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Create Your Own Web Data Mart with MySQL

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What We'll Cover ...

- System i Web Reporting solutions
- Enterprise Open-source Web Reporting software
- Plan the Web Reporting solution
- Create a data mart
- Load the data mart from production data
- Design Web Reports
- Run Web Reports from the data mart
- Build your Web data mart roadmap

Why a data mart?

- Good reporting starts with good reporting data
  - Simple, accurate, flexible, timely data
  - Data designed for reporting use cases, not transactions
    - User report usage is key to good use cases
    - Interactive Web reports may beat paper
- Many vendors sell large-scale data warehouse solutions
  - Data marts can be easier, faster, lower-cost starting point
  - May be physical (data replicated) or logical (data views)
  - Physical data marts require data replication
    - ETL jobs (Extract-Transform-Load) to move data
    - More work but may offer significant performance improvements
  - Logical data mart: good for quick POC to validate solution

What software to use for data mart solution?

- Database to host data mart
  - DB2/400? Great for transactions, good for data mart
    - Other choices? Oracle, MySQL, SQL Server, Derby, DB2 UDB
    - MySQL will run on top of DB2/400 soon!
- Data mart design software
    - ERWIN, DB Designer4
- Data management software
    - iSeries Navigator DB2 plugin, Squirrel, TOAD or ?
- ETL software to load data mart
    - Queries & DB loads, ETL tools (Kettle)
- Web reporting software & Java Web server
    - Many choices for both

What do you want for Web Reporting?

- System i data only or ***all your data***?
- Reports built by programmers, users or ***both***?
- Runs on System i only or ***runs anywhere***?
- Runs on ***any Java server*** or WebSphere only?
- Proprietary license or ***free, open-source with support options?***
- ***Integrates RPG logic & reports on the Web***?
- ***Integrates all Microsoft objects*** (docs, spreadsheets, data)?
- High cost or ***low cost of ownership***?
- ***Easy to learn***?
- ***Simplifies complex reporting problems without programming***?
- ***Affordable Enterprise quality support & services available***?
- What else is important?

System i Web Reporting Solutions .. Many choices

- **New DB2 Web Query**
- **Web enabled RPG-based report writers**
  - MRC, others
- **Standard ERS offerings**
  - Cognos, Crystal Reports, Essbase, WebFocus, WOW and more
- **System i specific Web report writers**
  - ASC Sequel, iNetSoft, IQ, others
- **Custom RPG using CGI-DEV2**
- **Custom Java Web apps using WDSC or ..**
- ***BIRT – Enterprise Open-source Web Reporting***

System i data management support

- DB2/400
- System i Navigator with DB2 plugin
- Client Access for ODBC to DB2/400 (not free)
- Java Toolkit for JDBC to DB2/400
- Native Java for local JDBC to DB2/400
- UPDDTA
- RUNQRY QRYFILE(AFILE)
- CPYTOIMPF, CPYFRMIMPF, CPYTOFLR, CPYFRMFLR, FTP
- STRTCPSVR NETSERVER
- Custom programming

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Enterprise Open-source (EOS) Web Reporting Software

- EOS
  - quality, standards-based open-source software
  - available Enterprise quality support & services
  - MySQL database
  - Java Web server: WebSphere CE, Tomcat, WebSphere or ?
  - BIRT Web Reporting tools and server
  - Eclipse WTP development environment with GRAILS
  - Squirrel SQL developer tool
    - iSeries Ops Nav Data tools with DB plugin is more common
  - DBDesigner4
  - Pentaho ETL tool
  - Open Office

MySQL – the open-source database standard

- Millions of servers running today
- Choose free license or Enterprise option with support
- Supports many SQL standards including some OLAP features
- Any platform including i5/OS (coming soon)
- Tables, views, foreign key relations
- Stored procedures, user-defined functions
- Binary logging to manage data rollback, recovery (journalling)
- GUI administrator tool is similar to System i Navigator
- JDBC, ODBC drivers work well
- Query tool good for building SQL SELECTs
- DB2/400 or MySQL?
  - *DB2/400 offers even more function than MySQL version 5.1*
  - *DB2/400 works for RPG apps, OS/400 production data*
  - *MySQL: great solution for any other application, Web data mart*
  - *MySQL on DB2/400 should allow RPG calls from MySQL*

Java Web application server

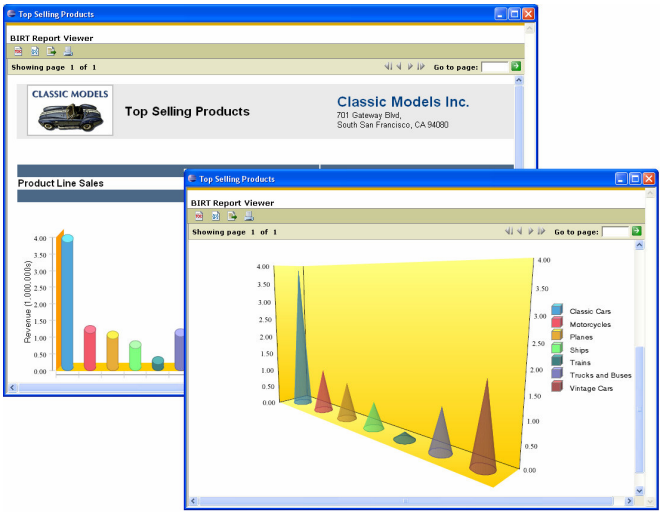
- **Java Web application server to run reports**
  - Leading Open-source choices
    - Apache Tomcat – runs everywhere including i5/OS
    - IBM WebSphere CE – option to buy IBM support
  - Also
    - WebSphere
    - WebSphere Express
    - Other J2EE application servers

BIRT Web Reporting tools

- BIRT includes:
  - User, developer visual report builder, tester
  - Java report server engine (WebSphere, Tomcat)
  - Reusable datasources that can access any type of database
    - *Integrates databases, documents, Web services and more*
  - Reusable datasets with filters for reports and cache control
  - User-defined report data parameters to dynamically filter data
  - Drag and drop report layout tools with report preview capability
  - Visually generate cross-tab reports and data cubes
  - Web Viewer to run and view reports as part of a Web application
  - Runtime prompting for cascaded parm values using lookups
  - Table of contents and navigation for Report results
  - Report Data export as csv, HTML, PDF or xml files
  - Reports easily packaged, shared for deployment as simple files
  - BIRT can call RPG as WS after Eclipse generation

BIRT Web Reporting tools

- Build reports, charts and queries visually
  - *Hyperlink reports & charts for easy drill-down*



Eclipse Web Tools Platform (WTP)

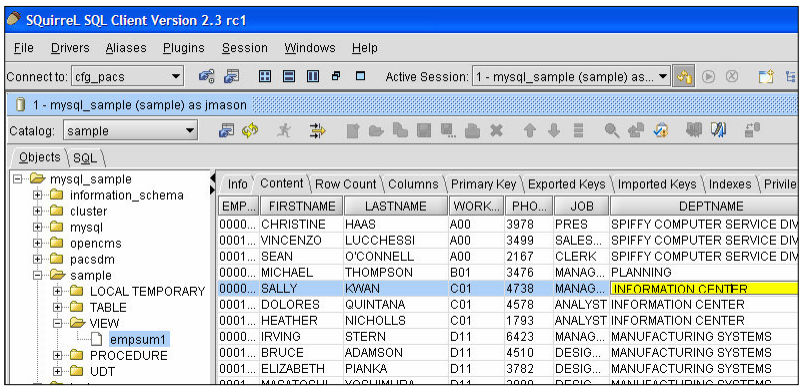
- Eclipse Web Tools Platform
  - For developers
  - Leading open-source IDE
  - Newer JEE support than other tools
  - Includes integrated BIRT Report development tools
  - Integrated Java Web server runtimes for testing reports
  - Integrated Web viewer to run & view reports in browser
  - Can generate RPG WS using free System i Java toolkit
- GRAILS (Groovy on RAILS) add-on
  - Generates Java Web DB apps for ANY database!
  - Groovy – much easier language to learn, use than Java

Squirrel SQL developer tool

- Visual SQL tool uses JDBC to connect to every database
  - Visually browse all data objects, data
  - See all metadata for tables / views etc
  - Visually edit all data including xml column documents
- SQL workbench for creating, testing any SQL
  - Run DDL scripts to build data objects
  - Run DML scripts to select, insert, delete and update data
  - Run stored procedure scripts
- Builds sample scripts automatically for:
  - SELECT, INSERT, UPDATE
  - Create, use, share bookmarks to create simple SQL commands with parms for complex statements

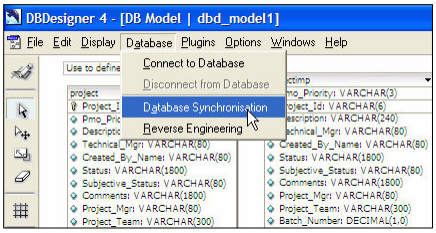
Squirrel

- Visually editing any data including DB2/400
  - Use Java toolbox JDBC driver



DB Designer4 – data mart design tool

- Visually design databases and data models
  - Tables, foreign key constraints and more
  - Primarily supports MySQL databases
  - Reverse engineer any database to create a data model
  - Change the database design
  - Updates the database from design model with 1 button!
  - Also supports Oracle, SQL Server SQL
    - *Not difficult to convert to DB2/400 DDL*



Pentaho ETL tools

- More advanced ETL tool suite
  - Data warehouse population
  - Export of database(s) to text-file(s) or other databases
  - Import of data into databases: from text-files to excel sheets
  - Data migration between database applications
  - Exploration of data in existing databases (tables, views, etc.)
  - Lookup data in databases, text-files, excel sheets and more
  - Data cleaning applying rules in data transformations
  - Application integration
- Simple ETL can be done with MySQL,BIRT
  - MySQL exports / imports csv and other text files easily
  - BIRT can generate text files from any database easily
  - ETL Script can be created in minutes with Groovy
    - *Groovy dbload.groovy productdb*

Open Office suite

- Open Office replaces Microsoft Office
  - Replaces all of Microsoft Office
    - Works with all existing Microsoft Office files
  - Open Base is an Access compatible DB front-end tool
    - Simple, custom data forms, queries and reports
    - Easy access to all databases using standard, free JDBC drivers
    - Instant data update forms System i tables and views
  - Free download
  - Review for fit compared to other options

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Plan the Web Reporting Solution

- QuickWeb Reporting Assessment
  - Current Reports
  - Current ACUTR2 – Accuracy / Cost / Use / Timeliness / Risks
- Reporting use cases
  - Analytic / on-demand / historical / control / management dashboard / statements / application reporting
  - DB2 or MySQL data mart?
  - Physical or logical data mart?
  - Data preparation and ETL (Extract – Transform – Load)?
  - Scheduled or on-demand reports?
  - Security requirements?
  - Delivery / access requirements?
    - *User runs or accesses pre-generated reports?*

Plan the Web Reporting Solution (cont)

- Define a pilot project
  - Find the reporting improvement opportunities
- Review requirements: reports, data, processing
- Select the software
- Build out basic infrastructure
  - If needed, EOS Reporting POC can be done on laptop
- Design & build the data mart
- Create data cleaning, load procedures
- Build & run basic reports
- Evaluate results
- Improve and expand solution

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Create a data mart

- Could be logical. This example is a physical data mart
- Create a MySQL database for data mart
- Model the data mart with DB Designer4
  - Create tables, indexes, views visually
  - Can reverse engineer or generate DDL as needed
- Squirrel can also reverse engineer or generate DDL as needed
- Integrate procedures as needed in views
  - DB2 can run RPG, Java procedures
  - MySQL has SQL procedures or UDFs
- Example here used:
  - Squirrel to reverse engineer DB2/400 production data model
  - DB Designer4 to create data mart design from data model

Create sample table

- SQL script generated by DB Designer4

```
DROP TABLE IF EXISTS `sample`.`employee`;
CREATE TABLE `sample`.`employee` (
  `EMPNO` CHAR(6) NOT NULL DEFAULT '',
  `FIRSTNME` VARCHAR(12) NOT NULL DEFAULT '',
  `MIDINIT` CHAR(1) NOT NULL DEFAULT '',
  `LASTNAME` VARCHAR(15) NOT NULL DEFAULT '',
  `WORKDEPT` CHAR(3) NULL,
  `PHONENO` CHAR(4) NULL,
  `JOB` CHAR(8) NULL,
  `SALARY` DECIMAL(9, 2) NULL,
  `BONUS` DECIMAL(9, 2) NULL,
  `COMM` DECIMAL(9, 2) NULL,
  `FKdepartmentDEPTNO`  NOT NULL,
  PRIMARY KEY (`EMPNO`),
```


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Load data mart from Production data

- Install ETL tools
  - Squirrel, BIRT, SQL procs, Pentaho ETL, ANT scripts
- Build & test data validation reports
- Build & test ETL scripts
- Setup production ETL jobs, logs, monitoring, alerts
- Example here used:
  - BIRT report to generate a csv file from production data
    - *BIRT report can visually do many complex data transforms*
  - MySQL to import csv file to tables with load script
    - *Could use Squirrel, Kettle to import & export data too*
  - Custom procedures to generate history for data changes

Create csv data to load in MySQL

- Csv data generated by simple BIRT report from DB2/400
  - Example below generated tpay as sum of salary, bonus, comm
  - Could be generated by Squirrel or Kettle as well

```
LASTNAME,FIRSTNAME,EMPNO,JOB,tpay
HENDERSON,EILEEN,000090,MANAGER,115489.0
PARKER,JOHN,000290,OPERATOR,95000.0
SCHNEIDER,ETHEL,000280,OPERATOR,88000.0
SETRIGHT,MAUDE,000310,OPERATOR,91000.0
SMITH,PHILIP,000300,OPERATOR,79000.0
```

MySQL load script

- Load script can insert or update data mart
  - Field & line termination characters customizable
  - Define selected or all columns to load from csv data

```
load data infile
'c:/save/data/cdm/pacs_requests_updated5.csv' replace
into table prjdm.projecti  fields terminated by ','
enclosed by '"' lines terminated by '\r\n'
(PMO_PRIORITY,PROJECT_ID,DESCRIPTION,TECHNICAL_MGR,CREATE
D_BY_NAME,STATUS,SUBJECTIVE_STATUS,COMMENTS,PROJECT_MGR,P
ROJECT_TEAM,BATCH_NUMBER)
```


Procedure to generate history data

- Procedure set to run on a MySQL trigger
  - When primary table has row inserted, history table records a history record automatically
    - *Similar to DB2/400 journal records*

```
use prjdm;
DROP TRIGGER prjdm.tprojectih;
delimiter $$
create trigger tprojectih AFTER INSERT on projecti for
each row begin insert into projecth (Project_id,
Target_date, Target_reason, Project_status)
values(NEW.Project_id, CURRENT_DATE, “daily load",
NEW.Project_status);
end;
$$
delimiter ;
```

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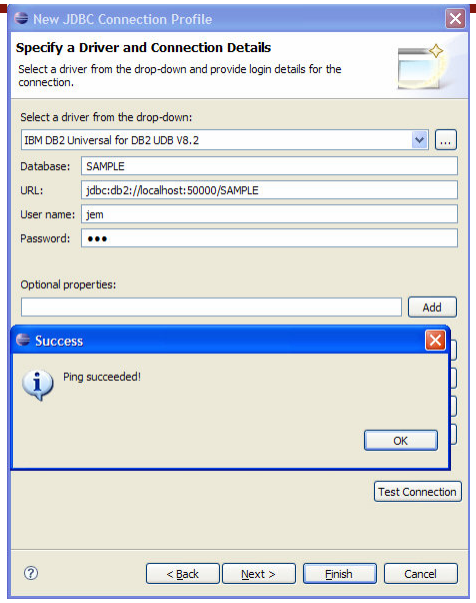
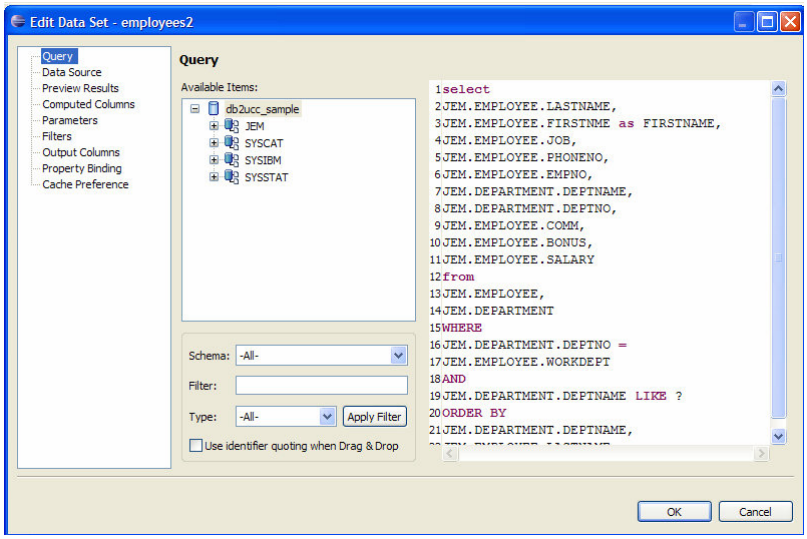
Create data source connection

- Connect to any database, files, scripts, documents or Web services



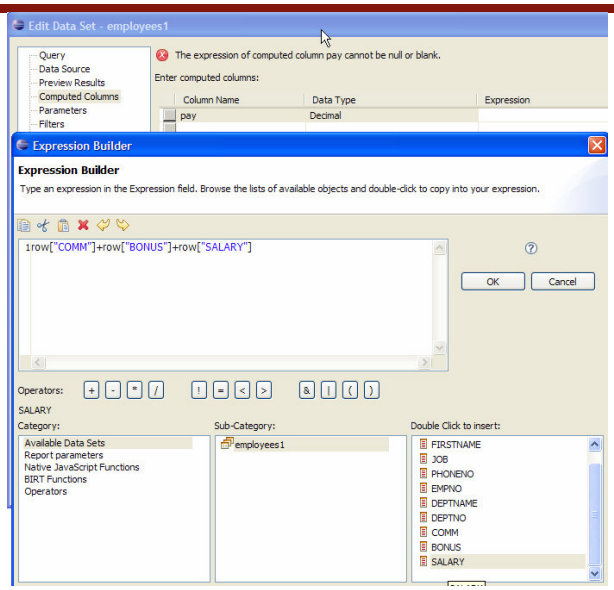
Create Reporting Data set with report parameters

- Create report data set with parameter for runtime values



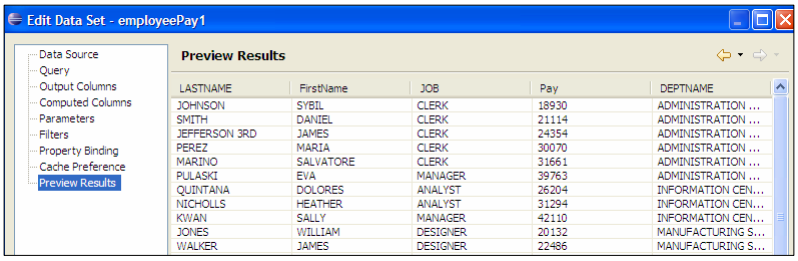
Create data set transformations

- Calculate total pay from data elements:
- Salary
- Bonus
- comm



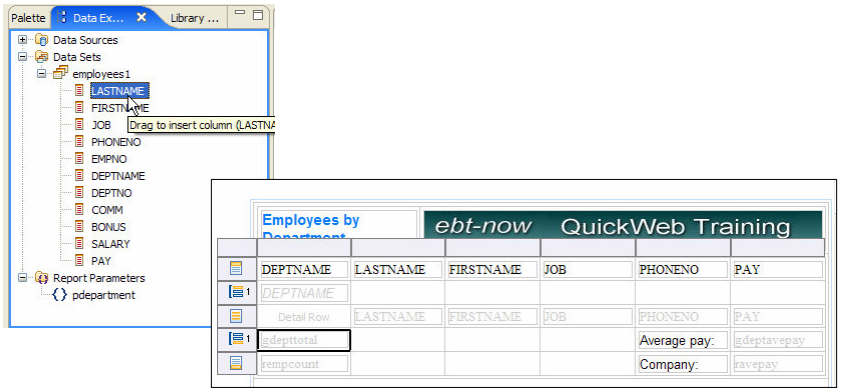
Preview data set results

- Easy data preview for data sets to validate definitions



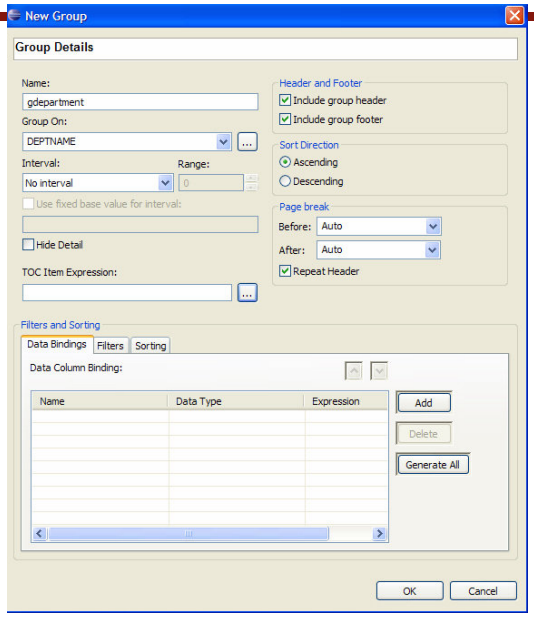
Drag and drop data columns on report layout

- Any column from data set can be dropped on report layout



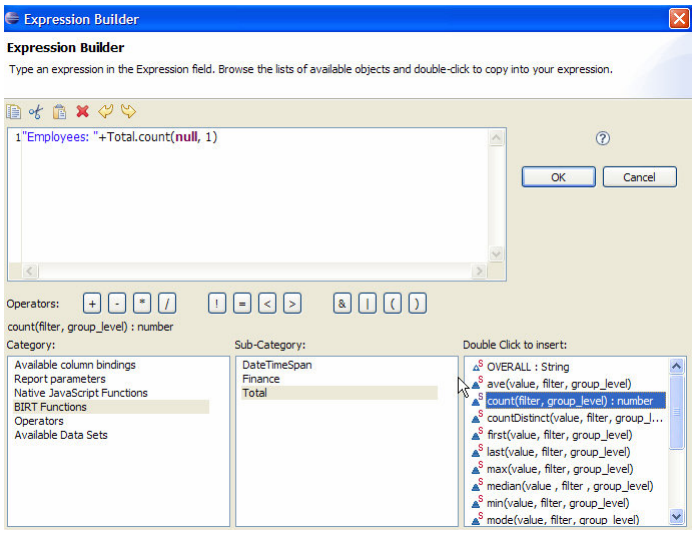
Insert a grouping section for departments

- Add group by section to total by department



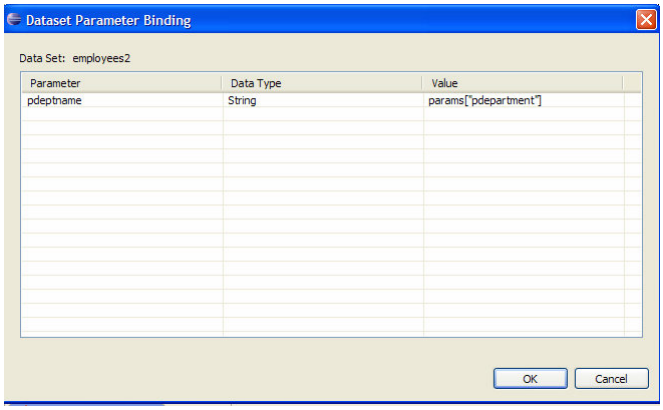
Expression builder is quicky, easy

- Drag & drop to create expressions to transform data



Data set parameters bound to report parameters

- Data set parameters can map to report parameters
  - Runtime parameter values are sent to database



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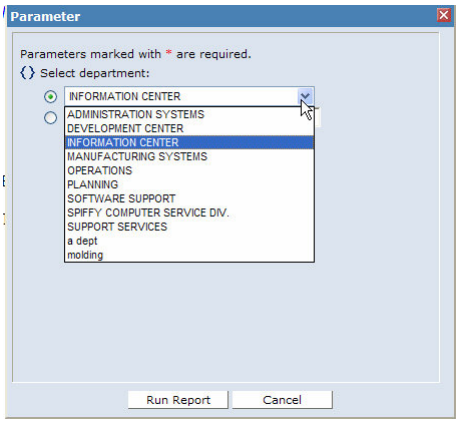
Testing your reports

- **Test Web server included on development clients**
  - Allows easy testing in local Web environment
- **Web viewer**
  - Easy viewing of queries, charts, reports
  - Optional table of contents for navigation
  - Paging controls for navigation
  - Automatic prompting for variable input parameters
  - Output options:
    - Excel, text files, PDF and more

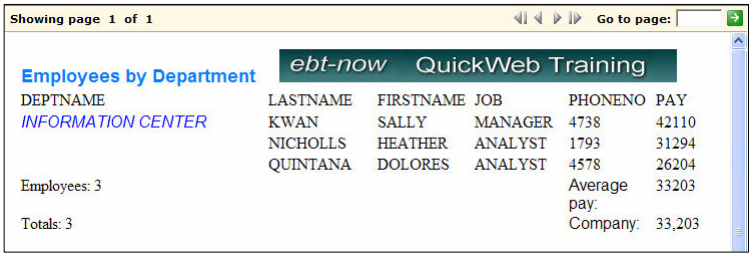
Testing report in Web viewer

- Runtime prompting for department name parameter
  - Values can be a simple table lookup (Department here)!



Testing Report in Web viewer

- Report for selected department



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Build your Web data mart roadmap

- Get help, training, support from service providers, vendors
- Define your Web reporting users, use cases, value
- Assess your Web data mart capabilities today
- Define Web data mart options
  - Use EOS data mart solutions for quick POC validations
  - Based on results, finalize options
- Set project keys: budget, authority, needs, timing, risks
- Create sample views to model data mart
- Design, tests reports on views with users
- Design data mart
- Define data load jobs
- Define user support, service, training metrics for data mart

Web data mart assessment

- What are your Web Reporting capabilities today?
  - Do users easily create, run the reports they want?
    - On time, accurately?
  - Do reports integrate all info easily?
    - DB2/400, other data, documents, programs, all servers?
  - What resources are needed to create good Web Data?
    - 1 person, 1 month or?
  - What resources are needed to implement Web Reporting?
    - 1 person, 1 month or?
  - Do users browse, define the data they want easily?
  - How much time, money to create a Web data mart?
    - 1 person, 1 month or?
  - How easy is it to change, move or migrate a database?
  - How easy is it to find, change data or data errors anywhere?
  - Can you easily version control database changes anywhere?
  - Is quality support available for your production deployments?
  - How much do you pay? Licenses / services / support?

Resources

- ebt-now training (www.ebt-now.com)
- QuickWebPlace web sites (www.quickwebplace.com)
- MySQL from MySQL AB (www.mysql.com)
- Apache Tomcat from Apache SF (www.apache.org)
- IBM WebSphere (www.ibm.com/software/webservers/appserv/was)
- BIRT report tools, server & Eclipse IDE (www.eclipse.org)
- Squirrel SQL tools (www.squirrel.org)
- DB Designer4 database design tools (www.fabforce.net)
- Pentaho ETL tools (www.kettle.pentaho.org)
- Open Office suite (www.openoffice.org)
- GRAILS (www.grails.org)

7 key Web data mart points to take home ..

1. EOS (Enterprise Open-Source) Web data mart solutions offer:
   1. Ease of use, low cost, fast payback for all data reporting
2. Vendors offer Enterprise quality support options for EOS
3. MySQL is a powerful reporting database, will run on i5/OS too
4. BIRT is great Web Reporting solution
5. Web data marts & reports give users what they want quickly
6. No programming needed for this sample Web data mart
7. Build your own Web data mart roadmap for success

Questions?

How to contact me:
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