Design Studio
Data Flow performance optimization
Performance optimization

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Introduction

- Design Studio = Development Tool
  As with other application development, ETL development should follow a methodology which includes tasks for both function and efficiency testing

- Data Flow Server works with a Pipeline Architecture
  For data load plans processing time is dependent on the rate that the data can flow through this pipeline
Performance optimization

Introduction – Pipeline Architecture

Bottleneck

Data Flow

100,000 records/minute

50,000 records/minute

20,000 records/minute
Performance optimization

Introduction – Analyzing a plan

Look for the three “S”:

- **Sources** – File Transforms and SQL Queries
- **Sinks** – File Sinks, SQL Sinks and Batch Loaders
- **Sorts** – Sort Transforms, Join, Pivot, SubPlans, Sorted Union and Rank Transforms
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Begin by looking at the performance of Plan sources:

• Use a terminal sink or monitor transform to look at source transforms performance

• If the source transform takes a large percentage of the overall Plan execution time, look at ways to speed up the source:
  • Modifying the SQL or adding indexing to tables.
  • Using multiple source transforms to read the source in parts.
  • Reduce the overhead of translating data from file sources.
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Plan sources – Sort related transforms 1

Try and push sorts back to the source whenever possible!

In some cases, Sagent can push sorting back to the source on its own.
In other cases Sagent can’t push sorting back to the source automatically.
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Plan sources – Sort related transforms 3

- Analyze the plan to see if the blocked input is going to be in proper sort order.
- Use the “Data is pre-sorted” feature to override Sagent disk sorts.
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Plan sinks – Overview

- Use batch loaders where appropriate
- Parallelize the sinks where possible to improve performance
  - Use Round Robin Splitter or segmented Data Flows to achieve parallelism
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Plan sinks – Round Robin Splitter

- Purpose:
  The Round Robin Splitter provides a way to distribute data in the data flow for processing more efficiently. It divides up the data and the processing so that multiple sets can be processed at the same time.
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Plan sinks – Database

- Use existing database features wherever feasible (e.g. Oracle direct path loading)
- Use RAID 0 where appropriate for temporary files to improve performance
- Make sure, the hardware of the database server matches your requirements
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Plan sinks – Other items to know

- Reduce the impact of copy transforms by reusing existing columns
- Use Round Robin Splitter with intermediate transforms such as Pivot and Expression Calculator
- Increasing Data Flow Block Sizes can affect performance in some cases
- Leave Key Lookups for the end of the plan
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Plan sorts - Overview

Sorting is any process of arranging items in some sequence and/or in different sets, and accordingly, it has two common, yet distinct meanings:
➢ ordering: arranging items of the same kind, class, nature, etc. in some ordered sequence
➢ categorizing: grouping and labeling items with similar properties together (by sorts)

Sort - to put in a certain place or rank according to kind, class, or nature.

- Merriam Webster Online
Performance optimization

Plan sorts - User specified Sorts

Sequences the input records based on a specified column or set of columns:

- SQL Query
  - Uses resources on the RDBMS
- Memory Sort
  - Uses memory resources on the Data Flow Server. Use for small amounts of data
- Disk Sort
  - Creates and uses temporary files stored on the Data Flow Server. Use for large amounts of data
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Plan sorts - Internal Sorts

- Sequences the input records based on columns which are determined by Transform specifications, not user-defined sort parameters.

- Unless otherwise specified by the user, the Data Flow will perform an internal sort when executing these transforms:
  - Join
  - Comparison
  - Sorted Union
  - Pivot
  - Rank

- The user has the option to override the Internal Sort on all of these transforms.

- Use the Advanced tab to avoid sorting data that is already sorted.

- Eliminating unnecessary sorting can increase performance.
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Plan sorts - Sort Pushback 1

- Each database system has its own way of sorting data internally
- Sybase and MS SQL Server use the same sorting mechanism
- Sagent Dataflow uses the American way of sorting. Make sure your database clients are set to American in an Oracle environment
- There is no universal sort mechanism, even in one country there are different ways of sorting.
- In case of doubt let dataflow do the sorting rather than the database system
In order to optimize plan performance, Data Flow will perform (if possible) what is known as a “sort pushback” to the RDBMS whenever there is a sort required by the plan.

The main attributes of sort pushback prior to version 5.5 are:

- If Data Flow can “push” a sort onto the SQL Query step, it will do so.
- If Data Flow cannot push the sort back to the SQL Query step and all the sinks in the plan are “Client Sinks” (i.e.; display sinks), Data Flow will perform an internal memory sort.
- If Data Flow cannot push the sort back to the SQL Query step and at least one of the sinks in the plan are “Non-Client Sinks” (i.e.; non-display sinks), Data Flow will perform an automatic disk sort.
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Plan sorts - Sort Pushback 3

- The main attributes of sort pushback in version 5.5 are:
  - If Data Flow can “push” a sort onto the SQL Query step, it will do so
  - If Data Flow cannot push the sort back to the SQL Query step and there is an output schema, Data Flow will insert an automatic disk sort into the plan
  - If Data Flow cannot push the sort back to the SQL Query step and there is NO output schema, Data Flow will perform an internal memory sort
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Plan sorts - Sort Pushback 4

- Sort pushback is attempted with the following transforms:
  - Join
  - Comparison
  - Sorted Union
  - Pivot
  - Rank
- Use the Advanced tab to bypass all sorts, internal or pushback
  - If the data are already sorted, you can ask Data Flow to bypass a sort pushback or an internal sort by specifying that the data are pre-sorted in the Advanced tab of these transforms
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Plan sorts - Sort Pushback 5

- Data Flow will attempt to pushback a sort to the RDBMS if:
  - The SQL Query does not already contain an ORDER BY clause
  - The SQL Query is not user-entered SQL
  - No intermediate step alters any of the sort fields
  - No intermediate step requires a sort of its own
  - No intermediate step adds or deletes records
  - No sort field originated in an intermediate step
  - No intermediate step has multiple inputs or outputs
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Data Load Plan

- Read data from two disparate data sources
- Transform data according to business rules
- Add a unique record identifier
- Load a dimension in the data mart
- Plan taking over 4 hours to complete

“Why doesn’t the Round Robin Splitter improve Performance?”
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Example – Steps to analyze plan

- Start at target and test for processing time of each query using terminal sink transform
  - Oracle query step took almost 4 hours
  - Indexing was added to reduce Oracle query to less than 20 minutes (~42,000 rec/min)
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Example – Analyze step by step

Move the Terminal Sink after the Join Transform

- Completes in 65 minutes
- Join transform incrementally increases processing time by 45 minutes
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Example – Pre-Sort both data sets

- Sort both Source Queries by common data field(s)
- Update Join transform to indicate that both sets of data are presorted
  - Eliminate automatic memory sort of both sets of data
  - Plan now completes in 40 minutes (reducing this portion of processing by 25 minutes)
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Example – Analyze step by step

Move the Terminal Sink after the Expression Calculator Transform

- Completes in 50 minutes
- Expression Calculator incrementally increases processing time by 10 minutes
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Example – Update data in flow

Update an existing column rather than adding a new column
- Plan now completes in 45 minutes (reducing this portion of processing by 5 minutes)
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Example – Continue step by step analysis

Move the Terminal Sink after the Key Generation Transform

- Completes in 50 minutes
- Key Generation incrementally increases processing time by 5 minutes
Add Oracle SQL Loader to update the data mart

- Completes in just under 3 hours (180 minutes)
- SQL Loader incrementally increases processing time by 2 hours
- Loads 1M records in 120 minutes (~8,300 rec/min)
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Example – Add additional loaders

Add Round Robin Splitter and additional Oracle SQL Loader
- Completes in just under 2 hours (120 minutes)
- Two SQL Loaders incrementally increases processing time by 1 hour
- Loads 1M records in 60 minutes (~16,700 rec/min)
- Continue to add Loaders until you reach a diminishing rate of return
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New Features – Status Monitor 1

- Purpose:
  - Use the Status Monitor Transform to track processing performance in a data flow.
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New Features – Status Monitor 2

- Parameters – Record interval:
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New Features – Status Monitor 3

- Parameters – Time interval:

  Select Interval Type
  - Records
  - Time (Sec)

  Time Interval (Sec)

  Summary Counts:
  - Records Processed
  - Total
    - TotalRecs
    - Per Interval
    - SampleRecs
  - Processing Time
    - Total
      - TotalTime
      - Per Interval
      - SampleTime

  Summary Statistics:
  - Avg Records Processed
    - SampleAvg
  - Min/Max Records Processed
    - Min Records
      - SampleMin
    - Max Records
      - SampleMax
  - Exclude First Sample From Summary Statistics

  OK
  Cancel
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New Features – Queue Monitor

- **Purpose:**
  - Use Queue Monitor to identify performance bottlenecks in data flows

- **Parameters:**
  - Set the sampling interval in seconds.
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New Features – Plan execution status

• Sagent repository contains 3 tables which track execution statistics about
  • Plans
  • Source and sink transforms within a plan
  • Tables and files loaded by a plan
• Baseview and Metaview can be created on top of the 3 tables to provide plan execution reporting and analysis
• Plans need to be tagged for tracking in the Design Studio for statistics to be collected
• Tracking data is stored in the 3 tables until someone executes a truncate or delete statement
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New Features – Sorted Union 1

• Purpose:
  • Use the Sorted Union Transform to produce a single result set by merging rows from two or more data flows.
Advanced Tab:

Select the check box for any input source that is already sorted in ascending order.

- If you sort your data with an Order By clause, Disk Sort or Memory Sort before unioning, you must sort in ascending order.
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Summary

- Test! Test! Test!
- Push bottlenecks to target
- Be aware and take advantage of new features designed to improve efficiency
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