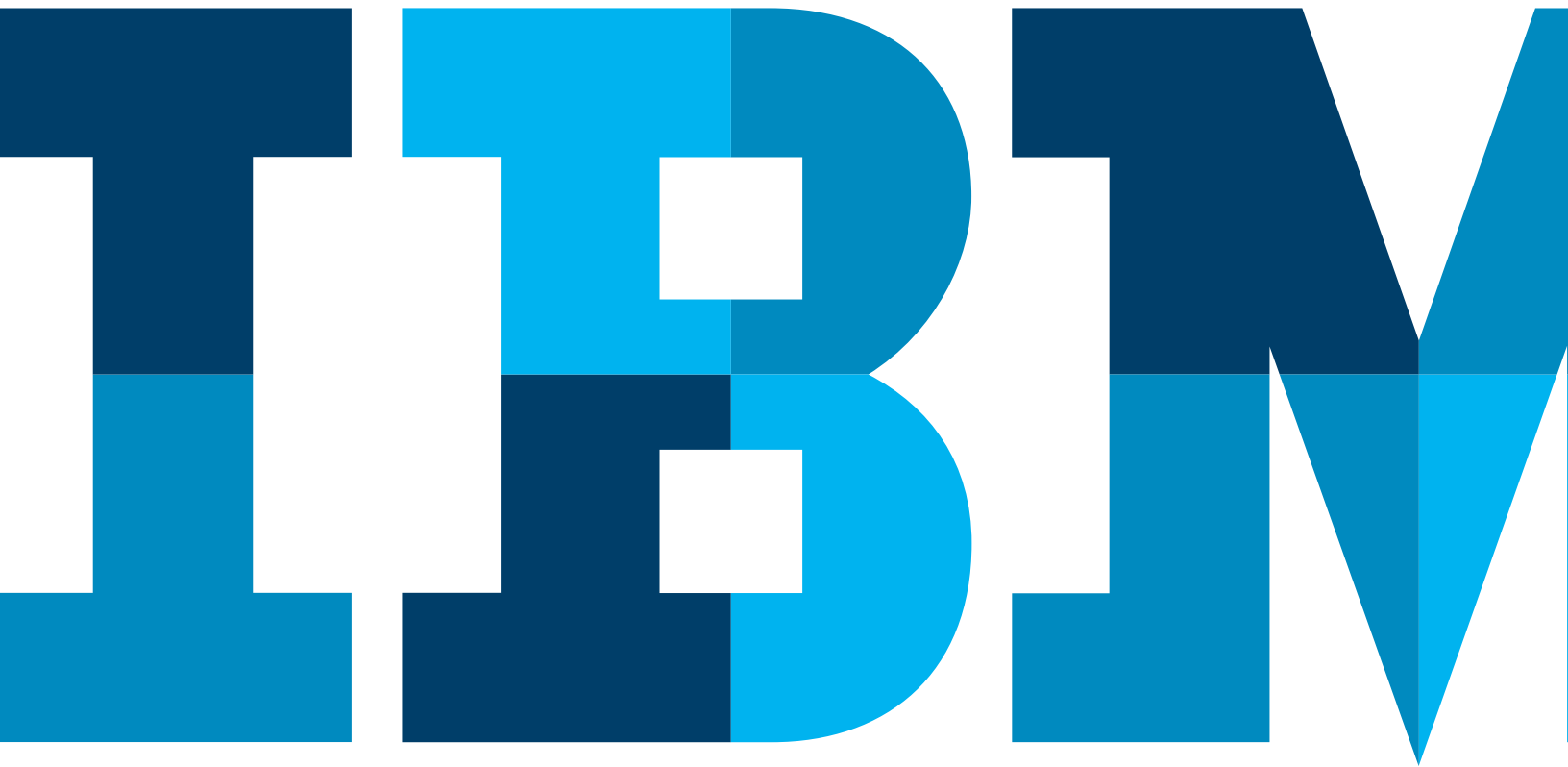


# The role of IBM Tivoli OMEGAMON XE for DB2 Performance Expert on z/OS in DB2 10 migrations



Be sure performance monitoring is part of your IBM® DB2® 10 migration. Why? The use of a systems monitor helps identify the return on investment (ROI) of your migration and quantifies DB2 10 performance improvements. Also, using a systems monitor helps you identify missed migration opportunities, for example, areas where you might take advantage of new DB2 10 capabilities. It helps you get more out of areas that DB2 itself improved, for example, real storage improvements, surfaced in IFCID 225.

DB2 10 can provide “out-of-the-box” CPU-usage reductions. IBM clients often use IBM Tivoli® OMEGAMON® XE for DB2 Performance Expert on z/OS® not only during migration, but on a regular basis to verify that they are achieving their goals. Frequently, IBM clients trust OMEGAMON to tell them how DB2, and their application, is actually performing, compared to what they might think certain DB2 and/or their application tuning knobs do.

Queries are tuned. Thread-types are redefined. Buffer pools are reorganized. Clients want to know that the impact of these changes meet their expectations. With DB2 10, IBM made changes designed to reduce CPU usage. OMEGAMON helps clients confirm those expectations.

The new DB2 performance metrics that OMEGAMON offers can provide insight into new opportunities to do things differently using DB2 10. For example, with DB2 10 you can examine real storage utilization (via IFCID 225), by using the metrics not available in prior releases. This might reveal new opportunities and/or requirements with respect to tuning DB2 10 in ways you may not have considered with earlier versions.

### The Performance Management Process

To be effective, performance monitoring must be an ongoing part of your business process. Nothing is static in our business environments—not if we want to survive! (See Figure 1.) So, performance management must begin with collecting the performance data, either in real time or through a passive background collection process.

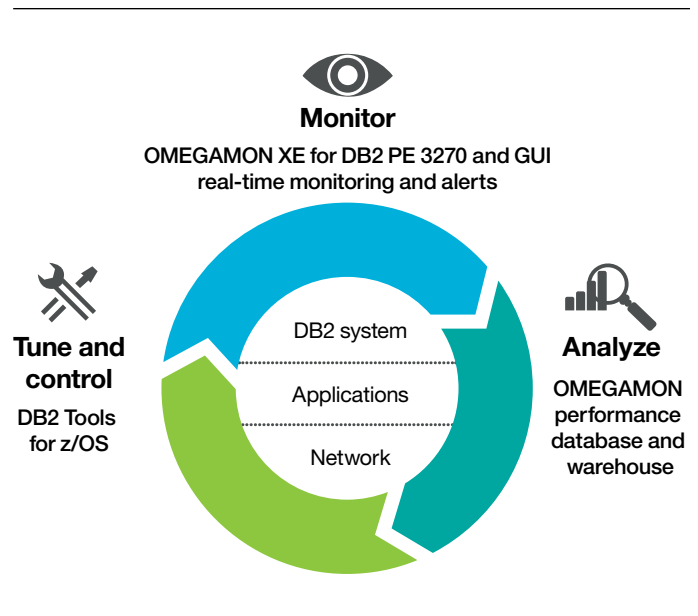


Figure 1: Performance management is an on-going, iterative process that involves three steps: monitor, analyze and tune.

The next step is to store that data in some sort of repository that may vary from “in your head” to elaborate performance analysis databases (either using capabilities that come with OMEGAMON or capabilities you have developed yourself). Finally, you make tuning decisions based on that analysis—and start all over again.

The OMEGAMON family of performance monitors (to which the OMEGAMON XE for DB2 Performance Expert belongs), uses real-time collection and historical analysis tools that make this process almost automatic.

### Monitoring Requirements for DB2 10

What are the OMEGAMON requirements for monitoring DB2 10? Version 5.1.0 is the version required to monitor DB2 10. V5.1 supports three versions of DB2: 8, 9 and 10. There is complete support for DB2 10 in OM PM (in addition to PE) as well as in V5.1 of the Buffer Pool Analyzer.

## Getting started

To begin, examine the basics of managing a DB2 10 migration. In preparation, DBAs should team up with the application and system people and spend some time thinking about and selecting metrics that make sense to them in helping to determine their level satisfaction with the migration. This will certainly not be a single event that concludes with single comparison of one report before and after the migration, but ongoing comparisons and analysis of the Key Performance Indicators (KPIs)—well after the migration is complete.

### Identify KPIs:

- Elapsed time
- CPU usage in the application and DB2 address space
- Lock/latch wait times
- Statistics/real-storage
- SQL statement metrics

Clients will also want to select applications—test applications or “simulations” that they have perhaps written to ascertain the migration’s success—or key production applications that are critical to their business and must be in top-notch running condition before they’re willing to officially cutover to DB2 10. Most clients run DB2 10 in compatibility mode (CM) for a period of time before enabling new function mode. And many of the DB2 10 performance benefits can be realized in CM.

Most of this pre- and post-analysis is best carried out using the batch reports delivered with OMEGAMON coupled with the Performance Database (PDB), but analysis of distributed applications can use the new Extended Insight feature to compare response times and the components making up response time for those types application before and after the migration.

## The Performance Database

Figure 2 illustrates what is probably a familiar diagram of the various ways that OMEGAMON supports historical reporting and analysis. In managing a DB2 migration, focus on basic batch reporting as the recommended method for performing this analysis. Using standard System Management Facilities (SMF) or Generalized Trace Facility (GTF) datasets as input, the OMEGAMON batch reporting tool coupled with the various SAVE or FILE output formats can be used to populate the PDB.

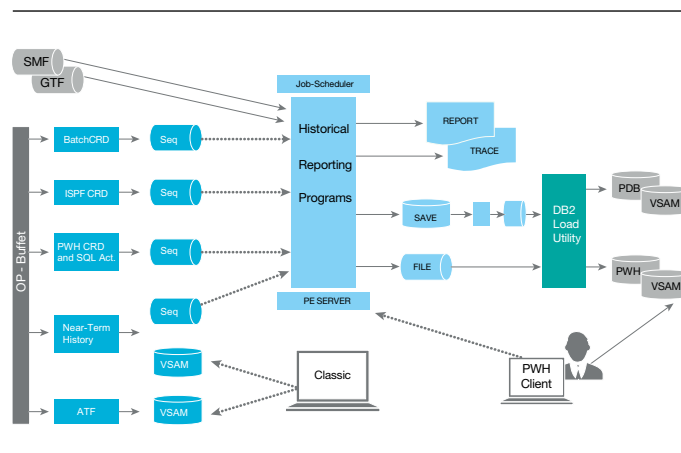


Figure 2: Analyze application performance using the performance database.

Using the PDB facilitates ad hoc queries and is a good technique for customers to examine the various metrics in detail and in different ways. Certainly, using the pre-defined reports provided with the batch reporter is a strong alternative.

DB2 10 beta test clients were provided OMEGAMON DB2 V5.1 licenses to use to validate and/or measure performance of their DB2 10 beta systems. Several batch reports were stipulated by the DB2 10 team plus clients were allowed to use OMEGAMON to monitor their DB2 10 performance real-time.

*“Thankfully, we had OMEGAMON or we could not have measured DB2 10 performance improvements”*

– DB2 10 beta test client

*“IBM DB2 Tools were critical to our successful DB2 10 beta test.”*

– DB2 10 beta test client

The OMEGAMON XE for DB2 10 Performance Database is a set of IBM-defined tables in a DB2 database in which you can store DB2 performance data and use for either ad hoc or scheduled analysis. IBM provides the data definition language (DDL) to create the database, and maintains and updates these table/column definitions throughout the release of OMEGAMON and the versions of DB2 it supports.

If coupled with the OMEGAMON DB2 batch reporter, loading the PDB is almost ‘automatic’ as a step in creating paper reports for day-to-day analysis. By automating this process as a part of normal DB2 performance management, the data is always there for ad hoc analysis. As part of evaluating DB2 migration performance, it is assumed you have either OMEGAMON PDB loaded with pre-DB2 10 performance data or you’re using some other repository to store the “BEFORE” picture.

Figure 3 illustrates the primary classifications of the data in the PDB. The key reports and tables used for migration analysis are the Accounting and Statistics reports and tables (with the key IFCIDs noted), though Record Trace can also provide some valuable data for analysis.

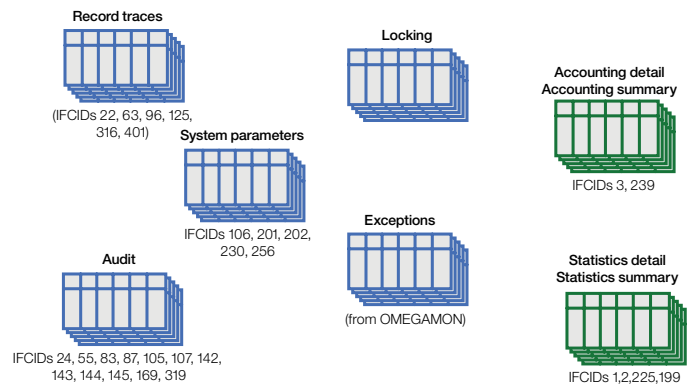


Figure 3: Information stored in the PDB can be broadly classified into these categories.

### Key before/after migration reports

The two key areas of the migration to DB2 10 are statistics and accounting. That is where a number of the DB2 10 enhancements were made. Note: when choosing metrics to compare, there are new metrics in DB2 10 that are not in your previous version. For an “apples-to-apples” comparison, you must select metrics that exist in both versions. There are certainly some DB2 10 metrics that will provide insight by themselves—without having a comparable DB2 9 metric. Therefore, there is no need to limit the analysis to strictly the lowest common denominator.

Figure 4 shows a sample of a statistics report from OMEGAMON. DB2 10 is all about storage and CPU savings. IFCID 225-related reports help you understand what has improved and what might be at risk following the migration. Be aware that, while there is certainly virtual storage relief in the DBM1 address space, that relief was created by moving control blocks above the bar. As a result, clients should monitor real storage utilization before and after migration.

```

LOCATION: DSNDA18          OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (VSRI)          PAGE: 1-1
GROUP: N/P                STATISTICS REPORT - LONG                REQUESTED FROM: NOT SPECIFIED
MEMBER: N/P                SCOPE: MEMBER                TO: NOT SPECIFIED
SUBSYSTEM: DSNDA1         INTERVAL FROM: 07/06/11 03:39:00.00    INTERVAL FROM: 07/28/10 08:45:00.15
DB2 VERSION: V10          DATA SHARING MEMBER: N/A            TO: 07/06/11 04:10:00.00
                                INTERVAL ELAPSED: 31:00.000490        OUTAGE ELAPSED: 0.000000
----- HIGHLIGHTS -----
INTERVAL START : 07/06/11 03:39:00.00    SAMPLING START: 07/06/11 03:39:00.00    TOTAL THREADS : 0.00
INTERVAL END   : 07/06/11 04:10:00.00    SAMPLING END  : 07/06/11 04:10:00.00    TOTAL COMMITS : 1192.0K
INTERVAL ELAPSED: 31:00.000490          OUTAGE ELAPSED: 0.000000                DATA SHARING MEMBER: N/A

SQL DML          QUANTITY /SECOND /THREAD /COMMIT  SQL DCL          QUANTITY /SECOND /THREAD /COMMIT
-----
SELECT           0.00      0.00    N/C      0.00    LOCK TABLE     0.00      0.00    N/C      0.00
INSERT           3537.7K  1901.97  N/C      2.97    GRANT           0.00      0.00    N/C      0.00
NUMBER OF ROWS  3537.7K  1901.99  N/C      2.97    REVOKE         0.00      0.00    N/C      0.00
UPDATE           4528.5K  2434.69  N/C      3.80    SET HOST VARIABLE 0.00      0.00    N/C      0.00
NUMBER OF ROWS  6674.0K  3588.17  N/C      5.60    SET CURRENT SQLID 0.00      0.00    N/C      0.00
MERGE            0.00      0.00    N/C      0.00    SET CURRENT DEGREE 0.00      0.00    N/C      0.00
DELETE          238.4K  128.17  N/C      0.20    SET CURRENT RULES 0.00      0.00    N/C      0.00
NUMBER OF ROWS  238.4K  128.17  N/C      0.20    SET CURRENT PATH 0.00      0.00    N/C      0.00
PREPARE          9337.8K  5020.32  N/C      7.83    CONNECT TYPE 1   0.00      0.00    N/C      0.00
DESCRIBE TABLE 9337.8K  5020.32  N/C      7.83    CONNECT TYPE 2   0.00      0.00    N/C      0.00
OPEN            9918.7K  5332.64  N/C      8.32    RELEASE         0.00      0.00    N/C      0.00
CLOSE           3883.9K  2088.12  N/C      3.26    SET CONNECTION   0.00      0.00    N/C      0.00
FETCH           3882.7K  2087.49  N/C      3.26
NUMBER OF ROWS  15660.0K 8419.33  N/C     13.13  ASSOCIATE LOCATORS 0.00      0.00    N/C      0.00
TOTAL DML        44665.5K  24.0K   N/C     37.45  ALLOCATE CURSOR 0.00      0.00    N/C      0.00
HOLD LOCATOR    0.00      0.00    N/C      0.00
FREE LOCATOR    0.00      0.00    N/C      0.00
TOTAL           0.00      0.00    N/C      0.00

STORED PROCEDURES QUANTITY /SECOND /THREAD /COMMIT  TRIGGERS          QUANTITY /SECOND /THREAD /COMMIT
-----
CALL STATEMENT EXECUTED 0.00      0.00    N/C      0.00    STATEMENT TRIGGER ACTIVATED 0.00      0.00    N/C      0.00
PROCEDURE ABENDED       0.00      0.00    N/C      0.00    ROW TRIGGER ACTIVATED      0.00      0.00    N/C      0.00
CALL STATEMENT TIMED OUT 0.00      0.00    N/C      0.00    SQL ERROR OCCURRED        0.00      0.00    N/C      0.00
CALL STATEMENT REJECTED 0.00      0.00    N/C      0.00

USER DEFINED FUNCTIONS QUANTITY /SECOND /THREAD /COMMIT  ROW ID           QUANTITY /SECOND /THREAD /COMMIT
-----
EXECUTED              0.00      0.00    N/C      0.00    DIRECT ACCESS      0.00      0.00    N/C      0.00
ABENDED               0.00      0.00    N/C      0.00    INDEX USED         0.00      0.00    N/C      0.00
TIMED OUT             0.00      0.00    N/C      0.00    TABLE SPACE SCAN USED 0.00      0.00    N/C      0.00
REJECTED              0.00      0.00    N/C      0.00

USE CURRENTLY COMMITTED QUANTITY /SECOND /THREAD /COMMIT
-----
INSERT ROWS SKIPPED     0.00      0.00    N/C      0.00
DELETE ROWS ACCESSED   0.00      0.00    N/C      0.00
UPDATE ROWS ACCESSED   0.00      0.00    N/C      0.00
    
```

Figure 4: Statistics reports help you understand what has improved and what might still be at risk following the migration.

Figure 5: shows a sample of the OMEGAMON Accounting Report-Long, and the use of the PDB to query relevant accounting metrics before and after the migration. The separation of lock and latch wait times is also new in DB2 10. Understanding these wait components will help evaluate and perhaps reveal application tuning opportunities with DB2 10.

```

ACCOUNTING
REPORT
LAYOUT (LONG)
ORDER (PRIMUTH-PLANNAME)
SCOPE (MEMBER)
...

LOCATION: OMEGAMON XE FOR DB2 PERFORMANCE EXPERT (VSRI)          PAGE: 1-1
GROUP: N/P                ACCOUNTING REPORT - LONG                REQUESTED FROM: NOT SPECIFIED
MEMBER: N/P                ORDER: PRIMUTH-PLANNAME                TO: NOT SPECIFIED
SUBSYSTEM: DSNDA1         SCOPE: MEMBER                INTERVAL FROM: 07/28/10 08:45:00.15
DB2 VERSION: V10          DATA SHARING MEMBER: N/A            TO: 07/28/10 08:45:00.15

PRIMUTH: SDA  PLANNAME: MULTIP6

ELAPSED TIME DISTRIBUTION          CLASS 2 TIME DISTRIBUTION
-----
APPL          CPU          CPU          CPU          CPU          CPU
DB2           SECU           SECU           SECU           SECU           SECU
SUSP          SUSP          SUSP          SUSP          SUSP          SUSP
-----
APPL          CPU          CPU          CPU          CPU          CPU
DB2           SECU           SECU           SECU           SECU           SECU
SUSP          SUSP          SUSP          SUSP          SUSP          SUSP
-----
APPL          CPU          CPU          CPU          CPU          CPU
DB2           SECU           SECU           SECU           SECU           SECU
SUSP          SUSP          SUSP          SUSP          SUSP          SUSP
-----
AVERAGE      APPL (CL.1)  DB2 (CL.2)  IFI (CL.5)  CLASS 3 SUSPENSIONS  AVERAGE TIME  AV. EVENT  HIGHLIGHTS
-----
ELAPSED TIME  3:23.32193  1:18.06838  N/A         LOCK/LATCH(DB2+IRLM)  0.155724      164.60    #OCURRENCES : 4
NONPENDED TIME  1:29.35495  1:15.25326  N/A         IRM LOCK=LATCH        0.076568      2.25     #ALLIEDS : 0
STORED PROC    1:02.05925  2:171807   N/A         DB2 LATCH             0.070156      161.75    #ALLIEDS DISTRIB: 0
UDF            51.002729   0.436014   N/A         SYNCHRON. I/O         0.824810      3889.75   #PAGETS : 0
TRIGGER        0.000000    0.000000   N/A         DATABASE I/O          0.250911      388.75   #PAGETS DISTRIB.: 0
CP CPU TIME    5.759037    5.236138   N/A         LOG WRITE I/O         0.073908      23.60    #NO PROGRAM DATA: N/P
AGENT          5.759037    5.236138   N/A         OTHER READ I/O        20.024125     6804.25   #NORMAL TESTMENT: 0
NONPENDED      2.394543    2.237011   N/A         OTHER WRITE I/O       19.592807     6323.50   #OFFRSFAR ROLLUP: 1
STORED PROC    2.394543    2.237011   N/A         SER. TASK SWITCH     5.102599      509.00    #ABNORMAL TERMIN: 0
UDF            0.013607    0.040425   N/A         UPDATE COMMIT         0.201105      571.25   #CF/PK PARALLEL.: 0
TRIGGER        0.000000    0.000000   N/A         OPEN/CLOSE           0.005983      0.75     #IO PARALLELISM : 0
PRG. TASKS    0.000000    0.000000   N/A         SYSLOGNG REC         0.019129      0.75     #INCREMENT. BTM: 4
TRIGGER        0.000000    0.000000   N/A         EXT/DEL/DEF          2.091036      6.25     #COMPLTS : 2397
PRG. TASKS    0.000000    0.000000   N/A         OTHER SERVICES        0.010183      2.60    #RPT BACKS : 40
    
```

Figure 5: Accounting reports help you use the PDB to query relevant accounting metrics before and after the migration.

OMEGAMON PDB users should notice that the performance database and performance warehouse columns support the larger 64-bit counters implemented in DB2 10 as a result of moving control blocks above the bar, as well as supporting longer DB2 address-space uptime, for example, for many statistics counters that are only reset when the address space is recycled.

### Extended Insight

Moving beyond host-based DB2 for z/OS applications, you examine the use of OMEGAMON to evaluate off-host, or distributed, applications that use DB2 for z/OS on the back end. With the many layers making up a distributed application, the three main components (that is, application, network and dataserver—in this case, DB2) are the top-level, most visible components that impact application response time.

With the OMEGAMON for DB2 Performance Expert Extended Insight feature, we can confirm which layer is the primary contributor. In our migration exercise here, what you should expect to see is no change, or a change for the better in DB2 (dataserver) time.

When using Extended Insight for comparing before and after migration, you employ a slightly different technique. The Extended Insight GUI provides a side-by-side comparison of different application workloads for a specific point in time. So, to compare different time periods, simply open two web consoles side-by-side, with the appropriate time periods selected, to display the average response time components before and after migration, that is, from Time Period A and Time Period B, as illustrated in Figure 6.



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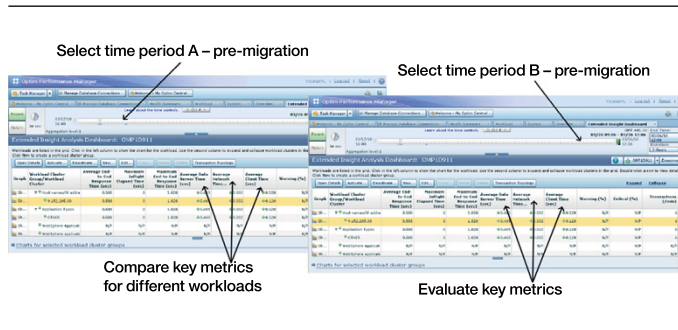


Figure 6: Using Extended Insight to compare pre- and post-migration application performance.

## Conclusion

There is no substitute for having the evidence you need to support your position, as well as the tools to generate the data. OMEGAMON for DB2 Performance Expert can quickly and clearly provide the information on which to base your performance claims.

To learn more about the IBM Tivoli OMEGAMON XE for DB2 Performance Expert on z/OS, please contact your IBM representative or IBM Business Partner, or visit the following website: [ibm.com/software/data/db2/zos](http://ibm.com/software/data/db2/zos)



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