IBM Software Group
White Paper

IBM Cognos 10 — Enhancing Query Processing Performance for Oracle Essbase

Contents

Executive summary

For over twenty years, IBM Cognos software query processing has continued to be developed and refined for Oracle Essbase.

The most recent developments in IBM Cognos 10 continue that trend, offering significant performance enhancements through patented MDX optimization and the new Dynamic Query with in-memory technology.

Optimized MDX combined with Dynamic Query provide the following key advantages:

- Increased solution resilience resulting from reduced Oracle-specific development requirements.
- Improved performance through optimized load between the Oracle OLAP processor and the Cognos environment.
- Decreased dependence on Oracle-specific patches and version upgrades with flexible option to migrate to the latest releases of Oracle Essbase.
- Faster diagnosis and issue resolution resulting from an improved ability to manage query parameters within the Cognos environment.
- Faster turnaround in resolving issues given less dependence on specialized Oracle Essbase resources.
- Reduction in MDX code volume, which helps simplify analysis and troubleshooting.
- Increased flexibility in the Cognos environment as report authors have infinite capacity to create lightweight queries against Oracle Essbase sources.

Introduction

IBM Cognos software has long been acknowledged as leading, innovative business analytics technology by customers and analysts alike, providing world-class enterprise business intelligence (BI), advanced analytics, financial performance management (FPM), and analytical applications and services.

Over the years, heavy investment has been put into Cognos software for Oracle applications — a tradition that continues today as Cognos software reinforces its leadership position under the ownership of IBM.

The latest Business Analytics release, IBM Cognos 10, shows clear evidence of this investment and innovative development. A next-generation, patented MDX optimization engine for Oracle Essbase, first introduced in Cognos 8 Business Intelligence and now refined for Cognos 10, offers significant performance enhancements for Oracle Essbase users.

Another breakthrough innovation in Cognos 10 is Dynamic Query, which provides deeper and more optimized integration with Oracle Essbase with in-memory technology —IBM has filed for more than 20 patents for the groundbreaking technology behind the new Dynamic Query.

This white paper discusses these new, extremely powerful developments for Cognos 10 in detail.

Some key terms defined

Multidimensional Expression (MDX) is an industry standard language used to query multidimensional data sources. In terms of Oracle Essbase, third-party reporting tools usually generate MDX, and pass requests to Oracle Essbase for execution.

For the purposes of this paper, it's important to distinguish between the various uses of MDX with Oracle Essbase.

Simple MDX – Simple MDX generates a basic request to Oracle Essbase where the result set is returned to the requesting application for additional processing. The approach is analogous to writing a SQL query, "*Select * from table1*".

All data elements (columns) and all transactions (rows) are returned from the data source.

What this means: Simple MDX has inherent limits in terms of the Oracle Essbase feature sets that can be supported, which necessitates that the requesting application or query tool handle additional activities such as filtering, calculations, and so on. These limits usually imply that these capabilities, which reside within Oracle Essbase, be replicated and managed manually by specialized IT or qualified users in order to maintain data accuracy and the integrity of the results queried from Oracle Essbase.

Deep MDX – Deep MDX generates a detailed request to the Oracle Essbase system and execution by the Oracle Essbase server, including filters, calculations, groupings and more. Cognos ReportNet used primarily deep MDX.

What this means: This approach allows you to leverage all the business rules created within an Oracle Essbase environment such as hierarchies, custom groupings and more. However, although deep MDX uses business rules and capabilities inherent to Oracle Essbase, it does place additional load on the Oracle Essbase OLAP Processor. Thus, deep MDX can often result in longer query run times and 'out of memory' conditions within the Oracle Essbase environment.

The MDX evolution with Oracle Essbase in Cognos applications

The ability of Cognos 10 to generate optimized MDX for Oracle Essbase is the result of many years of development and refinement.

It first started with the release of Cognos 8.2 Business Intelligence, which introduced an innovative approach to generating optimized MDX for Oracle Essbase. Specifically, Cognos 8.2 Business Intelligence reduced reliance on the Oracle Essbase OLAP processor by generating intelligent and optimized MDX statements prior to creation and subsequent delivery of a result set from Oracle Essbase. Further, Cognos 8 Business Intelligence provided the option

to partition processing between Cognos 8 Business Intelligence and Oracle Essbase environments, resulting in a reduced load on the Oracle Essbase OLAP Processor and improved performance for complex and large data volume queries.

Cognos Business Intelligence features *patented MDX methodology* where exploratory metadata requests are rapidly cycled within the Oracle Essbase environment to provide preexecution decision inputs on how to optimize the multi-dimension expression request that is sent to the Oracle Essbase Processor to generate a data result set.

What this means: Optimized MDX leverages Oracle Essbase structures, business rules and reduces processing loads placed on the Oracle Essbase OLAP Server. Performance is enhanced for queries that are complex in terms of application of business rules, calculations, filtering and other processing requirements.

Patented MDX Methodology: Cognos 8 Business Intelligence

As mentioned earlier, the process where query components are essentially disassembled into a series of metadata reconnaissance steps to determine the most effective method for requesting data from Oracle Essbase using MDX was first introduced in Cognos 8 Business Intelligence.

The first step of discovery consists of multiple, rapid 'metadata reconnaissance' probes into Oracle Essbase to view structures, business rules and other context. Each reconnaissance probe generates context on the scope and nature of the end result set that is being requested from Oracle Essbase.

This context is used to create an optimized MDX statement regarding the processing and data requirements of both the target Oracle Essbase Data Provider and its specific constructs. The optimized MDX is then passed to Oracle Essbase for execution.

To sum up, the order of operations is as follows:

1. *Discovery:* Pre-execution reconnaissance of Oracle Essbase and context therein, such as business rules and structures.

2. *Optimization:* Generation of an optimized MDX data request expression.

3. *Execution:* The optimized expression is sent from the Cognos environment to the Oracle Essbase OLAP Processor.

4. *Delivery:* The resulting data is sent, delivered by Oracle Essbase to the Cognos environment.

Dynamic Query Processing: Cognos 10

Cognos 10 and the introduction of Dynamic Query significantly evolve the MDX optimization. Part of the evolution lies in an enhanced query planning that has the intelligence to determine if certain analytic functions should be generated into the MDX query or be processed in-memory, based on performance cost and database capabilities.

With this functionality, the generated MDX queries are simpler and better performing while providing the same query capability. Examples of these analytic functions are sorts, totals and aggregations, top counts, etc.

The query planner also takes into account the evolution of the MDX language and generates better and cleaner MDX as compared to older versions. The idea here is that what is not in the query does not have to be optimized. So certain query functions have been integrated into the query engine and do not have to be placed into the MDX anymore. Again this makes for more optimized MDX and better performance.

Optimizations are further enhanced to streamline the 'reconnaissance steps' by making more intelligent discovery queries, and by caching intermediate results to lighten the load on the database and improve performance. The discovery queries are created according to a cost-based logic, taking into account information about the database objects, like cardinality.
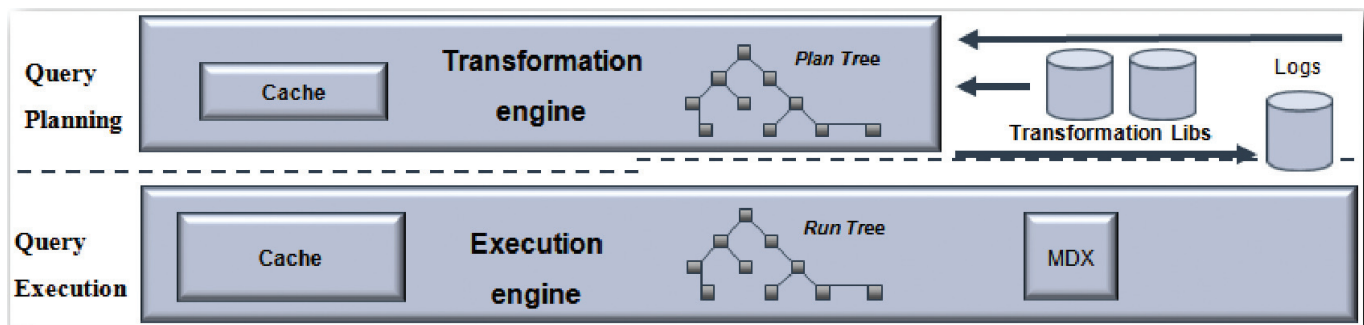
IBM has filed for more than 20 patents for Dynamic Query in Cognos 10

Summary

In summary, in lieu of passing a single complex MDX query which is digested and processed within Oracle Essbase, Cognos 10 uses the patented MDX methodology first introduced in Cognos 8 Business Intelligence to leverage business rules within Oracle Essbase, consistent with the capability Cognos Reportnet customers found to be of value.

And with Cognos 10, further advances for a more optimized and cleaner MDX and introduction of in-memory technology for Dynamic Query processing can reduce the load on the Oracle Essbase database and improve overall query performance. [For additional information and a deeper technical understanding of Dynamic Query processing advances for Oracle Essbase, please see the "IBM Cognos 10 Dynamic Query Cookbook."]

In-memory technology

Dynamic Query processing uses in-memory technology to cache data result sets from Oracle Essbase in Cognos 10. This in-memory technology provides an enhanced Java-based query mode that offers several key abilities, including:

- Query optimizations to simplify and speed up queries and reduce data volumes with improved query execution techniques.
- Significant improvement for complex OLAP queries through intelligent combination of local and remote processing and better MDX generation.
- Security-aware caching.
- New data interfaces using 64-bit processing.
- Ease of maintenance with query visualization.

Benefits of Dynamic Query in Cognos 10

Organizations can realize numerous benefits from the Dynamic Query and optimized MDX available in Cognos 10. The patented MDX methodology provides greater flexibility for processing options between the Cognos and Oracle Essbase environments. It also reduces dependence on Oracle Essbase OLAP processing bandwidth (and the subsequent performance constraints) that result from other approaches.

Dynamic Query processing reduces the amount of processing performed within the Oracle Essbase OLAP Processor, making load distribution between environments even more effective.

Optimized MDX combined with Dynamic Query offer the following key advantages in Cognos 10:

- Increased solution resilience resulting from reduced Oracle-specific development requirements.
- Improved performance through optimized load between the Oracle Essbase OLAP processor and the Cognos environment.
- Decreased dependence on Oracle-specific patches and version upgrades with flexible option to migrate to the latest releases of Oracle Essbase.
- Faster diagnosis and issue resolution resulting from improved ability to manage query parameters within the Cognos environment.
- Faster turnaround in resolving issues given less dependence on specialized Oracle Essbase resources.
- Reduction in MDX code volume, which helps simplify analysis and troubleshooting.
- Increased flexibility in the Cognos environment as report authors have infinite capacity to create lightweight queries against a variety of Oracle Essbase data providers.

Conclusion

IBM continues to lead the market with a purpose-built, unified Business Analytics system based on a service-oriented architecture. An investment in Cognos software for Oracle applications lets you embrace Oracle skills and infrastructure and enhance the value of your Oracle data. Cognos Business Analytics software and expertise increase the value of Oracle data and extend the user reach and impact of your Oracle and non-Oracle data, applications, and infrastructure.

About IBM Business Analytics

IBM Business Analytics software delivers complete, consistent and accurate information that decision-makers trust to improve business performance. A comprehensive portfolio of business intelligence, advanced analytics, financial performance and strategy management and analytic applications gives you clear, immediate and actionable insights into current performance and the ability to predict future outcomes. Combined with rich industry solutions, proven practices and professional services, organizations of every size can drive the highest IT productivity and deliver better results.

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Business Analytics software