Tips and techniques to improve DB2 Web Query for i performance and productivity

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Agenda

- Performance
  - Compute and Define fields
  - DB2 optimization
  - Legacy Dates
  - Tips
- MS Excel Output
- V2.1 Architecture and Security
- Metadata and Applications
- Input Parameters - GUI
- V2.1 End User Dashboards
- Row/Record Security
- Filters and Business Views
- More Tips
- Data profiling
- Even More Tips

Performance / Complexity
versus
Ease of Use / Simplicity
Compute vs Define Fields

- **DEFINE field (Detail field / Virtual Column)**
  - Executed on database read => Calculated every time a record is read
  - Can be used for Filtering
  - IA Data Ribbon, Developer Workbench, RA/GA wizard on left

- **COMPUTE field (Summary field)**
  - Calculated after data is sorted and aggregated
  - Cannot be used for Filtering
  - Often required for percentages and variances
  - IA Data Ribbon, Developer Workbench, RA/GA wizard on right

- Use **COMPUTE** where possible

**DB2 Performance Recommendation**

**“Push” as much logic as possible down to DB2**

- Use SQLTrace option
  - 2.1 available in InfoAssist under Run command in HF1
  - 1.1.2 Report Assist/Graph Assist browser option “Run w SQL trace”
    - 1.1.2 InfoAssist – must remove or comment out “ON TABLE SET EMPTYREPORT ON” in fex

- Look for database optimization disablers

Assume that our database table has 1 million records and 100 distinct dates (output summed by date)
Performance Example: Convert Legacy Date to Smart Date

- Output 100 records
- DB2 retrieved 1 million records
- Web Query then read 1 million records, sorted 1 million records, grouped 1 million records, summed 1 million records, output 100 records
- Very, very slow!!

Performance Example: Convert Legacy Date to Smart Date

- DB2 processed 1 million records
- DB2 output 100 records
- Web Query receives, formats and outputs 100 records
- Very, very fast!!
- Make sure you handle non date values you may have inserted in your date fields (filter out or convert to 99990101)
Performance Example: Summing Character Fields

FST. or LST.  “where sort fields do not cover the key”
DB2 Web Query Tips and Techniques

Aggregation

- DB2 aggregation
  - `DATECVT` with 8 alpha or numeric field
  - `DPART`
  - Strong concatenation (|)
  - Weak concatenation (||)
- Use SQLTrace to determine optimization

Aggregation using Prefix Operators:

- DB2 aggregation
  - Average
  - Count
  - Count Distinct
  - Number of Distinct
  - Max
  - Min
  - Sum
- Web Query Aggregation
  - Average Square
  - First
  - Last
  - Percent
  - Count Percentage
  - Row Percentage
  - Total

Additional DB2 Performance Tips

- Use the DB2 CLI adapter
  - Both the Heritage File and Query/400 adapter use CQE
  - Recreate Query/400 reports as new reports that use synonyms based on DB2 CLI adapter
  - No way to avoid it for multi-format files (must use Heritage File adapter)
  - Use SQL Aliases to access multiple members
    - CREATE ALIAS MYLIB/MYALIAS FOR MYLIB/Filename (MBRNAME)

V5R4

- Maximize SQE usage - Avoid SQE Inhibitors
- Avoid creating metadata over DDS logical files
- Watch out for Select-Omit logical files against physical files

Web Query 1.1.1

- Use SQL Engine Joins
- Initially use for every report, including single table reports
DB2 Web Query Tips and Techniques

### Numeric Legacy Dates

**Actual:** P8 I6  
**Usage:** P8YYMD I6MDY

**Optimized Techniques**

- Output 2011/04/01
  - P8YYMD – new field format or Master file Usage
  - Dates less than 8 digits use math to create 8 digit date  
    - i.e. Year * 10000 + Mth * 100 + Day  
- **SORT/BY/ACROSS**
  - Mathematically extract components
  - Month Name 01 = Jan
  - Extract Month component (01-12) format as Mt
  - Use output format Mt for legacy date field

**Smart Dates if required:**

- Must start with an 8 digit field
  - DATECVT(Date8Num, 'P8YYMD', 'YYMD')
- If 6 or 4/2/2 long use arithmetic to create 8 digit date for conversion
- Date Components Required:
  - DPART(DateFld, 'YEAR', 'I4') starting with your YYMD field

### Character Legacy Dates

**Actual:** A8 A6  
**Usage:** A8YYMD A6YMD

**Optimized Techniques**

- Output 2011/04/01
  - A8YYMD – new field format or Master file Usage
  - Use "|" (concatenate) to combine components when less than A8  
- Components:
  - Use SUBSTR (or EDIT) to decompose date
  - Month Name 01 = Jan
  - Use output format Mt

**Smart Dates if required (new with 1.1.2):**

- Must start with an 8 character field
  - DATECVT(DateA8, 'A8YYMD', 'YYMD')
  - Cannot currently combine Concatenate and DATECVT and retain optimization
  - For dates less than 8 characters use an SQL View for optimization when Smart dates are required
Date dimension table

- Create a table containing one record for every date
- Create individual fields for each date type and component
  - Can include additional information about a date such as fiscal year ends, retail seasons, holidays, flags ...
- Join your date field to date table and have access to all fields in date table with full DB2 optimization support

![Diagram of ORDERS and DATE TABLE](image)

Technique described in article in WIKI

SQL Views

- Very good technique when additional date formats or components are required
  - Work very well when smart dates are required and you don’t have 8 character date fields
  - Can be used to create fields actual month name (i.e. January)
  - Can calculate Q1-Q4
- SQL Views are for much more than dates
  - Used whenever we need to ensure that optimization is done by DB2
  - Great for row level security
  - Joining multiple tables, access to additional join types
    - All joins defined in a view are executed whether or not fields from the joined files are used – different from Web Query defined join

Process

- Create SQL View
- Create synonym over view
- All fields in view, including calculated or converted fields, treated as if in base table
- Transparent to report developer

See Version 2 or later of the redbook for details and examples
MS Excel output

• Excel Formula
  • Compute fields – formula
  • Define fields – static value

• Table of Contents

• Document
MS Excel output

- Excel Formula
  - Compute fields – formula
  - Define fields – static value

Table of Contents

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MS Excel output

Document
And the Tips just keep coming

- **InfoAssist development performance**
  - Can change IA default per user

- **IE Control key is marvelous!**  
  (now default in 2.1)

- **Tip: Reduce records sent to IE**
  - Use prompting or drill down

**and Coming…..**

**SQL Passthru**
- Directly invoke a DB2 SQL function
  - `SQL.function_name(parms)`
  - `WEEKNUM/I2=SQL.WEEK_ISO(ORDERDATE)`
- Can invoke a user defined function as well
  - `MYDATE/YYMD = SQL.MYDATEUDF(ORDDAT);`

**Conditional Drill Down**
- Via Traffic Lighting Condition display

**Pages on Demand**
- Store report on server
- Send desired page to browser
- Perform search on server
Input Parameter Alternatives

- Creating HTML page front-end
  - Using HTML Composer in Developer Workbench
  - Controls grouped and passed together rather than individually. The more parameters, the better the performance (over Auto Prompt)
  - More efficient techniques to build the HTML for the drop down lists
  - Aesthetically more options and more pleasing
  - Many controls are available with Active Reports/Dashboards in InfoAssist

- Usage Tip
  - Consider HTML Composer with calendar icons for date prompting

V2.1 End User Dashboards

- End user can create their own dashboards from reports they are authorized to
Joining Tables

- Use DB2 Foreign Key support if possible
- Developer Workbench
  - Reference existing synonyms
  - R1.1.2+ system will try to autojoin the two tables you select
- In reporting tool

V2.1 Architecture

- DB2 Repository
  - Folders
  - Procedures
  - HTML files
  - Bitmaps
  - Schedules
  - Distribution Lists
- Synonyms are still stored as text files in Apps directories in IFS
V2.1 New Security Model

- More granular control of objects
- Rules define what a user can or cannot do and are made up of:
  - Groups – container of users or subgroups with similar capabilities.
    - Each top level folder will automatically create 6 groups/roles.
      - Folder-Run
      - Folder-Analyst
      - Folder-Developer
      - Folder-DBA
      - Folder-Sched
      - Folder-Admin
    - Web Query Administrator
    - Developer Workbench Group

Metadata

- V2.1 added requested security granularity separating programming rights and metadata creation
  - Only Folder DBAs and Web Query Administrators can create synonyms
  - Synonyms can be created and EDITED from the Web Query portal (browser)
  - Synonyms are created in application folders associated with Top Level Folders (same name)
  - Only synonyms in baseapp can be seen by all Top Level Folders
- Refresh synonym
  - Adds/deletes columns
  - Maintains manual changes (joins/filters/dimensions/formatting etc.)
  - For mass refresh use CRTWQSYYN
- Green screen command CRTWQSYYN allows you to create synonyms in batch
  - Can specify *ALL files in a library
  - Developer Workbench is not required for metadata editing (but is very nice to use!)
**Row/Record Security Alternatives**

Complete security – including securing developers
- SQL Views!
- Join to a table containing userid and security values
- Allows for more complex selection
- Very fast: DB2 optimization and checking
- A programmer with DBA rights can create their own synonym and bypass secured synonyms
- See white paper in Wiki

**DBA**
- Store security data and information directly in synonym
- Optimized DB2
- Details next slide

**Web Query Join**
- Create table with userid and authority values
- Join Security table to master file with secured field (i.e. COUNTRY)
- Retrieve run time userid
- Select records where run time user equals security userid
- In Report, compare user to &FOCUSER
  - &FOCUSER optimized
  - Report developer makes security decision
- In Master File have to use GETUSER('10')
  - NOT optimized

**DBA**

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Business Views

- Simplify list of columns by categorizing fields within folders
- Reduce fields user sees (simplicity and security)
- Part of Developers Workbench and browser portal (2.1)

Global Filters

- Predefined Filters
  - Global filters
  - Report designer can easily select and reuse
    - i.e. Europe filter might automatically select all countries in Europe
  - Modified filters automatically used by all existing reports
Subfootings and Subheadings

5) Question: How to have a calculation at subtotal and not at detail level.
   Answer: Subfootings and Prefixes.

Data Profiling:
Developer Workbench and Web Query Synonym Editor (2.1)

- By column / table / cluster / view
- Pattern count, outliers
- Identifies Avg, Min/Max
- Number of distinct Values
- % of Nulls
General Tips

- SQL Wizard – type or import an SQL statement
  - Part of Developer Workbench
  - Result set is sent to reporting tool for formatting
- Developer Workbench
  - “Show Desktop on Explorer Tree”
  - “Confirm Close” – Use this setting

General Tips

- Consider using a Prefix for synonym names to assist in grouping related tables together particularly in baseapp
- Backup libraries and IFS
  R1.2
  - SAVLIB – QWEBQRY76 and QWEBQRY77
  - Sav - /QIBM/PRODDATA/WEBQUERY/IBI/*
  - Sav - /QIBM/USERDATA/WEBQUERY/IBI/*
  R2.1
  - SAVLIB – QWEBQRY and QWQREPOS
  - Sav - /QIBM/PRODDATA/QWEBQUERY/*
  - Sav - /QIBM/USERDATA/QWEBQUERY/*
- Use style sheets to format your reports
  - You can modify provided style sheets or create your own .STY and .CSS
  - Set your own default theme in InfoAssist
**IBM Lab Services offerings for DB2 Web Query**

- The **DB2 for i Center of Excellence** team within IBM Lab Services consists of a group of highly trained, senior level consultants with over 150 years of combined experience in helping AS/400, iSeries, System i and now IBM i on Power Systems clients with database related services.
- **DB2 Web Query Getting Started Services:**
  - Three days of onsite assistance
  - Audience specific training (targeted training modules)
    - Combination of presentation, demonstration and hands on labs covering DB2 Web Query, performance considerations, and critical success factors
  - Getting started with Meta Data Workshop
- **Query/400 Modernization Services**
  - Three days of onsite assistance
  - Analyze current Query/400 environment using Lab Services developed discovery and analysis tools
  - Develop roadmap to modernize reporting environment
  - Build prototype of modernized environment with DB2 Web Query
- **Use Services Voucher to cover or supplement costs of services**
  - For more information, contact Doug Mack at mackd@us.ibm.com

**The Forum and the WIKI**

- **IBM developerWorks site for DB2 Web Query**
  - Registration Recommended
  - KnowledgeBase and Forum
  - Links to Additional Information
  - WIKI – Repository of technical information

- **DB2 Web Query home page**
  - Getting Started with DB2 Web Query Redbook
    - V2.1 redbook available 4Q 2012
    - Download Sample Database (installed automatically with V2.1)