TREMENDOUS IMPROVEMENT IN PERFORMANCE IN SAP BW WITH ORACLE DATABASE IN-MEMORY AND "FLAT CUBES WITH ORACLE"

Implemented with a modest amount of work

With an annual turnover of approximately 820 million and over 7,700 employees, Villeroy & Boch is one of the world's leading premium brands for ceramic products. The family business, which was founded in 1748 and is headquartered in Mettlach/Germany, stands for innovation, tradition and exceptional style. As a renowned lifestyle brand, Villeroy & Boch offers products from the sectors Bathroom and Wellness and Tableware, and is active in 125 countries.

Both business areas use an SAP ERP and an SAP BW system as well as other SAP solutions. Villeroy & Boch has also been using Oracle's proven, reliable database to great advantage for around 20 years. Over the years the use of BW/BI has steadily increased. The company has approximately 2,500 SAP users worldwide, including some 1,700 in the SAP BW environment. Certified SAP hosting partner Rödl IT Operation GmbH (with offices in Mettlach, Selb, and Frankfurt) operates a manages a range of systems including all SAP systems on behalf of Villeroy & Boch AG.

Putting Oracle Database In-Memory to the test

Shortly after the Oracle Database In-Memory technology was officially certified by SAP in the middle of 2015, Villeroy & Boch joined forces with Rödl & Partner, its hosting partner, to put Oracle Database In-Memory to the test. This new database 12*c* technology for its SAP BW was extensively tested on a sandbox system on the exact same hardware as used with the productive system. During this process, the fact tables (E and F tables) of the biggest InfoCube (COPA) – containing approximately 94 million complete datasets – were loaded in the Oracle database's additional, column-oriented memory area "Column Store". The tests mainly involved directly comparing pure read times for selected queries with the productive system. The database system needed to be upgraded from Oracle 11*g* to Oracle 12*c* to use Database In-Memory. The database's main storage was In-Memory. The database's main storage was expanded by 96 GB. This new memory is only used in the database for column-oriented In-Memory tables. The buffer sizes in the System Global Area (SGA), such as those for the data block buffer cache and shared pool remained unchanged. The entire test took just 1.5 days. Only two Oracle database parameters are needed to use Database In-Memory.

- inmemory_max_populate_servers=4
  (limits the number of database background processes for loading the In-Memory tables, default = 4)

- inmemory_size=69G
  (defines the size of the In-Memory Store)

- inmemory_clause_default = „PRIORITY HIGH"

The SAP LISTCUBE transaction, to name but one example, was used when carrying out the tests. The database response times were calculated with SQL traces using SAP transaction ST05 (performance analysis). All the database tables were compressed on the productive system using Oracle Advanced Compression technology. The indexes, meanwhile, were compressed with Index Compression, which has been usable in SAP since Oracle 10*g*. Both compression operations therefore took place using the test system too.

Expectations exceeded

Comparisons with the productive system were made on identical hardware with various test scenarios on the SAP NetWeaver BW system.

- In the first test, 1 million datasets were selected without database aggregation several times over. While 24 seconds were measured for this query in the productive system, a response time of 160 milliseconds was recorded on the identical test system with Oracle In-Memory.

- These 1 million datasets were aggregated in the second test too. Here, the execution time was shortened from 44 seconds to 11 seconds.

- In the third test, the entire data volume of the loaded tables (94 million datasets) was read and aggregated. While the execution did not give a result in the productive system due to a time-out, it was completed in 22 seconds on the test system.
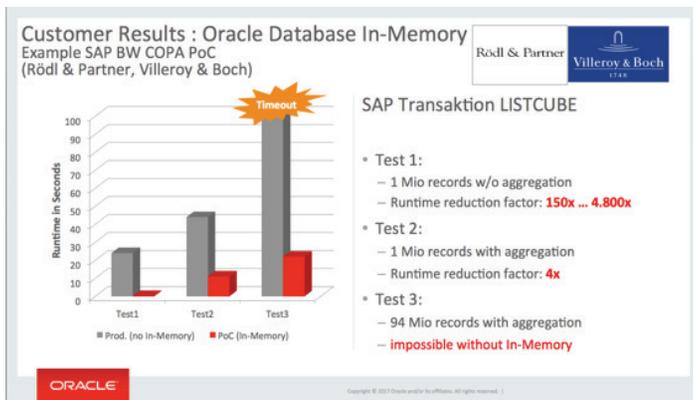
Figure: Performance of Oracle Database In-Memory

In further tests, two existing COPA queries were used and compared without any adaptations.

Here, the execution times were greatly accelerated, going from 50 to 1.5 seconds and from 72 to 2.5 seconds.

Figure: Performance of Oracle Database In-Memory for COPA queries

The now-shorter execution times are particularly valuable for Villeroy & Boch, as is the modest amount of implementation work required. Use of Oracle Database In-Memory now enables selection and aggregation of extremely large amounts of data in far shorter times.

The moderate amount of implementation work is a key argument in favor of using Oracle Database In-Memory. In a nutshell, only the following was necessary:

- Use of existing hardware, operating system, and virtualization technology

- Database upgrade from Oracle 11*g* to Oracle 12*c*

- Activation of Database In-Memory using a few database parameters

- Activation of tables for In-Memory

- **N**o table or database migration

- **N**o adaptations to the SAP application code

Low resource requirement, many benefits

Villeroy & Boch was expecting performance to increase substantially. This much has certainly been confirmed – and impressively so. At the same time, it became clear just how much potential the Oracle Database In-Memory technology harbors.

The swift implementation and performance of the tests both make a completely convincing argument. The fact that there was no need to buy any brand-new hardware given the moderate additional memory costs was yet another positive aspect in favor of using the technology. Use of Oracle Database In-Memory is activated only for tables that are useful for this purpose. It is not appropriate to equip all the tables in a database with In-Memory technology. Doing so makes tables smaller, or even creates tables on which a pure single set query is performed. Column-oriented storage with Oracle In-Memory is not necessary for this.

The technology can be used immediately in the existing infrastructure and virtualized environment. No special adaptations or modifications to the existing database or within the SAP application are necessary. The administrative work involved is also very moderate. The minimum risk involved in upgrading the Oracle database is well-known due to many years of experience in dealing with the Oracle database.

- Oracle Database In-Memory results in a significantly improved report execution time
- Improvements several times over
- Moderate implementation work
- Implementation on existing hardware
- No modifications necessary in the application
- No data migration required
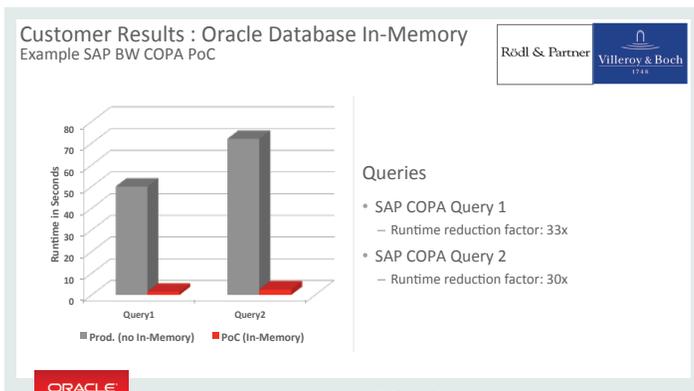- Unmodified use of all Oracle database functionalities

Further developments in the SAP NetWeaver BW now available with Flat Cubes and Oracle too

When it launched SAP HANA, SAP developed the HANA-optimized InfoCubes, which was only possible due to the use of column-oriented In-Memory technology. The "SnowFlake" data model of the existing InfoCubes made up of fact and dimension tables was dissolved and migrated to a flat table.

The same technology has been available to all SAP NetWeaver BW customers since the middle of 2016 along with the Oracle database and the In-Memory option under the keyword "Flat Cube on SAP BW on Oracle" (see SAP Note: 2335159). Existing InfoCubes are converted as needed using the SAP standard program RSANAORA. By means of re-partitioning, the InfoCube (E and F fact tables and all the associated dimension tables) are being created as a single flat table in a partitioned format.

Following the productive launch of Oracle In-Memory technology in the middle of 2016, Villeroy & Boch converted some InfoCubes to Flat Cubes in SAP NetWeaver BW during another test conducted at the end of 2016 / start of 2017.

So, for instance, an InfoCube with 110 million datasets and measuring 13 GB in size (7 GB of which was index) needed one hour and 42 minutes for the conversion process. Once the conversion was complete, the Flat Cube was 7.2 GB in size and had a 0.3 GB index. In addition to the improvement in response time, which again was to be expected, there was also a reduction in database size within storage.

Further significant increase in performance thanks to Flat Cubes in Oracle

Following the conversion, the execution times of 100 seconds on the previous In-Memory solution could be substantially improved yet again, being shortened to 20 seconds with a Flat Cube and In-Memory. What's more, the benefits also include approximately 30% faster loading, eliminated aggregates and simplified BW modeling – and all of this is achieved through using a Flat Cube.
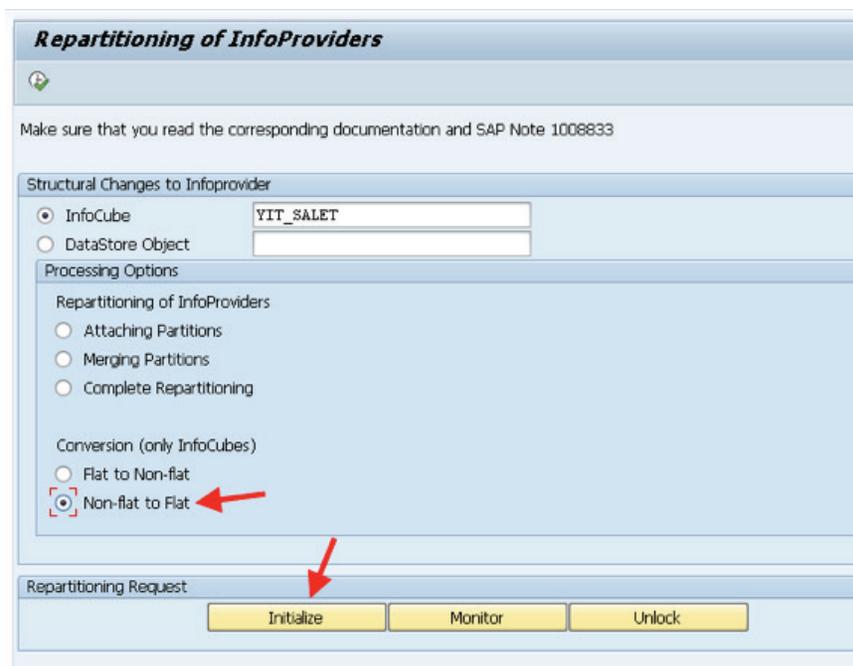

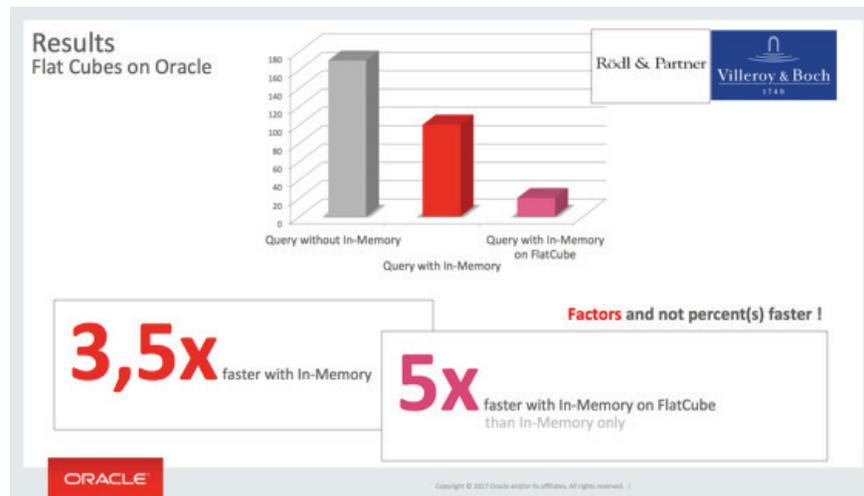*Figure: Re-partitioning and activation of the Flat Cube*

Figure: A comparison of execution times

Oracle recommends using the SAP NetWeaver version 7.40 with SP16 for conversion to Flat Cubes. As things stand today, it is still impossible from an SAP standpoint to convert transactional (plannable) InfoCubes or semantically partitioned objects (SPOs). SAP has made plans for this in 2017.

Summary of the tests

Using Oracle Database In-Memory, there is currently no need for Villeroy & Boch to replace its Oracle database for the current SAP NetWeaver systems, which has been reliable for many years, with another database system. Villeroy & Boch is successfully using the Oracle Database In-Memory technology for the productive SAP NetWeaver BW as well as SAP CRM systems.

With a reasonable amount of work and acceptable costs for the investments, the following benefits very quickly became a reality thanks to the Oracle Database In-Memory technology:

- several significant increases in the speed of query times for reports
- far more effective analysis options in reporting

The Oracle database is thus once again proving its position as a long-term stability factor for databases in the SAP environment and delivers innovations that can be implemented very quickly and with very little effort.
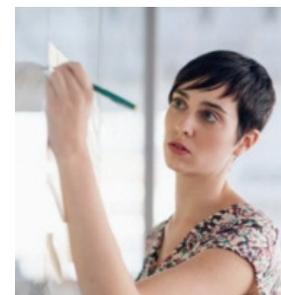
"With our tests based on Oracle 12c and Oracle Database In-Memory, the PoC produced amazing results in terms of improved performance. From a BI point of view I was also especially pleased with the fact that once SAP applications have been created, they can be used with Oracle Database In-Memory without any modifications. It's also easy to choose which SAP BW tables are processed with In-Memory and which are not."

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