Performance Tuning Massive SAP BW Systems - Tips & Tricks

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OfficeMax
BW Technical Team Lead
SAP Systems at OfficeMax

Decentralized Warehouse Management Systems

- Las Vegas
  - WM1
- Hazelton, Pennsylvania
  - WM2
- McCalla, Alabama
  - WM3

• Deliveries made
• Inv Adjustments

Retail and Core Business

- Shaker Heights, Ohio
  - Retail

• Order Status
• Inventories

• Customers
• Orders

• Sales, Inventory
• Purchasing, etc.

• Sales Analysis (infospoke)

Customer Call Center

- Shaker Heights, Ohio
  - CRM

• Campaign Analysis

• Market Basket (data mining)
• Customer Analysis

• Financial Simulation (transactional cube)

Business Intelligence and Modeling

- Shaker Heights, Ohio
  - BW/SEM

• Financial Simulation (transactional cube)
Agenda

1. BW Technical Overview
2. Modeling
3. Extraction
4. Changerun
5. Queries
6. Compression & Aggregates Rollup
7. SEM BPS Functions
BW Technology Platform

Solaris 2.8
SUN E10K
48-CPU / 48GB

1 App Server
SUN V880
8-CPU / 32GB

Hitachi 9960
(6TB/Monthly Growth 25GB)

BW 3.1C (SP15)
SEM 3.2B (sp12)
Oracle 9.2

SAP Portal 6.0
Crystal Enterprise 8.5
IGS

NT Servers
8-CPU

Windows XP
SAP GUI 6.20
## Application Areas & InfoProviders

<table>
<thead>
<tr>
<th>Cubes</th>
<th>Aggregates</th>
<th>ODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALES</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>INVENTORY</td>
<td>12</td>
<td>76</td>
</tr>
<tr>
<td>PURCHASING</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>FINANCE</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>HR</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>CRM</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>SEM</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>STAFFWORKS</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BW STATISTICS</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
Performance Statistics for Loads

<table>
<thead>
<tr>
<th>Data</th>
<th>Process</th>
<th>Records</th>
<th>Runtime</th>
<th>Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>Cube Load</td>
<td>1.8m</td>
<td>30 mins</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>ODS</td>
<td>1.8 m</td>
<td>1.5 hours (actv)</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Rollup</td>
<td>1.8 m</td>
<td>15 minutes</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Compression</td>
<td></td>
<td>20 mins</td>
<td>1</td>
</tr>
<tr>
<td>Inventory Snapshot</td>
<td>Cube Load</td>
<td>27 m</td>
<td>2 hours</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Rollup</td>
<td>27 m</td>
<td>1.5 hours</td>
<td>1</td>
</tr>
<tr>
<td>Purchasing</td>
<td>Cube &amp; ODS</td>
<td>1.4 m</td>
<td>2 hrs</td>
<td>24</td>
</tr>
<tr>
<td>Master Data (27 info objects)</td>
<td>Full/Delta Load</td>
<td>140 K</td>
<td>40 mins</td>
<td>10</td>
</tr>
<tr>
<td>Master Data Alignment</td>
<td>Change run</td>
<td>20000</td>
<td>3 hours</td>
<td>8</td>
</tr>
</tbody>
</table>
BW Users - Yearly

- Year-2004: 680 Users
- Year-2003: 504 Users
- Year-2002: 195 Users
- Year-2001: 149 Users
BW Users - Daily

8/16/2004: 226
8/23/2004: 178
8/30/2004: 222

Bar chart showing daily user counts.
Modeling – Performance aspects - 1

• Line Item Dimensions
Line Item Dimensions & Cardinality
Logical Partitioning – Yearly cubes
- Parallel queries run on basic infocubes
- Change run can be run parallel

Year 2004 Cube  Year 2003 Cube  Year 2002 Cube
Modeling – Performance aspects - 4

- Run Program SAP_INFOCUBE_DESIGN for existing Infocubes

Print a list of the cubes in the system and their layout

<table>
<thead>
<tr>
<th>Cube</th>
<th>Rows</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_I_MAN02</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MAN02</td>
<td>1,073</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MAN02</td>
<td>15</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MAN02</td>
<td>1</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MAN02</td>
<td>65,306,599</td>
<td>100 %</td>
</tr>
<tr>
<td>R_I_MAN02</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>2,142</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>29,830</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>15</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>1</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>53</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>24,569,910</td>
<td>100 %</td>
</tr>
<tr>
<td>R_I_MV_01</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>2,014</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>34,380</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>13</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>422</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>1</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>304</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>4</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>356,937,493</td>
<td>100 %</td>
</tr>
<tr>
<td>R_I_MV_02</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_03</td>
<td>2,899</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_03</td>
<td>40,958</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_03</td>
<td>16</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_03</td>
<td>393</td>
<td>0 %</td>
</tr>
<tr>
<td>R_I_MV_03</td>
<td>1</td>
<td>0 %</td>
</tr>
</tbody>
</table>

Compression ratio
Physical Partitioning
Aggregates
Navigational attributes
Database partitions and secondary Indexes on ODS.
Dimensions with more than one Characteristic
Agenda

- BW Technical Overview
- Modeling
- Extraction
- Changerun
- Queries
- Compression & Aggregates Rollup
- SEM BPS Functions
Data Load Performance

- Data Load from Source System
  - Configuring ROIDOCPRMS table
    - Transaction SBIW
    - General Settings->Maintain Control Parameters for Data Transfer
    - Refer OSS Note : 417307
  - Infosource specific values can be maintained in Scheduler
  - TSV_TNEW_PAGE_ALLOC_FAILED if Packet Size is Huge
  - Reorg ARFCSDATA & ARFCSSTATE tables

- Flat File load Performance
  - Maintain the parameters thru transaction RSCUSTV6
  - Load from application server not from Client reduces network load.
When loading large quantities of data into an InfoCube, the number range buffer should be increased for the dimensions that are likely to have a high number of values.

Use Function module RSD_CUBE_GET to identify the object name of the dimension.
Data Load Performance – Number range buffering - 2

- Use Transaction SNRO ->EDIT-> Setup Buffering->Main memory
- Never set buffering for package dimension

Set the values between 500 and 1000.
Use transaction SMLG and create logon group

Logon group for Load balancing

BW system
Data Load Performance – Load balancing - 2

- Change RFC settings in the source system
- Use transaction SM59
Data Load Performance

- Drop Unused Partitions
- Use program SAP_DROP_EMPTY_FPARTITIONS
  - Avoid Long execution times for Index rebuild
Data Load Performance

- Drop and recreate source twin Structures
  - Program LMCSWTOP set flag FLG_DCT = ‘X’
- Drop and Recreate Bitmap indexes on F table
- Use Parallel Processing
- ODS loads & activation parallel
- Check Update / Transfer rules
- Index on source tables for full loads with selection
- Define PSA Part. size using transaction RSCUSTV6
  - Minimum no. of records in a PSA partition
  - Use program SAP_PSA_PARTITION_COMPRESS for existing PSA tables
- Compress Cubes and aggregates regularly
Agenda

- BW Technical Overview
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- SEM BPS Functions
- Changerun
Change run performance - 1

- How Change run works on aggregates
  - Inserts new records positively and old records negatively
Change run Performance - 2

● Function module RSCDS_CONDENSE_CUBE

Aggregate name

Enter X for aggregate

Value of cnsid_to of table rsddaggrdir
**Change run Performance – Threshold & Block size**

- **Transaction RSCUSTV8**

  If the Changes more than 20% Aggregates are rebuilt

  Choose the block size depending on the Temporary table space available
Create an RFC server group using transaction RZ12
- After the RFC server group is defined use report SAP_RSADMIN_MAINTAIN to create the object entries CR_RFCGROUP in the table RSADMIN
- OSS Note – 534630 Parallel Processing of Change run
- Parallel Processing of Change run Increases memory consumption
Change run Performance – Monitoring - 1

- Use Table RSDDSTATAGGR to find the run times

Table RSDDSTATAGGR Display

<table>
<thead>
<tr>
<th>STATUID</th>
<th>3V0NwFBVDQL8K270Z1O8NXT8w</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGGCUBE</td>
<td>106517</td>
</tr>
<tr>
<td>INFOCUBE</td>
<td>WSNAP6401</td>
</tr>
<tr>
<td>PARENTCUBE</td>
<td>WSNAP6401</td>
</tr>
<tr>
<td>UNAME</td>
<td>ZBWBATCH</td>
</tr>
<tr>
<td>CHANGEMODE</td>
<td>D</td>
</tr>
<tr>
<td>TIMEREAD</td>
<td>893.535158</td>
</tr>
<tr>
<td>TIMEINSERT</td>
<td>0.558894</td>
</tr>
<tr>
<td>TIMEINDEX</td>
<td>0.496894</td>
</tr>
<tr>
<td>TIMEBANALYZE</td>
<td>14.929683</td>
</tr>
<tr>
<td>TIMECONDENSE</td>
<td>0.000000</td>
</tr>
<tr>
<td>STARTTIME</td>
<td>20.046,997,215,616,2568820</td>
</tr>
<tr>
<td>REC READ</td>
<td>762,585</td>
</tr>
<tr>
<td>REC INSERTED</td>
<td>2</td>
</tr>
</tbody>
</table>

Change mode | Short text
--- | ---
N | Reconstructing aggregates
D | Add from delta because of master data changes
R | Rolling up data from the source cube into the aggregate
Program RSDDS_CHANGERUN_MONITOR

The Change Run is executing:

Attribute OMATERIAL_ZTHIRDPT for basic characteristic OMATERIAL: 17 changes
Attribute OMATERIAL_Z2ZARTSTAT for basic characteristic OMATERIAL: 75 changes
Attribute OMATERIAL_ZOVEN for basic characteristic OMATERIAL: 2 changes

Characteristics to be activated:
OBPARTNER
OMATERIAL
OMAT_PLANT
OTCTOERID
OTCTQUERY

Hierarchies to be activated:

Affected aggregates and InfoCubes:

<table>
<thead>
<tr>
<th>Aggregate</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001_R_I_MV_02</td>
<td>100712</td>
</tr>
<tr>
<td>Aggregate adjusted</td>
<td></td>
</tr>
<tr>
<td>0002_R_I_MV_02</td>
<td>100722</td>
</tr>
<tr>
<td>Aggregate adjusted</td>
<td></td>
</tr>
</tbody>
</table>
Query Performance - 1

- **Cause of Query Performance issues**
  - **Database**
    - Database parameters may not be set properly (OSS note: 180605)
    - Database Statistics is not setup properly
    - Degenerated Indexes
    - Check if database partitioning is used
    - Possibility of building an aggregate
    - ORACLE_PARALLEL_DEGREE value in RSADMIN
  - **OLAP**
    - BW Basis parameters (OSS Note: 192658)
    - Buffers, I/O, CPU, memory on the database server are exhausted
    - Check the Read mode of queries / cubes
    - Check the no. of available dialog processes
    - Usage of restricted / Calculated keyfigures in the query
  - **Frontend**
    - Check the amount of data being transferred
Query Performance - 2

- Build Aggregates
- OLAP Cache
- Pre Calculated Value Sets
- Pre Calculated Web Templates
- Logical Partitioning - Multi Providers
- Physical Partitioning
- Look for degenerated Indexes
- Compress Infocubes regularly
Query Performance – OLAP Cache

OLAP Cache Settings using transaction RSCUSTV14
Maintain the settings in Reporting Agent
Query Performance – Pre-Calculated Valuesets
Switch on Statistics

Administrator Workbench: Modeling

BW Statistics - Entry Mode

InfoCube | Description
--- | ---
R_O_SHRK | Shrink ODS -- Movements
R_O_SYW | ODS View on last 2 years of Sales ODS data
R_O_SYW1 | ODS View on 2002 and 2003 Sales ODS
R_O_SYW2 | ODS View for Sales Buckets
R_P_OFO | Line Item Detail Cube for Purchasing (PO's, RTVs)
R_P_STO | Line Item Detail Cube for Purchasing (STO's)
R_P_ST005 | STC Cube (Copy of 0RT_C05)
R_RPT_D02 | EIS Reporting Cube - 2002
R_RPT_D03 | EIS Reporting Cube - 2003
R_RPT_D04 | EIS Reporting Cube - 2004
R_RTL_BF | ODS for Coupon MatchBack
R_R_NPOOL | Unpooled Stores / Forecasted Sales
R_SPCYY | Space Management InfoCube
R_S_D2001 | Daily Sales for 2001
R_S_D2002 | Daily Sales for 2002
R_S_D2003 | Daily Sales for 2003
R_S_D2004 | Daily Sales for 2004
R_TCNT_1R | Detail level transaction counts for YEAR 2001
R_TCNT_2R | Detail level transaction counts for YEAR 2002
R_TCNT_3R | Detail level transaction counts for YEAR 2003
R_TCNT_4R | Detail level transaction counts for YEAR 2004
R_W_B04 | Staffworks BINs InfoCube
R_W_B04 | Staffworks Labor2 InfoCube

Technique:
- 0BWV
- NODESNOTCONNECTED
- 0CRM
- 0CRM_CUST
- 0CRM_PROD
- 0SALES
- 0CRM_SALES
- 0CRM_SALES_0
- 0CSAL_C09
- 0CSAL_C03
- 0CRM_BP_SAL
- 0CRM_BP_SAL__T
- 0CRM_COMP
- ZCRMSALH
- 0CRM_SALO
- R_MC_CRMT
- 0FMCO
- 0CA
- 0SCM
- 0PA
- ZOMX

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Query Performance Tuning Techniques - 2

ST03N Expert mode

Workload in System BP2

Reporting - InfoCubes: Share of Total Time (s)

Queries for InfoCube R_MC_WK
Query Performance Tuning Techniques - 3

- Run Transaction SM66
- Identify the process id
- Run transaction ST04 and find the process in Oracle session
- Get the execution Plan
Query Performance Tuning Techniques - 4

Switch on/off aggregates
Query Performance Tuning Techniques - 5

- Read mode (Table RSRREPDIR)
- Tables RSDDSTAT / RSDDSTATAGGR
- Cache Monitor (RSRCACHE)
- Function Module
  RSDDCVER_RFC_BW_STATISTICS
- BW Stats Cubes
- RSRT
- RSRTRACE
Aggregate Rollup & Compression Performance

- **Aggregates Rollup**
  - Compress Cubes & aggregates regularly
  - Rebuild Indexes on Etable of aggregates
  - Build statistics on Aggregate tables
  - Include partitioning Characteristic in the aggregates
  - Do not build stats on the F table of the cube

- **Compression Performance**
  - Make sure P index exists on the Etable of Cube & aggregates
  - Aggregates Ftable size
Aggregate Rollup & Compression Performance

- **Aggregates Rollup**
  - Compress Cubes & aggregates regularly
  - Rebuild Indexes on E table of aggregates
  - Build statistics on Cubes & Aggregates
  - Include partitioning Characteristic in the aggregates
  - Do not build stats on the F table of the cube if the table is huge

- **Compression Performance**
  - Make sure P index exists on the E table of Cube & aggregates
  - Aggregates F table size
Agenda

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SEM BPS Performance - 1

- Activate Statistics
- Transaction BPS_STAT0

![SAP Screen Showing Statistics for SEM-BPS Performance]
- Database Parameter Settings (OSS Note: 358921)
- Executing Specialized functions faster than General functions (eg:- Copy function instead of writing formula to copy)
- Program UPC_BW_SELECTION_DEBUG can be used to do the analysis of read access in SEM-BPS
- Save the results after ending a planning session before starting another transaction since the memory is released only after the save or exiting the session.
- Compress the Infocubes
- Build aggregate if possible
- Code Formula functions effectively avoiding multiple loops
Summary

- Check Oracle Parameter & Basis Parameter Settings
- Deploy Parallel Processing wherever possible
- Look for degenerated Indexes
- Use transactions ST03N / ST04 / ST02
- ROIDOCPRMS table settings for Load Performance
- Make use of Load balancing
- Use OLAP Cache
- Use Pre-Calculated Value sets and Web Templates
Questions?

Q&A
Please complete your session evaluation.
Be courteous — deposit your trash, and do not take the handouts for the following session.

Thank You!
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