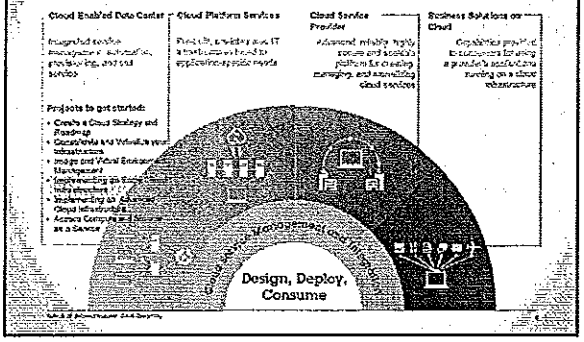
Cloud computing is fundamental to changing the economics of business infrastructures and speeding the delivery of innovative products & services



Adoption patterns are emerging for successfully beginning and progressing cloud initiatives



IBM delivers prescriptive, repeatable cloud solutions for our clients' most pressing priorities.



Build a low-touch, highly scalable cloud with IBM SmartCloud Provisioning

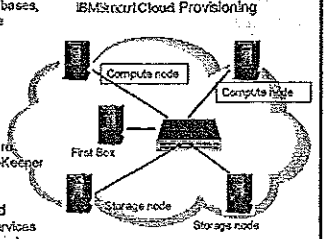
IBM SmartCloud Provisioning is a true Infrastructure-as-a-Service cloud, reducing cost and providing a highly scalable, rapid-deployment environment with near-zero downtime and automated recovery across heterogeneous platforms.

Key benefits:

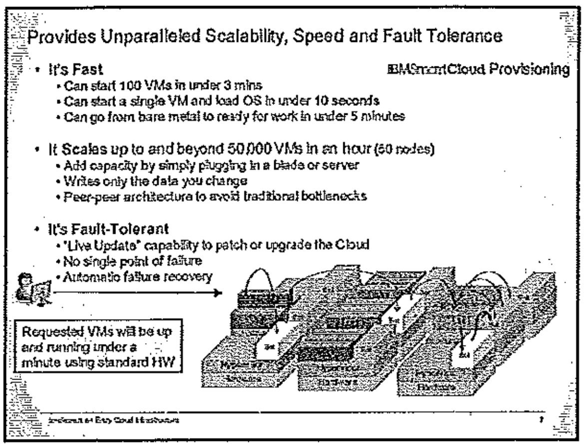
- **Rapid scalable deployment** designed to meet business growth with near-instant deployment of 100s of virtual machines
- **Reliable, non-stop cloud** capable of automatically tolerating and recovering from software and hardware failures
- **Save IT labor resources at scale** by enabling self-service request and highly automated operations
- **Reduce complexity** through ease of use and improve time to value

Quickly Get Started with SmartCloud Provisioning

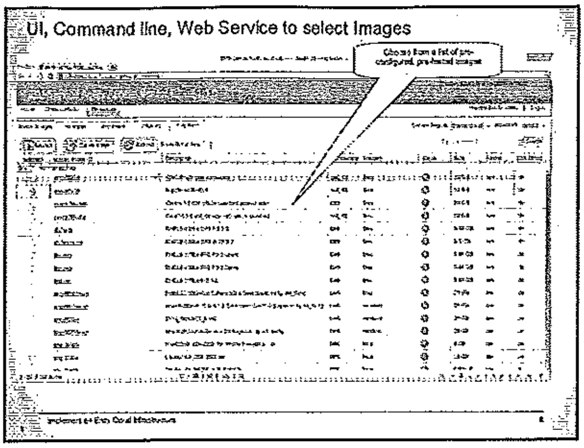
- Quickly stand up a cloud
  - Start small and scale based on need
  - No additional pre-reqs such as databases, app servers, messaging middleware
  - Freedom of choice for hypervisors
    - Avoid expensive vendor lock in
    - VMWare ESX, KVM, Xen
- Highly cost effective solution
  - Requires no additional hypervisor management tools
  - Requires no HA hardware or software
  - Based on Apache Hadoop and ZooKeeper Technology
- Rich set of interfaces into the cloud
  - Web interface, scripting and web services
  - All function can be driven by a user or by scripts for complete automation



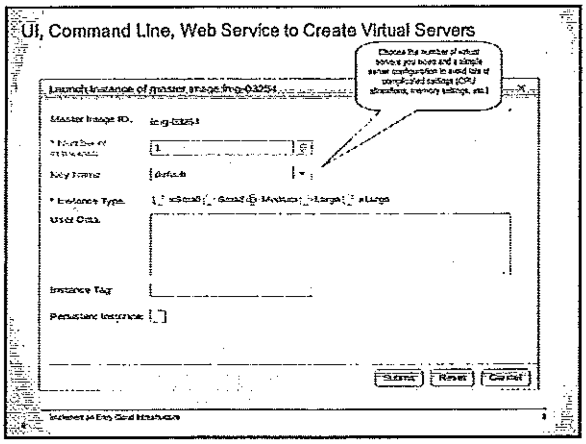
- Out-of-the-box and running in less than 4 hours
- Get started with only 4 servers



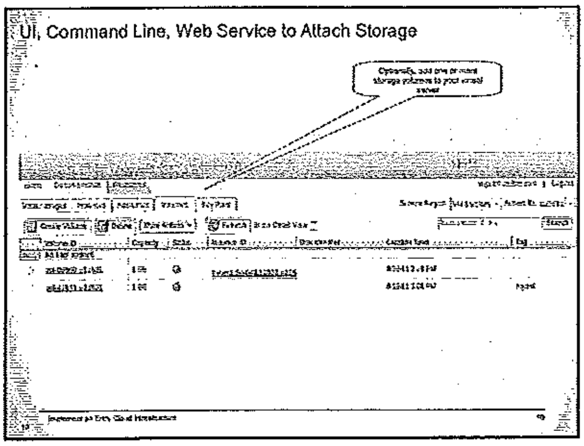
Provides Unparalleled Scalability, Speed and Fault Tolerance
IBM SmartCloud Provisioning
• It's Fast
• Can start 100 VMs in under 3 mins
• Can start a single VM and load OS in under 10 seconds
• Can go from bare metal to ready for work in under 5 minutes
• It Scales up to and beyond 50,000 VMs in an hour (50 nodes)
• Add capacity by simply plugging in a blade or server
• Writes only the data you change
• Peer-peer architecture to avoid traditional bottlenecks
• It's Fault-Tolerant
• "Live Update" capability to patch or upgrade the Cloud
• No single point of failure
• Automatic failure recovery
Requested VMs will be up and running under a minute using standard HW



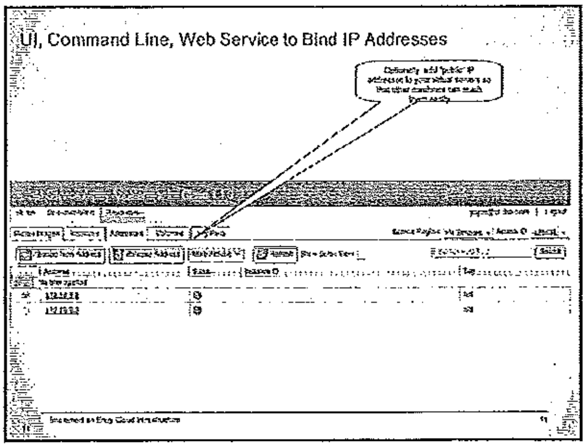
UI, Command line, Web Service to select Images



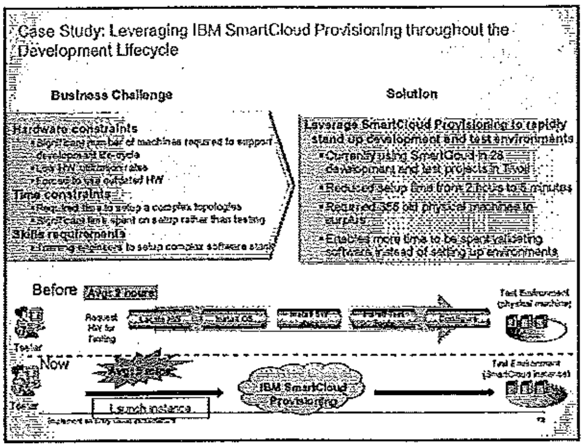
UI, Command Line, Web Service to Create Virtual Servers
User Data
Instance Tag



UI, Command Line, Web Service to Attach Storage



UI, Command Line, Web Service to Bind IP Addresses



Case Study: Leveraging IBM SmartCloud Provisioning throughout the Development Lifecycle
Business Challenge
Hardware constraints
Time constraints
Skills requirements
Solution
Leverage SmartCloud Provisioning to rapidly stand up development and test environments
Before
Now
Tester
IBM SmartCloud Provisioning
Launch instance

IBM Inter-University
Programming Contest 2012

Chapter 2: Tivoli Netcool Omnibus

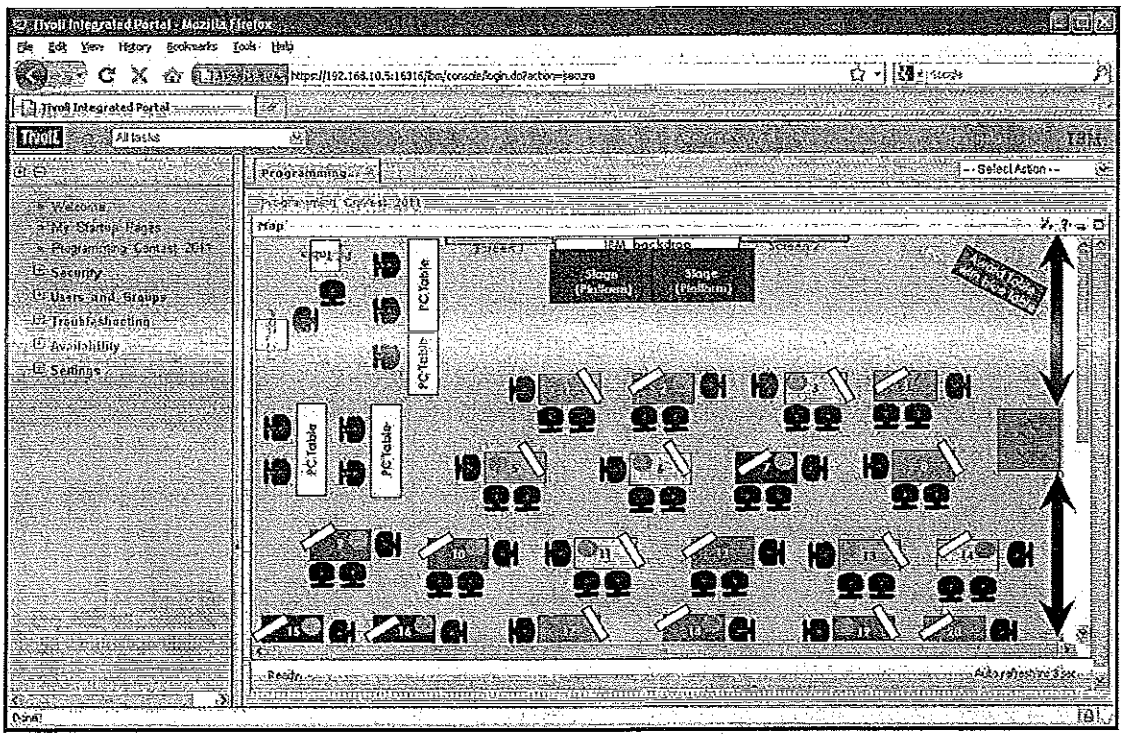
Objectives

In this exercise, we will learn:

- Review server interface of Omnibus
- Review and change Omnibus client scripts
- Observe the reaction of the Omnibus based on client request

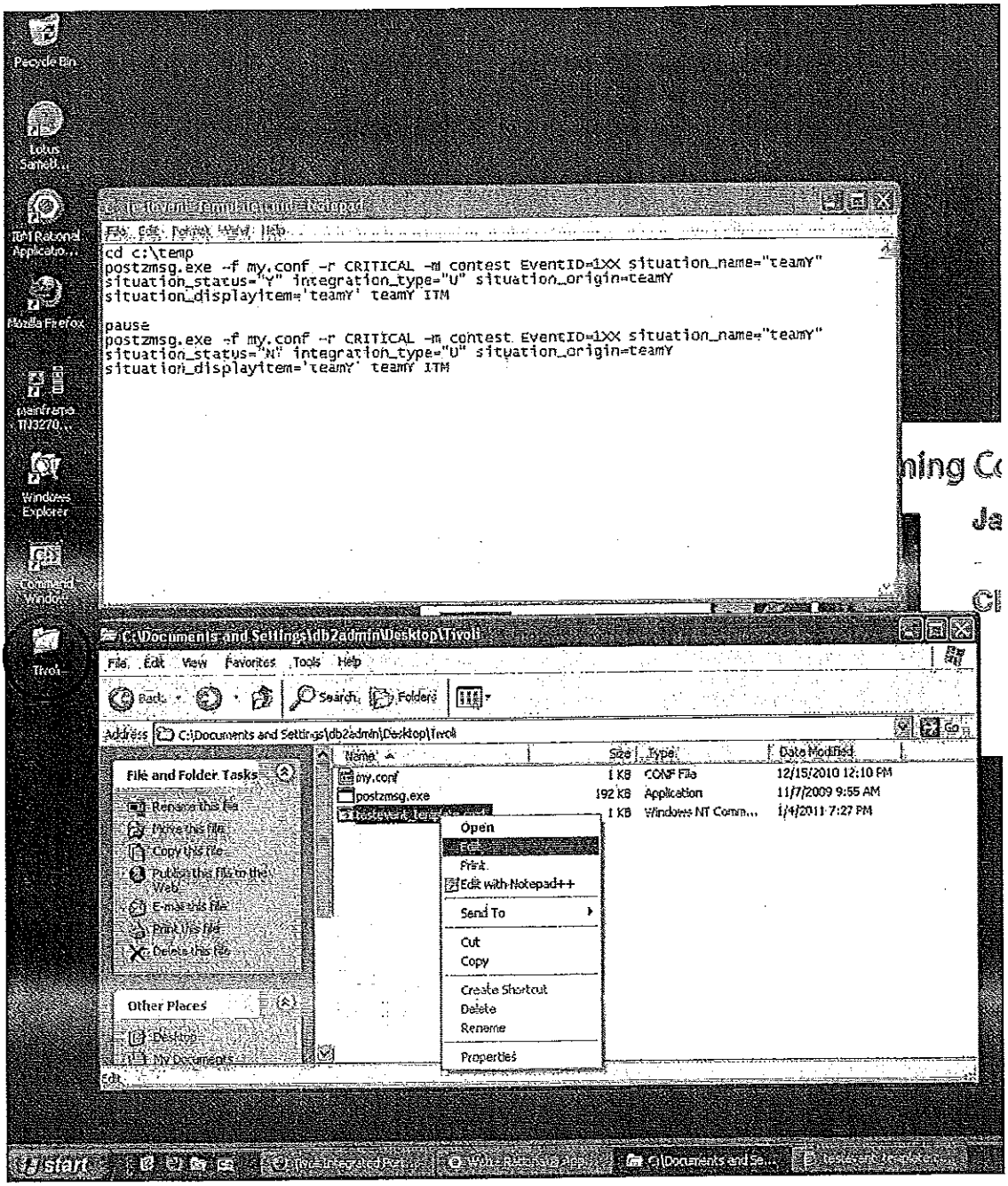
Exercises

1. Review the server interface of the Omnibus server as provided by the instructor



All the traffic lights in the tables are green in color. Now you will write a script to change the color of your table to red and then back to green.

2. Double click the folder "Tivoli" on the desktop, then select the file "testevent_template.cmd" then right clicked it and then press "Edit":



then an editor pops up with the content of the script file displayed in the editor.

3. You can see there are two commands in the script file. The first command is to change the traffic light of team<Y> to red, and the second command is to change the traffic light of team<Y> back to green.

4. Modify the two commands by change Y to your team number, and XX = Y with a prefix 0 if Y is single digit. For example, if Y = 2, then XX = 02. Then the two commands will become:

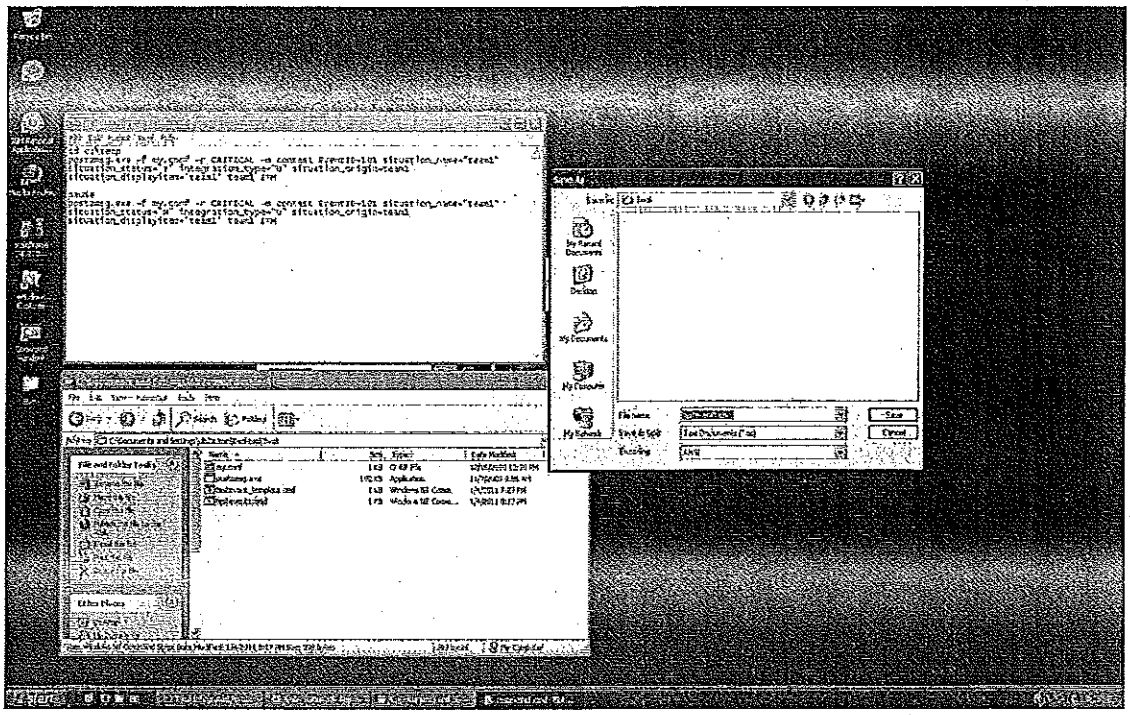
   ```
   postzmsg.exe –f my.conf –r CRITICAL –m contest EventID=101
   situation_name="team1" satuation_status="Y" integration_type="U"
   situation_origin=team1 situation_displayitem='team1' team1 ITM
   ```

   and

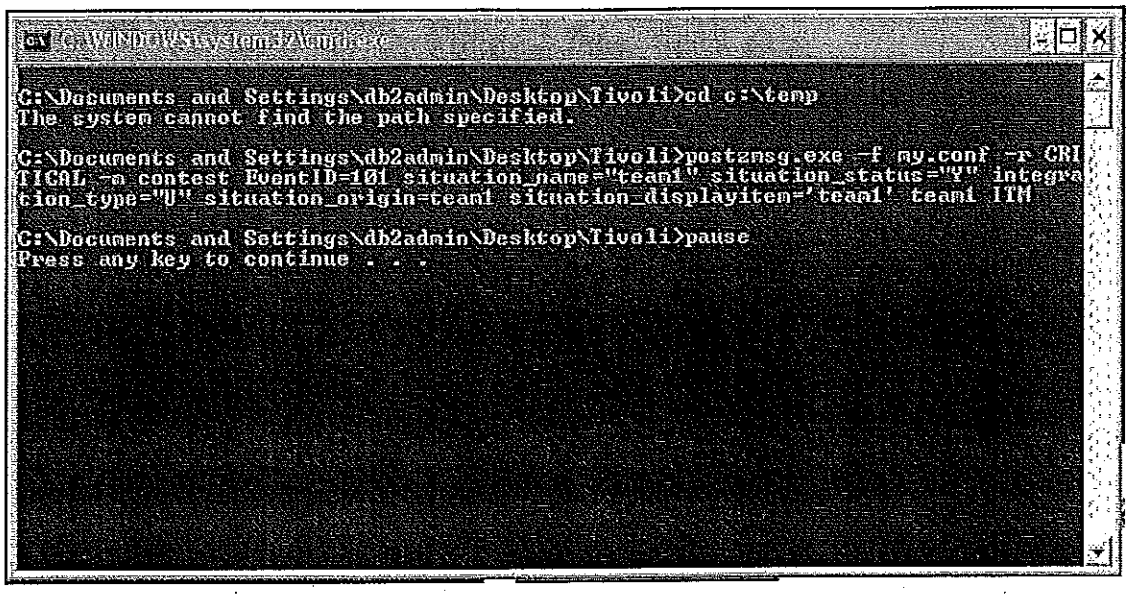
   ```
   postzmsg.exe –f my.conf –r CRITICAL –m contest EventID=101
   situation_name="team1" satuation_status="N" integration_type="U"
   situation_origin=team1 situation_displayitem='team1' team1 ITM
   ```

   respectively.

5. After the two commands are changed, run the command "File"->"Save As" from the editor and give a new name (e.g., testevent1.cmd)::



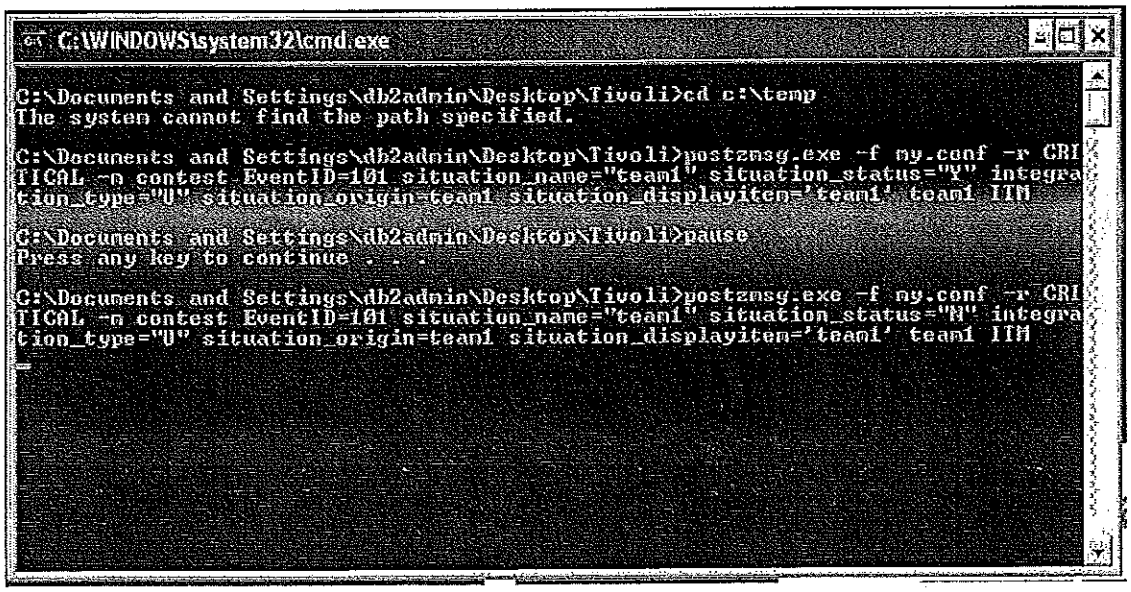
6. Double click the file "testevent1.cmd" to run the script file. You will see the following window:



The first command is run and then it will pause and wait for your input. Don't press any key right now.

7. Look at the Omnibus server screen. Wait until the traffic light of your team changes to red. The screen will be refreshed every 5 seconds.

8. Press enter on the script window. The second command is run now and you will see the following output:



9. Look at the Omnibus server screen. Wait until the traffic light of your team changes back to green. The screen will be refreshed every 5 seconds.

10. This is the end of this exercise.

IBM Software Group Hong Kong
07 Jan 2012

IBM Inter-University Programming Contest 2011 Training

Chapter 3: Application Server

IBM Inter-University
Programming Contest 2012
February 11, 2012 (Saturday)
Ontario, Hong Kong

Agenda

- What is an Application Server?
- JEE Packaging Overview
- Application Server Administration
  - Integrated Solutions Console
  - Application Install
  - Problem Determination
- Application Server Architectural Overview
- Application Server in Cloud Computing
  - Topology Deployment
  - Infrastructure Virtualization
  - Health Management

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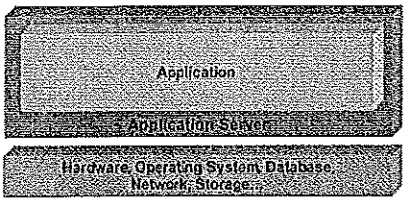
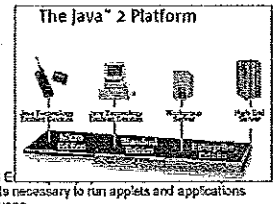
What is an Application Server?

- Provides the infrastructure for running applications that run your business
  - Insulates applications from hardware, operating system, database, network…
  - Provides a common environment and programming model for applications
    - Write once, run anywhere (WORA)
    - Platform for developing and deploying Web Services
  - Provides a scalable, reliable transaction engine for your enterprise



The Java Platforms

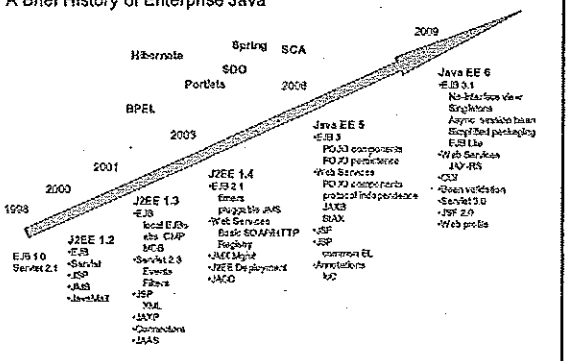
- **Java 2 Micro Edition (J2ME)**
  An optimized Java runtime environment for the consumer space. It covers the range of extremely tiny devices such as smart cards or a pager all the way up to the set-top box.
- **Java 2 Standard Edition (J2SE)**
  A complete environment for applications development on desktops & servers.
  - Java Runtime Environment, Standard E… virtual machine, and other components necessary to run applets and applications written in the Java programming language.
  - Java Software Development Kit, Standard Edition (SDK) - A superset of the JRE that includes tools such as the compilers and debuggers necessary for developing applets and applications.
- **Java Enterprise Edition (JEE) -- formerly J2EE**



Java Enterprise Edition (JEE)

- Built upon J2SE, JEE provides the specifications for developing multi-tier enterprise applications with Java
- Accelerates and simplifies enterprise application development
  - With applications based on standardized, modular components
  - Providing a complete set of services to those components
    - Standard APIs for common services such as database access, transaction management, messaging, etc.
  - Handling many details of application behavior automatically, without complex programming (e.g. transaction management, security)
  - Providing a foundation for the third party component market (e.g. JCA, JMS, JDBC)
- Improves systems and operations management by providing:
  - Packaging, deployment, and management standards for enterprise applications
- Fulfills the promise of true portability
  - Hardware, operating system and vendor

A Brief History of Enterprise Java



JEE and WebSphere Application Server

- Application servers, based on standards, can be perceived as commodities
- WebSphere Application Server (WAS) delivers more value to customers than just standards compliance
  - Quality of service, such as
    - Workload management
    - High availability and failover
    - Performance
  - Tooling support
    - Runtime embedded in Application Developer products
  - Programming model extensions
    - Future standards
    - Customer identified critical functions
  - Foundation for evolving WebSphere Software Platform

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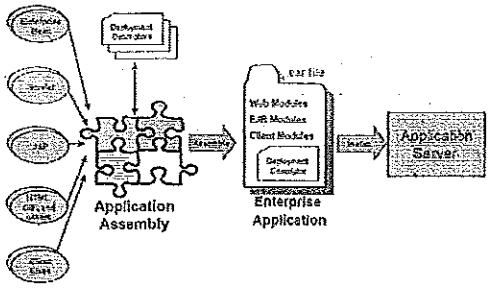
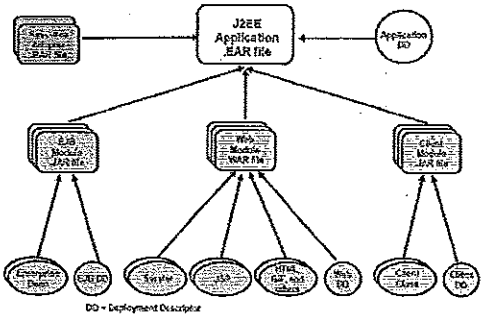
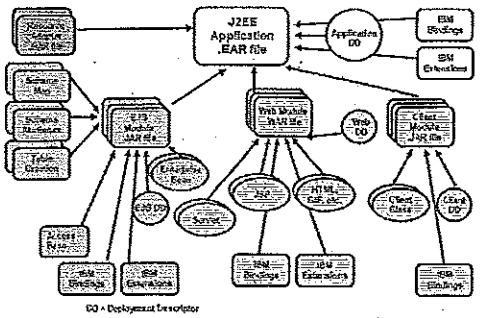
Overview of Application Assembly and Installation



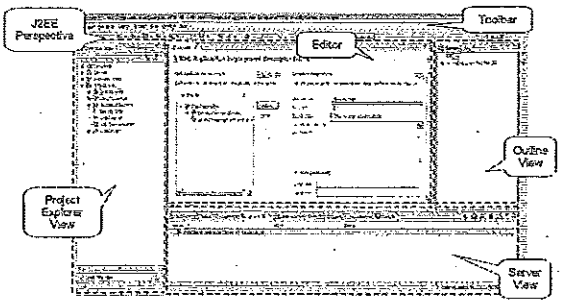
JEE Packaging



WebSphere Application Packaging



The Application Server Toolkit Workbench



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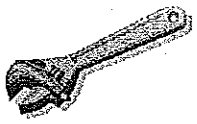
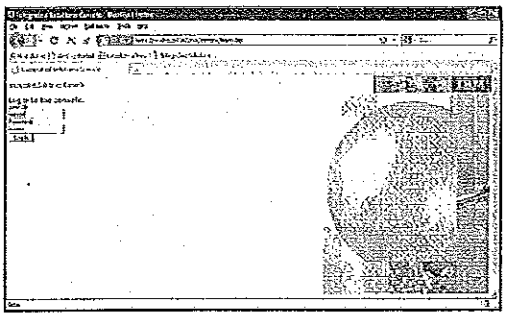
System Administration Tools

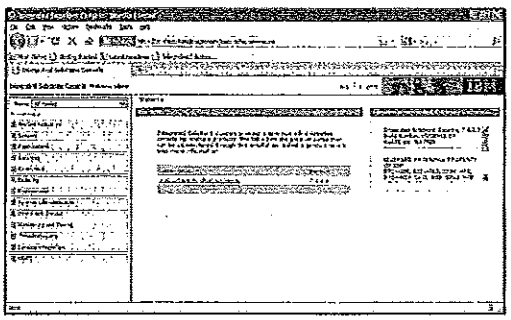
- WebSphere Integrated Solutions Console
  - Browser-based interface
- Command-line operation tools
  - Available in the bin directory.
- wsadmin scripting
  - Interactive and batch modes
  - Supports JACL or Jython scripts
- Ant
  - Java-based build and automation tool
- Java-based JMX APIs
  - Programming interface for custom Java applications



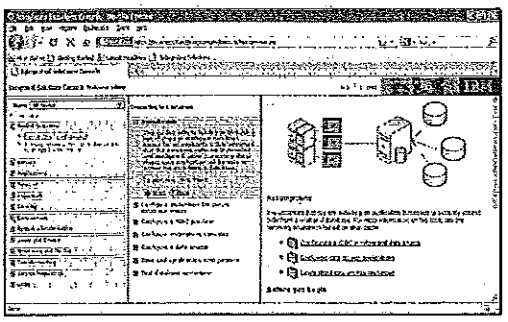
Integrated Solutions Console



Integrated Solutions Console – Welcome Page



Integrated Solutions Console – Cheat Sheet



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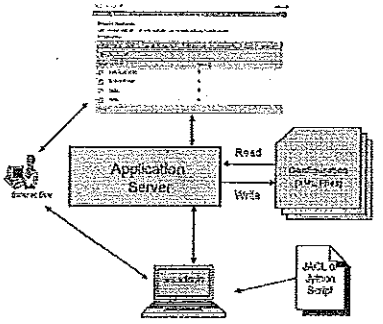
Installing Enterprise Application



Installation Tasks

- Configure the application environment as required
  - Variables, virtual hosts, classpath, security, and so forth
- Configure application resources
  - JDBC provider, DataSources
- Install application

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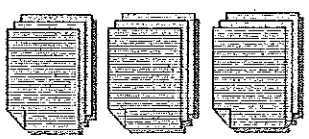
Logging and Tracing

- Message logging (messages) and diagnostic trace (trace) are conceptually similar since they are using the same Java logging API
- They have important differences:
  - A message entry is an informational record that is intended for end users, systems administrators, and support personnel to view. The text of the message must be clear, concise, and interpretable by an end user.
  - A trace entry is an information record that is intended for service engineers or developers to use. As such, a trace record might be considerably more complex, verbose and detailed than a message entry.



Log Files and Locations

- The destination and names for the log files are configurable. The default location is:
  <was_root>\profiles\<profile_name>\logs\<server_name>
- Log Files:
  - **SystemOut.log** and **SystemErr.log** - Standard JVM output and error log
  - **startServer.log** and **stopServer.log**
    - Startup and shutdown of the Application Servers
  - **activity.log** - Events that show a history of installation activities
    - Use Log Analyzer to read output from this file
  - **trace.log** – Output from diagnostic trace
    - Destination and name are configurable
  - **http_plugin.log** – Not in <was_root>
    - Location: <plugin_root>\logs\<webserver_name>

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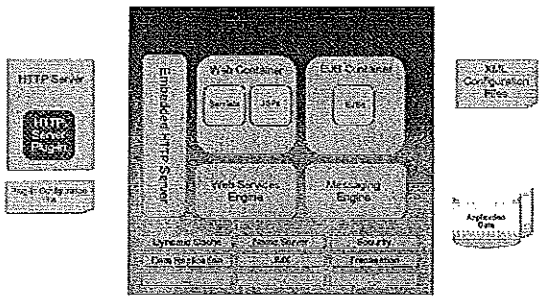
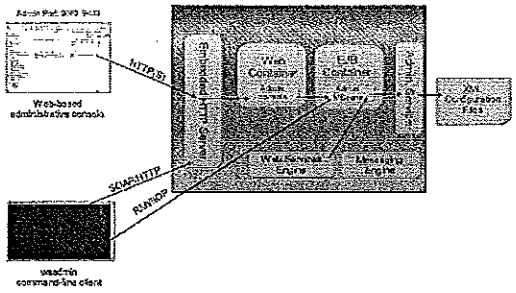
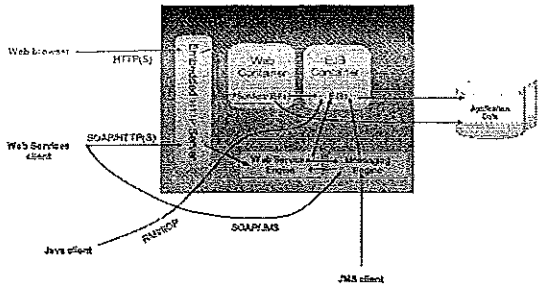
Basic Architecture



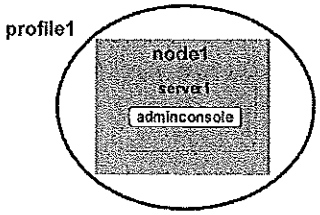
Administering the Server



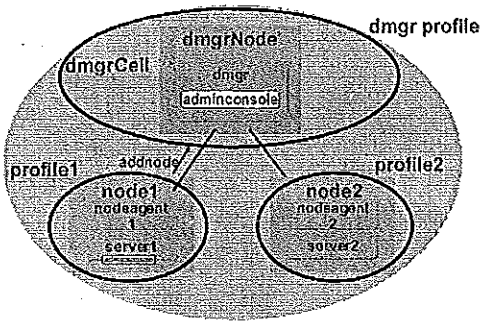
Accessing Server Resources



Application Server – Standalone Solution

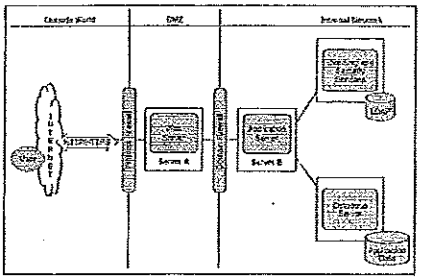


Application Server – Cluster Solution

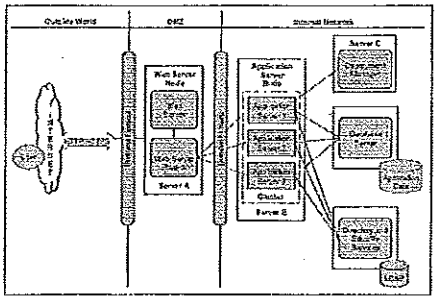


Application Server Base Topology

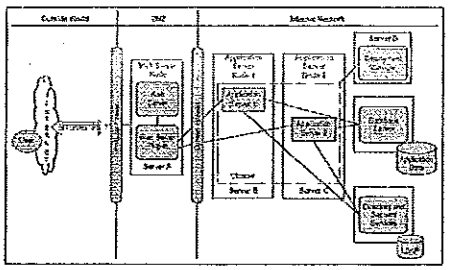
Single machine, single node, web server separated



Application Server Vertical Scaling Topology



Application Server Horizontal Scaling Topology



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- What is an Application Server?
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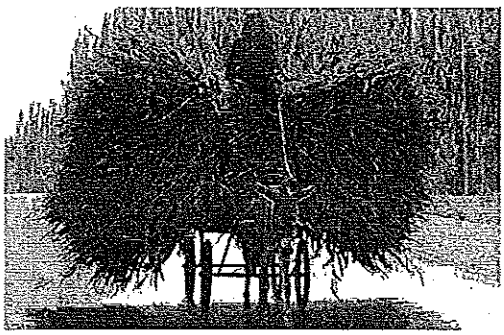

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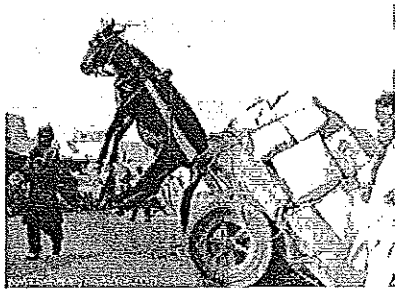
Do you feel like this?



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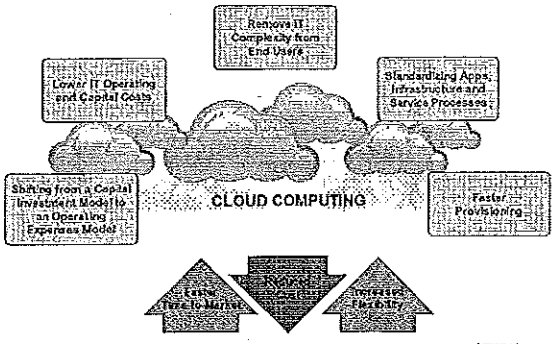
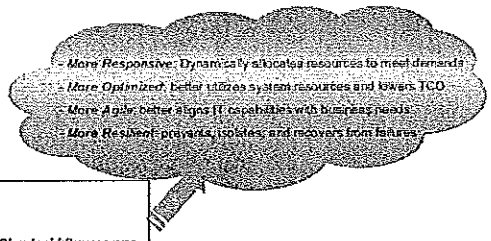
Cloud computing benefits



Characteristics of a Cloud

IBM



Pre-Cloud middleware was..

- ***Scalable***: Add additional resources to meet demands
- ***Available***: Redundancy to avoid outages
- ***Consolidated***: Shared hardware resources

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Topology Deployment Pains

- Customer Pains
  - *Takes too long to create middleware infrastructures*
  - *Manual and error-prone process*

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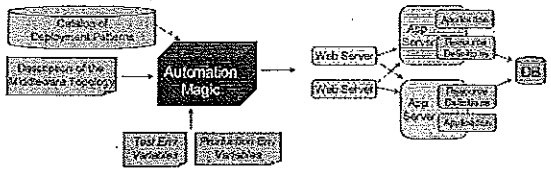
What admin & management efficiencies can be made?

- The average lead time to get a new application environment up and running is 4-6 weeks
  - Approvals, procurement, shipment, HW installation, license procurement, OS installation, application installation, configuration
- 30% of bugs are introduced by inconsistent configurations
  - These bugs are often of the most difficult variety to detect
  - They often emerge when moving between dev/test, QA, production
- Because it's so expensive to set up an environment, there is an incentive to hold onto them even when no longer needed "just in case."
  - Future environments = new hardware, instead of recycling returned hardware, and this takes time and money

Application Configuration & Provisioning Characteristics

IBM

1. *Speed* - build out environments quickly
   - A new application cell should take you minutes, not weeks
2. *Repeatability* - automation to avoid redundancy
   - Your 2nd, 3rd, and Nth environment should be faster to build than your 1st environment
3. *Consistency* - limit the variables across deployments
   - Your configurations should get seamlessly promoted from test -> pre-production -> production



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Middleware Infrastructure Pain

1. Static Middleware Infrastructure
   - Doesn't react well to spikes in demand
   - Resources are under-utilized
   - Not well-aligned with the business

   The infrastructure should manage provisioning application and middleware resources to achieve some stated business level objectives

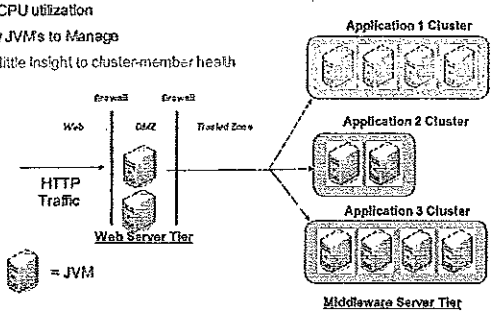
2. Fragile Middleware Infrastructure
   - System can't detect that a failure will probably occur
   - Failures aren't isolated, and impact more than it should

   The infrastructure should monitor and react to conditions that affect the "health" of the cluster-member JVM's

Traditional Middleware Architecture

IBM

-Application clusters are statically defined
-Low CPU utilization
-Many JVM's to Manage
-Very little insight to cluster-member health



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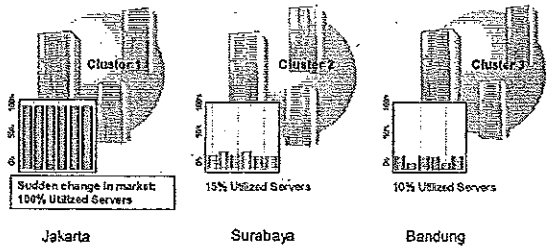
Static clustered environment without IBM Smart Cloud



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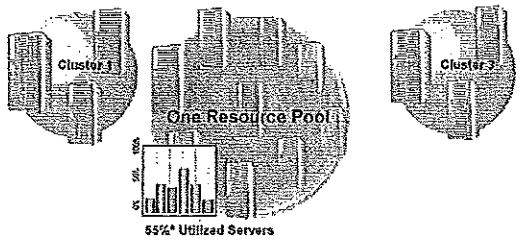
IBM Smart Cloud provides application infrastructure virtualization capabilities to maximize application server utilization



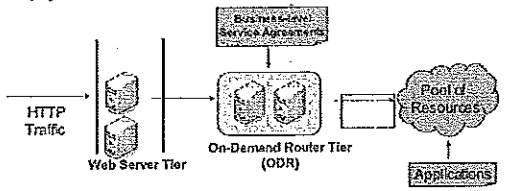
* Hypothetical, for illustrative purposes

Policy-based Management

IBM

-ODR is responsible for:

- -starting/stopping JVM's to meet demand
- -Ensuring higher priority applications/users/etc are serviced first (via flow control)
- -Administrators describe requirements (min/max application instances, etc) through policies
- -Resource-driven load-balancing within clusters
- -Keeping track of application/user/etc resource usage (for chargeback)

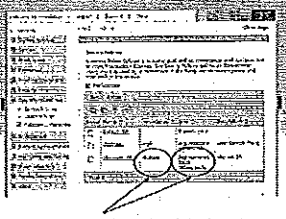


Application Prioritization: Doing What's Important to You

IBM

IBM Smart Cloud easily allows an administrator to specify the relative importance of applications; IBM Smart Cloud then manages to it

- Service policies are used to define application service level goals
- Allow workloads to be classified, prioritized and intelligently routed
- Enables application performance monitoring
- Resource adjustments are made if needed to consistently achieve service policies



Service Policies define the relative importance and response time goals of application services; defined in terms the end user result the customer wishes to achieve

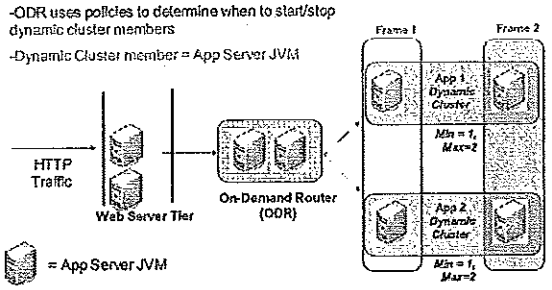
Optimizing the Pool of Resources with Dynamic Clusters

IBM

-Applications are installed to a *Dynamic Cluster*

-ODR uses policies to determine when to start/stop dynamic cluster members

-Dynamic Cluster member = App Server JVM

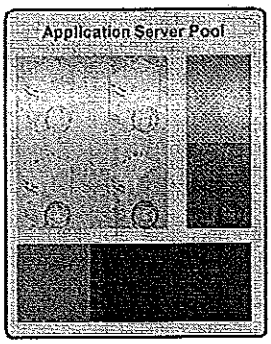


IBM

Ensures SLAs are met

Application Name	Priority	Avg. CPU Utilization
Jakarta	High	10%
Surabaya	Medium	25%
Bandung	Low	30%

Hypothetical scenario #1:
Interest rates DROP in JKT



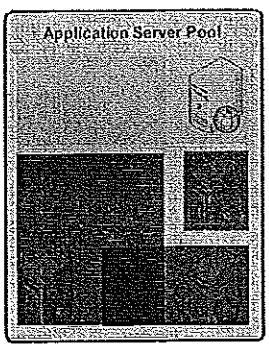
* Hypothetical, for illustrative purposes

IBM

Ensures SLAs are met

Application Name	Priority	Avg. CPU Utilization
Jakarta	High	10%
Surabaya	Medium	15%
Bandung	Low	5%

Hypothetical scenario #2:
Jobs increase 20% in SUB



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IBM

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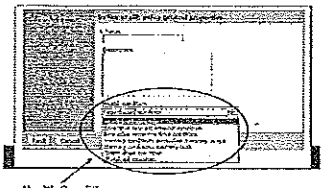
Health Management – Health Policies

Helps mitigate common health problems before production outages occur

- Health policies can be defined for common server health conditions
- Health conditions are monitored and corrective actions taken automatically
  - Notify administrator
  - Capture diagnostics
  - Restart server
- Application server restarts are done in a way that prevent outages and service policy violations



Health Conditions

- Age-based: *amount of time server has been running*
- Excessive requests: *% of timed out requests*
- Excessive response time: *average response time*
- Excessive memory: *% of maximum JVM heap size*
- Memory leak: *JVM heap size after garbage collection*
- Storm drain: *significant drop in response time*
- Workload: *total number of requests*

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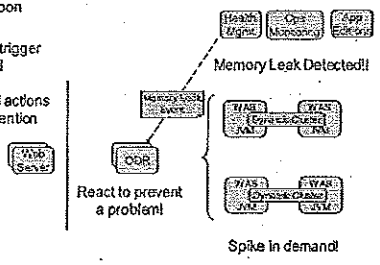
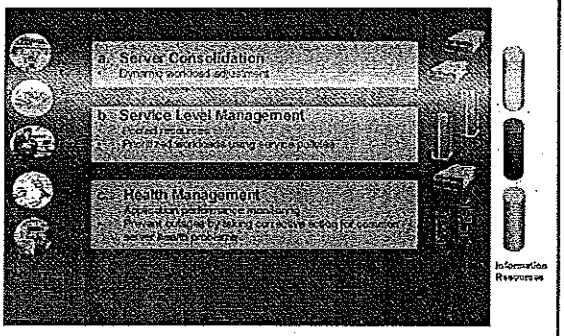
IBM Smart Cloud- Some examples

- A memory leak in the JVM could be detected and reacted upon
- A spike in demand could trigger additional JVM's be started
- Decisions can made, and actions taken without Admin Intervention



IBM Smart Cloud Key Capabilities

IBM



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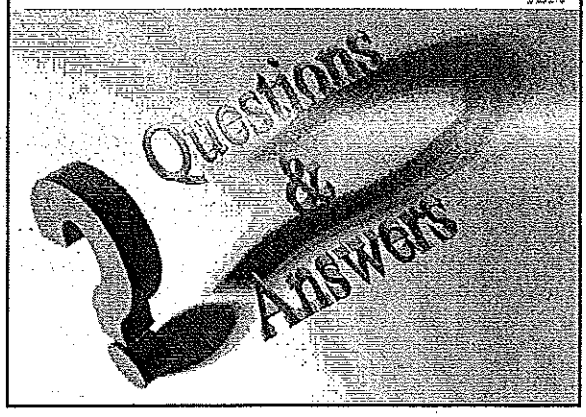


IBM Software Group Hong Kong
07 Jan 2012

IBM Inter-University Programming Contest 2012 Training

Chapter : Software Analysis with IBM Rational Application Developer

IBM Inter-University
Programming Contest 2012
February 11, 2012 (Saturday)
Cityone, Hong Kong

Agenda

- Introduction to Integrated Development Environment (IDE)
- Introduction to Static Analysis
- Real World Static Analysis Examples
- Lab

What is Integrated Development Environment (IDE) ?

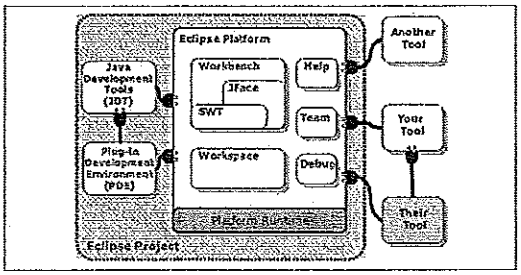
- An integrated development environment (IDE) also known as integrated design environment or integrated debugging environment is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of:
  - Source code editor
  - Compiler and/or an interpreter
  - Code visualisation tool
  - Build automation tools
  - Debugger or Profiler
  - Version Control tool or adaptor
  - Runtime test environment integration

Eclipse (Open Source) IDE
www.eclipse.org (free to download)

- Multi-language software development environment comprising an IDE and a plug-in system to extend it. It is written primarily in Java and can be used to develop applications in Java and, by means of the various plug-ins, in other languages as well, including C, C++, COBOL, Python, Perl, PHP, and others. The IDE is often called Eclipse ADT for Ada, Eclipse CDT for C, Eclipse JDT for Java and Eclipse PDT for PHP.

Release	Date	Platform version
Eclipse 3.0	28 June 2004	3.0
Eclipse 3.1	28 June 2005	3.1
Callisto	30 June 2006	3.2
Europa	29 June 2007	3.3
Ganymede	25 June 2008	3.4
Galileo	24 June 2009	3.5
Helios	23 June 2010	3.6

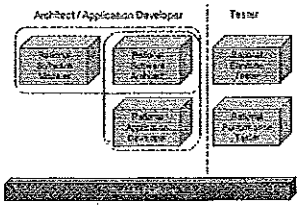
Eclipse Architecture



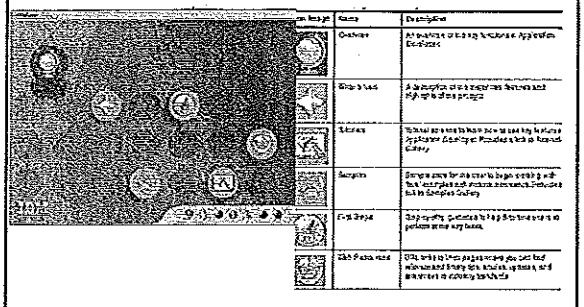
Commercial Tool: IBM Rational Application Developer

IBM Rational Application Developer for WebSphere Software (RAD) is an integrated development environment (IDE) that extends Eclipse,for:

- Visually designing,
- Constructing,
- Testing, and deploying Web application, web services, portals, and
- Java Enterprise Edition (JEE) applications.

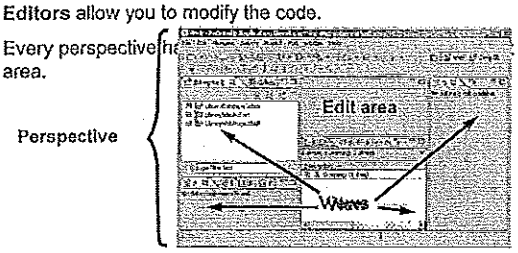


Workbench basic



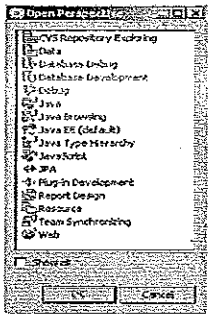
Perspectives, views, and editors

- A **perspective** is a collection of views, toolbar icons, and menus, grouped to accomplish a specific type of work.
- A **view** supports editors and presents information differently.
- **Editors** allow you to modify the code.
- Every perspective has an edit area.



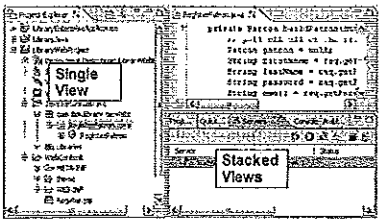
Perspectives

- A perspective defines the initial set and layout of views in the Workbench window.
- Each perspective provides functionality aimed at accomplishing a specific type of task, or works with specific types of resources.
- Perspectives control what appears in certain menus and toolbars.
  - They define visible action sets, which you can change to customize a perspective.



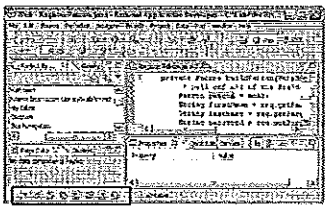
Views

- There are two states for views
  - Single
    - There are no other views at that position in the perspective
  - Stacked
    - There are other available views, represented by tabs at the top of the view pane



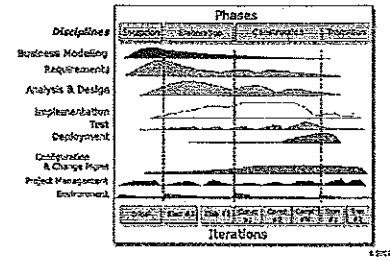
Fast views

- You can quickly open and close fast views.
  - This functionality is available via the fast view bar
- There are two ways to create a fast view:
  - Drag a view onto the shortcut bar
  - Right-click the view icon and choose Fast View
- To restore a fast view, right-click the icon in the shortcut bar, and clear the Fast View option.



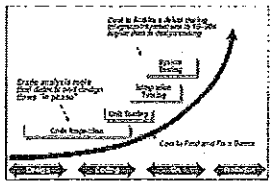
Rational Unified Process (RUP) Project Lifecycle

- A typical software development process consists of the following phases and disciplines
  - Each phase is broken into iterations



The high cost of fixing defects

- A single defect can cost between $12-18K.
- Thousands of potential defects in a large piece of software can cost between $600K-$2.7M.

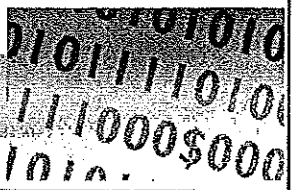


A real-world example: Ford recall

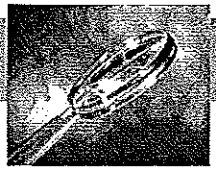
- A two-year investigation determined that the problem was system-related.
- Pain includes:
  - –costs of the recall itself
  - –bad PR
  - –customer satisfaction
  - –potential safety lawsuits
- Potential cost to manufacturer of **$54 million dollars.**

Mechanisms for identifying defects early in the lifecycle

- Agile Process – Test Driven Development



- Peer Code Review

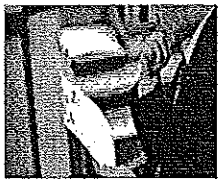


Agile Process - Test Driven Development

- A technique involving short iterations, where:
  - –New test cases covering new functionality are written first.
  - –Next, the production code necessary to pass tests is implemented.
  - –Finally, the software is refactored to accommodate changes.

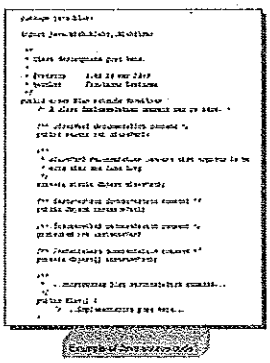
Peer code review

- A systematic examination of source code by human experts.
  - –Intended to find and fix mistakes overlooked in the initial development phase.
  - –Improves both the overall quality of software and the developers' skills.



Adherence to coding guidelines

- **Coding guidelines** are important for a number of reasons:
  - –80% of the lifetime cost of a piece of software goes to maintenance.
  - –Hardly any software is maintained for its whole life by the original author.
  - –Adhering to coding guidelines improves the readability of the software, allowing engineers to understand new code more quickly and thoroughly.



The static analysis tool

- Processes such as agile development and peer code review are not enough.
- More and more, we need the assistance of automated analysis tools such as **IBM Rational Application Developer** that can ensure adherence to coding guidelines.
- The best time to find problems is to review the source code as it is written.

Note that static analysis is simply another tool to improve code quality. It is *not* a complete replacement for manual code reviews.

What is static analysis?

- **Static analysis** is the study of source and/or binary code that is not currently executing.
- Static analysis can:
  - Ensure that the source adheres to a predefined coding standard.
  - Detect common performance problems.
  - Understand the dependencies of the imports of each class.

Static analysis vs. runtime analysis

- **Static analysis**
  - The study of source and/or binary code that is not currently executing
  - Examines architectural elements of software to find problems relating to dependencies in code (What is the impact of changing a class?)
  - Examines the complexity of code (Are there too many paths through the code?)
  - Simulates data movement through a system testing for data security problems (does the password get passed outside the system?)
- **Runtime analysis**
  - Understanding software component behavior by using data collected during the execution of the component
  - Provides information about how the developed component – or the whole application – behaves when it runs
  - Provides explanations for various exposed or potential misbehaviors

Categories of static analysis – Code Review

- Performs automated code parsing
  - Each source file is loaded and passed through a **parser** that looks for particular code patterns violating a set of established rules.
    - In some languages like C++, rules are built into the compiler or available in external programs like Lint.
    - In other languages like Java, the compiler does little in the way of automated code review.
- Code Review is a good tool to:
  - Enforce coding standards
  - Find basic performance problems
  - Find possible API abuse.

Categories of static analysis – Code Dependency

- Does not examine the format of individual source files.
- Examines the **relationships between** source files (typically classes) to build a map of the overall architecture of a program.
- Commonly used to discover known design patterns (good) or common anti-patterns (bad) in code.

Categories of static analysis – Code Complexity

- Analyzes the program code and compares it to established software metrics
  - Determines if it is unnecessarily complex.
- If a particular piece of code exceeds a given threshold, it can be flagged as a candidate for **refactoring** to help improve maintainability.

Categories of static analysis – Trending

- Trend analysis does not use code artifacts directly.
- It is the study of improvements/degradations in code quality based on other forms of analysis.
  - Analyzing the results of analysis.
- Results generated by trend analysis typically appeal to managers and executives.
  - They make a statement about the direction of quality improvements, answering the question "Is the code getting better or worse?

Real-world Example in Java #1

- Rule: "Always surround if and loop statements with curly braces"

```
if( condition )
     methodCall();
     anotherMethodCall();
```

- What was the developer's intended behavior?
- Is this a real bug?

Real-world example in Java #1 Solution

- Both method calls should have been called when the "if" was true

```
if( condition ) {
     methodCall();
     anotherMethodCall();
}
```

- This was a real bug!

Real-world example in Java #2

- Rule: "Avoid returning null instead of iterator"

```
public Iterator myMethod() {
     List list = getList();
     if( trueCondition ) {
          return list.iterator();
     }
     return null;
}
```

- What's wrong with this?

Real-world example in Java #2

- Inline usage of myMethod()

```
for( Iterator it = myMethod(); it.hasNext(); ) {
     // Do something
}
```

- Under the right conditions myMethod() can return null resulting in NPE
- This is particularly bad because "the right condition" may not happen until a customer executes the code.

Real-world example in Java #2 Solution

- Modify myMethod()

```
public Iterator myMethod() {
     List list = getList();
     if( trueCondition ) {
          return list.iterator();
     }
     return new ArrayList(0).iterator();
}
```

IBM

Real-world example in Java #3

- Rule: "Avoid multiple invocations of the same method"

```
public static void satisfy( List fullList, IRuleFilter filter ) {
    for( Iterator it = fullList.iterator(); it.hasNext(); ) {
        ASTNode node = (ASTNode)it.next();

        boolean satisfied = filter.satisfies( node );
        if (!filter.isSuccessful()
              || ((filter.isInclusive() && !satisfied)
              || (!filter.isInclusive() && satisfied))) {
            it.remove();
        }
    }
}
```

- Why does filter.isInclusive() get called twice?

IBM

Real-world example in Java #3 Solution

- Sometimes a seemingly harmless call is expensive
- Add a temporary variable

```
public static void satisfy( List fullList, IRuleFilter filter ) {
    boolean inclusive = filter.isInclusive();
    for( Iterator it = fullList.iterator(); it.hasNext(); ) {
        ASTNode node = (ASTNode)it.next();

        boolean satisfied = filter.satisfies( node );
        if (!filter.isSuccessful()
              || ((inclusive && !satisfied)
              || (!inclusive && satisfied))) {
            it.remove();
        }
    }
}
```


IBM

Real-world example in Java #4

- Rule: "Consider using HashSet instead of List"

```
List employees = new ArrayList();
...
if (!employees.contains(emp)) {
   employees.add(emp);
}
```

- What is wrong with this code?

IBM

Real-world example in Java #4 Solution

- Sets assure uniqueness without requiring programmers to check for duplicates

```
Set employees = new HashSet();
...
employees.add(emp);
...
```

- Better performance since it does not require searching through the entire collection
- If order is important use a LinkedHashSet

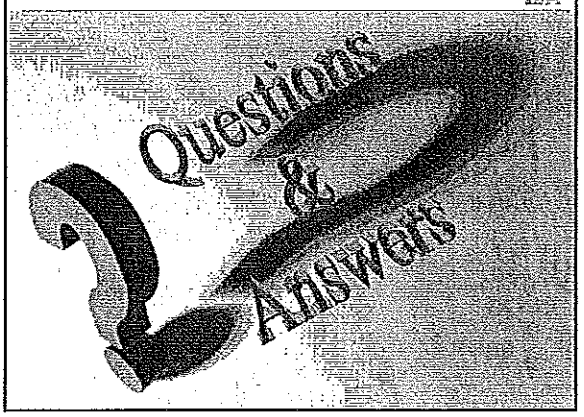
Lab Overview

IBM

- Create Rule for Analysis
- Configuration of Analysis
- Analysis the project

Enjoy your lab !

IBM



IBM Inter-University
Programming Contest 2012

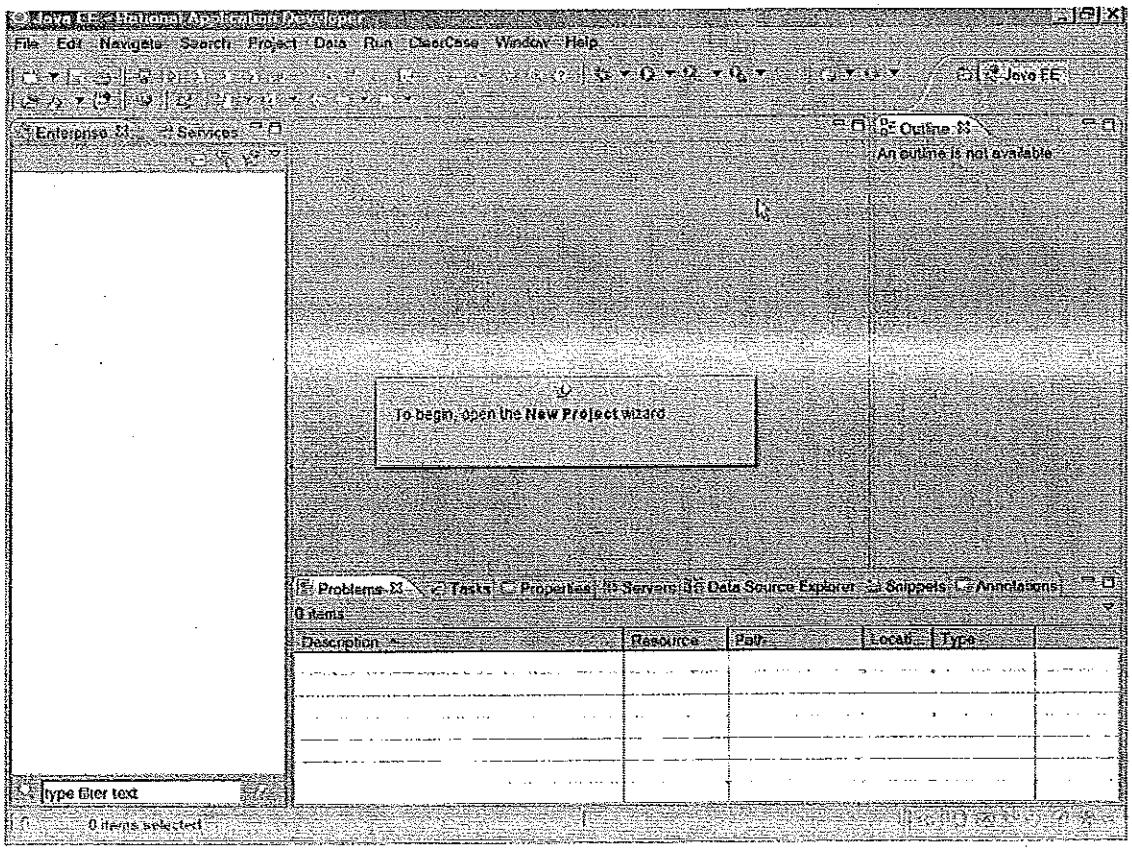
Chapter 4: Rational Application Developer

Objectives

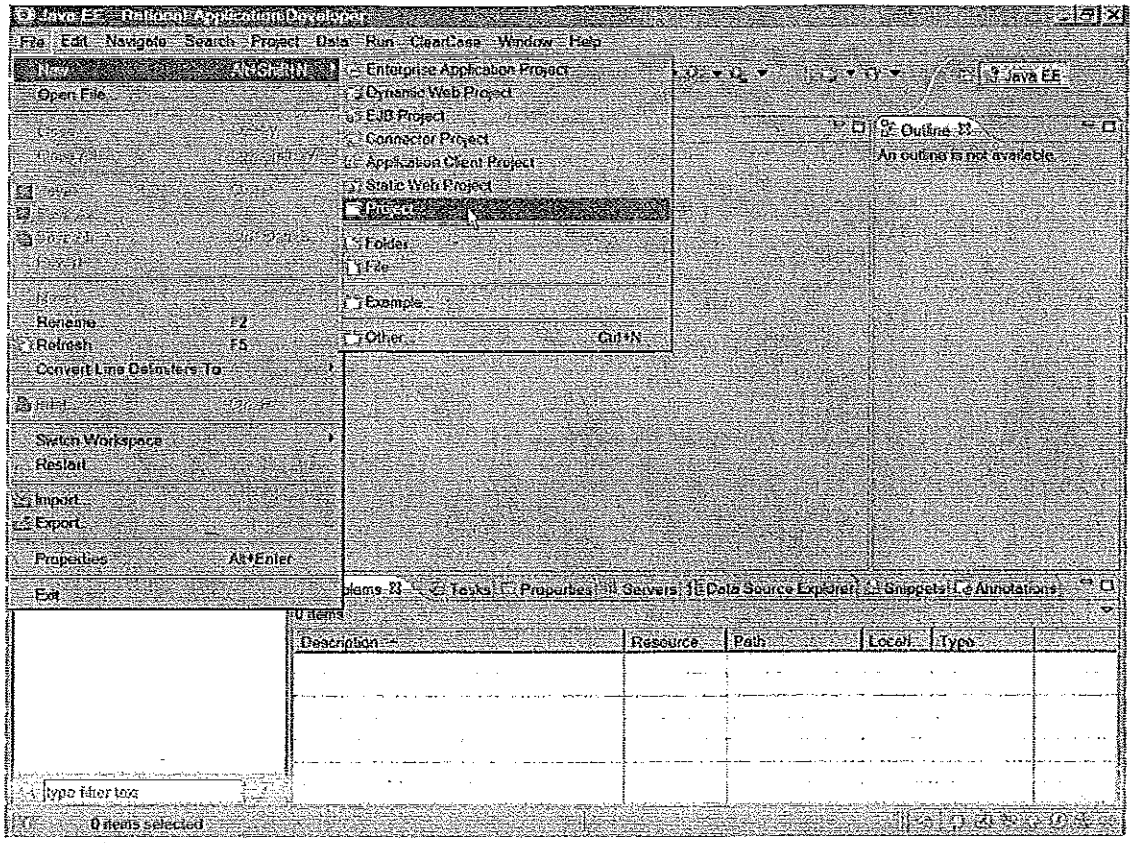
In this exercise, we will learn:

- Create Java source files
- Run a Java program on a server
- Debug a Java program

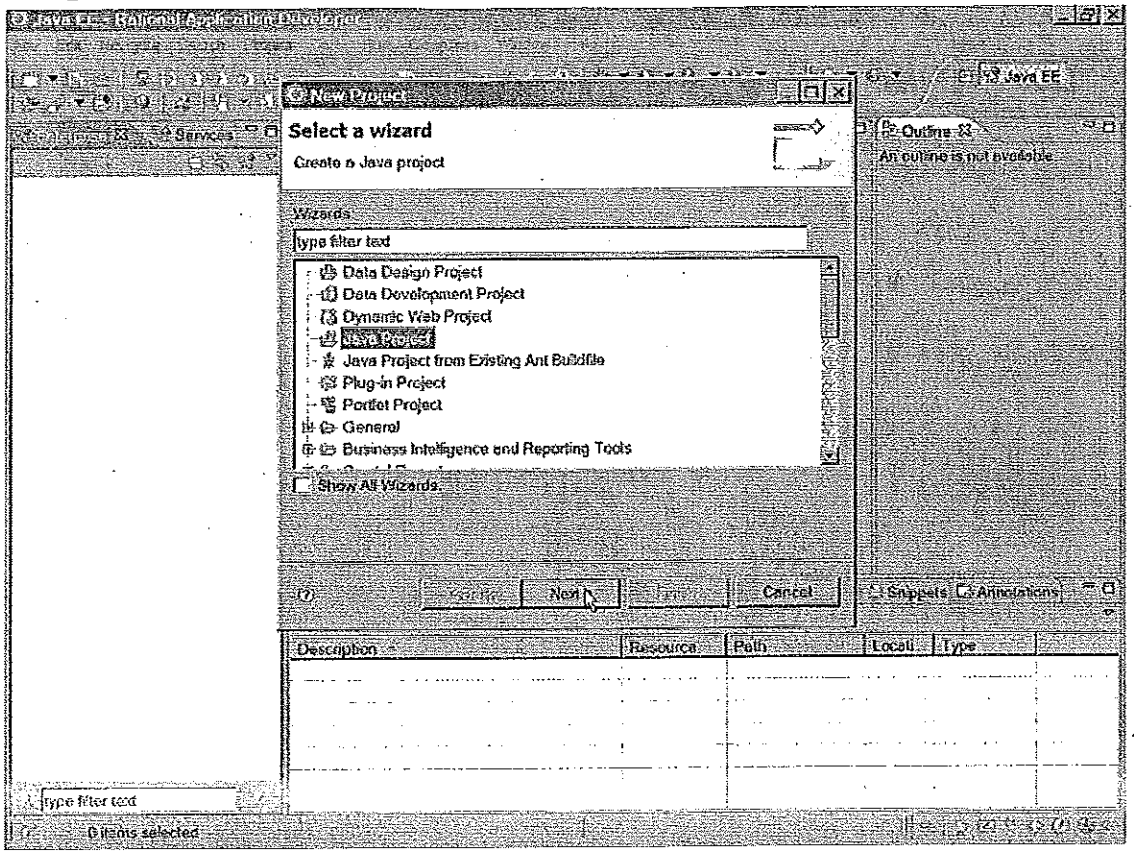
Exercises



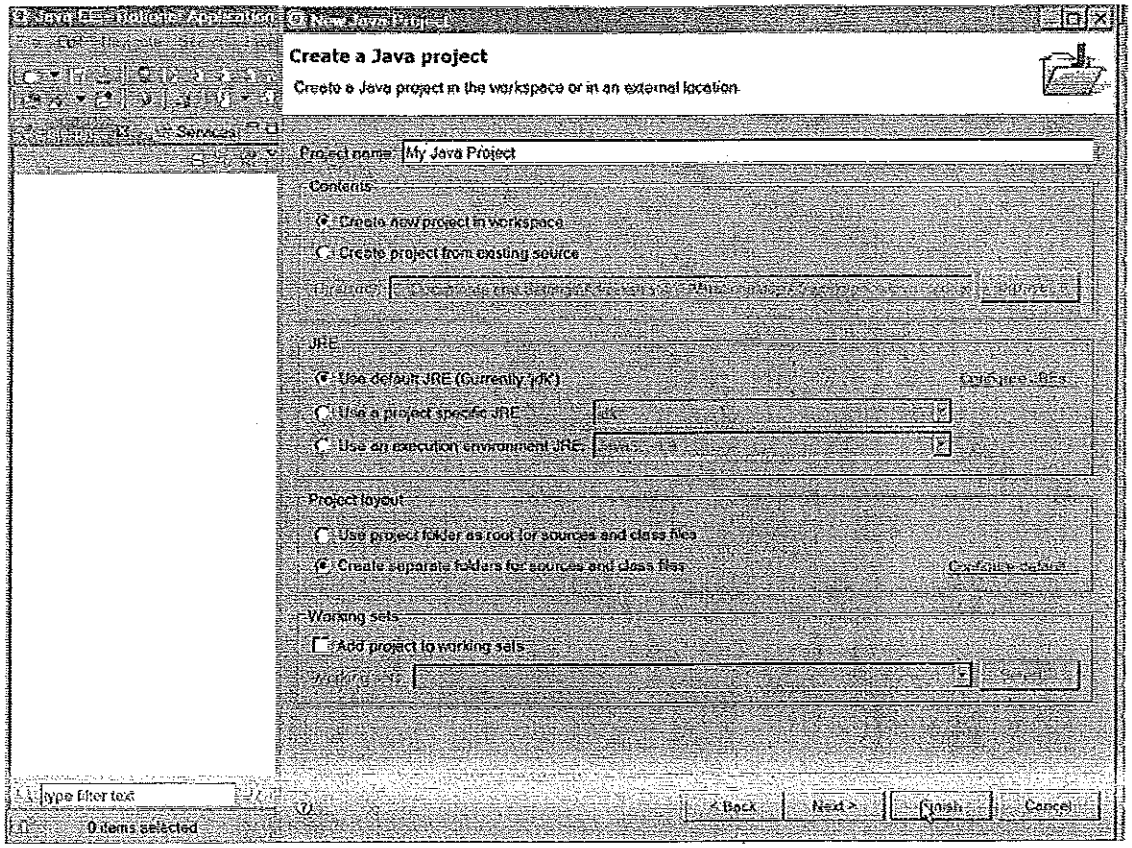
1) open new project wizard



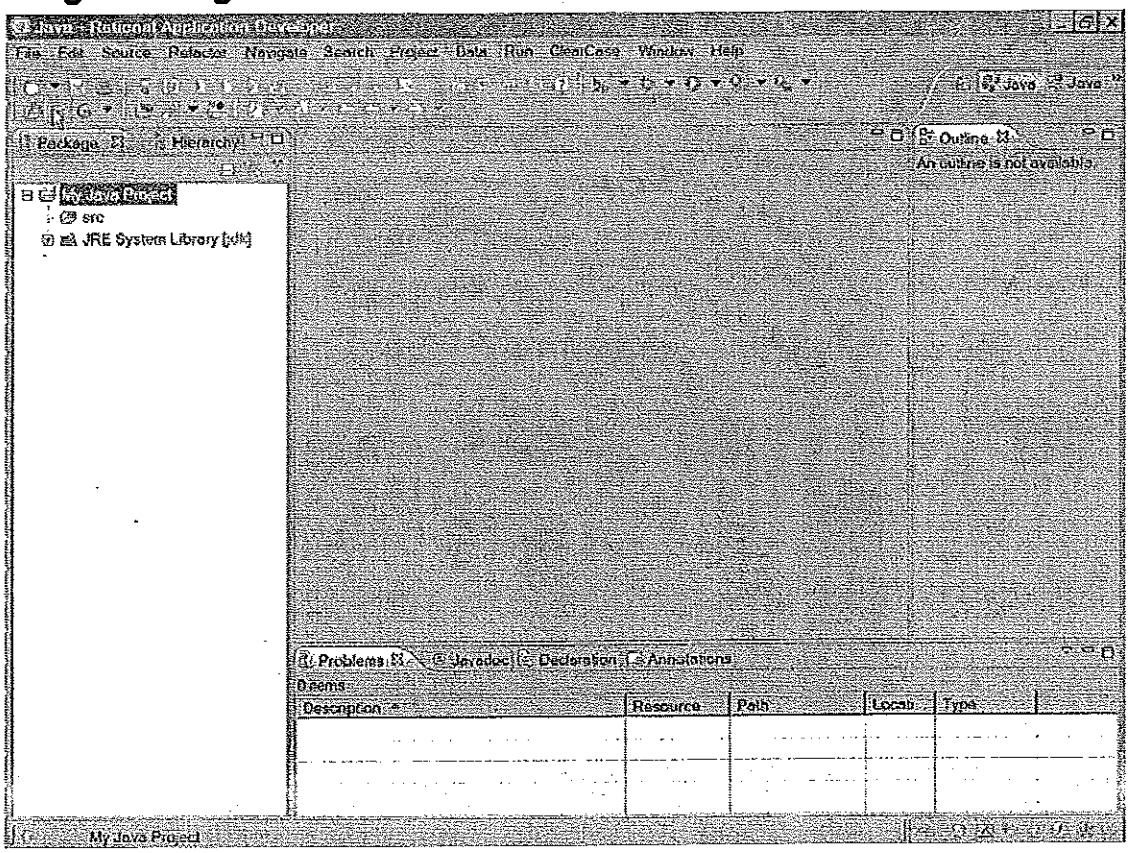
2) Click Project...



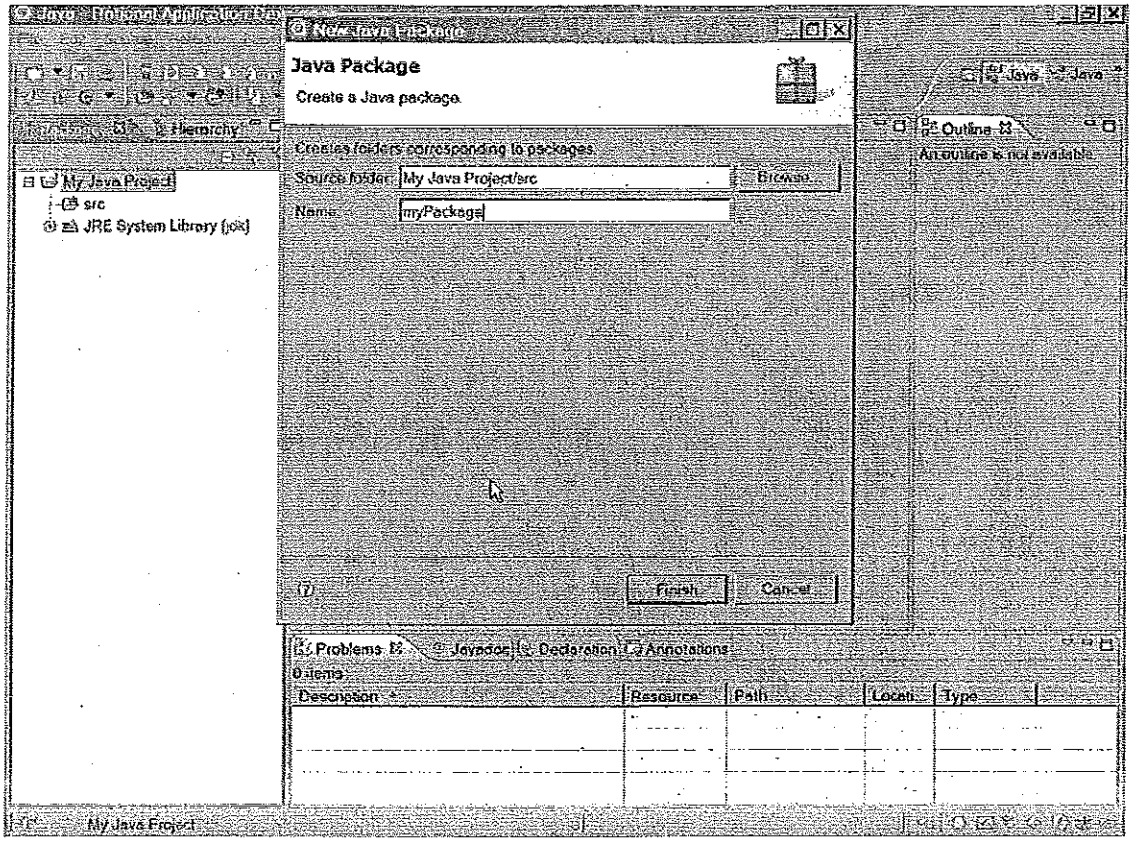
3) Select Java Project



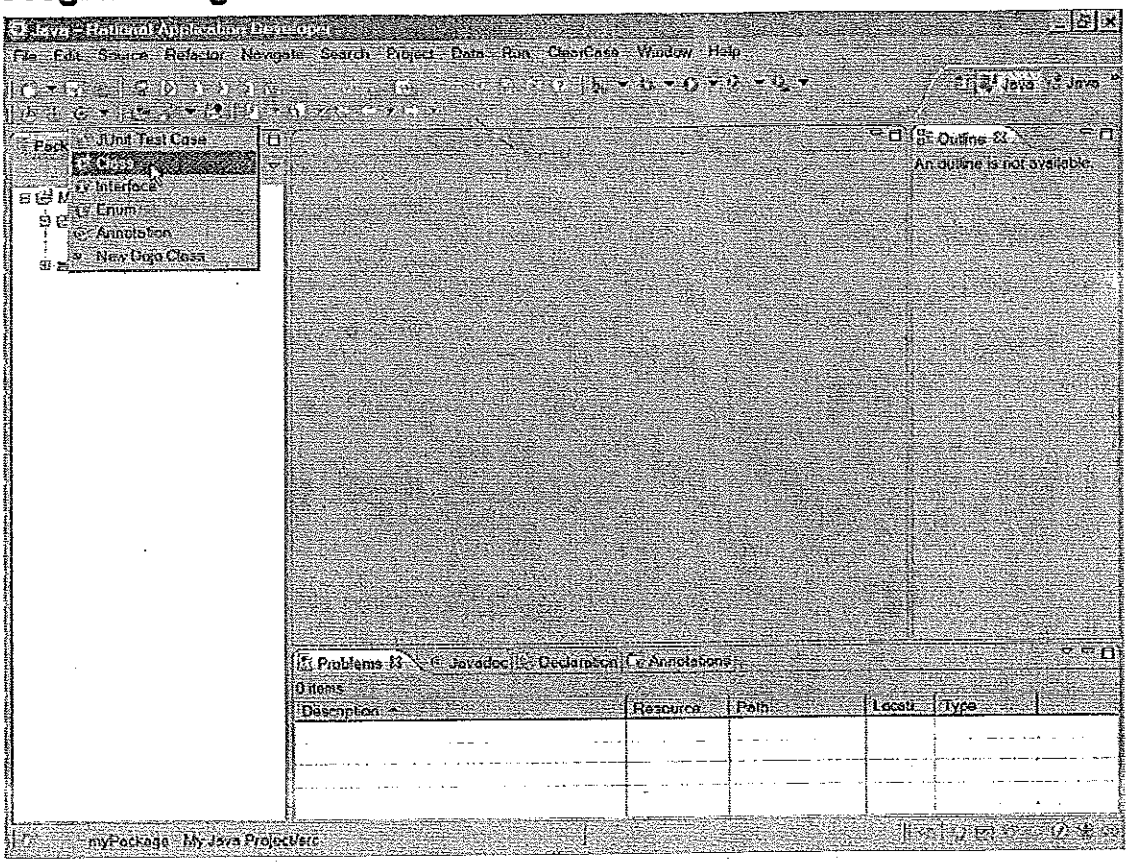
4) edit Project Name



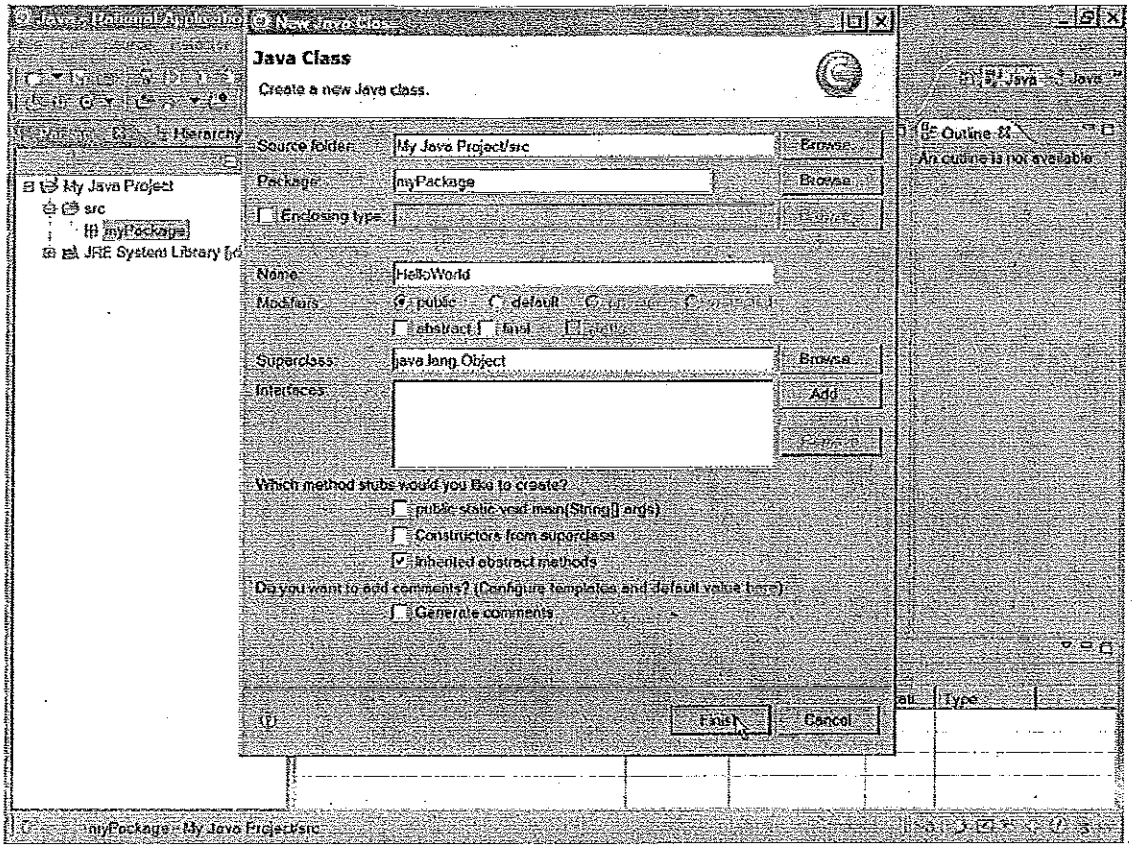
5) Click New Package



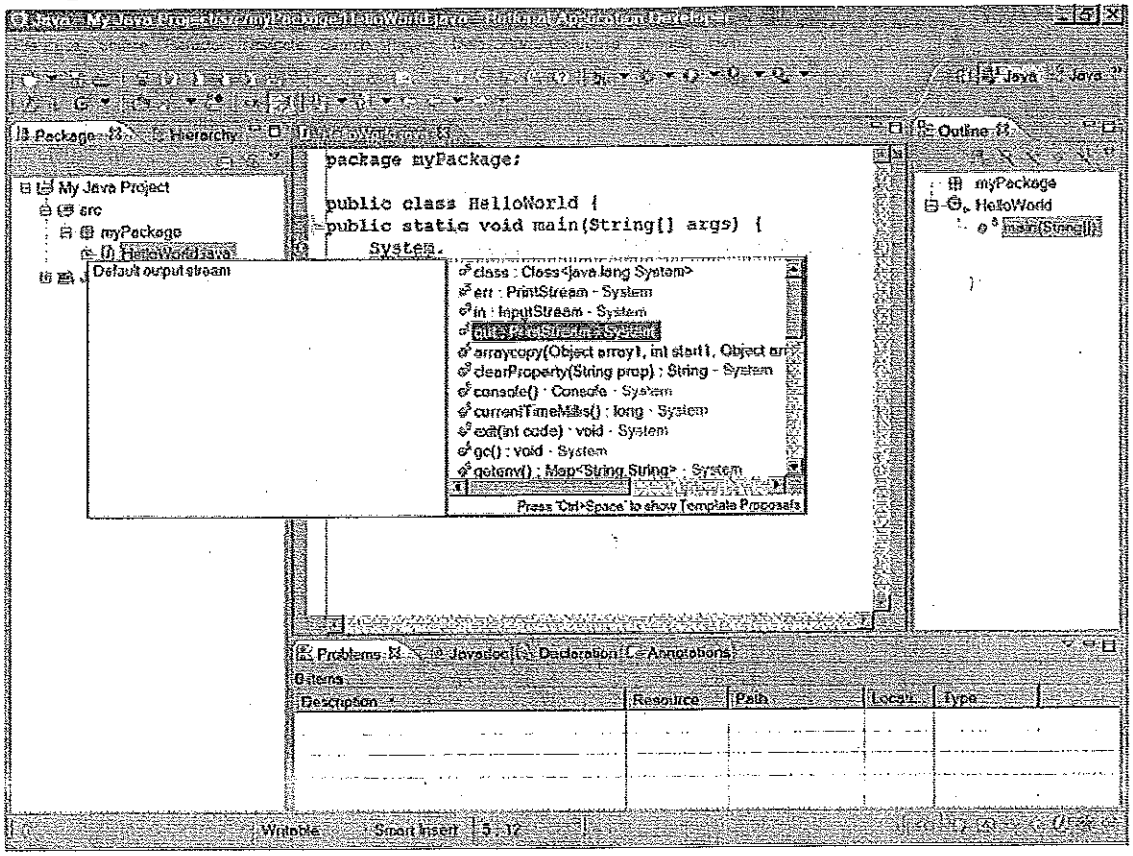
6) Edit Package Name



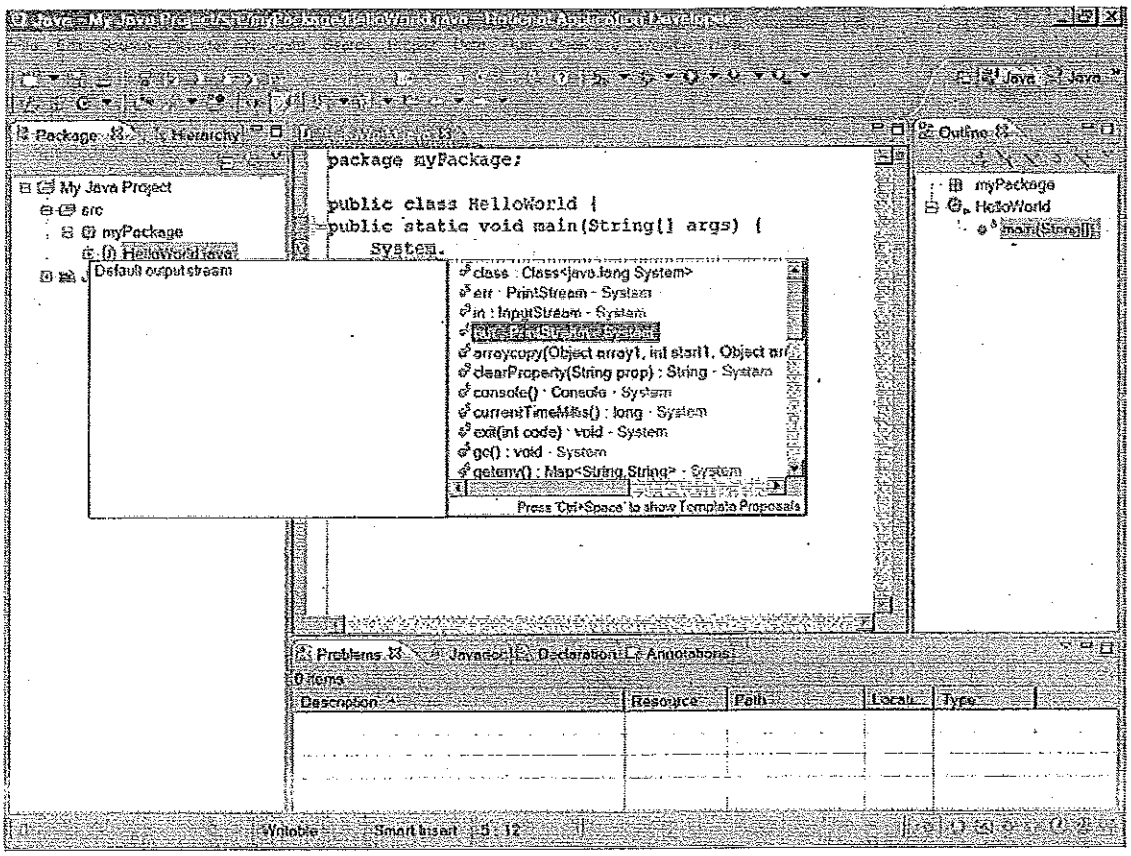
7) Create Class



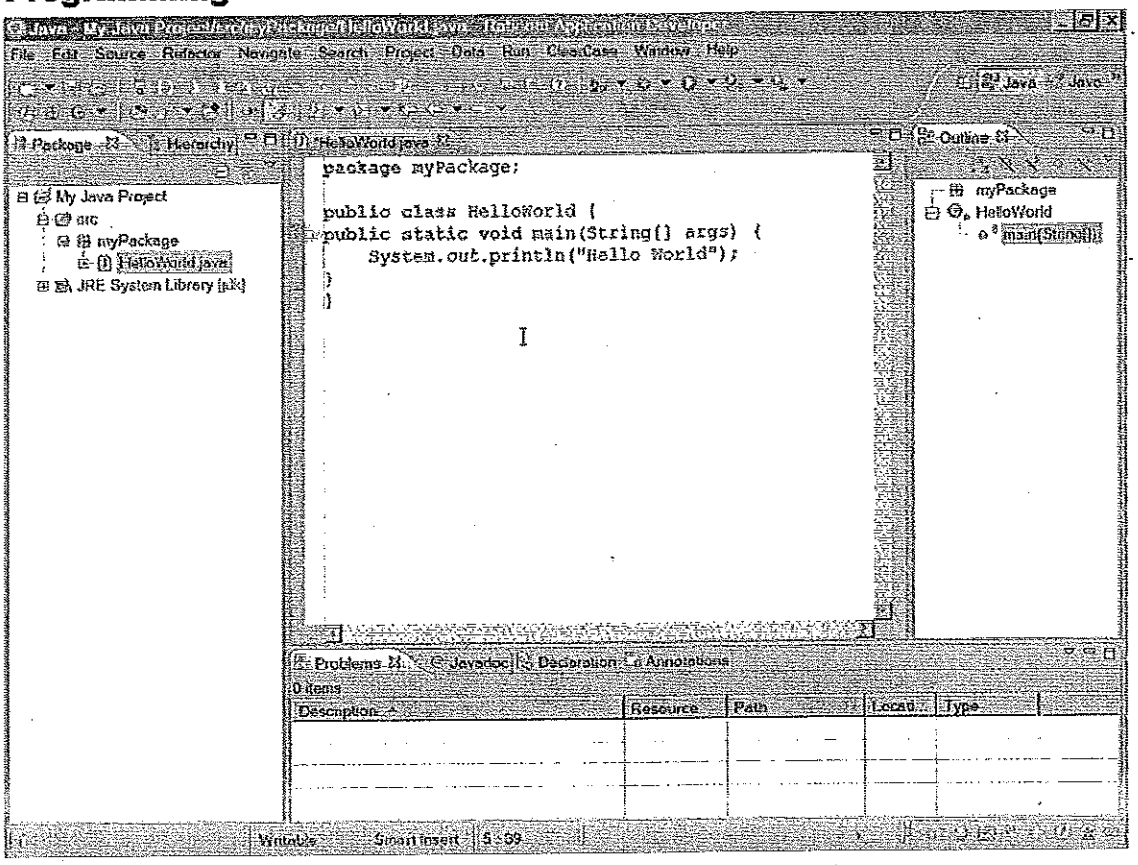
8) edit Class Name, and other details



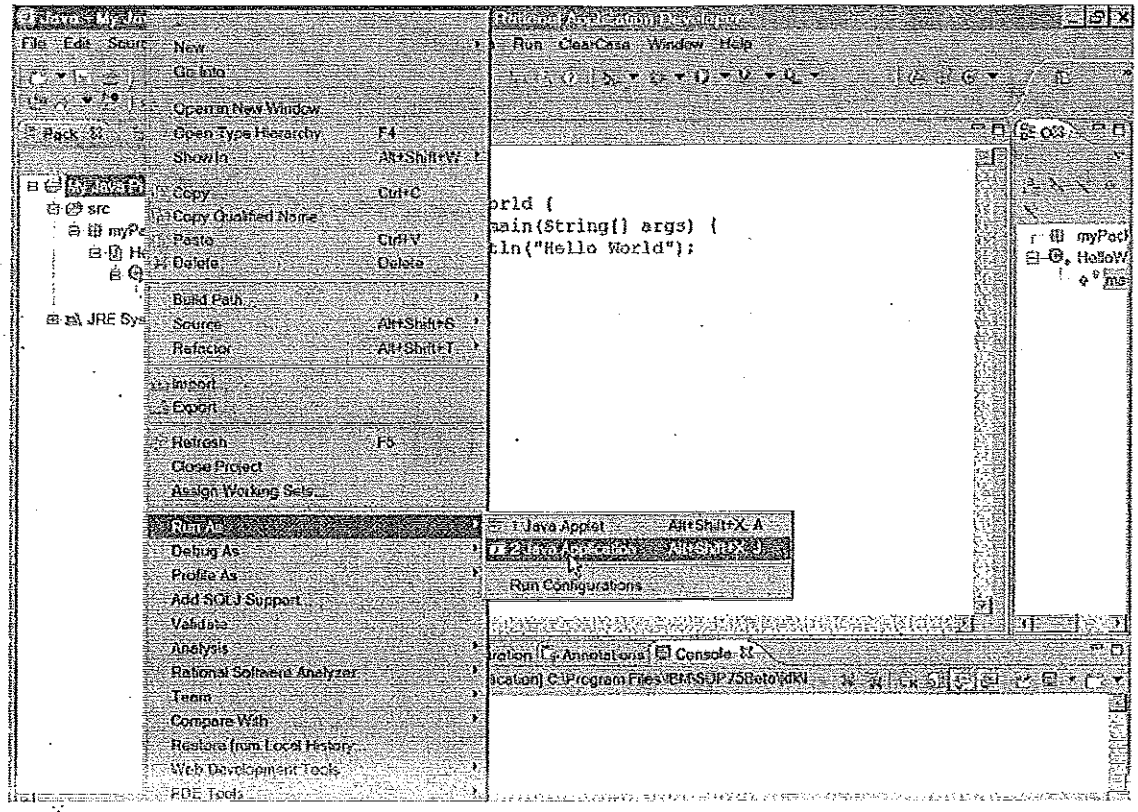
9) Class Created, edit the source, and you will get hints when editing.



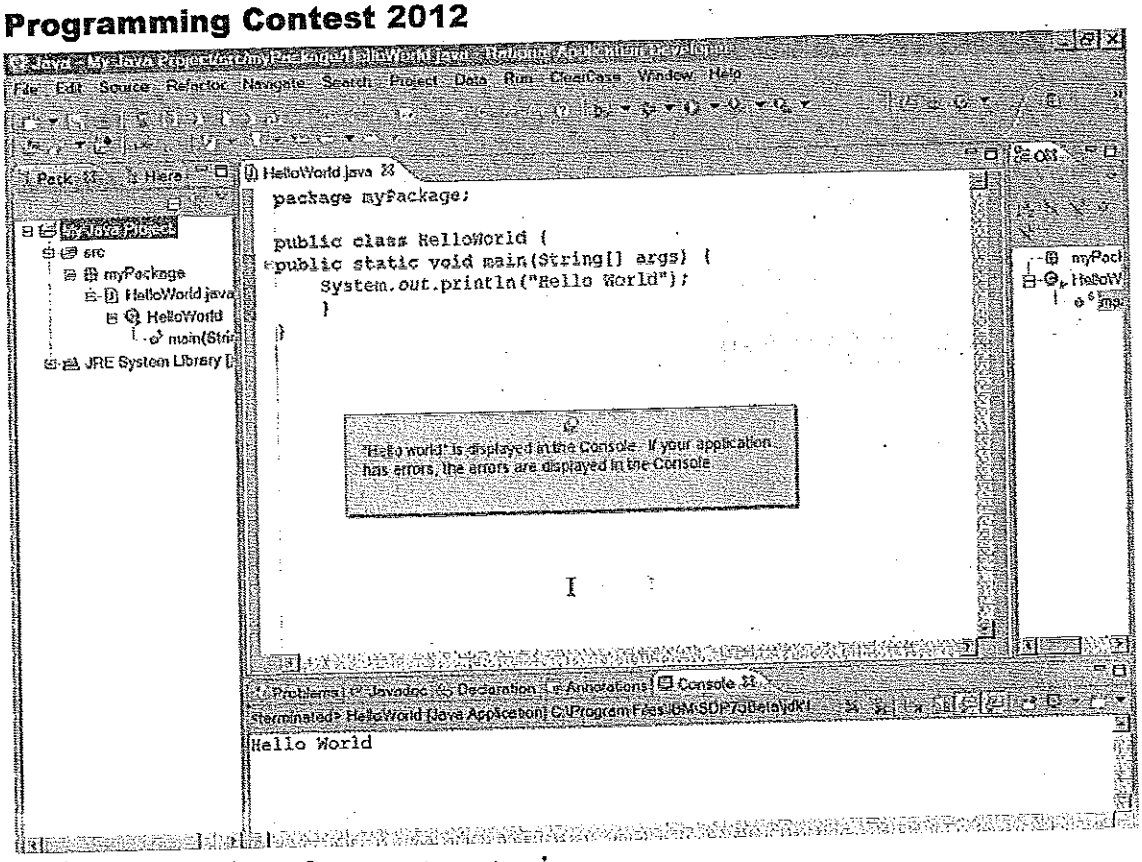
9) Class Created, edit the source, and you will get hints when editing.



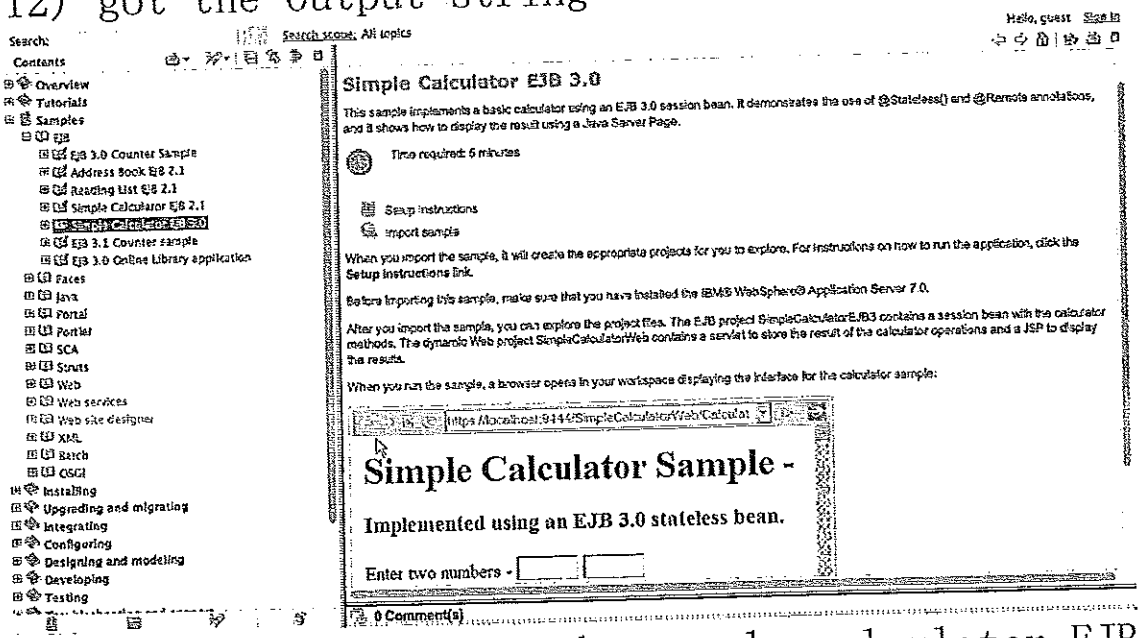
10) write some hello world code as it.



11) run as java application

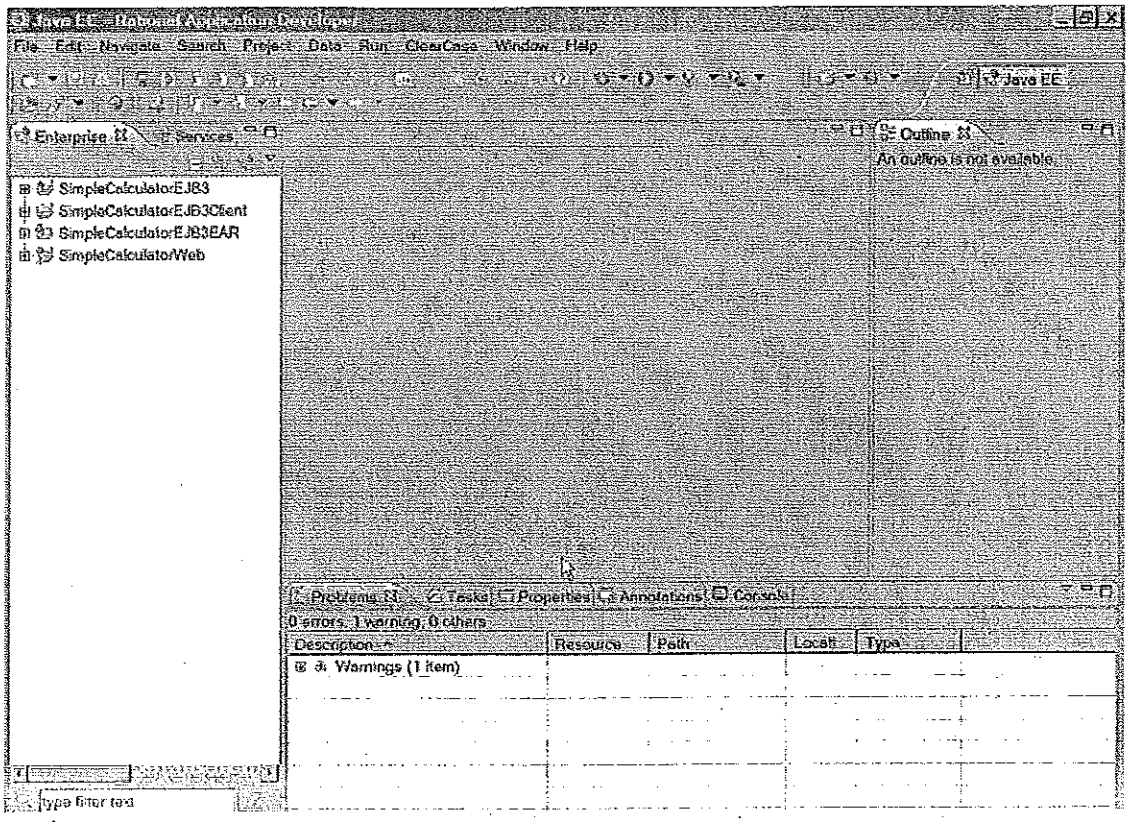


12) got the Output string

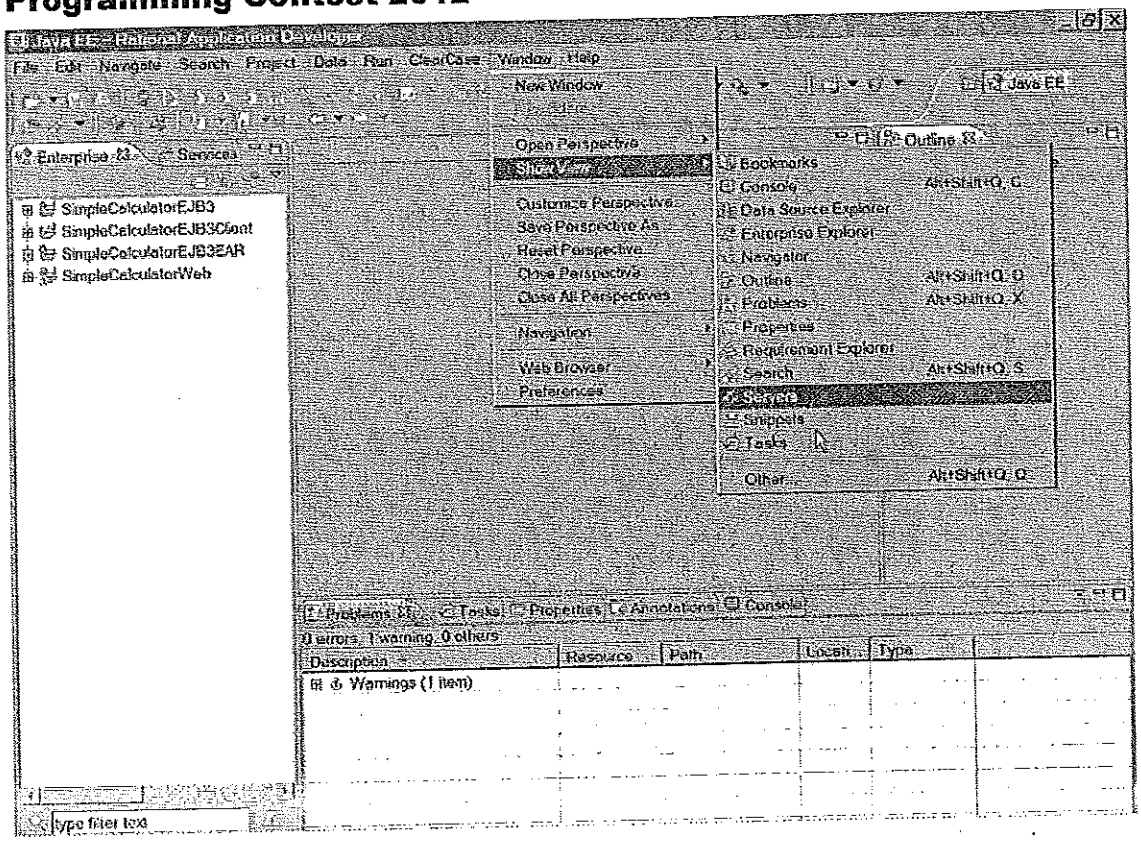


13) open help, and get the sample calculator EJB 3.0 sample down to your RAD.

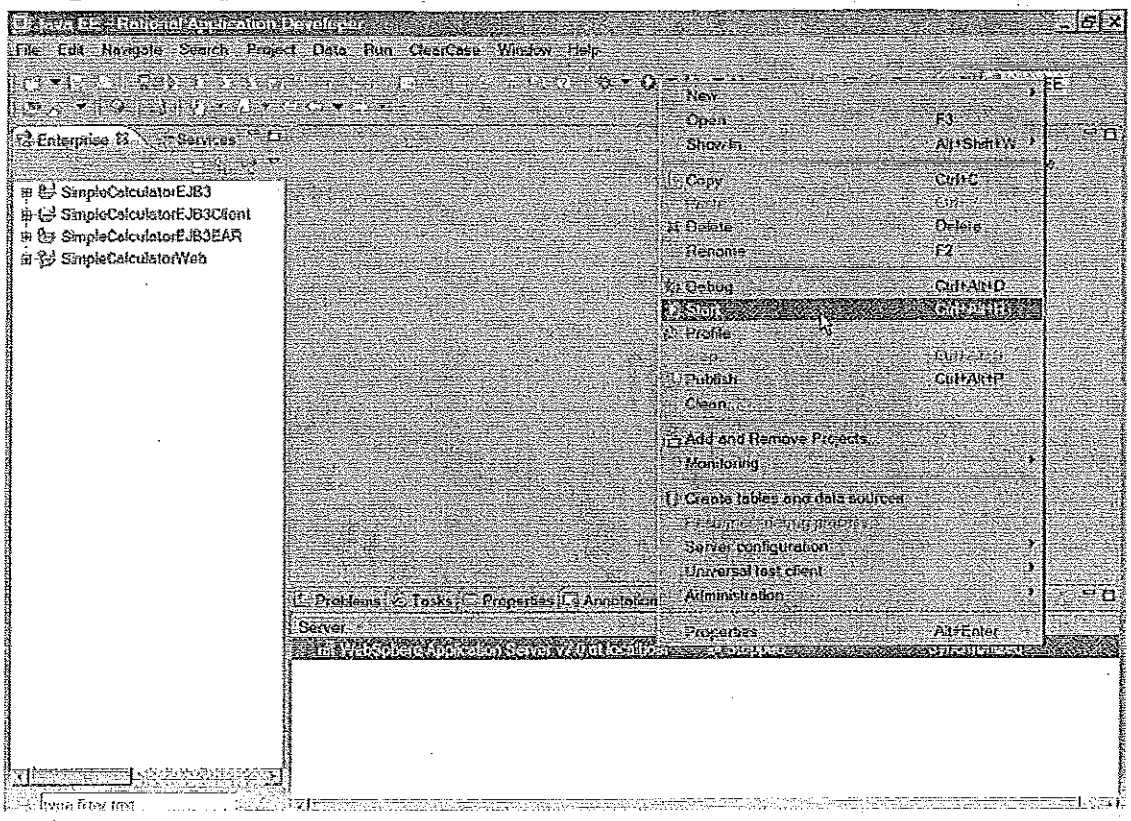
Step 13 to 23



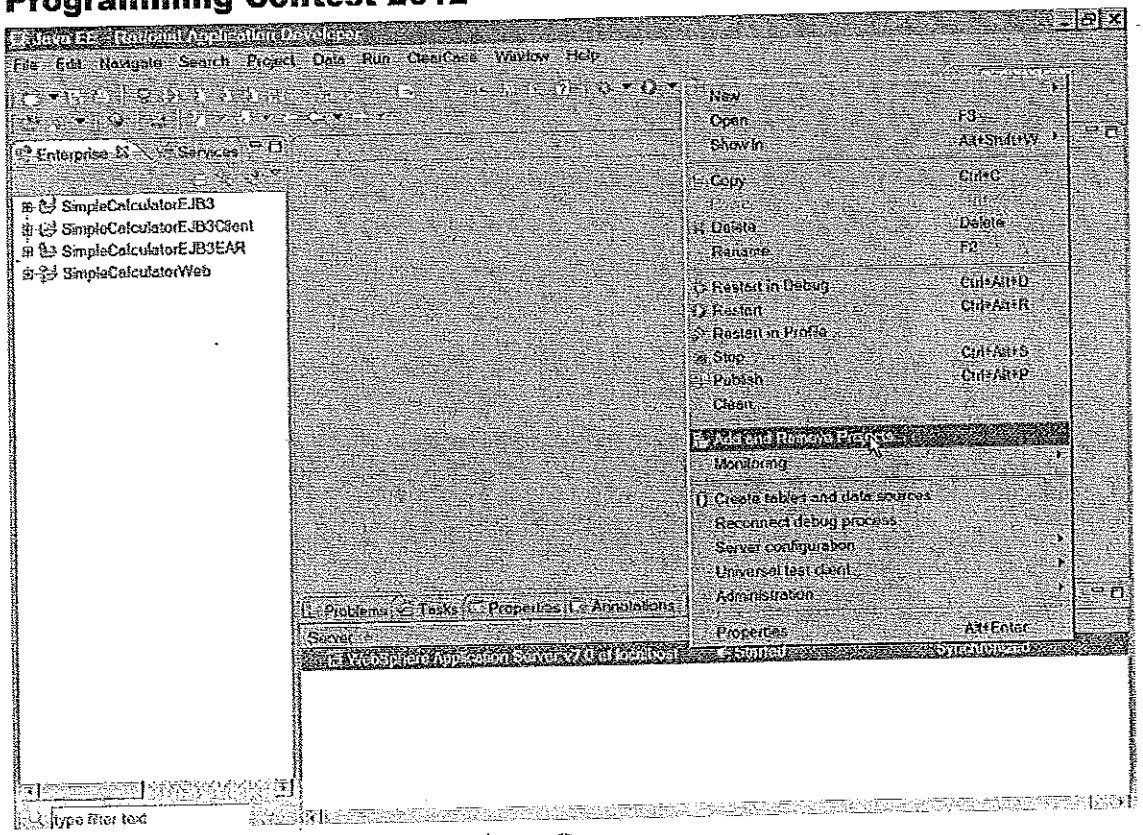
14) show the SimpleCalculatorEJB3 project



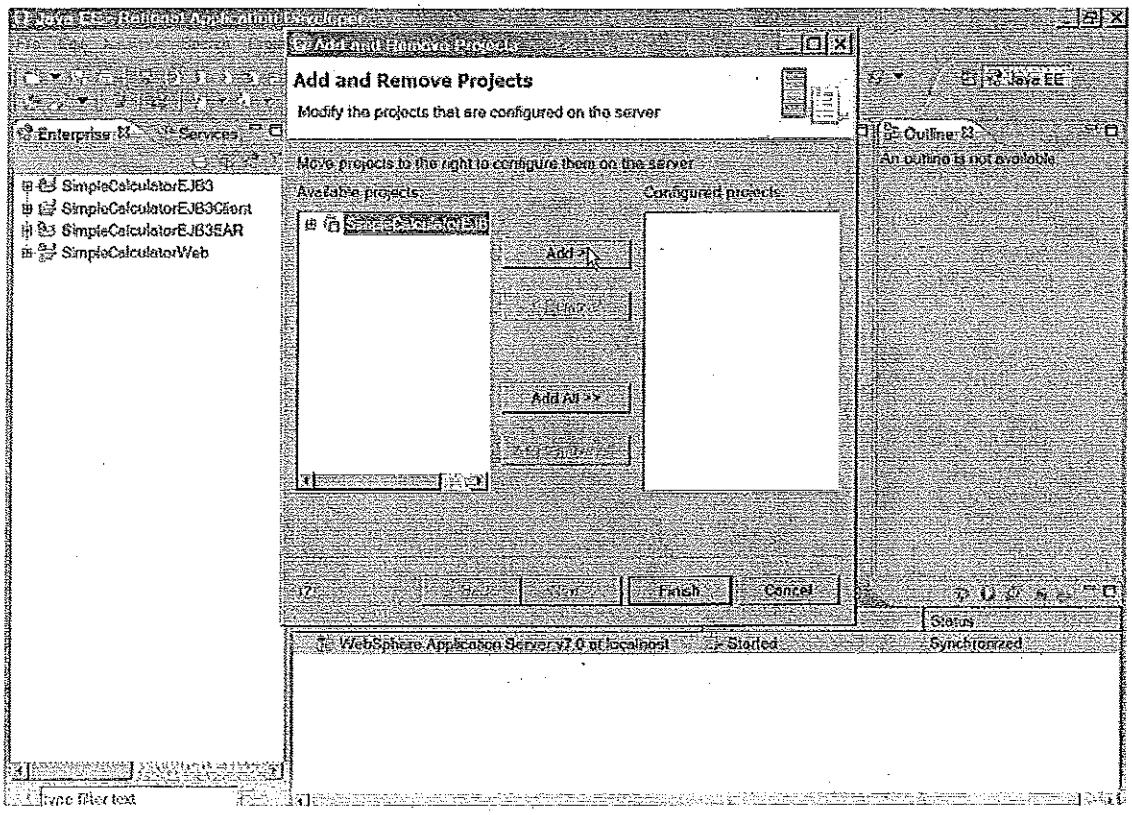
15) Show Servers View



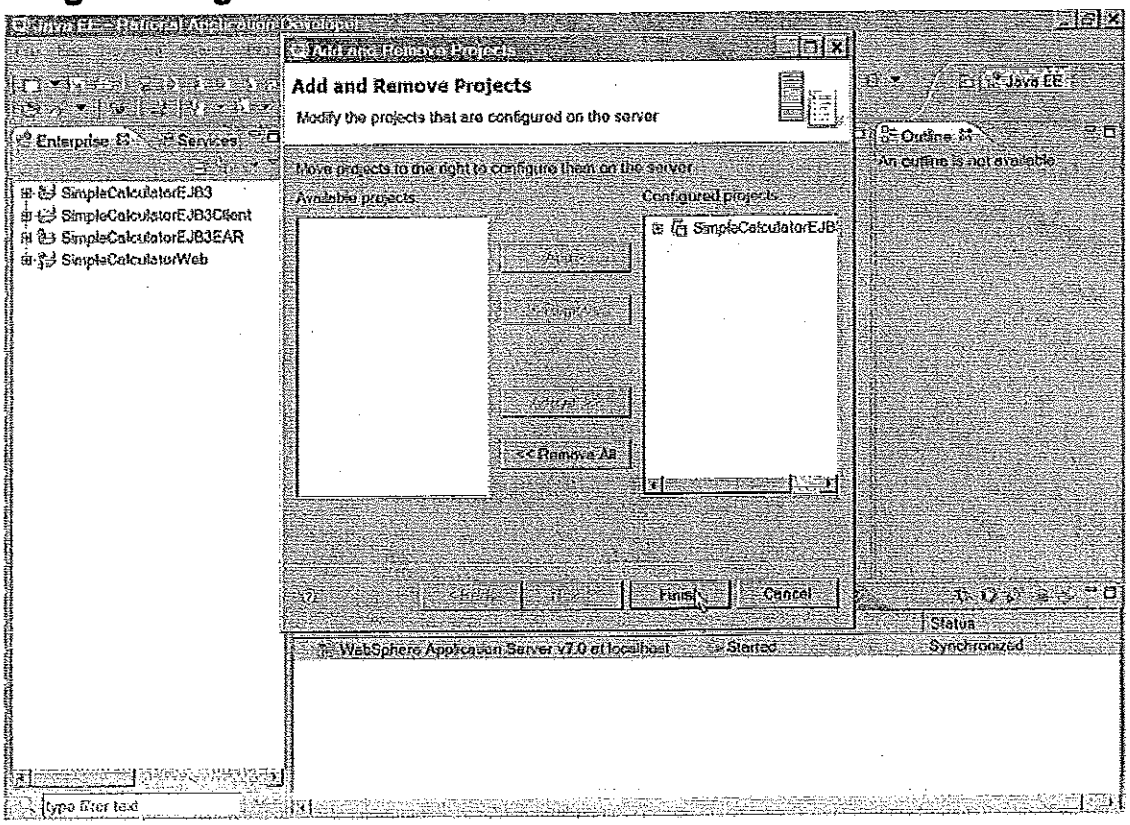
16) Pick WebSphere Application Server v7.0, and Start the server.



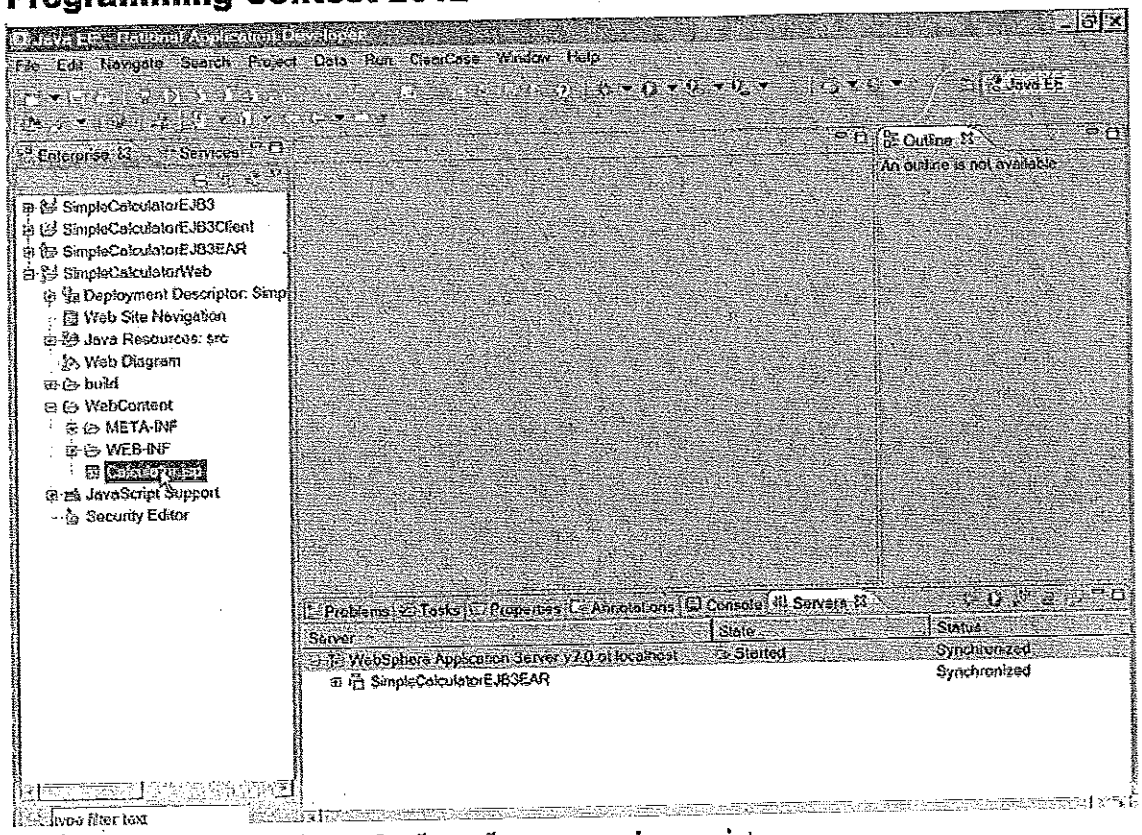
17) Add Project to the Server



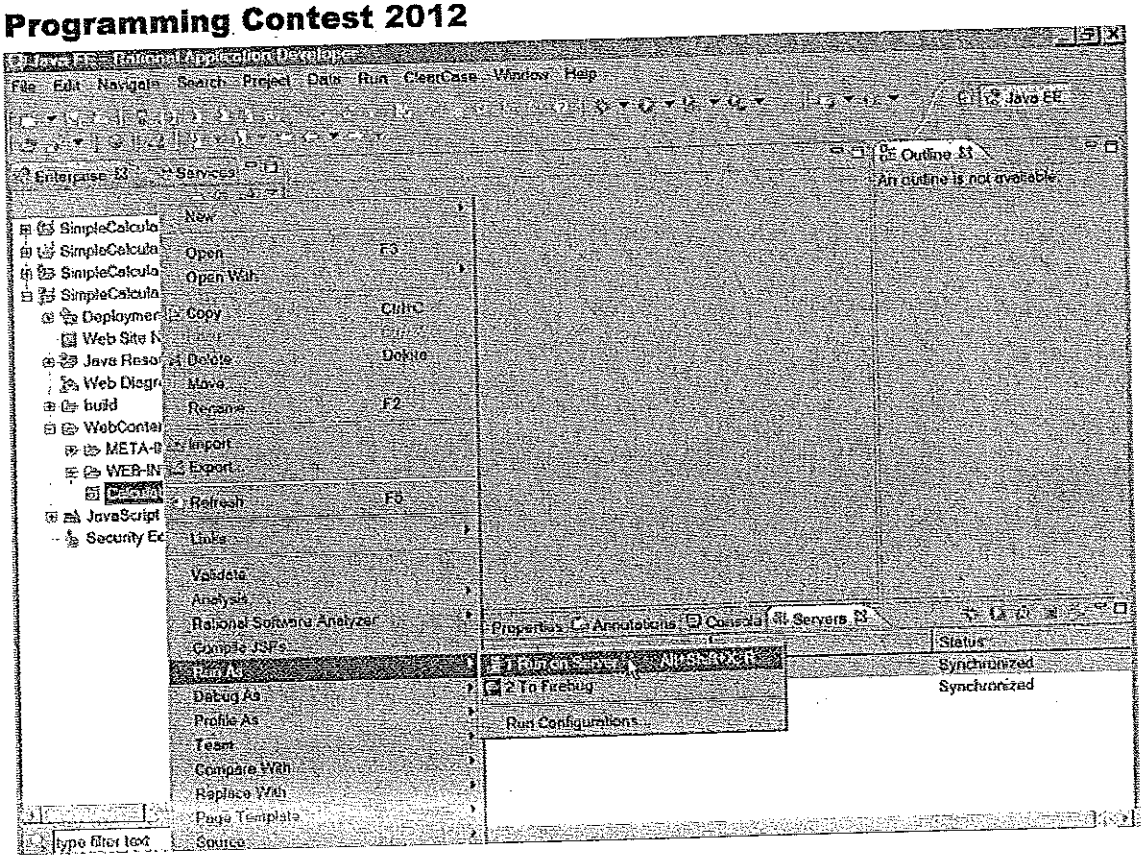
18) select the SimpleCalculatorEJB3 project



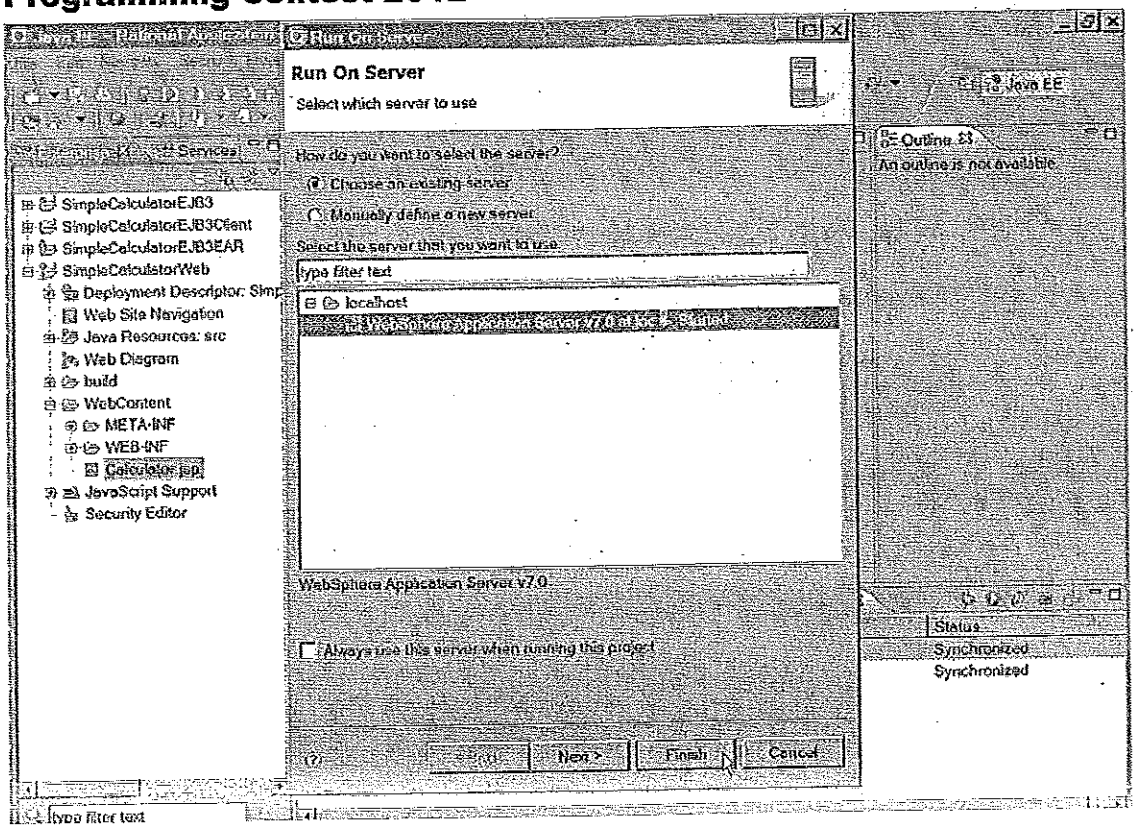
19) finish the selection.



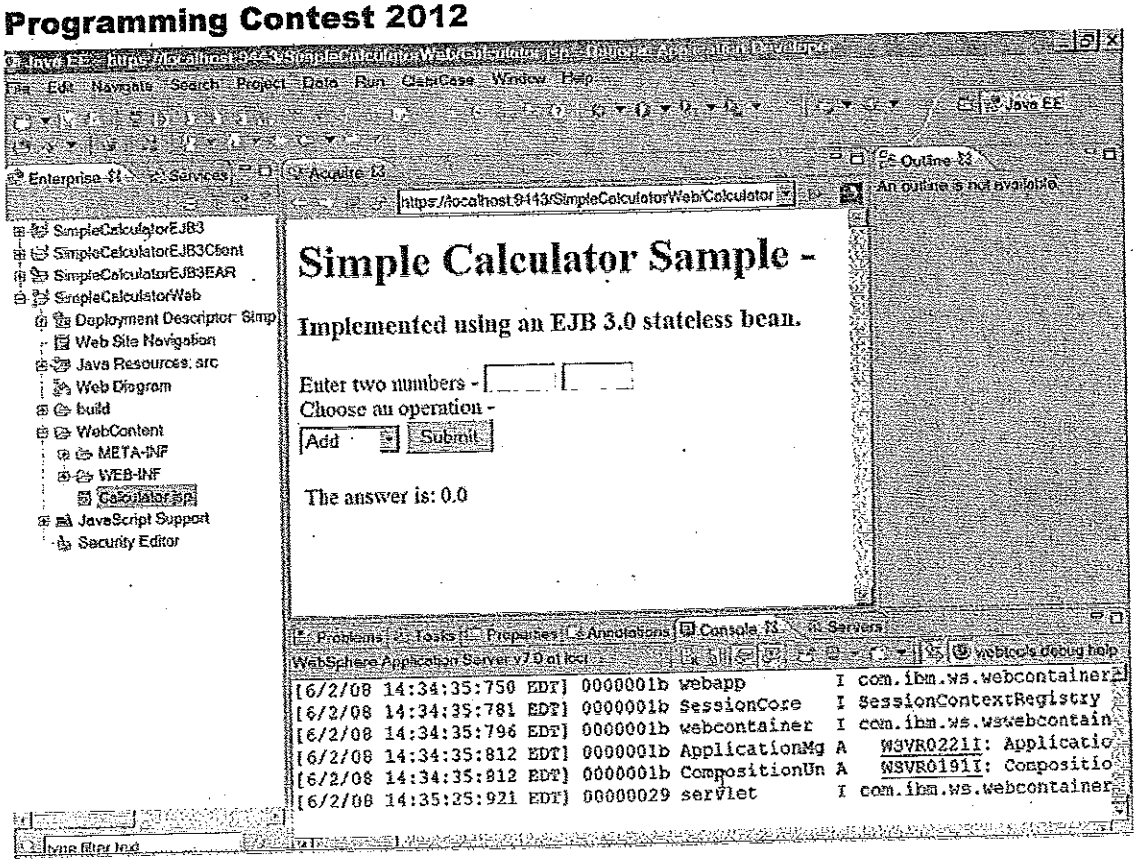
20) select the Calculator.jsp item



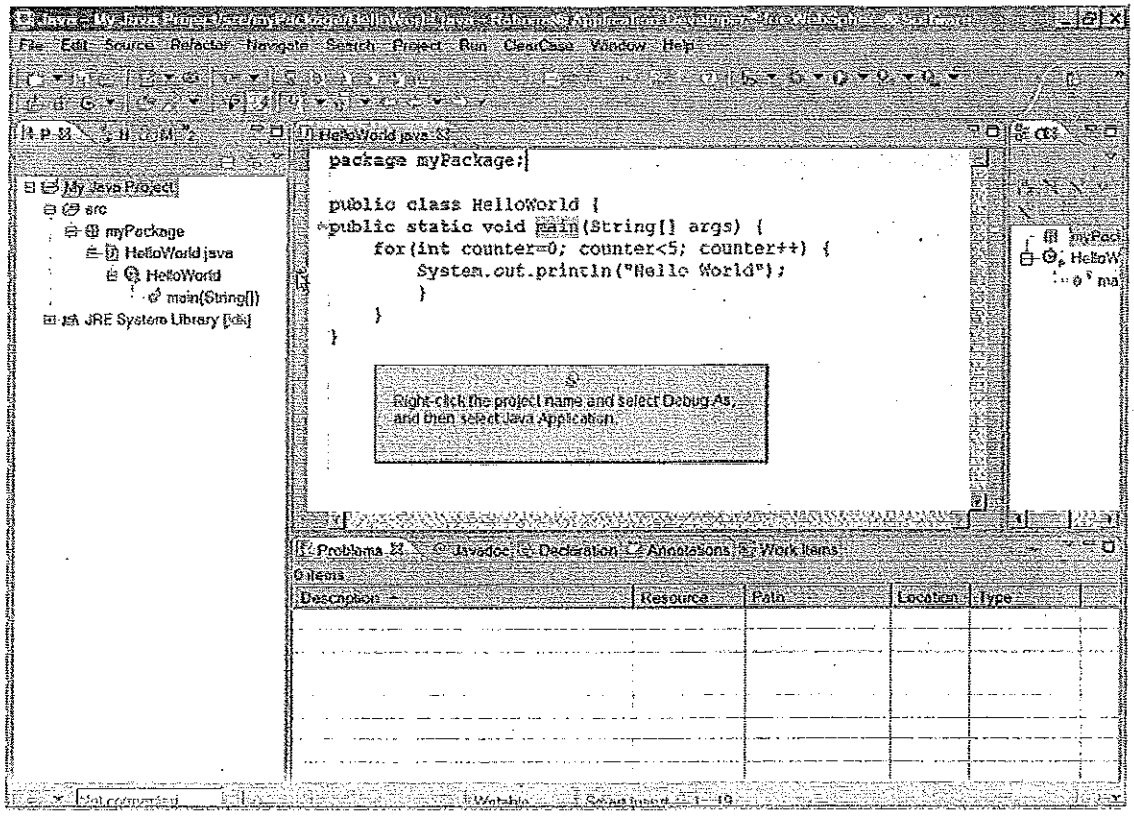
21) Run on Server



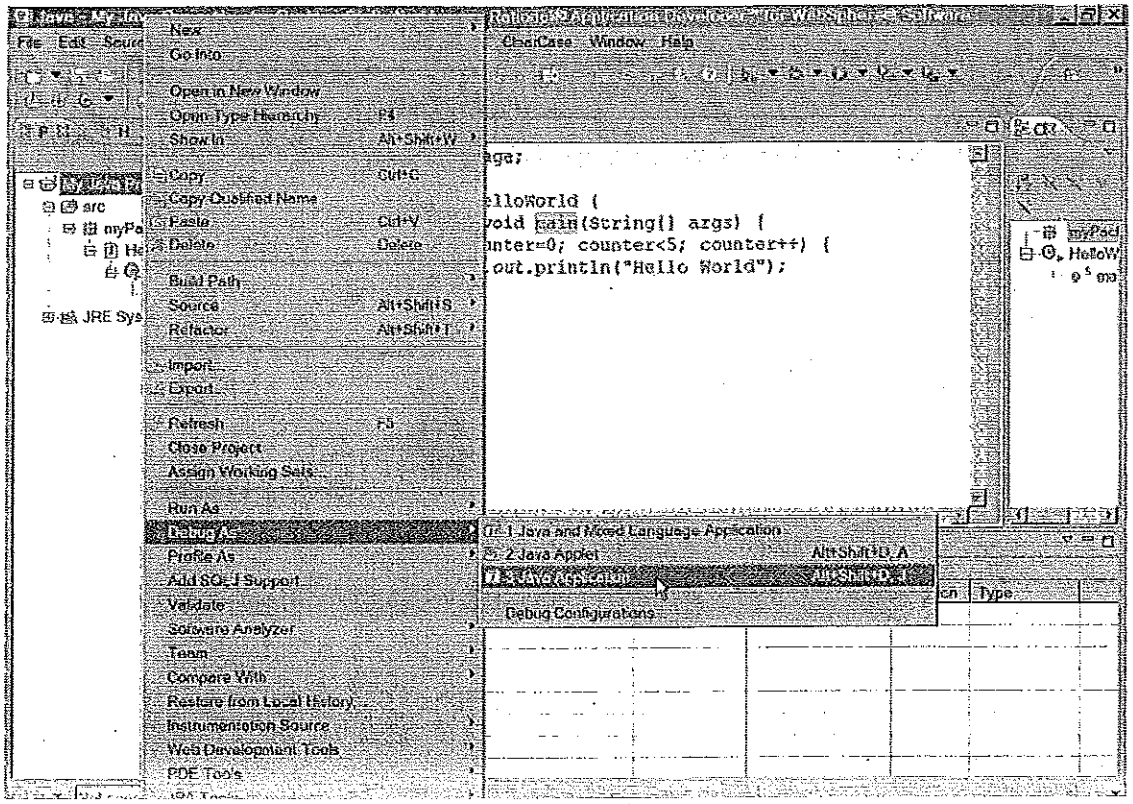
22) choose an existing server.



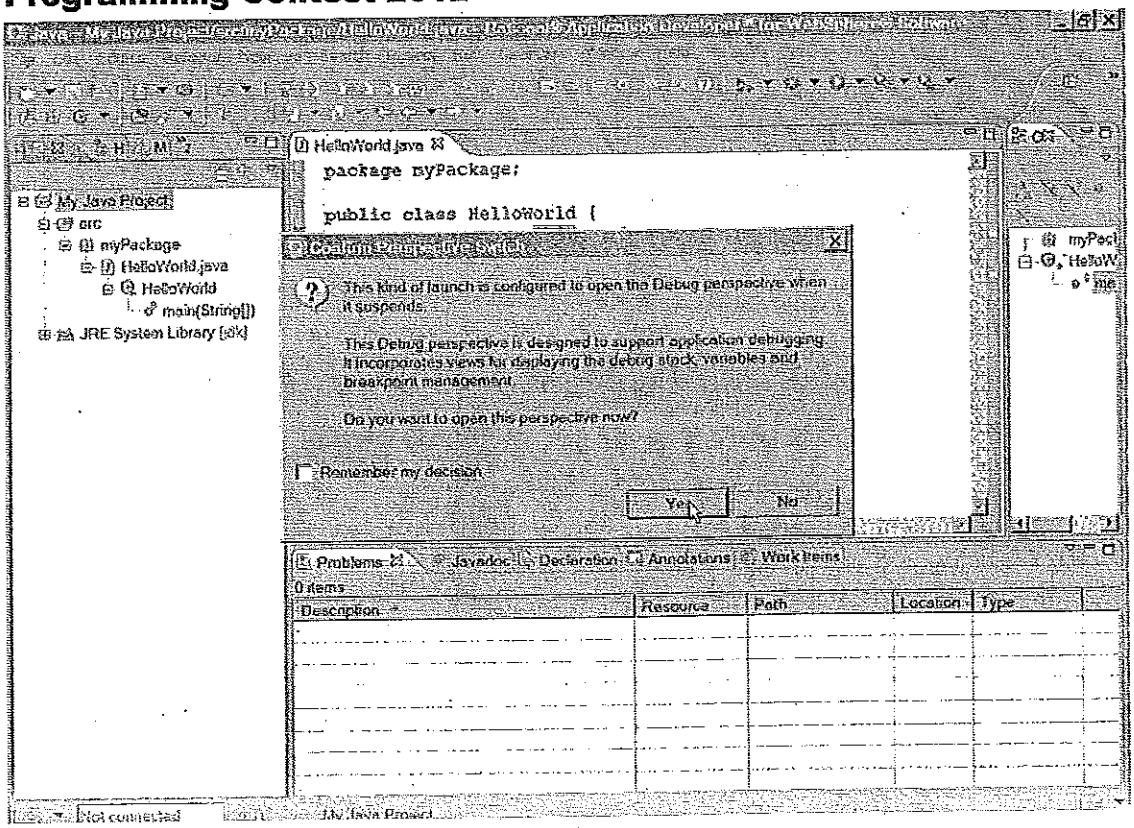
23) show the jsp page



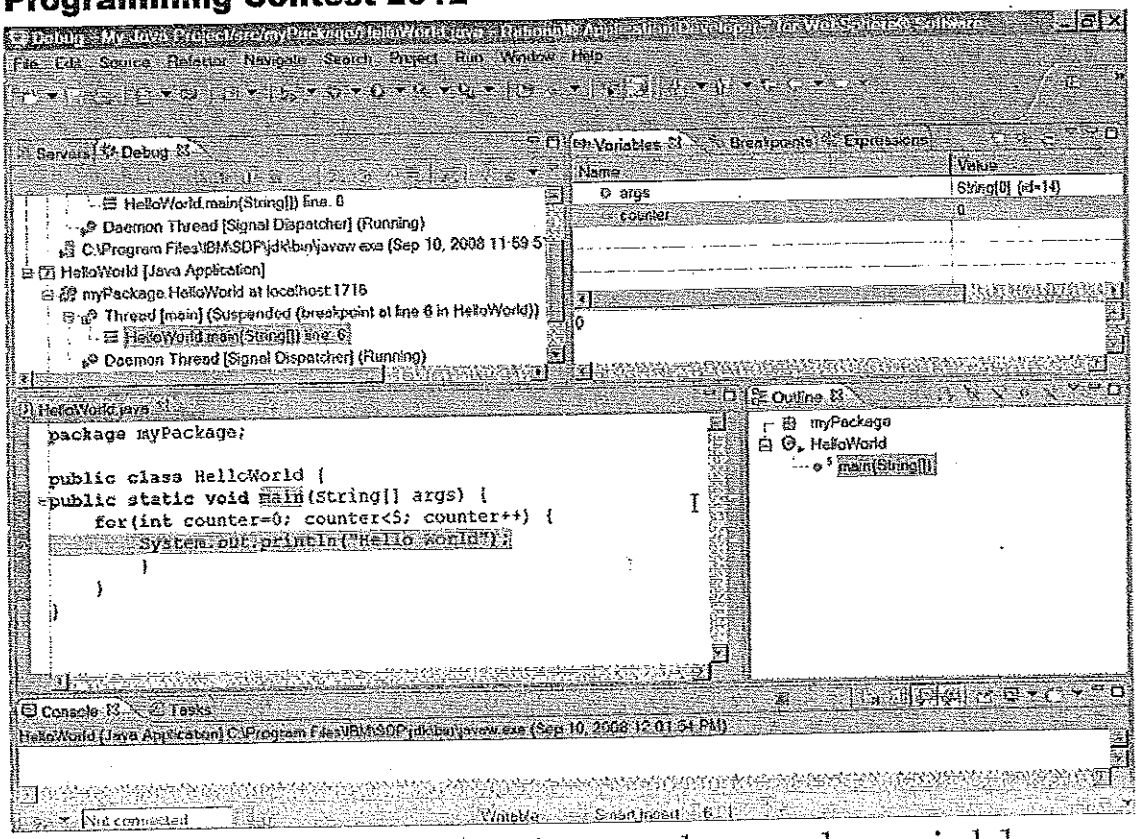
24) back to the MyJavaProject, right click the left bar to add breakpoint



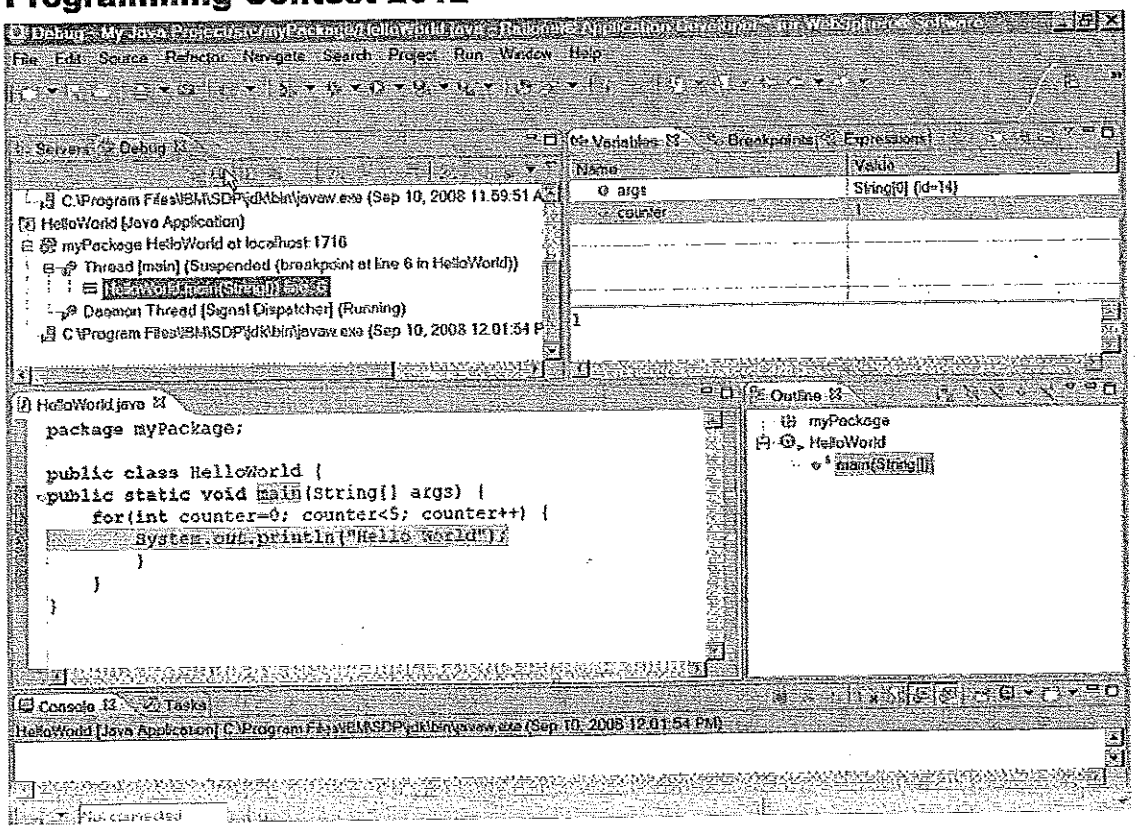
25) Debug as java application


HelloWorld.java
package myPackage;
public class HelloWorld {
My Java Project
src
myPackage
HelloWorld.java
HelloWorld
main(String[])
JRE System Library [jdk]
This kind of launch is configured to open the Debug perspective when it suspends.
This Debug perspective is designed to support application debugging. It incorporates views for displaying the debug stack, variables and breakpoint management.
Do you want to open this perspective now?
Remember my decision
Yes
No
Problems
Javadoc
Declaration
Annotations
Work Items
0 items
Description
Resource
Path
Location
Type
Not connected
My Java Project

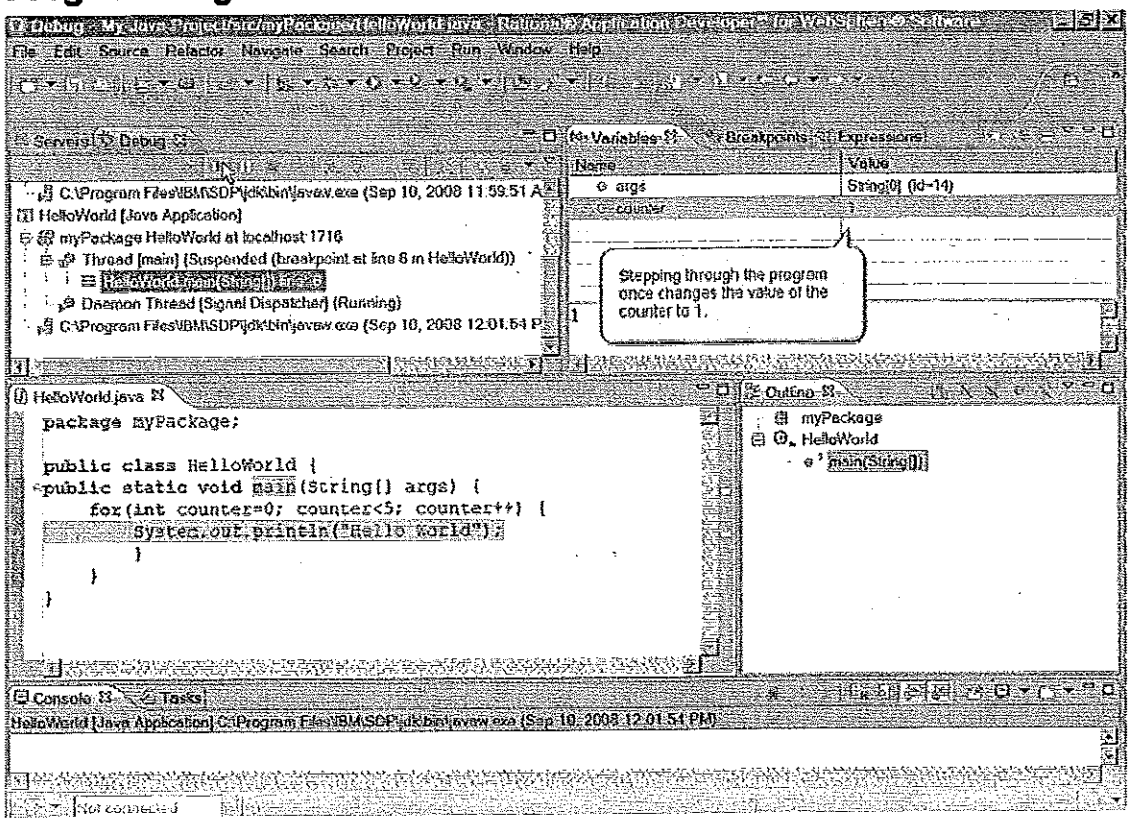
26) click yes



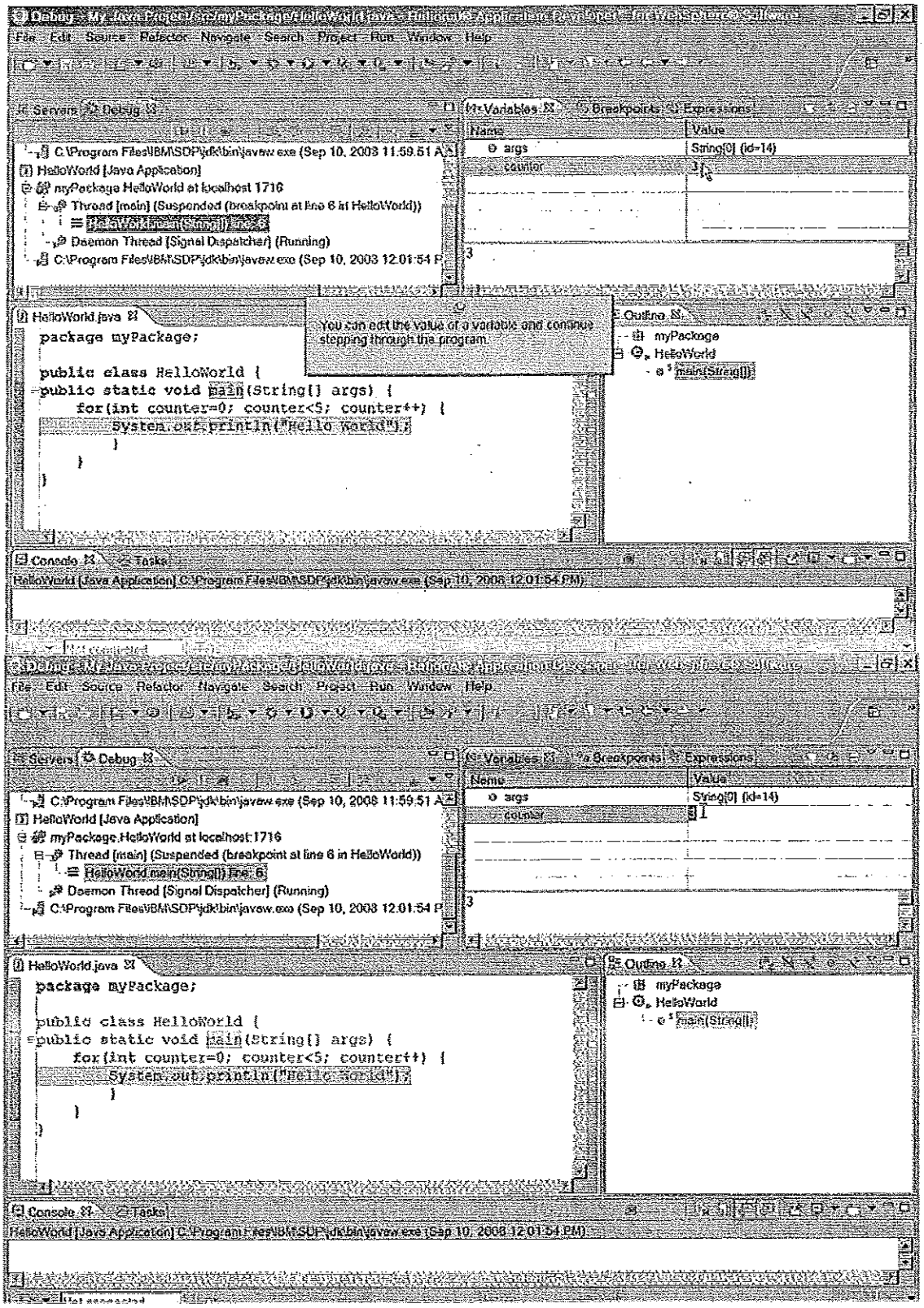
26) run to the breakpoint code, and variable show.



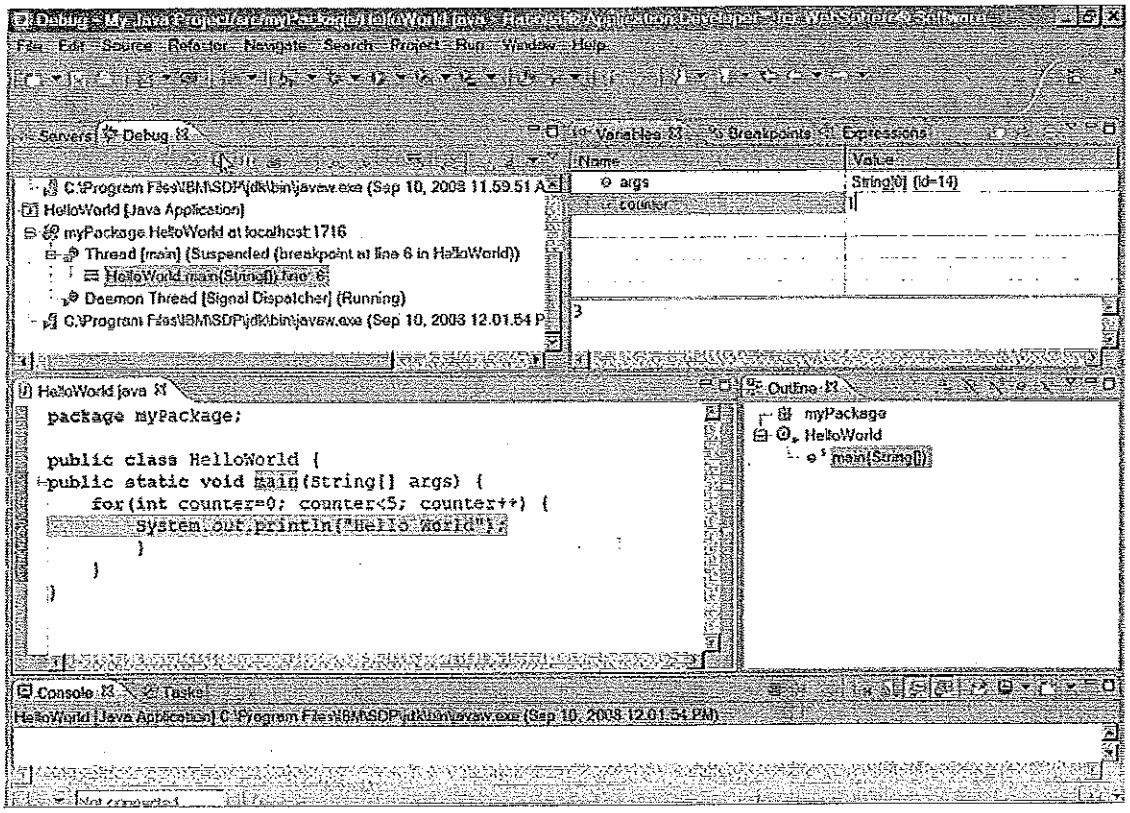
27) step to next iteration.



28) step further



29) you can edit the value of a variable.



30) then step to run

IBM Software Group Hong Kong
17 Jan 2012

IBM Inter-University Programming Contest 2011 Training

Chapter : 5 IBM WebSphere Portal

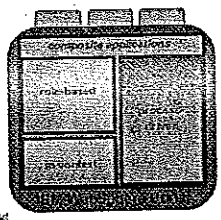
IBM Inter-University
Programming Contest 2012
February 11, 2012 (Saturday)
Cathay, Hong Kong

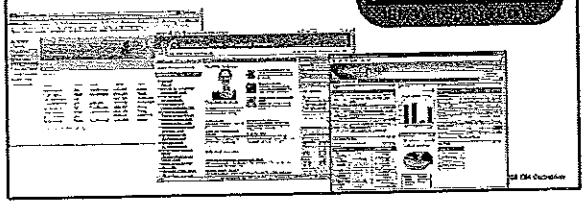
Agenda

- Value Proposition of a Portal
- What is a Portal?
- WebSphere Portal V7.0 Architecture
- Methods to quickly populate your Portal with existing content and applications
  - Feeds
  - Static HTML
  - Dynamic web applications
- WebSphere Portal delivers Exceptional Mobile Experience

WebSphere Portal -- What It Does

WebSphere Portal:
- provides a framework,
- for delivering role based, contextual & process driven composite applications,
- that make more people, more productive,
- in the context of what they do everyday.

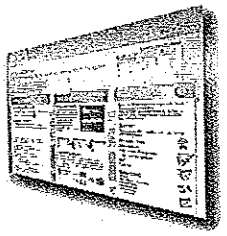




WebSphere Portal Strategy

Delivering Exceptional User Experiences:

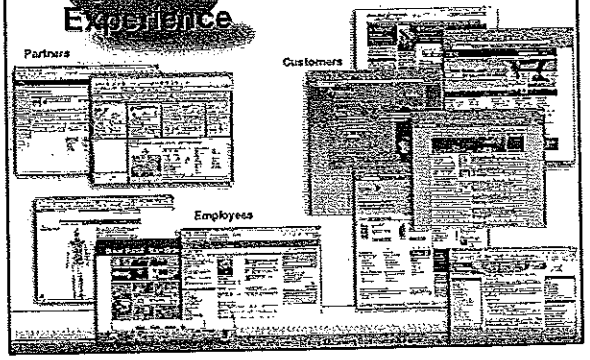
- Deliver the user experiences they choose to their partners, employees, customers, or citizens, with flexibility for change and based on open standards
- Quickly leverage existing investments, through market-leading composite application tooling and robust framework
- Create highly personalized applications that adapt to users' context, community, role, actions, location, and preferences
- Interact with information from the user's device of choice
- Deliver a front-end to SOA, enabling business flexibility and agility
- Speed time to value with Prebuilt Portal snap-ons for specific business problems



WebSphere Portal

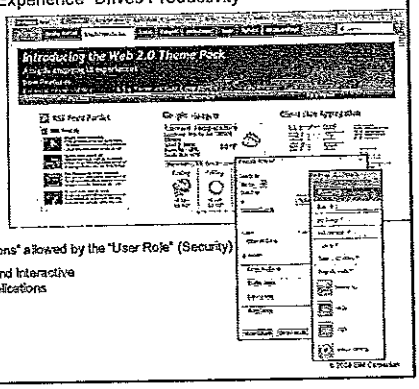
Exceptional User Experience

IBM enables organizations to quickly deliver rich, personalized web sites that optimize business goals and generate loyalty.



Exceptional "User Experience" Drives Productivity

- Contemporary, Fresh Look and Feel
- Fly Out Menus and Page navigation
- Drag & drop support
- Portlet Palette
- Search
- Menus delivered "in context"
  - Appropriate actions based on the portal object
  - Only shows the "actions" allowed by the "User Role" (Security)
- Super-responsive, rich and interactive portlets, content and applications



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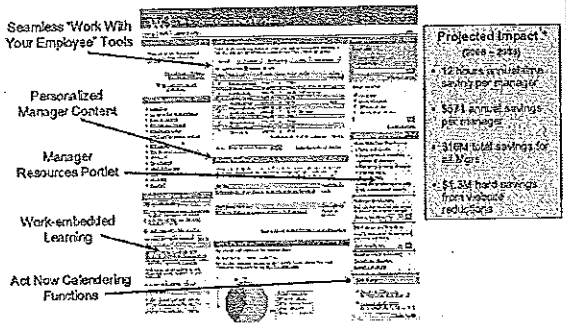
On Demand Workplace: Manager Portal



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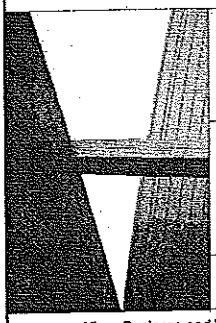
Service Oriented Architecture: The Blueprint for Change



An on demand business is an enterprise whose business processes—integrated end-to-end across the company and with key partners, suppliers and customers—can respond with speed to any customer demand, market opportunity or external threat.

Why SOA?

- Flexibility
- Facilitates re-use of existing applications
- Supports effective business process implementations
- Designed for change

Portal is the front end of SOA

Aligns Business and IT goals to grow revenue and contain costs

IBM

Agenda

- Value Proposition of a Portal
- What is a Portal?
- WebSphere Portal V7.0 Architecture
- Methods to quickly populate your Portal with existing content and applications
  - Feeds
  - Static HTML
  - Dynamic web applications
- WebSphere Portal delivers Exceptional Mobile Experience

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Portal Principle

- Combines portlets together into one unified presentation
- Delivers a highly personalized experience, considering role, personal settings, and device settings
- Separates
  - site design
  - site/page assembly
  - administration
  - application design
- Provides application integration, collaboration, single sign-on services and much more

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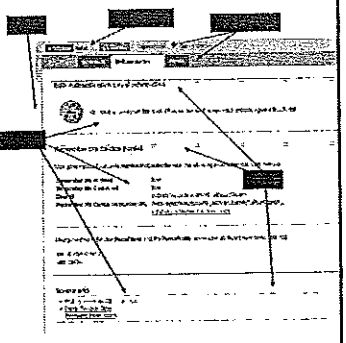
Pages and Portlets

- A portlet is a "window" on a page
  - Each portlet is a separate application
  - Can be placed anywhere on page
  - Each portlet has it's own state (max, min, edit, etc)
  - Dynamic deployment and configuration
  - Supports multiple markups
  - Business logic can be shared between portlets
  - Can be rendered independently
- A theme is the overall design and navigation for a page
  - Includes "Web 2.0" capabilities
  - Enforces branding, style
  - Can include functions, e.g., search bar
- A skin is the border of a portlet
  - Can be invisible to user
  - Presents customization options to user
  - Also enforces branding, style



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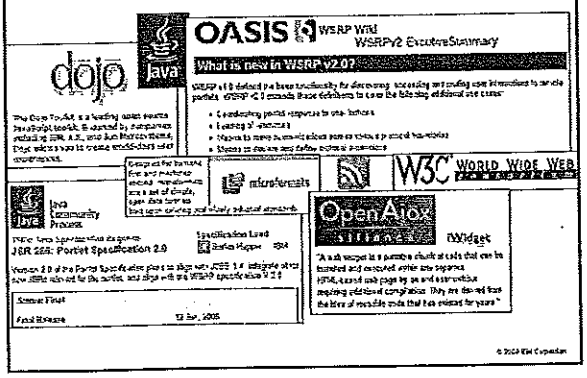
IBM Incorporates Open Standards



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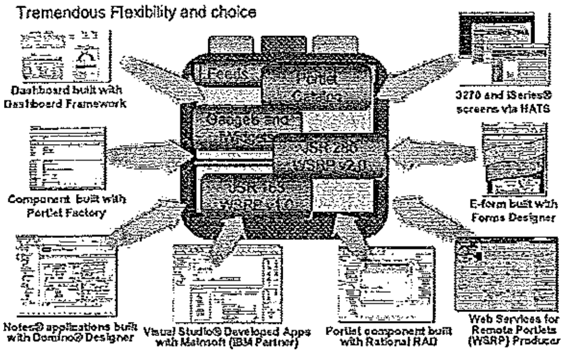
Leverage Your Investments to Populate Portal

Tremendous Flexibility and choice



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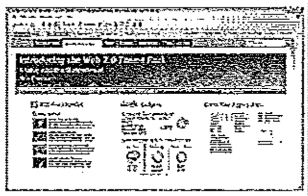
Putting Pages, Applications & Other Content into Portal

1. **Display Existing HTML/Web Apps**
   Web Clipping, Web Application Integrator
2. **Install Existing Portlets Out-of-the-Box or from the Portlet Catalog**
   Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), eMail, Green Screen, Dashboard, etc. (drag and drop on to pages)
3. **Use HTML tools ("Static Pages")**
   Build HTML/CSS with HTML editor. Add portlets, live text, instant messaging, etc.
4. **Lotus Web Content Management**
   HTML/JS content, Personalization, Web Content Integrator, Doc Libraries*
5. **Use Built-in Web 2.0 Services**
   Semantic Tagging (Live Text), Client-Side aggregation, AJAX, REST
6. **Incorporate Collaboration**
   Awareness, Instant Msg, Team spaces, etc
7. **Consume a Web Service or WSRP**
   Standards based integration, WSRP 2.0
8. **Build Composite Applications, eForms & Business Processes**
   C2A*, Cooperative portlets, HATS, App templates, Process Portal, Lotus Forms



9. **Develop Custom Portlets**
   Portlet Factory, RAD, (Java™, JSPs, Web Services, REST*, AJAX*, Java Specification Request (JSR 286*)
   Run .net apps as Java apps (Mainsoft*)
10. **Extend the Browser**
   Utilize desktop/mobile clients, e.g. Expeditor, Client portlets, Mobile Portal

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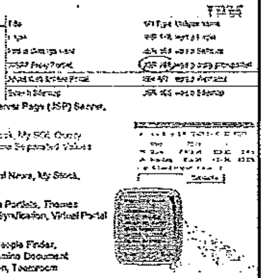
Portlets

Provided with WebSphere Portal 7

- Mail / PIM Solutions – Lotus Notes®, Exchange, IMAP/POP3
- Web Apps Integration, Bookmarks, Banner, Quicklinks, Webpage, Web Clipper, Really Simple Syndication (RSS), File Server, Java Server Page (JSP) Server, Servlet Invoker, Web Services (producer and consumer)
- Personal Organization: Reminder, PDF Document Viewer, World Clock, My SQL Query Reports, Retirement Planner, Currency Calculator, My ToDo's, Comma Separated Values (CSV) file viewer
- News and Information, Events, News, Links, My Weather, My Vertical News, My Stock, Company Tracker,
- Administration Portlets – Site Management, Manage Pages, Manage Portlets, Themes and Skins, Web Services, Manage Search, Web Content Libraries, Syndication, Virtual Portal manager, etc
- Collaboration: Lotus Instant Messaging Contact List, Who Is Here, People Finder, My Team Workplaces, Web Conferencing, Domino Web Access, Domino Document Manager, NotesView, Notes Mail, Calendar, Tasks, ToDo, Discussion, Teamroom
- Utility Portlets, Login, Profile Management, About WebSphere Portal, Directory Search, Search Center, Instant Messaging connect
- Search: Document Search, Search Center, Suggested Links
- Content Integration: Web Content Management, Productivity Components, converters and viewers
- Business Process Integration: My Tasks and process portlets
- Sample Portlet Applications: Basic, Struts framework, cooperative portlets



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Agenda

- Value Proposition of a Portal
- What is a Portal?
- WebSphere Portal V7.0 Architecture
- Methods to quickly populate your Portal with existing content and applications
  - Feeds
  - Static HTML
  - Dynamic web applications
- WebSphere Portal delivers Exceptional Mobile Experience

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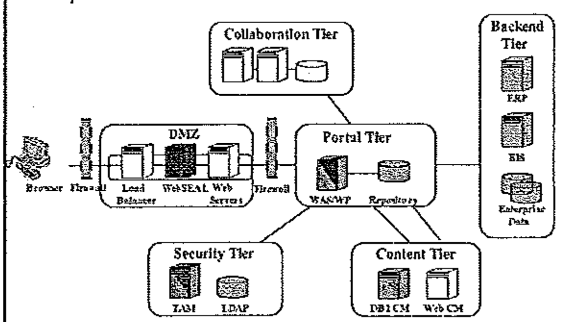
WebSphere Portal Production Architecture



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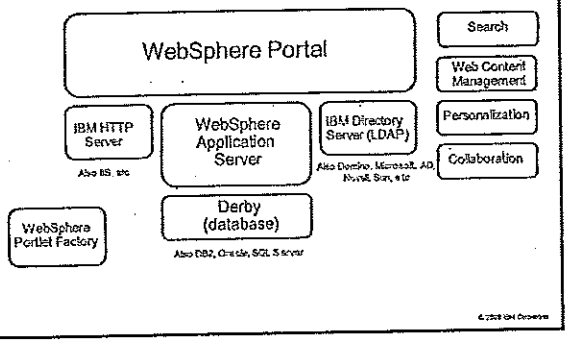
Works with your Environment

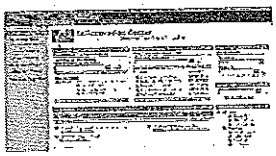
- Platforms
  - AIX®, i5/OS®, RHEL and SLES Linux® (Intel®, pSeries®, zSeries®), HP-UX, zOS® (native), Solaris™ and Windows®
- Databases
  - IBM DB2®, Oracle®, SQL Server®, Derby (Cloudscape®)
- Directories
  - Microsoft® Active Directory, Novell® eDirectory, Sun™, Domino®, IBM Directory Server, Custom User Registry
- External Security Manger
  - Tivoli® Access Manager, SiteMinder
- HTTP Web Servers
  - IBM, Apache, Microsoft, Sun
- Browsers
  - Microsoft Internet Explorer, Firefox®

WebSphere Portal Main Components



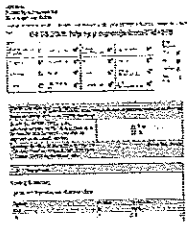
Portlet Perspective

- To an End User: a portlet is a window to display their preferred content
- To a Content Provider: a means for targeting content to the end user.
- Portal Administrator: a WAR file
- Portal Server: a component rendered and aggregated into one of its pages
- Developer: a java application whose lifecycle is managed by the container



Portlet Standards

- Java™ Specification Request (JSR) 286 – Java Portlet Specification V2.0
  - IBM is leading this JSR, all major Java technology portal (commercial and open source) vendors represented
  - Approved. March 04th 2008 (WebSite complete April 9th)
- Web Services for Remote Portlets (WSRP) V2.0
  - Standard protocol for accessing portlets as web service
  - Defined at OASIS, chaired by IBM, Approved. March 31st 2008
- Common goals
  - Enable coordination between portlets and allow building composite applications based on portlet components (events and render content (e.g. public render parameters))
- WebSphere Portal seamlessly integrates JSR168, JSR286 and WSRP 2.0 Portlets.
  - Also integrates IBM Portlet API and WSRP 1.0



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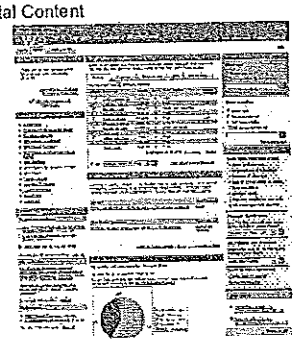
Various Methods to Display Portal Content

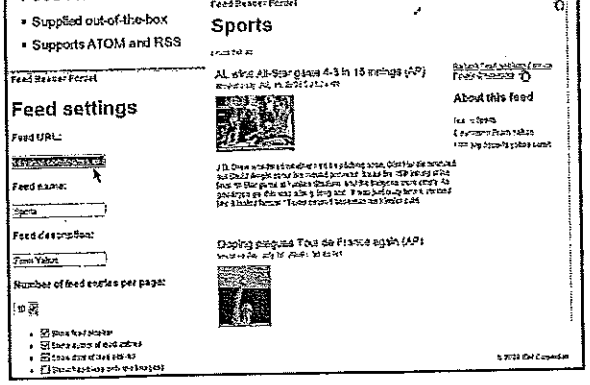
- Provide links to existing content*
- Display existing static pages*
- Include dynamic web applications*
- Leverage feed sources*
- Build custom portlets
- Supplied email and Lotus portlets
- Download vendor portlets from IBM® Portal Catalog
- Render Web Services for Remote Portlets (WSRP)
- Web Content Manager
- Others?

* We will cover these during this presentation



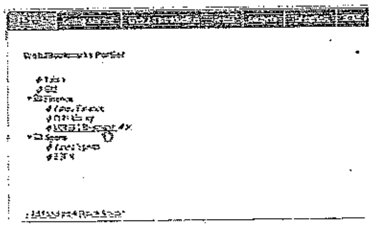
Feed Reader Portlet

- Supplied out-of-the-box
- Supports ATOM and RSS



Links and Bookmarks

- New Web 2.0 Bookmarks Portlet
- Supplied out-of-the-box
- Web 2.0 user interface makes it fast and easy to use!
- Can bookmark external URLs and internal Portal pages



Google Gadgets

- Place any Google gadget on a page
- Download the IBM Portlet for Google Gadgets™ from the Portal catalog
- Seamless integration with thousands of web-based solutions

Web Application Integrator

- Centralizes access to external web applications within the enterprise
- Integration of web applications occurs by injecting Portal navigation into external web applications themselves
- No portlet development required
- Does NOT use an IFrame element
- Portal markup is "injected" into an external web application by adding an HTML <script> tag to the web app
- User believes he/she is still within the Portal environment
  - In reality, they are natively browsing the external web application
- The integrated web application can use any technology (e.g. .NET, Ruby on Rails™, PHP, PEARL, Domino®, J2EE, etc.)
- Download this portlet from IBM Portal catalog

Web Application Integrator

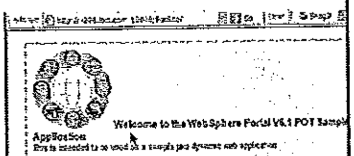
Three easy steps:

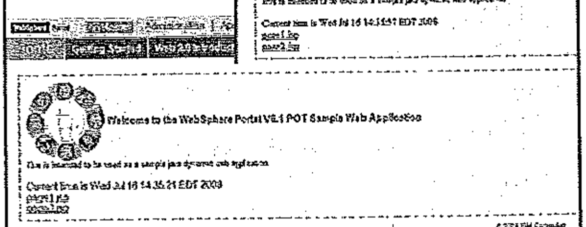
1) Create a standard Portal URL page, specifying the URL to the external web application
2) Use the new *WebAppIntegrator* portlet to generate an HTML <script> tag for your web application
3) Add the script tag to the header component of the web application. For some themes, the script tag must also be added to the footer component.

```
<!-- BEGIN PORTAL NAVIGATION INTEGRATION -->
<script type="text/javascript"
src="http://192.168.123.10?:10040/wps/myportal/!ut/p/c5/04_[illegible]
[illegible]
[illegible]/?Portal_Page_ID=[illegible]">
</script>
<!-- END PORTAL NAVIGATION INTEGRATION -->
```


Web Application Integrator

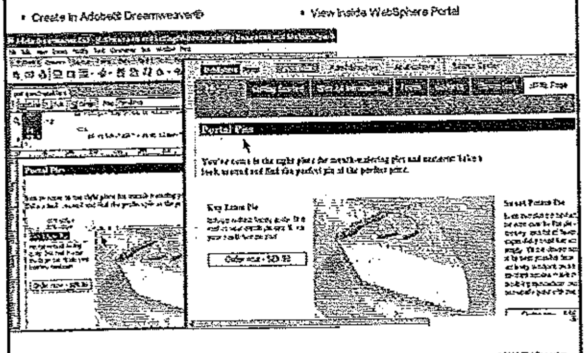
- After "injection", the web application works both inside and outside the Portal





Static Web Page Integration

- Create in Adobe® Dreamweaver®
- View inside WebSphere Portal



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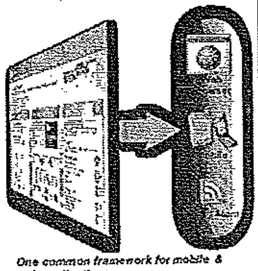
Why Leverage a Portal Framework for Mobile Solution Delivery?

To create mobile applications that:

1. Integrate with your back-end systems, including web content management
2. Are personalized to a user's role, preferences, and behavior
3. Support end-user customization
4. Are secure
5. Can be measured and optimized using analytics
6. Can adapt their presentation and functionality according to the device



One common framework for mobile & web applications

Websphere Portal Themes for Smartphones

Extend Portal web experience to mobile devices though the use of Portal themes for smartphones

Optimizes look & feel for smaller screens (site branding, navigation, page layout)

Optimizes page download size for mobile connections

Create native-looking smartphone Portal themes using familiar technologies and skillsets (HTML, CSS, Javascript)

Two mobile theme options provided:

- Dedicated mobile themes can serve dedicated mobile pages and content
- Single theme can detect the device and serve mobile presentation or full site and content.

Sample themes can be downloaded on

Portal Solutions catalog

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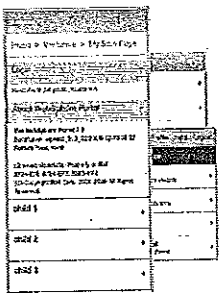


Mobile Portal Accelerator

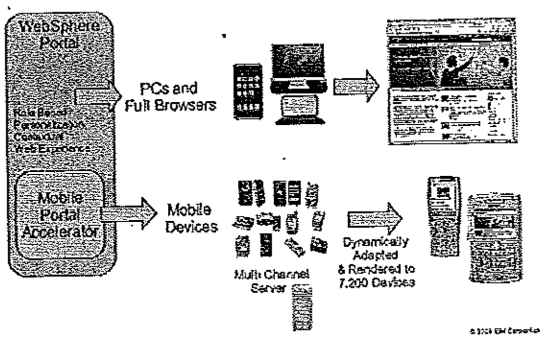
WebSphere Portal extension that delivers online content and applications to virtually all mobile devices.

Adapt your content to over 7,200 mobile devices. MPA provides intelligent Multi-Channel Server capabilities that dynamically renders content to specific device characteristics and capabilities.

Speed your development with Mobile Portal Toolkit which enables both the development and testing of XDIME (XHTML with Device Independent Markup Extensions) portlets in IBM Rational Application Developer.

Keep pace with the latest mobile devices with IBM Mobile Portal Accelerator Device Update. Provides regular updates to mobile device definitions as they become available from device manufacturers

Mobile Portal Accelerator - Mobile Multi-Channel Capabilities



Reference materials

- WebSphere Portal Wiki
  - [illegible]
- Portal Zone on developerWorks
  - [illegible]
- Portal Business Solutions Catalog
  - [illegible]
- WebSphere Portal Product Information
  - [illegible]
- WebSphere Portal Information Center
  - [illegible]
- Self-Help Central for Portal
  - [illegible]
- Migration Central for Portal and Web Content Management
  - [illegible]
- IBM Software Events
  - [illegible]

IBM
Questions
&
Answers

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Chapter 5: IBM WebSphere Portal

Objectives

In this exercise, you will integrate existing web content into your new IBM® WebSphere® Portal. This shows you how easily and quickly you can consolidate existing content into your Portal.

- **Web Page Portlet** – configure and display Google and Yahoo webpage

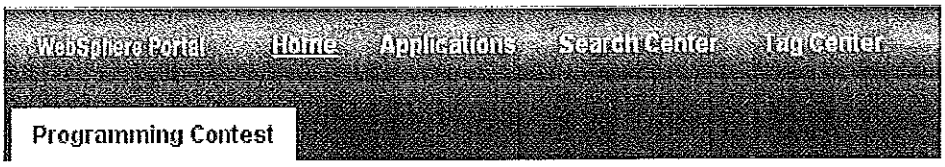
When finished, you will see a portlet for each exercise, and the specified content displayed inside each portlet.

Exercises

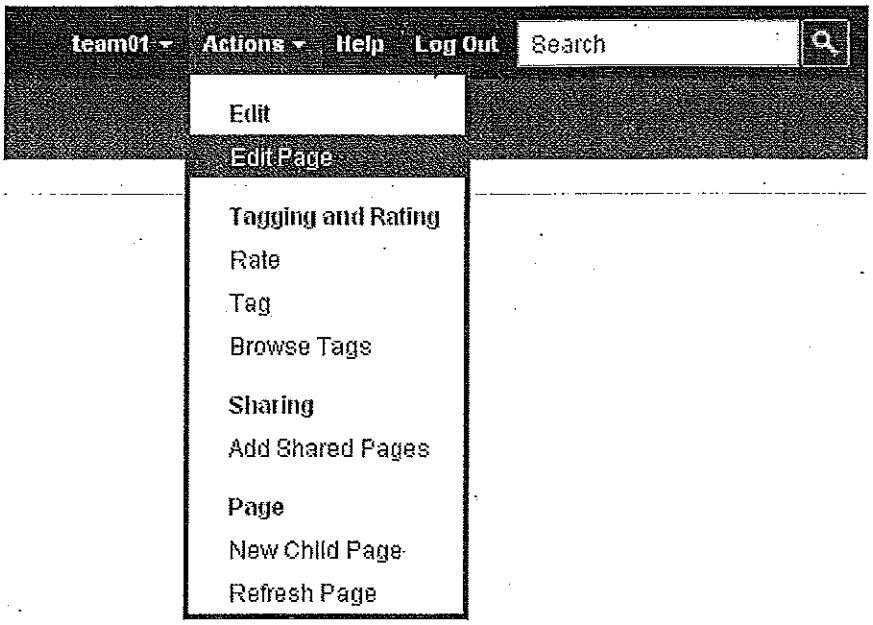
Add Webpage portlets to the page

__1. Open a new browser (Portal should be the default URL http://allen.ibm.com:10039/wps/myportal) and login to the base Portal using **teamXX/password** as your credentials. ***XX*** is your team number. For example team 1 uses **team01/password**, team 30 uses **team30/password.**

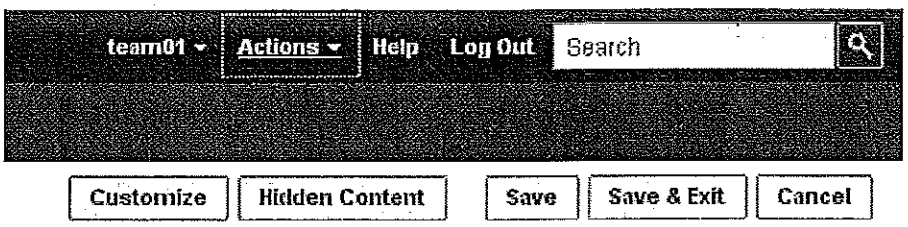
__2. Click **Home.** It should be the default page. It is blank at the moment



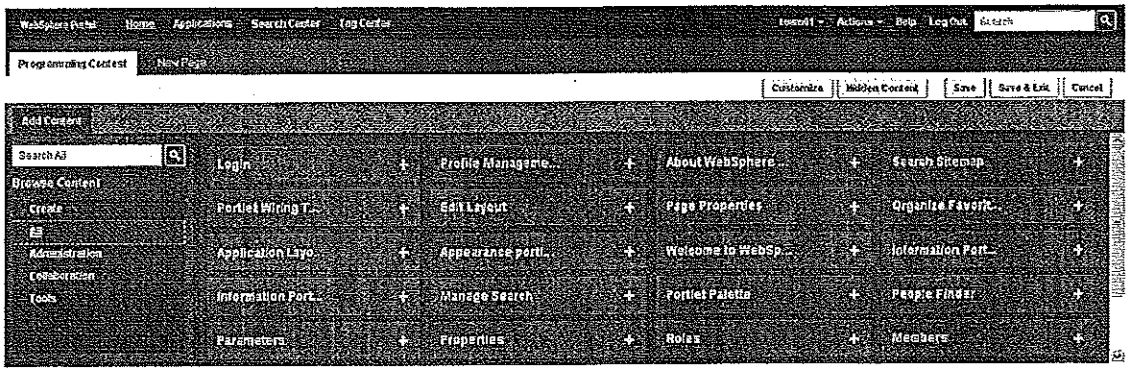
__3. Click **Actions** on the top right corner, then **Edit Page**.



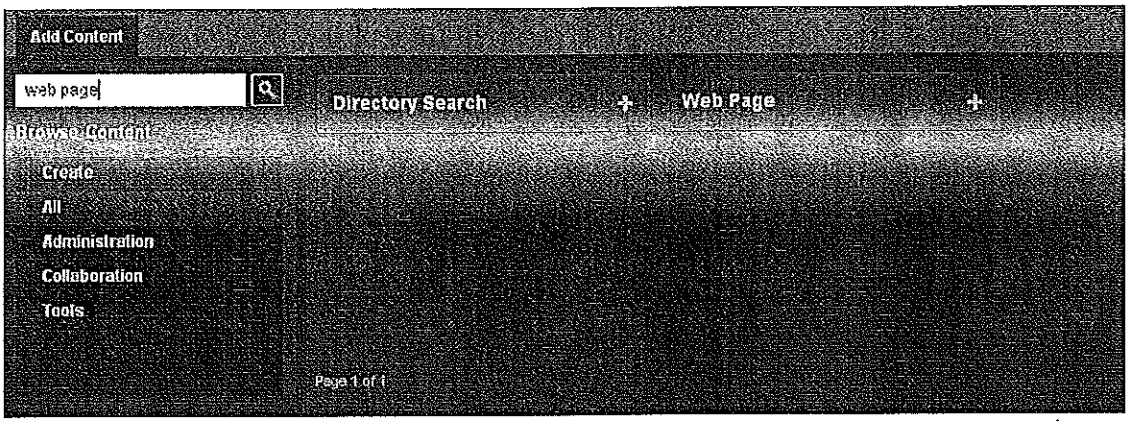
__4. Click **Customize**.



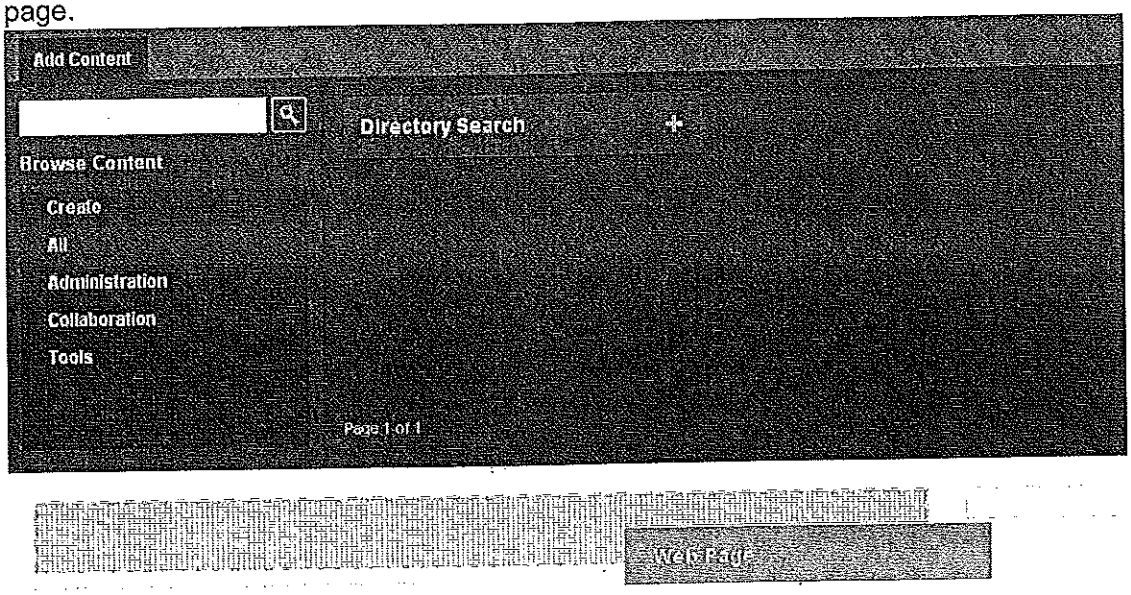
__5. You can see a list of portlets. Click **All** to show all portlets.



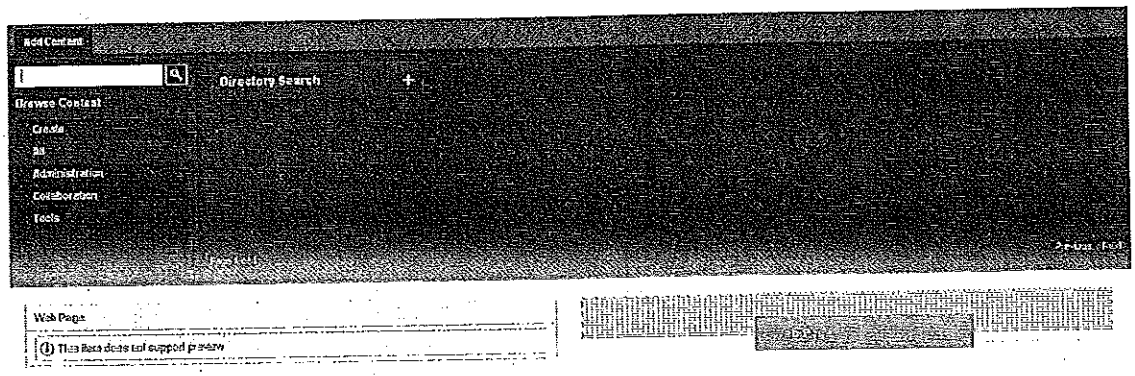
__6. In the Search field, type **web page** and click  to search for the Web Page portlet.



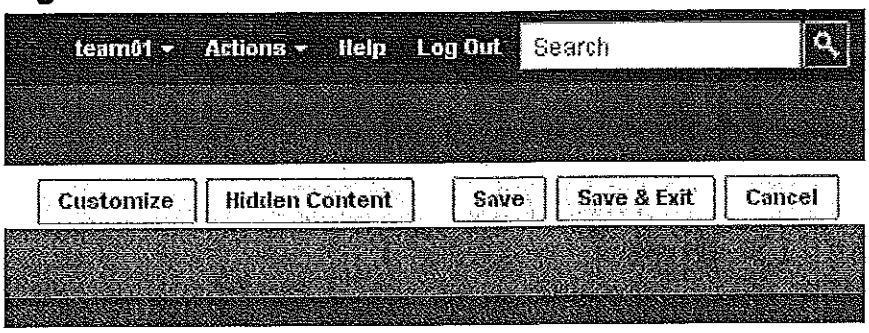
__7. To add the portlet to the page, you can press  or drag & drop it to the page.

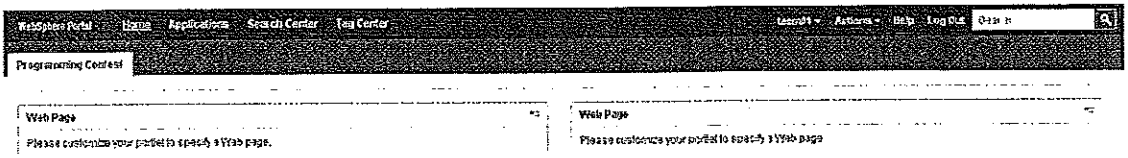


__8. To add another portlet, you can press  again or drag & drop it to another column on the page.



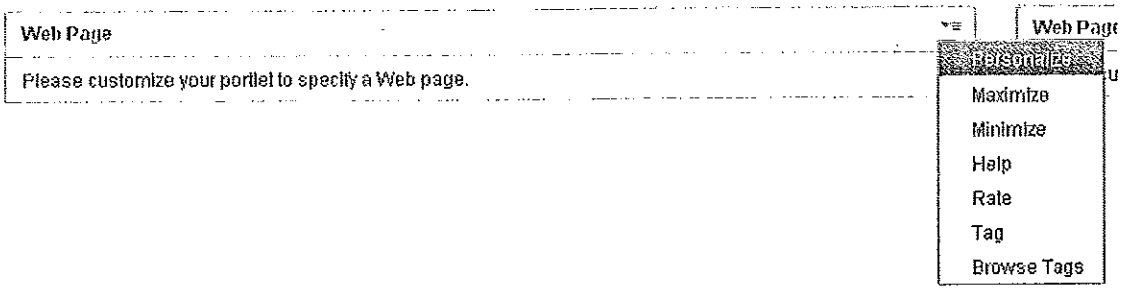
__9. Click **Save & Exit.**



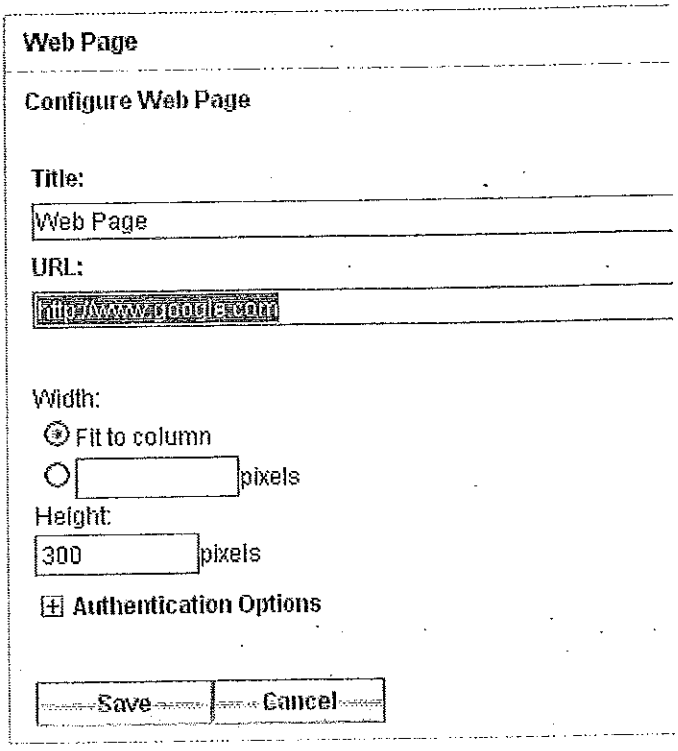


Configure the portlets

__10. Click on the arrow on the top right corner of one of the portlet and select **Personalize.**

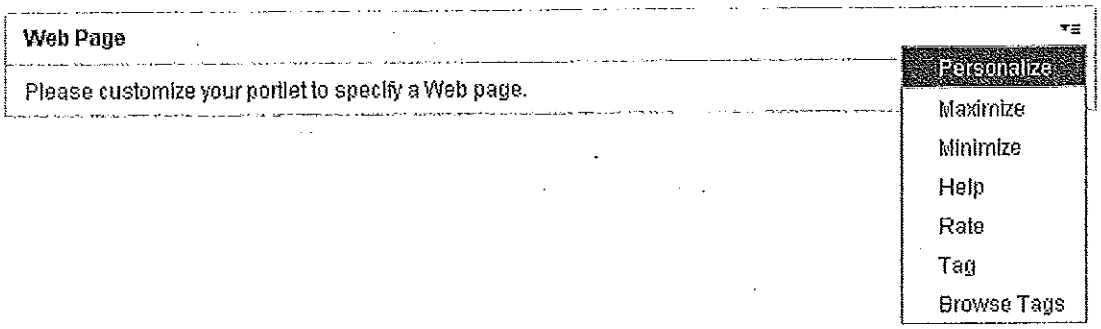


__11. Type *www.google.com* in the URL filed. Then click **Save**.

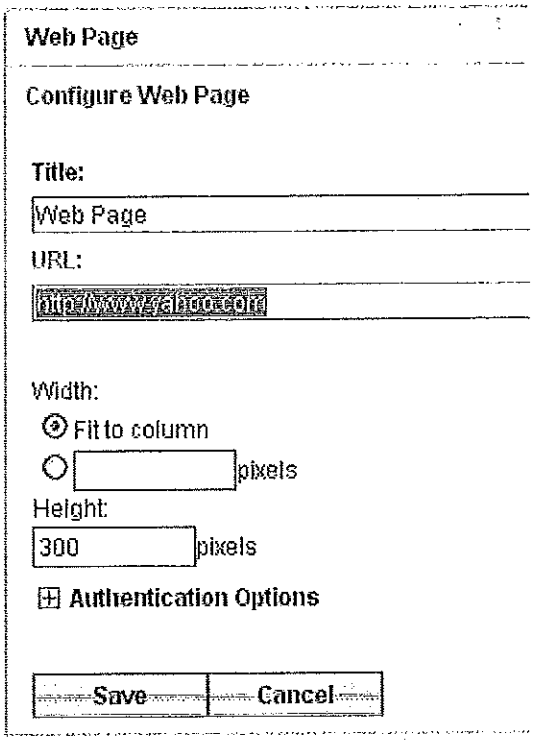


__12. See the Google webpage!

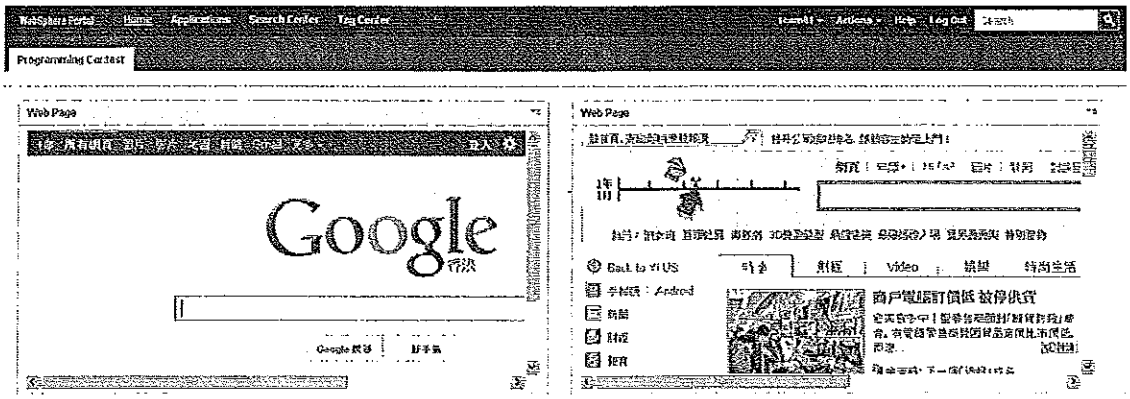
__13. Click on the arrow on the top right corner of the other portlet and select **Personalize**.



__14. Type *www.yahoo.com* in the URL filed. Then click **Save**.



__15. See both Google and Yahoo webpage!



End of Exercise

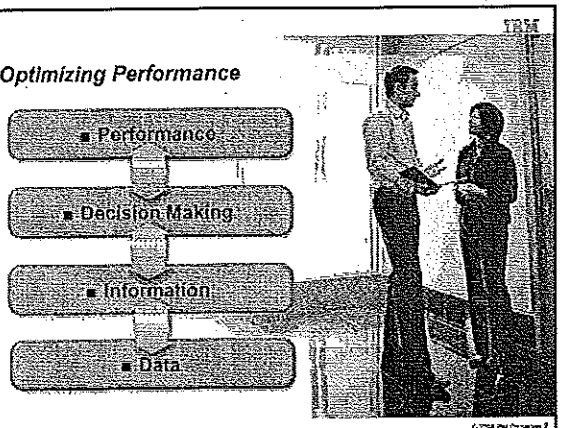
IBM Software Group Hong Kong
07 Jan 2012

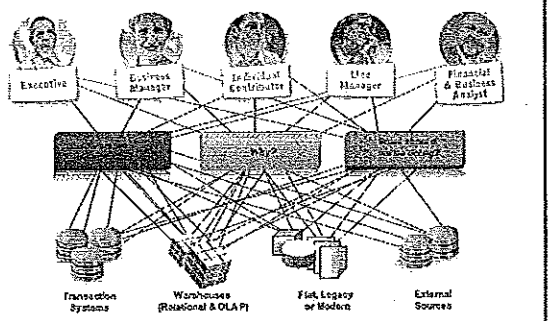
IBM Inter-University Programming Contest 2011 Training

Chapter : Business Analytic

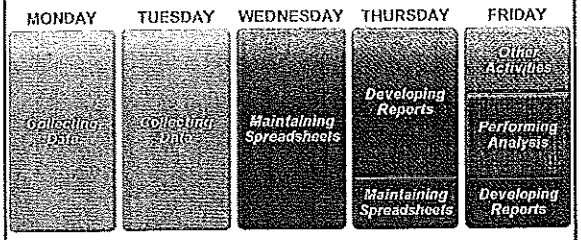
IBM Inter-University
Programming Contest 2012
February 11, 2012 (Saturday)
Chinese, Hong Kong

Optimizing Performance

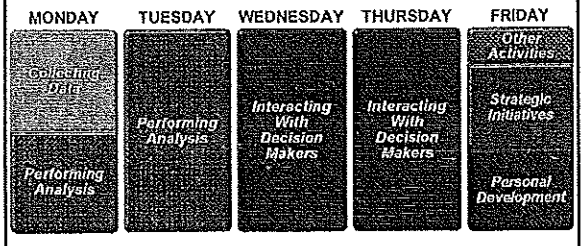




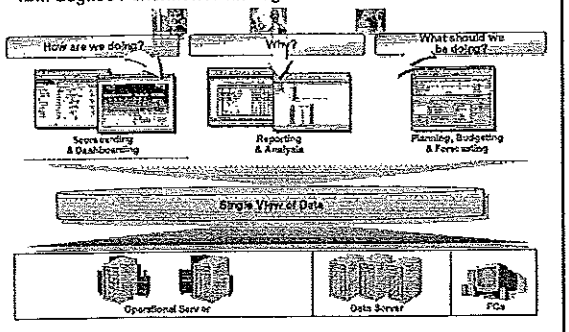
Many Organizations are wasting valuable talent



The Best Drive Analytics & Insight



IBM Cognos Performance Management Solution



IBM

How can we help?

- Provide information and knowledge about your customers, your competitors, your partners
- Enable public safety & security organizations to create a flexible and reliable information environment
- Deliver a foundation for more proactive law enforcement /policing
- Provide greater predictive analysis and data mining from disparate data sources
- Provide visibility and control of information across the organization.
- Respond to inquiries, requests for services and investigative actions in a timely manner and increase citizen satisfaction
- Increase quality of decisions by providing more accurate, timely reporting.
- Move beyond physical records retention to electronic transactional history, reporting, analysis, planning and monitoring.

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Broad Range of BI Capabilities

Reporting

- Provides full breadth of report types
- Delivers consistent information across all types of report output
- Can be personalized and targeted
- Enables collaboration across users, communities and with IT
- Provides access via email, portal, MS-Office, search and mobile devices etc

Analysis

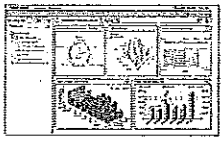
- Provides guided exploration across multiple dimensions of information
- Performs complex analysis and scenario modeling easily and quickly
- Gets to the "why" behind trends to reveal symptoms and causes
- Moves from summary level to detail levels of information effortlessly

IBM

Broad Range of BI Capabilities

Dashboards

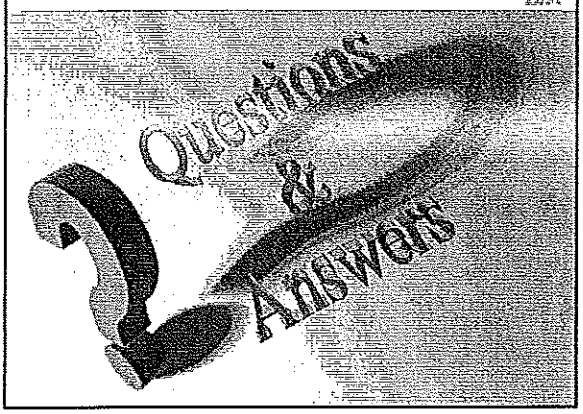
- Provides at-a-glance, high impact views of complex information
- Helps quick focus on issues that need attention and action
- Are highly visual and intuitive
- Combines information across disparate sources



Scorecards

- Provides instant measurement relative to targets and benchmarks
- Aligns decisions and tactics with strategic initiatives
- Supports scorecarding methodologies
- Ensures ownership and accountability

IBM



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Programming Contest 2012

Chapter 6: Cognos Business Intelligence

In this exercise, we will learn:

- Using Report Studio to create a Chart Report

Exercises

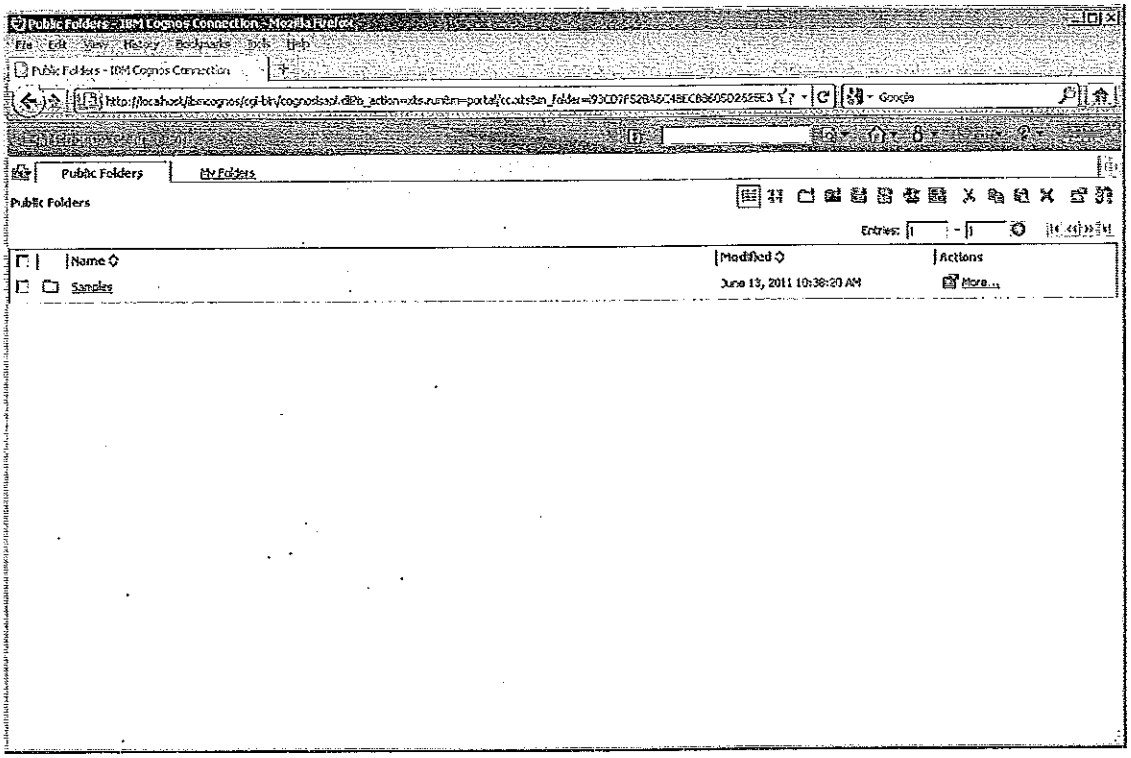
Purpose:
You want to create a report that shows revenue by product line and quantity by region. You want the report to focus on Camping Equipment, Mountaineering Equipment, and Personal Accessories sales for the three European sales regions. You will build a combination chart and a crosstab that report on the same information.

Task 1. Create a combination chart.

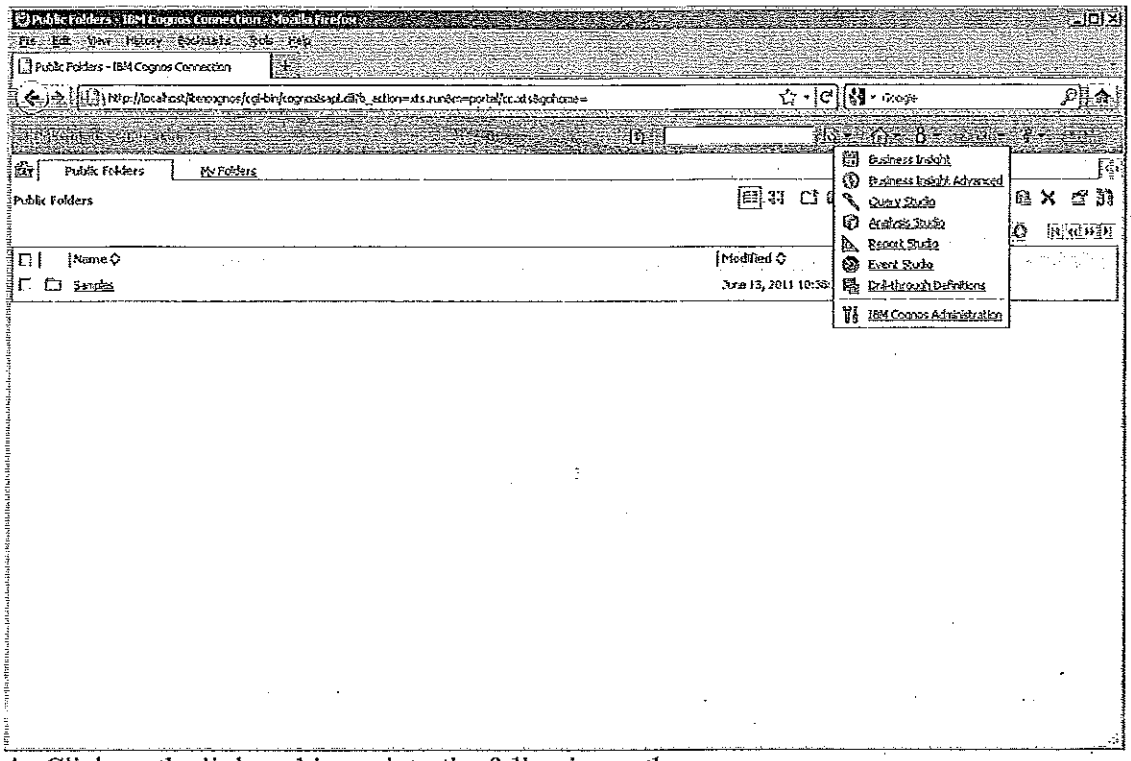
1. Log into the PC using the username and password provided by instructor.

2. Open an Firefox Browser and then go to the following link:

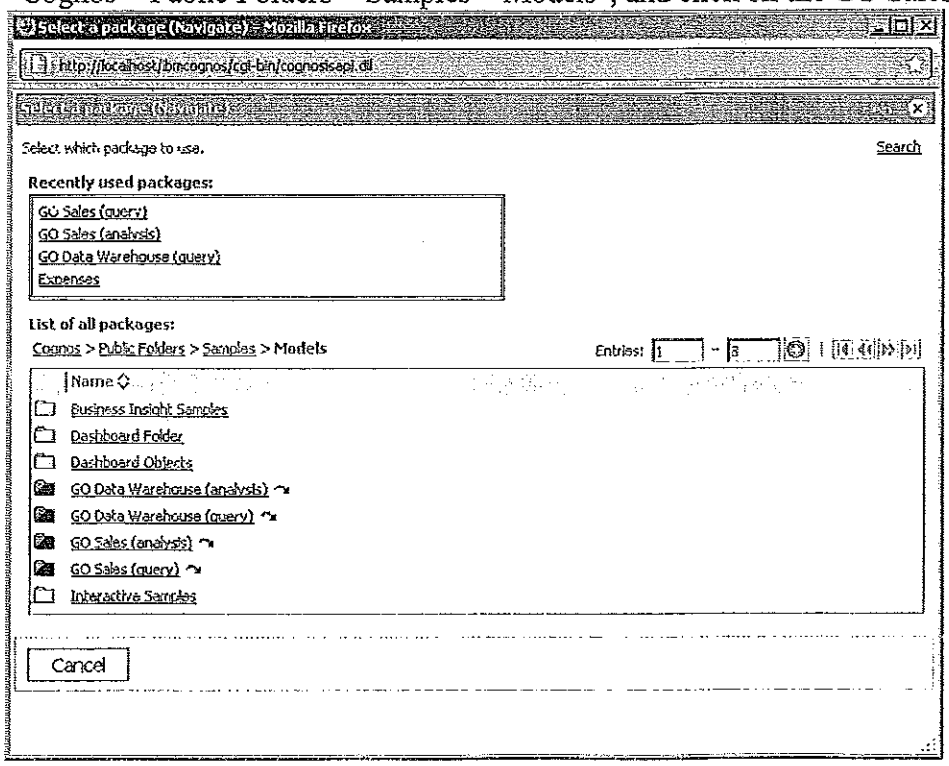
   http://*IP to be assigned*/ibmcognos/



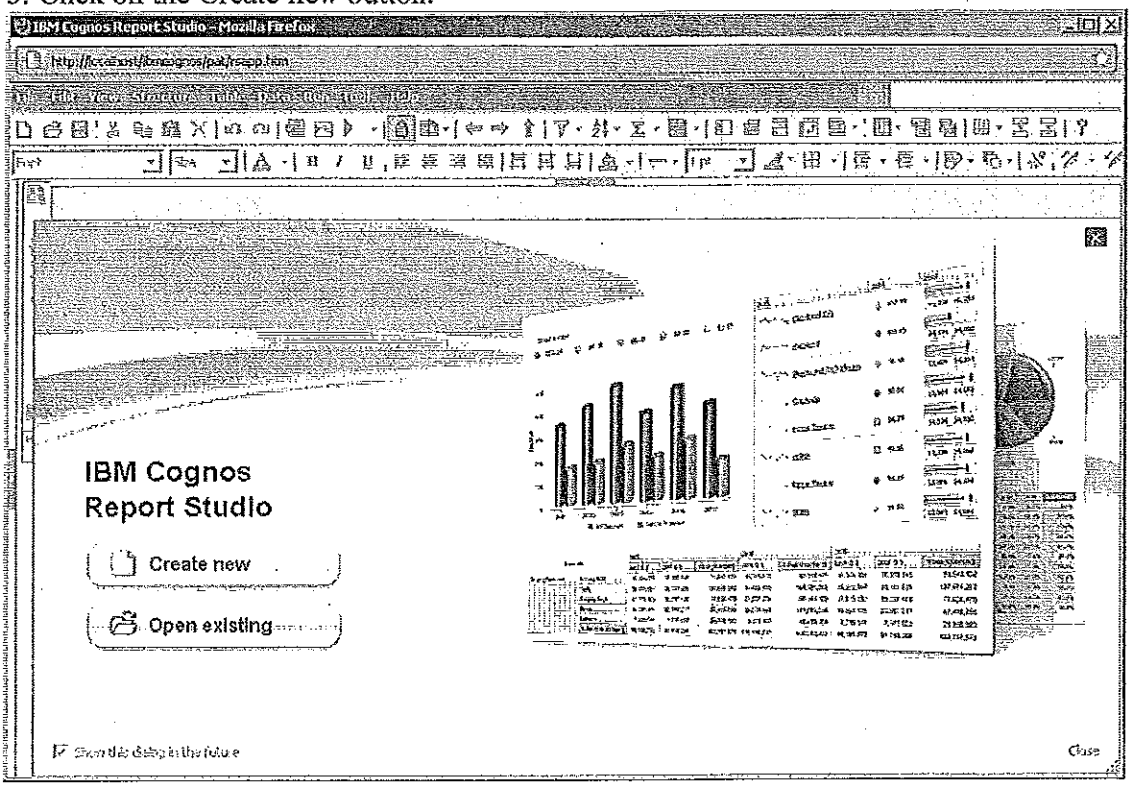
3. Click on the Right Top "Launch" - > Report Studio:



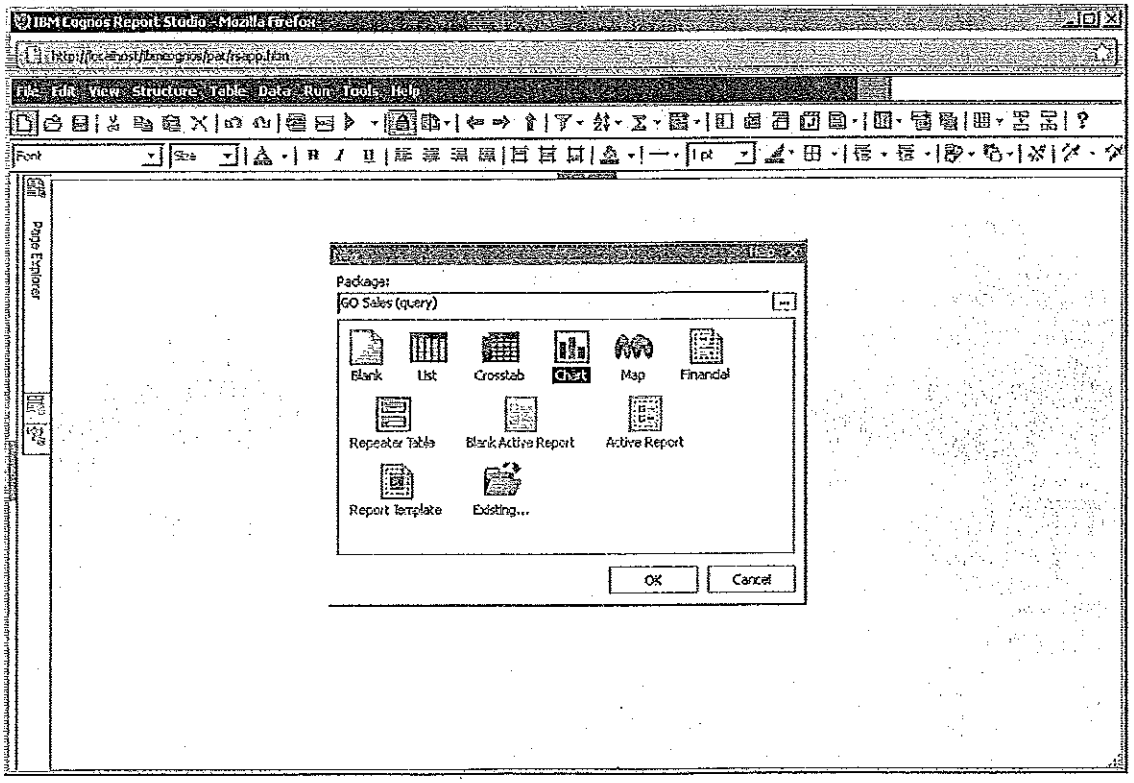
4 . Click on the link and jump into the following path:
"Cognos > Public Folders > Samples > Models", and click on the GO Sales (query) link:



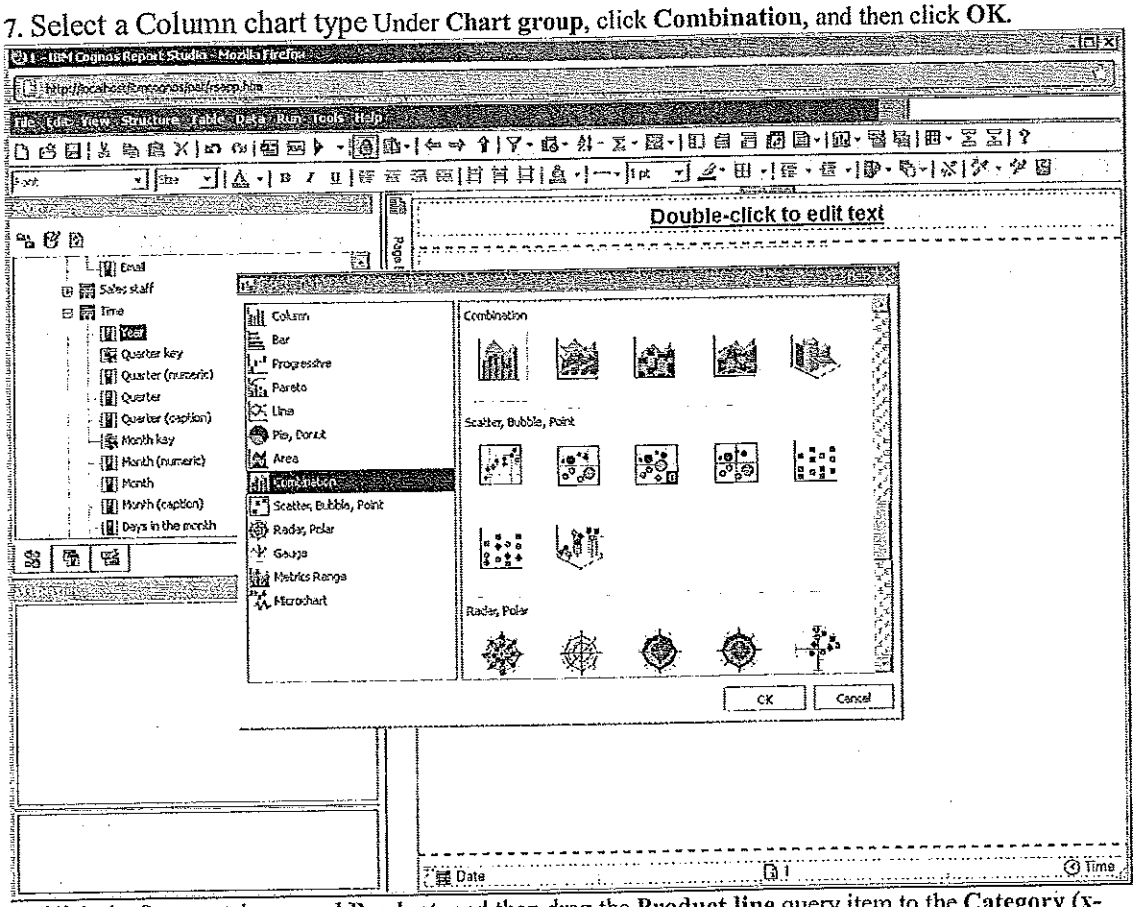
5. Click on the Create new button:



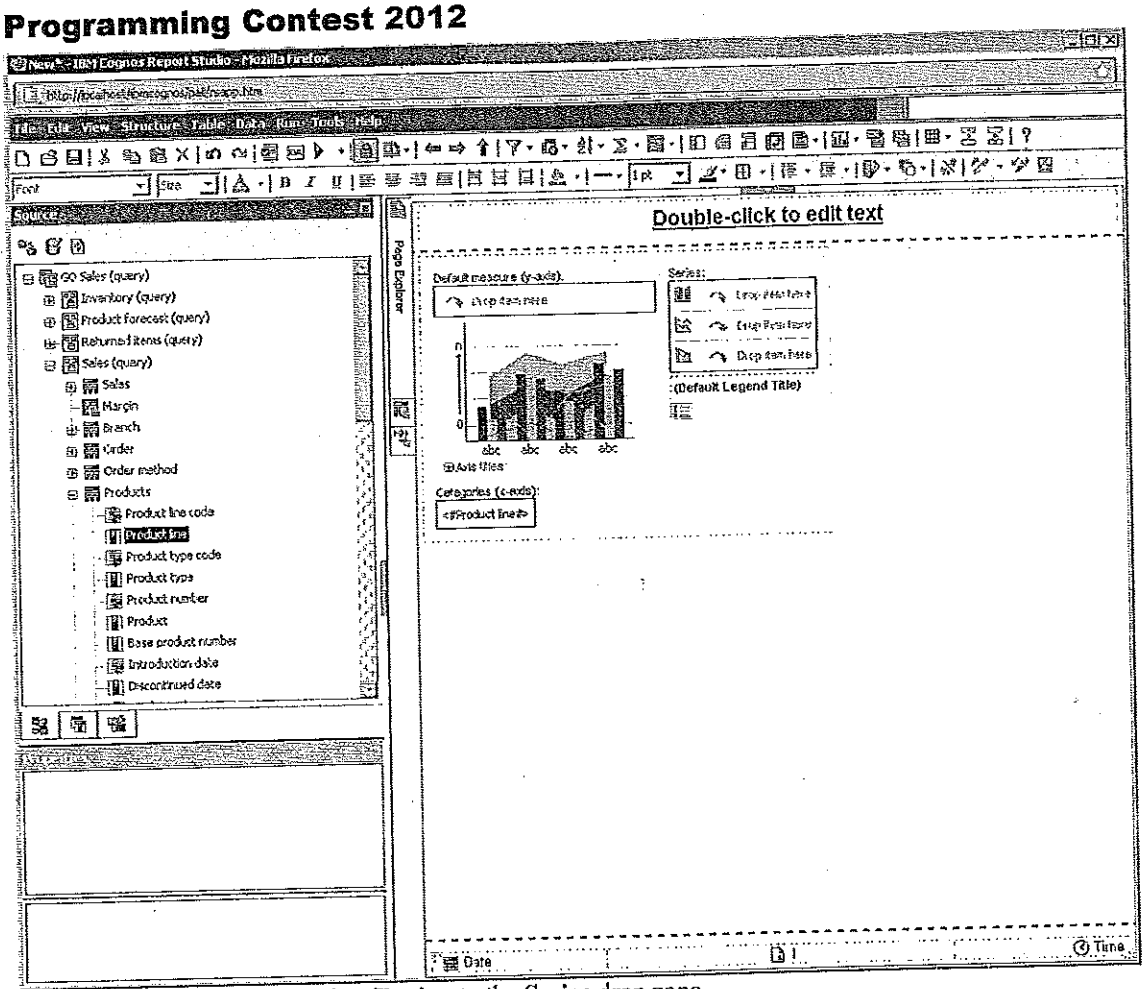
6 . Select Chart:



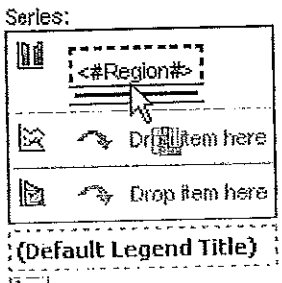
7. Select a Column chart type Under **Chart group**, click **Combination**, and then click **OK**.



8. Click the **Source** tab, expand **Product**, and then drag the **Product line** query item to the **Category (x-axis)** drop zone.



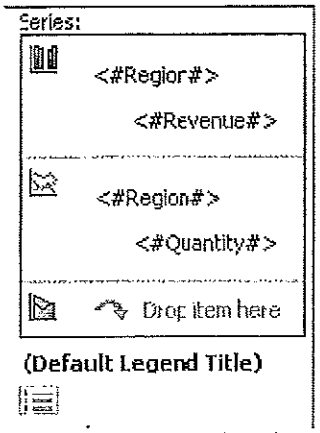
9. Expand **Retailer site**, and drag **Region** to the **Series** drop zone.
Expand **Sales**, and drag **Revenue** under <#Region#>, inside the same box.
The results appear as follows:



Task 2. Show two measures on different Y axes.

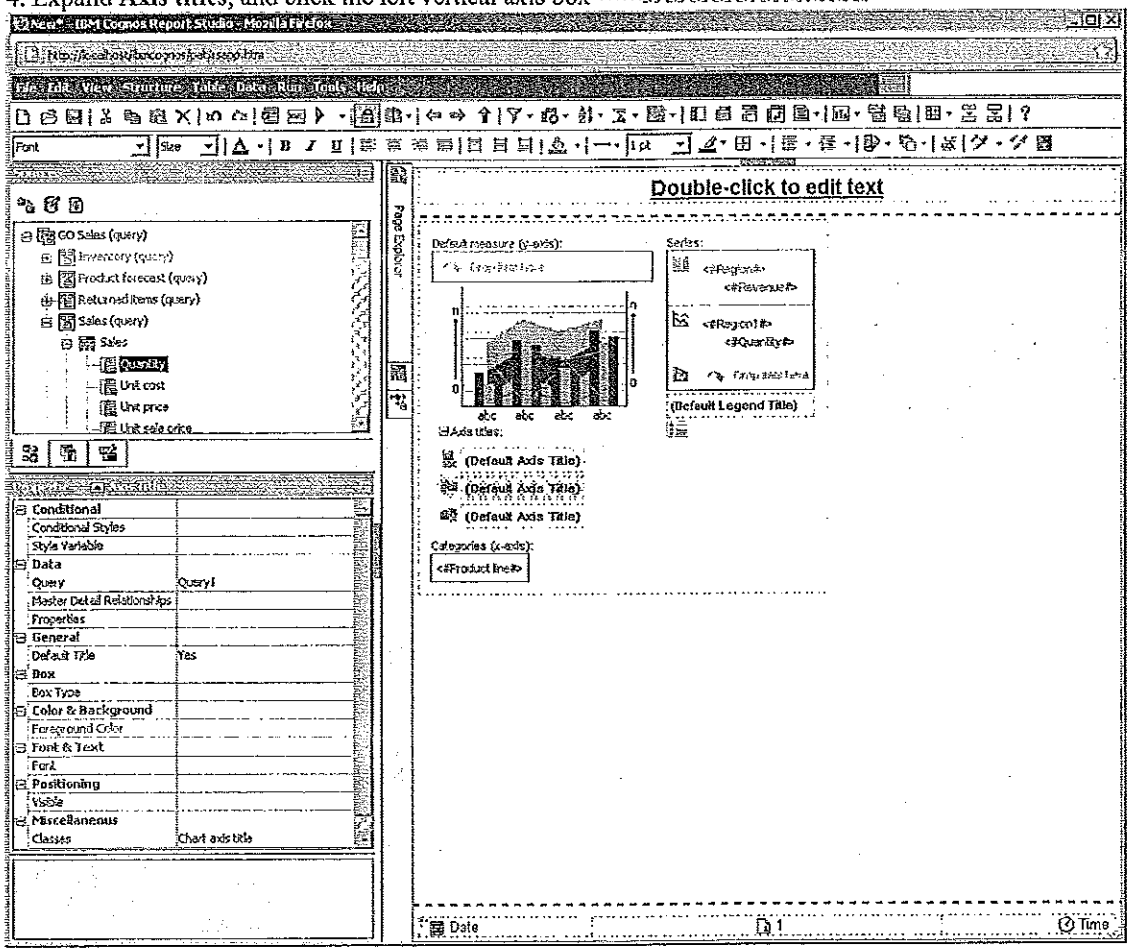
1. In the Source tab, on the **Data Items** tab, drag **Region** to the second **Series** box.
2. From the **Source** tab, drag **Quantity** under **Region** inside the second **Series** box.

The results appear as follows:

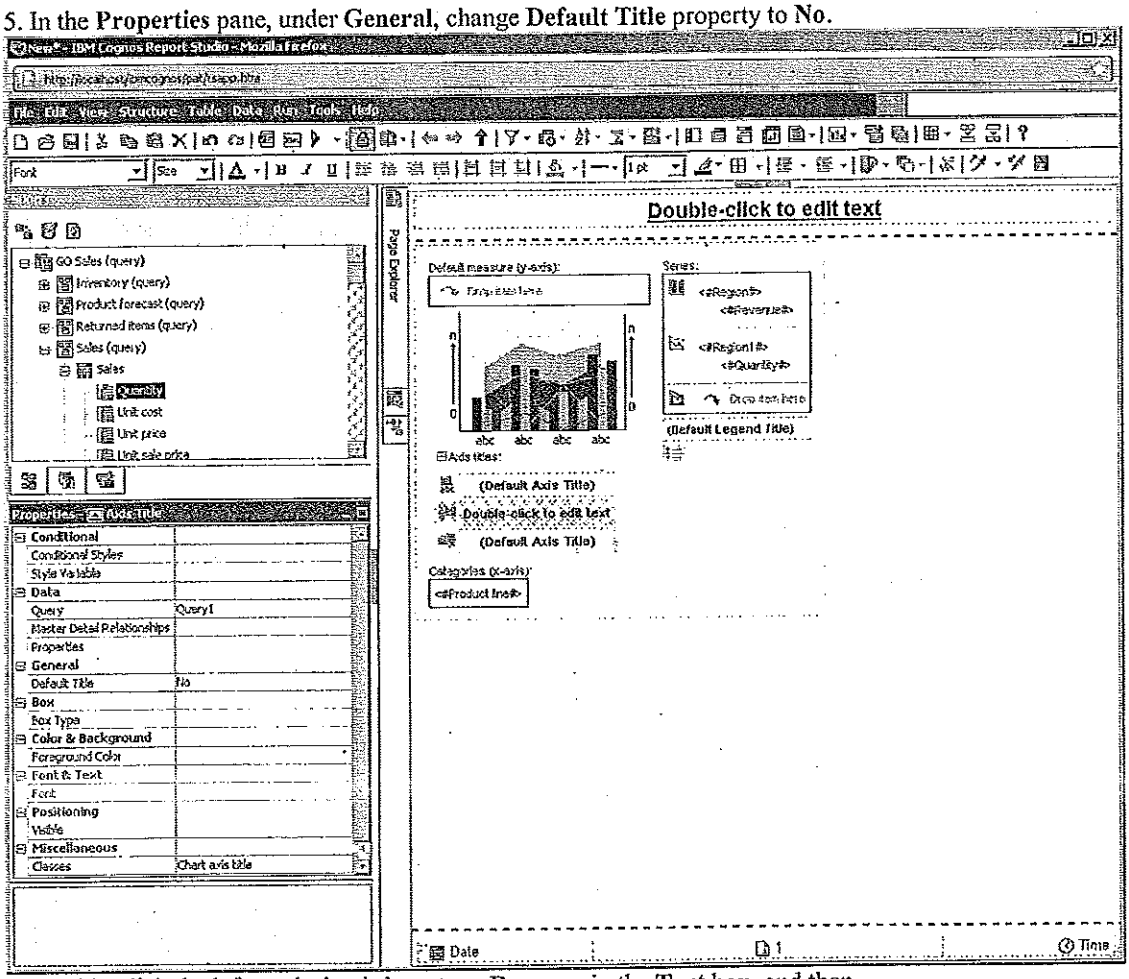


3. Click on the chart icon in the second **Series** box to select it, and in the **Properties** pane, in the **Axis Assignment** list, click **Y2 Axis**.

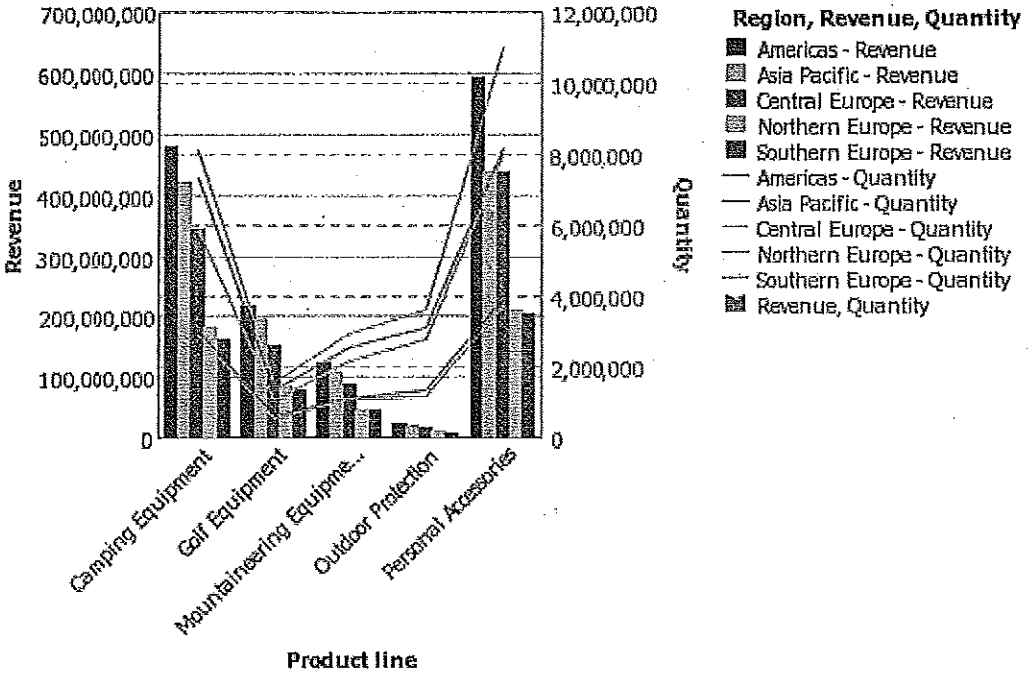
4. Expand **Axis titles**, and click the left vertical axis box (Default Axis Title)



5. In the Properties pane, under General, change Default Title property to No.



6. Double-click the left vertical axis box, type Revenue in the Text box, and then click OK.
7. On the toolbar, click Run Report.
The results appear as follows:

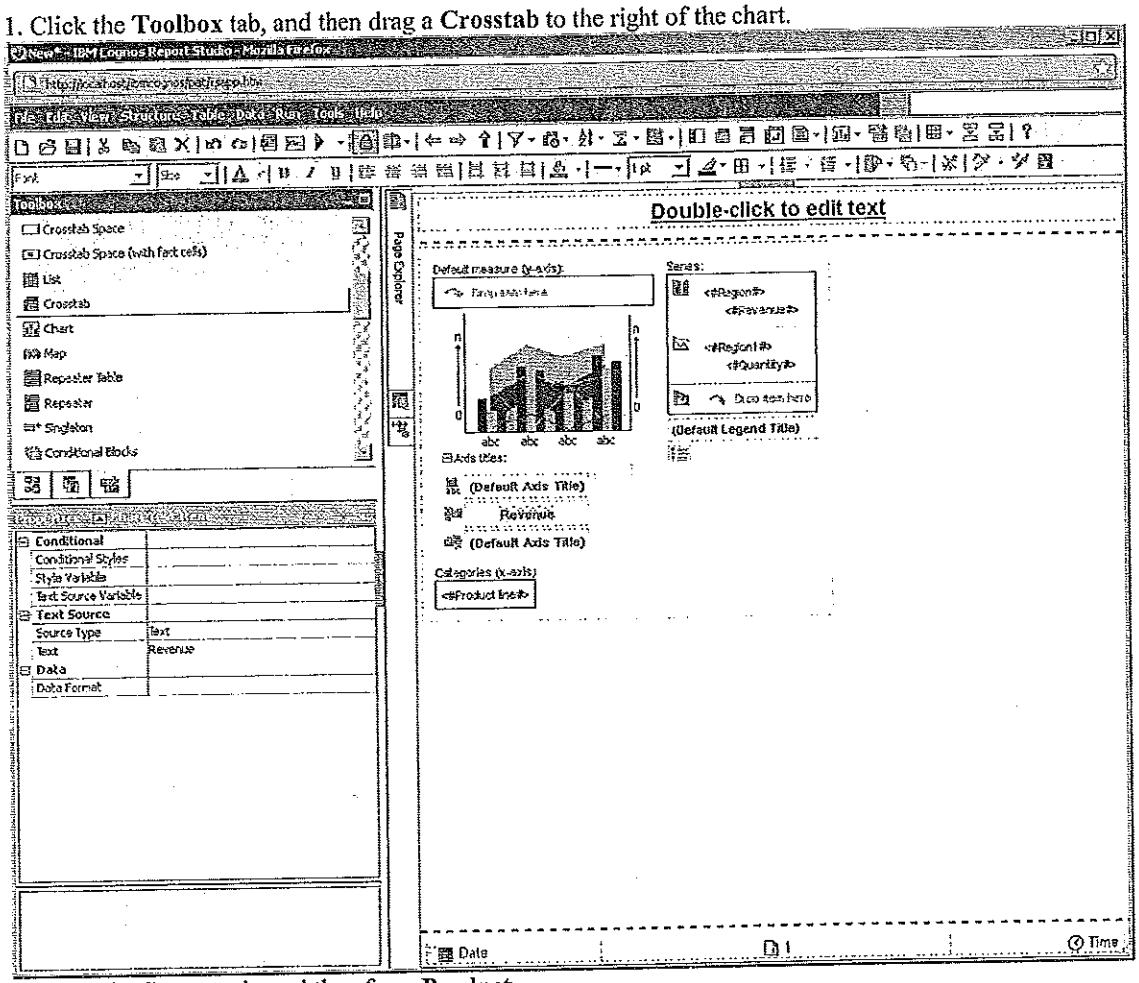


This chart is too complicated for your consumers to read clearly. In Task 4 you will add filters to report only on Camping Equipment, Mountaineering Equipment, and Personal Accessories in the three European regions.

8. Close **Cognos Viewer**.

Task 3. Add a crosstab to the report.

1. Click the **Toolbox** tab, and then drag a **Crosstab** to the right of the chart.



2. Click the **Source** tab, and then from **Product** drag **Product line** to **Rows**.

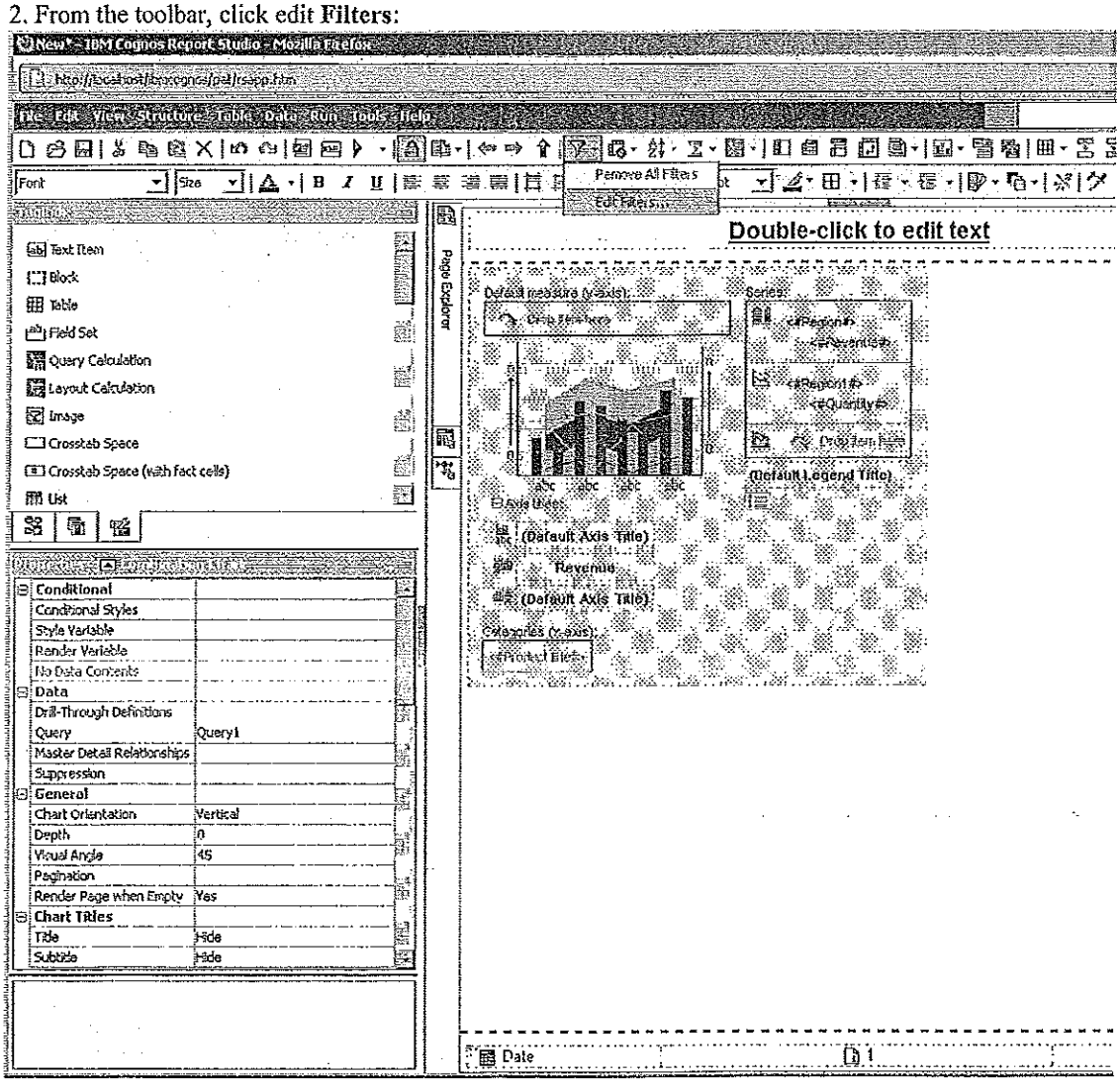
3. From **Retailer site**, drag **Region** to **Columns**.
4. From **Sales fact**, drag **Revenue** under **Region** as a nested column.
5. Drag **Quantity** to the right of **Revenue** as another nested column under **Region**.

	<#Region#>		<#Region#>	
	<#Revenue#>	<#Revenue#>	<#Revenue#>	<#Revenue#>
<#Product line#>	<#1234#>	<#1234#>	<#1234#>	<#1234#>
<#Product line#>	<#1234#>	<#1234#>	<#1234#>	<#1234#>

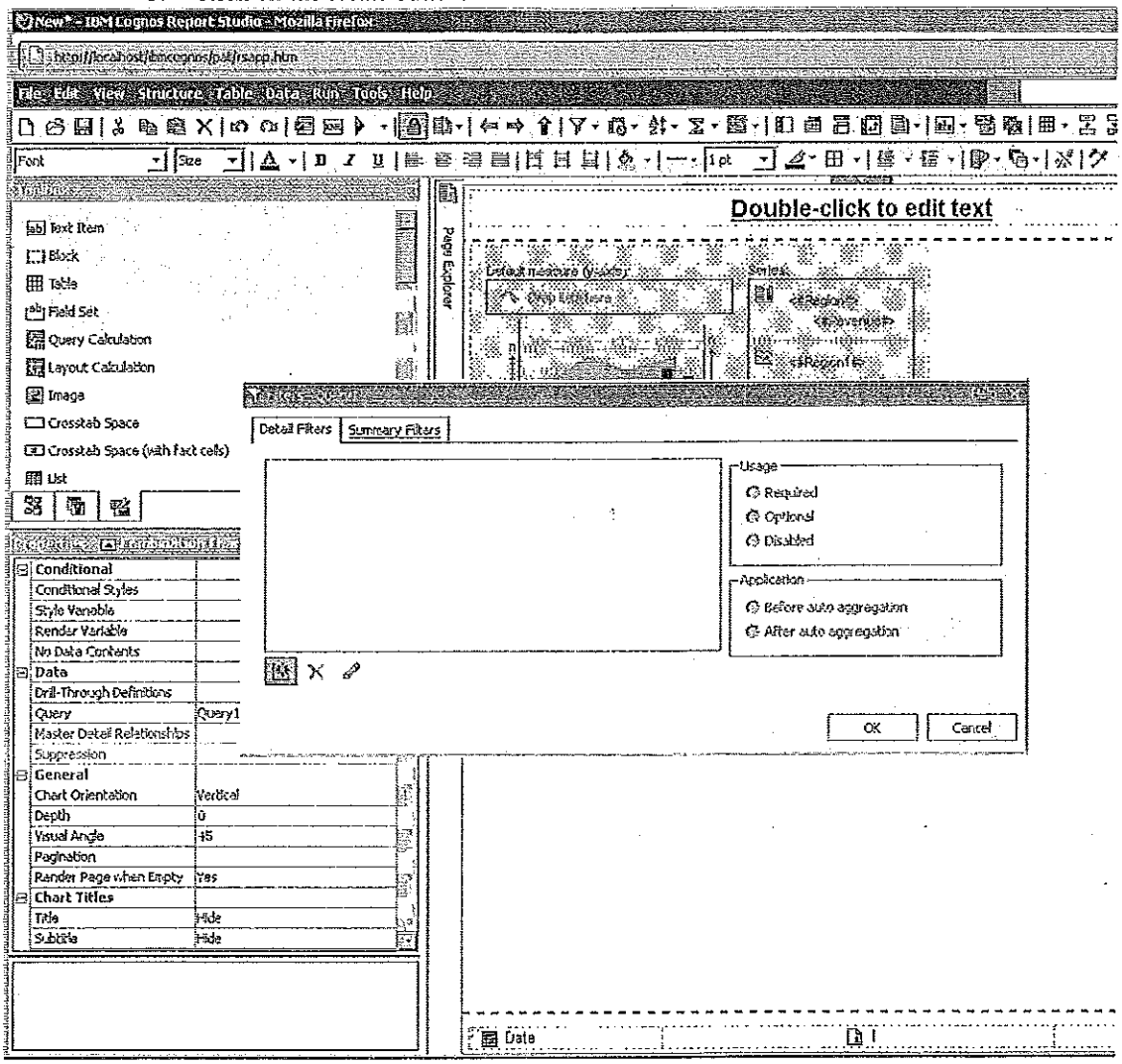
6. Run the report.
You can see in the combination chart that the top revenue generating region is Americas. The crosstab provides the exact numbers as in the chart. You want to filter the results to focus on sales in the European regions for Camping Equipment, Mountaineering Equipment, and Personal Accessories.
7. Close **Cognos Viewer**.

Task 4. Add filters to focus the data.

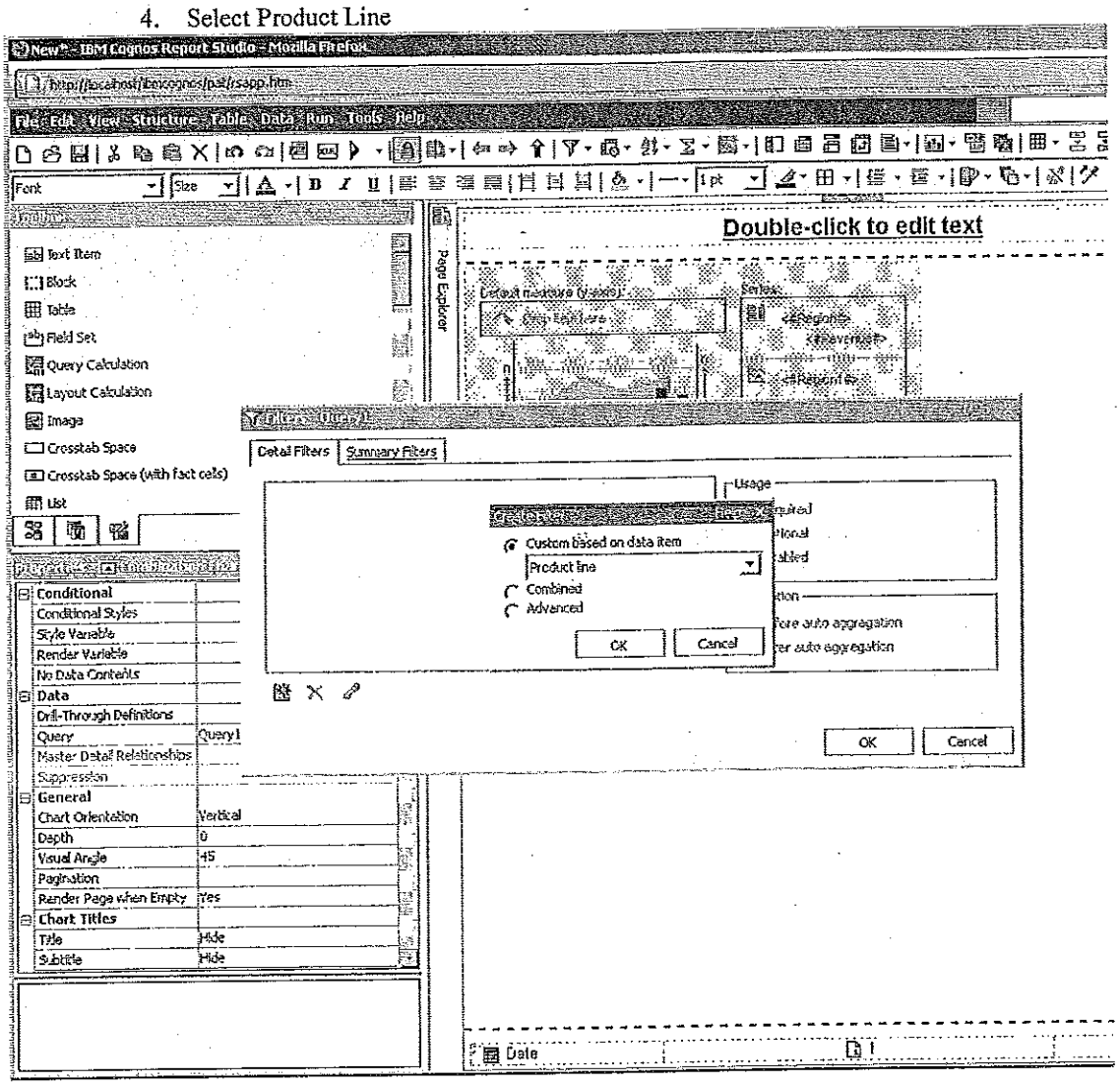
1. Click the combination chart to select it.
2. From the toolbar, click edit **Filters**:



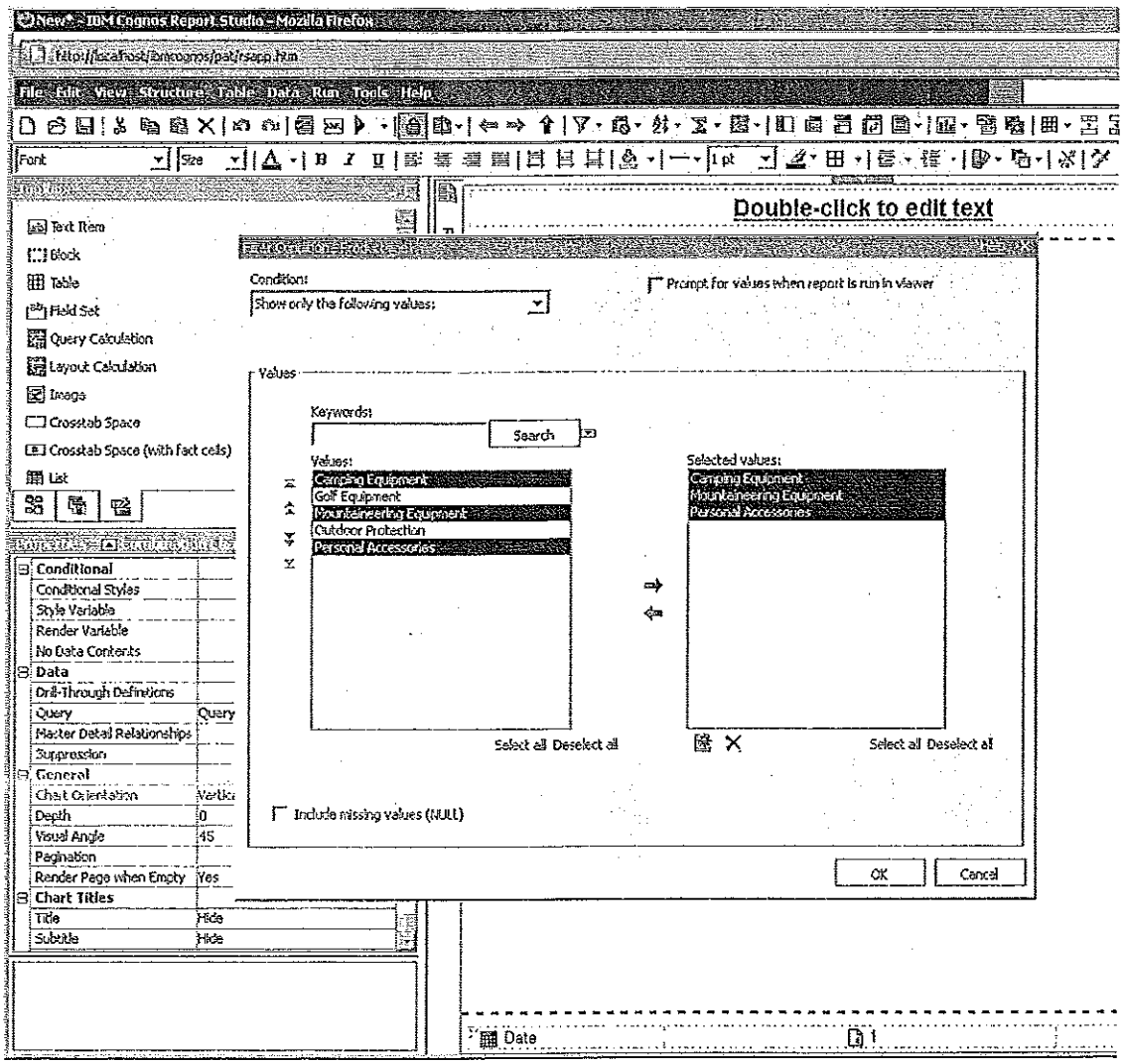
3. Click on the create button:



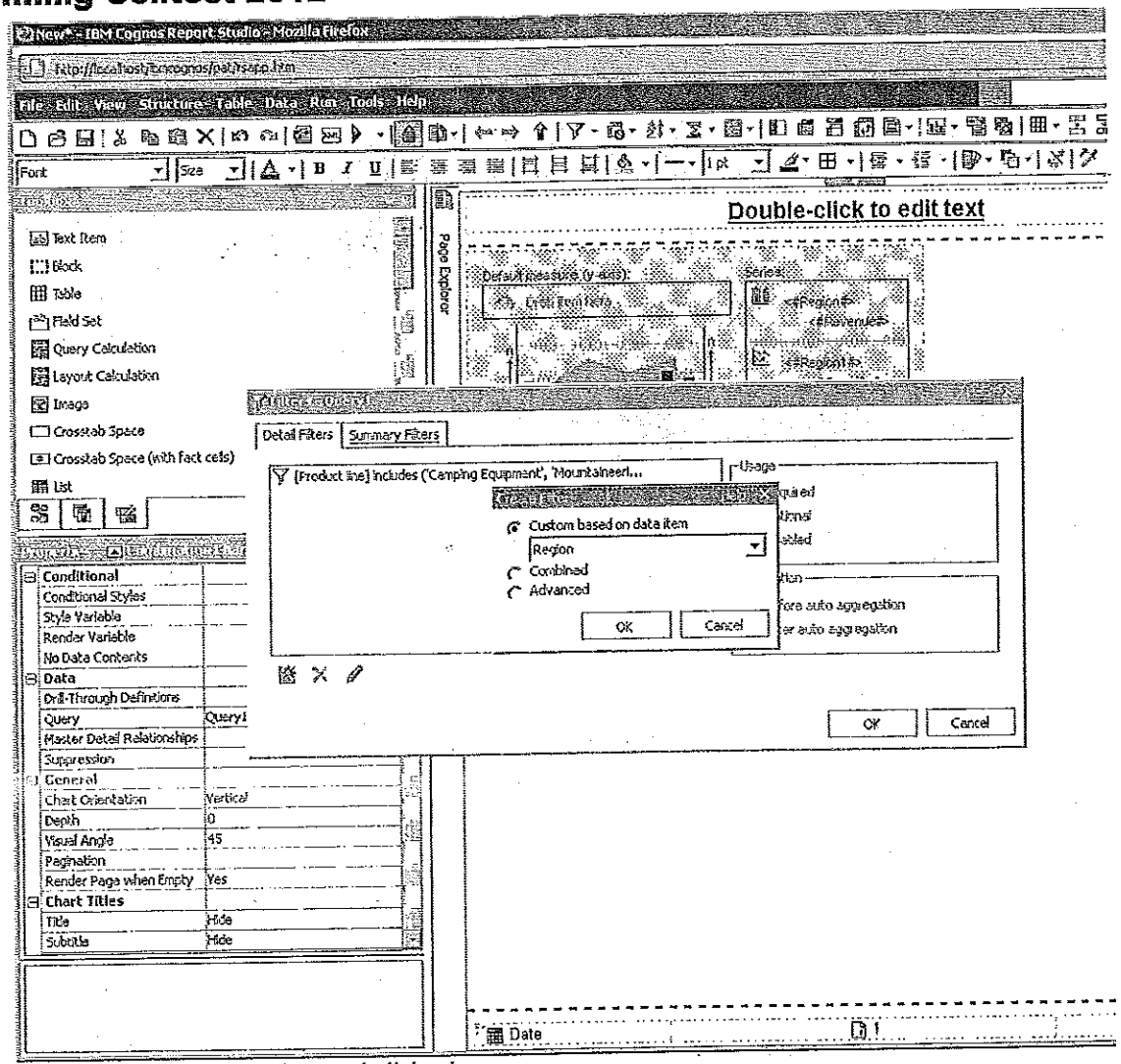
4. Select Product Line



5. **Select 'Camping Equipment', 'Mountaineering Equipment', 'Personal Accessories' and add to the right hand side**

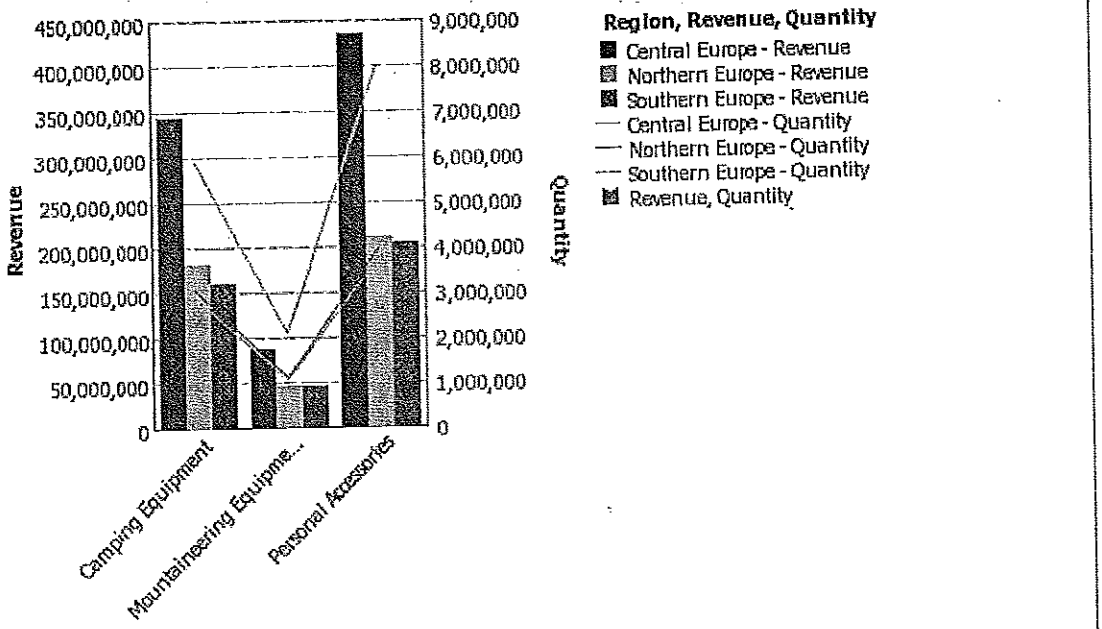


6. Add another filter using **Region** as follows:**'Northern Europe', 'Southern Europe', 'Central Europe'**



7. Click OK Twice to close each dialog box.
8. Repeat steps 4 - 6 to add the same filters (Region and Product line) to the crosstab. Run the report.

The result appears as shown below:

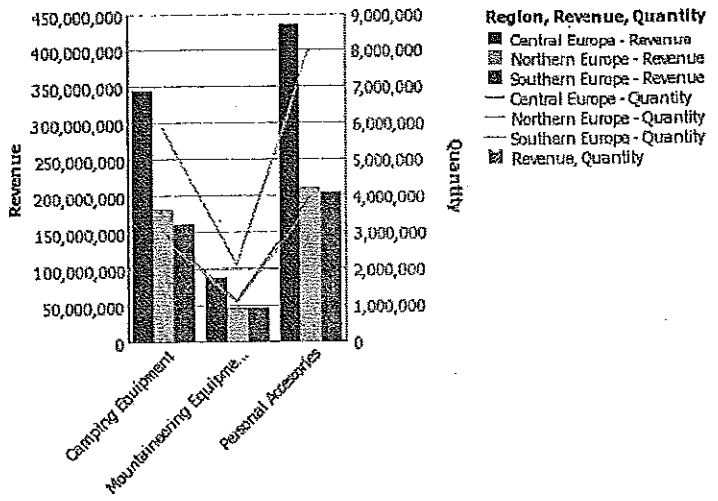


Product line

	Central Europe		Northern Europe		Southern Europe	
	Revenue	Quantity	Revenue	Quantity	Revenue	Quantity
Camping Equipment	343,645,848.36	5,904,428	160,851,396.88	3,046,563	161,454,246.13	2,882,345
Mountaineering Equipment	88,051,532.89	2,146,207	46,091,108.04	1,131,215	44,884,319.08	1,102,837
Personal Accessories	437,336,485.23	8,016,774	210,608,208.82	3,954,449	204,231,710	3,739,270

9. Close Cognos Viewer.

Results:
You created a combination chart with two measures on different Y axes and then added a crosstab to see product line sales revenue and quantity by region. You focused on Camping Equipment, Mountaineering Equipment, and Personal Accessories sales for the three European sales regions.



	Central Europe		Northern Europe		Southern Europe	
	Revenue	Quantity	Revenue	Quantity	Revenue	Quantity
Camping Equipment	343,645,848.36	5,904,428	180,851,396.88	3,046,563	161,454,246.13	2,882,345
Mountaineering Equipment	88,051,532.89	2,146,207	46,091,108.04	1,131,215	44,884,319.08	1,102,837
Personal Accessories	437,336,485.23	8,016,774	210,608,208.82	3,954,449	204,231,710	3,739,270

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Chapter 6B: Multiple Choice Screen Walkthrough

Objectives

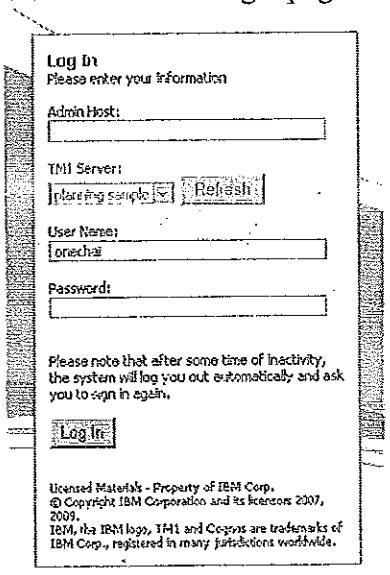
In this exercise, we will learn:

- How to connect to the multiple choice screen
- How to log in
- How to answer each multiple choice question
- How to submit your answer once you are finished
- How to examine your submission status

Exercises

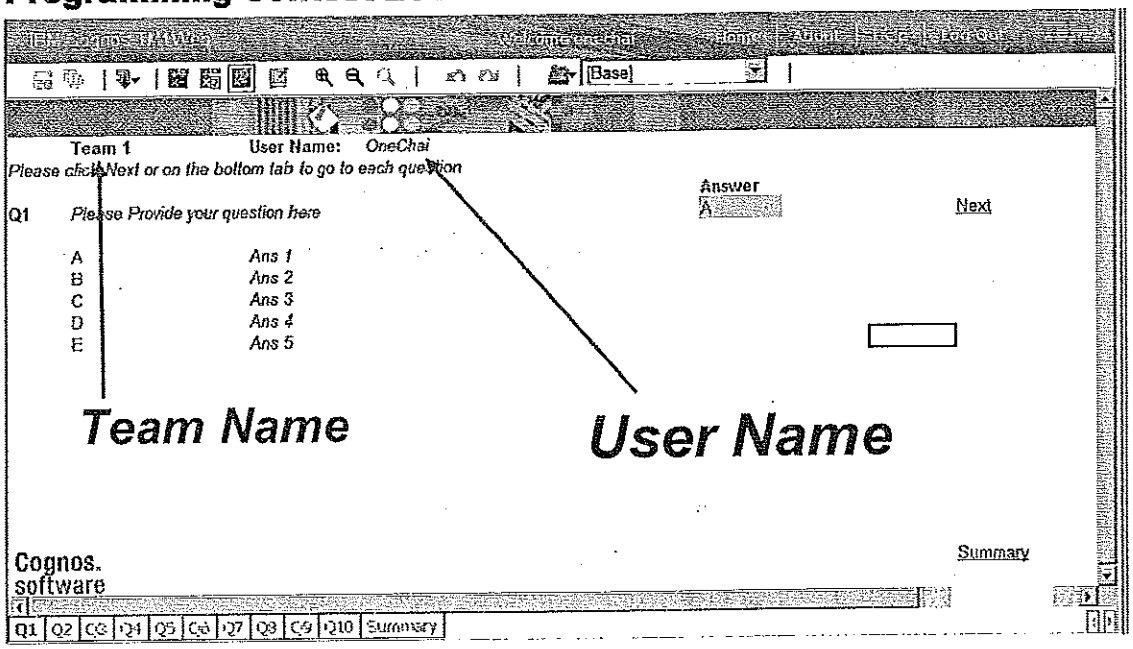
1. In the VM that is started in Chapter 1, open an Internet Explorer and type the URL http://cogserver/tm1web

   You will see the login page like this,

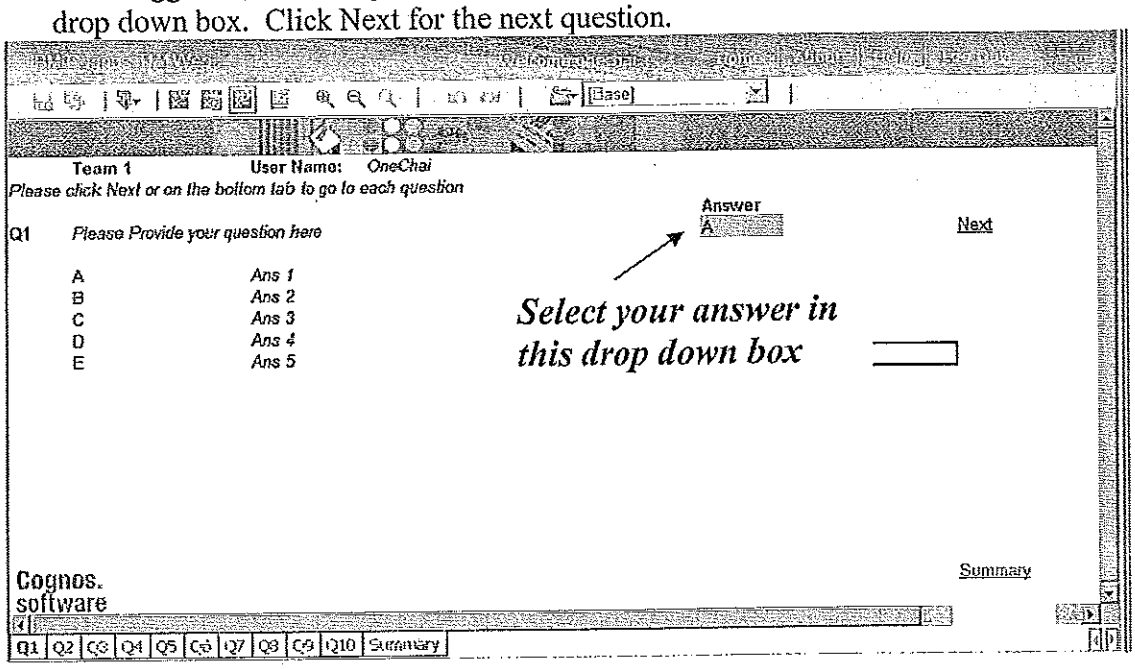


2. In the Log In screen, just leave the Admin Host blank, and select "planning sample" in the TM1 Server.

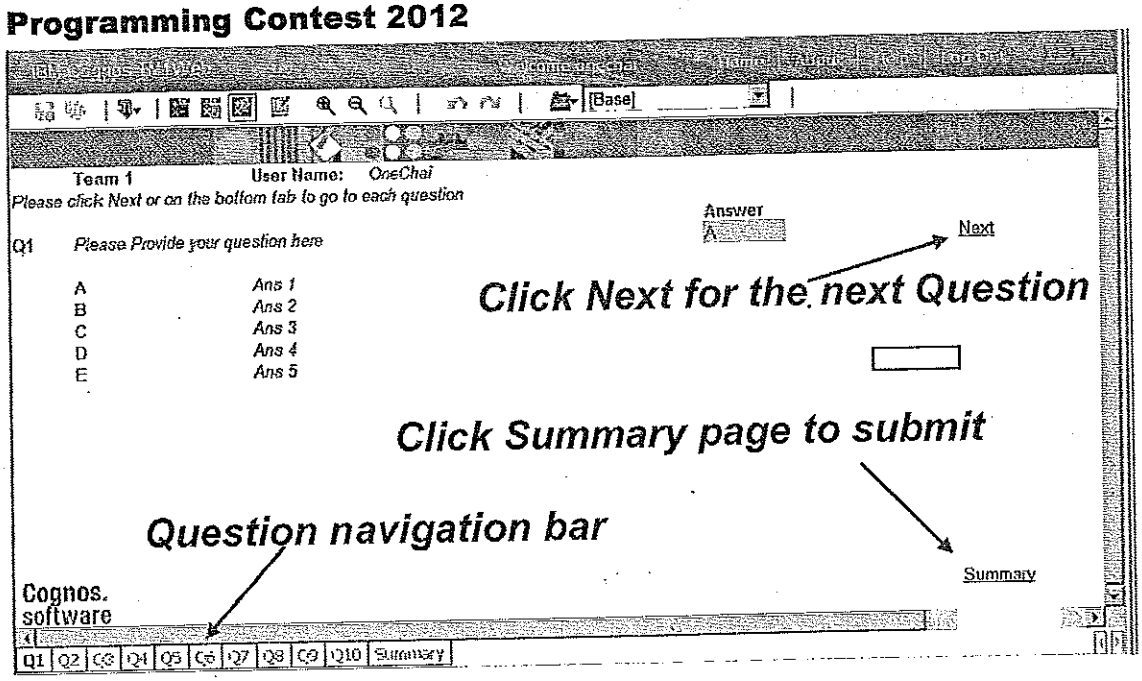
   Next, Login into the multiple choice application by the supplied credentials. After you had logged in, you can check if the team name and user name is correct.



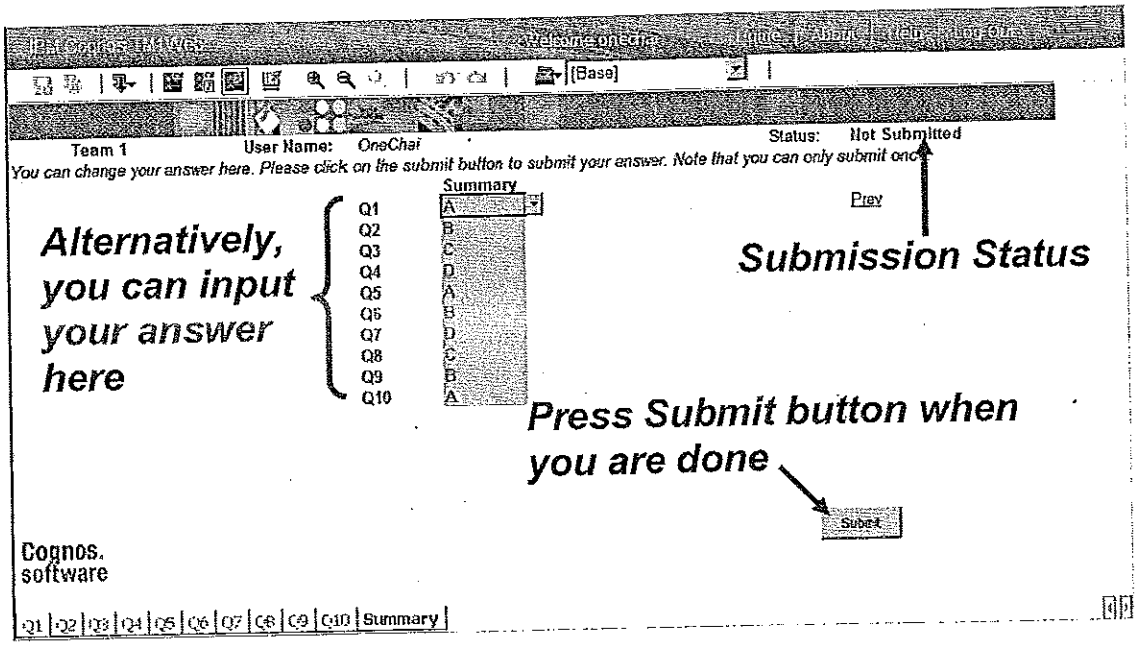
3. After logged in, the first question is displayed and selects the correct answer in the drop down box. Click Next for the next question.



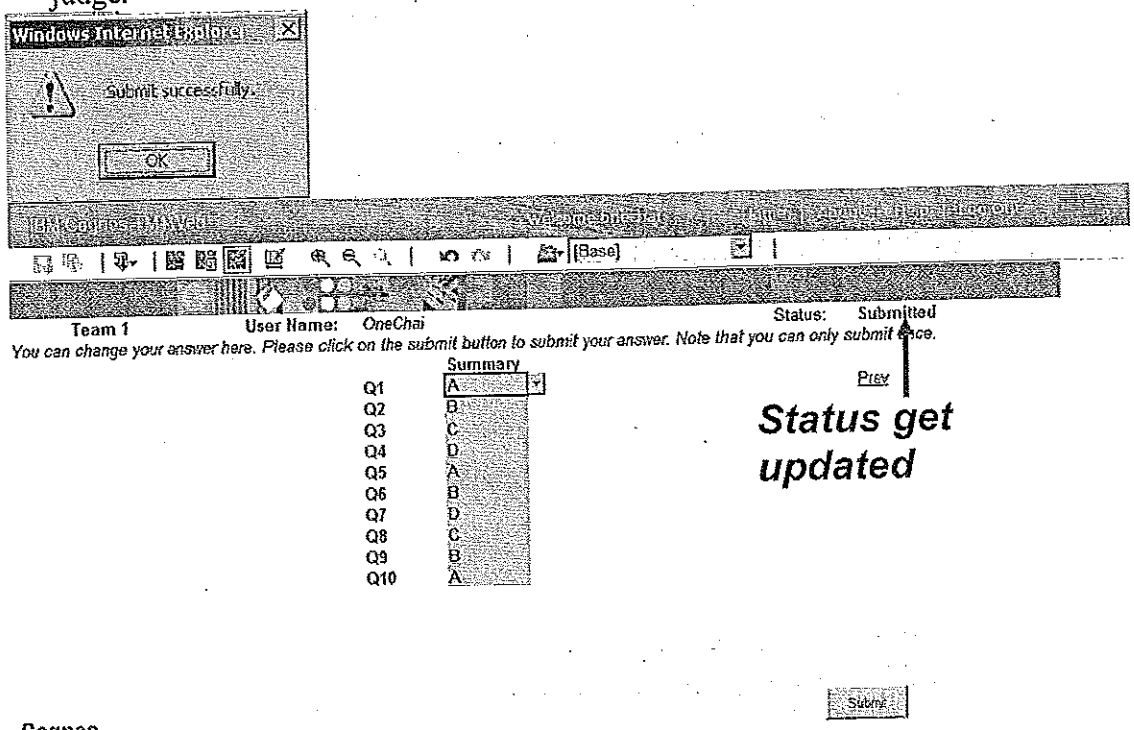
4. To navigate to different questions directly, you may access it through the bottom tab.



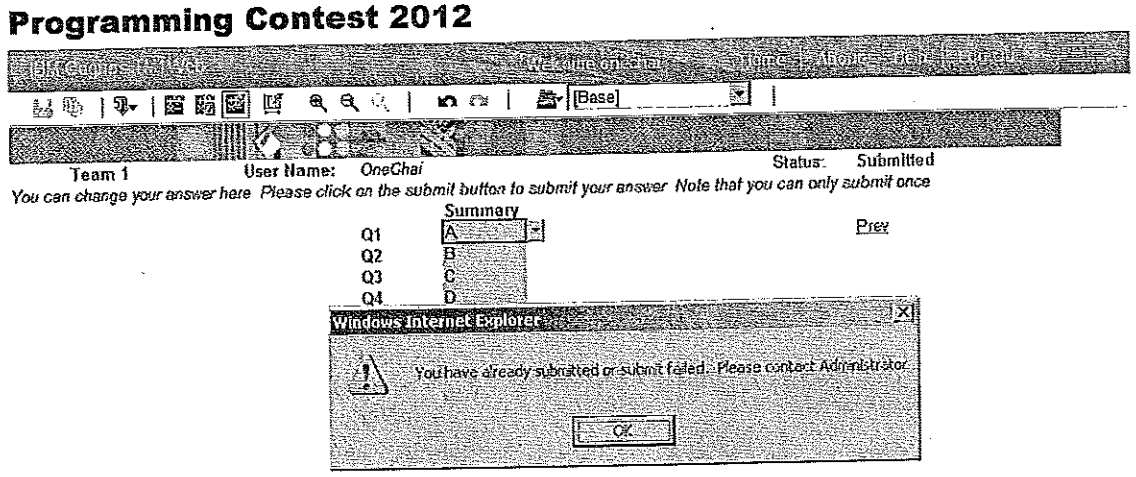
5. In order to submit your answer, you must go to the summary page and review your answer. For your convenience, you may also answer the question in this summary page directly from each of the drop down box besides the question number. Note that your Status now should be "Not Submitted". After you confirm it, press the button "Submit".

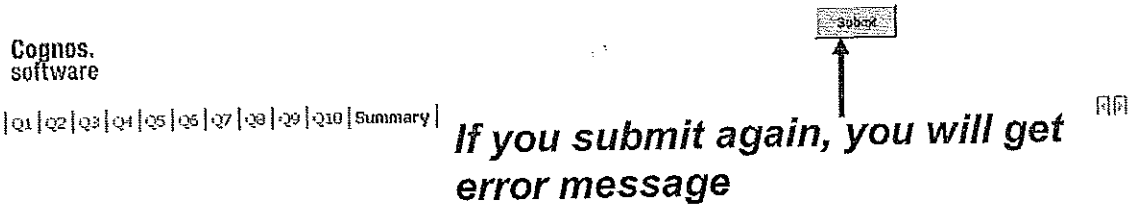


6. Once you submitted, a confirmation box should be appeared. Also check the status should be changed to "Submitted". If you got an error message, please contact your judge.

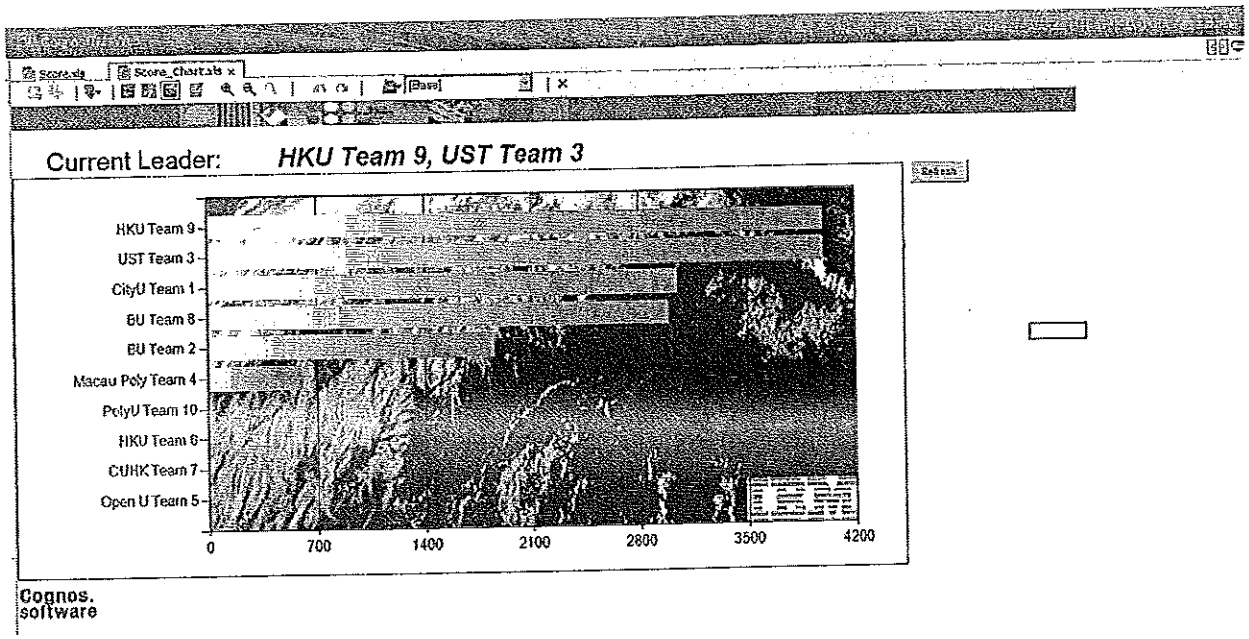


7. If you try to resubmit your answer, you will get an error message like this.





8. Once you have submitted your answer, the score will be appeared in the Score Dashboard after a refresh.



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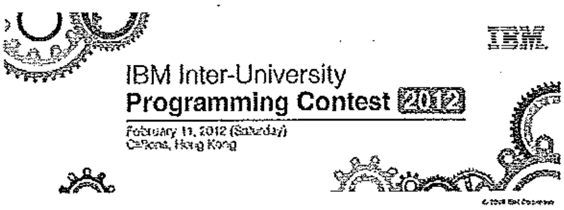
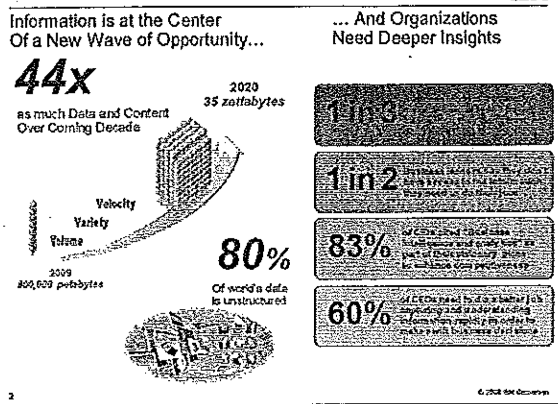
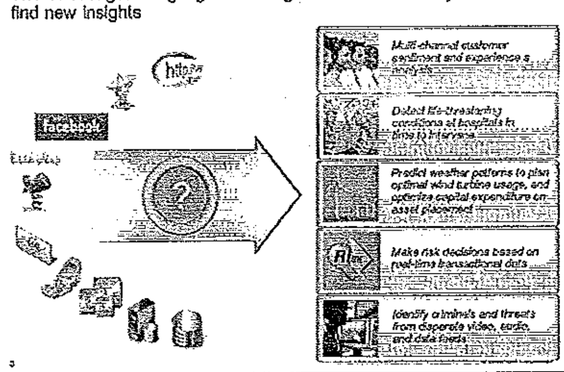
Chapter 7 : Big Insight

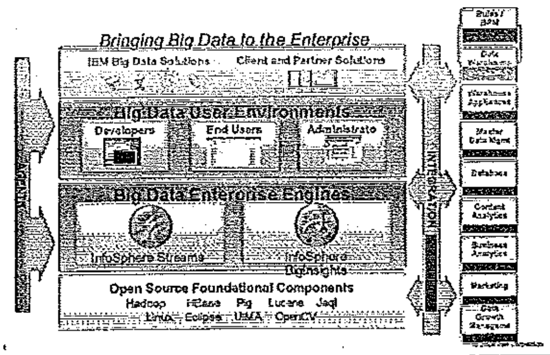




The Challenge: Bring together a large volume and variety of data to find new insights



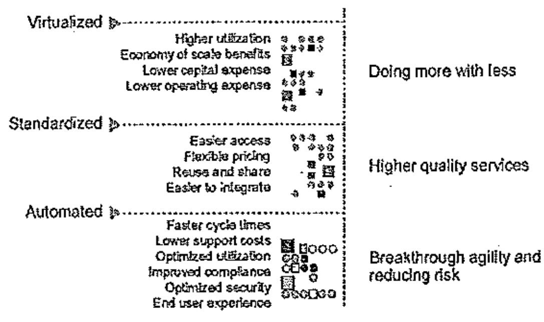
IBM's Big Data Platform Vision



Hadoop architecture

- Please watch the video

IT and Business Benefits of Cloud Computing



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Big Data and Cloud

- Big Data Solutions and Cloud are perfect fit
- The Cloud allows you to set up a cluster of systems in minutes and it is relatively in expensive

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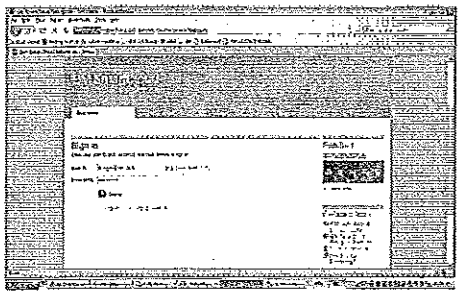
IBM SmartCloud Demo



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Exercises on Big Insight on Cloud

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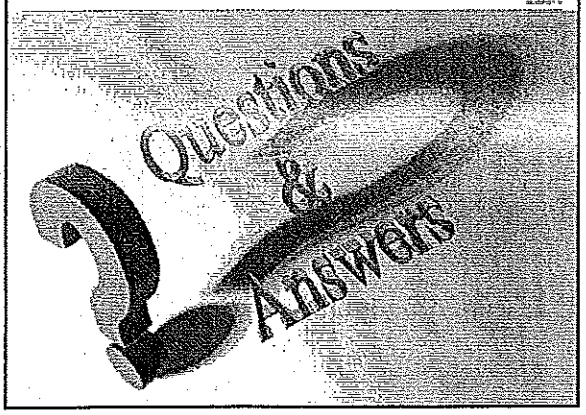

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Chapter 7: BigInsight

Objectives

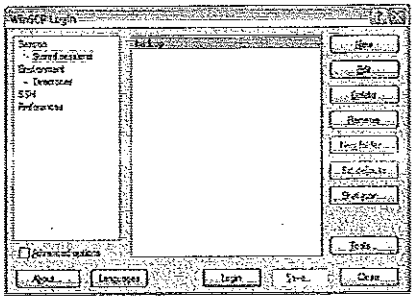
In this exercise, we will learn:

- Basic command on the HDFS system
- Transfer files from local system to HDFS system
- Run Word Count command which is store in a Jar file
- Use the HIVE shell to consolidate the result to table and query on it
- Load HIVE query result into text file

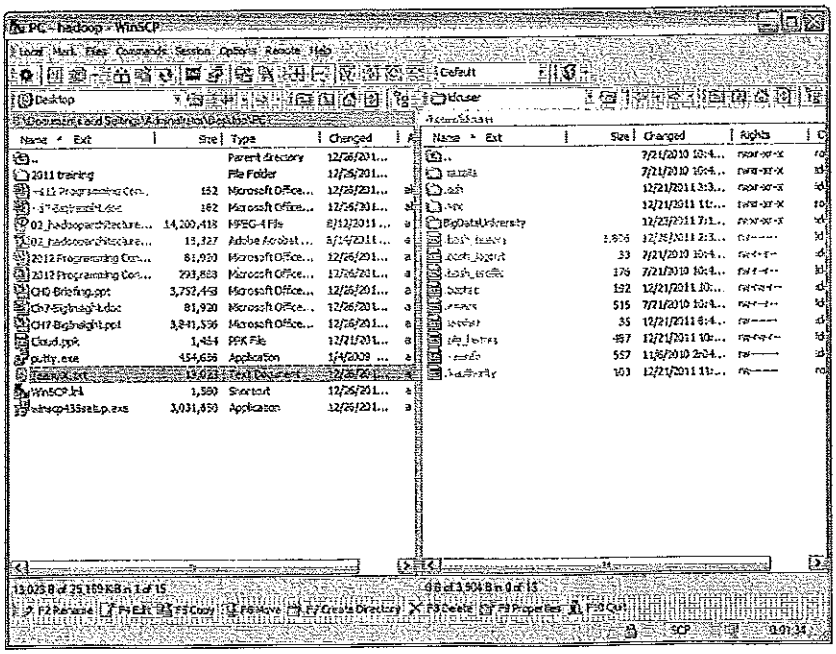
Exercises

1. Rename the TeamXX.txt to your team number (eg Team01.txt)

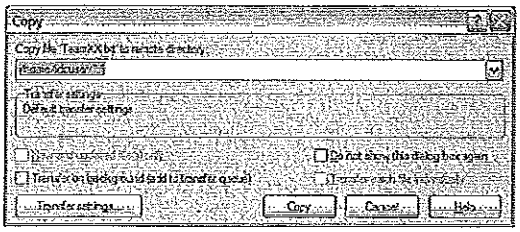
2. Open WinSCP and highlight "hadoop" and click "Login"



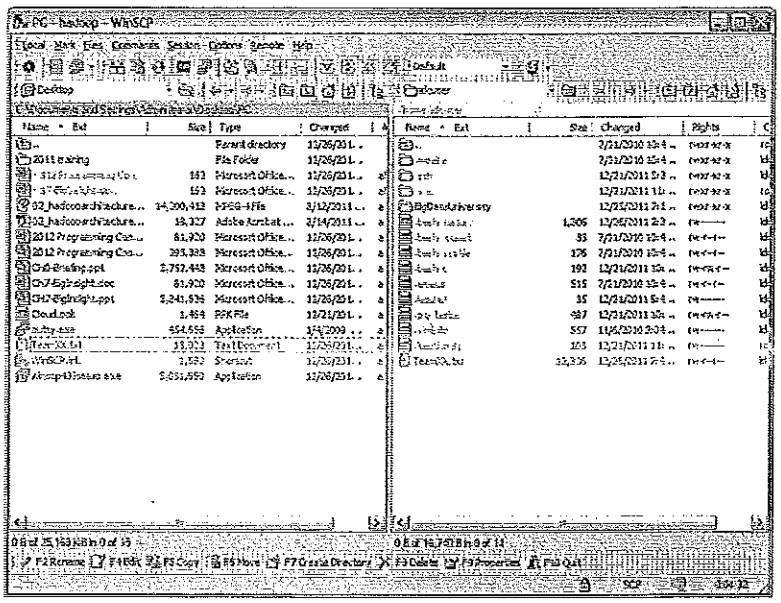
3. Locate your TeamXX.txt and press F5



4. Press Copy

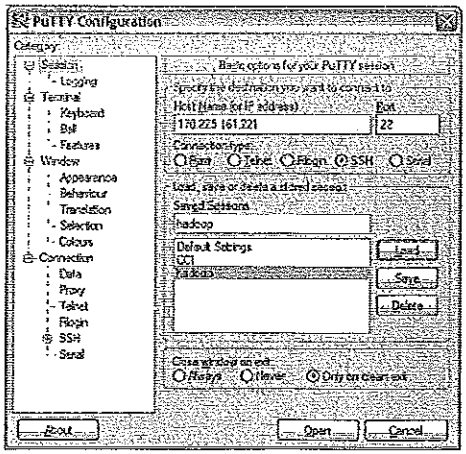


5. You will see the TeamXX.txt file at "/home/idcuser"

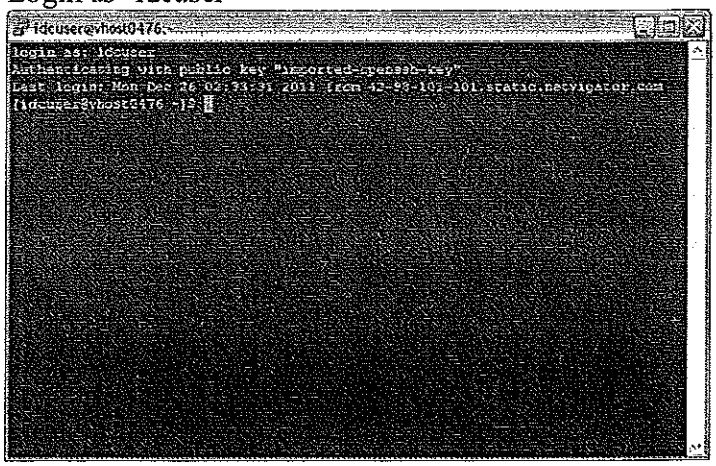


6. Open Putty on your desktop.

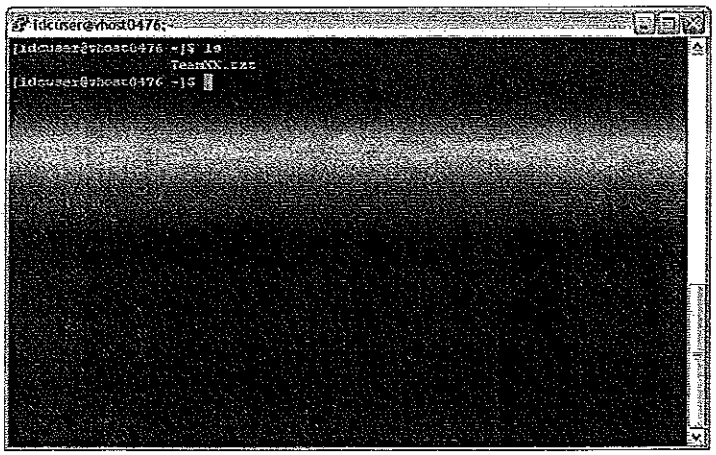
7. Double click on hadoop at the Saved Sessions



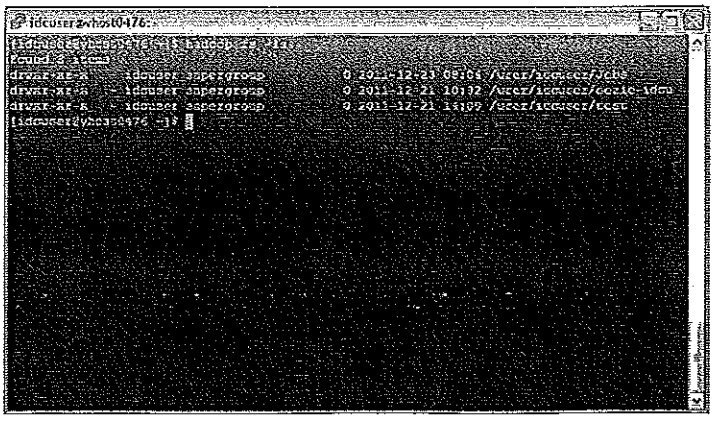
8. Login as "idcuser"



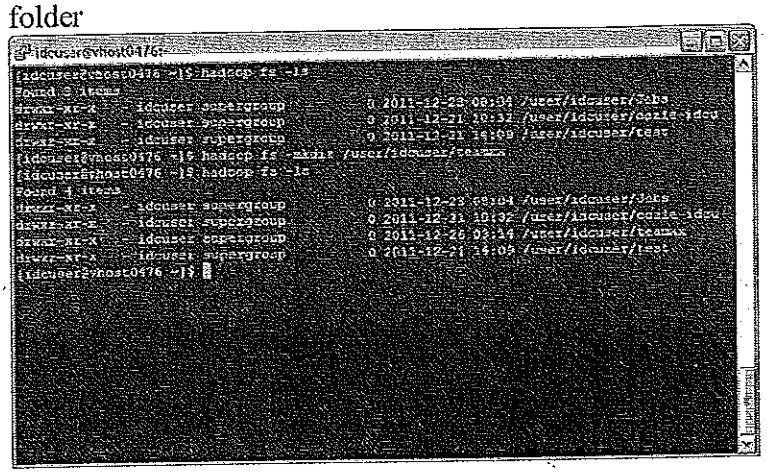
9. Type "ls" to see the file structure and confirm the TeamXX.txt file



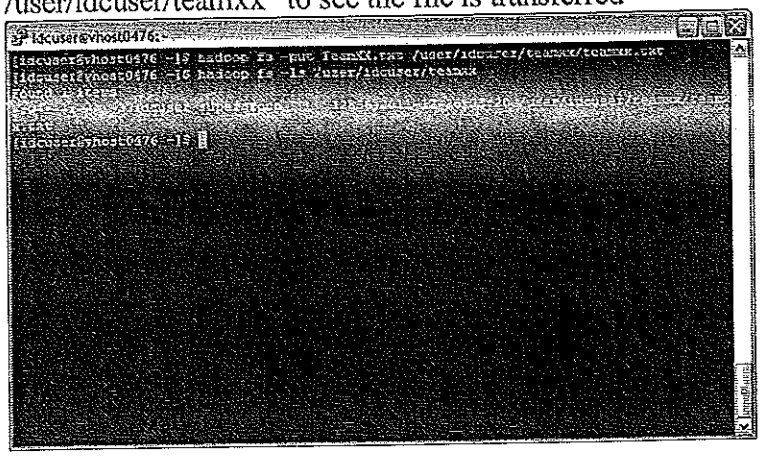
10. To access the HDFS system you will need to type the following "hadoop fs –ls", you will notice the difference between the two file system



11. Create a folder to store your test file, type "hadoop fs –mkdir /user/idcuser/teamxx" xx is your team number. User the ls commend to confirm the creation of your team folder

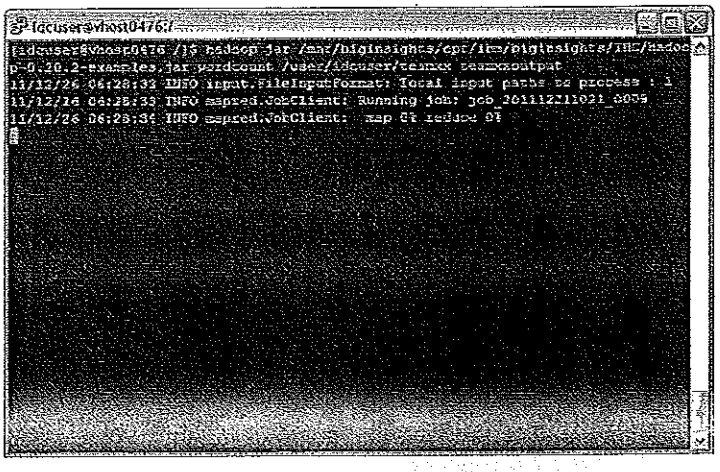


12. To transfer the file from local system to HDFS system, type the following "hadoop fs –put TeamXX.txt /user/idcuser/teamxx/teamxx.txt". Then type "hadoop fs –ls /user/idcuser/teamxx" to see the file is transferred

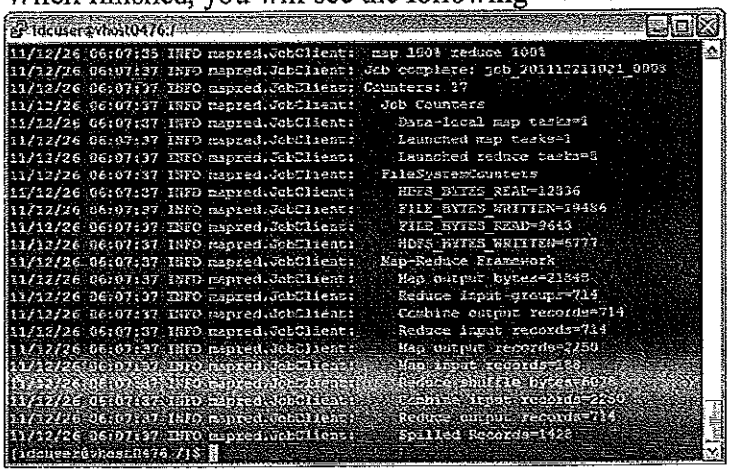


13. In order to count the word in the text file that is uploaded, a sample jar file which content the word count command will be deployed. The command line will like the following "hadoop jar /mnt/biginsights/opt/ibm/biginsights/IHC/hadoop-0.20.2-examples.jar wordcount /user/idcuser/teamxx teamxxoutput"

    Where the "mnt…/hadoop-0.20.2-examples.jar" is the path of the jar, "/user/idcuser/teamxx" is the folder which store the text file (multiple files can count at the same time) and "output" is the path the output files will be stored

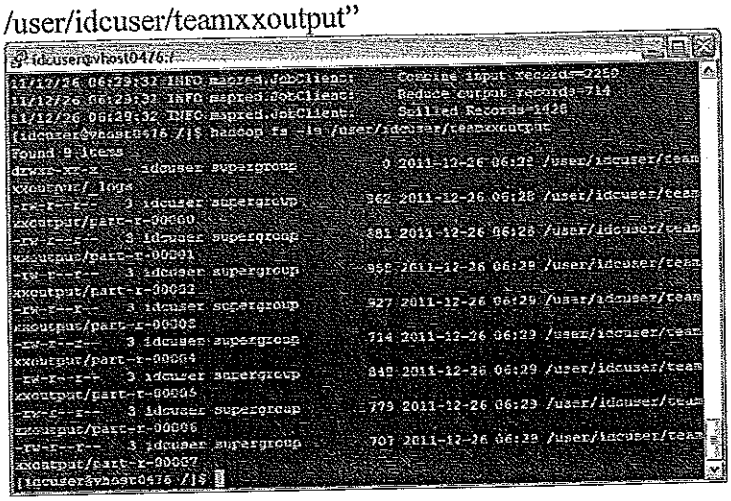


When finished, you will see the following



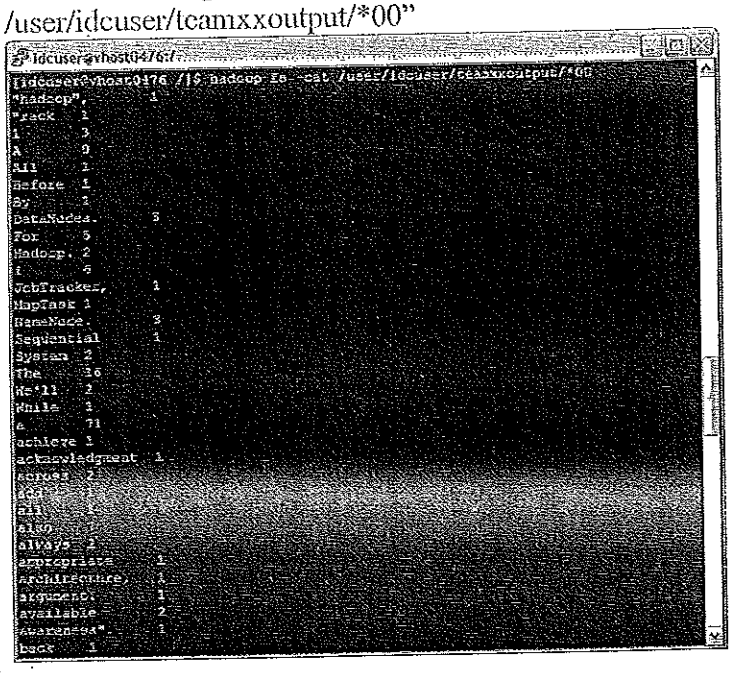
Please make notes of the job number after "Job complete" = job_201112211021_0008

14. We can see the output files, but using the following command "hadoop fs –ls /user/idcuser/teamxxoutput"



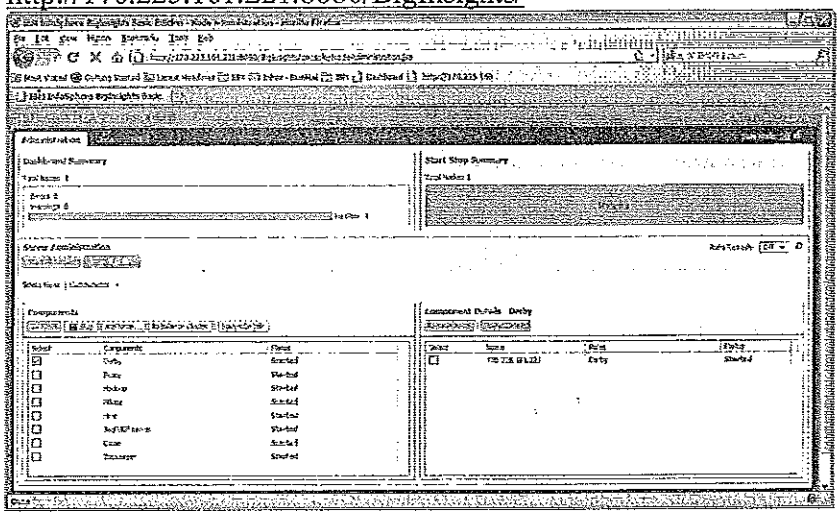
You will notice there are 8 files starting from "part-r-00000" to "part-r-00007". That is because 8 parallel tasks are used to perform this action

15. To view the output file, use the following command "hadoop fs –cat /user/idcuser/teamxxoutput/*00"

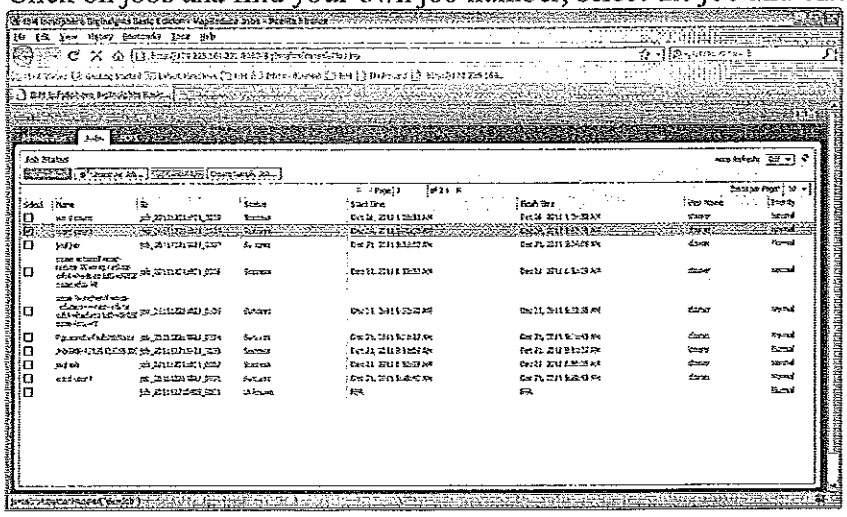


The list of word counted will be shown

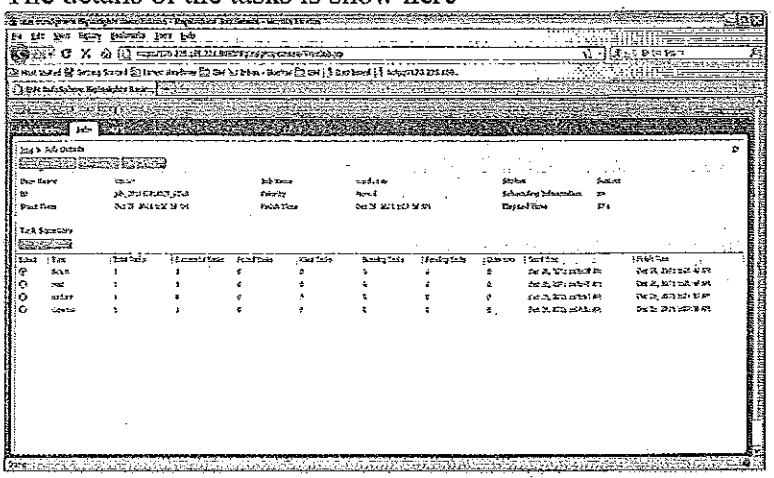
16. We can review the job over the web as well, open a browser and go to the following address
http://170.225.161.221:8080/BigInsights/



17. Click on jobs and find your own job number, select the job and click on "View job"

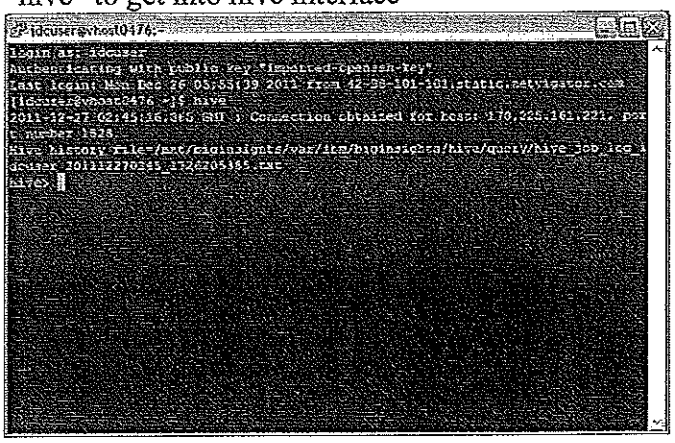


18. The details of the tasks is show here

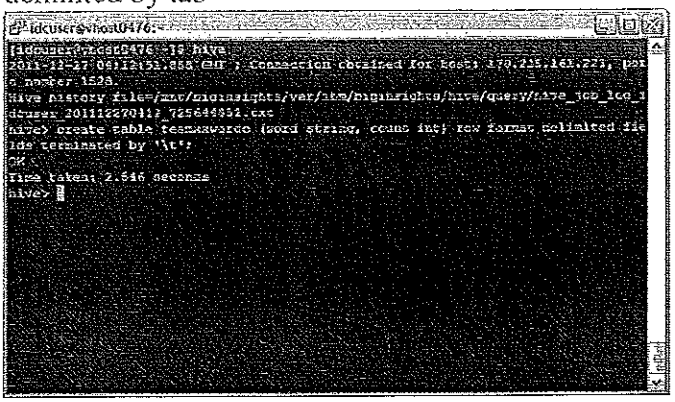


You will notice the 8 tasks is run on the Reduce type

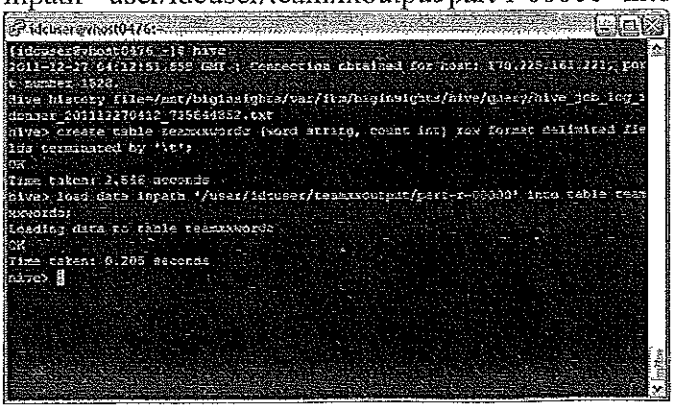
19. Now we have to word count result, we will leverage one of the language HIVE to store the result and select the top words. Return to the Putty Windows and type "hive" to get into hive interface



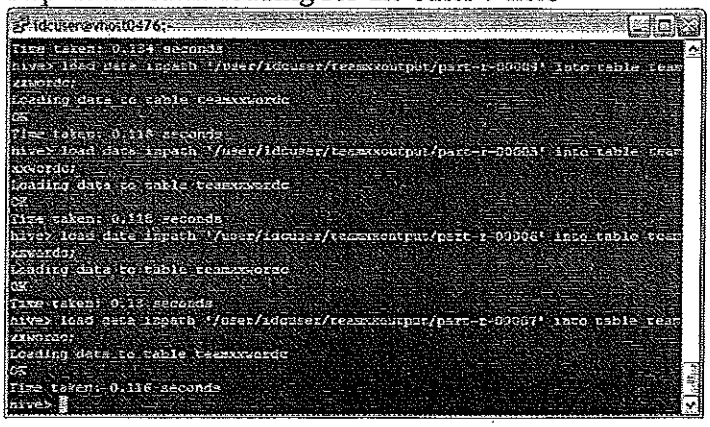
20. You will create a table to store the result, it will have 2 column, one is the word, other is the count. Use the following command "create table teamxxwordc (word string, count int) row format delimited fields terminated by '\t';" where the create table with name teamxxwordc with two column word of string and count of interger and field delimited by tab



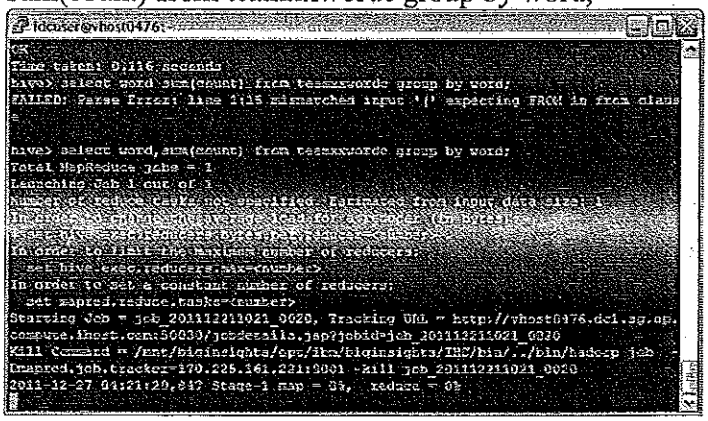
21. You will load the first data file to the table by the following command "load data inpath 'user/idcuser/teamxxoutput/part-r-00000' into table teamxxwordc;'



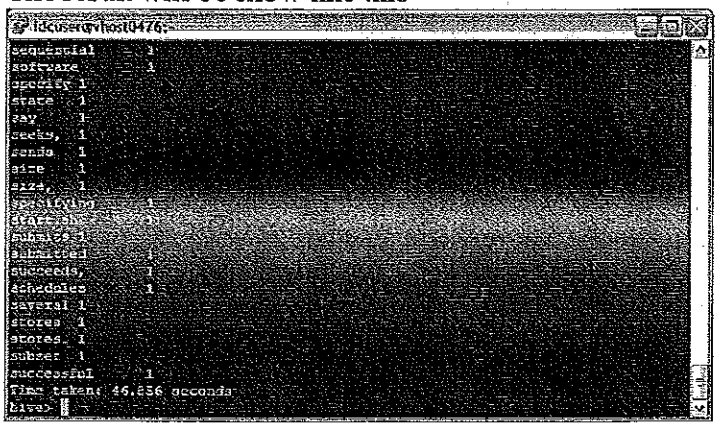
22. Repeat the same loading for the other 7 files



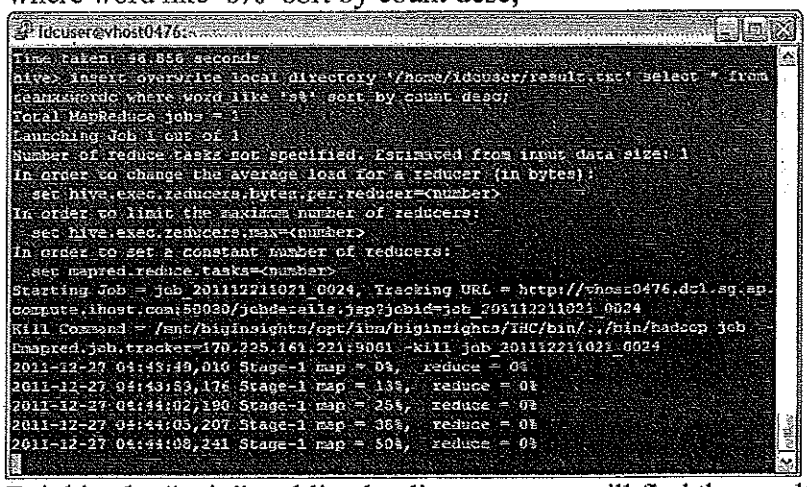
23. You can now use SQL like state to query the table, for example "Select word, sum(count) from teamxxwordc group by word;"



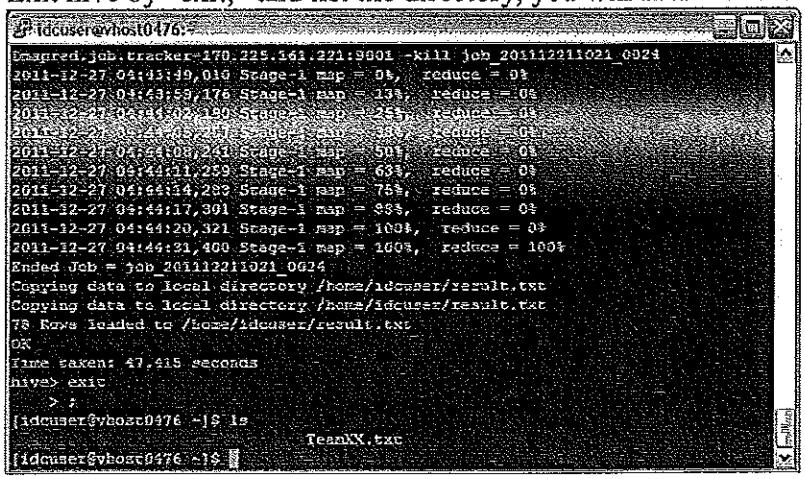
The result will be show like this



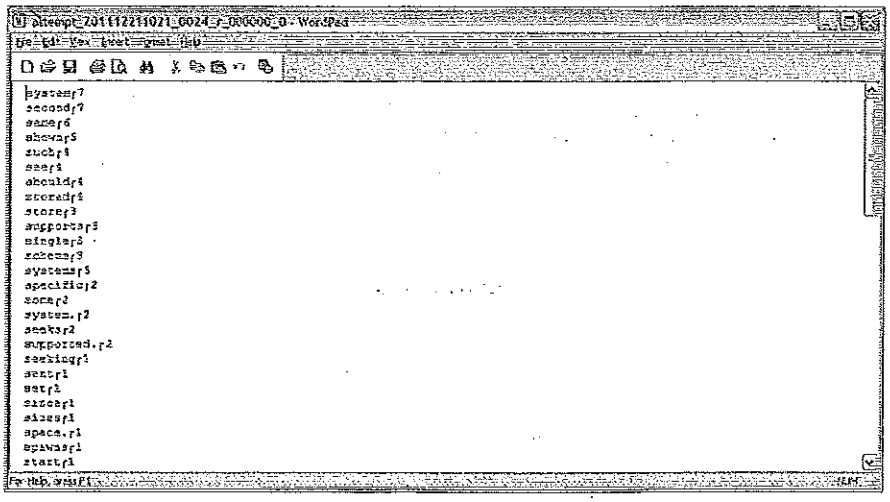
24. You can output the result to a test file in the local system, the command is as follow "insert overwrite local directory '/home/idcuser/result.txt' select * from teamxxwordc where word like 's%' sort by count desc;"



Exit hive by "exit;" and list the directory, you will find the result.txt file



25. Transfer the file from result folder to local machine and open the file in word pad, and the result will be shown as follow



26. This is the end of the lab for BigInsight