



BW 2.x/3.0 Performance

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Agenda

Data Load Performance Concepts

Reporting Performance Analysis Tools

Reporting Performance Analysis Techniques

Aggregates

Reporting Performance Tuning Concepts

DB Connect

Data Load Performance Concepts

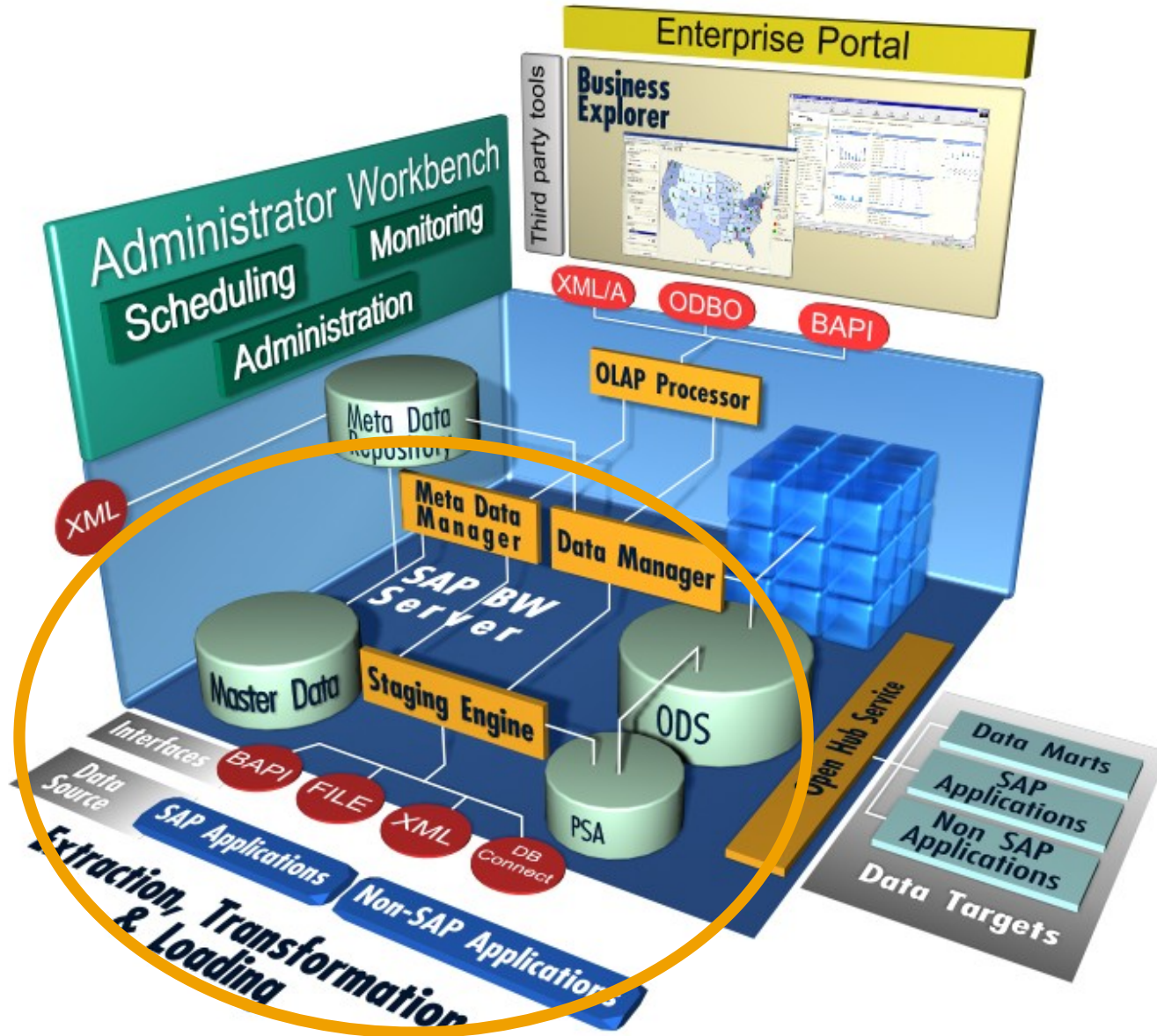
Reporting Performance Analysis Tools

Reporting Performance Analysis Techniques

Aggregates

Reporting Performance Tuning Concepts

Architecture: Data Load

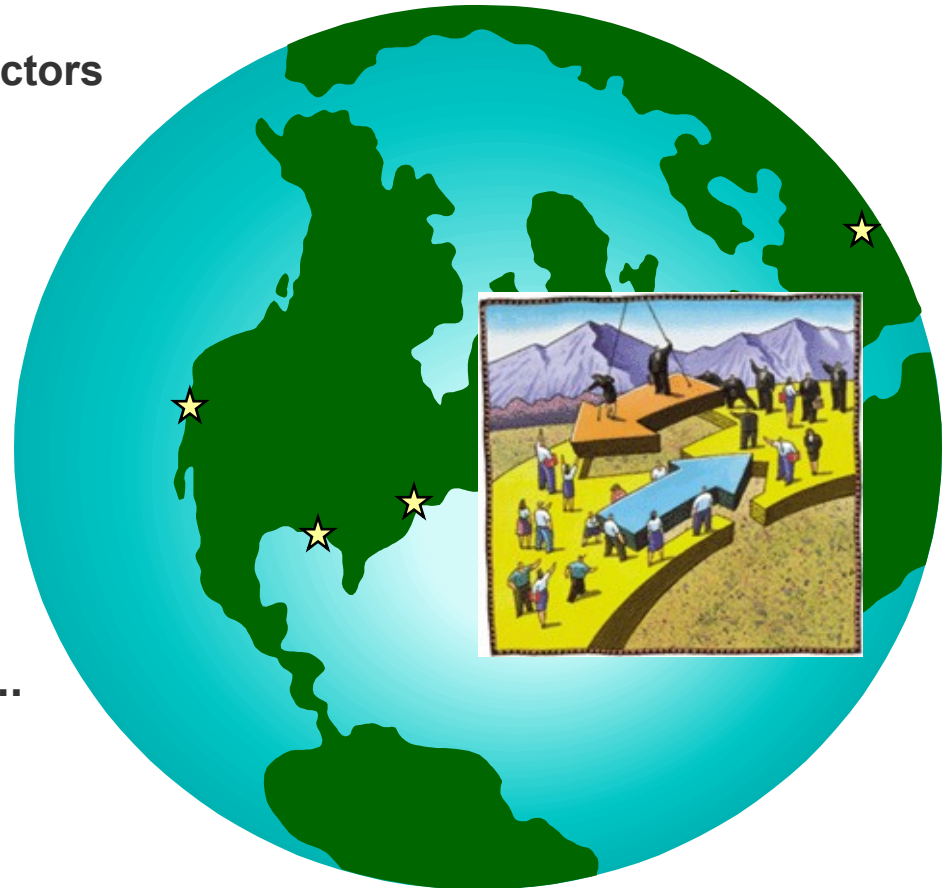


Data Load Performance: Key Concepts

The extraction and load process

Analyzing loading performance issues

- **Collection and Extraction**
 - ◆ SAP Content and Generic extractors
- **Staging**
 - ◆ PSA
- **Loading**
 - ◆ ODS
 - ◆ InfoCubes
 - ◆ Master Data
- **Transformation**
 - ◆ Transfer and update rules
- **Other tuning aspects including..**
 - ◆ Partitioning
 - ◆ Archiving



Overview: Data Load Process

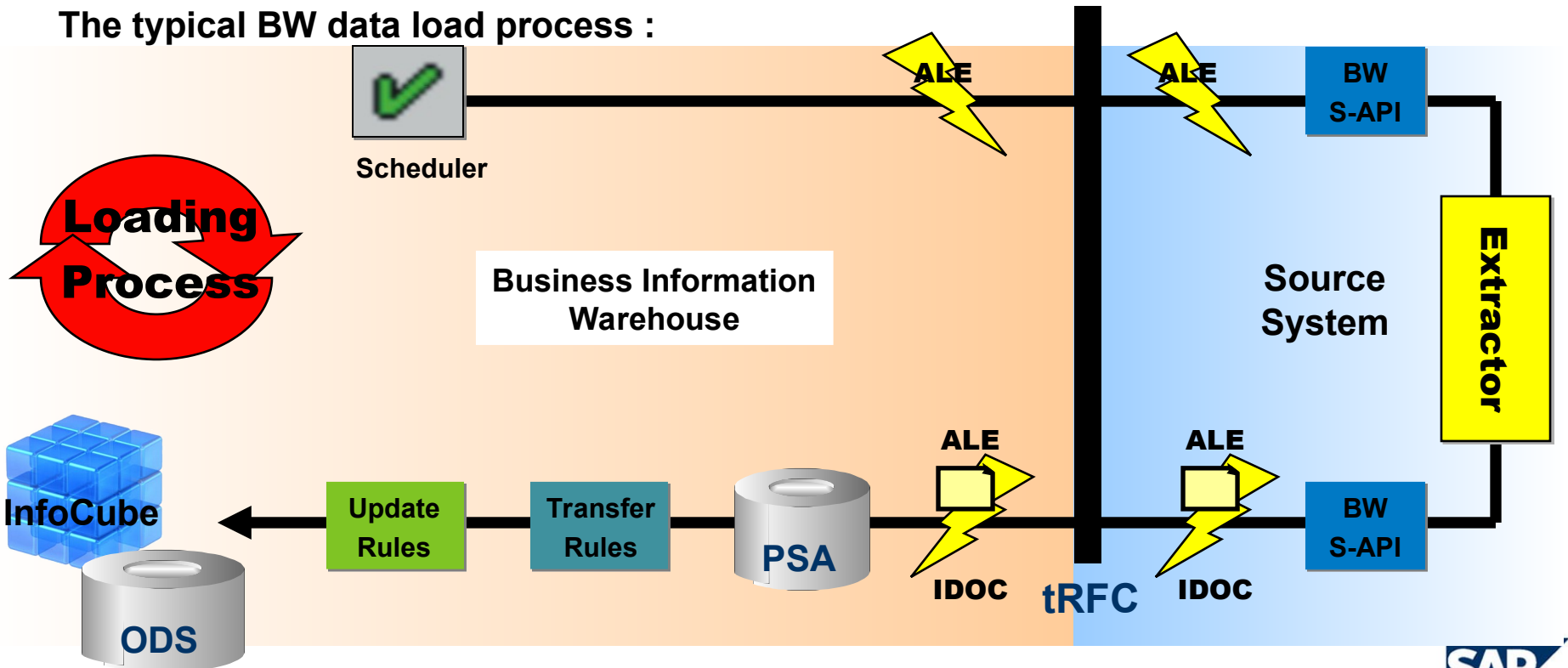
Goals of performance optimization:

First tune the individual single execution and then the whole load processes.

- Eliminating unnecessary processes
- Reducing data volume to be processed
- Deploying parallelism on all available levels

Only Parallel processes are fully scalable!

The typical BW data load process :

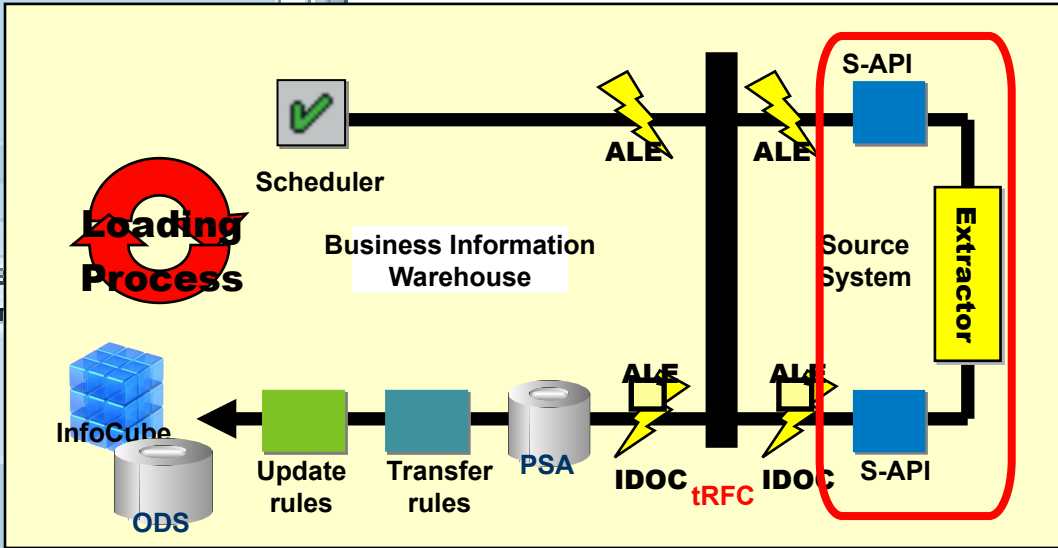


How to identify high Extraction Time ?

The screenshot shows the SAP BW monitoring interface with the following status details:

- Overall status:** Errors occurred: Or Missing messages:
 - Requests (messages): Everything OK
 - Data request arranged
 - Confirmed with: OK
 - Extraction (messages): Everything OK
 - Data request received
 - Data selection scheduled
 - 90 Records sent (90 Records received)
 - Data selection ended
 - Transfer (Idocs and TRFC): Everything OK
 - Request IDoc : Application document posted
 - Info Idoc 2 : Application document posted
 - Info Idoc 1 : Application document posted
 - Info Idoc 3 : Application document posted
 - Data Packet 1 : 90 Records Arrived in BW
 - Info Idoc 4 : Application document posted
 - Processing (data packet): Everything OK
 - Data Packet 1 (90 Records) : Everything OK
 - Transfer rules : No errors
 - Transaction data received. Processing being s
 - Transfer 90 data records in communication st
 - Update PSA : No errors
 - Update rules : No errors
 - Update : No errors

A blue bracket groups the 'Extraction (messages)' and 'Transfer (Idocs and TRFC)' sections, with a callout box labeled 'Extraction' pointing to it.



Extraction Time is too high ?

Further Analysis
in case of
PERFORMANCE
problems
extracting data...

Transaction:
RSA3

DataSource: 2LIS_01_S262

Settings

Request number	TEST
Data records/call	100
Extrac. calls display	10
Update mode	F
Target sys	

Execution modes

- Debug mode
- Authoriz. trace

Selections

Field	From value	To value	Short text
SPTAG			Calendar day
VBELN			Billing document

For specific application areas specific notes exist. Please refer to SAP notes what should then be applied.

Extraction | Display list | Display log

RSA3 | bwph1082 | INS

Extraction Time is too high ?

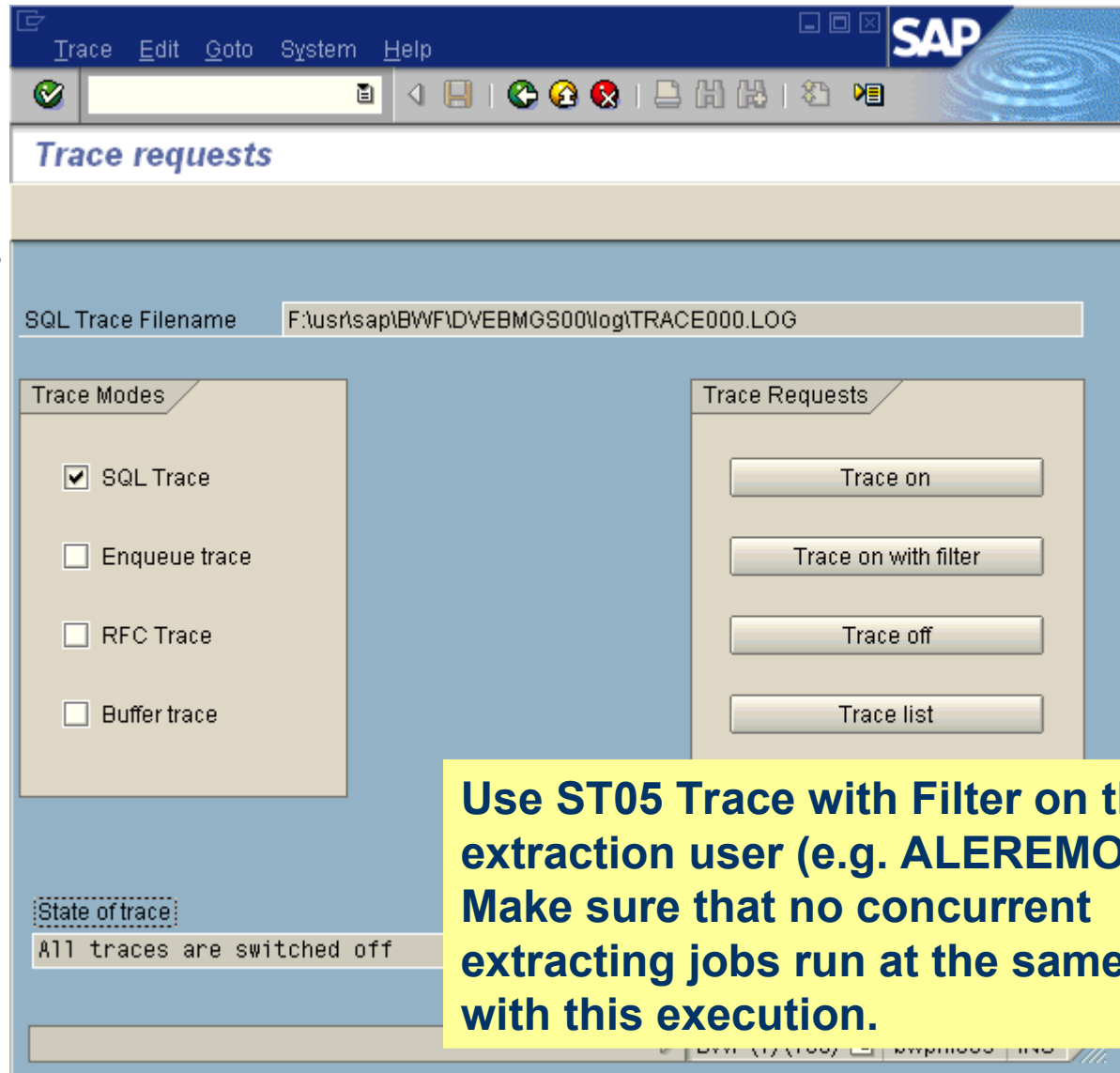
Analyze
high ABAP
Runtime:

Particularly
Useful for
User Exits

Use SE30 Trace option "in parallel session". Select corresponding Work process with executing extraction job

Extraction Time is too high ?

Identify expensive SQL Statements



The screenshot shows the SAP ST05 'Trace requests' dialog box. The 'SQL Trace Filename' field is set to 'F:\usr\sap\BWF\DVEBMGS00\log\TRACE000.LOG'. Under 'Trace Modes', the 'SQL Trace' checkbox is checked, while 'Enqueue trace', 'RFC Trace', and 'Buffer trace' are unchecked. Under 'Trace Requests', the 'Trace on' button is highlighted. The 'State of trace' section at the bottom indicates 'All traces are switched off'.

Use ST05 Trace with Filter on the extraction user (e.g. ALEREMOTE). Make sure that no concurrent extracting jobs run at the same time with this execution.

Extraction Tuning: Load Balancing

Parallel processes:

- distribute to different servers
 - ◆ avoid bottlenecks on one server

Defining a specific server:

- Configure in table ROIDOCPRMS



RFC destinations (Trx SM59):

- Example: RFC connection from BW to R/3 and R/3 to BW
- InfoPackages, event chains and Process Chains: all can be processed on specified server groups.
- XML Data loads: HTTP/HTTPS processes can be allocated to specific server groups

Expected Results:

- Avoid CPU/Memory bottlenecks on one server
- Greater Throughput: Faster time to completion per request

Size of DataPackages: Influencing Factors

- Specific to application datasource, the contents and structure of records in the extracted datasets.
- Package size: impacts frequency of COMMITs in DB .
- SAP OSS note 417307: Extractor Packet Size Collective Note for SAP Applications
- Consider both the source system and the BW system (table RSADMINC).
- Package size specified in table ROIDOCPRMS and/or InfoPackages

Scenario:

- Set up the parameters according to the recommendations; if upload performance is not improved, try to find other values that fit exactly your requirements.

Expected results:

- In a resource constrained systems, reduce the Data Package size
- In larger systems, increasing the package size to speed collection;
 - ◆ but take care not to impact communication process and unnecessarily hold work processes in SAP source system.
- Greater throughput = Faster time to completion per request

Tuning Extraction: Configuration

Further Analysis in case of Resource problems when extracting data...

Use Selection Criteria

SAP Scheduler (Maintain InfoPackage)

InfoPackage: Sales Document Item Data(ZPAK_3738XS17UW71FJMPI3IC1VEXT)
InfoSource: Sales Order Item Data (As of 2.0B)(2LIS_11_VAITEM)
DataSource: Sales Document Item Data(2LIS_11_VAITEM)
Source system: R3B Client 800(T90CLNT090)
Last changed by: CONSULTANT Date: 05/21/2001 Time: 16:57:58
Possible types of data: Transaction dat

Select data Processing Data targets Update parameters Schedule

Load transaction data from the source system

Enter selections (optional):

Description	InfoObject	Technical ...	From value	To value	Ent...	Type...	Det...	R Da
Sales and distrib...	0DOC_NUMB...	VBELN			→			CH
Item number of t...	0S_ORD_IT...	POSNR		?	→			NU
Company Code	0COMP_CODE	BUKRS			→			CH
Sales organizati...	0SALESORG	VKORG			→			CH
Date on which th...	0CREATEDON	ERDAT		?	→			DA

Check Conversion exit is switched on

RSAP1 bwphi083 INS

Consider building indices on DataSource Tables based on selection criteria

SAP Content extraction

- Convert old LIS extractors to new V3 collection method
- V3 Collection jobs for different DataSources can be scheduled and executed in parallel
- Tune customer exit coding

Generic extractors:

- Collector jobs can be executed in parallel
- InfoPackages executed in parallel to extract data
 - ◆ Not possible for delta extracts from one generic DataSource
- Investigate Secondary indexes on fields used for selection
 - ◆ Too many Indexes may slow collector job
- Optimize custom 'collector' ABAP coding



Extraction / Load Tuning: Flat Files

- ✓ Use a **predefined record length** (ASCII file)
- ✓ File should **reside on the application server**
i.e. not on the client PC
- ✓ Avoid large loads **across a slow networks.**
- ✓ Avoid reading load files **from tape** (copy to disk first)
- ✓ Avoid placing input load files **on high I/O disks**
Example: same disk drives or controllers as the DB tables being loaded.



Parallel Processing Power: Extraction & Load

Automatic parallelism by the SAP system

- Data Packets - extracting from an SAP system
- Loading into PSA and data targets in parallel

You can start several processes manually (in parallel)

- InfoPackages
- InfoPackage groups (individual groups)
- Event chains
- Process chains

User-controlled parallelism

- Via InfoPackages
 - ◆ Loading from the same or different DataSource(s) with different selection criteria simultaneously
 - ◆ File Source Systems:
 - split files up for multiple InfoPackages
Note: Individual InfoPackage groups don't extract in parallel for files
 - Enables parallel PSA → DataTarget load process (PSA partitions care used)



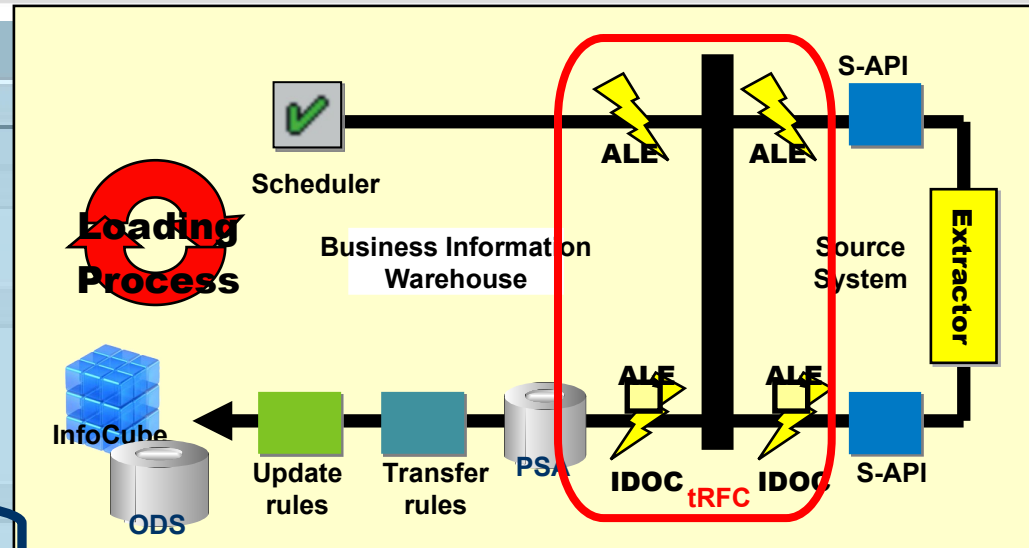
Data Transfer Times Too High ?

Header Status Details

Overall status: Errors occurred: Or: Missing messages

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 - Data request arranged
 - Confirmed with: OK
- Extraction (messages): Everything OK
 - Data request received
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 - Data selection ended
- Transfer (Idocs and TRFC): Everything OK
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 - Info Idoc 1 : Application document posted
 - Info Idoc 3 : Application document posted
 - Data Packet 1 : 90 Records Arrived in BW
 - Info Idoc 4 : Application document posted
- Processing (data packet): Everything OK
 - Data Packet 1 (90 Records) : Everything OK
 - Transfer rules : No errors
 - Transaction data received. Processing being started.
 - Transfer 90 data records in communication structure
 - Update PSA : No errors
 - Update rules : No errors
 - Update : No errors

Select a node and choose the context menu for more information

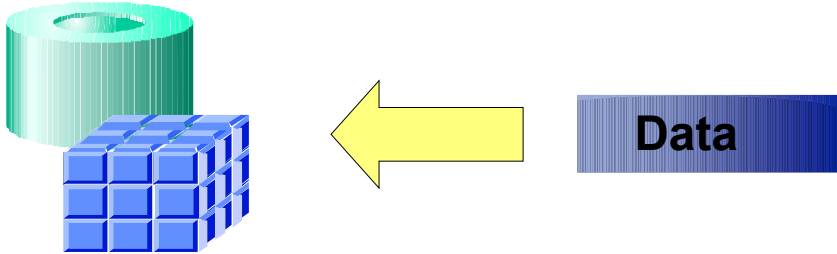


Transfer

Data load Monitor :
Transaction RSMO



Loading R/3 data uses too many work processes

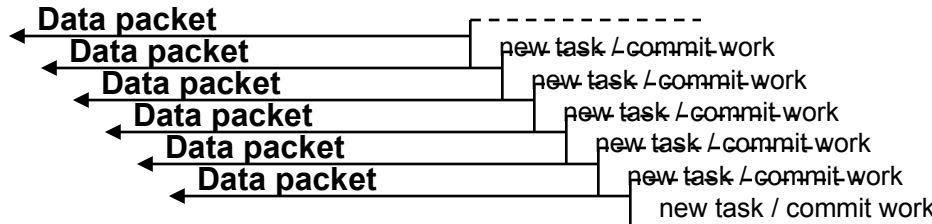


Method "Update Data Targets in Parallel"

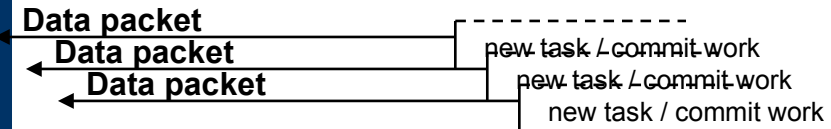
When BW resources are constrained:

- CPU/Memory
- Network connection speed
- I/O bottleneck

Avoid large data loads with Parallel Update Method



6 Dialog WPs



3 Dialog WPs

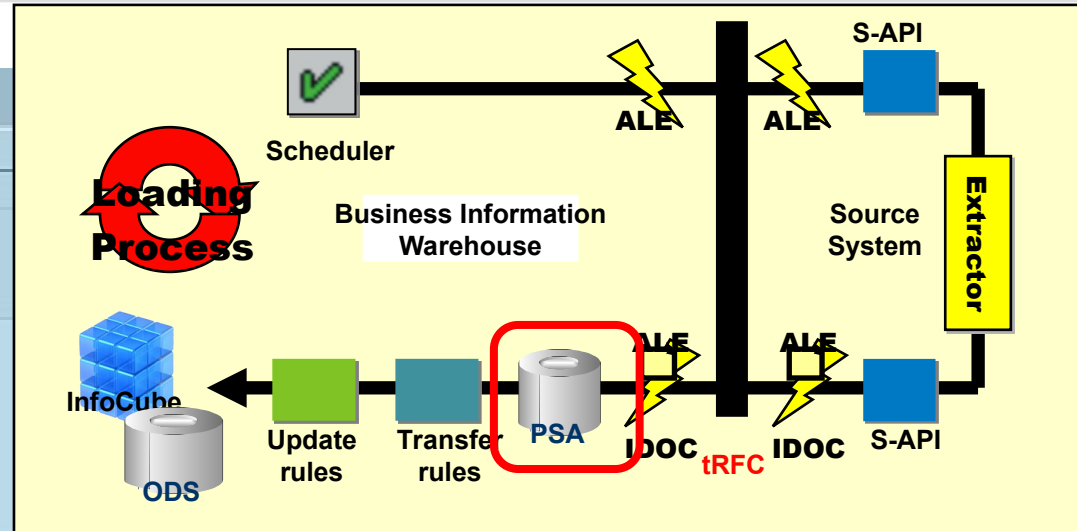
BW OLAP

Analyze high PSA Upload Times

Header Status Details

- Overall status: Errors occurred: Or: Missing messages
 - Requests (messages): Everything OK
 - Extraction (messages): Everything OK
 - Transfer (Idocs and tRFC): Everything OK
 - Request IDoc : Application document posted
 - Info Idoc 2 : Application document posted
 - Info Idoc 1 : Application document posted
 - Info Idoc 3 : Application document posted
 - Data Packet 1 : 20 Records Arrived in BW
 - Info Idoc 4 : Application document posted
 - Processing (data packet): Everything OK
 - Data Packet 1 (20 Records) : Everything OK
 - Transfer rules : No errors
 - Transaction data received. Processing being started.
 - Transfer 20 data records in communication structure
 - Update PSA : No errors**
 - Data save in PSA started
 - 20 records written in PSA 0BBP_TD_INV_1_XF
 - Reading data from PSA started
 - 20 records read from PSA 0BBP_TD_INV_1_XF
 - Update rules : No errors
 - Update : No errors
 - Processing end : No errors
 - QDS activation (change-log) : Not yet activated

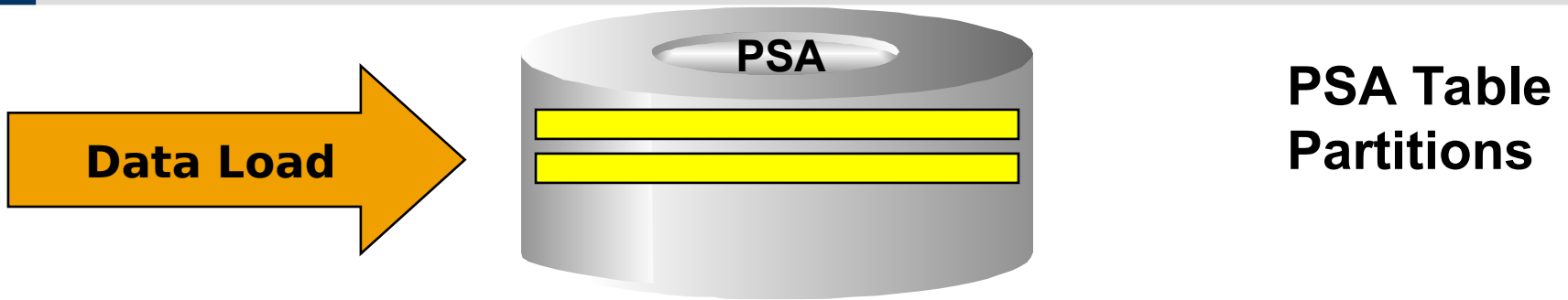
Select a node and choose the context menu for more information



Load Into PSA

Data load Monitor :
Transaction RSMO

PSA Partitioning



BW: Threshold Value for Data Load	
FrequencyStatus-IDOC	20
Packet size	20000
Partition size	1,000,000

Size of each PSA partition, value in number of records

Transaction SPRO or RSCUSTV6 :

- From SPRO Business Information Warehouse > Links to Other Systems > Maintain Control Parameters for the Data Transfer
 - ◆ Note: If you start more than one load process at a time expecting to have each request in a separate partition, it probably will not work as expected; the PSA threshold is not yet reached when the second process starts writing into PSA

Potential PSA Bottleneck

Possible bottleneck (large loads or multiple parallel loads)

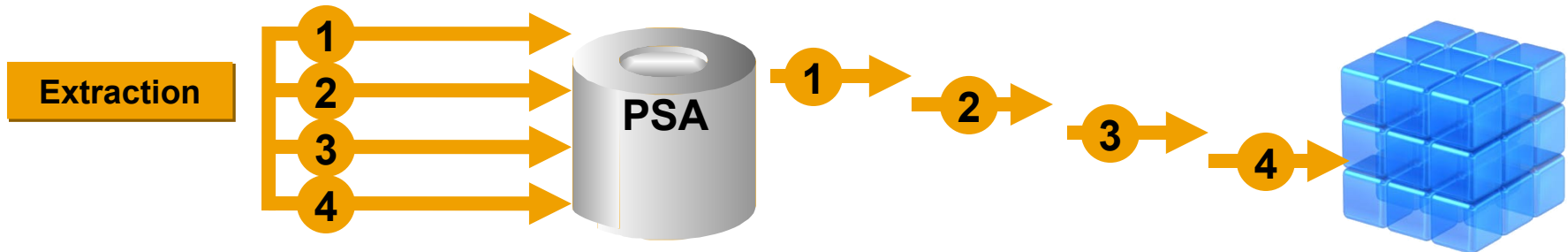
■ I/O contention

- ◆ High no. of writes during large data loads
- ◆ Disk layout and striping configuration
 - What is located on the same disk or tablespace/DB Space/etc?
- ◆ Database I/O

■ Partitioning configuration

- ◆ Partition defined too large, no parallel database sub processes used?
- ◆ Partition too small, too many parallel database sub processes used?

■ Sequential loading from PSA to DataTargets selected



■ DB Statistics

- ◆ Usually not an issue as PSA tables are normally sequentially read

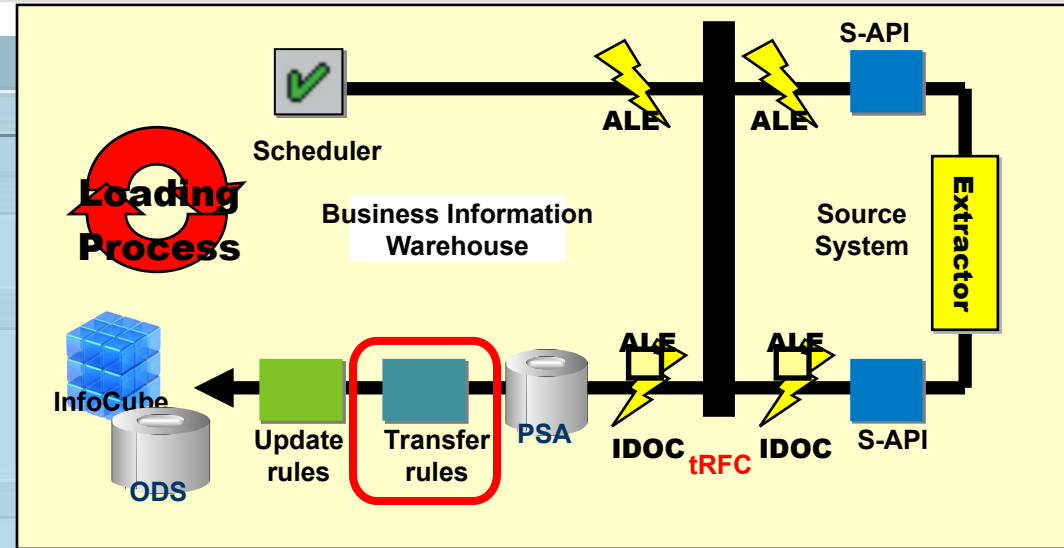
Data Processing-Transfer Rules

Header Status Details

Overall status: Errors occurred. Or Missing messages:

- Requests (messages): Everything OK
 - Data request arranged
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- Extraction (messages): Everything OK
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 - Data selection scheduled
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 - Data selection ended
- Transfer (Idocs and TRFC): Everything OK
 - Request IDoc : Application document posted
 - Info Idoc 2 : Application document posted
 - Info Idoc 1 : Application document posted
 - Info Idoc 3 : Application document posted
 - Data Packet 1 : 90 Records Arrived in BW
 - Info Idoc 4 : Application document posted
- Processing (data packet): Everything OK
 - Data Packet 1 (90 Records) : Everything OK
 - Transfer rules : No errors
 - Transaction data received. Processing being started.
 - Transfer 90 data records in communication structure
 - Update PSA : No errors
 - Update rules : No errors
 - Update : No errors

Select a node and choose the context menu for more information



Data load Monitor :
Transaction RSMO

Transfer Rules

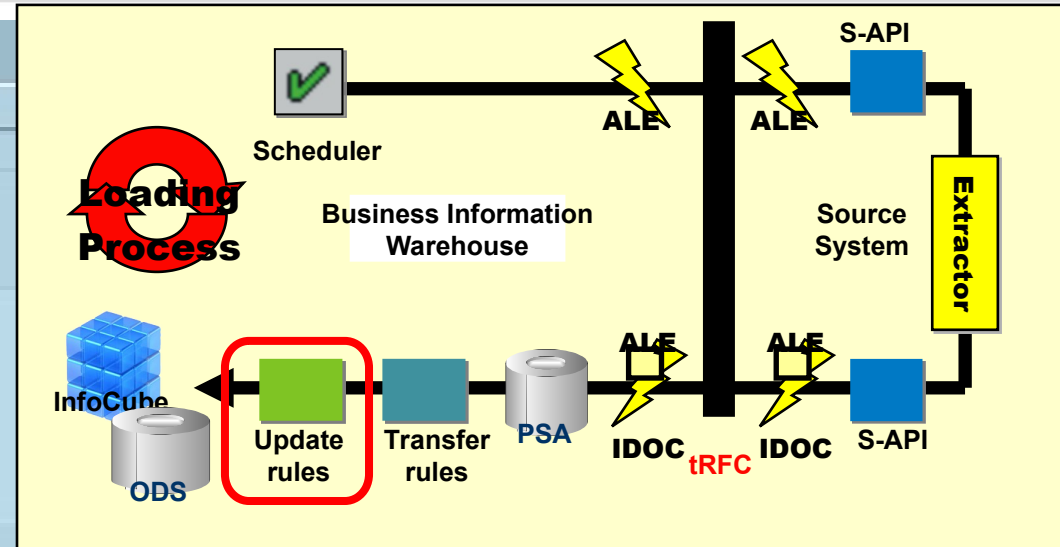
Data Processing-Update Rules

Header Status Details

Overall status: Errors occurred: 0; Missing messages

- Requests (messages): Everything OK
- Extraction (messages): Everything OK
- Transfer (docs and TRFC): Everything OK
 - Request IDoc : Application document posted
 - Info Idoc 2 : Application document posted
 - Info Idoc 1 : Application document posted
 - Info Idoc 3 : Application document posted
 - Data Packet 1 : 20 Records Arrived in BW
 - Info Idoc 4 : Application document posted
- Processing (data packet): Everything OK
 - Data Packet 1 (20 Records) : Everything OK
 - Transfer rules : No errors
 - Update PSA : No errors
 - Update rules : No errors:**
 - ODS tables to be updated: 1 ODS table(s)
 - ODS table OBBP_INV will be updated
 - Start processing update rules for InfoCube/ODS table OBBP
 - Finished processing update rules for InfoCube/ODS table 0
 - Update : No errors
 - Processing end : No errors
 - ODS activation (change-log) : Not yet activated

Select a node and choose the context menu for more information



Update Rules

Data load Monitor :
Transaction RSMO

Tuning Transfer and Update Rules (BW 3.0B)

Debugging and tuning Update and Transfer rules:

- Simple tool for debugging of transfer or update rules
- Improves error search and analysis – together with the enhanced error messages

Monitor - Administrator Workbench

Monitor

- successful (1)
 - PM_HIER_CUBE (TA data for 11.04.2002
 - PC_FILE (<No text av...
- incorrect (2)
 - PM_HIER_CUBE (TA data for 11.04.2002
 - PC_FILE (<No text av...

Header Status Details

Overall status: Everything OK

- Requests (messages): Everything OK
- Extraction (messages): Everything OK
 - Data request received
 - 10 Records sent (10 Records received)
 - Data selection ended
- Transfer (IDocs and TRFC): Everything OK
 - Info IDoc 1 : Application document posted
 - Data Package 1 : 10 Records arrived in BW
 - Info IDoc 2 : Application document posted
 - Info IDoc 3 : Application document posted
- Processing (data packet): Everything OK
 - Data Package 1 (10 Records) : Everything OK
 - Update PSA (10 f... Help for node
 - Transfer rules (10... psa Mainten...
 - Update rules (10... Simulate update
 - Update (10 new... Simulate cancellation
 - Processing end: i...

Date	Time	Record...	Record...
11.04.2002	13:09:53	2	10 10

Simulation Selections

Data packet number: 1

For which InfoCube should the update simulation be carried out?
InfoCube: Hierarchy demo InfoCube

Activate Debugging in Transfer Rules

Activate Debugging in Update Rules

Simulation Record Selection

Use All Data Packet Records for the Simulation

Select Simulation Records

Perform simulation

Routines: Potential Performance Bottlenecks

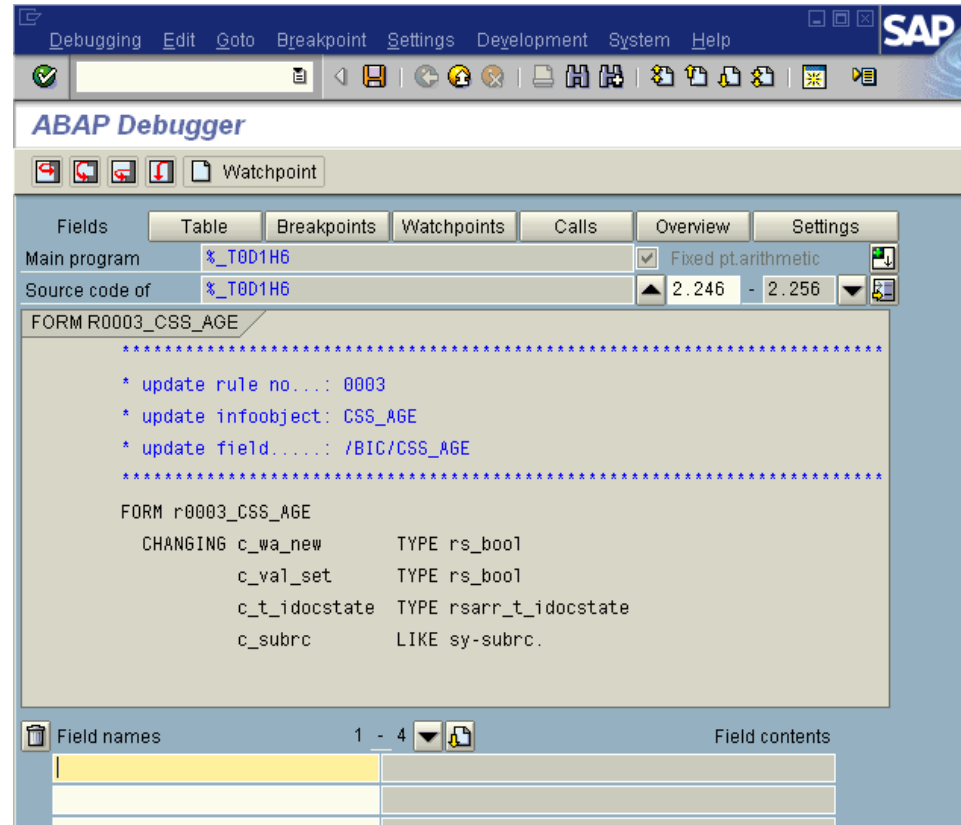
Identify the expensive update/transfer rules rules:

Debug from one update rule to the next update rule for each InfoObject.

Also use ST05 or SM30

Recommendations:

- SINGLE SELECTs are one of the performance “killers” within these codings; use buffers (such as internal tables) and array operations instead.
- Avoid too many library transformations, as they are interpreted at runtime (currently not compiled like routines)
 - ◆ The transformation engine or library is new in BW 3.0



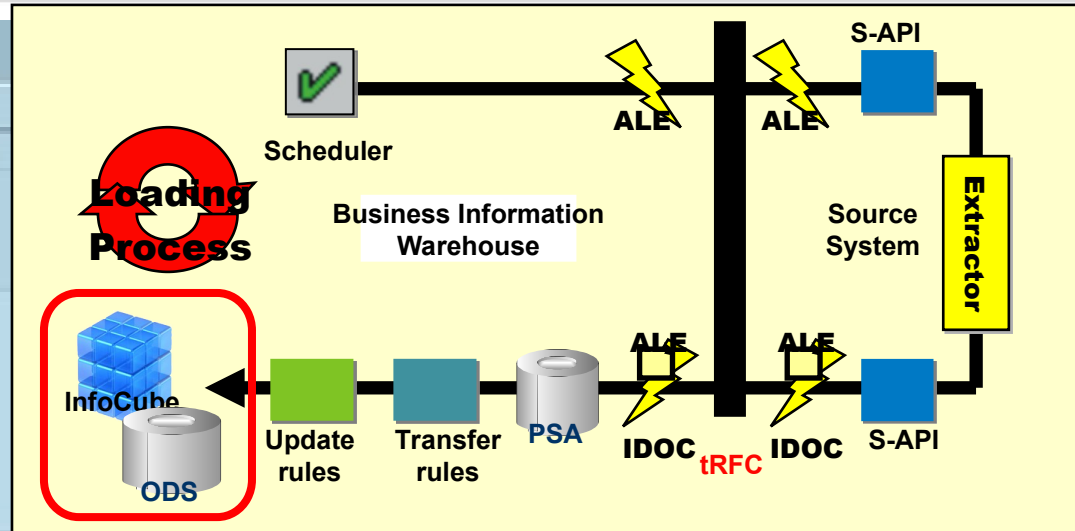
Data Load: Data Targets

Header Status Details

Overall status: Errors occurred: Or: Missing messages

- Requests (messages): Everything OK
- Extraction (messages): Everything OK
- Transfer (Idocs and TRFC): Everything OK
 - Request IDoc : Application document posted
 - Info Idoc 2 : Application document posted
 - Info Idoc 1 : Application document posted
 - Info Idoc 3 : Application document posted
 - Data Packet 1 : 20 Records Arrived in BW
 - Info Idoc 4 : Application document posted
- Processing (data packet): Everything OK
 - Data Packet 1 (20 Records) : Everything OK
 - Transfer rules : No errors
 - Update PSA : No errors
 - Update rules : No errors
 - Update : No errors
 - ODS 08BP_INV content changed (new 6 , changed 0)**
 - Processing end : No errors
 - Processing 2 finished
 - Processing completed
 - ODS activation (change-log) : Not yet activated

Date	Time	Target table	Description
19.06.2008	19:53:16	60 08BP_INV	ODS 08BP_



Load Into Data Targets

Data Load Monitor - RSMO

Initial and Large Data load volume tuning

Buffering Number Range (InfoCube):

Activate The number range buffer for the dimension ID's

Reduces application server access to Database.

- e.g. set the number range buffer for one dimension to 500, the system will keep 500 sequential numbers in memory
- SAP OSS note 130253: Notes on upload of transaction data into BW

Scenario:

- High volumes of transaction data: significant DB access (NRIV table) to fulfill number range requests.

Expected Results:

- Accelerates data load performance per load request.

Note:

- After the load, reset the number ranges buffer to its original state: minimize unnecessary memory allocation. Also, If the system crashes, the numbers held in the memory are gone.



Transactional Data Load Performance Tuning

Load Master data **before** transaction data

- ◆ Creates all SIDs and populates the master data tables (attributes and/or texts).
- ◆ SAP OSS note 130253: Notes on upload of transaction data into the BW

Scenario:

- Always load master data before transaction data.
 - ◆ ODS and InfoCube.
- When completely replacing existing data, delete before the load!

Expected Results:

- Accelerates transaction data load performance: all master data SID's are created prior to transaction load.



“Snapshot” Reporting: Data Deletion

- ◆ Some reporting scenarios require no historical data

Scenario:

- When completely replacing existing data, delete before load!

Expected Results:

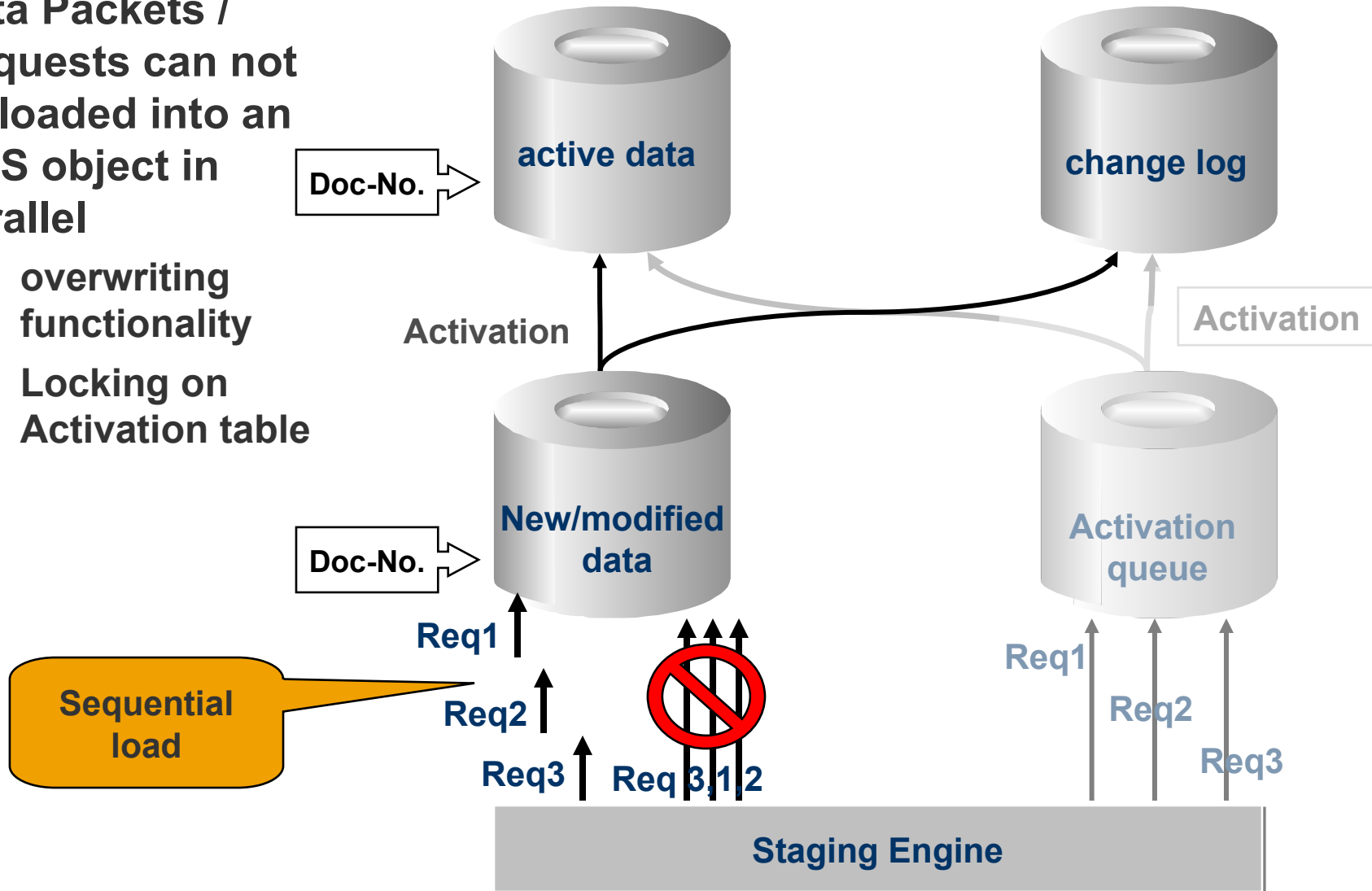
- Data deleted from PSA can reduce PSA read times
- Data deleted from InfoCube reduces deletion and compression time.
 - ◆ “Drop partition...” DDL statement instead of “delete from table...” DML statement only takes seconds
- Deleting Data also speeds data availability (aggregates, etc)



ODS Activation in BW 2.x

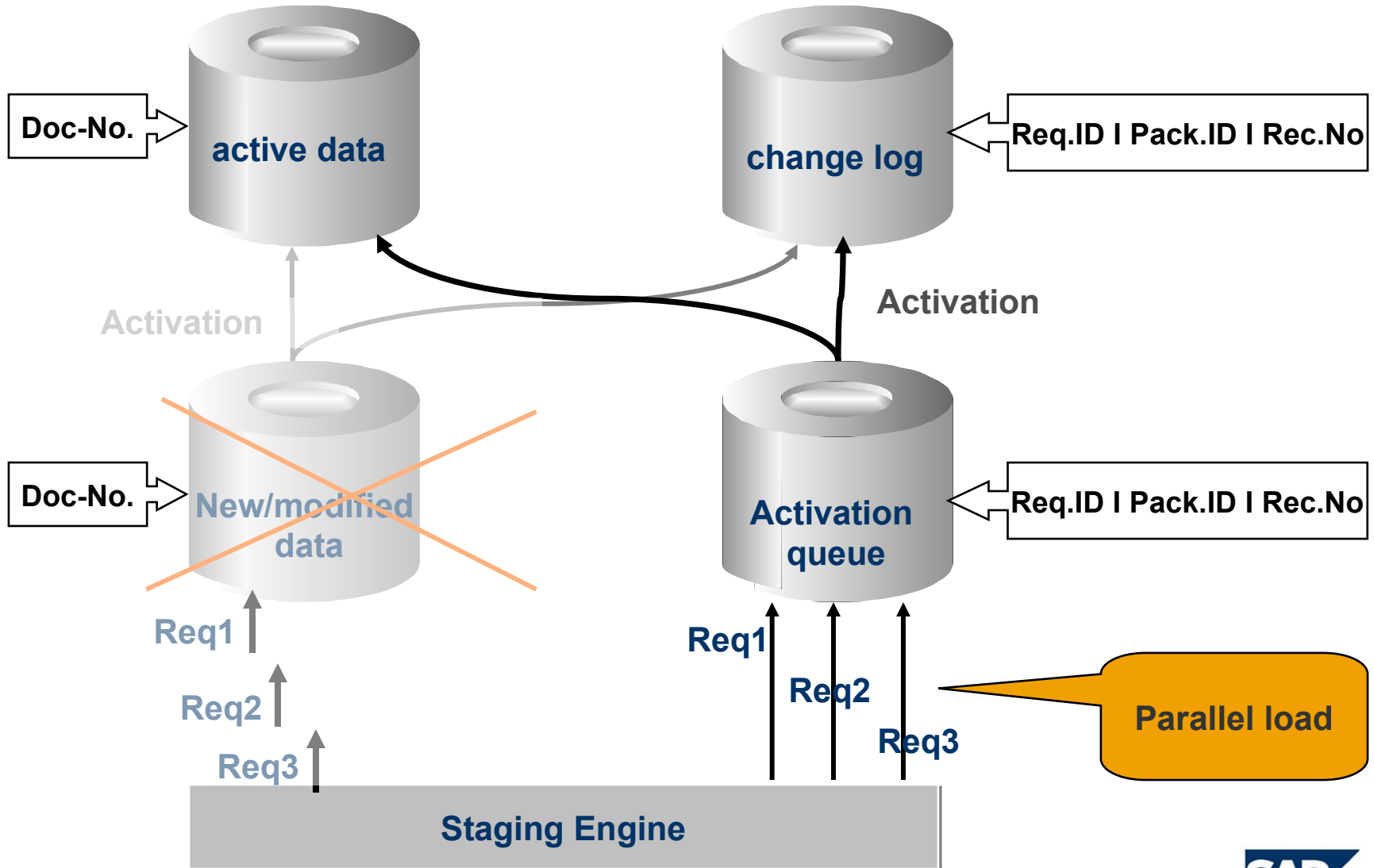
Data Packets / Requests can not be loaded into an ODS object in parallel

- overwriting functionality
- Locking on Activation table

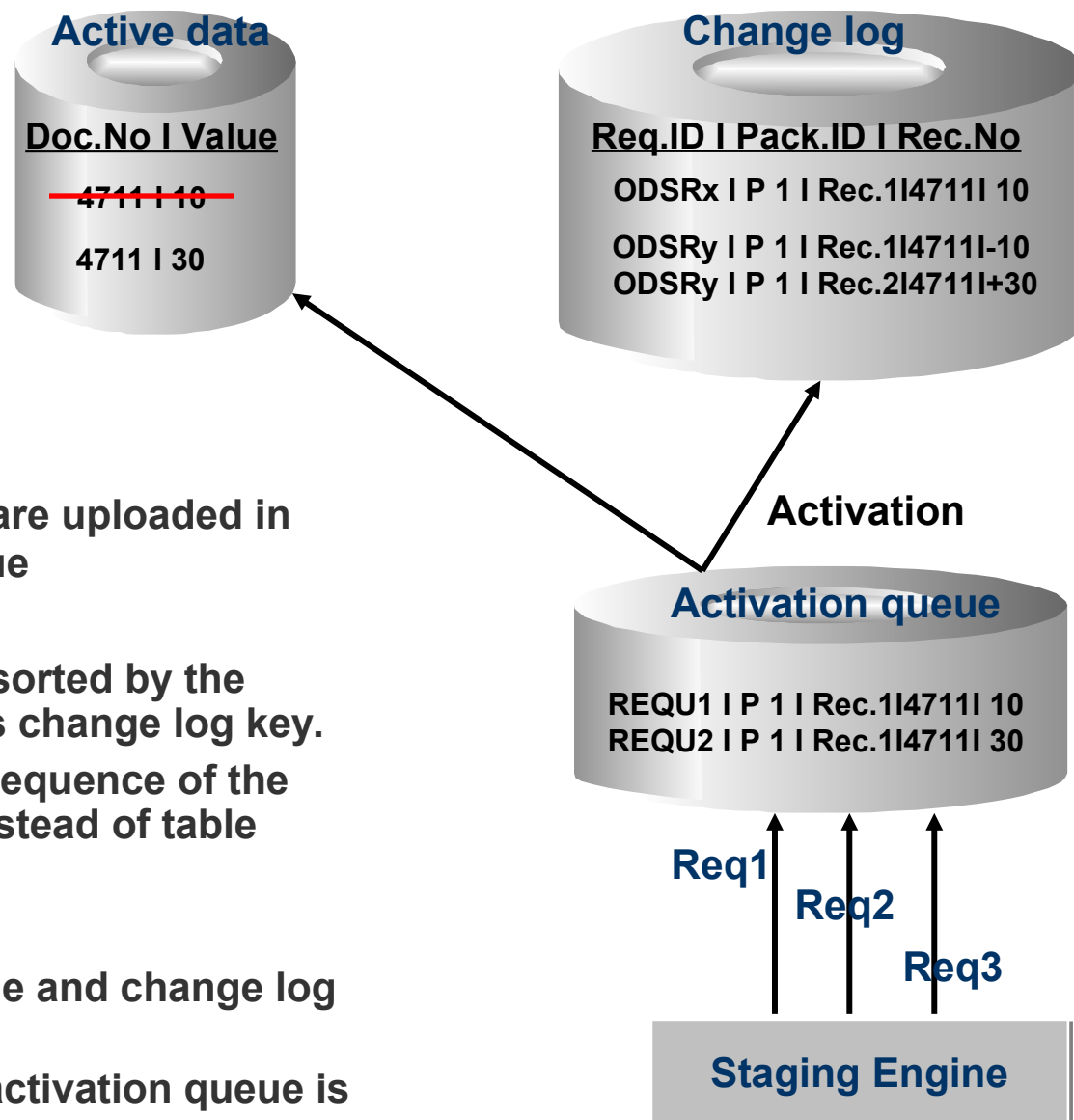


ODS Activation in BW 3.x

New queuing mechanism replacing previous Maintenance (M)table



ODS Activation example (BW 3.0)



Upload to Activation queue

- Data from different requests are uploaded in parallel to the activation queue

Activation

- During activation the data is sorted by the logical key of active data plus change log key.
- This guarantees the correct sequence of the records and allows inserts instead of table locks.

Before- and After Image

- Request ID in activation queue and change log differ from each other.
- After update, the data in the activation queue is deleted.

Control of ODS Data load Packaging and Activation

Transaction RSCUSTA2

The screenshot displays the SAP transaction RSCUSTA2, titled "Change View 'Maintenance View for ODS Fields (RSADMINA)': Details". The interface includes a menu bar (Table View, Edit, Goto, Selection, Utilities, System, Help) and a toolbar with various icons. The main content area shows a table with the following data:

Maintenance View for ODS Fields (RSADMINA)	
No. of Par. Proc.	3
Min. No. Data Recs.	10000
Wait Time in Sec.	3600
Server Group	DATA_LOAD

Four callout boxes provide additional context for the values in the table:

- Max. no. of parallel Dialog work processes** points to the value 3 in the "No. of Par. Proc." row.
- Min. no. of recs per package** points to the value 10000 in the "Min. No. Data Recs." row.
- Max. Wait Time in secs. for ODS Activation** points to the value 3600 in the "Wait Time in Sec." row.
- Server Group for RFC Call when Activating Data in ODS** points to the value DATA_LOAD in the "Server Group" row.

Controls data packet size utilized during parallel update/activation and number and allocation of work processes.

ODS Load/Activation Tuning Tips

Non-Reporting ODS Objects:

▼ Data Archiving ODS	ARCHODS1
▼ Status Info	
Version	⚠ Revised
Save	⊖ Not saved
Status	📁 Active, executable
▼ Settings	
BEx Reporting	<input type="checkbox"/>
ODS Object Type	Standard
Unique Data Records	<input type="checkbox"/>
Check table for InfoObject	
Set quality status to 'OK' autom	<input checked="" type="checkbox"/>
Activate ODS object data autorr	<input checked="" type="checkbox"/>
Update data targets from ODS	<input type="checkbox"/>
▶ Key fields	
▶ Data Fields	
▶ NavAttribute	
▶ Indexes	

BEx Flag: Computation of SIDs for the ODS can be switched off

BEx-flag must be switched on if BEx-reporting on the ODS is executed

Loads are faster as Master Data SID tables do not have to be read and linked to the ODS data

Further ODS Loading/Activation enhancements (3.0)

Update of ODS object with unique records

- Significantly simplifies activation process
- No lookup of existing key values
- No updates in active table, only inserts
- **Note: User is responsible for uniqueness!!**

Index maintenance

- Index speed querying
- Slow down activation

Parallel SID creation

- SIDs are created per package
- Multiple packages are handled in parallel by separate dialog processes

▼ Data Archiving ODS	ARCHODS1
▼ Status Info	
Version	⚠ Revised
Save	⊘ Not saved
Status	📦 Active, executable
▼ Settings	
BEx Reporting	<input checked="" type="checkbox"/>
ODS Object Type	Standard
Unique Data Records	<input checked="" type="checkbox"/>
Check table for InfoObject	
Set quality status to 'OK' automatically	<input checked="" type="checkbox"/>
Activate ODS object data automatically	<input checked="" type="checkbox"/>
Update data targets from ODS object a	<input type="checkbox"/>

Using InfoCube Data Load Performance Tools

Admin WB > Modeling > InfoCube Manage > Performance Tab

Recommendation: Drop secondary Indexes for large InfoCube data loads

The screenshot displays the SAP Admin Workbench (Admin WB) interface for the 'Performance' tab of the 'InfoCube Manage' section. The top navigation bar includes tabs for 'Contents', 'Performance', 'Requests', 'Rollup', 'Collapse', and 'Reconstruct'. The main content area is titled 'InfoCube:GRLS InfoCube 1 (GRLSCUBE)' and contains two primary sections: 'Indexes' and 'DB Statistics'.

Indexes Section: This section contains several buttons for managing indexes. A callout box points to the 'Create Index (Batch)' button, stating: **Create Index button: set automatic index drop / rebuild**. Other buttons include 'Delete Indexes (Immediately)', 'Repair Indexes (Immediately)', 'Delete Index (Batch)', 'Check Indexes', 'Check Aggr. Indexes', 'Delete Aggr. Indexes', and 'Repair Aggr. Indexes'.

DB Statistics Section: This section contains buttons for 'Check Statistics', 'Refresh Statistics', and 'Create Statistics (Batch)'. A callout box points to the 'Create Statistics (Batch)' button, stating: **Statistics Structure button: set automatic DB statistics run after a data load**. Below these buttons, there is a progress indicator showing '10' and the text 'Percentage of IC Data Used to Create Statistics'.

Using InfoCube Data Load Performance Tools

New in BW 3.X

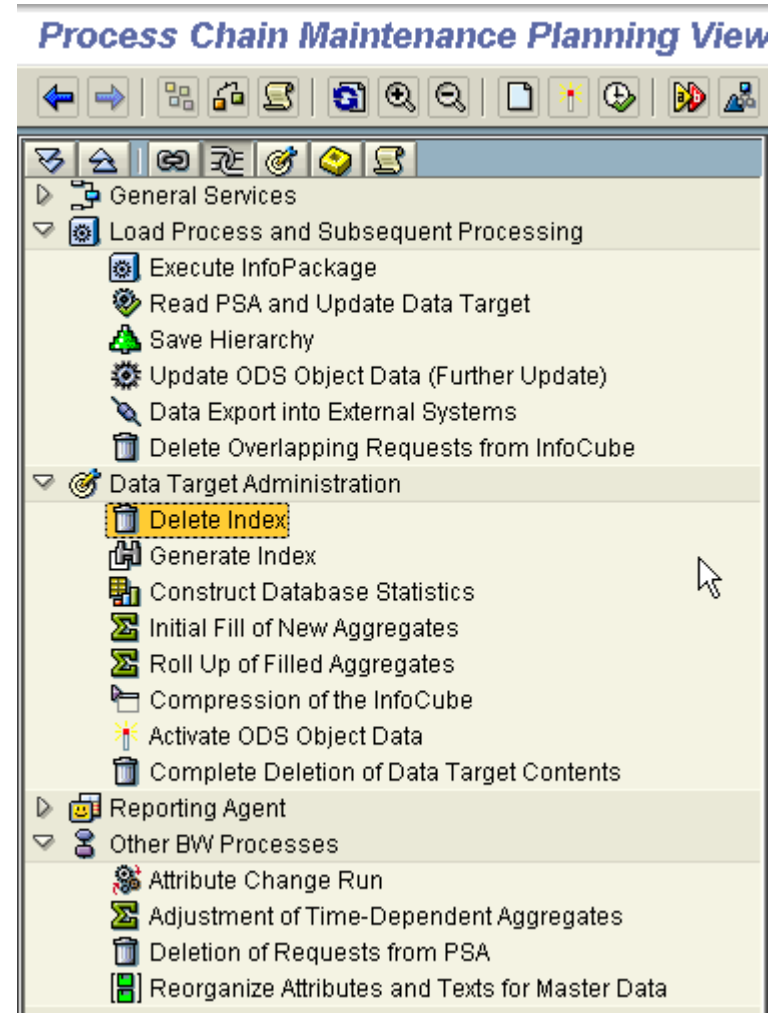
Process Chains

- Replacement for Event chains

Transaction RSPC

Process type :

- Delete Index
- Generate Index
- Auto suggestion depending on InfoPackage selected.

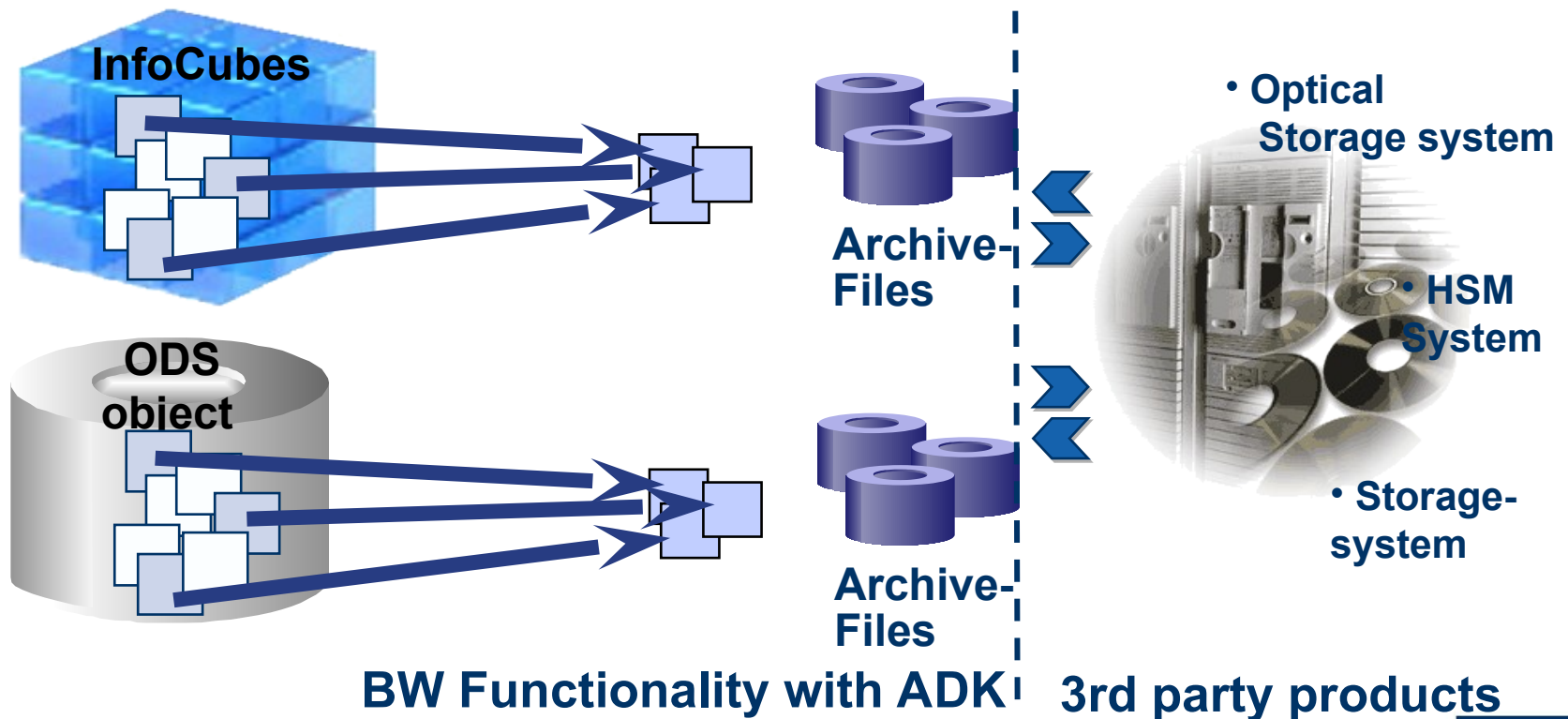


Archiving in BW

Archiving to reduction data volume

- IDOC archiving available in BW and R/3 (BW 1.2 onwards)
 - ◆ Improves extraction/load performance (including use of load monitor)
- Data Archiving (InfoCubes and ODS Objects) available in BW 3.x

Archiving TechEd session: ARCH201 Data Archiving in SAP R/3 Enterprise



Data Load Performance Concepts

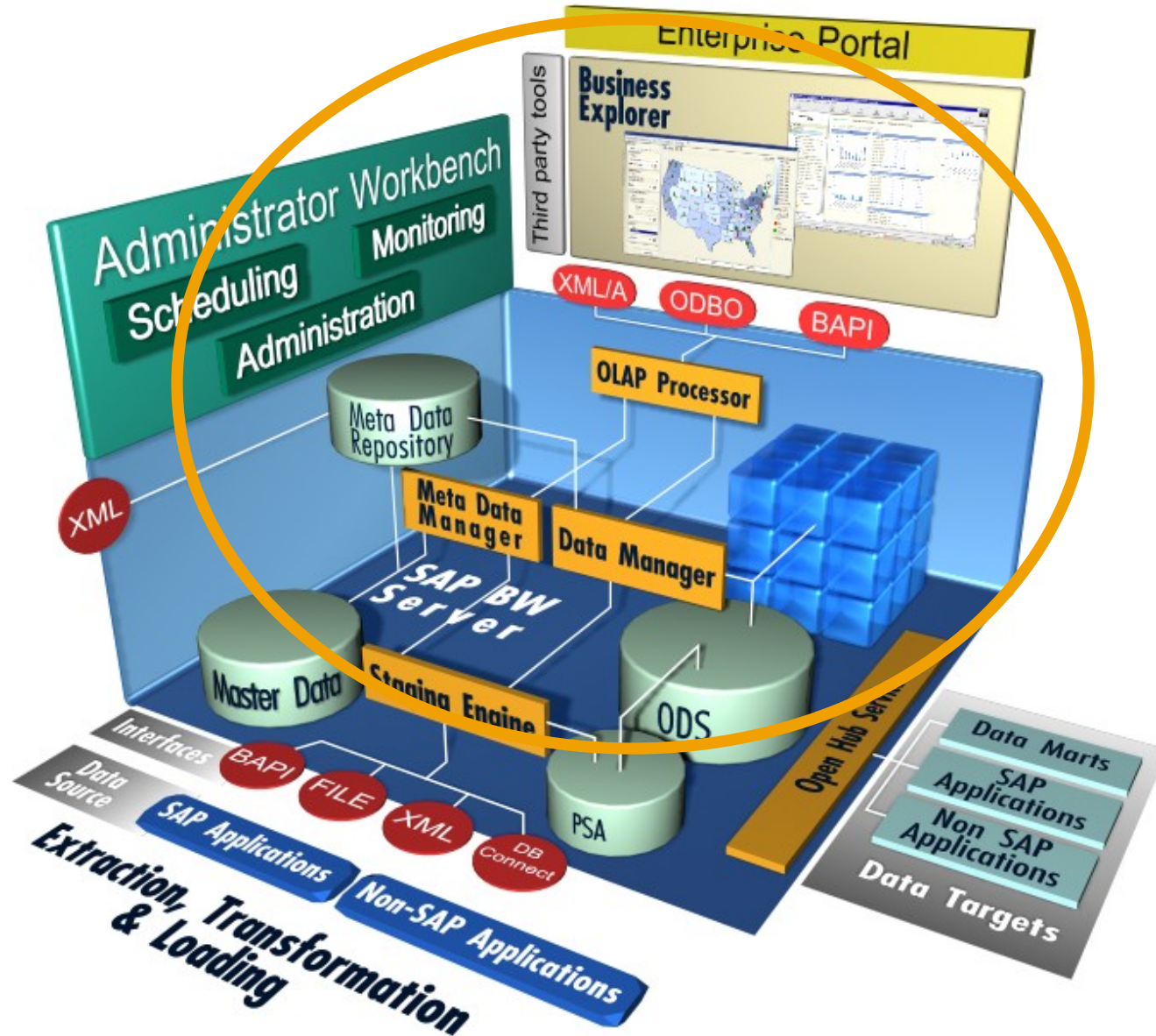
Reporting Performance Analysis Tools

Reporting Performance Analysis Techniques

Aggregates

Reporting Performance Tuning Concepts

Architecture: Reporting



Many Aspects of Performance

Are there resource constraints at the hardware or DB level impacting system-wide performance?

Do the queries of one InfoCubes generally run slower than the queries of other InfoCubes?

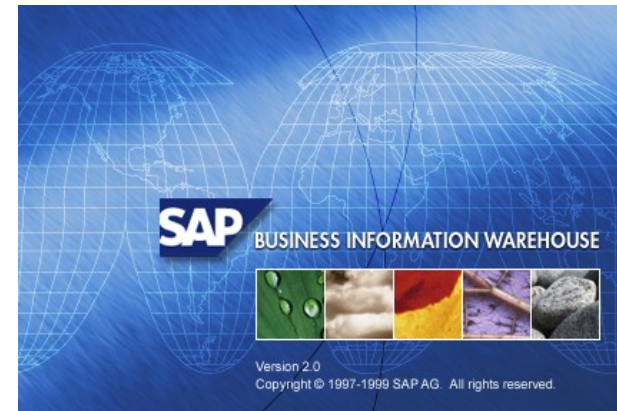
Which queries are the biggest performance concerns?

- Frequently executed by many users
- Lots of navigations by analysts
- High average runtimes

Performance monitoring and tuning is part of a larger design and system maintenance strategy.

Best Practices:

- Performance should be considered in design
- Monitoring and tuning efforts are ongoing and proactive!



Scenario

- General system performance is bad
- You assume a hardware / OS bottleneck

Useful Key Figures

- Current Values (snapshots) and history (previous hours)
 - ◆ CPU
 - ◆ Memory
 - ◆ Swap

Check following parameter values:

- CPU utilization
- Free memory



Analysis Tools: Database Monitor (ST04)

Scenario

General DB performance is bad; you assume a DB bottleneck

Useful Key Figures

- Deadlocks
- DB Buffer Hit Rates
- DB Process Overview
- Explain Query

Check following parameter values:

- Check for deadlocks
- Hit ratios on SGA buffers > 95% (or higher)
- Which access path in the explain plan?
 - ◆ Are the DB statistics up to date?
 - ◆ Are all indexes available?



Analysis Tools: Database Performance Monitor (DB02)

Scenario

- General DB performance problems
- You assume missing indexes or
 - ◆ (e.g. in ORACLE) degenerated indexes

Useful Features

- Missing Indexes
- Table, Index analysis

Check following parameter values:

- Compare index size with table size



Analysis Tools: Buffer Monitor (ST02)

Scenario

- The general system performance is bad
- You are concerned about efficient memory utilization

Important Buffers for BW

- Generic Key Table Buffer
 - ◆ Most BW-specific control tables (RS*-tables)
- Single Record Key Table Buffer
 - ◆ Master Data Tables
- Export/Import Shared Memory
 - ◆ OLAP Query Cache

Check following parameter values:

- Hit Ratio
- Swaps
- Free Space / Free Directory

SAP

BUSINESS INFORMATION WAREHOUSE



Analysis and Repair of BW Objects (RSRV)

Scenario

Performance of queries of one specific InfoCube is bad

Useful Features

- Database
 - ◆ DB statistics for an InfoCube and its aggregates
 - ◆ DB indices for an InfoCube and its aggregates
 - ◆ DB parameter settings check
 - ◆ DB Information about InfoProvider tables
 - InfoCube: Relative size of dimension tables compared to fact table
- “Repair” feature

Check following parameter values:

- Ensure DB statistics are up-to-date for an InfoCube
- Ensure indices exist for InfoCube
- Check for unbalanced InfoCubes
 - ◆ (dimension table size 10% or more compared fact table size)

RSRV – Tools for Analysis: Database tools

Admin WB > Modeling > InfoCube Manage > Goto menu > Data Target Analysis or Transaction RSRV

Analysis of BW Objects

Analysis Analysis in Batch Results Without Warnings Repair

InfoSource Query Database InfoObject Others

Analysis description
DB information on tables of an InfoCube
Parameters of the database
DB statistics of an InfoCube and its aggregates
Indices of an InfoCube and its aggregate

InfoCube 0APO_C05

Tests in Transaction RSRV

- All Elementary Tests
 - Master Data
 - Transaction Data
 - Hierarchies
 - Database
 - Database Indices of an InfoCube and Its Aggregates
 - Check Database Parameter(s)
 - Databank Statistics for an InfoCube and Its Aggregates
 - Database Information about InfoProvider Tables
 - Databank Parameters of *-Schema Tables for InfoCube
 - Aggregates
 - PSA Tables
 - All Combined Tests

Note the checks for parameter settings, DB statistics, and Indices. The index analysis can detect most degenerated indices, and the repair tool can repair these indices.

Scenario

- General Query performance is bad. Find out the queries with the worst performance and try to optimize them.

Useful Features

- Expert Mode
- BW System Load → Analysis of table RSDDSTAT

Check following parameter values:

- Check queries with highest runtimes and check where most time has been consumed
 - ◆ OLAP init
 - ◆ DB
 - ◆ OLAP
 - ◆ Frontend
 - ◆ Master data time



Using Analysis Tools: ST03N - Drill Down to Query

Highest contributor in Total Run Time per InfoCube

High % DB Time

Double Click

No of runs

Highest DB time

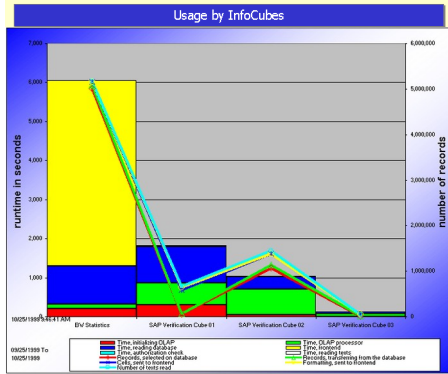
Low Front-end time

InfoCube	Query no.	Nav. steps	Total time	% OLAPINIT	% OLAP	% DB	% frontend	% mst.data	OLAPINIT time	OLAP time	DB time	Frontend time	Master
TOTAL	13	34	73.9	61.11	2.35	30.04	11.98	0.00	59.7	2.3	23.8	11.7	
OD_DECU	9	29	73.9	51.83	2.17	30.04	15.83	0.00	38.3	1.6	22.2	11.7	
OD_DECU	TOTAL	29	73.9	51.83	2.17	30.04	15.83	0.00	38.3	1.6	22.2	11.7	
OD_DECU	OD_SD_DEMO_Q0001	11	26.8	22.76	1.87	54.85	20.52	0.00	6.1	0.5	14.7	5.5	
OD_DECU	OD_SD_DEMO_Q0002	9	11.2	35.71	2.68	41.07	20.54	0.00	4.0	0.3	4.6	2.3	
OD_DECU	DECUQUERY1	2	10.3	89.32	3.88	6.80	0.00	0.00	9.2	0.4	0.7	0.0	
OD_DECU		2	7.8			5.41	50.00	0.00	3.3	0.1	0.5	3.9	
OD_DECU		1	5.0			10.80	0.00	0.00	4.4	0.0	0.5	0.0	
OD_DECU		1	4.1			9.76	0.00	0.00	3.6	0.1	0.4	0.0	
OD_DECU		1	3.3			9.09	0.00	0.00	2.9	0.1	0.3	0.0	

Drill down – check if there is any single query that could be the major contributor. Where is the major contribution coming from?

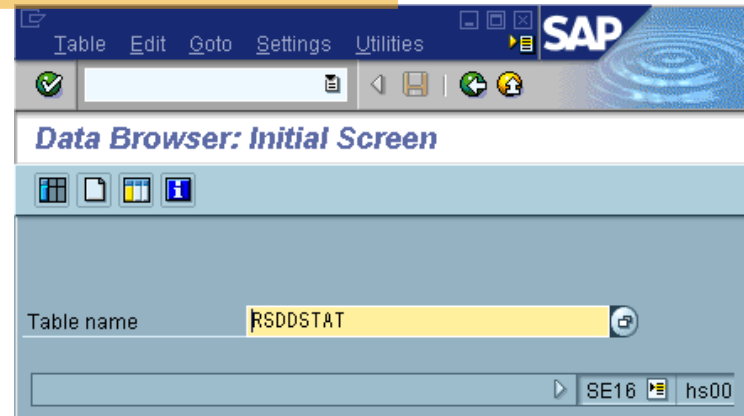
Example shows an active query, high DB time, with low OLAP & front-end time.

Overview: Reporting Performance Analysis Tools



BW Statistics

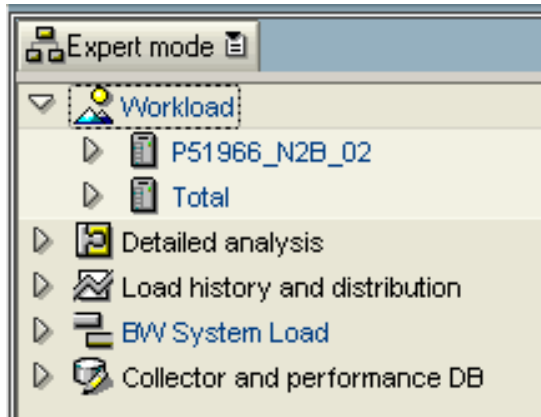
Table RSDDSTAT



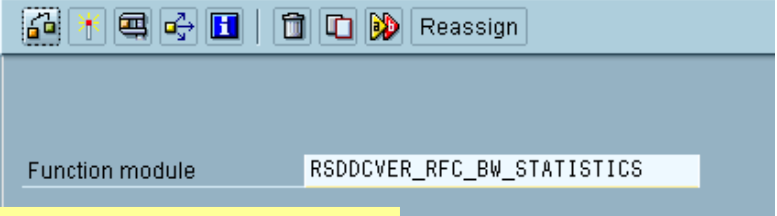
Queries of BW STATISTICS

Using table RSDDSTAT as InfoSource

BW Workload Analysis – ST03N



Function Builder: Initial Screen



Collecting information from table RSDDSTAT

Function module RSDDCVER RFC BW STATISTICS

Enable Capture of Statistical Performance Data

The screenshot shows the SAP Administrator Workbench interface in 'Modelling' mode. The main window is titled 'BW Statistics: Entry Mode' and displays a table of Infocubes with columns for 'InfoCube', 'Description', 'OLAP', and 'WHM'. The 'Tools' menu is highlighted, and a callout points to 'Tools > BW Statistics for Infocubes'. Another callout points to the 'OLAP' and 'WHM' checkboxes, stating they can be turned on/off. A third callout points to the 'Save' button, indicating that settings can be stored permanently. A fourth callout points to the 'Data targets' folder in the left-hand navigation pane, stating that old data can be deleted from database tables (buffers).

InfoCube	Description	OLAP	WHM
0ABC_C01	Activity-Based Costing (Costs and Quantities)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0ABC_C02	Activity-Based Costing (Statistical Key Figures)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0BWVC08_M	0BWVC08_M	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC09	0BWVC09	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC10	0BWVC10	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC11	0BWVC11	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC_C01	SAP Verification Cube 01	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC_C02	SAP Verification Cube 02	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC_C03	SAP Verification Cube 03	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC_C04	SAP Verification Cube 04	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC_C05	SAP Verification Cube 05	<input type="checkbox"/>	<input type="checkbox"/>
0BWVC_C09	0BWVC_C09	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Choose Tools > BW Statistics for Infocubes

Can be turned on/off for OLAP/WHM

You can delete old data from database tables (buffers)

You can store new settings permanently

SAP-delivered tools for analyzing and tuning system performance

Delivered Business Content beginning with BW 1.2A

- Redesigned for BW 2.0A

Usage of tools requires Business Content installation

Content Delivery Consists of:

- MultiCube
- InfoCubes
- Queries
- Workbook
- InfoSources
- Transfer Structures, Transfer Rules
- Update Rules
- InfoPackages, InfoPackage Groups
- Role



BW Statistics: Facts (continued)

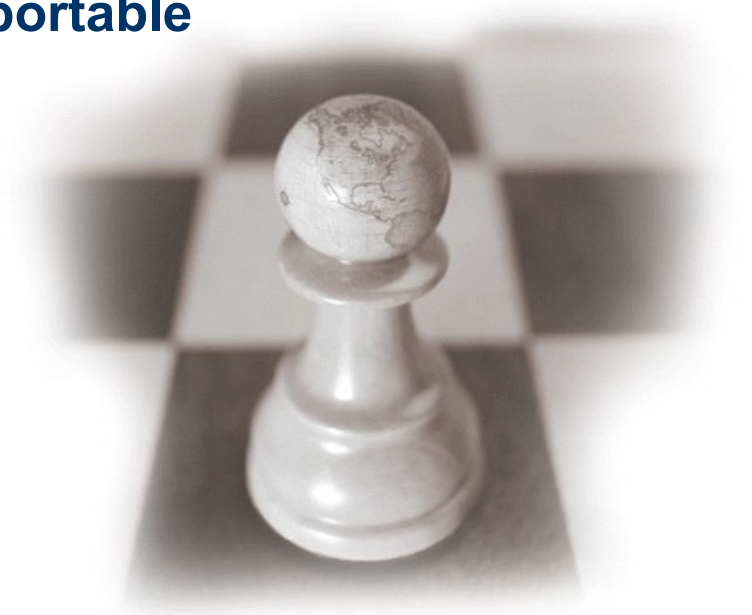
Maintenance requires scheduling data loads and monitoring

- **Delta load functionality delivered**
- **Transaction Data**
- **Master Data**

Can be utilized when building aggregates

- **System can “propose” aggregates from BW stats data**

Object metadata of BW Statistics is transportable



Data Load Performance Concepts

Reporting Performance Analysis Tools

 **Reporting Performance Analysis Techniques**

Aggregates

Reporting Performance Tuning Concepts

Analyzing Reporting Performance Issues

Building Aggregates:

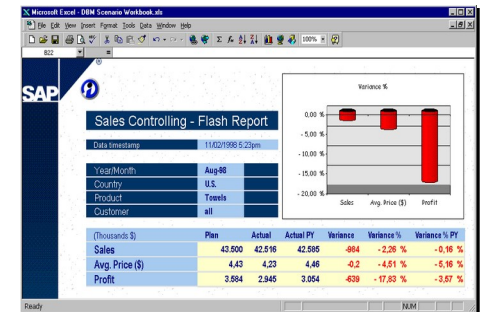
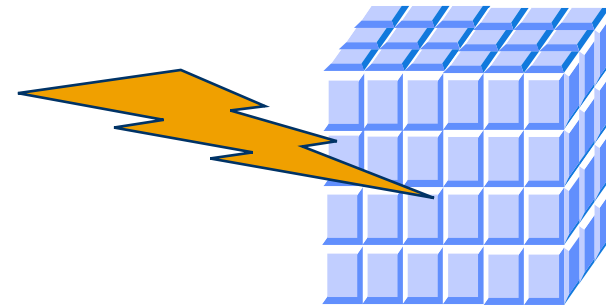
- Primary technique for tuning reporting performance
- Analyze to determine if building aggregates will help

Different Starting Points:

Analyze specific InfoProviders

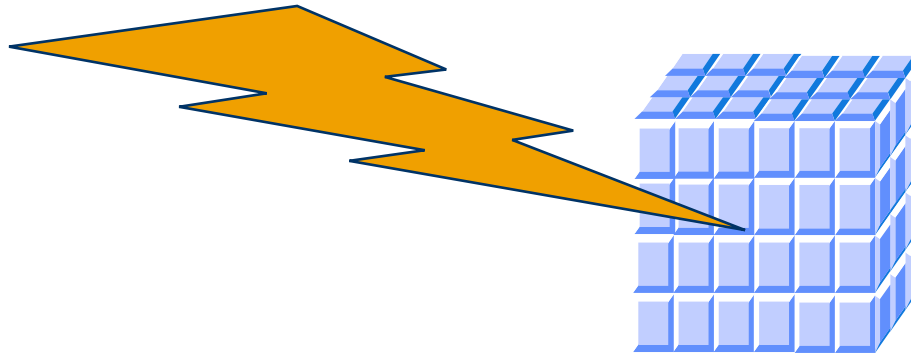
OR

Find problem queries, then analyze them



Analyzing Reporting Performance Issues

**Approach: Find InfoCubes of concern
& consider aggregates**



BW Statistics or ST03N: Find InfoCubes for Analysis

Microsoft Excel - Book2

File Edit View Insert Format Tools Data Window SAP Business Explorer Help

A7 = InfoCube

Sort by mean overall time to find InfoCubes with queries having the highest runtimes

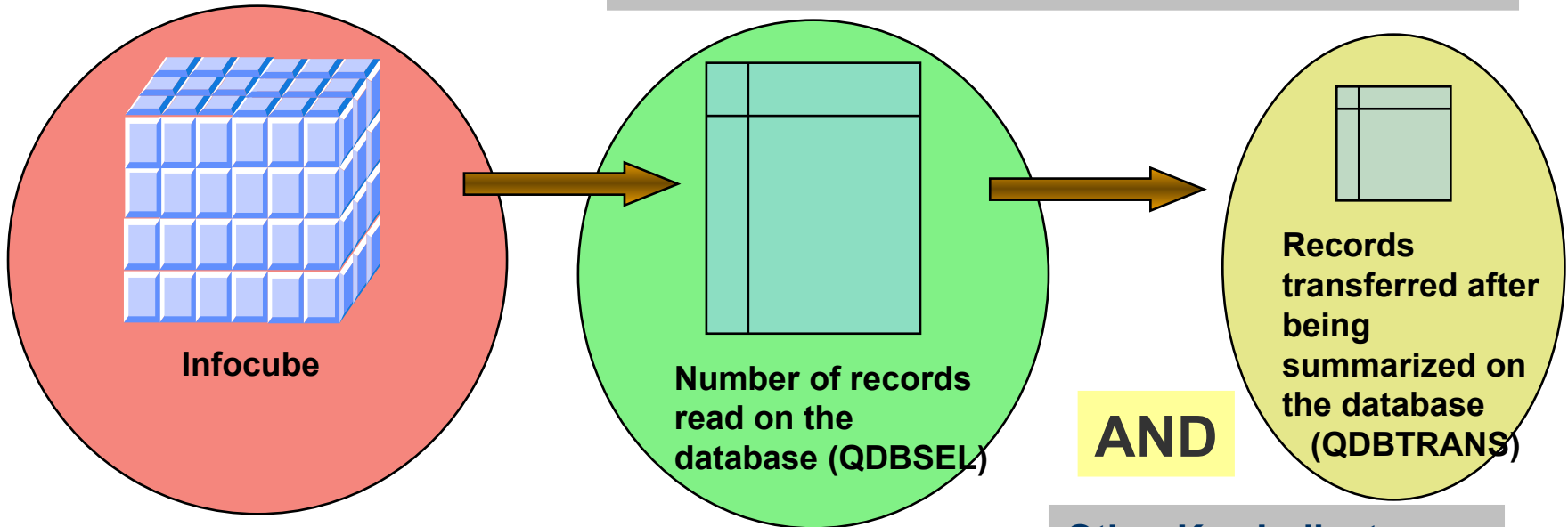
InfoCube	# navigations	Mean overall time	Overall time	Time, reading database	Records, selected	Records, transferring
TMB/OIC_C01	54	315,2882	17.025,561	6.771,404	289.990.489	12.050.721
TMB/OPCA_C01	66	97,9923	6.467,493	5.285,245	1.809.717	58.767
TMB/OFIAA_C01	38	47,9144	1.820,748	1.287,015	536.887	7.072
TMB/COPA_C01	406	17,7890	7.222,337	1.042,079	476.872	83.869
TMB/#	1.898	15,0373	28.540,850	1.011,250	5.235	161
TMB/OFIAA_C03	87	12,8895	1.121,390	382,260	7.640	3.419
TMB/OPA_C01	97	18,6091	1.805,085	331,498	464.196	83.702
TMB/OSD_C01	405	14,0774	5.701,354	293,520	330.750	52.113
TMB/OPY_C02	38	16,5247	627,937	279,654	712.885	65.177
TMB/OCCA_C01	34	22,7781	774,455	252,802	459.893	120.374
TMB/D_IC_003	20	19,5756	391,512	291,546	1.805.436	604
TMB/OOOM_C01	13	21,2654	276,450	171,976	84.129	7.623

Ready

Indicators That Aggregates Will Help

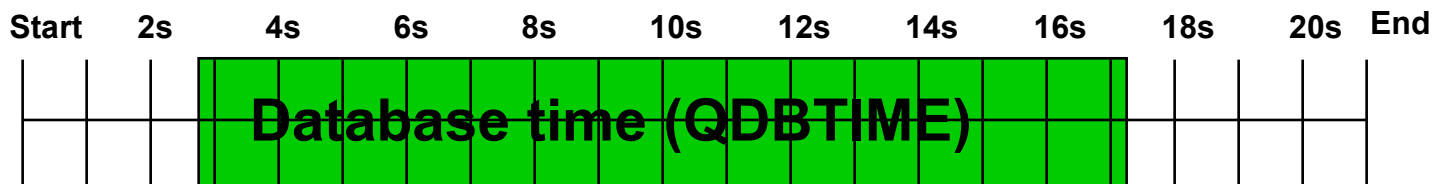
Look for many more records selected than necessary!

One Key Indicator:
Ratio records selected / records transferred > 10



Total query runtime (QRUNTIMECATEGORY)

Other Key Indicator:
database time for queries > 30% of total query runtime



Analysis of BW Statistics at InfoCube Level (1)

Microsoft Excel - Book2

File Edit View Insert Format Tools Data Window SAP Business Explorer Help

A7 = InfoCube

	A	B	C	D	E		
1	Utilizing OLAP per InfoCube						
2							
3	BW system identifier						
4	Times and data records (OLAP)						
5	InfoCube						
6							
7	InfoCube	# navigations	Mean overall time	Overall time	Time, reading database	Records, selected	Records, transferring
8	TMB/OIC_C01	54	315,2882	17.025,561	6.771,404	289.990,489	12.050,721
9	TMB/OPCA_C01	66	97,9923	6.467,493	5.285,245	1.809,717	58,767
10	TMB/OFIAA_C01	38	47,9144	1.820,748	1.287,015	536,887	7,072
11	TMB/COPA_C01	406	17,7890	7.222,337	1.042,079	476,872	83,869
12	TMB/#	1.898	15,0373	28.540,850	1.011,250	5,235	161
13	TMB/OFIAA_C03	87				7,640	3,419
14	TMB/OPA_C01	7				464,196	83,702
15	TMB/OSD_C01	105				330,750	52,113
16	TMB/OPY_C02	38				712,885	65,177
17	TMB/OCCA_C01	34	22,7781	774,455	252,802	459,893	120,374
18	TMB/D_IC_003	20	19,5756	391,512	291,546	1.805,436	604
19	TMB/OOOM_C01	13	21,2654	276,450	171,976	84,129	7,623

Ready

Database time ~40% of total runtime (6771 of 17 025 seconds)

Ratio records selected / records transferred: 24

Aggregates will probably improve query performance

Analysis of BW Statistics at InfoCube Level (2)

Microsoft Excel - Book2

File Edit View Insert Format Tools Data Window SAP Business Explorer Help

A7 = InfoCube

Utilizing OLAP per InfoCube

BW system identifier
Times and data records (OLAP)
InfoCube

Database time ~3,5% of total runtime (1011 of 28 540 seconds)

Ratio records selected / records transferred: 32

InfoCube	# navigations	Mean overall time	Overall time	Time, reading database	Records, selected	Records, transferring
TMB/0IC_C01	54	315,2882	17.025,561	6.771,404	289.990.489	12.050.721
TMB/0PCA_C01	66	97,9923	6.467,493	5.285,245	1.809.717	58.767
TMB/0FIAA_C01	38	47,9144	1.890,748	1.287,015	536.887	7.072
TMB/0COPA_C01	406	17,7890	2.337	1.042.079	76.872	83.869
TMB/#	1.898	15,0373	28.540,850	1.011,250	5.235	161
TMB/0FIAA_C03	87				7.640	3.419
TMB/0PA_C01	97				464.196	83.702
TMB/0SD_C01	405				330.750	52.113
TMB/0PY_C02	38				712.885	65.177
TMB/0CCA_C01	34	22,7781	774,455	252,802	459.893	120.374
TMB/D_IC_003	20	19,5756	391,512	291,546	1.805.436	604
TMB/0COOM_C01	13	21,2654	276,450	171,976	84.129	7.623

Aggregates will **not** improve query performance

Analysis of BW Statistics at InfoCube Level (3)

Microsoft Excel - BW_STAT_UTILIZING_per_Cube

File Edit View Insert Format Tools Data Window SAP Business Explorer Help

A7 = InfoCube

	A	B	C	D	E	F	G
1	Utilizing OLAP per InfoCube						
2							
3	BW system identifier						
4	Times and data records (OLAP)						
5	InfoCube						
6							
7	InfoCube	# navigations	Mean overall time	Overall time	Time, reading database	Records, selected	Records, transferring
8	TMB/OIC_C01	54	315,2882	17.025,561	6.771,404	289.990.489	12.050.721
9	TMB/OPCA_C01	66	97,9923	6.467,493	5.285,245	1.809.717	58.767
10	TMB/OFIAA_C01	38	47,9144	1.820,748	1.287,015	536.887	7.072
11	TMB/COPA_C01	406	17,7890	7.222,337	1.042,079	476.872	83.869
12	TMB/#	1.898	15.0373	28.540.850	1.011.250	5.235	161
13	TMB/OFIAA_C03	87				7.640	3.419
14	TMB/OPA_C01					464.196	83.702
15	TMB/OSD_C01	405				330.750	52.113
16	TMB/OPY_C02	38	10,5247	627,957	279,054	712.885	65.177
17	TMB/OIMFA_1	127	9,7558	1.228,986	148,837	5.021	3.736
18	TMB/OTRCM_C01	63	11,6245	1.346	145,312	10.303	7.263
19	TMB/OSD_C03	71	22,1542	1.572,951	1.420,523	141.330	127.343

Ratio records selected / records transferred: 1.1

Database time ~90% of total runtime (1420 of 1572 seconds)

Aggregates will not improve query performance

ST03N - Workload By InfoCube

Expert mode

Workload

- P51966_N2B_02
- Total
- Detailed analysis
- Load history and distribution
- BW System Load
- Last minutes load
- Day
 - Today
 - 25.06.2001 Mon
 - 24.06.2001 Sun
- Week
 - This week
 - 18.06.2001 - 24.06.2001
 - 11.06.2001 - 17.06.2001

instance: TOTAL
 Period: 26.06.2001
 Task type:

Share of runtime | Average times (AVG) | All data

Reporting - InfoCubes: Share of total time (s)

InfoCube	Query no.	Nav. steps	Total time	% OLAPINIT	% OLAP	% DB	% frontend	% mst.data	OLAPINIT time	OLAP time	DB time	Frontend time	Master
TOTAL	13	34	97.7	61.11	2.35	24.26	11.98	0.00	59.7	2.3	23.8	11.7	
0D_DECU	9	29	73.9	51.83	2.17	30.04	15.83	0.00	38.3	1.6	22.2	11.7	
0BWTC_C10	2	3	9.0	85.56	4.44	10.00	0.00	0.00	7.7	0.4	0.9	0.0	
0BWTC_C01	1	1	7.7	92.21	2.60	3.90	0.00	0.00	7.1	0.2	0.3	0.0	
0BWTC_C07	1	1	7.1	92.96	1.41	5.63	0.00	0.00	6.6	0.1	0.4	0.0	

Load display | Goto | Environment | System | Help

SAP

Highest contributor in Total Run Time per InfoCube

High % DB Time

Load Analysis in System N2B

Expert mode

Workload

- P51966_N2B_02
- Total
- Detailed analysis
- Analysis views
 - Reporting
 - Maturity periods
 - Ranking Lists

instance: TOTAL
 Period: 06/2001
 Task type:

First record: 01.06.2001 00:00:00
 Last record: 30.06.2001 23:59:59
 Time period: 29 Day(s) 23:59:59

Share of runtime | Average times (AVG) | All data

Reporting - InfoCubes: Ø times / navigation step (s)

InfoCube	Query no.	Nav. steps	Total time	Ø total	Med. total	OLAP time	Ø OLAP	DB time	Ø DB	Frontend time	Ø frontend	Selected	Select/transferred	No. o
TOTAL	24	109	470,6	4,3	2,3	29,3	0,3	99,5	0,9	56,7	0,5	0	0,0	
0D_DECU	9	58	266,0	4,6	1,6	21,6	0,4	54,7	0,9	24,9	0,4	0	0,0	
0BWTC_C10	11	44	172,6	3,9	2,6	6,9	0,2	42,9	1,0	31,8	0,7	0	0,0	
0BWTC_C07	1	2	14,2	7,1	7,1	0,5	0,3	1,2	0,6	0,0	0,0	0	0,0	
0BWTC_C06	2	4	10,1	2,5	3,3	0,1	0,0	0,4	0,1	0,0	0,0	0	0,0	
0BWTC_C01	1	1	7,7	7,7	7,7	0,2	0,2	0,3	0,3	0,0	0,0	0	0,0	

N2B (1) (100) | P51966 | INS

SAP

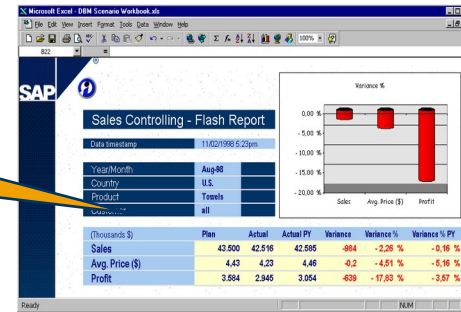
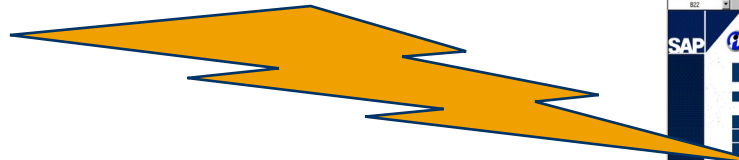
Expert Mode!!

High ratio: Selected / transferred records



Analyzing Reporting Performance Issues

Approach: Find queries of concern, then analyze them



BW Stats or ST03N: Find Queries for Analysis

Microsoft Excel - BW_STAT_UTILIZING_per_Query

File Edit View Insert Format Tools Data Window SAP Business Explorer Help

Query

Utilizing OLAP per Query

Sort by overall time to find queries that have the highest total runtime

Query	# navigations	Mean overall time	Overall time	Time, reading database	Records, selected	Records, transferring
Query3	11	425,9320	4.685,252	2.798,516	160.954.142	2.962.877
Query4	5	936,1282	4.680,641	968,673	7.994.970	3.293.697
Query5	7	607,2927	4.251,049	1.421,591	5.494.612	879.079
Query6	77	29,3621	2.260,882	189,893	5.104	1.825
Query7	8	251,8872	2.015,098	1.400,190	48.528	3.730
Query8	1	1.343,2190	1.343,219	1.340,875	10.512	420
Query9	54	24,6693	1.332,144	150,645	24.235	1.278
Query10	2	657,9240	1.315,848	1.276,168	30.368	932
Query11	11	105,7175	1.162,892	1.064,407	15.828	7.412
Query12	12	84,7605	1.017,126	86,312	16	8
Query13	70	14,2516	997,612	298,347	224.765	42.285

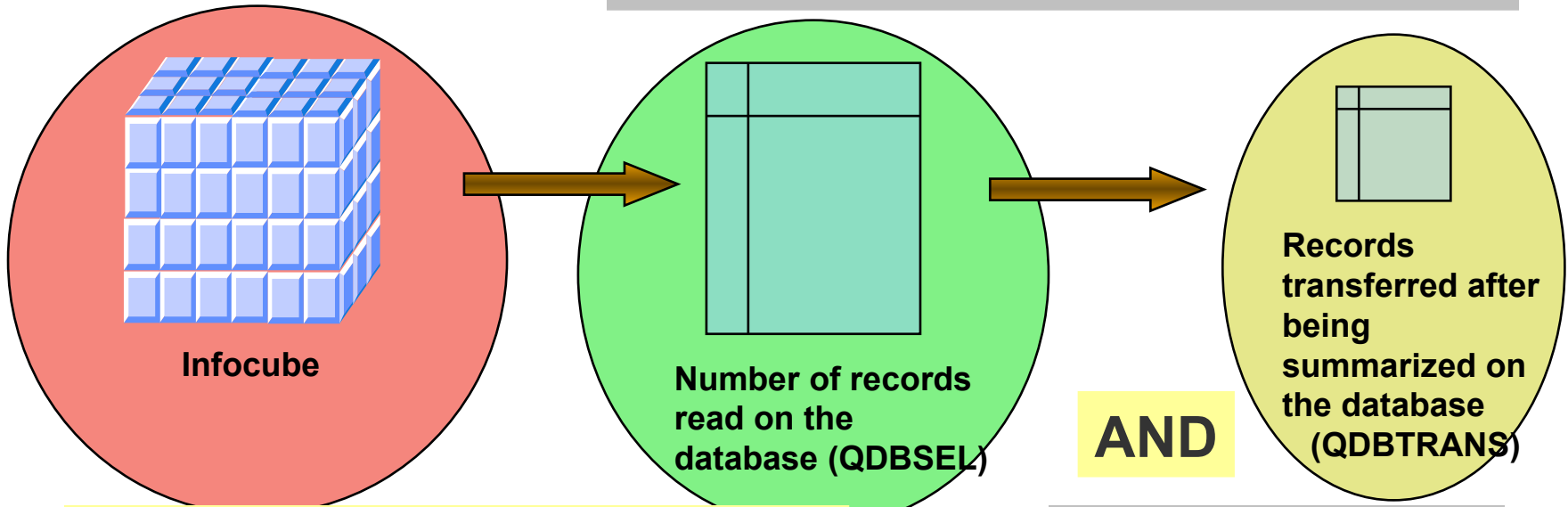
Sheet1 / Sheet2 / Sheet3 /

Ready NUM

Indicators That Aggregates Will Help

Look for many more records selected than necessary!

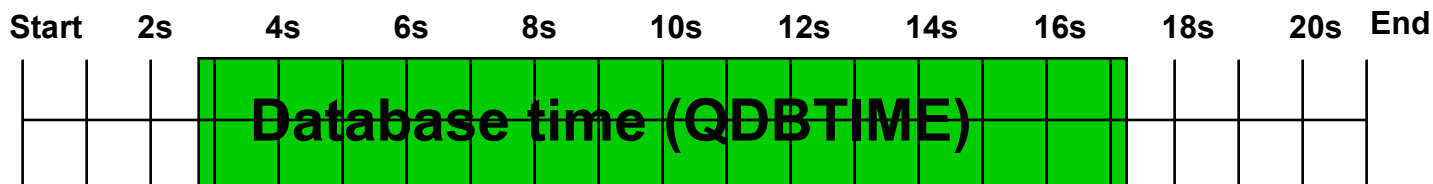
One Key Indicator:
Ratio records selected / records transferred > 10



Same Key Indicators for Queries!

Other Key Indicator:
database time for queries > 30% of total query runtime

Total query runtime (QRUNTIMECATEGORY)



Analysis Techniques: Key Components of Runtime

Microsoft Excel - BW_STAT_UTILIZING_per_Query

File Edit View Insert Format Tools Data Window SAP Business Explorer Help

Query

Utilizing OLAP per Query

Times and data records (OLAP)
InfoCube

Database time ~60% of total runtime (2.798 of 4.685 seconds)

Ratio records selected / records transferred: 54

Query	# navigations	Mean overall time	Overall time	Time, reading database	Records, selected	Records, transferring
Query3	11	425,9320	4.685,252	2.798,516	160.954.142	2.962.877
Query4	5	936,1282	4.680,641	968,673	7.994.970	3.293.697
Query5	7	607,2927	4.251,049	1.421,591	5.494.612	879.079
Query6	77	29,3621	2.260,882	189,893	5.104	1.825
Query7	8	251.8872	2.015.098	1.400.190	48.528	3.730
Query8	1				10.512	420
Query9					24.235	1.278
Query10	2				30.368	932
Query11	11				15.828	7.412
Query12	12	84,7605	1.017,126	86,312	16	8
Query13	70	14,2516	997,612	298,347	224.765	42.285

Aggregates will improve query performance

Analysis Techniques: Key Components of Runtime

Microsoft Excel - BW_STAT_UTILIZING_per_Query

File Edit View Insert Format Tools Data Window SAP Business Explorer Help

A6 = Query

Utilizing OLAP per InfoCube

Times and data records (OLAP) InfoCube

Database time ~89% of total runtime (1064 of 1162 seconds)

Ratio records selected / records transferred: 2.1

Query	# navigations	Mean overall time	Overall time	Time, reading database	Records, selected	Records, transferring
Query3	11	425,9320	4.685,252	2.798,516	160.954.142	2.962.877
Query4	5	936,1282	4.680,641	968,673	7.994.970	3.293.697
Query5	7	607,2927	4.251,049	1.421,591	5.494.612	879.079
Query6	77	29,3621	2.260,882	189,893	5.104	1.825
Query7	8	251,8872	2.015,098	1.400,190	48.528	3.730
Query8	1	1.343,2190	1.343,219	1.340,875	10.512	420
Query9	54	24,6693	1.332,444	150,645	24.235	1.278
Query10	2	657,9240	1.276,168	1.276,168	16	932
Query11	11	105,7175	1.162,892	1.064,407	15.828	7.412
Query12	12	84,7605	1.017,126	86,312	16	8
Query13	70	14,2516	997,612	298,347	224.765	42.285

Aggregates will **not** improve query performance

Query Monitor – Transaction RSRT

Scenario

- The performance of one specific query is bad. Debug the query to analyze possible bottlenecks

Useful Features

- Execute query in debug mode
 - ◆ SAP statistics
 - ◆ Explain Plan
 - ◆ Display found aggregates
- OLAP query cache monitor

Check following things:

- Are aggregates used?
- Is the OLAP query cache used? (DB time = 0)
- Are the statistics up-to-date?

Query Monitor – Transaction RSRT

Query Monitor

The screenshot shows the SAP Query Monitor interface. At the top, there is a toolbar with icons for 'Execute + Debug', 'Properties', and 'Help Texts'. Below this is a secondary toolbar with buttons for 'Technical Information', 'Cache Monitor', 'Query Variants', 'IGS Test', 'Get Variant', and 'Create Variant'. The main area displays the query name '00_SD_C03/Z_20B_WEB' and a 'List' button. A dialog box is open, showing a list of options with checkboxes. The 'Displays Aggregate Found' option is highlighted with a dashed border. Several callout boxes provide instructions on how to use these options.

Choose *Execute + Debug* to get a dialog box with options

Displays the best possible aggregate for this query execution

Displays statistics of database table RSDDSTAT (for this execution)

Switch off the usage of aggregates to check runtime

Switch to NOPARALLEL mode for MultiProvider queries, or find explain plans

- Display Statistics Data
- Displays Aggregate Found**
- Display SQL Query
- Display Run Schedule
- Do Not Use Aggregates
- Do Not Use Cache
- RRI Transformations
- No Parallel Processing
- Multiprovider Explain
- Default Breakpoints
- Download Query Scenario

Best Possible Aggregate (1)

Number of database accesses (if all best possible aggregates are available)

Suggested aggregation type (*, F, H, blank)

Fixed value used (if aggregation F is used)

D...	Aggregate/	InfoObject	InfoObject	S...	S: Hier...	D...	S: ...	S: Fixed v	A...	A: Hier...	A: Fix...
1	ZTEST_AP	0ACTTYPE	Activity type	*	0			0		0			
1	ZTEST_AP	0CO_AREA	Controlling a...	*	0			0		0			

Structure to be read (InfoCube or aggregate)

Hierarchy used (if aggregation H is used)

Hierarchy level (if aggregation H is used)

Best Possible Aggregate

Structure to be read
(InfoCube or aggregate)

Suggested aggregation
type (*, F, H, or blank)

...	Aggregate	InfoObject	InfoObject	S...	S: Hierarc	S: ...	S: Fixed v	A...	A: Hierarc	A: ...	A: Fixed v
1	100005	0CALMONTH	Calendar Y...	*	0	0		*	0	0	
		OD_MATERIAL	Material SA...	*	0	0		*	0	0	
		OD_PLANT	OD_PLANT		0			*	0	0	
2	100003	0CALMONTH	Calendar Y...	*	0	0		*	0	0	
		OD_MATERIAL	Material SA...	*	0	0		*	0	0	
		OD_PLANT	OD_PLANT		0			*	0	0	
		OD_VENDOR	Vendor nu...	F	0	10		*	0	0	

Number of
database accesses
(if all best possible
aggregates are
available)

Aggregation type of
existing aggregate

RSRT Query Monitor: BW Statistics Data

For detailed information choose *Details*

Detail: Display

STATUID	QAGGRUSED
51 24MAXCHW4P17LKRBCG367	

STATUID	85PH9A93W7ZPFV54CQ1AA003Z
SESSIONUID	87U7EM7P9LQDL1B0KDQT4CB9R
NAVSTEPUID	89YXJY6AMZH1Q7I8S1GBYNFJ
INFOCUBE	JXPCUBE2
HANDLE	1
QUERYID	JXPCUBE2/PGCOSTOFSALES
User name	MIHAN
QNACHLESEN	H
OLAPMODE	1
QRUNTIMECATEGORY	3
QNAVSTEP	1
QDBSEL	19.420
QDBTRANS	367
QNUMCELLS	1.635
QNUMRANGES	87
QTIMEOLAPINIT	0,359375
QTIMEOLAP	0,828125
QTIMEDB	1,281250
QTIMECLIENT	0,109375
TIMEAUTHCHECK	0,015625
DMTCUBEACC	1,281250
Long form of time stamp	20.001.128.094.022,2900000

RSRT | pwdf0261 | INS

Trace Tool: RSRTRACE

Activates logging for specific user id

configure trace tool

Configure user User logs CATT logs All logs

Activate user

User TESTUSER All users

User(s) activated for logging

User	Date	Time
MIHAN	28.11.2000	10:51:45

User 'MIHAN' is activated for the logging RSRTRACE pwdf0261

Displays all existing logs

Deactivates logging for user id

User already activated for logging

Trace Tools: RSRTRACE > RSRCATTRACE

The screenshot shows the SAP RSRTRACE tool interface. The title bar reads "Processing/deletion of logged callups". Below the title bar is a menu bar with "List", "Edit", "Goto", "Settings", "System", and "Help". A toolbar contains various icons for navigation and actions. The main area displays a table with the following data:

System	Logno.	User	Date	Time	Description	
<input type="checkbox"/>	QB4	70	MIHAN	28.11.2000	11:00:31	
<input type="checkbox"/>	QB4	69	MIHAN	28.11.2000	10:59:59	
<input type="checkbox"/>	QB4	67	MIHAN	28.11.2000	10:58:42	
<input type="checkbox"/>	QB4	64	ALBRECHTC	23.11.2000	14:55:50	
<input type="checkbox"/>	QB4	63	RIZZO	17.11.2000	17:07:29	
<input type="checkbox"/>	QB4	62	ALBRECHTC	15.11.2000	15:42:47	
<input type="checkbox"/>	QB4	61	ALBRECHTC	15.11.2000	15:40:57	

At the bottom of the window, the status bar shows "RSRTRACE" and "pwc".

Copy Log Number from RSRTRACE into Transaction RSRCATTRACE

RSRCATTTRACE: specific log from RSRTRACE is input, tool gives aggregates suggestions for first execution AND all further navigations performed

- Display Statistics Data
- Displays Aggregate Found
- Display SQL Query
- Display Run Schedule
- Do Not Use Aggregates
- Do Not Use Cache
- RRI Transformations
- No Parallel Processing
- Multiprovider Explain
- Default Breakpoints
- Download Query Scenario

Data Load Performance Concepts

Reporting Performance Analysis Tools

Reporting Performance Analysis Techniques

Aggregates

Reporting Performance Tuning Concepts

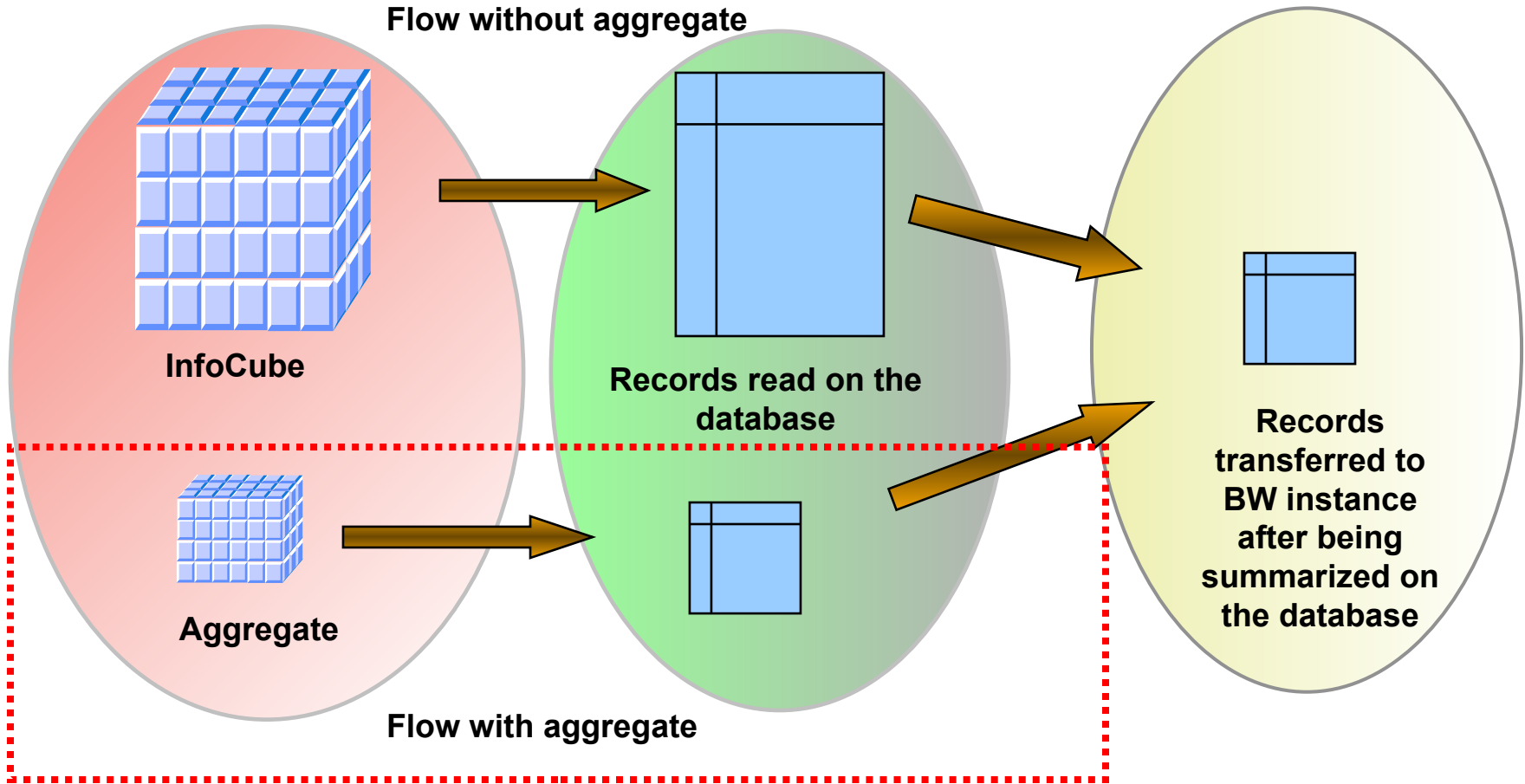
Aggregates: Definition

Aggregates are materialized subsets of fact table data. They are independent structures where summary data is stored within separate, transparent InfoCubes.



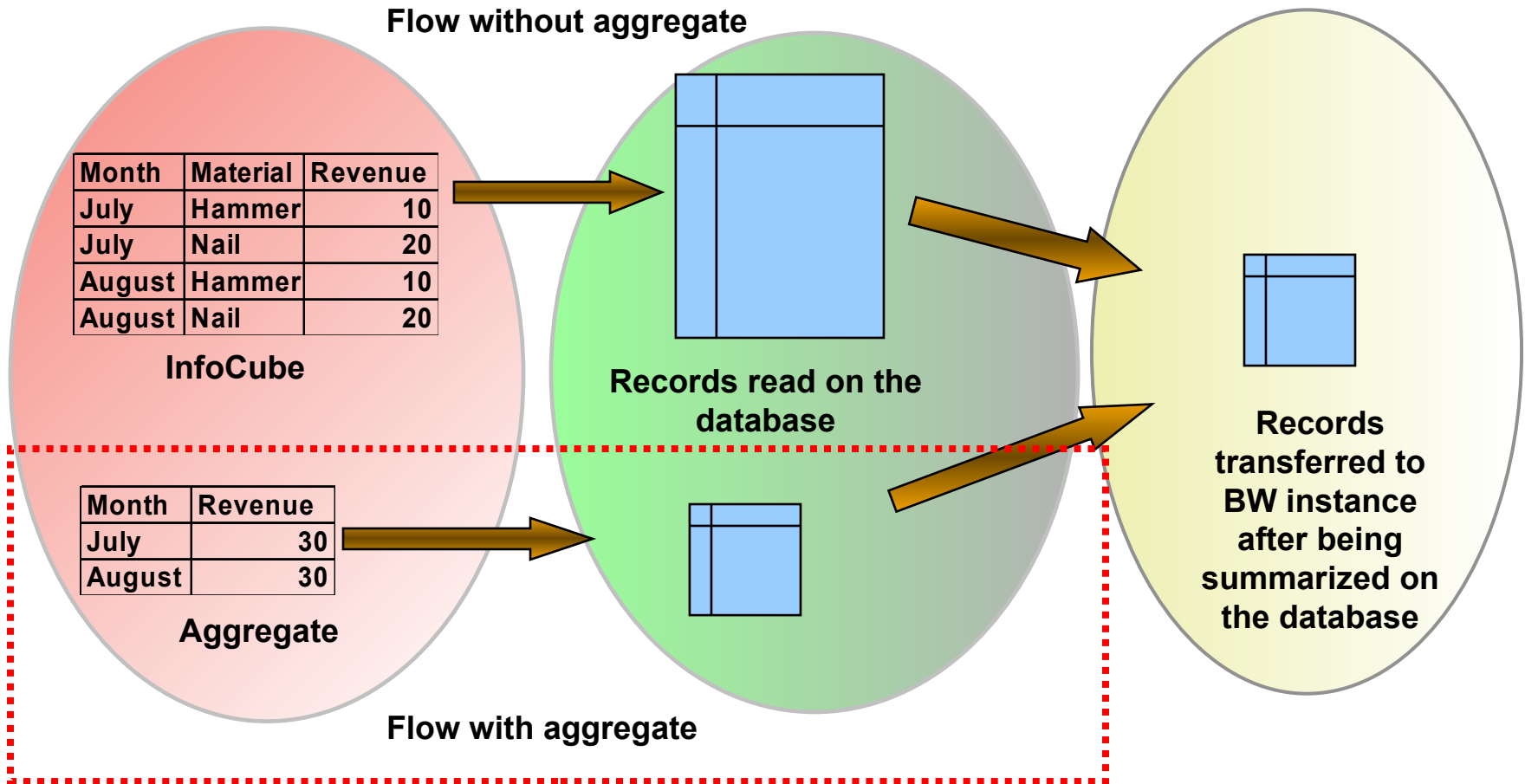
Aggregates: Concept

Data transfer from InfoCube to query



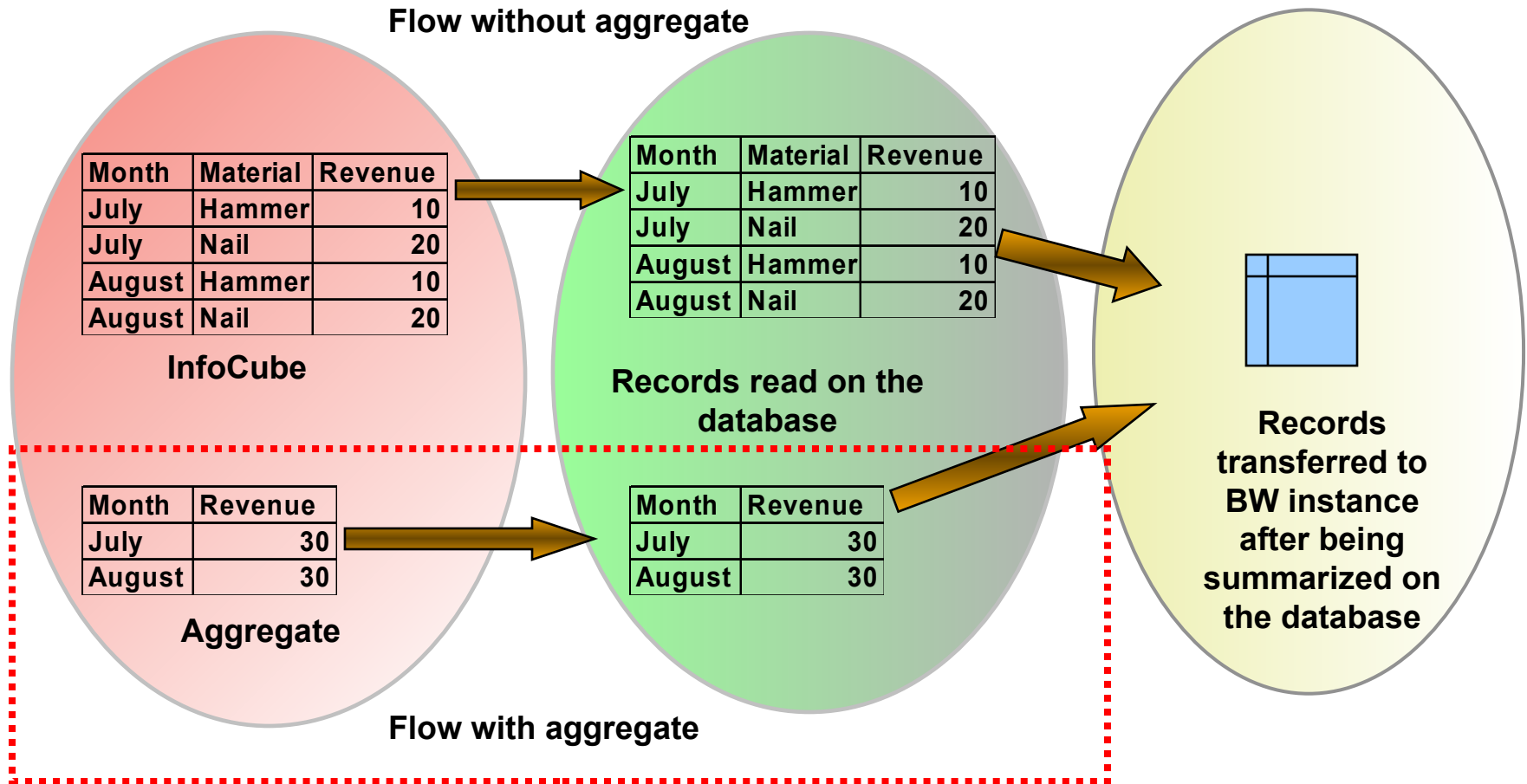
Aggregates: Concept

Data transfer from InfoCube to query (revenue grouped by month)



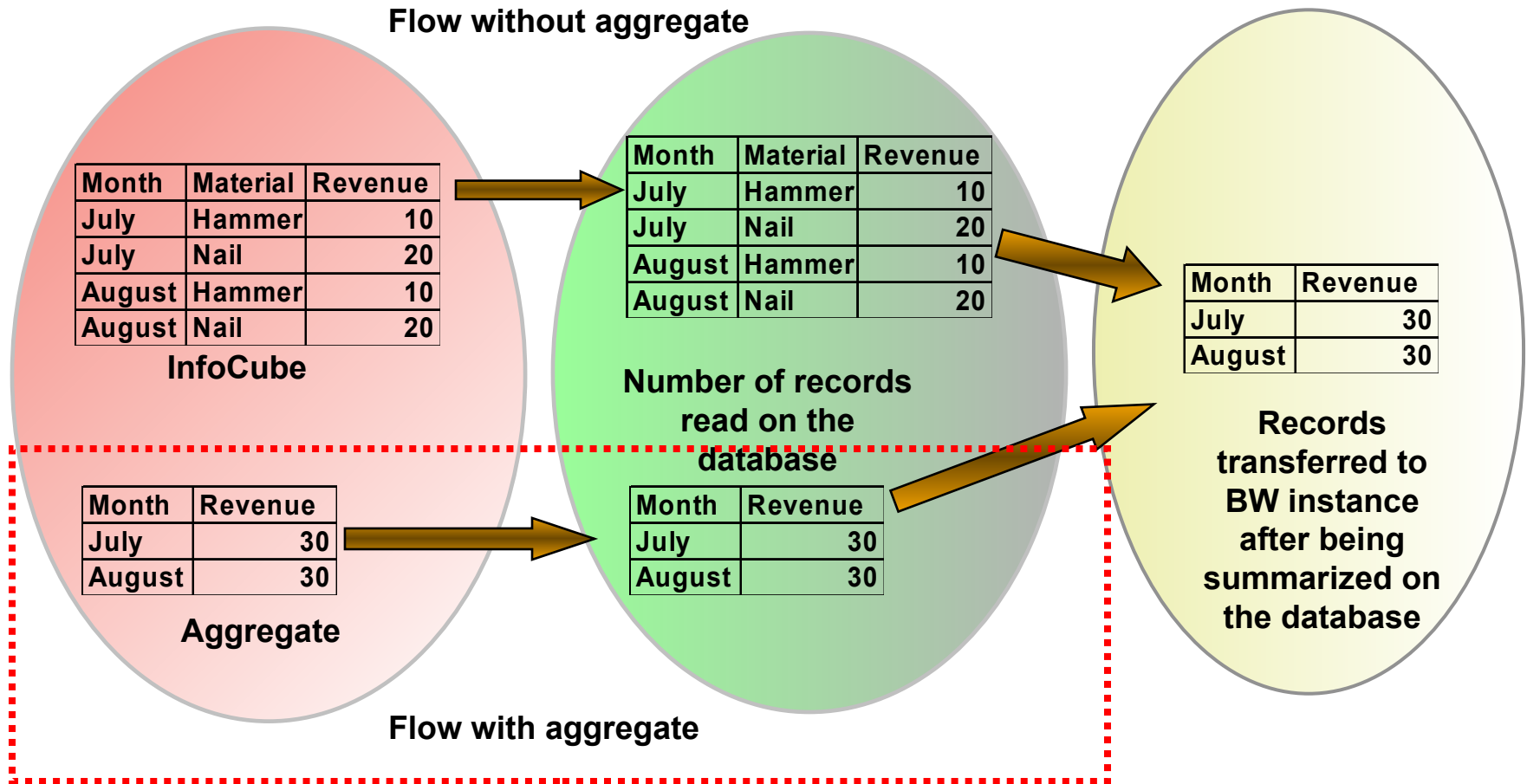
Aggregates: Concept

Data transfer from InfoCube to query (revenue grouped by month)



Aggregates: Concept

Data transfer from InfoCube to query (revenue grouped by month)



To accelerate the response time of queries, by reducing the amount of data that must be read in the database for a given query navigation step.



Query Design: General Recommendation

Create queries to start at an summarized level

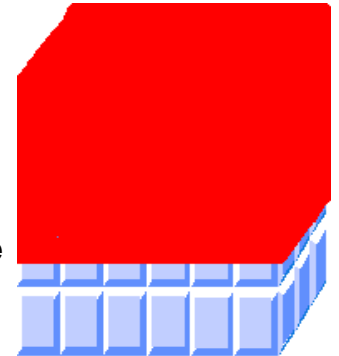


Using Aggregates



Aggregate 1

No Aggregates available

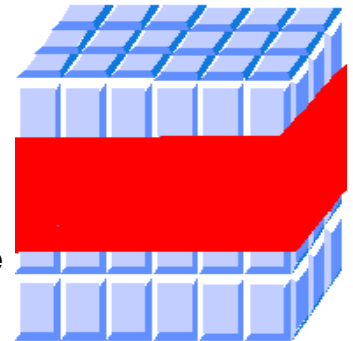


InfoCube

First drilldown may have to read a larger structure

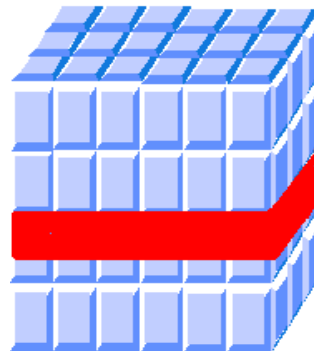


Aggregate 2

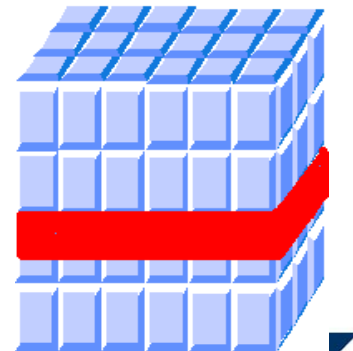


InfoCube

Second drilldown may have to read a large structure
but with increasing filter restrictions



InfoCube



Amount of data that has to be read

Aggregates can be created:

- For Basic InfoCubes
- For dimension characteristics
- Using navigational attributes
- On hierarchy levels
- Using time-dependent navigational attributes
- On hierarchy levels where the structure is time-dependent

New for 3.0!

New for 3.0!



Aggregate Concepts: Summarize by Characteristic

Fact Table: Sales Data

Country	Customer	Sales
USA	Winsoft Inc.	10
Germany	Internetworks	15
USA	Funny Duds Inc.	5
Austria	Internetworks	10
Austria	Thor Industries	10
Germany	Funny Duds Inc.	20
USA	Winsoft Inc.	25

Aggregate Tables: Sales Data

Country *

Customer Space

Country	Sales
USA	40
Germany	35
Austria	20

Aggregate Concepts: Fixed Value (Subset of Data)

Fact Table: Sales Data

Country	Customer	Sales
USA	Winsoft Inc.	10
Germany	Internetworks	15
USA	Funny Duds Inc.	5
Austria	Internetworks	10
Austria	Thor Industries	10
Germany	Funny Duds Inc.	20
USA	Winsoft Inc.	25

Aggregate Tables: Sales Data

Country F, Germany
Customer *

Country	Customer	Sales
Germany	Internetworks	15
Germany	Funny Duds Inc.	20

Aggregate Concepts: Sum. By Navigational Attributes

Navigational Attribute for Characteristic Customer

Customer	Industry
Winsoft Inc.	Technology
Funny Duds Inc.	Consumer Products
Internetworks	Technology
Thor Industries	Chemical

Fact Table: Sales Data

Country	Customer	Sales
USA	Winsoft Inc.	10
Germany	Internetworks	15
USA	Funny Duds Inc.	5
Austria	Internetworks	10
Austria	Thor Industries	10
Germany	Funny Duds Inc.	20
USA	Winsoft Inc.	25

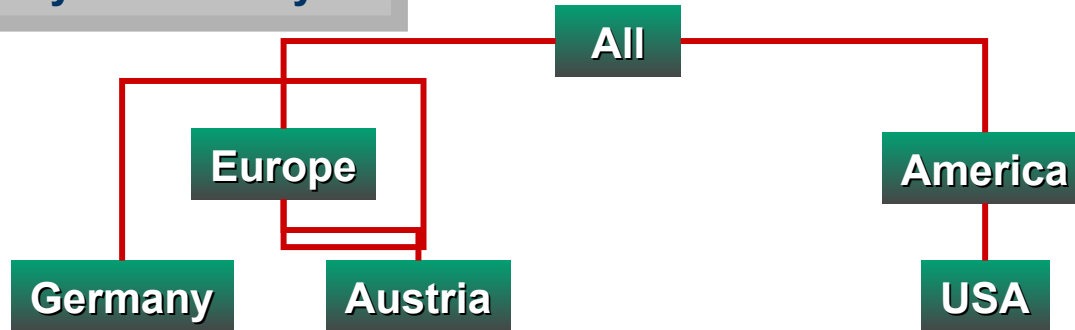
Aggregate Tables: Sales Data

Country
Customer__Industry Space *

Industry	Sales
Technology	60
Consumer Products	25
Chemical	10

Aggregate Concepts: Summarize on Hierarchy Levels

Hierarchy for Country



Time-independent hierarchies are stored outside the dimension, in a table called /BI0/ICOUNTRY

Fact Table: Sales Data

Country	Customer	Sales
USA	Winsoft Inc.	10
Germany	Internetworks	15
USA	Funny Duds Inc.	5
Austria	Internetworks	10
Austria	Thor Industries	10
Germany	Funny Duds Inc.	20
USA	Winsoft Inc.	25

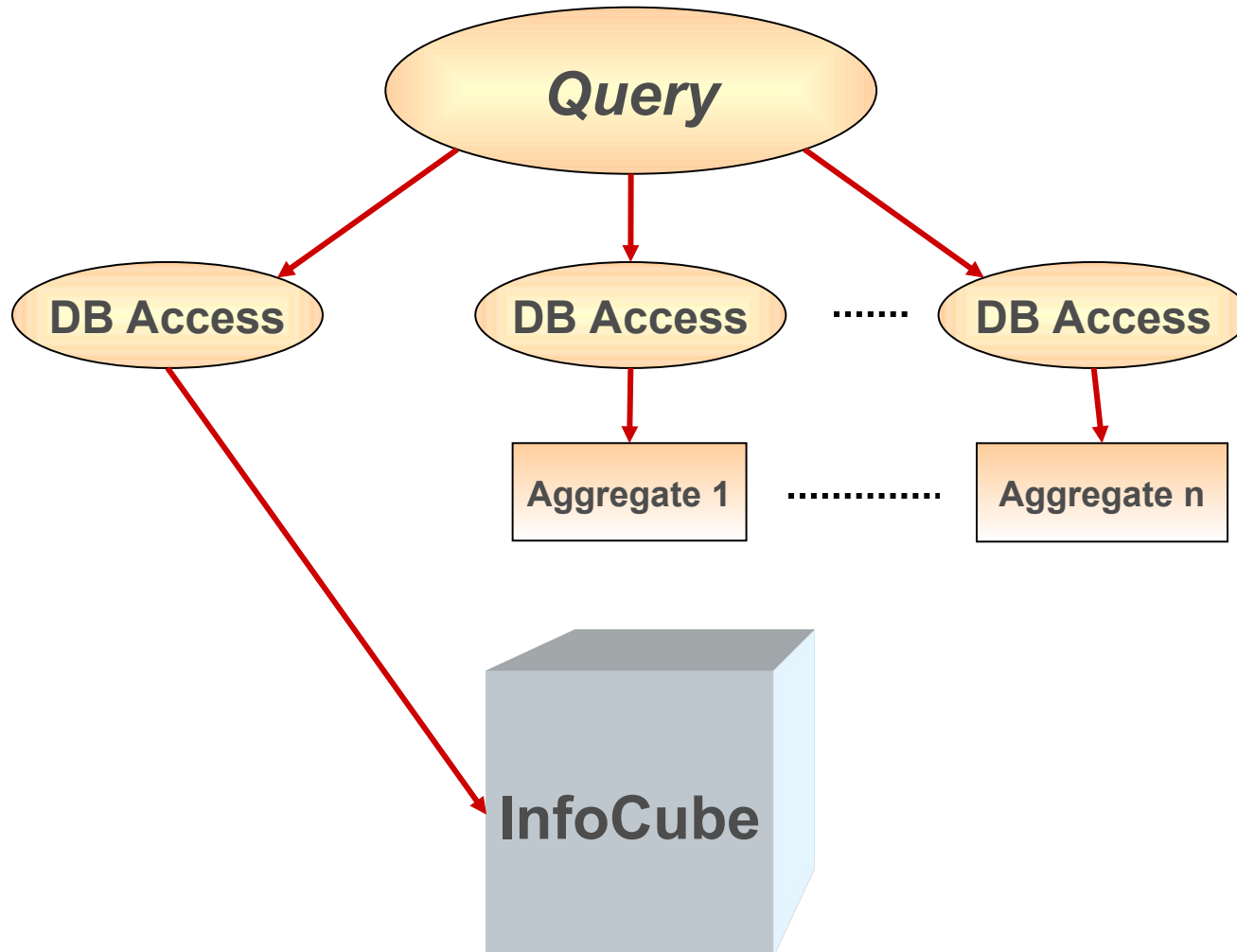
Aggregate Tables: Sales Data

Country Customer H, Level 2 Space

Country	Sales
America	40
Europe	55

Query Behavior: Multiple aggregates per navigation

Queries may be automatically split up over several aggregates, as many queries are comprised of multiple select statements



Rollup and Change run (Master Data Activation)

Definition: Rollup

To apply the newly loaded transaction data to the aggregate

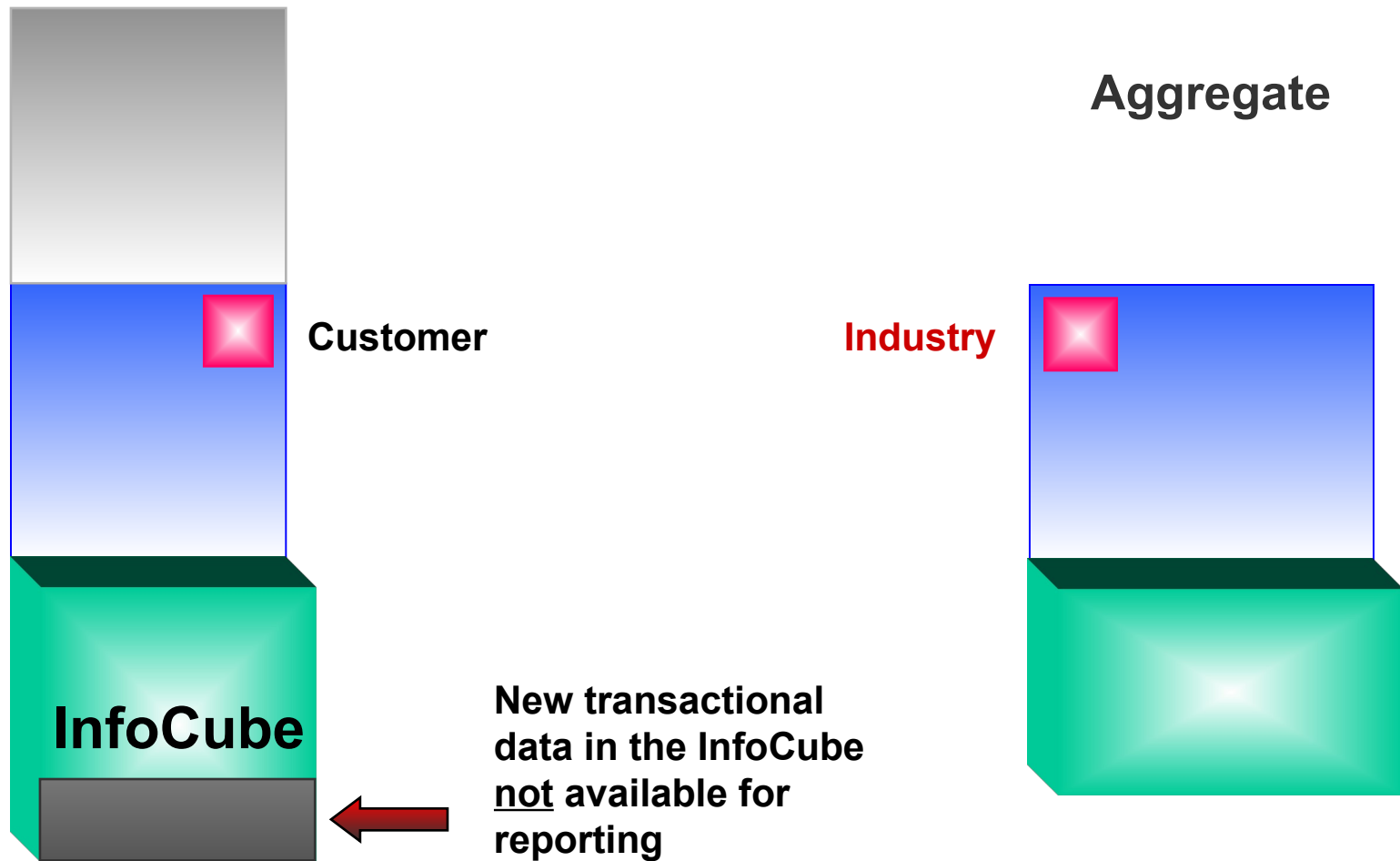
Definition: Change Run

To activate the changes of master data and hierarchies

- During the change run, all aggregates containing navigational attributes and/or hierarchies are realigned

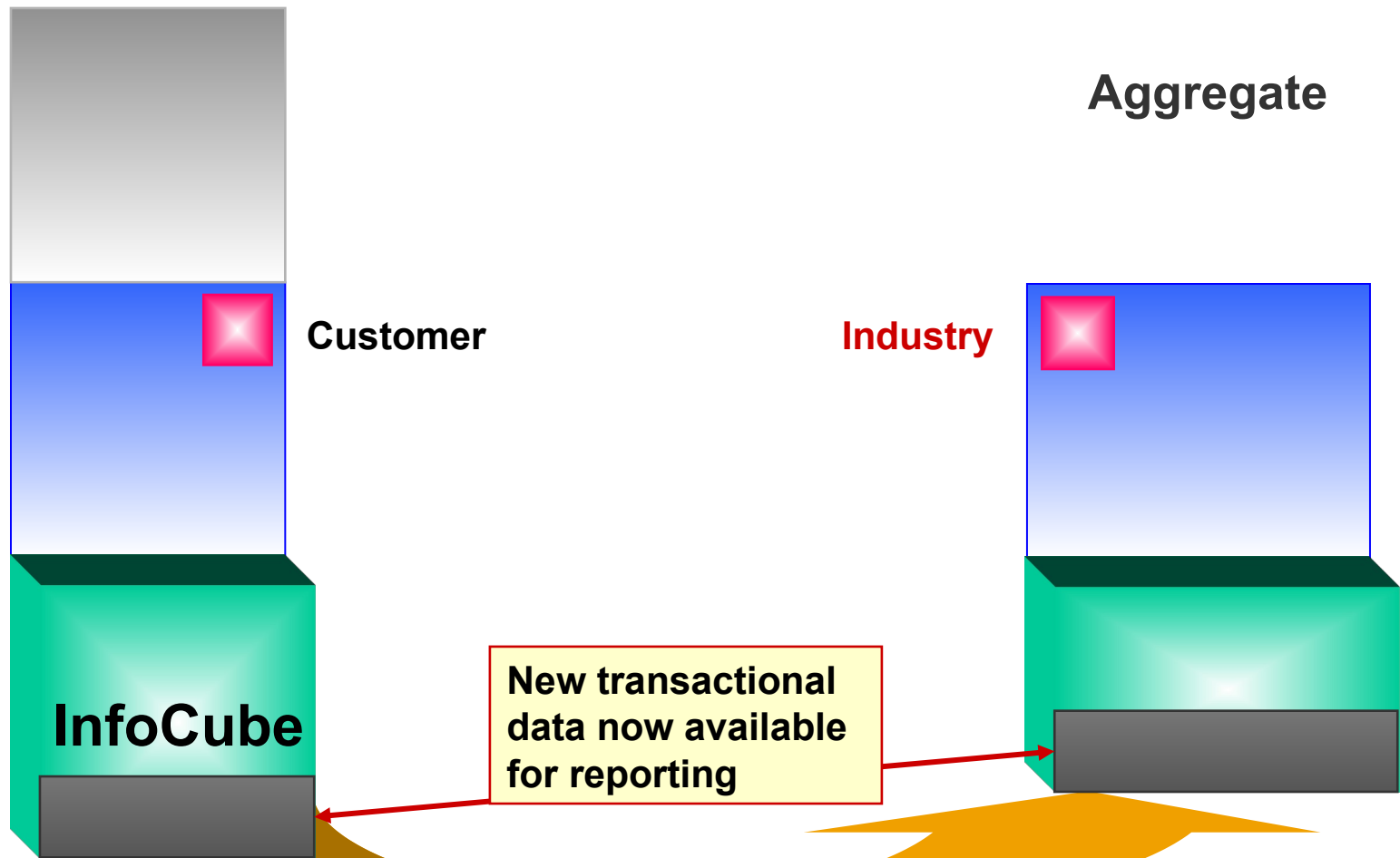
Aggregates Concepts: Rollup (1)

Rollup applies the newly uploaded transaction data to the aggregate



Aggregates Concepts: Rollup (2)

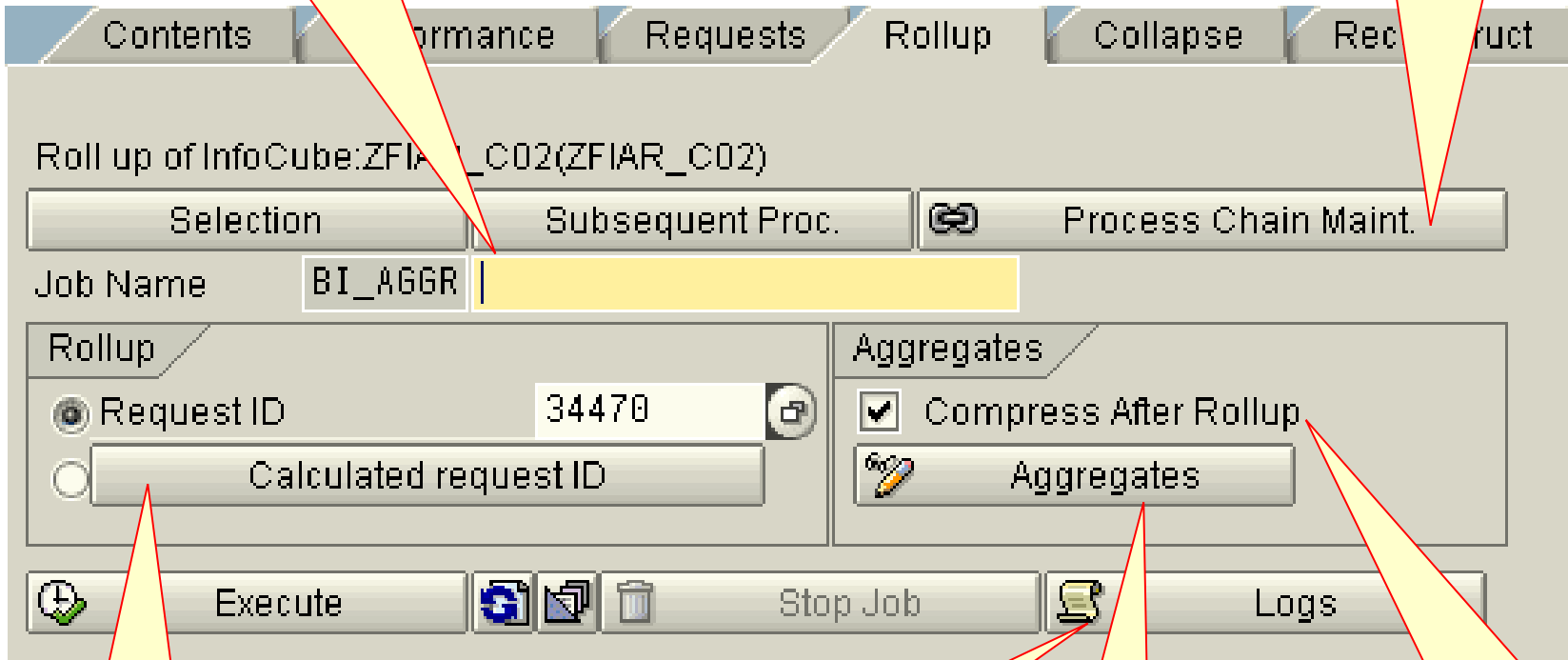
Rollup applies the newly uploaded transaction data to **all** aggregates of an InfoCube



Aggregate Rollup: Create Batch Job

Once selection is made, system-generated batch job name goes here

Aggregate Rollup can be performed via Process Chain



The screenshot shows the SAP BI configuration interface for an Aggregate Rollup. At the top, there are tabs for 'Contents', 'Performance', 'Requests', 'Rollup', 'Collapse', and 'Reconstruct'. The main title is 'Roll up of InfoCube: ZFIAR_C02(ZFIAR_C02)'. Below this are three buttons: 'Selection', 'Subsequent Proc.', and 'Process Chain Maint.'. The 'Job Name' field contains 'BI_AGGR'. The 'Rollup' section has two radio buttons: 'Request ID' (selected) with the value '34470' and a lock icon, and 'Calculated request ID'. The 'Aggregates' section has a checked checkbox for 'Compress After Rollup' and an 'Aggregates' button with a pencil icon. At the bottom, there are buttons for 'Execute', 'Stop Job', and 'Logs'.

Parameters for system to calculate requests to rollup

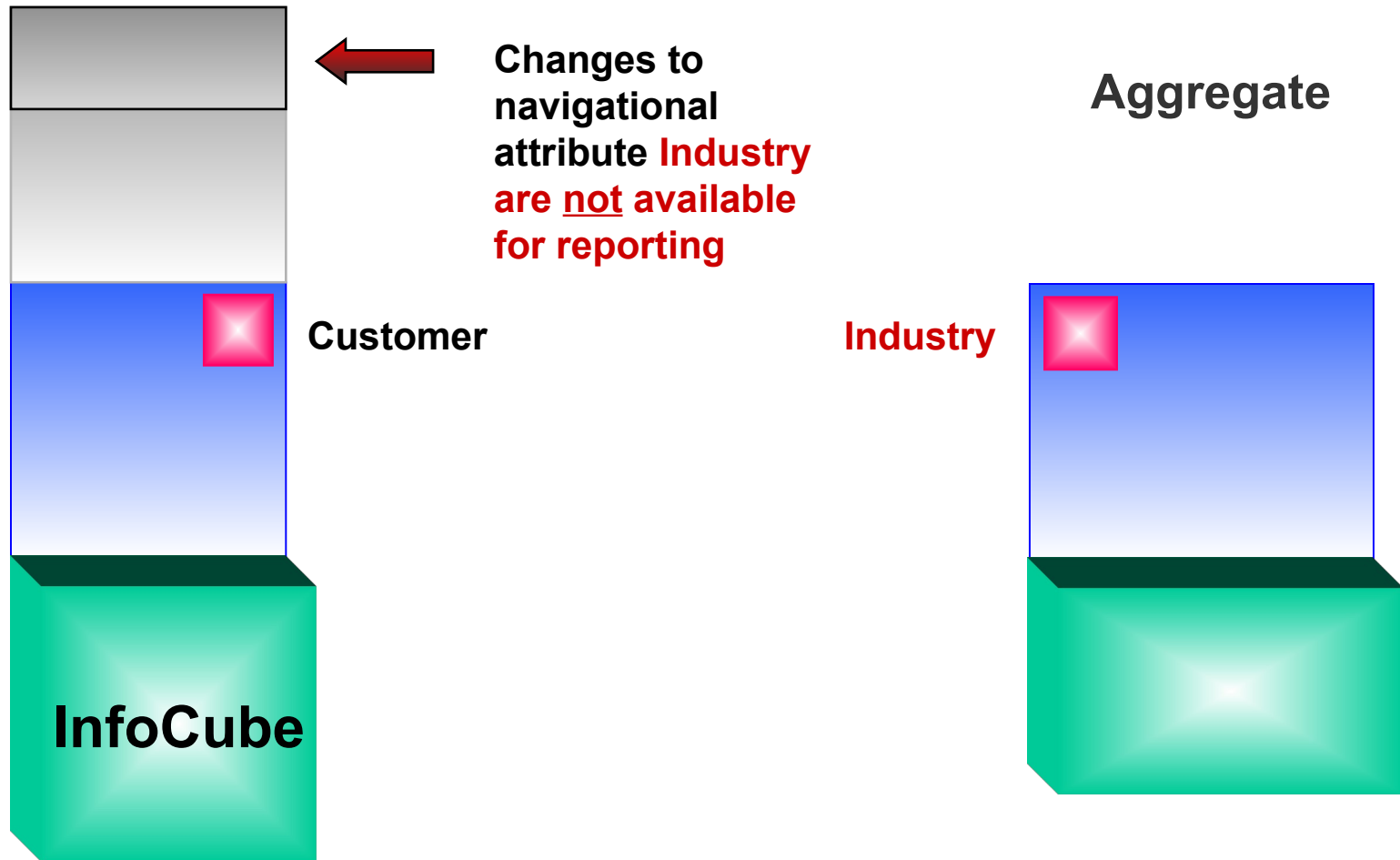
View batch job logs for aggregate rollup

View InfoCube aggregates

Compress aggregates with rollup or with IC compression?

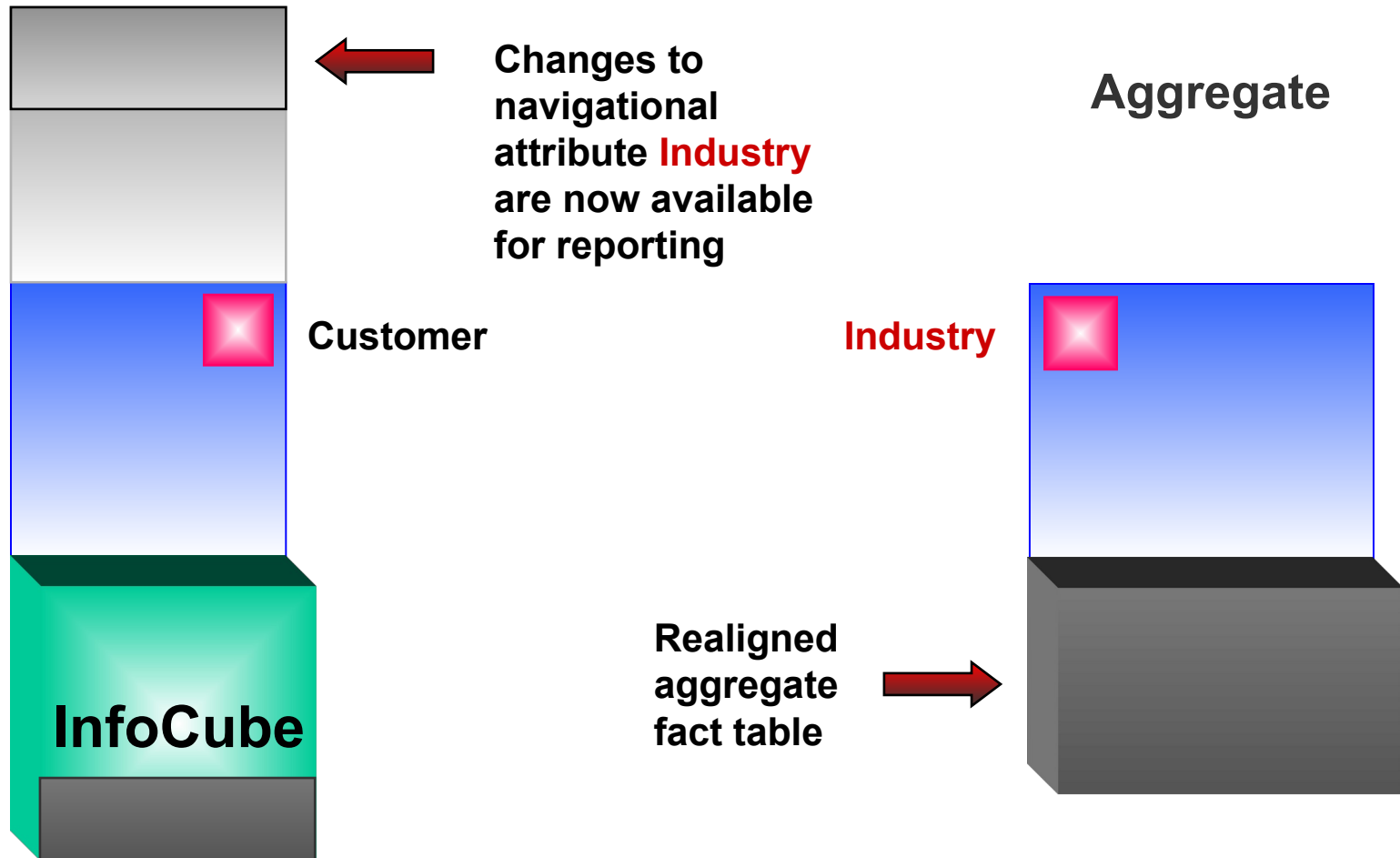
Aggregates Concepts: Change Run

Master data activation = Activating the changes of master data and hierarchies. During the change run, all aggregates containing navigational attributes and/or hierarchies are realigned.



Aggregates Concepts: Change Run

Master data activation = Activating the changes of master data and hierarchies. During the change run, **all aggregates containing navigational attributes and/or hierarchies** are realigned.

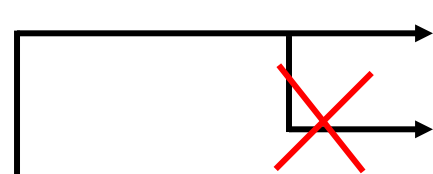


Aggregates Concepts: Change Run

Navigational Attribute for Characteristic Customer

Customer	Industry
Winsoft Inc.	Technology
Funny Duds Inc.	Consumer Products
Internetworks	Technology
Thor Industries	Chemical
New: Internetworks	Consumer Products

Changed master data **not available for reporting**



Fact Table: Sales Data

Country	Customer	Sales
USA	Winsoft Inc.	10
Germany	Internetworks	15
USA	Funny Duds Inc.	5
Austria	Internetworks	10
Austria	Thor Industries	10
Germany	Funny Duds Inc.	20
USA	Winsoft Inc.	25

Aggregate Tables: Sales Data

Country	Space
Industry	*
Industry	Sales
Technology	60
Consumer Products	25
Chemical	10

Aggregates Concepts: Change Run

Navigational Attribute for Characteristic Customer

Customer	Industry
Winsoft Inc.	Technology
Funny Duds Inc.	Consumer Products
Internetworks	Technology
Thor Industries	Chemical
New: Internetworks	Consumer Products

Changed master data now available for reporting

Fact Table: Sales Data

Country	Customer	Sales
USA	Winsoft Inc.	10
Germany	Internetworks	15
USA	Funny Duds Inc.	5
Austria	Internetworks	10
Austria	Thor Industries	10
Germany	Funny Duds Inc.	20
USA	Winsoft Inc.	25

Aggregate Tables: Sales Data

Country	Space
Industry	*
Industry	Sales
Technology	35
Consumer Products	50
Chemical	10

Aggregates Concepts: Change Run and Consistency

Situation **before** master data activation:

Navigational Attribute for Characteristic Customer

Customer	Industry	Object version
Winsoft Inc.	Technology	Active
Funny Duds Inc.	Consumer Products	Active
Internetworks	Technology	Active
Thor Industries	Chemical	Active
New: Internetworks	Consumer Products	Modified

Old:

New: Internetworks

Changed master data, **not** available for reporting

Master data activation, including change run, of affected aggregates

Situation **after** master data activation:

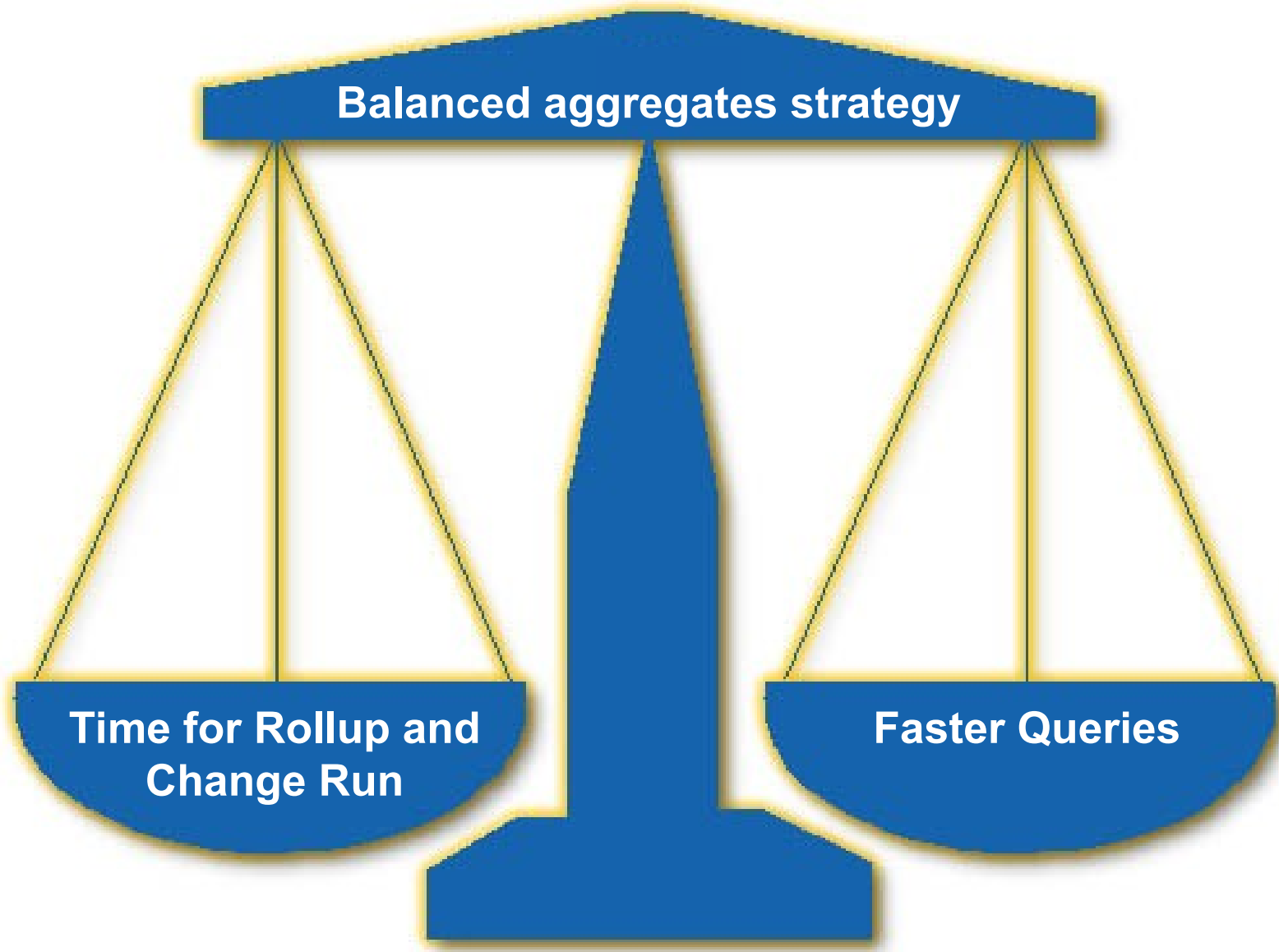
Navigational Attribute for Characteristic Customer

Customer	Industry	Object version
Winsoft Inc.	Technology	Active
Funny Duds Inc.	Consumer Products	Active
Thor Industries	Chemical	Active
New: Internetworks	Consumer Products	Active

New: Internetworks

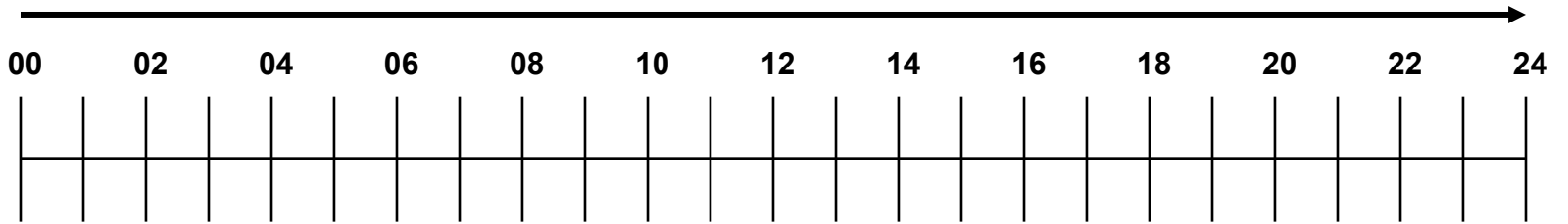
Changed master data, now available for reporting

Why Can Too Many Aggregates Be Harmful?



Time Frame

Period of time



**Aggregate
maintenance
UploadReportin
g
ce**

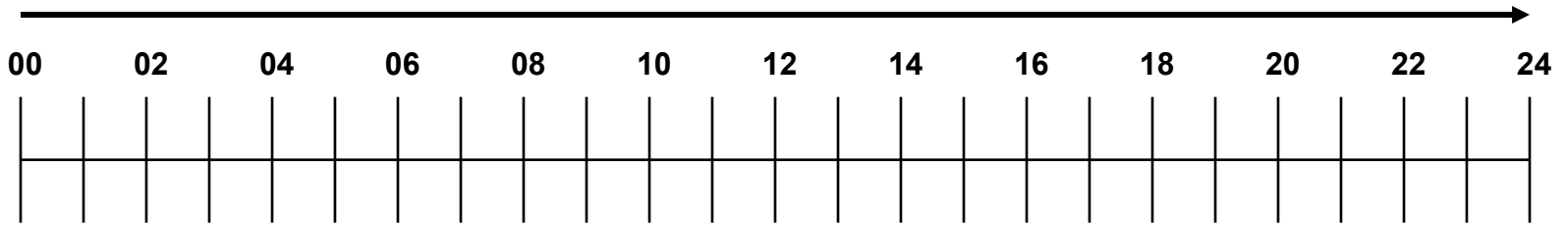
**7 hours available
for aggregate
maintenance**

**14 hours online reporting;
current data in aggregates needed**

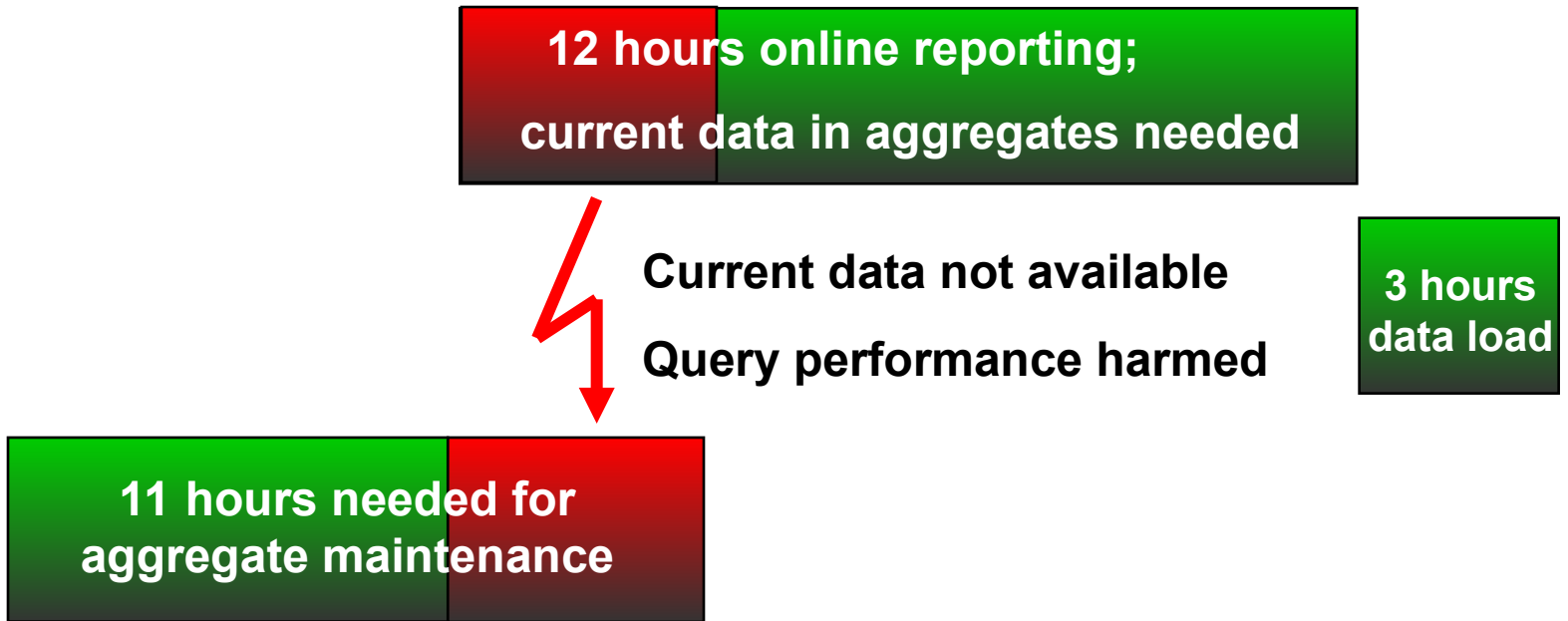
**3 hours
data load**

Time Frame: Problem

Period of time



**Aggregate
maintenance
UploadReportin
ce**



Aggregates: Tuning Tips

Tips for Maintaining Good Aggregates:

- Relatively small compared to parent InfoCube
- Try for summarization ratios of 10 or higher
- Find good subsets of data (frequently accessed)
- Build on some hierarchy levels, not all
- Not too specific, not too general – should serve many different query navigations
- Consider “component” aggregates
- Should be frequently used and used recently (except basis aggregates)

Characteristics of Bad Aggregates:

- Too many very similar aggregates
- Aggregates not small enough (compared to parent cube)
- Too many “for a certain query” aggregates, not enough general ones
- Old aggregates, not used recently
- Infrequently or unused aggregates

Aggregates: New Features

Time-dependent aggregates

Compression & Data Request

Filling Aggregates: Block Size

Flat Aggregates

MOLAP Aggregates

Aggregates with Time-Dependent Components

Aggregates with a time-dependent component (navigational attribute or hierarchy) are calculated for a specific Keydate

A Keydate can be specified in the query definition.

The Keydate can be determined by:

- a BEx variable which is filled via a SAP- or User- Exit.
- a fixed date.

When the aggregate is filled, data is stored in a manner representative of the state of the data as of the specified Keydate

Using Time-dependent Aggregates in Queries



If time-dependent components are used in a query, it can only use aggregates with the same Keydate.

Important for the use of aggregates is not the variable, but the processed Keydate: only data for this Keydate is available in the aggregate.

Adjustment of Time-dependent Aggregates

Since the Keydates the users are interested in change, the time-dependent aggregates need to be updated regularly.

Process “*Adjustment of Time-Dependent Aggregates*” adjusts data of all aggregates with variables for the Keydate to the changes of the Keydate.

This process is only available in the process chains.

Only aggregates are recalculated if their Keydate has changed.

This adjustment can take a long time and use many system resources.



Time-Dependency: Example Using Master Data

Master Data Table: Country

Country	Valid from	Valid to	Sales Person
Austria	1/1/2000	12/31/2000	Huber
Austria	1/1/2001	12/31/2001	Meyer
Germany	1/1/2000	03/31/2001	Meyer
Germany	4/1/2000	12/31/2001	Huber
USA	1/1/2000	12/31/2001	Smith

Fact Table: Sales Data

Country	Customer	Revenue
USA	Buggy Soft Inc.	10
Germany	Ocean Networks	15
USA	Funny Duds Inc.	5
Austria	Ocean Networks	10
Austria	Thor Industries	10
Germany	Funny Duds Inc.	20
USA	Buggy Soft Inc.	25

Aggregate Tables: Sales Data

Sales Person	*
Key date	9/1/2001

Sales Person	Revenue
Huber	35
Meyer	20
Smith	40

Aggregates – Maintenance with Key date

The screenshot shows the SAP 'Maintenance for aggregate' window. The main table lists various aggregates with their technical names and key dates. Three blue callout bubbles highlight specific features:

- Var Keydate:** Points to the 'Variable for MODAT' property of the 'timedependent' aggregate.
- Processed for 8/16/2001:** Points to the 'Key Date' of the 'FABCUBE51' aggregate, which is '16.08.2001'.
- Not time-Dependent:** Points to the 'Key Date' of the 'Region' aggregate, which is '00.00.0000'.

Aggregates	Technical ...	S.	P.	S.	Fixed ...	V
Shipto Hierarchy	100023					--
timedependent	100013			●		
Properties						
Variable for MODAT						
Key Date	16.08.2001					
FABCUBE51	PM031					
Order number	00COORDER					
Ship to Cust	FABSHPTO					
FABCUBE52	PM032					
Additional	PM033					
FABCUBE5T	PM03T					
MAX	100015			● ●		
Region	100016			● ●		
Properties						
Variable for k						
Key Date	00.00.0000					
FABCUBE52	PM032					
FABCUBE5T	PM03T					

Aggregates: BW 3.0 New Features

Time-dependent aggregates

Compression & Data Request

Filling Aggregates: Block Size

Flat Aggregates

MOLAP Aggregates

Aggregates – Automatic Compression vs. Delayed

InfoCubes can be marked such that the request is kept in its aggregates.
(Administrator Workbench; Tabstrip 'Rollup')

Requests which are not compressed can then be deleted out of the InfoCube and its aggregates, without completely rebuilding the aggregates.

New

Aggregates of marked InfoCubes are compressed together with the InfoCube.

This feature should only be used for InfoCubes for which deletion of rolled up requests is necessary -> Performance penalty when aggregates are not compressed.

SAP

BUSINESS INFORMATION WAREHOUSE



Version 2.0
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SAP

THE BEST-RUN BUSINESSES RUN SAP

"Two Fact Table" Concept

E fact table

- ... contains consolidated data
- ... is optimized for reading
- ... might be huge
- ... is partitioned by the user
- ... cannot be partitioned once InfoCube contains data!

F fact table

- ... contains data on request level
- ... is optimized for writing / deleting
- ... should be small
- ... is partitioned by the system

Aggregates: New Features

Time-dependent aggregates

Compression & Data Request

Filling Aggregates: Block Size

Flat Aggregates

MOLAP Aggregates

Aggregates – Block Size

**Data of large InfoCubes is read in several blocks to prevent resource problems when filling an aggregate.
(Transaction SPRO)**

New

Potential problems are, for example, temporary tablespace, memory.

Blocks are distinguished by characteristic values.

The block size can be customized (system-wide).

The best block size depends on the sizing of your system

Aggregates: New Features

Time-dependent aggregates

Compression & Data Request

Filling Aggregates: Block Size

Flat Aggregates

MOLAP Aggregates

Flat Aggregates











If an aggregate has less than 15 components, each component is put into a separate dimension (“Flat Aggregates”).

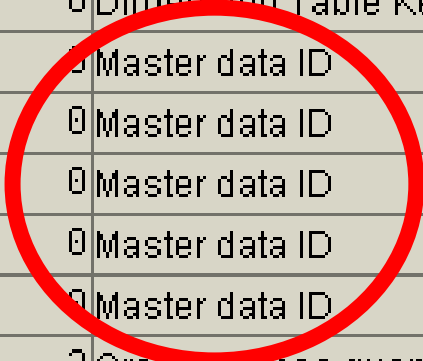
The dimensions (except the package and unit) are marked as “Line Item”.

“Flat Aggregates” are filled / rolled up without loading the data into the application server (performance gain).

Line item / high cardinality dimensions already specified in the InfoCube are also used for aggregates for corresponding dimensions (also for non-flat aggregates).

Flat Aggregates

Transp. table	/BIC/F100061	Active					
Short text	KWFAB5						
<div style="display: flex; justify-content: space-between;"> Attributes Delivery and Maintenance Fields Entry help/check Currency/Quantity Field </div>							
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="display: flex; gap: 5px;">      </div> <div style="display: flex; gap: 5px;">     </div> <div style="display: flex; gap: 5px;">  Srch help </div> <div style="border: 1px solid gray; padding: 2px;"> Built-in type </div> </div>							
Field	Key	Initi...	Data element	DTyp	Length	Dec.p...	Short text
KEY 100061P	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSDIMID	INT4	10	0	Dimension Table Key
KEY 100061T	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY KWFAB5U	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSDIMID	INT4	10	0	Dimension Table Key
KEY 1000611	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000612	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000613	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000614	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000615	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
CRMEM_QTY	<input type="checkbox"/>	<input type="checkbox"/>	/BIO/OICRMEM_QTY	QUAN	17	3	Credit memos quantity



Data Load Performance Concepts

Reporting Performance Analysis Tools

Reporting Performance Analysis Techniques

Aggregates

Reporting Performance Tuning Concepts

Reporting **Performance Tuning Concepts**



MultiProvider



Partitioning



Data Modeling and Line Item Dimension



Web Reporting



OLAP Query Cache



MultiProvider

Partitioning

Data Modeling and Line Item Dimension

Web Reporting

OLAP Query Cache

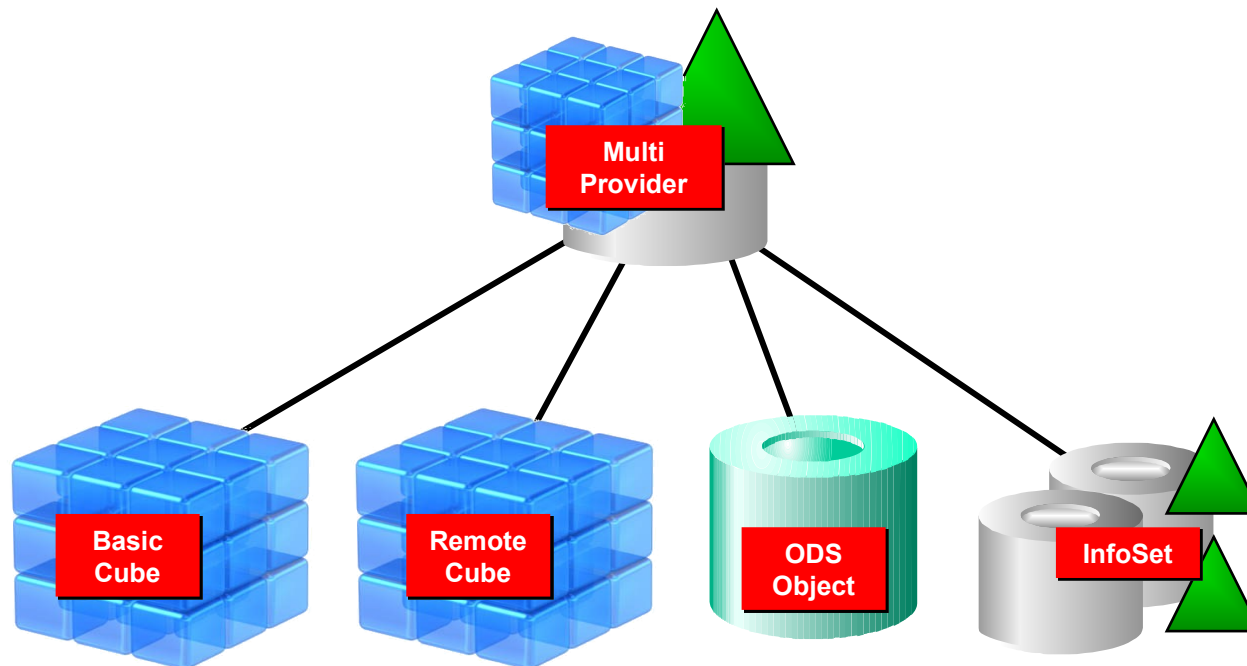
Performance Tuning Concepts: MultiProvider

Combination of all types of InfoProviders

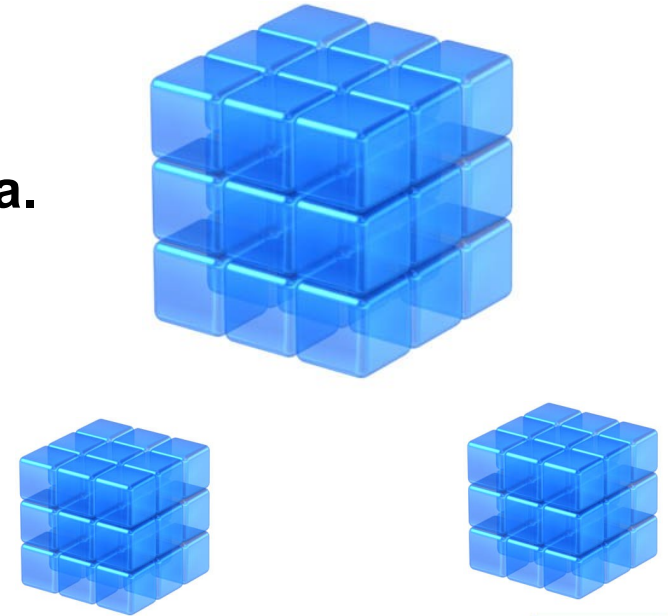
No additional data storage

Queries are split automatically and distributed to InfoProviders

Transparent usage for reporting

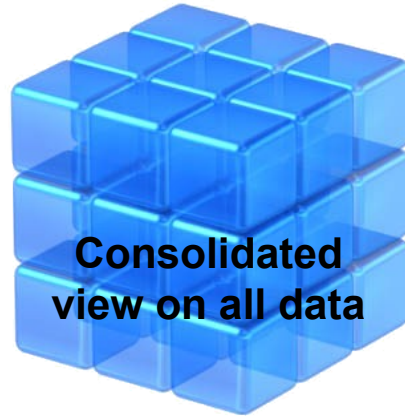


- An InfoCube represents a reporting scenario.
- Reporting scenarios might comprise sub-scenarios.
- Example (1): plan and actual data.
- Example (2): order, delivery, billing data.



Logical Partitioning via Data Marts

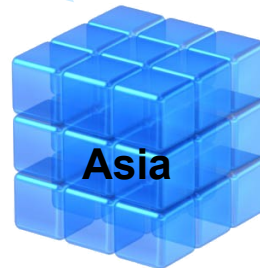
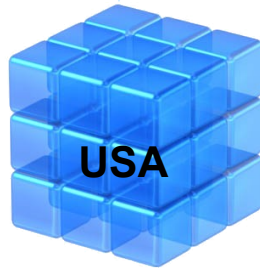
MultiProvider



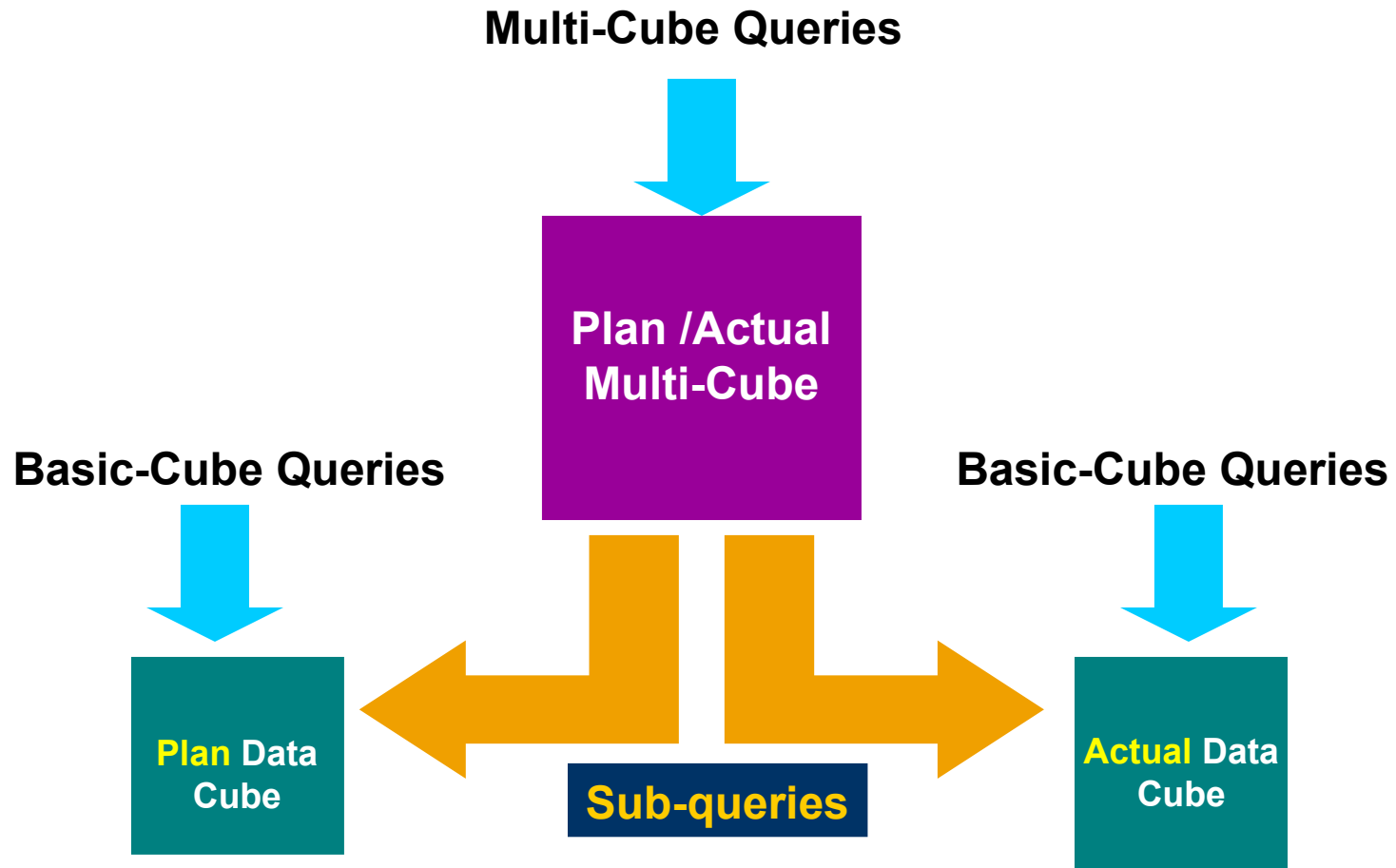
Parallel SELECT Statements

The Power of Parallel Processing!

InfoCubes

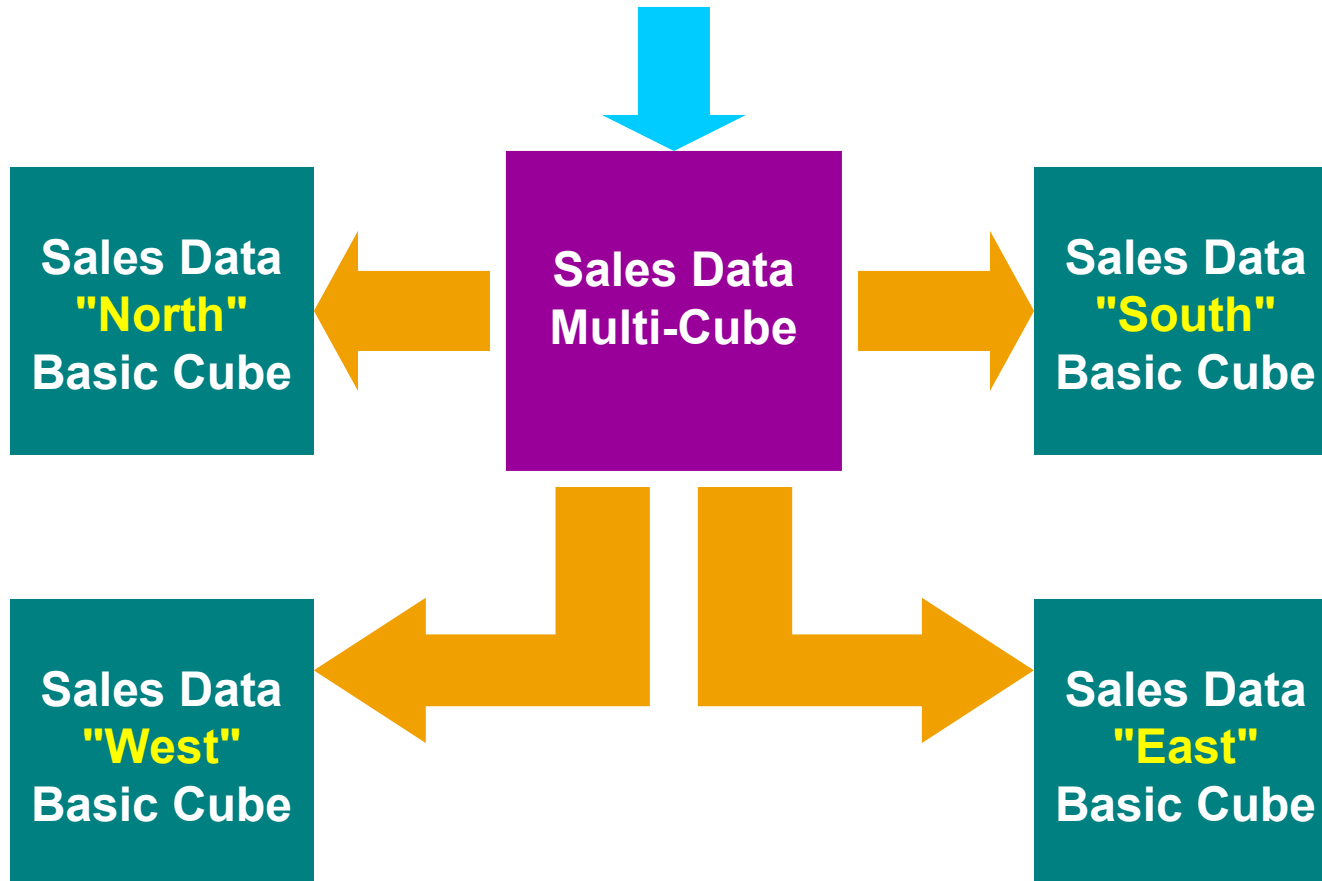


Multi-Cube Example



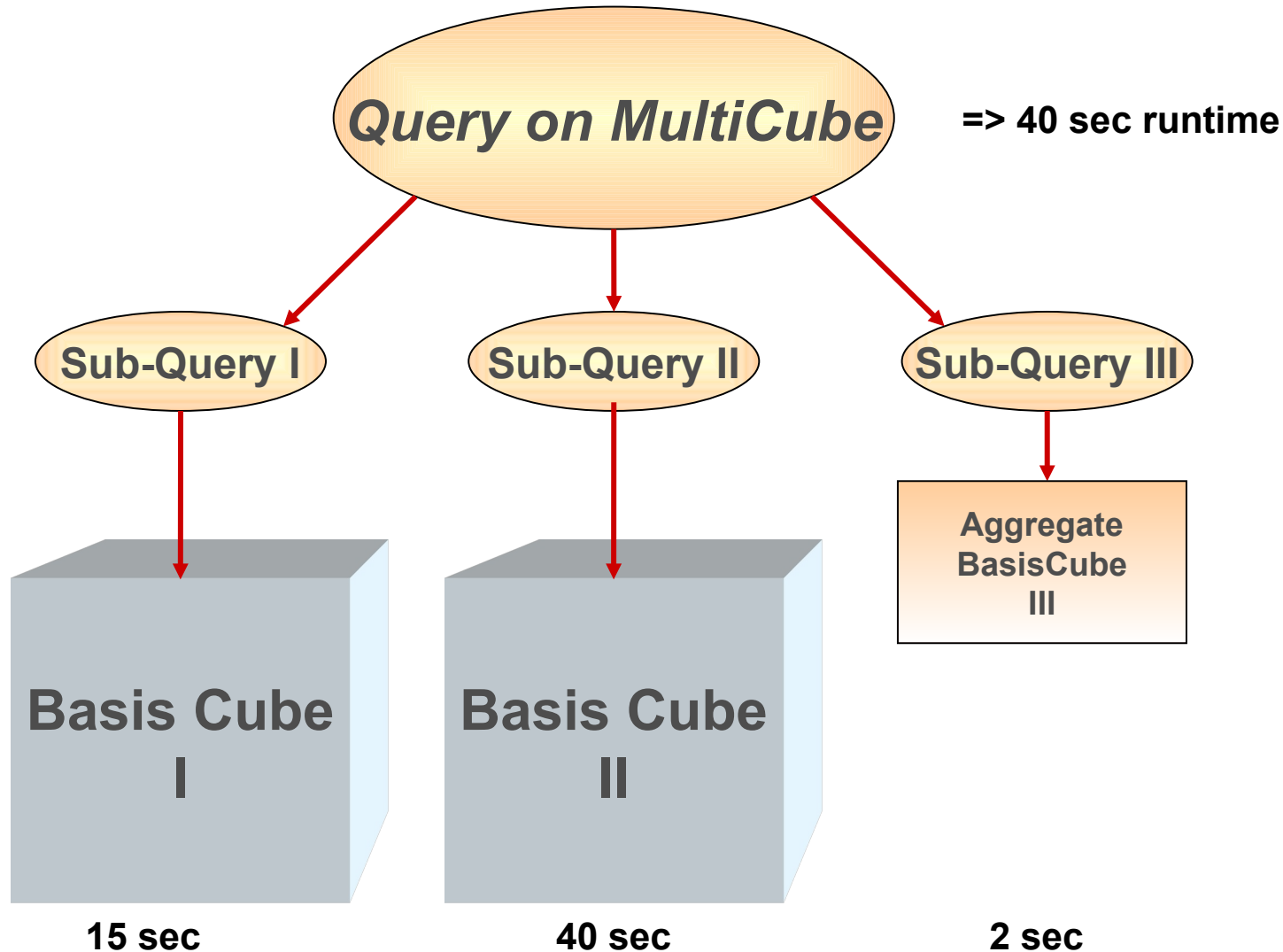
Multi-Cube Example

MultiCube Queries



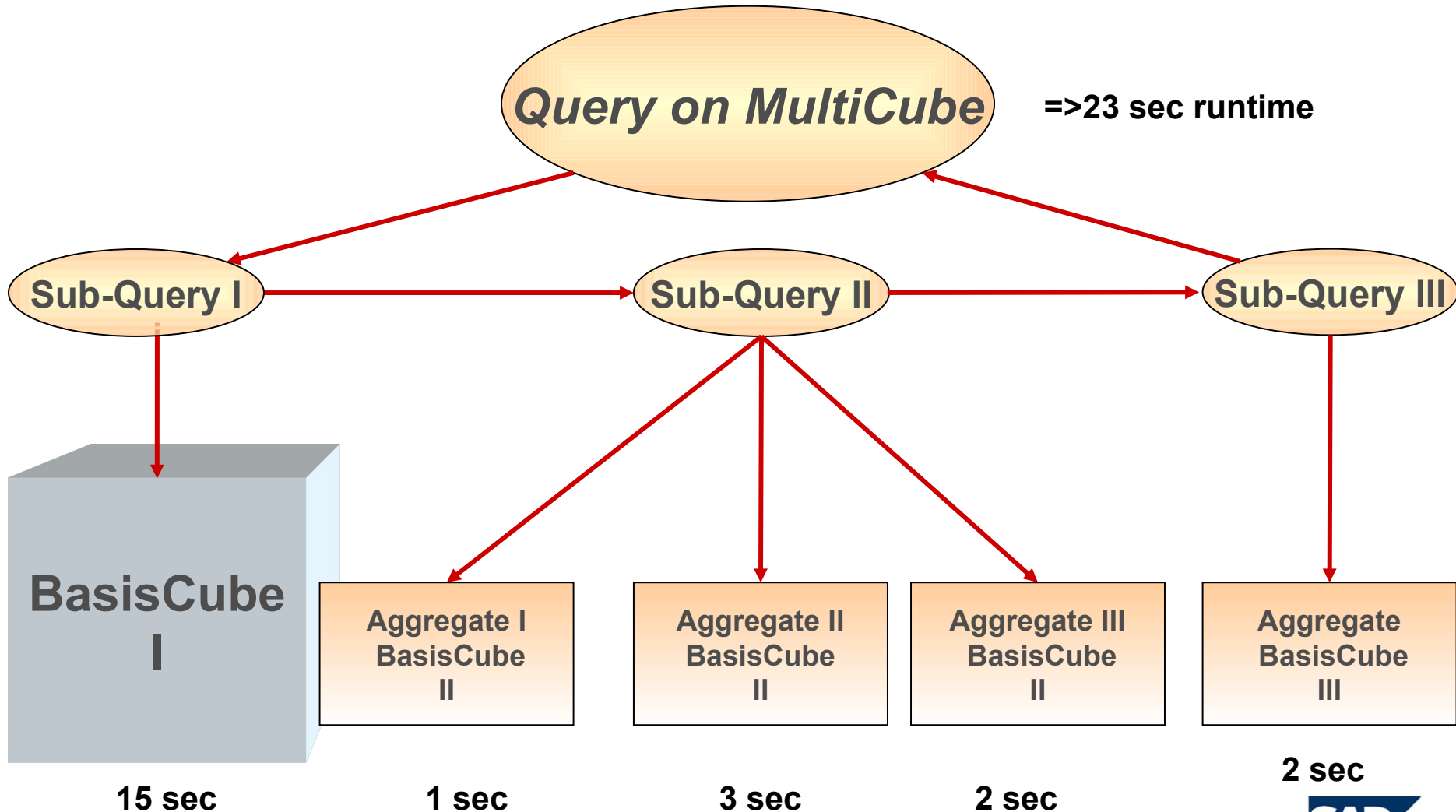
Query on MultiCubes - PARALLEL

Queries on MultiCubes are split up over the different Basis Cubes with parallel access to the InfoCube or maximal one aggregate per Cube



Query on MultiCubes - NOPARALLEL

NOPARALLEL execution is automatic via the data manager in BW 3.0



Reporting

- ◆ Local queries (on each InfoProvider)
- ◆ Global queries (parallel execution)

Data load

- ◆ Independent (parallel) into individual InfoProviders
- ◆ Small total data volumes (less redundancy)

Database tables / views

- ◆ Smaller
- ◆ Less complex
- ◆ Less sparsely filled



Performance Tuning Concepts

MultiProvider

 Partitioning

Data Modeling and Line Item Dimension

Web Reporting

OLAP Query Cache

Platforms with Table Partitioning

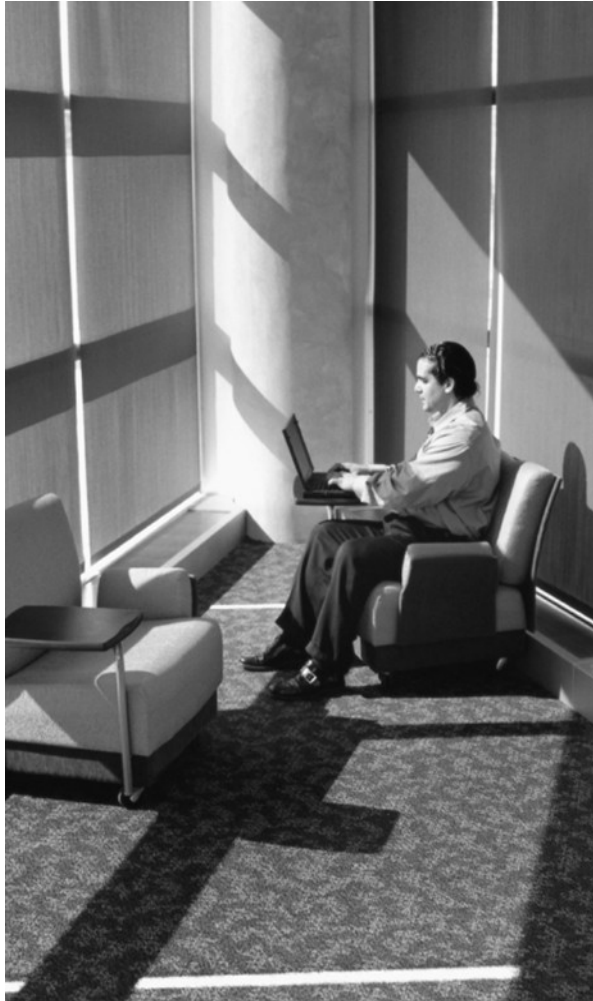
- **IBM DB2/UDB***
- **IBM DB2/390**
- **Informix**
- **Oracle**

* hash partitioning

Platforms without Table Partitioning

- **IBM DB2/400**
- **Microsoft SQL Server**
- **SAP DB**

InfoCube Structure: Two Fact Table Concept



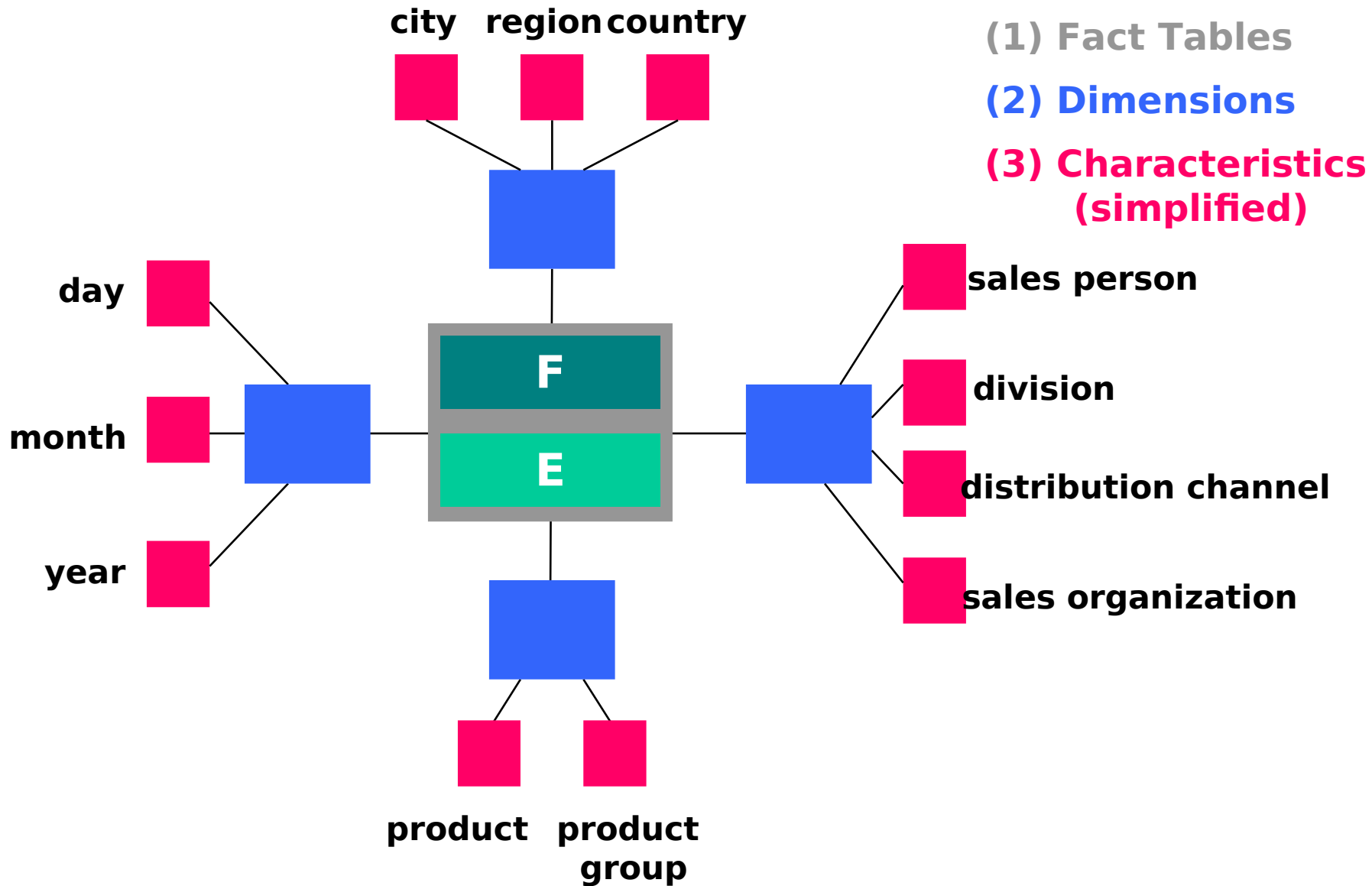
E fact table

- ... contains consolidated data
- ... is optimized for reading
- ... might be huge
- ... is partitioned by the user
- ... cannot be partitioned once InfoCube contains data!

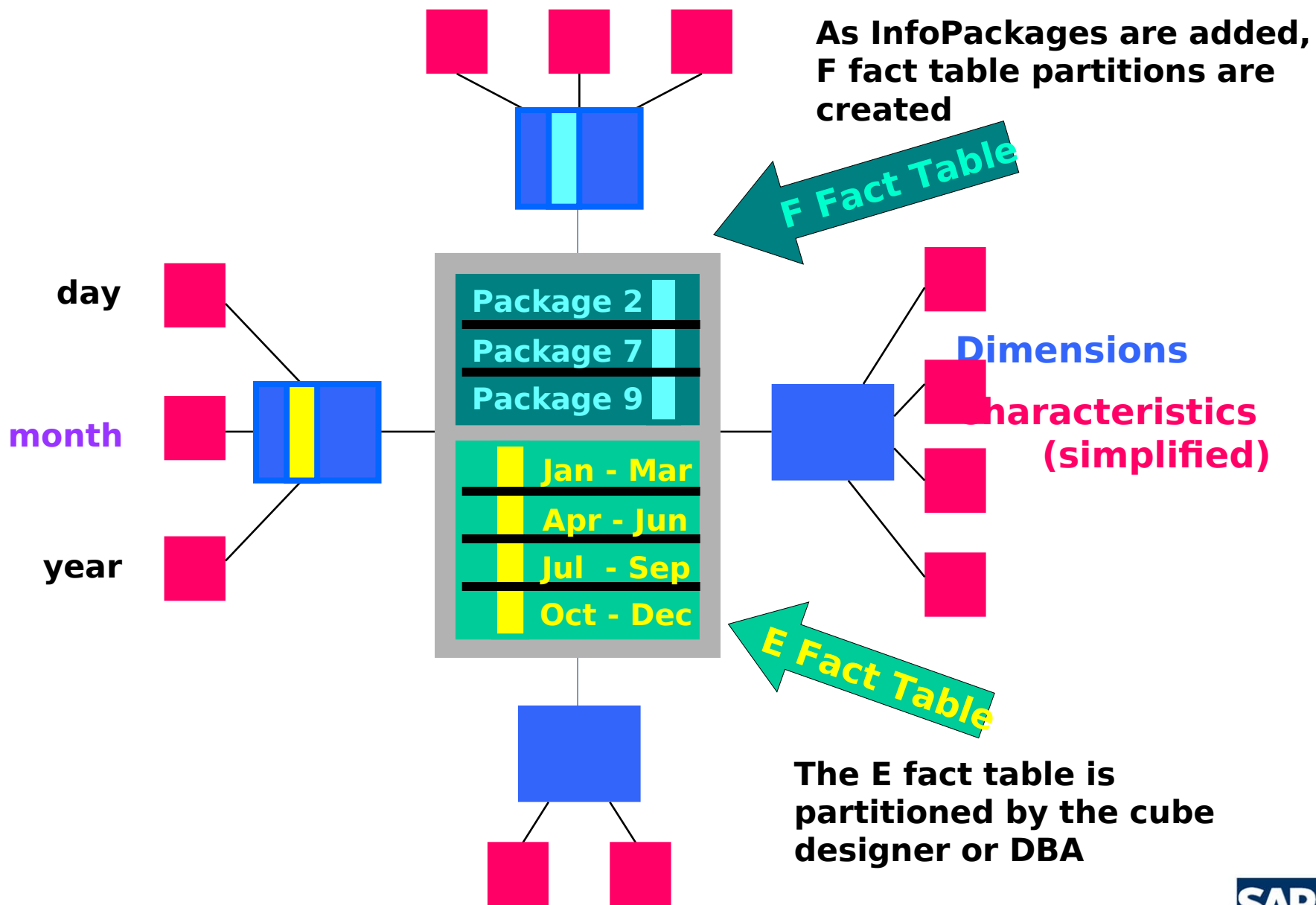
F fact table

- ... contains data on request level
- ... is optimized for writing / deleting
- ... should be small
- ... is partitioned by the system

InfoCube Range Partitioning: Example

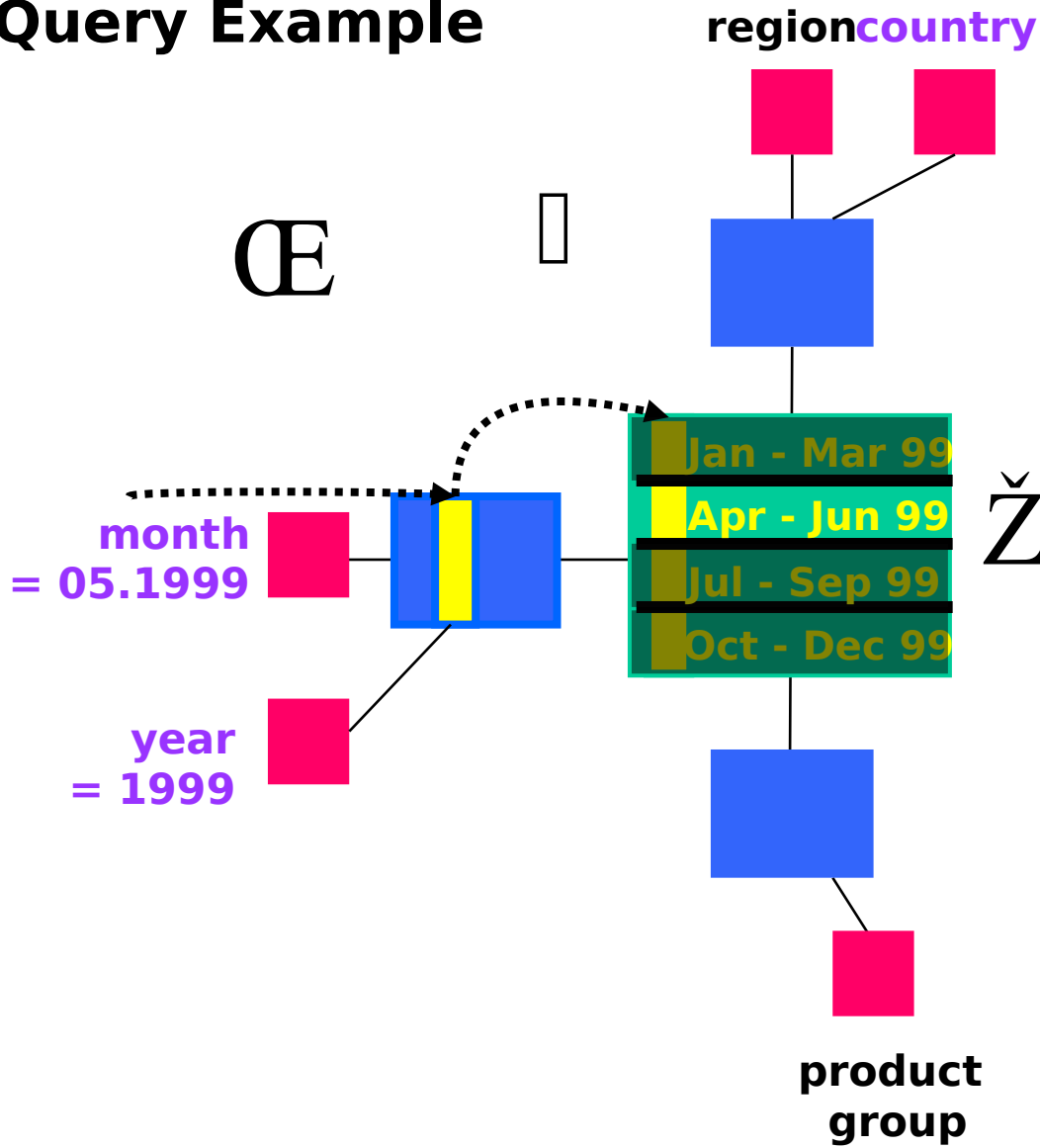


InfoCube Partitioning example: Two fact tables



E Table Partitioning: Read a smaller dataset

Query Example



- (1) E Fact Table
- (2) Dimensions
- (3) Characteristics (simplified)

⊕ apply restriction to dimension

□ apply restriction to fact table

Ž discard irrelevant partitions

User Interface: E Table Partitioning

The screenshot shows the SAP BW Performance Center 'Edit InfoCube' interface. The menu is open, and 'Partitioning' is highlighted. The background shows the 'Structure' and 'Template' tables for InfoCube 0COPA_C02.

Menu Items:

- IC-specific properties of InfoObjects
- Unlock InfoObjects
- Inactive InfoObjects
- M**ultiCube
- Maintain non-cumulative values
- Maintain DB-storage parameters
- P**artitioning
- Logs
- InfoCube status
- Write transport request Ctrl+Shift+F11
- Oobject directory entry

Structure Table:

Field	Description
Characteri...	Long description
0CURTYPE	Currency type
0VALUATION	Valuation view
0VTYPE	Value type for reporting
0VERSION	Version
0REC_TYPE	Transaction/event type
0CO_AREA	Controlling area
0CUSTOMER	Customer number
0BPARTNER	Business Partner

Template Table:

Field	Description	Status
Characteri...	Long description	
/SAPAPO/T...	löjkö	Green triangle
0ABC	Business process number	Green triangle
0ABCINDIC	ABC indicator for technical ...	Green triangle
0ABCKEY	ABC indicator	Green triangle
0ABCPROC..	Business process number	Green triangle
0ACCNT_A...	Account assignment group ...	Green triangle
0ACCNT_G...	Customer account group	Green triangle
0ACCOUNT	Account number	Green triangle

User Interface: E Table Partitioning: Slide 2

The main dialog box, titled "Determine Partitioning Condition", contains a table with the following data:

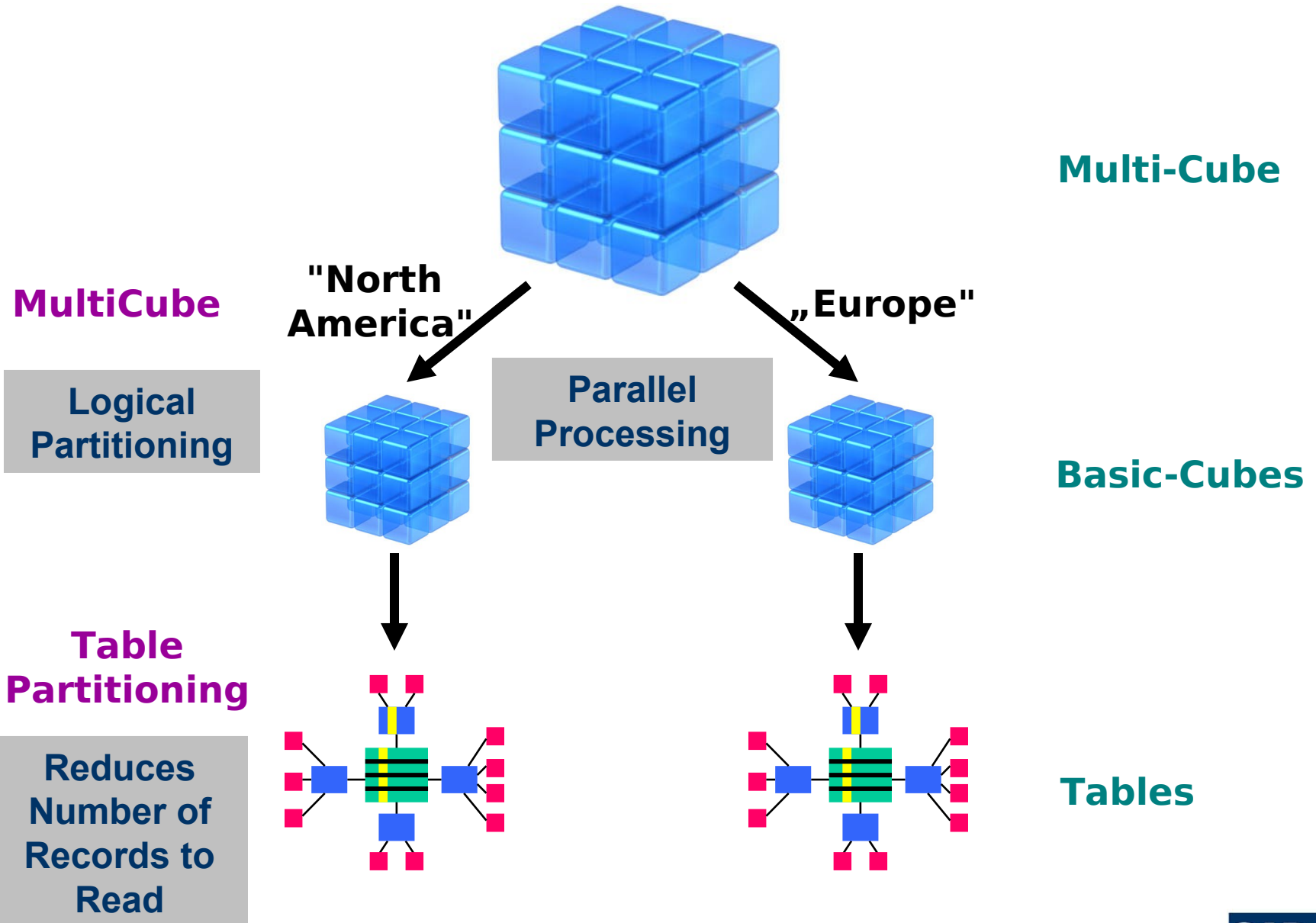
Time characteristic	Long description	Choose
0CALDAY	Calendar day	<input type="radio"/>
0CALMONTH	Calendar Year/Month	<input checked="" type="radio"/>
0CALWEEK	Calendar Year / Week	<input type="radio"/>
0FISCPER	Fiscal year / period	<input type="radio"/>
0FISCVARNT	Fiscal year variant	<input type="radio"/>

The sub-dialog box, titled "Value Area (Partitioning Condition)", is open and shows the following details:

- Calender year/month: From 01/1998 To 12/2002
- Options: Max. no. partitions (input field)

Both dialog boxes feature a toolbar with a checkmark, a question mark icon, and an "Explanations" label. The main dialog also includes a trash icon and a close button. A black arrow points from the "Max. no. partitions" field in the sub-dialog to the "Explanations" label in the main dialog's toolbar.

Partitioning/ MultiCube Example: A combination



Performance Tuning Concepts

MultiProvider

Partitioning

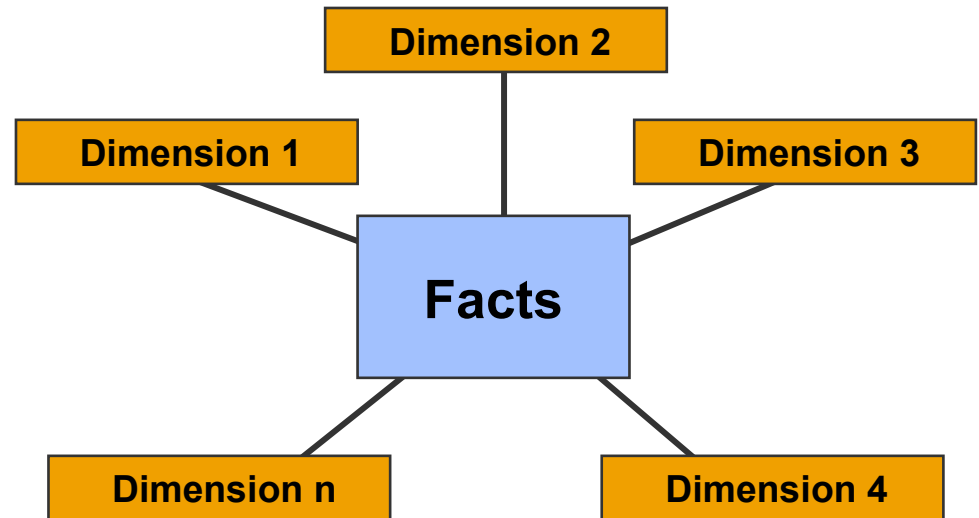
 Data Modeling and Line Item Dimension

Web Reporting

OLAP Query Cache

SAP BW InfoCube Data Model

- An InfoCube is designed, or “modeled” to meet a set of business reporting requirements.
- Modeling is the process by which reporting requirements are structured into an object with the facts and characteristics that will meet the reporting needs.
- Characteristics are structured together in related branches called “Dimensions” .
- The key figures form the “Facts”.
- The configuration of dimension tables in relation to the fact table results in what is known as the “star schema”




Characteristics of Dimensions

- Dimensions are groupings of related characteristic attributes.
- The keys of the dimension tables are foreign keys in the fact table. The key is a “DIMID” used to map related values.
- A dimension table contains a primary key (DIMID), characteristic values , and SID values to link to master data tables.


Customer dimension

C	Customer #	Region	...
	13970522	West	...

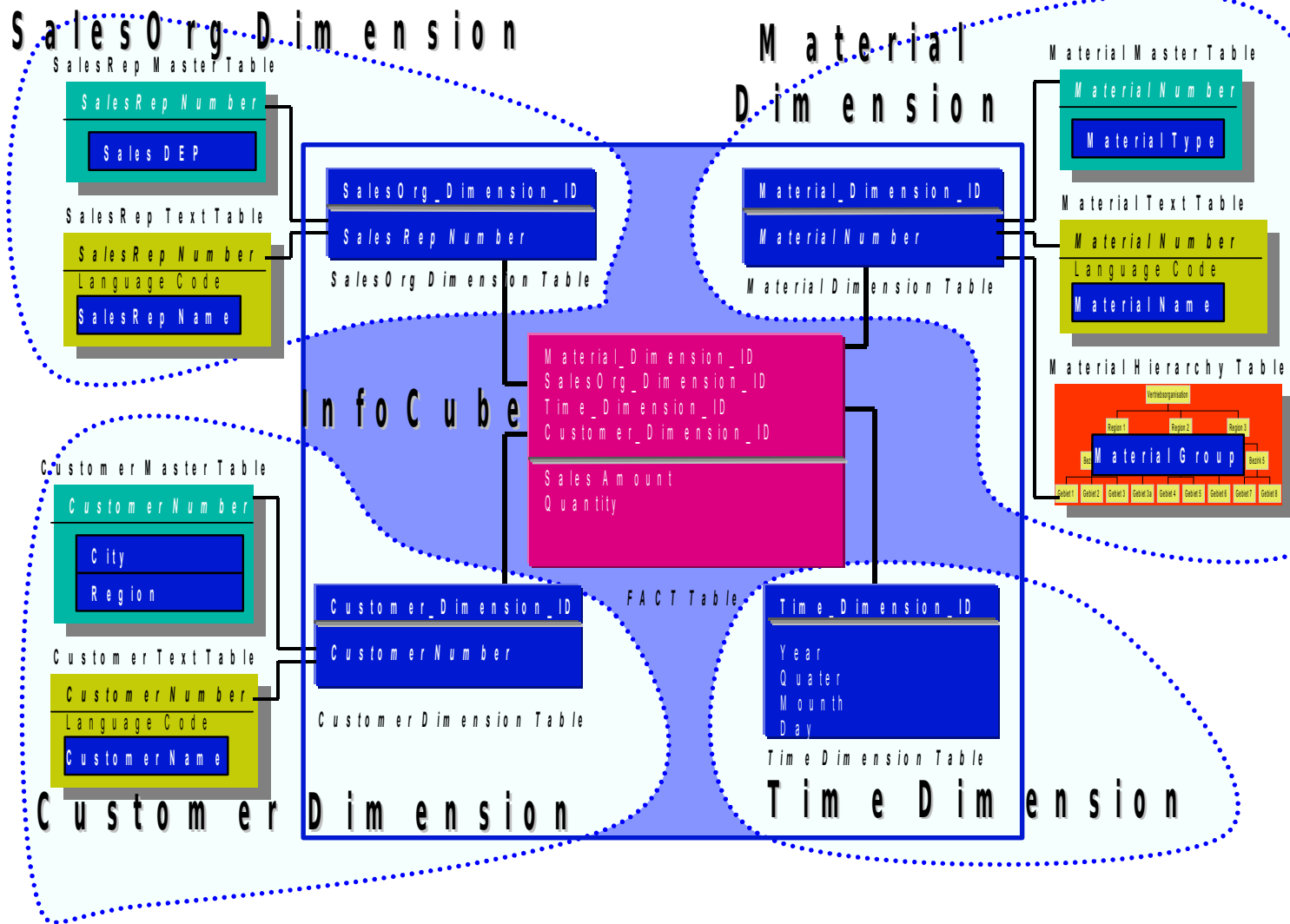
Product Service Line dimension

P	Product #	Product group	...
	2101004	Displays	...

Time dimension

T	Period	Fiscal year	...
	10	1997	...

Example: Multidimensional Schema in BW



Query Execution Example: Table Joins

Fact Table

Table : /BIC/FIUSALES

Displayed fields: 8 of 8 Fixed columns:

List width 0250

	KEY_IUSALES	KEY_IUSALES	KEY_IUSALES	KEY_IUSALES	KEY_IUSALES	/BIC/IUPROFIT	/BIC/IUQUAN
<input type="checkbox"/>	5	731	0	29	62	982-	820
<input type="checkbox"/>	5	732	0	30	63	1.051	140
<input type="checkbox"/>	5	732	0	31	66	3.389	390
<input type="checkbox"/>	5	732	0	41	79	31-	140
<input type="checkbox"/>	5	732	0	46	70	2.144-	540

Dimension 1

Table : /BIC/DIUSALES1

Displayed fields: 4 of 4 Fixed columns:

	DIMID	SID_IUCITY	SID_IUCOUNTRY	SID_IUREGION
<input type="checkbox"/>	0	0	0	0
<input type="checkbox"/>	29	2	2	2
<input type="checkbox"/>	30	3	3	3
<input type="checkbox"/>	31	4	4	4
<input type="checkbox"/>	32	5	5	5

Table : /BIC/SIUIPOP

Displayed fields: 5 of 5 Fixed columns:

	/BIC/IUPOP	SID	CHCKFL	DATAFL	INCFL
<input type="checkbox"/>	000000000	0	X	X	X
<input type="checkbox"/>	000500000	500.000		X	X
<input type="checkbox"/>	000600000	600.000		X	X
<input type="checkbox"/>	000800000	800.000		X	X
<input type="checkbox"/>	001000000	1.000.000		X	X

S (Population)

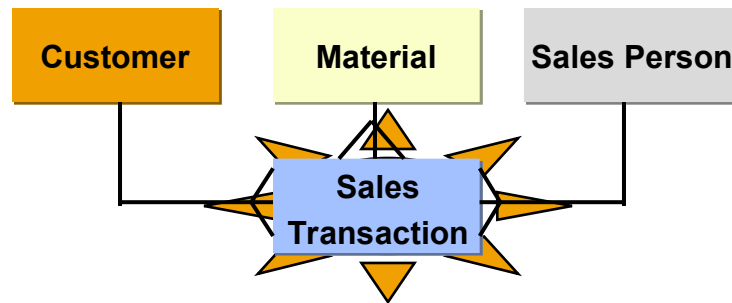
Table : /BIC/XIUCITY

Displayed fields: 5 of 5 Fixed columns:

X (City)

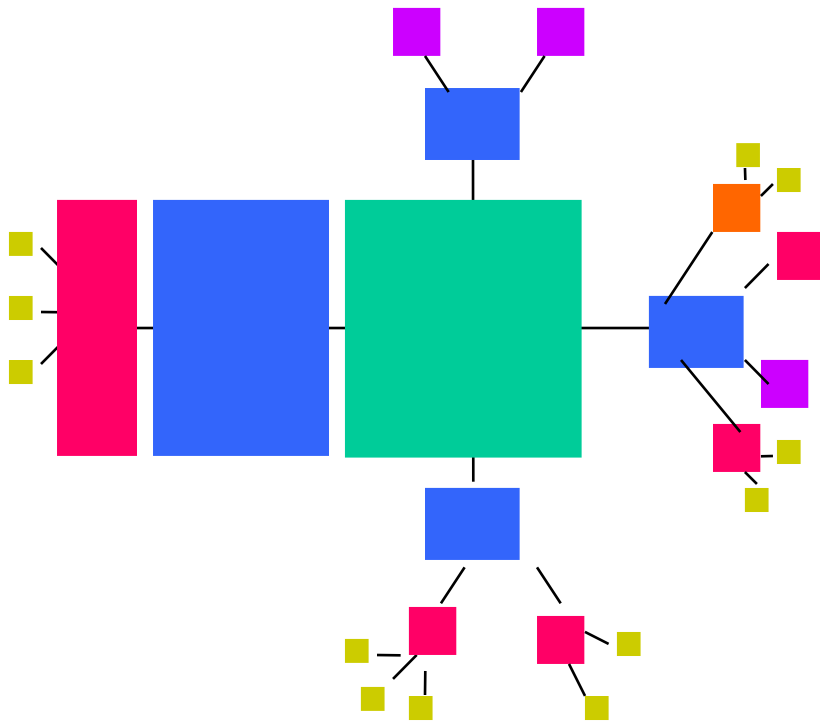
	SID	OBJVERS	/BIC/IUCITY	CHANGED	S_IUPOP
<input type="checkbox"/>	0	A			0
<input type="checkbox"/>	2	A	LYON		2.000.000
<input type="checkbox"/>	4	A	MONTREAL		2.000.000
<input type="checkbox"/>	3	A	NEWCASTLE		600.000
<input type="checkbox"/>	5	A	SAN DIEGO		2.150.000
<input type="checkbox"/>	1	A	WALLDORF		0

Line Item Dimensions



- **Line-item or *degenerate* dimensions arise in nearly every case where the granularity of the fact table represents an actual working document like an order number, invoice number, sequence number, etc.**
- **Why are line-item dimensions a concern?**
 - **DIMID column values are often high cardinality (slow read times if bitmap index is used)**
 - **Join of large dimension table with large fact table is a big overhead for reporting response times.**

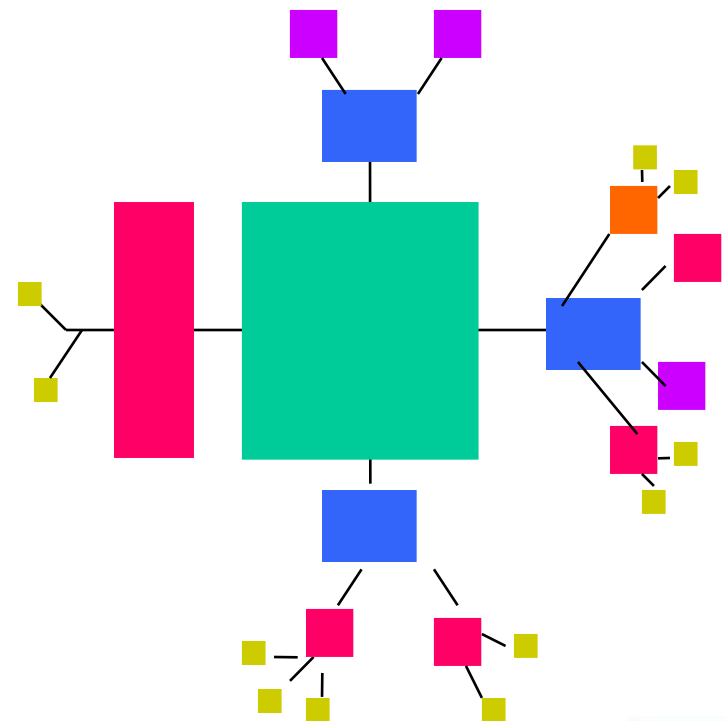
Line-Item Dimension: The Star Schema



Without line-item dimension designated

- (1) Fact Table
- (2) Dimension
- (3) time-independent-SID
time-dependent-SID
traditional SID Char
- (4) SID Attr

With line-item dimension













Fact table with line item dimension

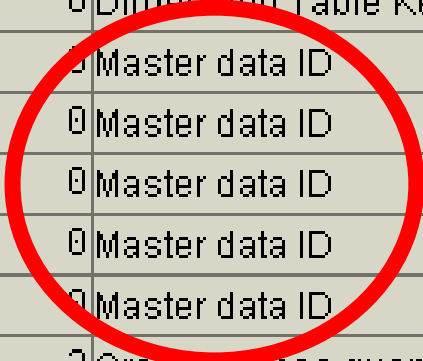
Transp. table: /BIC/F100061 Active

Short text: KWFAB5

Attributes | Delivery and Maintenance | Fields | Entry help/check | Currency/Quantity Field











 Srch help Built-in type

Field	Key	Initi...	Data element	DTyp	Length	Dec.p...	Short text
KEY 100061P	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSDIMID	INT4	10	0	Dimension Table Key
KEY 100061T	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY KWFAB5U	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSDIMID	INT4	10	0	Dimension Table Key
KEY 1000611	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000612	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000613	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000614	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
KEY 1000615	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RSSID	INT4	10	0	Master data ID
CRMEM QTY	<input type="checkbox"/>	<input type="checkbox"/>	/BIO/OICRMEM QTY	QUAN	17	3	Credit memos quantity



Performance Tuning Concepts

MultiProvider

Partitioning

Data Modeling and Line Item Dimension

Web Reporting

OLAP Query Cache

Different types of users in OLAP reporting

Stand-Alone Query Designer*

~2%

Power User

~8%

~20%

Analyst

~70%

Information Consumer

high

Analytical ability required

low

~98% Potential web reporting users

- Report creation
- Ad-hoc reporting
- Multi-dimensional analysis
- Self-explanatory, predefined navigational paths
- Predefined data collections
- Static reports

*Only needed for Global Report Creation

Performance: Web Reporting VS. BEX Analyzer

Query activity using the Business Explorer Analyzer requires many more “round trips” for data packets than the Browser

- Communication between the GUI and BW
- Multiple round trips reduces efficiency of data transfer
- Some communication needed for screen controls, MS-interface, etc.

Browser-based web reporting, using http, represents a significant gain in query response time!

- The number of round trips is significantly less than the BEx analyzer!
- HTML compression, MIME compression, MIME caching all possible with Web Reporting only



Data Compression and MIME Compression

Data Compression is a benefit to web reporting performance.

- Data volume is reduced, consuming less bandwidth, enabling faster throughput

SAP BW development recommends enabling compression for the ICF services used by BW: BEX Service, MIME Service, others.

Implement the latest BW 3.0B support packages: SP 6 and SP 7 contain important performance improvements

MIME (images – company logo, etc) objects are also compressed

- Images can be large, and compression speeds data transfer!



WAS ICF: ICF Services

Transaction SICF

- services defines URL for HTTP handlers
- Default user settings for public sites
- Default client, language
- definition of Aliases
- Individual ICF Services for BSP and HTTP Applications
- BW services delivered as standard

The BEx Service is utilized for BW Web reporting

The screenshot displays the SAP SICF transaction interface. The main window shows a tree view of services under 'Virt.Hosts / Services'. The 'default_host' is expanded to show 'sap', which is further expanded to show 'bw'. The 'bw' service is selected, showing its details in a table:

Virt.Hosts / Services	Docu.	Ref.Serv.
default_host	VIRTUAL DEFAULT HOST	/default_host/sap/bc/bsp
sap	SAP NAMESPACE; SAP IS OBLIGED NOT T...	
option	RESERVED SERVICES AVAILABLE GLOBA...	
public	PUBLIC SERVICES	
bc	BASIS TREE (BASIS F	
bds	BDS DATA	
bw	BW	
BEx	Business Explorer	
ce_url	CALL URL	
doc	BW DOKUMENTE	
dr	DRAG & RELATE	
Mime	MIME IN WEB REPOR	
ps	PAGE STORAGE	
xml	XML SERVER	
meData	meData synchronizati	
xslt		
SAPconnect	SAPCONNECT (E)SM	

Overlaid on this is the 'Create/Change a Service' dialog box for the BEx service. The 'ICF Path' is '/default_host/sap/bw/'. The 'ICF Object' is 'BEx' and the 'Service (Active)' checkbox is checked. The 'Description' is 'Business Explorer'. The 'Service Data' tab is active, showing 'Anonymous Logon Data' with 'Logon Data Required' unchecked, 'Client' set to 'User', 'Password' set to 'still initial', and 'Language' set to 'English'. The 'Service Options' section shows 'Server Group' and 'SAP Authorizati' fields, 'Session Timeout' set to '00:00:00', and 'Compression (if possible)' unchecked. The 'Security Requirements' section has 'Standard' selected. The 'Basic Authentication' section has 'Standard R/3 User' selected. The 'Administration' section shows 'Last Changed By' as 'GRAFAR' and 'Created By' as 'GRAFAR', with dates '04.05.2001' and '05.03.2001' respectively.

ICF BEX Service: Enable Compression (trans SICF)

The BEx Service and MIME service: Enable Compression!

See OSS notes:
550669 & 553084

Enable compression for the
BW-relevant ICF services:

sap->BW->BEx

sap->BW->Mime

sap->BW->doc->browser

sap->BW->doc->hier

sap->BW->doc->mast

sap->BW->doc->meta

sap->BW->doc->metadata

sap->BW->doc->tmpl

sap->BW->doc->tran

Also, "http 1.1" should be
configured in the browser settings

The screenshot shows the 'Create/Change a Service' configuration window for the BEx service. The 'Service Options' section is highlighted with a red box, and a red arrow points to the 'Compression (if possible)' checkbox, which is currently unchecked. The 'Service Data' tab is selected, and the 'ICF Path' is set to '/default_host/sap/bw/'. The 'ICF Object' is 'BEx' and the 'Service' is 'Active'. The 'Description' is 'Business Explorer' and the 'Language' is 'English'. The 'Service Options' section includes fields for 'Server Group', 'SAP Authorizatr', 'ErrorType', 'Session Timeout', and 'Compression (if possible)'. The 'Security Requirements' section has 'Standard' selected. The 'Basic Authentication' section has 'Standard R/3 User' selected. The 'Administration' section shows 'Last Changed By' as GRAFAR, 'Changed On' as 04.05.2001, 'CreatedBy' as GRAFAR, and 'Created On' as 05.03.2001.

Browser Cache of MIME objects

MIME objects are now cached in the browser, see OSS note 561792 - BW 3.0B SP 7

Performance Gain: Static images (i.e. company logo, etc) are not reloaded (from the server MIME cache) every time a query result set is rendered in the browser – less data to send!

Note:

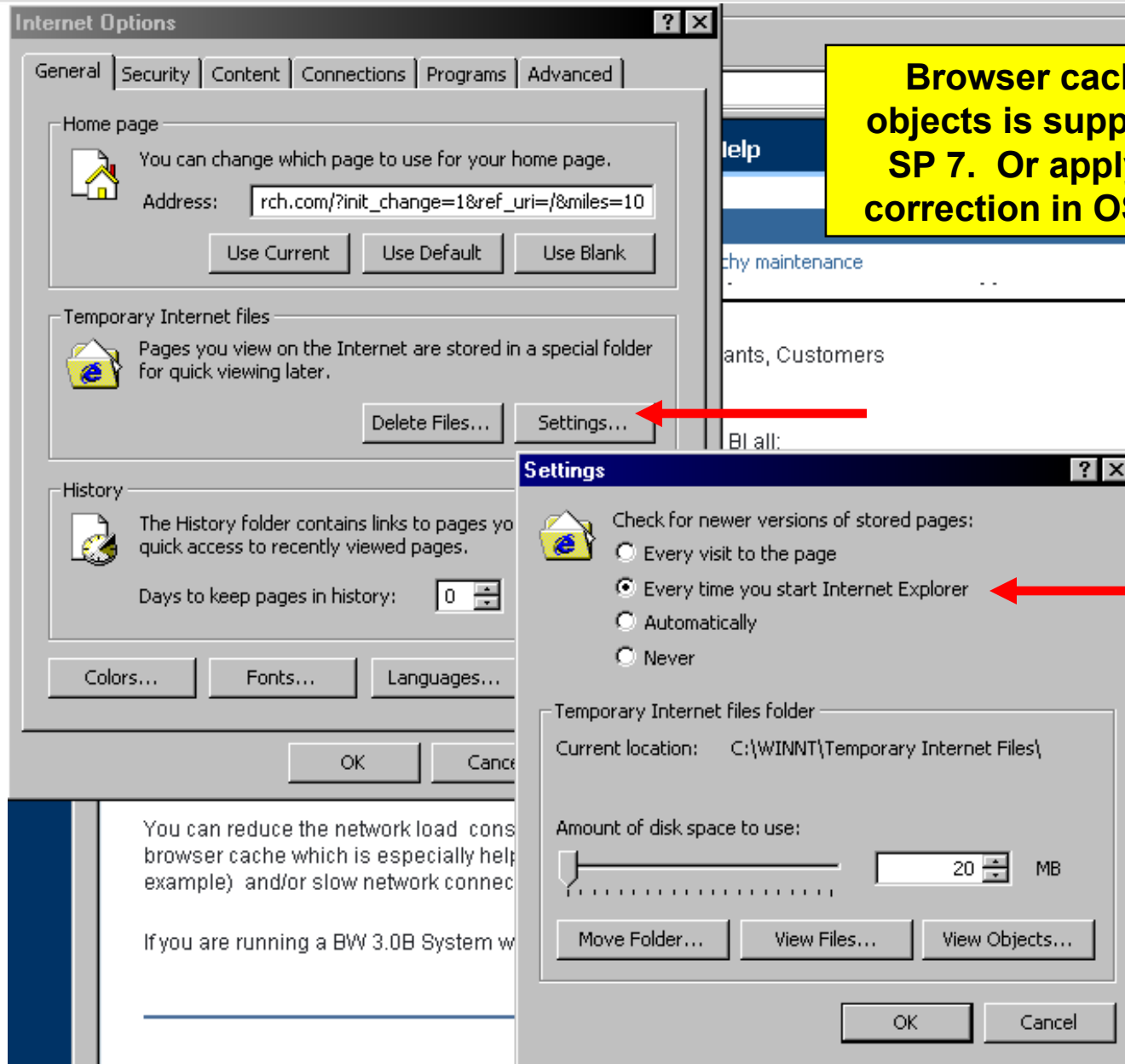
The ICM will attempt to force a new version of the image into the browser's cache periodically

- based on an instance profile parameter setting.
- A performance gain can be achieved by extending the time MIMEs will sit in the browser cache before the ICM reloads them from the MIME server cache.

The related profile parameter is 'icm/HTTP/server_cache_0/expiration'.



Browser Settings for Client Caching of MIMEs

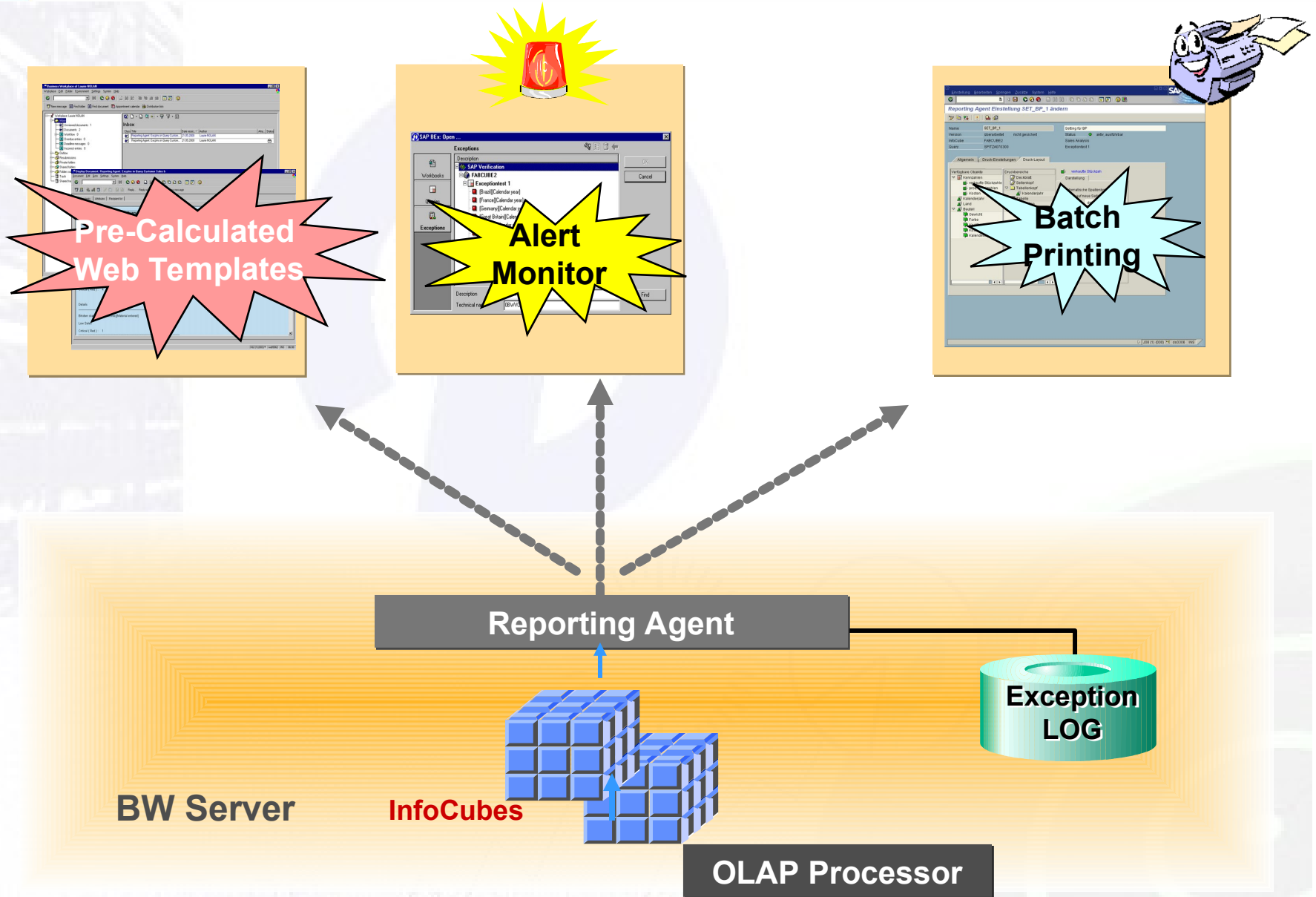


Browser caching of MIME objects is supported as of BW SP 7. Or apply the advance correction in OSS note 561792

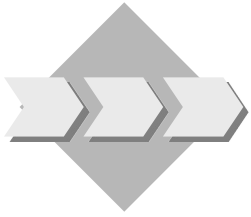
You can reduce the network load (consolidate browser cache which is especially helpful for example) and/or slow network connections.

If you are running a BW 3.0B System with

Reporting Agent: Overview



Reporting Agent: Precalculated Template



The Reporting Agent has performance enhancing functionality!

Precalculation is a set of techniques where you can distribute the workload of running the report to off-peak hours, and have the report result set ready for very fast access to the data



Response-time performance is greatly improved to the end user

... And overall system workload is reduced during peak hours

Scope of Application

- Web reports that are accessed by many users.
- Web reports that are static, or involve limited navigation.
- Web reports that should be made available offline.

Goal

- Reduce server load significantly.
- Provide faster data access.
- Re-use data that goes into many web reports.



Pre-Calculating Web Templates – Setup

Realization

Access

Access modes

- NEW = Default
- STORED
- HYBRID
- STATIC
- STATIC_HYBRID

Settings

Output formats

- Data
- HTML for Web Browser
- HTML for Pocket IE
- Excel

Parameterization

- specify filter values
- pre-assign variables



Access Modes for Web Templates

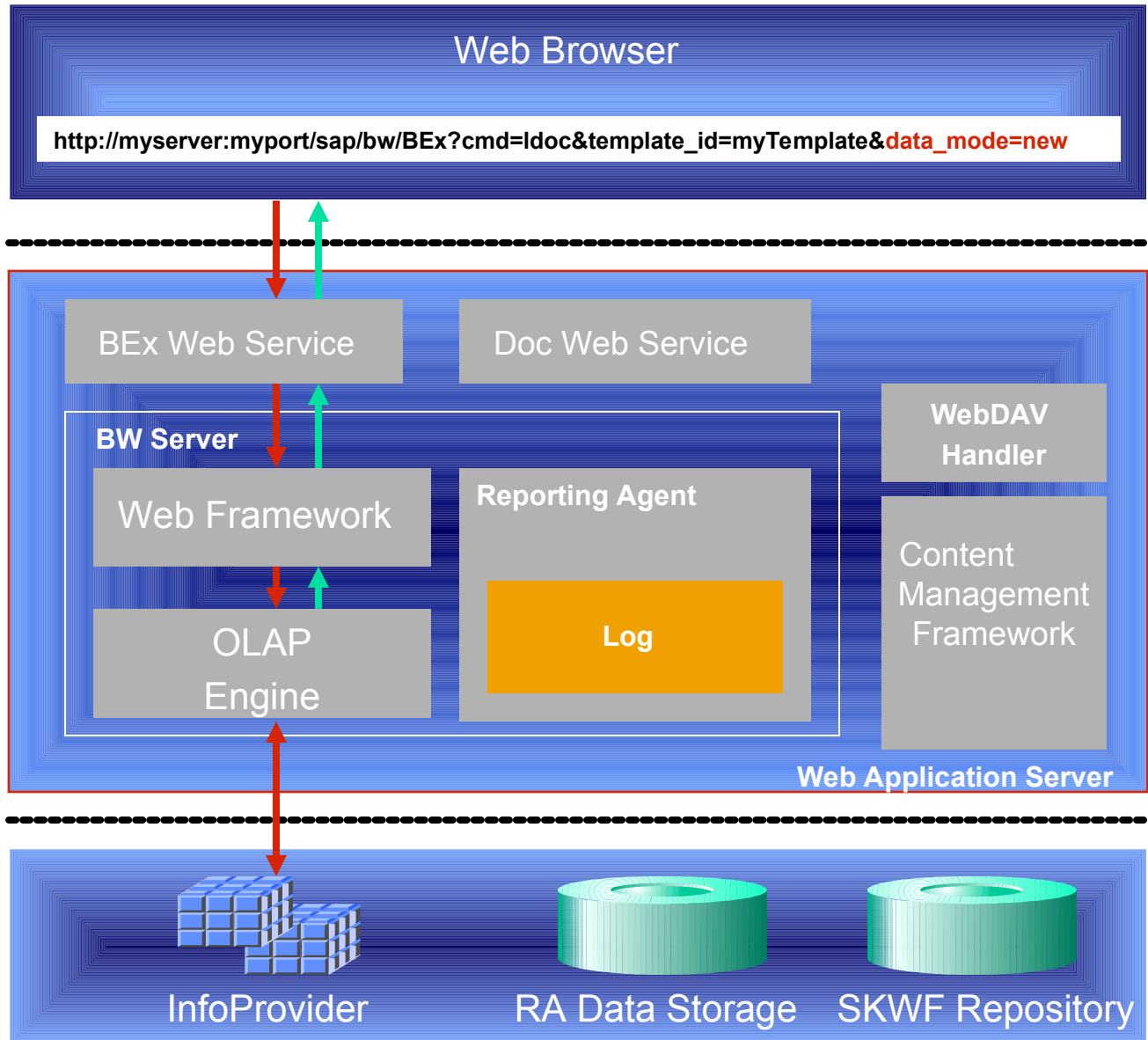
DATA MODE



NEW

STORED

HYBRID



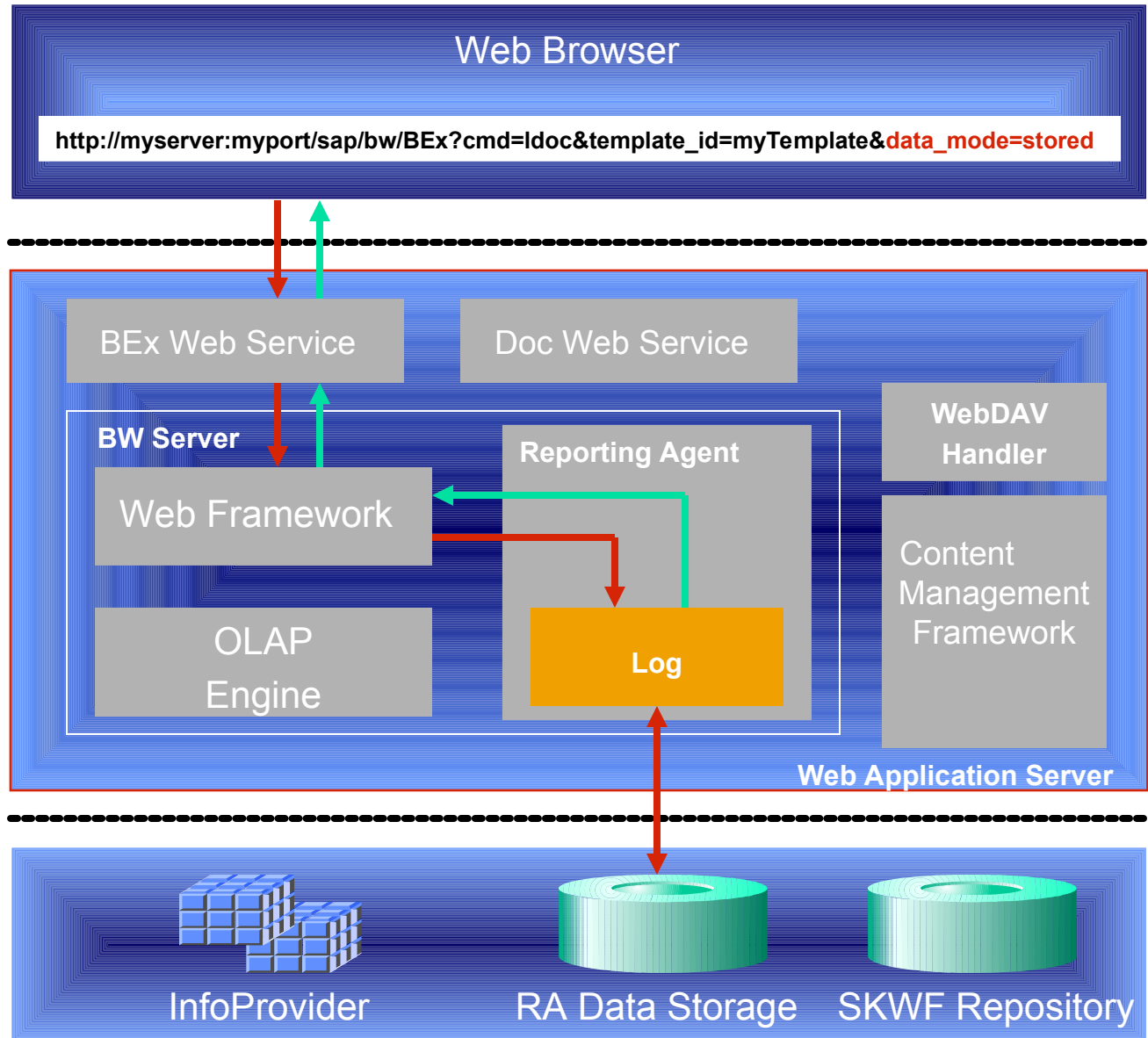
Access Modes for Web Templates

DATA MODE

NEW

→ STORED

HYBRID



Performance Tuning Concepts

MultiProvider

Partitioning

Data Modeling and Line Item Dimension

Web Reporting

 OLAP Query Cache

Query results and navigation states of the OLAP processor are stored in a cache area of the application server as clustered data

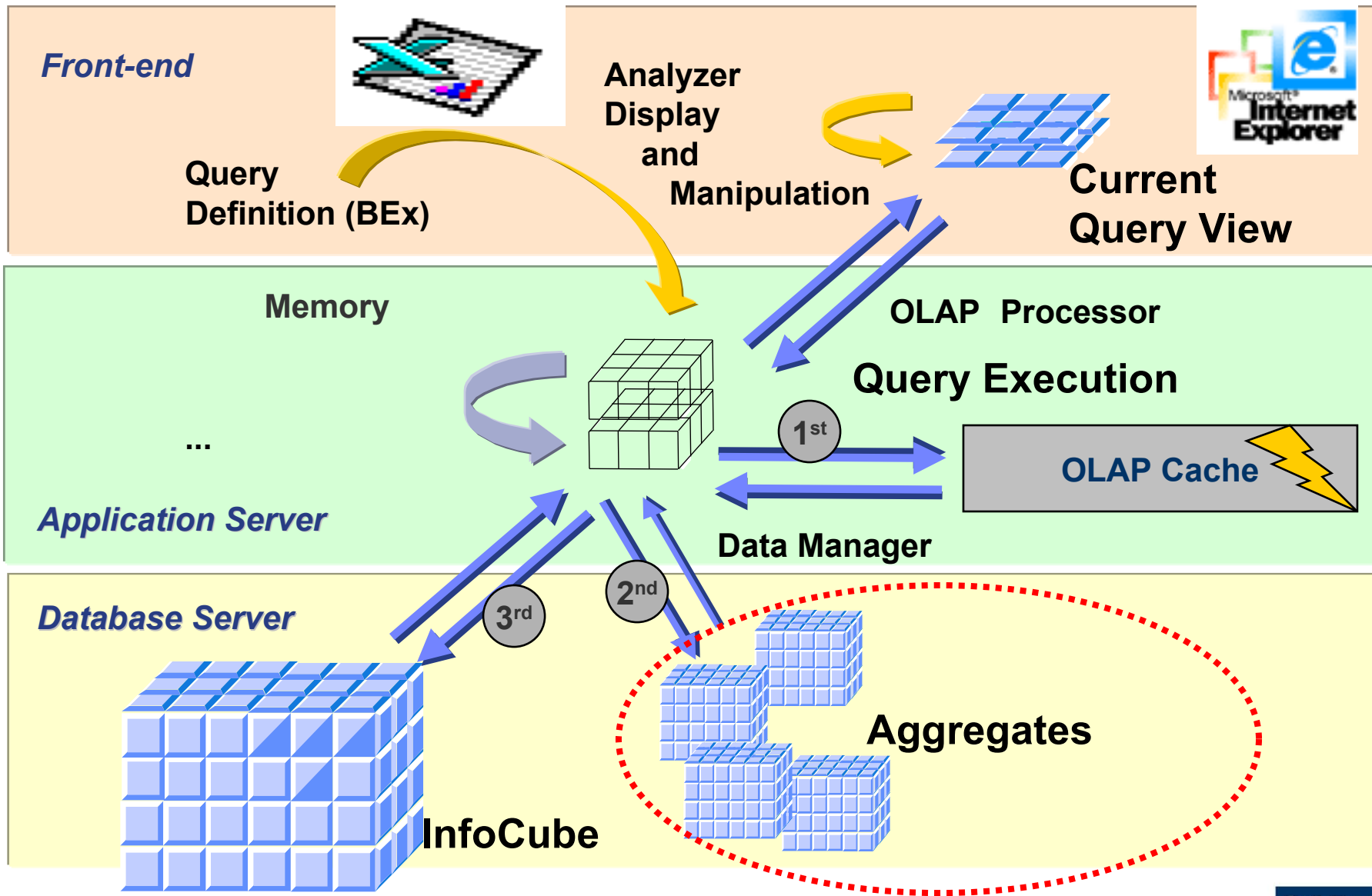
Caching in 2.x and 3.0A:

- One local cache for each session
- No cache access across sessions
- No possibility to set size of cache

Caching in 3.0B:

- Additional global cache which is accessible from all sessions
- Global and local cache sizes can be adjusted
- Global cache can be switched off entirely

Query Execution: From Memory, Aggregate, or Cube



OLAP Caching

Cache is part of application buffer (Import / Export SHM)

Specific Instance Profile parameters:



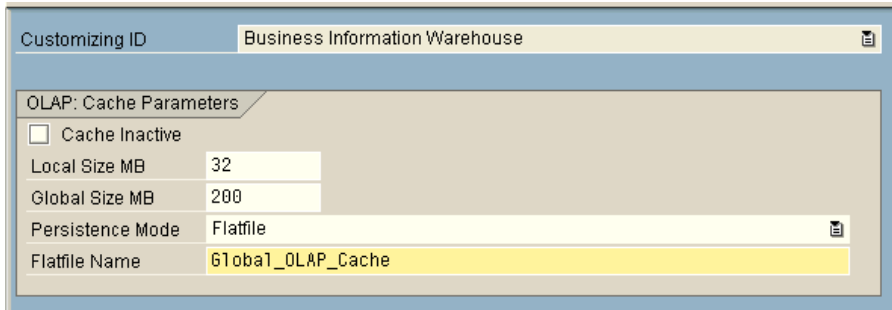
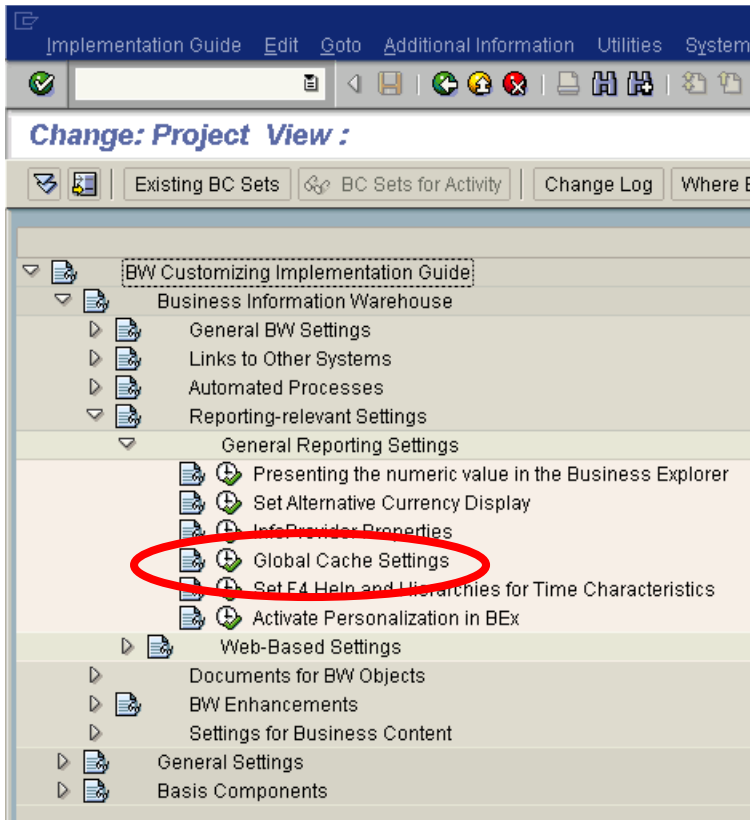
Buffer small by default!

<code>rsdb/esm/buffersize_kb</code>	4096 (kB)	Size of exp/imp SHM buffer
<code>rsdb/esm/max_objects</code>	2000	Max. number of objects in the buffer
<code>rsdb/esm/large_object_size</code>	8192 (byte)	Estimation for the size of the largest object
<code>rsdb/esm/mutex_n</code>	0	Number of mutexes in Exp/Imp SHM buffer

Local cache will be used if data cannot be stored in global cache (e.g. if global cache has been switched off)

Benefits: reduced workload on database and application server

OLAP Caching Global Settings

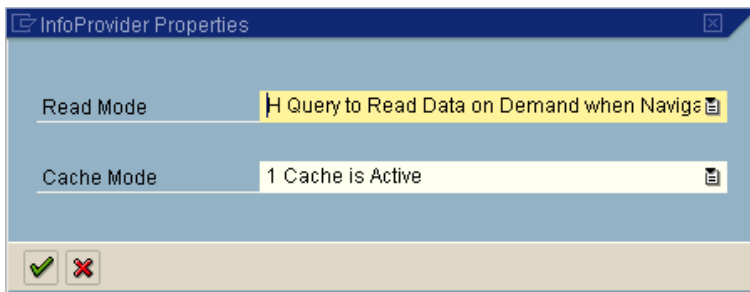
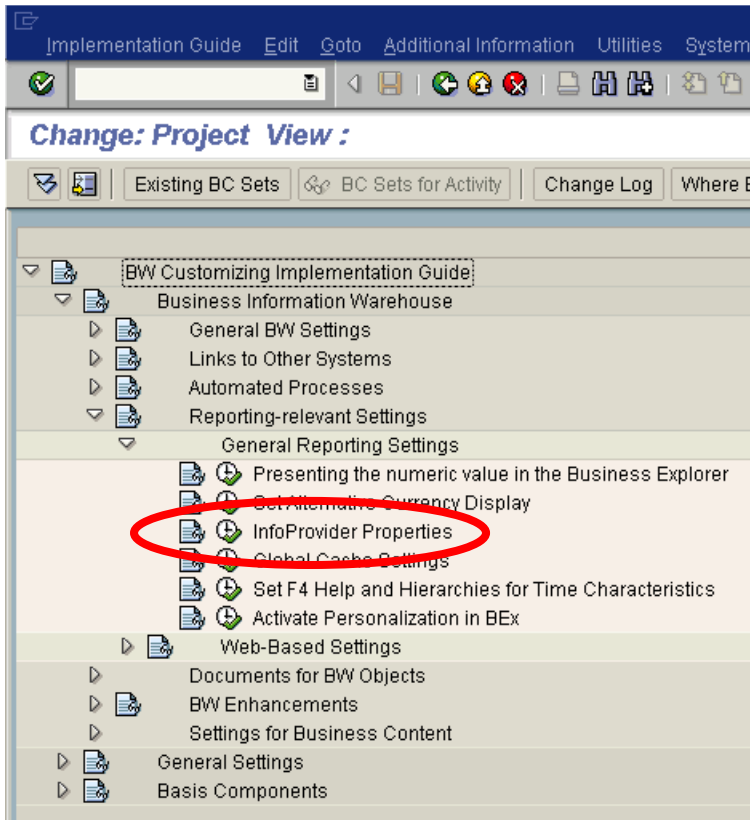


Customization menu (SPRO)

- Cache inactive:
 - ◆ Switch *global* caching off
- Local size:
 - ◆ Max. size of *local* cache (session results only)
- Global size:
 - ◆ Max. size of *global* cache (used for all sessions)
- Persistence Mode
 - ◆ Optional: Flat file or clustered table

Note: total size of (uncompressed) runtime objects, actual memory requirements are lower due to compression

OLAP Caching Settings for InfoProvider



For each InfoProvider:

- Set cache mode BEFORE defining a query (inactive / active)
Cache is active by default

Settings can also be changed for individual queries (RSRT):
run query in debug mode, select „Do not use cache“

OLAP Cache Monitor in Transaction RSRT

Query Cache

- Part of application buffer
- Query results and navigation status stored
- Similar queries (from any user) can use the cache

Query Cache Monitor

Cache Monitor

Cache Parameter | Buffer Monitor | Buffer Overview | Logical File Names | Directory Overview

Cache Parameter			
Cache Act.	Local Cache Size	100 MB	Global Cache Size 200 MB
Cache Persistence Mode	Flat File		
Cache Persistence Logical File Name	BW_OLAP_CACHE	<SYSID> Parameter Missing	

Shared Memory

Runtime Object	
Max. Cache Size	204800 KB 200 MB
Current Cache Size	3 KB
Curr. Swap Size	0 KB
Cache Rsvd	0 %
Curr. Entries Total	11
Curr. Cache Entries	11
Curr. Swap Entries	0
Buffer Poll Time	26.09.2002 13:15:58
Buffer Reserved	1 %

List Display

Memory ID	Swapped	Read Flag	Write Flag	Dirty Flag	Directory	Size in Bytes	Buffer ID	Logical ID
QUERY	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	190	00000001	ROOT
VAR/SH	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	164	0000000E	3D91957A92C40AF0E1000000A1410...
SP	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	263	0000000F	3D91958092C40AF0E1000000A1410...
SP	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	255	00000010	3D91958192C40AF0E1000000A1410...
SP	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	194	00000011	3D91958292C40AF0E1000000A1410...
SP	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	211	00000012	3D91958392C40AF0E1000000A1410...
FF	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	411	00000013	3D91957B92C40AF0E1000000A1410...
VAR/SH	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	247	00000014	3D91E9CB92780AEEEE1000000A141...
SP	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	856	00000015	3D91E9D392780AEEEE1000000A1410...
SP	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	334	00000016	3D91E9D492780AEEEE1000000A1410...
FF	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	373	00000017	3D91E9CC92780AEEEE1000000A141...

Hierarchical Display