TechTip: Converting Legacy Date Fields to DB2 Web Query Dates, Part II

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Extend your legacy date fields to support a richer set of date values and improve the performance of your reports.

In my previous Tech Tip, "Converting legacy date fields to DB2 Web Query dates – Part 1", I described how you would use the powerful DB2 Web Query for IBM i built-in functions to convert your legacy date fields to "smart dates". These smart dates are virtual columns stored in the metadata, and as such, can be used in DB2 Web Query reports and graphs just like any other field in the data source. In part 2 of this tech tip, I am going to show you an alternate way of extending your legacy date fields to support a richer set of date values and improves the performance of your reports. This technique involves the introduction of a new table (physical file) to your database: the date conversion table.

Date conversion table

The idea behind a date conversion table is relatively simple. Create a table that contains one row for each individual day within a specified date range. Each row is made up of columns that represent the same date value in various ways (e.g, day of week). Your reporting and business intelligence requirements will dictate how many date value representations that you add to your conversion table. For example, a date conversion table could include the following columns:

- Julian date
- Date (a "true" DB2 date field)
- Fiscal Year
- Fiscal Quarter
- Day of the week (Monday, Tuesday, etc.)
- Month of the year (January, February, etc.)
- Season (spring, summer, autumn, winter)
- Super Bowl Sunday flag (Y or N)
- Day before a holiday flag (Y or N)
- Day after a holiday flag (Y or N)
- Full moon flag (Y or N)
- And so on

In order for this technique to work, the date conversion table must have a column that represents the date in the same format as the legacy file. When the report is run, the join operation is applied to rows in the date conversation table that match those in the legacy file. This matching column in the conversion table will be the unique key. Defining a referential constraint relationship between the two tables will enable DB2 Web Query to recognize this join relationship between the tables and generate the SQL join syntax necessary to join the legacy file and the date conversion table. The result is a very efficient date conversion implementation and a faster running report.

With this technique, each date format in the date conversion table is available to the DB2 Web Query development tools and therefore can be easily be included in any report. This gives the report developer the ability to effortlessly do some interesting customized analysis. For example:

- What are the profit margins on days before and after holidays?
- What is the rate of product returns on the day after Christmas as compared to any other day of the year?
- Are more galoshes sold in the spring or the fall?
- How many cases of motor oil are sold on days when there is a full moon?

To be thorough, you will want your conversion table to contain a broad range of dates (for example every day between Jan 1, 1900 and Dec 31, 2030). This way, any possible dates in your legacy files would have a matching row in the conversion table. You shouldn't be too concerned about the size of the date conversion table: to represent every day in this 130 year range, the table would contain 47,847 rows. This is a relatively small table in most IBM i shops.

The beauty of this technique is that the conversion has been performed before any report has been run. Each possible day is represented by a row in the table that has already been converted in all the different formats that you have specified. Consequently, instead of the DB2 Web Query tool (or any other application that uses this method) performing the CPU intensive date conversions, the work is pushed down into DB2. However, the work done by DB2 for i is not date conversion work at all, but rather joining the rows from the legacy file to the date conversion table. Since the database engine is very good at join processing (especially if the right indexes are in place), the end result is faster delivery of reports that rely on intensive date conversions.

Steps to implement date conversion table

Implementing the date conversion method is relatively simple and can be performed in the following five steps:

1. Create the date conversion table
2. Populate the date conversion table
3. Create constraints
4. Create synonym against legacy file
5. Create reports

Step 1 :Create the date conversion table

The first step for this solution should be obvious: you need to create the table that stores the converted dates for each day in your date range. An example with various ways that dates can be represented is provided below. Execute these SQL statements from any SQL interface.

```
CREATE TABLE DATE_CONV (
      DC_DATE DATE  ,
      DC_MDYY_PD DECIMAL(8, 0),
      DC_MDYY_CHAR CHAR(8),
      DC_YEAR INTEGER ,
      DC_DOW INTEGER ,
      DC_DOY INTEGER,
      DC_QOY INTEGER,
      DC_CC NUMERIC(2, 0),
      DC_YY NUMERIC(2, 0),
      DC_MM NUMERIC(2, 0),
      DC_DD NUMERIC(2, 0),
      DC_DAY_NAME CHAR(9),
      DC_QUARTER_NAME FOR COLUMN DC_QTR_NAM CHAR(6)  ,
      DC_WEEKEND CHAR(1),
      DC_HOLIDAY CHAR(1),
      DC_BEFORE_HOLIDAY FOR COLUMN DC_BFR_HOL CHAR(1),
      DC_AFTER_HOLIDAY FOR COLUMN DC_AFT_HOL CHAR(1),
      DC_SEASON CHAR(6)  DEFAULT NULL,
      DC_FISCAL_YEAR FOR COLUMN DC_FIS_YR INTEGER,
      DC_FISCAL_QUARTER FOR COLUMN DC_FIS_QTR INTEGER,
      DC_MONTH_NAME FOR COLUMN DC_MO_NM CHAR(9),
      DC_MONTH_ABRV FOR COLUMN DC_MO_ABV CHAR(3),
      DC_JULIAN NUMERIC(7, 0),
      DC_FULL_MOON FOR COLUMN DC_FLLMOON CHAR(1));

LABEL ON COLUMN DATE_DIM.DATE_CONV
(
DC_DATE TEXT IS 'Date (date format)',
DC_YEAR TEXT IS 'Year (4 digits)' ,
DC_MDYY_PD TEXT IS ‘Date (MMDDYYY decimal)’,
DC_MDYY_CHAR TEXT IS ‘Date (MMDDYYY character)’,
DC_DOW TEXT IS 'Day of week (1-7)',
DC_DOY TEXT IS 'Day of year (1-366)',
DC_QOY TEXT IS 'Quarter of year (1-4)',
DC_CC TEXT IS 'Century (2 digits)',
DC_YY TEXT IS 'Year (2 digits)',
DC_MM TEXT IS 'Month (2 digits)',
DC_DD TEXT IS 'Day (2 digits)',
DC_DAY_NAME TEXT IS 'Day of Week Name (Monday,etc.)',
DC_QUARTER_NAME TEXT IS 'Quarter name (2008Q1)',
DC_WEEKEND TEXT IS 'Weekend Flag (Y or N)',
DC_HOLIDAY TEXT IS 'Holiday Flag (Y or N)',
DC_BEFORE_HOLIDAY TEXT IS 'Day Before Holiday Flag (Y or N)',
DC_AFTER_HOLIDAY TEXT IS 'Day After Holiday Flag (Y or N)',
DC_SEASON TEXT IS 'Season (Spring, Summer, Autumn, Winter)',
DC_FISCAL_YEAR TEXT IS 'Fiscal year (4 digits)',
DC_FISCAL_QUARTER TEXT IS 'Fiscal quarter (1-4)',
DC_MONTH_NAME TEXT IS 'Month name (January, etc)',
DC_MONTH_ABRV TEXT IS 'Month abbreviation (Jan, Feb, etc)',
DC_JULIAN TEXT IS 'Date in Julian format',
DC_FULL_MOON TEXT IS 'Full Moon Flag (Y or N)');
```

To be perfectly honest, I actually do not know of any application that needs to know whether a particular day falls on a full moon. The point here is that that you have the ability and freedom to provide creative types of dates in your reports and deliver this information to your report consumers.

Step 2 – Populate the date conversion table

Now that you have a date conversion table, the next step is to load it with data. There are various ways you can do this, but the recommended approach is to leverage the power of SQL and all it's built-in date functions. An example SQL stored procedure has been provided below. Simply create and run this stored procedure from any SQL interface.

Note: In order for this stored procedure to work as written, you will first need to make sure that the date format for your SQL session is *ISO. This can be done by checking JDBC settings from Run SQL Script window, or if you are using interactive SQL (STRSQL command), press F13=Services, then select option 1 (Change Session Attributes). Make sure this is done before you create the stored procedure.

```
CREATE PROCEDURE LOAD_DATE_CONVERSION_FILE ( )
LANGUAGE SQL

BEGIN

DECLARE var_date DATE DEFAULT NULL;
DECLARE var_date_mdyy_dec DECIMAL(8,0);
DECLARE var_date_mdyy_char CHAR(8);
DECLARE var_year INTEGER;
DECLARE var_DOW INTEGER;
DECLARE var_DOY INTEGER;
DECLARE var_QOY INTEGER;
DECLARE var_CC NUMERIC(2, 0);
DECLARE var_YY NUMERIC(2, 0);
DECLARE var_MM NUMERIC(2, 0);
DECLARE var_DD NUMERIC(2, 0);
DECLARE var_DAY_NAME CHAR(9);
DECLARE var_QUARTER_NAME CHAR(6);
DECLARE var_WEEKEND CHAR(1);
DECLARE var_HOLIDAY CHAR(1);
DECLARE var_BEFORE_HOLIDAY CHAR(1);
DECLARE var_AFTER_HOLIDAY CHAR(1);
DECLARE var_SEASON CHAR(6);
DECLARE var_FISCAL_YEAR INTEGER;
DECLARE var_FISCAL_QUARTER INTEGER;
DECLARE var_MONTH_NAME  CHAR(9);
DECLARE var_MONTH_ABRV CHAR(3);
DECLARE var_JULIAN NUMERIC(7, 0);
DECLARE var_FULL_MOON CHAR(1);

SET var_date = '1900-01-01';
SET var_holiday = 'N';
SET var_before_holiday = 'N';
SET var_after_holiday = 'N';
SET var_full_moon = 'N';

REPEAT

    SET var_date_mdyy_char = substring(char(var_date),6,2) ||
substring(char(var_date),9,2) || substring(char(var_date),1,4);
    SET var_date_mdyy_dec =DECIMAL(var_date_mdyy_char);
    SET var_year = YEAR (var_date);
    SET var_DOW = DAYOFWEEK_ISO (var_date);
    SET var_DOY = DAYOFYEAR(var_date);
    SET var_QOY = QUARTER(var_date);
    SET var_CC = decimal(substring(char(year(var_date)),1,2));
    SET var_YY = decimal(substring(char(year(var_date)),3,2));
    SET var_MM = MONTH(var_date);
    SET var_DD = DAY(var_date);
    SET var_DAY_NAME =
        (CASE var_dow
            WHEN  1
               THEN  'Monday'
            WHEN  2
               THEN  'Tuesday'
            WHEN  3
               THEN  'Wednesday'
            WHEN  4
               THEN  'Thursday'
            WHEN  5
               THEN  'Friday'
            WHEN  6
               THEN  'Saturday'
          WHEN  7
               THEN  'Sunday'
            ELSE ''
        END);
    SET var_quarter_name= TRIM(CHAR(YEAR(var_date))) CONCAT 'Q' CONCAT
TRIM(CHAR(QUARTER(var_date)));
    SET var_weekend =
        (CASE var_dow
            WHEN  1
               THEN  'Y'
            WHEN  7
               THEN  'Y'
            ELSE 'N'
        END);
   SET var_season =
        (CASE
            WHEN  var_mm < 3  OR (var_mm = 3 and var_dd <21)
               THEN  'Winter'
            WHEN  var_mm < 6  OR (var_mm = 6 and var_dd <21)
               THEN  'Spring'
            WHEN  var_mm < 9  OR (var_mm = 9 and var_dd <21)
               THEN  'Summer'
           WHEN  var_mm < 12  OR (var_mm = 12 and var_dd <21)
               THEN  'Autumn'
            ELSE 'Winter'
        END);
   SET var_fiscal_quarter =
        (CASE
            WHEN  var_mm < 4
               THEN  2
            WHEN  var_mm < 7
               THEN  3
            WHEN  var_mm < 10
               THEN  4
            ELSE 1
        END);
   SET var_fiscal_year =
        (CASE
            WHEN  var_mm < 10
               THEN  YEAR(var_date)
            ELSE YEAR(var_date) + 1
        END);
   SET var_month_name = MONTHNAME(var_date);
   SET var_month_abrv =
        (CASE var_mm
            WHEN  1
               THEN  'JAN'
            WHEN  2
               THEN  'FEB'
            WHEN  3
               THEN  'MAR'
            WHEN  4
               THEN  'APR'
            WHEN  5
               THEN  'MAY'
            WHEN  6
               THEN  'JUN'
            WHEN  7
               THEN  'JUL'
            WHEN  8
               THEN  'AUG'
            WHEN  9
               THEN  'SEP'
            WHEN  10
               THEN  'OCT'
            WHEN  11
               THEN  'NOV'
            WHEN  12
               THEN  'DEC'
            ELSE ''
        END);
    SET var_JULIAN = decimal(substring(char((year(var_date)*1000 +
dayofyear(var_date))), 1,7));
    INSERT INTO date_conv VALUES(
     var_date,
     var_date_mdyy_dec,
     var_date_mdyy_char,
     var_year,
     var_DOW,
     var_DOY,
     var_QOY,
     var_CC,
     var_YY,
     var_MM,
     var_DD,
     var_DAY_NAME ,
     var_QUARTER_NAME,
     var_WEEKEND,
     var_HOLIDAY,
     var_BEFORE_HOLIDAY,
     var_AFTER_HOLIDAY,
     var_SEASON,
     var_FISCAL_YEAR,
     var_FISCAL_QUARTER,
     var_MONTH_NAME,
     var_MONTH_ABRV,
     var_JULIAN,
     var_FULL_MOON );

    SET var_date = var_date + 1 day;
    UNTIL var_date> '12/31/2030'
END REPEAT;

END;
```

NOTE: The above stored procedure example uses the SQL function DAYOFWEEK_ISO to populate the integer value (1-7) of the column DC_DOW (day of week). The DAYOFWEEK_ISO function returns an integer between 1 and 7 that represents the day of the week, where 1 is Monday and 7 is Sunday. An alternative to this is DAYOFWEEK function which returns 1 for Sunday and 7 for Saturday. Use whichever function matches your company's definition of the first day of the week.

While SQL does provide most of the built-in functions to convert the date and populate the table in this stored procedure example, there are some columns that cannot be populated with SQL functions. For example, there is no SQL function to return whether a day is a holiday (and consequently the day before or after a holiday), the season, or even (believe it nor not) whether the day falls on a full moon. These values vary depending on factors such as your country, geographic location, and culture. Therefore, for these columns, the table will either have to updated manually or perhaps populated from existing file in your database that already contains this information. In this stored procedure example, the flag column values are all set to 'N' and the season column is populated based on the commonly applied United States date boundaries for the seasons.

Step 3 - Create Constraints

The next step is to create the Referential Integrity (RI) constraints to link the files together and force the conformance of the constraint. This involves creating unique key constraints in the date conversion table and foreign key constraints in the legacy file.

Note: It must be pointed out that implementing Referential Integrity is an optional step in this process. There are advantages provided when RI constraints are in place at the database level and they are described later in this article; but from a pure DB2 Web Query perspective, the primary advantage is that they greatly simplify the process of joining tables together. If you are not comfortable with implementing RI and would like to bypass this step, refer to section 12.1.4 Joining tables in the IBM Redbook Getting Started with DB2 Web Query for System i for examples on manually creating joins using the DB2 Web Query development tools. The Redbook can be downloaded at this URL: http://www.redbooks.ibm.com/abstracts/sg247214.html

Create unique keys in date conversion table

To create a unique key constraint against the date conversion table, first determine what the date format is in the legacy file. The column in the date conversion table that matches this date format is the one that you will want to make the unique key. In the following example, this is the field DC_MDYY_PD field. This is a packed decimal field in MMDDYYYY format. To create this unique key constraint, run the following SQL statement:

```
ALTER TABLE DATE_CONV
      ADD CONSTRAINT DATE_CONV_UNIQUE_KEY_BY_DC_MDYY_PD
      UNIQUE( DC_MDYY_PD ) ;
```

As an alternative, constraints can be created using the Control Language (CL) command ADDPFCST. If you are more comfortable using CL, issue the following command from a 5250 command line:

```
ADDPFCST FILE(DATE_DIM/DATE_CONV)
TYPE(*UNQCST)
KEY(DC_MDYY_PD)
CST(DATE_CONV_UNIQUE_KEY_BY_DC_MDYY_PD)
```

Create foreign key constraints on legacy files

Once the unique key constraint is in place, foreign keys can be created on the legacy file. If you are not familiar with foreign keys, the concept is pretty simple: a foreign key is a column (or set of columns) in a table that matches a unique or primary key field (also called a parent key) in another (parent) table. Its purpose is to enforce data integrity by preventing users or processes from entering column values that do not exist in the parent table. Any database insert or update request that violates this rule is rejected by the database, thus preserving the data integrity. A database insert request will always be validated by the constraint; an update request will only go through constraint enforcement if the value of the foreign key is updated. In either case, the insert or update will fail request if a matching row is not found in the parent table. This underlying checking process is referred to as constraint enforcement.

For example when the appropriate foreign key constraint is in place, a user entering a new order is not allowed to insert a new row if the part number specified does not exist in the parts master table.

In this tip, an example legacy file named ORDHDR is used. Here is the format for this order header file:

	Data	Field	Column
Field	Type	Length	Heading
ORDER	PACKED	7 0	Order Number
CUST	CHAR	5	Customer Number
ORDDAT	PACKED	8 0	Order Date
SHPVIA	CHAR	15	Ship Mode
ORDSTS	CHAR	1	Order Status
ORDAMT	PACKED	11 2	Order Amount
TOTLIN	PACKED	3 0	Order Total
INVNUM	CHAR	7	Invoice Number

Similar to unique key constraints, a foreign key constraint can be created against an existing file using the ALTER TABLE SQL statement. In this step, the foreign key is defined as the packed decimal date column, ORDDAT, that references DC_MDYY_PD - the unique key column in the date conversion table with the same format. Run the following SQL statement to do this:

```
ALTER TABLE ORDHDR
      ADD CONSTRAINT FK_ORDHDR_ORDDAT
      FOREIGN KEY( ORDDAT )
      REFERENCES DATE_CONV ( DC_MDYY_PD )
      ON DELETE NO ACTION
      ON UPDATE NO ACTION ;
```

Or issue the following equivalent CL command:

```
ADDPFCST FILE(COBBG/ORDHDR) TYPE(*REFCST) KEY(ORDDAT)
CST(FK_ORDHDR_ORDDAT)
PRNFILE(DATE_DIM/DATE_CONV) PRNKEY(DC_MD00001)
DLTRULE(*NOACTION) UPDRULE(*NOACTION)
```

Once the foreign key constraint has been created, referential integrity enforcement is in effect at the database level.

Constraint considerations

Once you have populated the date conversion table with a broad range of dates, you should have a matching row for every date field in your legacy files. But if the date fields in your legacy files contain blanks, nulls, or invalid date values, you will have problems when attempting to create the foreign key constraint due to the RI enforcement process described above. The attempt will fail and the SQL0667 message (FOREIGN key value does not match a value in the parent key of constraint) will be issued. Consequently, in order to implement this solution, you must either create rows in the date conversion table with null or blank key values (so that matching rows can be found) or clean up the “dirty data” from your legacy files. The latter option is recommended because your reports will be more accurate and useful if the rows contain valid and correct date field values. Once your data is cleaned up and the constraint is successfully created, going forward you will be able to take advantage of the true objective of RI constraints: users (regardless of the interface) will no longer be able to enter invalid dates into this date field. Consequently, any applications that insert or update rows with invalid dates would fail with the SQL0530 message (Operation not allowed by referential constraint) and would need to be updated to handle this error appropriately.

Step 4 - Create synonym

Now that the conversion table and the necessary constraints are in place, you are ready to create the metadata (synonym) against the legacy file. To do this, take the following steps:

1. Open a DB2 Web Query metadata session and from the right mouse click menu, specify Create Synonym against the DB2 CLI local adapter as show in Figure 1 - Create synonym.

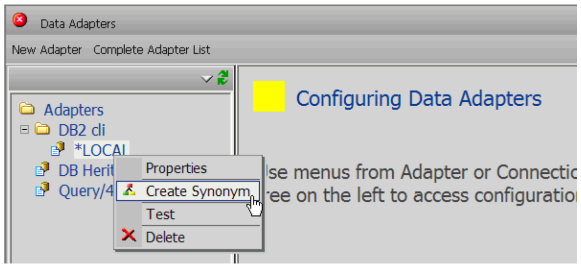
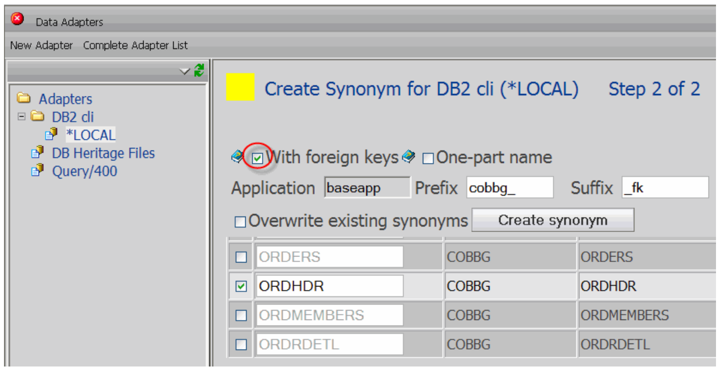


Figure 1 - Create synonym

2. Specify the library that contains the legacy file and click the Next button.
3. On the screen Create Synonym for DB2 cli (*LOCAL) Step 2 of 2, select the “With foreign keys” setting, specify the Prefix and Suffix values, select the ORDHDR file from the list of files, and click the Create synonym button. An example of this screen is shown in Figure 2 - Create synonym with foreign keys.


Data Adapters

New Adapter Complete Adapter List

- Adapters
  - DB2 cli
    - *LOCAL
  - DB Heritage Files
  - Query/400

Create Synonym for DB2 cli (*LOCAL) Step 2 of 2

[✓] With foreign keys ☐ One-part name

Application: baseapp Prefix: cobbg_ Suffix: _fk

☐ Overwrite existing synonyms Create synonym

☐	ORDERS	COBBG	ORDERS
✓	ORDHDR	COBBG	ORDHDR
☐	ORDMEMBERS	COBBG	ORDMEMBERS
☐	ORDRDETL	COBBG	ORDRDETL

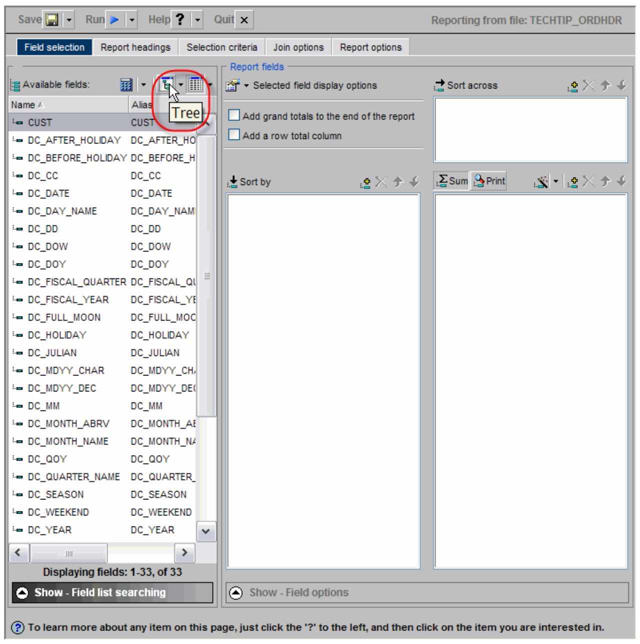
Figure 2 - Create synonym with foreign keys

Once a foreign key has been established, there is an implicit relationship between the files – they are essentially joined by the foreign key field of the legacy file and the unique key of the parent date conversion table. DB2 Web Query is well aware of this implied relationship; and by selecting the “With foreign keys” setting during the synonym creation process, you are instructing DB2 Web Query to look for these file relationships. If they exist, DB2 Web Query uses this information to build the necessary SQL join syntax whenever any report based on this synonym is ultimately executed.

Step 5 - Create reports

Finally you are ready to create reports using this technique. Follow these steps to create a new report.

1. Create a new report using Report Assistant
2. Select the synonym you just created
3. The Report Assistant development is displayed. Notice all the columns from the synonym are displayed in alphabetical order. For a more organized look, you might want to display the columns in their separate segments. To do this select the Tree view icon as show in Figure 3 - Select Tree view.


Save
Run
Help
Quit
Reporting from file: TECHTIP_ORDHDR
Field selection
Report headings
Selection criteria
Join options
Report options
Available fields:
Tree
Report fields
Selected field display options
Sort across
Add grand totals to the end of the report
Add a row total column
Sort by
Sum
Print
Displaying fields: 1-33, of 33
Show - Field list searching
Show - Field options
To learn more about any item on this page, just click the '?' to the left, and then click on the item you are interested in.

Name	Alias
CUST	CUST
DC_AFTER_HOLIDAY	DC_AFTER_HO
DC_BEFORE_HOLIDAY	DC_BEFORE_H
DC_CC	DC_CC
DC_DATE	DC_DATE
DC_DAY_NAME	DC_DAY_NAM
DC_DD	DC_DD
DC_DOW	DC_DOW
DC_DOY	DC_DOY
DC_FISCAL_QUARTER	DC_FISCAL_QU
DC_FISCAL_YEAR	DC_FISCAL_YE
DC_FULL_MOON	DC_FULL_MOC
DC_HOLIDAY	DC_HOLIDAY
DC_JULIAN	DC_JULIAN
DC_MDYY_CHAR	DC_MDYY_CH
DC_MDYY_DEC	DC_MDYY_DE
DC_MM	DC_MM
DC_MONTH_ABRV	DC_MONTH_AE
DC_MONTH_NAME	DC_MONTH_N
DC_QOY	DC_QOY
DC_QUARTER_NAME	DC_QUARTER_
DC_SEASON	DC_SEASON
DC_WEEKEND	DC_WEEKEND
DC_YEAR	DC_YEAR

Figure 3 - Select Tree view

4. Expand the segments by clicking on the plus sign next to the segments as shown in Figure 4 – Expand segments in tree view.

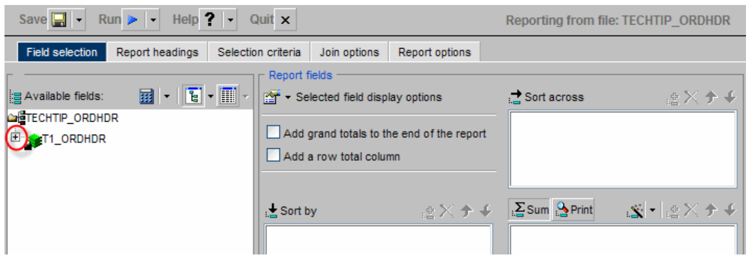


Figure 4 – Expand segments in tree view

Once all your segments are expanded, the screen will look like the example shown in Figure 5 - Tree view with expanded segment.

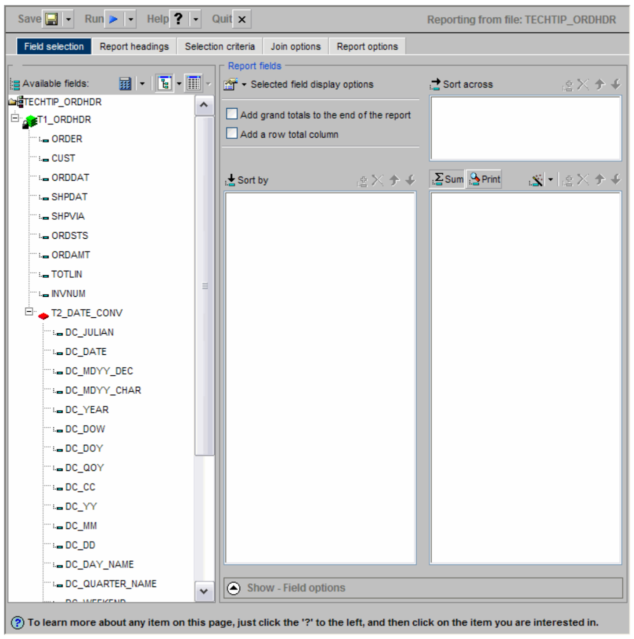


Figure 5 - Tree view with expanded segment

Notice that all the fields from both files are available to be used in the report. Because of the previous steps that were taken, DB2 Web Query has brought them all as if it were a single virtual table. All of the various ways to represent the date can be easily included in your report. You simply select the columns that from this list of available fields. An example of this is shown in Figure 6 - Select report columns.

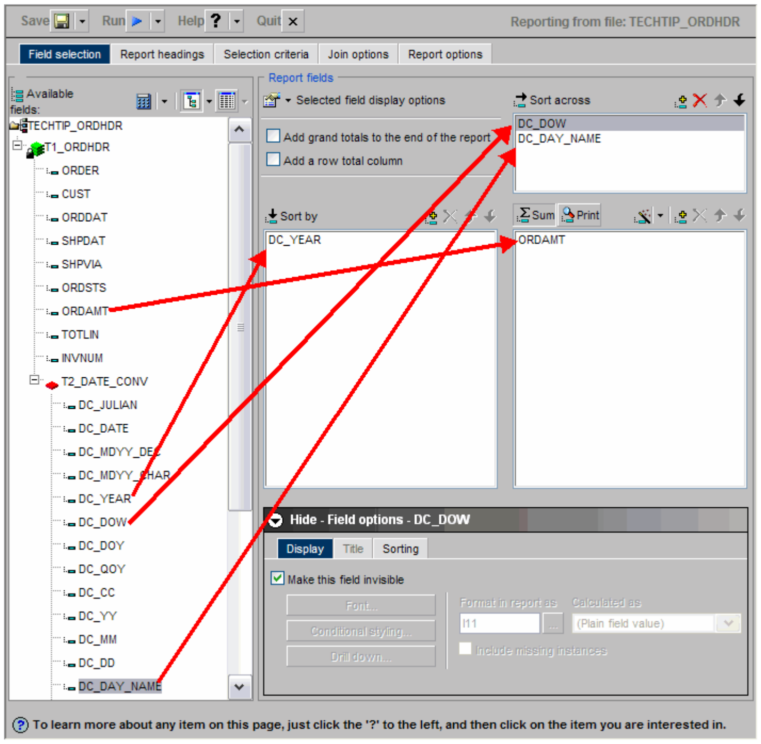
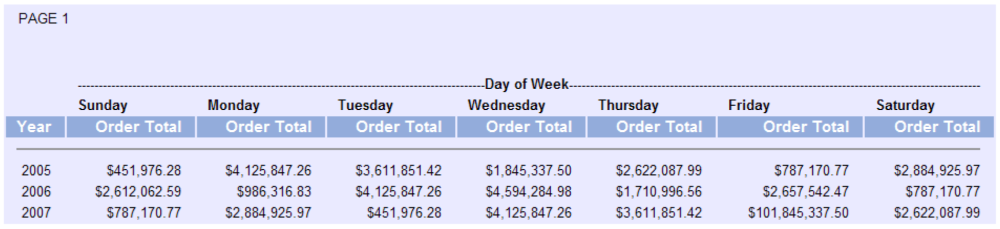


Figure 6 - Select report columns

When the report is executed, DB2 Web Query will handle the generation of all of the join syntax. The join will bring in all of the matching rows with the converted date values. At this point you do not need to worry about any date conversion functions or joining files together – it's all been done. How easy is that?

An example of what this report looks like is show in Figure 7 - Example report using date conversion table.



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	Day of Week						
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Year	Order Total	Order Total	Order Total	Order Total	Order Total	Order Total	Order Total
2005	$451,976.28	$4,125,847.26	$3,611,851.42	$1,845,337.50	$2,622,087.99	$787,170.77	$2,884,925.97
2006	$2,612,062.59	$986,316.83	$4,125,847.26	$4,594,284.98	$1,710,996.56	$2,657,542.47	$787,170.77
2007	$787,170.77	$2,884,925.97	$451,976.28	$4,125,847.26	$3,611,851.42	$101,845,337.50	$2,622,087.99

Figure 7 - Example report using date conversion table

Performance differences – does it matter?

In a previous tech tip, I described how to use the DB2 Web Query built-in-functions (BIFs) to convert your date fields. This particular tip relies on database join logic to retrieve the dates from a file whose columns have already been converted. So you are probably wondering, does it matter which method I use? From a report performance perspective, the answer is "yes." The date conversion technique does provide significant report performance advantages, but exactly to what degree will always vary depending on such factors as system resources, system activity, available indexes, the number of rows retrieved and number of columns converted. But to give you some idea of what gains can potentially be realized, I conducted a mini benchmark that compared the performance results of the two techniques. The following tables provide information about the files and reports used in this benchmark:

Legacy file specifications:

Legacy file attribute	**Value**
Name	ORDDTL
Number of rows	600,000
Number of date fields to convert	1

Date conversation table specifications:

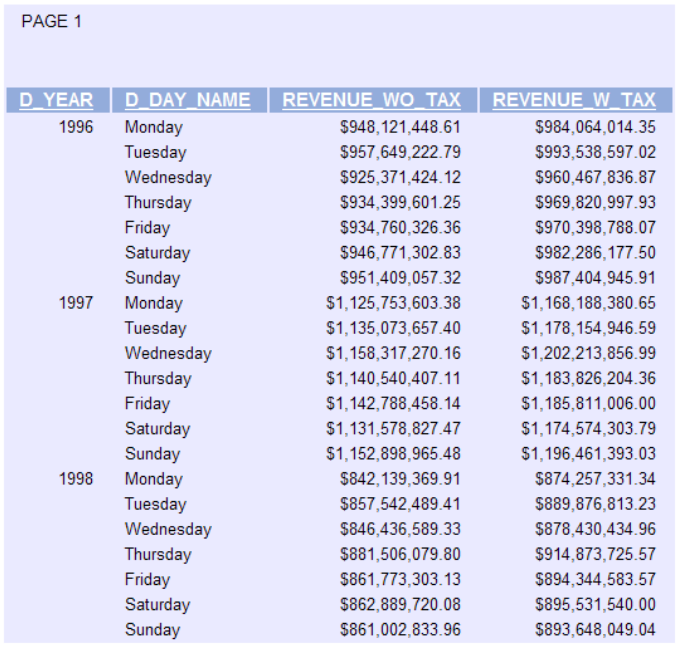
Date conversion table attributes	**Value**

Name	DATE_CONV
Number of rows	47,847 (one row for every day in the range Jan 1, 1900 and Dec 31, 2030)

Report specifications:

Report attributes	
Name	DATE_CONV
Sort/Group by columns	• Year • Numeric day of the week – hidden column with the value of 1 through 7. Without this field, the report would be sorted in alphabetical order of the Day of the week column. • Descriptive day of the week (Monday, Tuesday, etc.)
Display columns	• Revenue without tax • Revenue with tax

Two versions of the same report were created and run (and yielded identical output results). The first version used the DB2 Web Query built in functions to convert the date field. The second version used the date conversion table. An example of the report output is shown in Figure 8 - Performance benchmark example report.



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D_YEAR	D_DAY_NAME	REVENUE_WO_TAX	REVENUE_W_TAX
1996	Monday	$948,121,448.61	$984,064,014.35
	Tuesday	$957,649,222.79	$993,538,597.02
	Wednesday	$925,371,424.12	$960,467,836.87
	Thursday	$934,399,601.25	$969,820,997.93
	Friday	$934,760,326.36	$970,398,788.07
	Saturday	$946,771,302.83	$982,286,177.50
	Sunday	$951,409,057.32	$987,404,945.91
1997	Monday	$1,125,753,603.38	$1,168,188,380.65
	Tuesday	$1,135,073,657.40	$1,178,154,946.59
	Wednesday	$1,158,317,270.16	$1,202,213,856.99
	Thursday	$1,140,540,407.11	$1,183,826,204.36
	Friday	$1,142,788,458.14	$1,185,811,006.00
	Saturday	$1,131,578,827.47	$1,174,574,303.79
	Sunday	$1,152,898,965.48	$1,196,461,393.03
1998	Monday	$842,139,369.91	$874,257,331.34
	Tuesday	$857,542,489.41	$889,876,813.23
	Wednesday	$846,436,589.33	$878,430,434.96
	Thursday	$881,506,079.80	$914,873,725.57
	Friday	$861,773,303.13	$894,344,583.57
	Saturday	$862,889,720.08	$895,531,540.00
	Sunday	$861,002,833.96	$893,648,049.04

Figure 8 - Performance benchmark example report

Each version of the report was run 20 times and the run time (the time between the user selecting the report and when report was displayed to the browser) was recorded and averaged. The results are displayed in Table 1 - Benchmark results.

Table 1 - Benchmark results

Date conversion technique	**Average runtime** **(20 executions)**
DB2 Web Query functions	41.6 seconds
Date conversion table	3.9 seconds

As you can see, for this particular example report, the performance difference between the two techniques was quite significant. The report that used the date conversion method ran over 10 times faster than the same report that used the built-in functions! While, as stated, your results may vary, this should be enough to convince you that the date conversion table method is at least worthy of a prototyping exercise in your environment.

Summary

Although DB2 Web Query does provides many built-in functions to help convert your legacy date fields to smart dates, there are advantages to implementing the date conversion table technique described in this tip. With referential integrity constraints in place, you ensure that no more invalid dates can be entered into your database files. And because the conversion work has already been performed, you may experience significant improvements in DB2 Web Query report performance. Finally, it is an extremely easy way to include some interesting ways to represent date values in your reports. Heck, you might even decide that a full moon flag might be useful after all!