Introduction to In-Memory Analytics and High Performance

Presented by: Jolanta Garlacz
Agenda

- Introduction to In-Memory Analytics
- Introduction to High Performance
- MicroStrategy OLAP Services
- Large In-Memory Datasets and Partitioning
- Questions and Answers
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Introduction to In-Memory Analytics

How to get from Raw Data to Visually Rich Dashboard?
Introduction to In-Memory Analytics

There are Different Processes Between Raw Data and Completed Dashboard
Introduction to In-Memory Analytics

Some of the Processes can be Done in Database while other can be Performed in Machine’s Random Access Memory (RAM)
Introduction to In-Memory Analytics

In-Memory Analytics is when Different Processes can be Done in Machine’s RAM Instead of Going to Database.

In-Memory Analytics

PROCESSSES

Aggregation
Formatting
Calculations
Querying Data
Data Transfer

Database

Database Queries
Calculations
Data Transfer
Introduction to In-Memory Analytics

MicroStrategy uses Intelligent Cube Technology - an In-Memory Version of Report that can be Manipulated by the MicroStrategy Analytical Engine. Users can slice and dice data in reports within Intelligent Cubes without having to re-execute SQL against the data warehouse.
Introduction to In-Memory Analytics

Another way to store report data on a system is MicroStrategy Result Cache. With caching, users can retrieve results from Intelligence Server rather than re-executing queries against a database.

In-Memory Analytics

Database

Caching

Database Queries
Calculations
Data Transfer
Introduction to In-Memory Analytics

Let’s Look at the Processes from the Time Perspective and Performance

Browser

BI Platform

- Render
- Transmit
- Format
- Assemble
- Predictive Calcs.
- Aggregation
- Consolidation
- Filters
- Metric Calcs.
- Transmit
- Aggregate
- Select & Join

Database

- Transaction Tables
- Transaction Data
Agenda

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Introduction to High Performance

There is a “Computational Distance” from Raw Data to Finished Dashboard

“Computational Distance” from Transaction Data to Finished Report

Total Time: 40 Seconds

Browser

BI Platform

Database

Transaction Data

Transaction Tables

Select & Join

Aggregates

Consolidation

Filters

Metric Calculations

Predictive Calculations

Aggregation

Assemble

Format

Transmit

Render

“Computational Distance” from Transaction Data to Finished Report
Introduction to High Performance

The Performance is Dominated by the Query time in the Database

"Computational Distance" from Transaction Data to Finished Report

Total Time: 40 Seconds

1 Second
1 Second
3 Seconds
1 Second
34 Seconds
Introduction to High Performance

Caching Can Dramatically Reduce the Computational Distance

Caching

1-2 Seconds

Browser

10% of all Reports

BI Platform

Render

Transmit

Format

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Predictive Calcs.

Aggregation

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Metric Calcs.

Transmit

Aggregate

Select & Join

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Transaction Data
Introduction to High Performance

Aggregating Database Can Also Reduce the Computational Distance

- **Browser**
  - Render
  - Transmit

- **BI Platform**
  - Format
  - Assemble
  - Predictive Calcs.
  - Aggregation
  - Consolidation
  - Filters
  - Metric Calcs.
  - Transmit

- **Database**
  - Aggregate
  - Select & Join

- **Transaction Tables**
  - Transaction Data

**Caching**
- 10% of all Reports

**DB Aggregates**
- 25% of all Reports

**1-2 Seconds**
- 2-20 Seconds
Introduction to High Performance

In-Memory Cubes Can Significantly Reduce the Computational Distance for Many Reports

- Caching: 10% of all Reports
- In-Memory Cubes: 40%-60% of all Reports
- DB Aggregates: 25% of all Reports

1-2 Seconds
1-3 Seconds
2-20 Seconds

Browser
BI Platform
Database

Render
Transmit
Format
Assemble
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Consolidation
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Metric Calcs.
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Select & Join
Transaction Tables
Transaction Data
Introduction to High Performance

Benchmark Lab Tests show that Caching Can Deliver 10x Faster Performance. MicroStrategy’s Caching Architecture Delivers Sub 2 Second Response at High User Loads.

Test Configuration:
- Intelligence Server
  4 CPUs Itanium
  16 GB Memory
- Web Server
  4 CPUs Itanium
  8 GB Memory
Introduction to High Performance

In-Memory Shifts the Query Work from Database to In-Memory Sources

**Performance Profile**
*Typical Operation*

**Performance Profile**
*In-memory Operation*

BEFORE | AFTER

**Number of Reports**
**User Wait Time**
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The main feature supporting MicroStrategy OLAP Services is MicroStrategy Intelligent Cube Technology, which allows you to create multi-dimensional cubes (sets of data) that are stored within MicroStrategy Intelligence Server memory.
MicroStrategy OLAP Services

OLAP Cube

Intelligent Cubes act as a layer between your data warehouse and MicroStrategy reports that analyze and display data.
MicroStrategy OLAP Services

Refreshing OLAP Cube

Data in Intelligent Cube can be refreshed by re-executing it against database. An Incremental refresh can be set up to update the Intelligent Cube with new data only.
MicroStrategy OLAP Services

Refreshing OLAP Cube

Data in Intelligent Cube can be refreshed by re-executing it against database. An Incremental refresh can be set up to update the Intelligent Cube with new data only.

**Update**
- Existing data is updated
- New data is added

**Insert**
- Only new data is added
Data in Intelligent Cube can be refreshed by re-executing it against database. An Incremental refresh can be set up to update the Intelligent Cube with new data only.
Data in Intelligent Cube can be refreshed by re-executing it against database. An Incremental refresh can be set up to update the Intelligent Cube with new data only.
MicroStrategy OLAP Services

OLAP - Online Analytical Processing

Additional OLAP analysis and features within MicroStrategy OLAP Services:

- Displaying data on the fly - dynamic aggregation allows metric values to be aggregated at different levels, depending on the attributes included on the report, without having to re-execute it against the data warehouse.

- Creating metrics on the fly - derived metrics perform calculations on the fly with the data available in a report.
MicroStrategy OLAP Services

OLAP - Online Analytical Processing

Additional OLAP analysis and features within MicroStrategy OLAP Services:

- Defining attributes elements on the fly - a derived element is a grouping of attribute elements on a report
- Filtering data on the fly - view filters dynamically restrict the data being displayed on the report without re-executing the report against the warehouse
MicroStrategy OLAP Services

OLAP - Online Analytical Processing

Additional OLAP analysis and features within MicroStrategy OLAP Services:

- Importing data as an Intelligent Cubes (in-memory dataset) - using the Import Data feature in MicroStrategy Web, data can be imported from different sources to a project and stored as Intelligent Cube
MicroStrategy OLAP Services

OLAP Services Combines the Benefits of Both MOLAP and ROLAP Analyses

• MOLAP - Multidimensional Online Analytical Processing - MOLAP tools place data in multi-dimensional cubes and perform consolidation in advance, allowing to run queries fast

• ROLAP - Relational Online Analytical Processing - ROLAP tools use complex SQL queries against relational databases to obtain multi-dimensional views of data on the fly
MicroStrategy OLAP Services

The Benefits of Using OLAP Services

- Analyze reports at the “speed of thought”, and manipulate them in real time
MicroStrategy OLAP Services

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- Analyze reports at the “speed of thought”, and manipulate them in real time
- Share Intelligent Cube data securely
MicroStrategy OLAP Services

The Benefits of Using OLAP Services

- Analyze reports at the “speed of thought”, and manipulate them in real time
- Share Intelligent Cube data securely
- Schedule Intelligent Cube execution and maintenance
MicroStrategy OLAP Services

The Benefits of Using OLAP Services

• Analyze reports at the “speed of thought”, and manipulate them in real time
• Share Intelligent Cube data securely
• Schedule Intelligent Cube execution and maintenance
• Drill from summary data to transaction-level details
MicroStrategy OLAP Services

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MicroStrategy OLAP Services

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- Apply security restrictions on users and objects
MicroStrategy OLAP Services

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- Apply security restrictions on users and objects
- Increase user self-service and productivity
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Large In-Memory Datasets and Partitioning

Large Intelligent Cubes

If your Intelligent Cubes contain large quantities of data, you can improve their performance by dividing the datasets into multiple segments, called partitions. Prior to MicroStrategy 10 data partition was not available.
Large In-Memory Datasets and Partitioning

Parallel Relational In-Memory Engine (PRIME) enables you to create in-memory cubes through Multi-Table Data Import (MTDI)

Parallel Partitioned Cube

DATA
DATA
DATA
DATA

……………

Core 1
Core 2
Core 3
Core 16

16 core CPU
Large In-Memory Datasets and Partitioning

Data limitation of 2B rows per cube is no longer the case
Large In-Memory Datasets and Partitioning

You can use MicroStrategy Data Import option to create an in-memory dataset containing data from multiple tables.
Large In-Memory Datasets and Partitioning

You can configure the number of partitions at Intelligent Cube level
## Large In-Memory Datasets and Partitioning

### Key Differences Between OLAP and In-Memory Analytics

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<td>Analytic Functionality</td>
<td>Filters and Metrics are not Fully Supported</td>
<td>Support multiple levels of aggregation and filtering</td>
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Large In-Memory Datasets and Partitioning

The Advantages of In-Memory Analytics

- Parallel dataset processing
Large In-Memory Datasets and Partitioning

The Advantages of In-Memory Analytics

- Parallel dataset processing
- Large data volumes
Large In-Memory Datasets and Partitioning

The Advantages of In-Memory Analytics

- Parallel dataset processing
- Large data volumes
- Broader schema support
Large In-Memory Datasets and Partitioning

The Advantages of In-Memory Analytics

- Parallel dataset processing
- Large data volumes
- Broader schema support
- Broader Analytic functionality
Large In-Memory Datasets and Partitioning

The Advantages of In-Memory Analytics

- Parallel dataset processing
- Large data volumes
- Broader schema support
- Broader Analytic functionality
- Search indexing
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Questions and Answers

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Thank YOU