

Oracle Database In-Memory für SAP

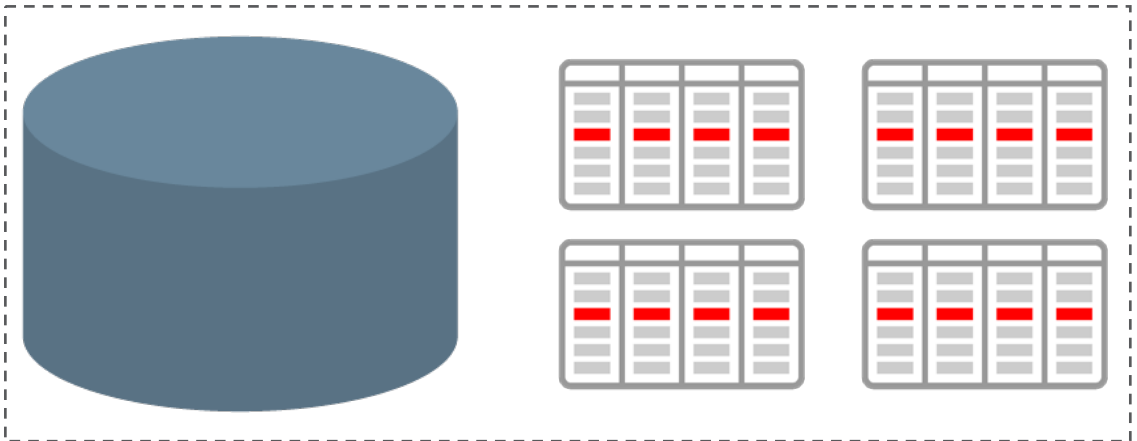
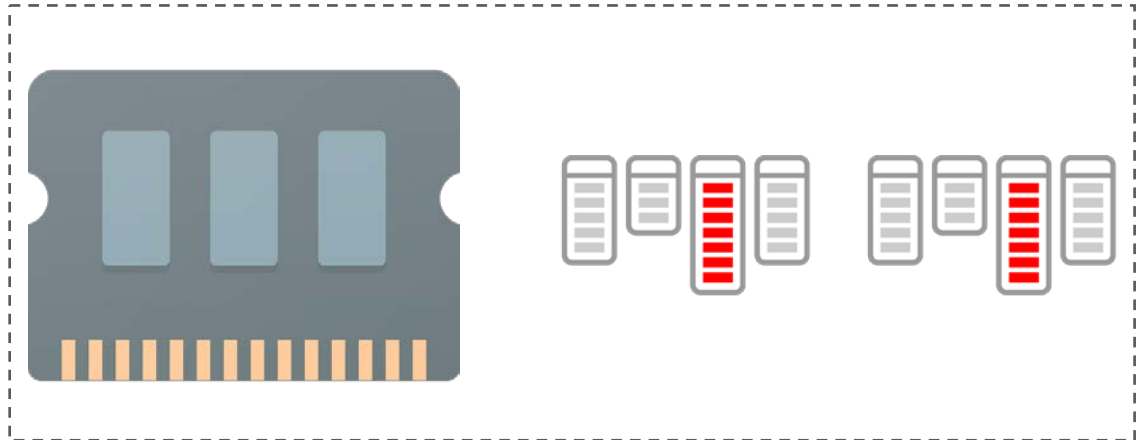
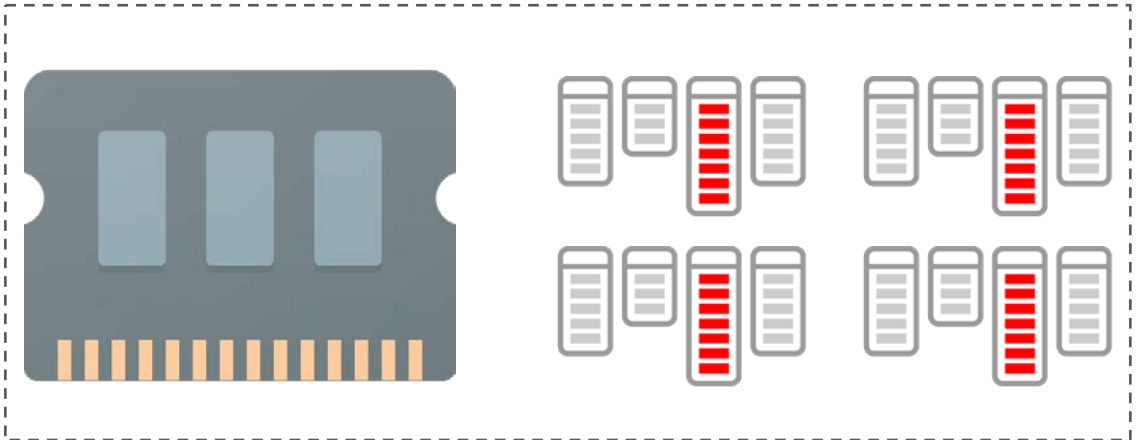


Einsatzmöglichkeiten anhand von Kundenbeispielen

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Juni 2017

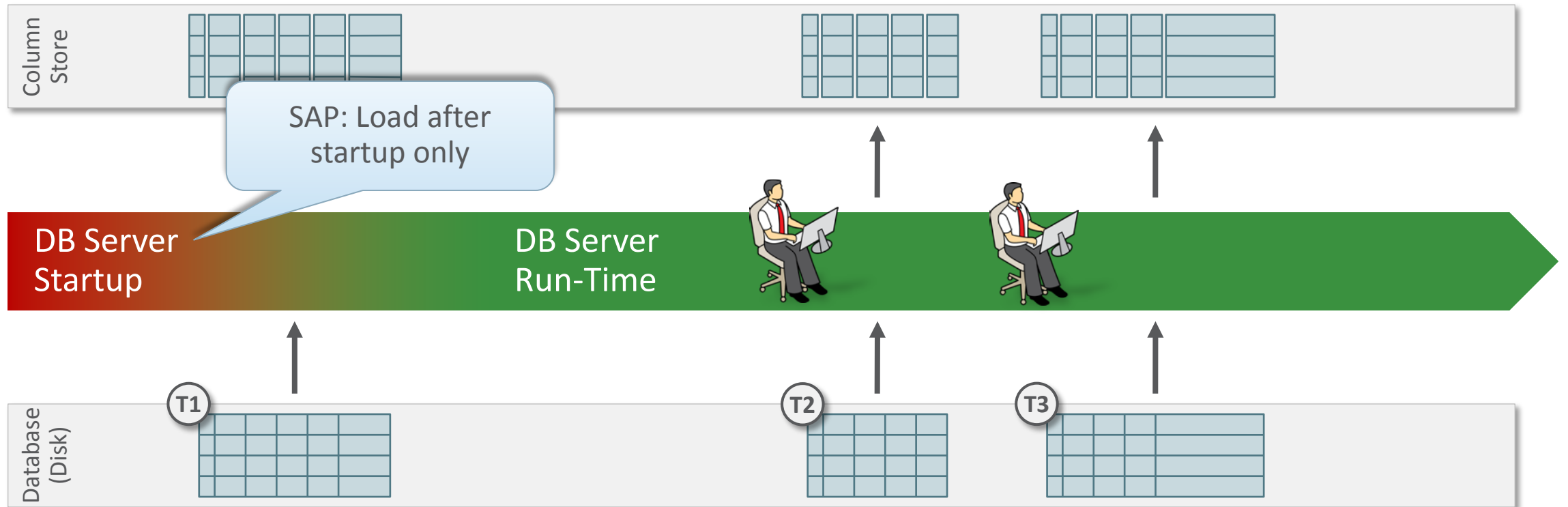
Background

In-Memory Database vs. Database In-Memory



Oracle Database In-Memory for SAP

Fine-Grained Control: Population Time



Oracle Database In-Memory: **An Easy Start**

- Define size of In-Memory Column Store
 - `inmemory_size = 500G`
- Configure background worker processes
 - `inmemory_max_populate_servers = 8`
- Select table(s) to be populated into In-Memory Column Store
 - `alter table t1 inmemory;`
 - `alter table t2 inmemory;`
 - ...

Research Field 1

Look for Analytical Workload

Row Format Databases vs. Column Format Databases

Row



- **Transactions** run faster on row format
 - Example: Insert or query a sales order
 - Fast processing few rows, many columns

Column



- **Analytics** run faster on column format
 - Example : Report on sales totals by region
 - Fast accessing few columns, many rows

Until Now Must Choose One Format and Suffer Tradeoffs

Implementation Approaches: **Select Applications**

- Oracle Database In-Memory is certified for all SAP applications
- However, that does not mean that it will improve performance in all cases
- Candidates:
 - SAP BW systems
 - SAP OLTP systems with high analytics processing percentage
 - See In-Memory Advisor report
 - Examples: CRM, HR, ERP (?)
 - SAP OLTP systems with customer-specific enhancements

Implementation Approaches: **Select Tables**

Systematic Approach

- Situation
 - Tables recommended/suitable for In-Memory are yet unknown
- Action
 - Run IM Advisor for recommendations
 - Relies on Automatic Workload Repository (AWR) & SQL Tuning Set data
 - See Oracle In-Memory white paper for detailed procedure

Individual Approach (Expert Mode)

- Situation
 - Reports with long running queries processing large amounts of data have already been identified
- Action
 - Put these tables in IM column store
 - Use SAP_IM_ADV package for column store sizing
 - See Oracle In-Memory white paper for detailed procedure

Research Field 2

Look for Data Model Optimizations

Research Field 2

Example 1

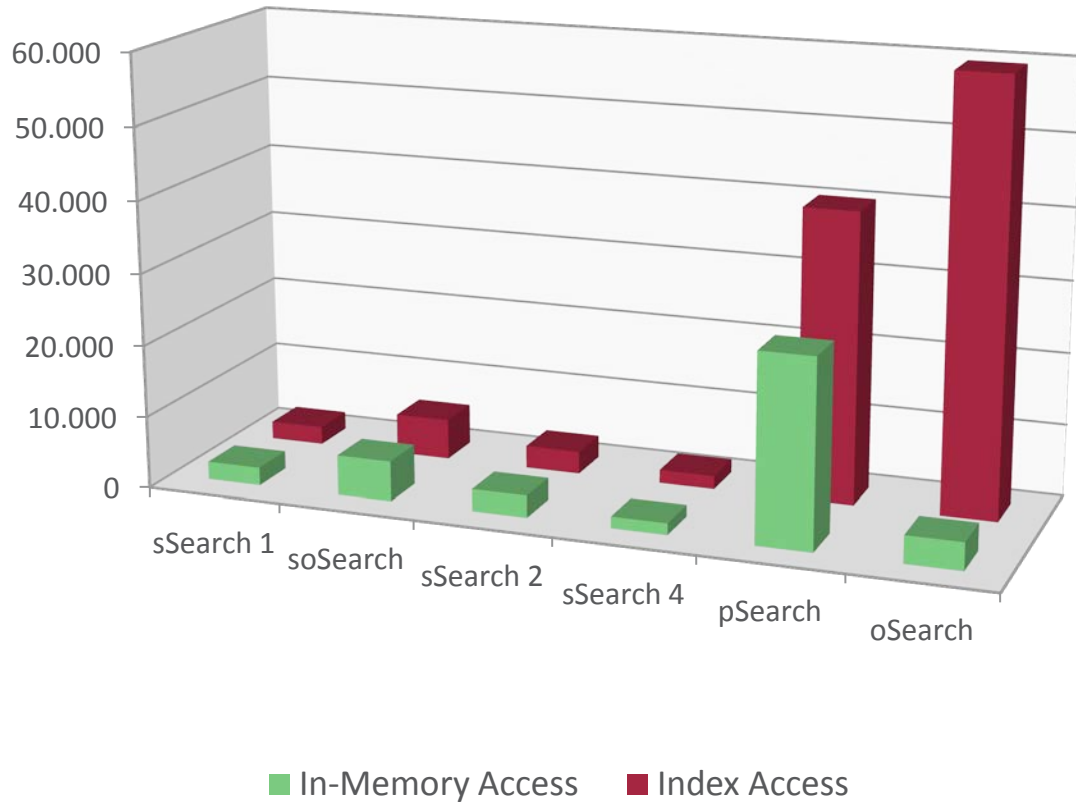
Customer Example: SAP CRM – Challenges



Table Name	# Std. Indexes	# Cust. Indexes
CRMD_ORDER_INDEX	10	15
CRMD_ACTIVITY_H	2	0
CRMD_CUSTOMER_H	1	7
CRMD_LINK	2	4
CRMD_ORDERADM_H	4	3
CRMD_ORDERADM_I	4	0
CRMD_PARTNER	3	4

- Customer Background:
 - Users are free to build their own queries on the fly
 - 33 customized indexes to support this
- Issues:
 - Storage requirements
 - DML (Insert, Update) performance
 - Index maintenance
- Customer Action:
 - Oracle Database In-Memory PoC

Customer Example: SAP CRM – Solution



- PoC Setup:
 - Relevant tables loaded into Column Store
 - All customized indexes dropped
 - Performance of frequently run queries tested
- Results:
 - Performance as good as or better than in existing environment
 - Disk storage reduced
 - Better DML performance
 - No index maintenance required

Research Field 2

Example 2

What is it?

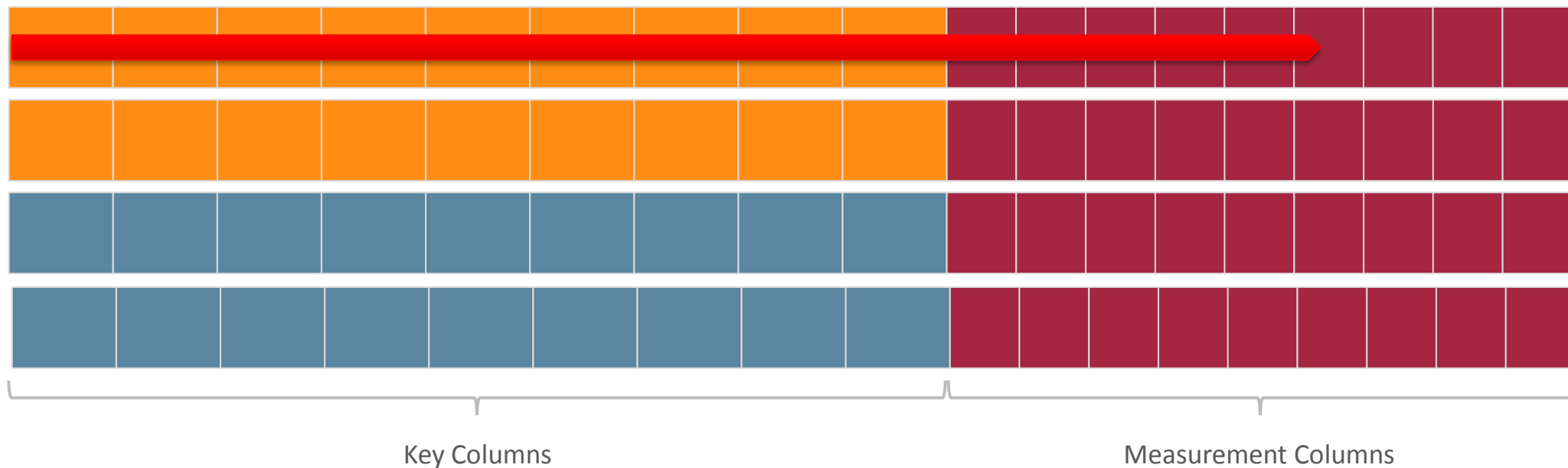
"HANA-Optimized InfoCubes"

- Data model optimization
- Originally developed for
 - SAP BW
 - on SAP HANA
- Not used by any other SAP application

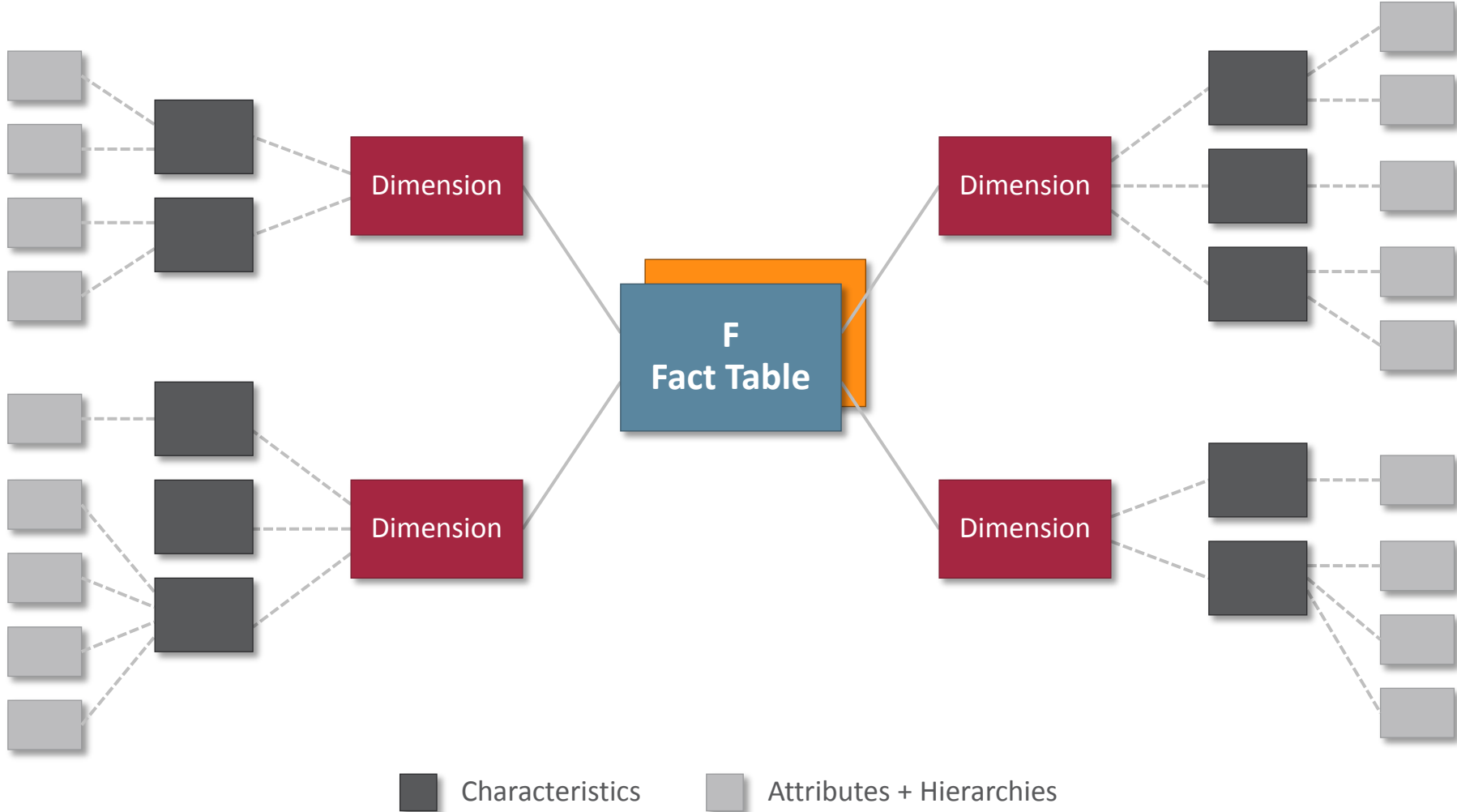
"Flat InfoCubes" / "Flat Cubes"

- Same optimization
- Now available for
 - SAP BW
 - on Oracle Database 12c and Oracle In-Memory
- Not used by any other SAP application

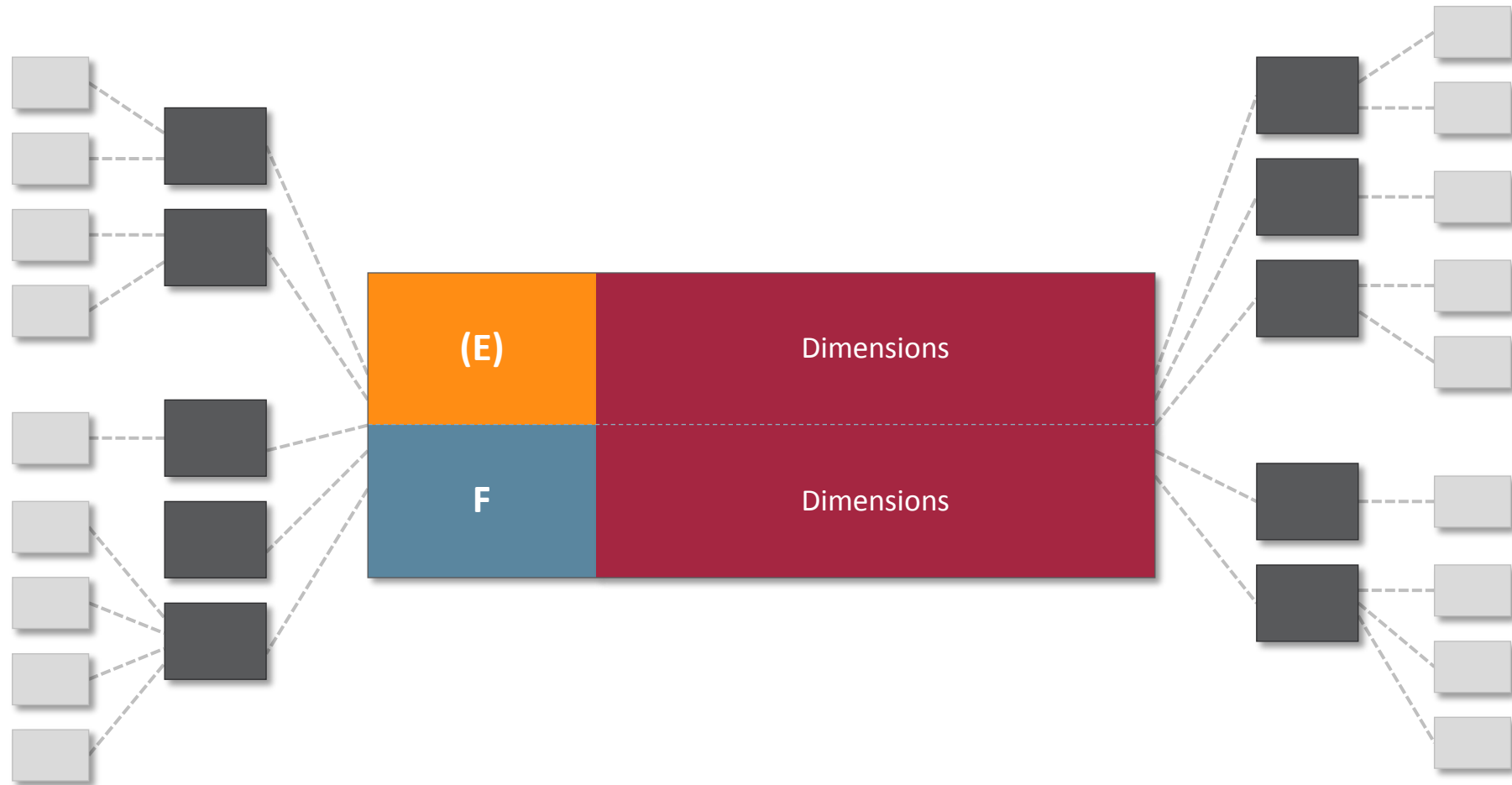
Wide Fact+Dimension Table: Row Format



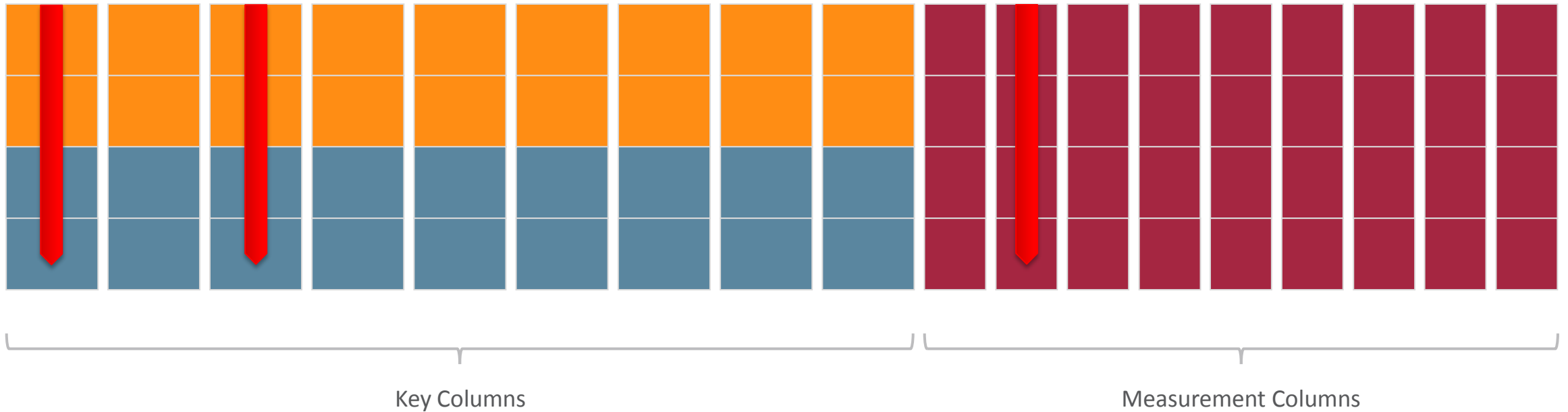
High Level View: Classic BW "Star Schema"



High Level View: Flat Cube



Wide Fact+Dimension Table: Columnar Format



Flat Cubes for SAP BW on Oracle Database 12c

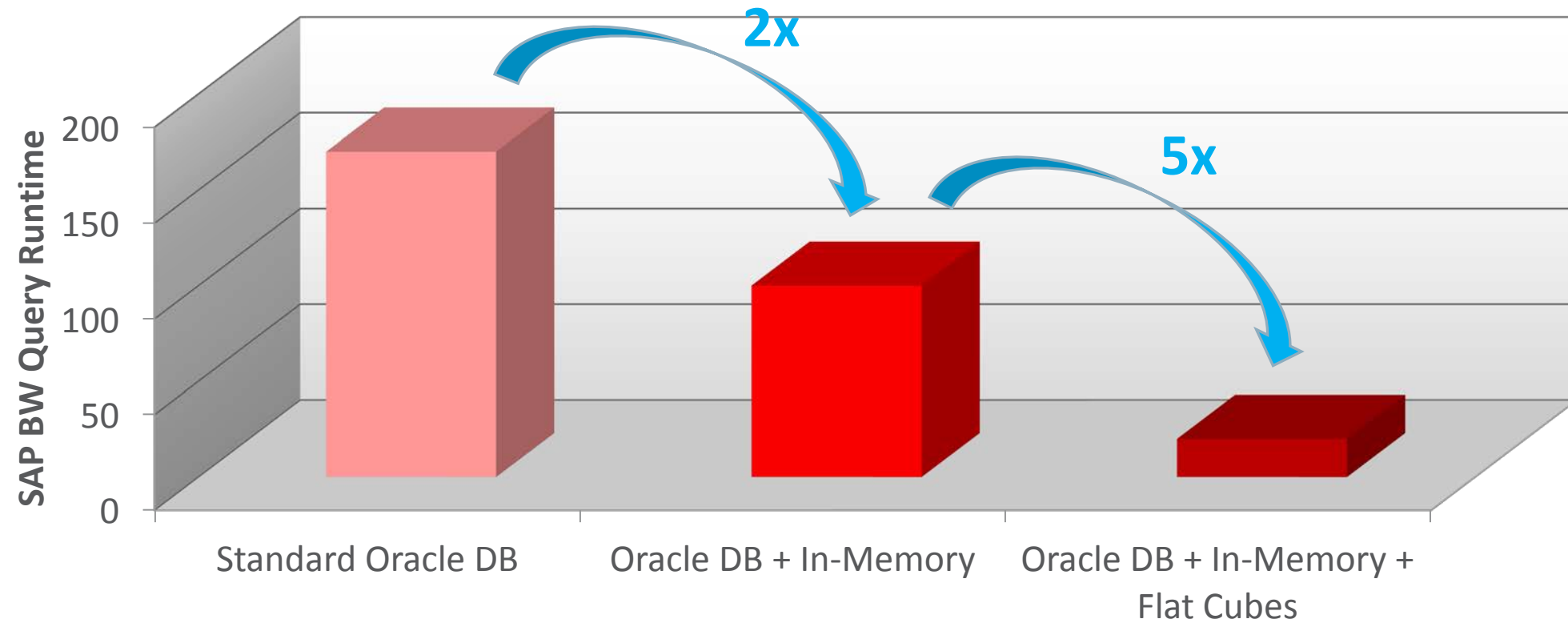
Requirements

- SAP BW 7.40 with SP15
or SAP BW 7.50 with SP04
- Oracle Database 12.1.0.2 with SAP
Database Bundle Patch May 2016
- Oracle Database In-Memory
- Oracle Partitioning
 - (general requirement for SAP BW on
Oracle Database)

Benefits

- No indexes required
- No joins with dimension tables
- Data load is fast
- Data can be compressed
 - on disk
 - in Column Store

Customer Example: SAP BW



Research Field 2

Example 3

Tyson PoC: Declustering of Table KONV

Action Plan

- Sandbox copy of production ECC 9tb (compressed)
 - Database version 12.1.0.2
- Decluster KONV (KOCLU) per SAP note 1892354
- Compress KONV using Oracle Compression (Advanced)
- Identify SQL queries to use for testing: (1) simple, (2) multi-table join
- Identify table candidates for DBIM: KONV, VBAP, VBAK
- Increase memory and parameters `sga_target` & `inmemory_size`
- Alter table(s) to “inmemory”

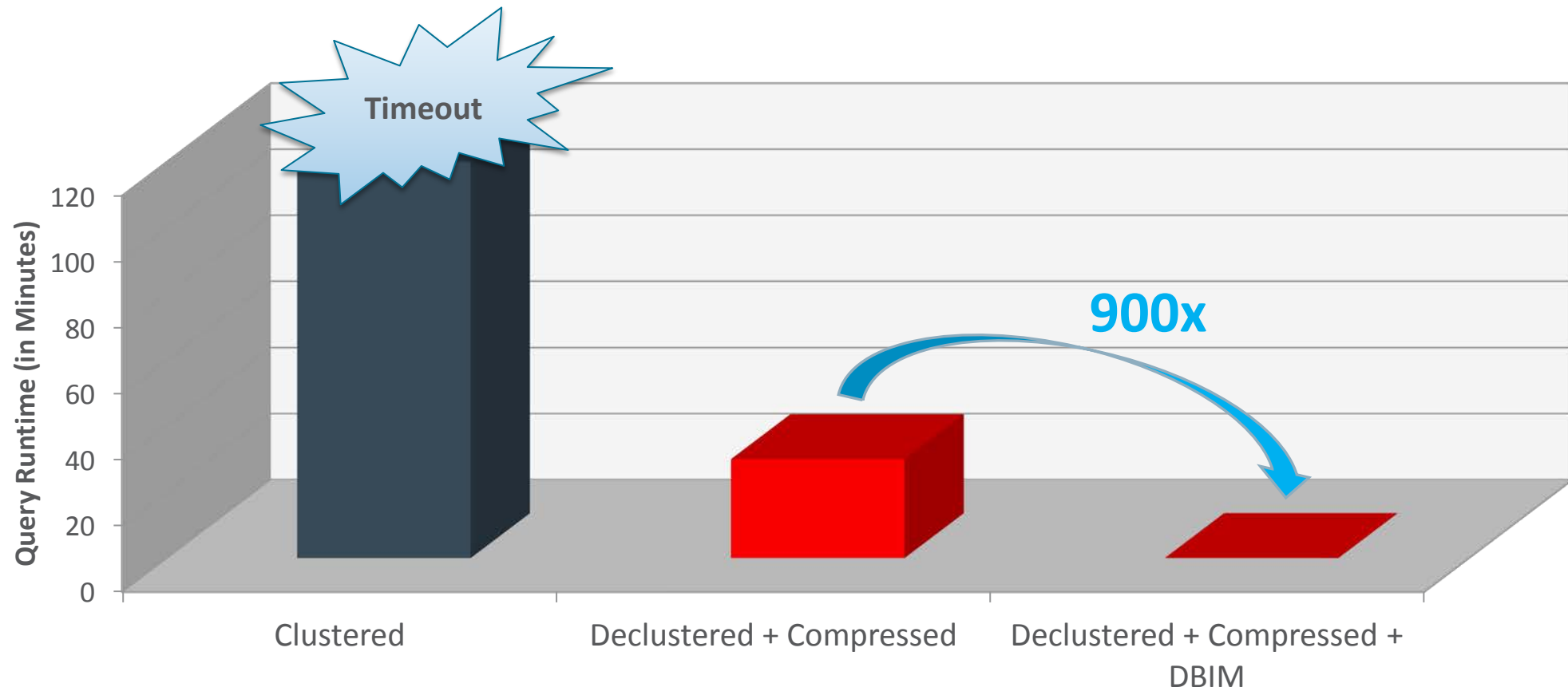
Tyson PoC: Declustering of Table KONV

Results (Overview)

KONV	Size (GB)	Query 1	Query 2	Comments
Clustered	150	DNF (> 2hrs)	Not Possible	SAP compression is space efficient
Declustered	680	N/A	N/A	KONV now contains 3.2B rows
Declustered, Oracle Compressed	170	30 minutes	40 sec	Oracle Advanced Compression
Declustered, Oracle Compressed, DBIM	170 + 84 (DBIM)	< 2 sec	*250 milliseconds	*DBIM-VBAP & VBAK

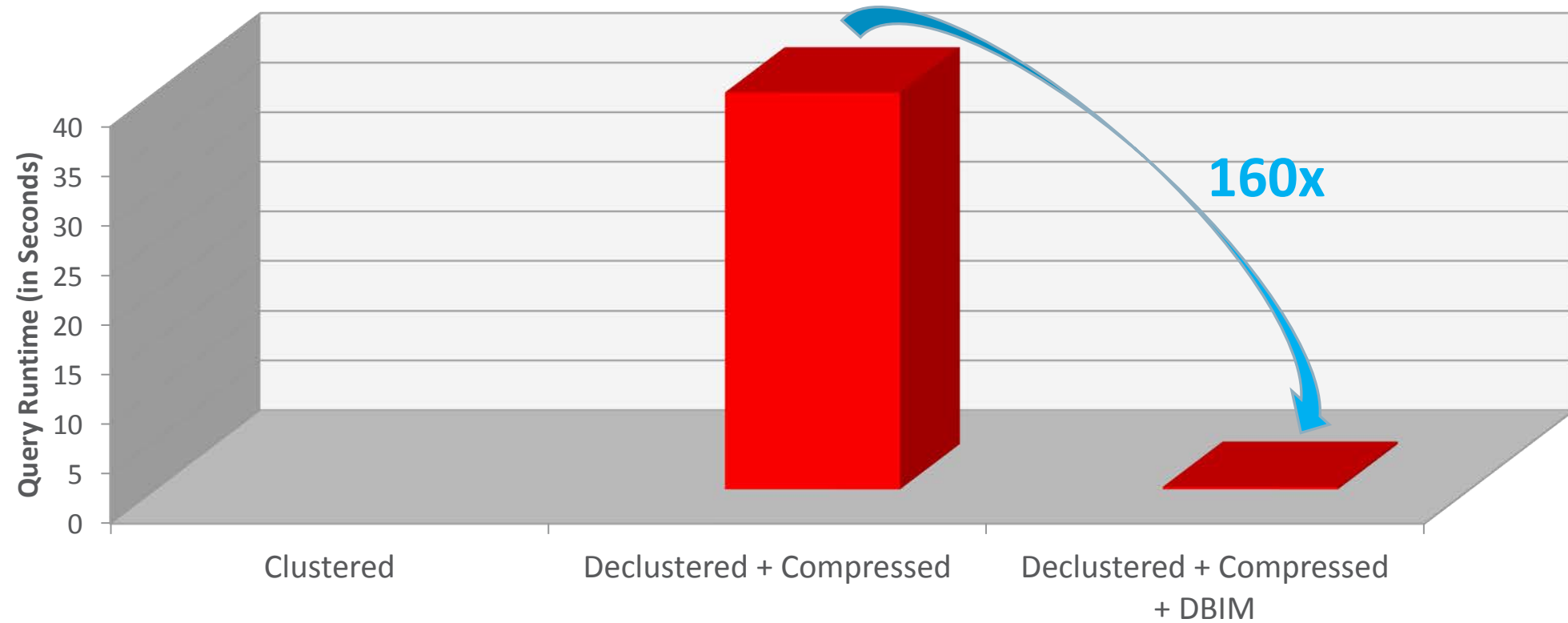
Tyson PoC: Declustering of Table KONV

Query 1



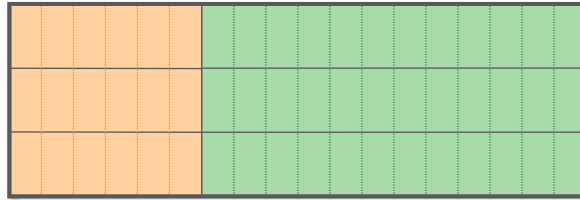
Tyson PoC: Declustering of Table KONV

Query 2



Database Performance Optimizations for SAP ERP

Pooled and Clustered Tables



SAP Issue:

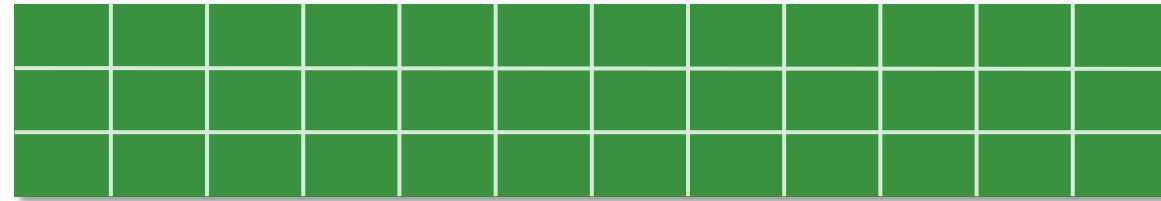
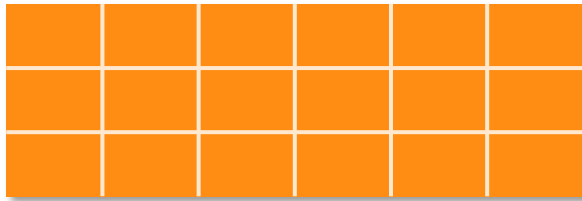
- Pooled and clustered tables have been created by SAP decades ago to optimize processing in disk-based databases.
- In-Memory databases cannot handle this format efficiently.

SAP Solution:

- Convert pooled and clustered tables to "transparent" (i.e. normal database) tables
- Optimization is available for HANA and non-HANA databases
- See [SAP Note 1835008](#) and [SAP Note 1892354](#)

Database Performance Optimizations for SAP ERP

Depooling / Declustering



Oracle Issue:

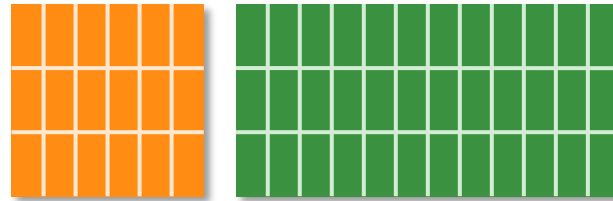
- As values in pooled and clustered tables had been compressed by SAP, "transparent" tables need more disk space and memory.

Oracle Solution:

- Use Oracle Advanced Compression to compress "transparent" table data on disk.
- If Oracle Database In-Memory is used, data will be compressed while populated into the Column Store.

Database Performance Optimizations for SAP ERP

Data Compression



Oracle Issue:

- Some of the depooled/declustered tables consist of more than 255 columns.
- Oracle Database 11g (Advanced Compression) can only compress tables with ≤ 255 columns.

Oracle Solution:

- The 255 column limit is lifted in Oracle Database 12c.

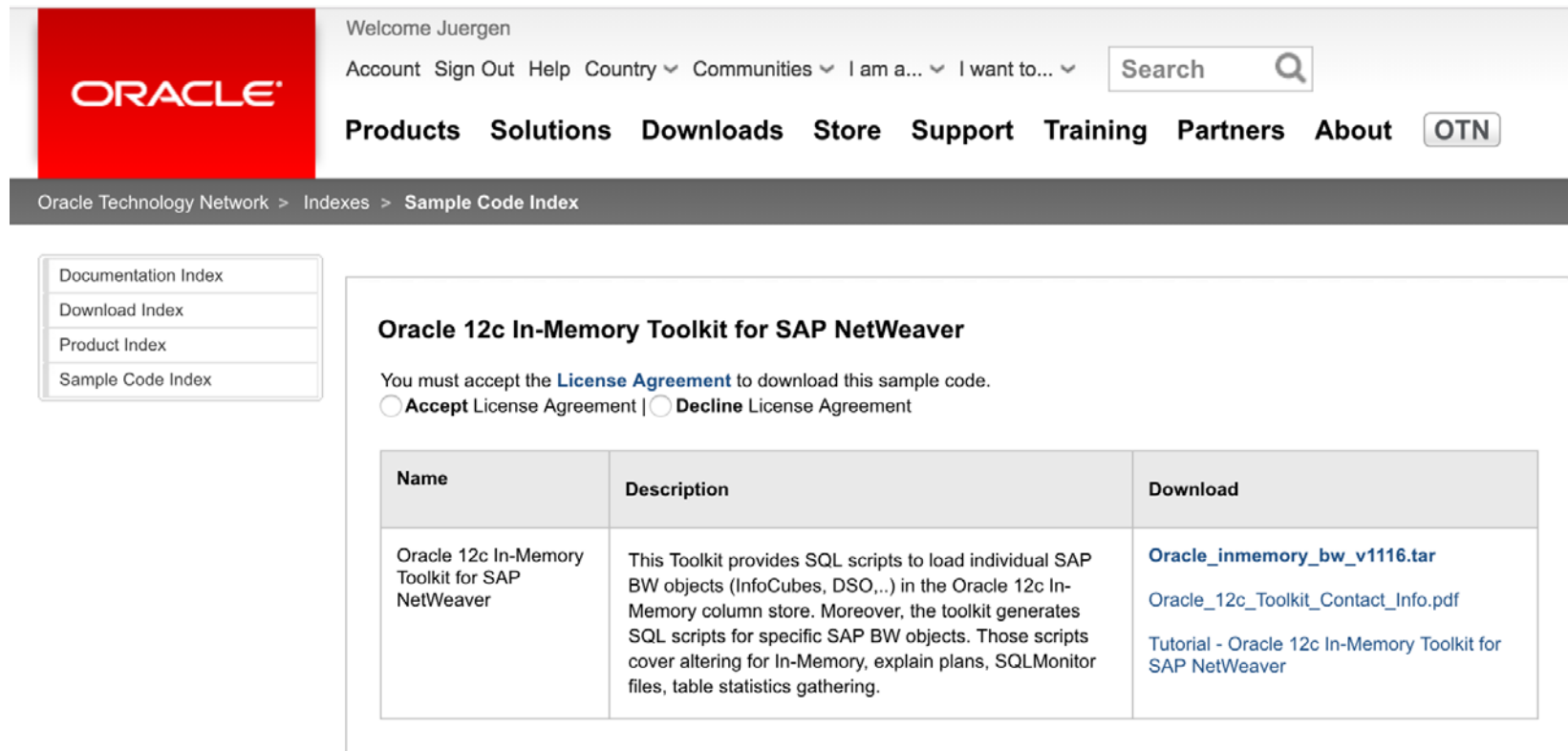
Research Field 2

Example 4

Oracle 12c In-Memory Toolkit for SAP BW

Where to download?

On OTN <http://www.oracle.com/technetwork/indexes/samplecode/in-memory-toolkit-3076228.html>



The screenshot shows the Oracle OTN website interface. At the top left is the Oracle logo. To its right, there is a user greeting "Welcome Juergen" and a search bar. Below the search bar is a navigation menu with links for Products, Solutions, Downloads, Store, Support, Training, Partners, and About, along with an OTN button. A breadcrumb trail indicates the current location: Oracle Technology Network > Indexes > Sample Code Index. On the left side, there is a sidebar menu with links for Documentation Index, Download Index, Product Index, and Sample Code Index. The main content area features the title "Oracle 12c In-Memory Toolkit for SAP NetWeaver" and a license agreement section with radio buttons for "Accept License Agreement" and "Decline License Agreement". Below this is a table with three columns: Name, Description, and Download. The table contains one row with details about the toolkit, including a description of its SQL scripts and a list of download links.

Name	Description	Download
Oracle 12c In-Memory Toolkit for SAP NetWeaver	This Toolkit provides SQL scripts to load individual SAP BW objects (InfoCubes, DSO,...) in the Oracle 12c In-Memory column store. Moreover, the toolkit generates SQL scripts for specific SAP BW objects. Those scripts cover altering for In-Memory, explain plans, SQLMonitor files, table statistics gathering.	Oracle_inmemory_bw_v1116.tar Oracle_12c_Toolkit_Contact_Info.pdf Tutorial - Oracle 12c In-Memory Toolkit for SAP NetWeaver

Oracle 12c In-Memory Toolkit for SAP BW

ODS, InfoCube and FlatCube prior to 7.40 SP14

A Structured Approach – Oracle In-Memory Toolkit

What you need to do:

- Identify Business query / question to accelerate
- Identify Info-Providers

What the Tool kit does for you:

Based on SAP BW Object:

- Identifies all fact-, dimension- and SID-tables to Info-Provider
- Generates all needed SQL scripts to alter objects and load data model
- Generates SQL script to generate query execution plans & SQLMonitor files of Top queries per object
- Generates Queries usage statistics

Oracle 12c In-Memory Toolkit for SAP BW

Example

```
[SQL> @cr_scripts
```

```
-----  
| Oracle 12c In-Memory Toolkit Version: Version 11.16 |  
| Copyright (c) 1999, 2016, Oracle Corporation. All rights reserved. |  
-----
```

```
[Existing subdirectory for result files (Default=result): nc
```

```
[Prefix of SAP Object : B49
```

```
[SAP Object : IC13
```

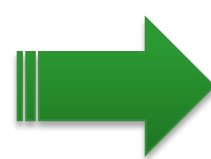
```
[Minimum rows (Default=10000) : 1000
```

```
[Minimum size kB (Default=64) : 64
```

```
[Number of top queries (default=50) : 100
```

SAP Object
Name
InfoCube:
IC13

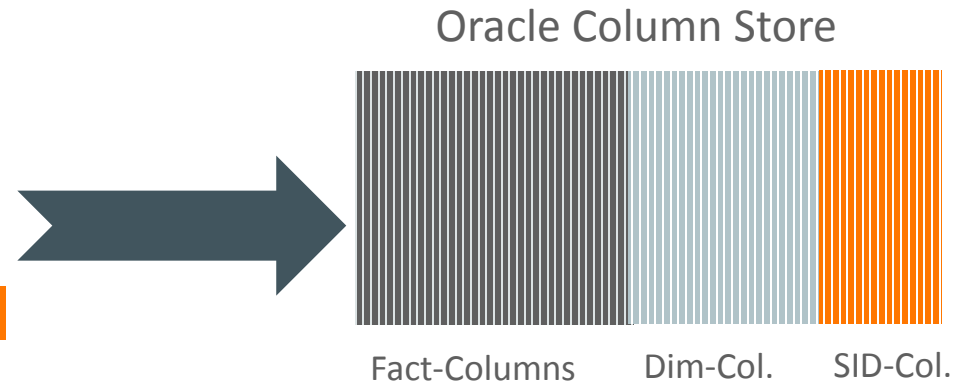
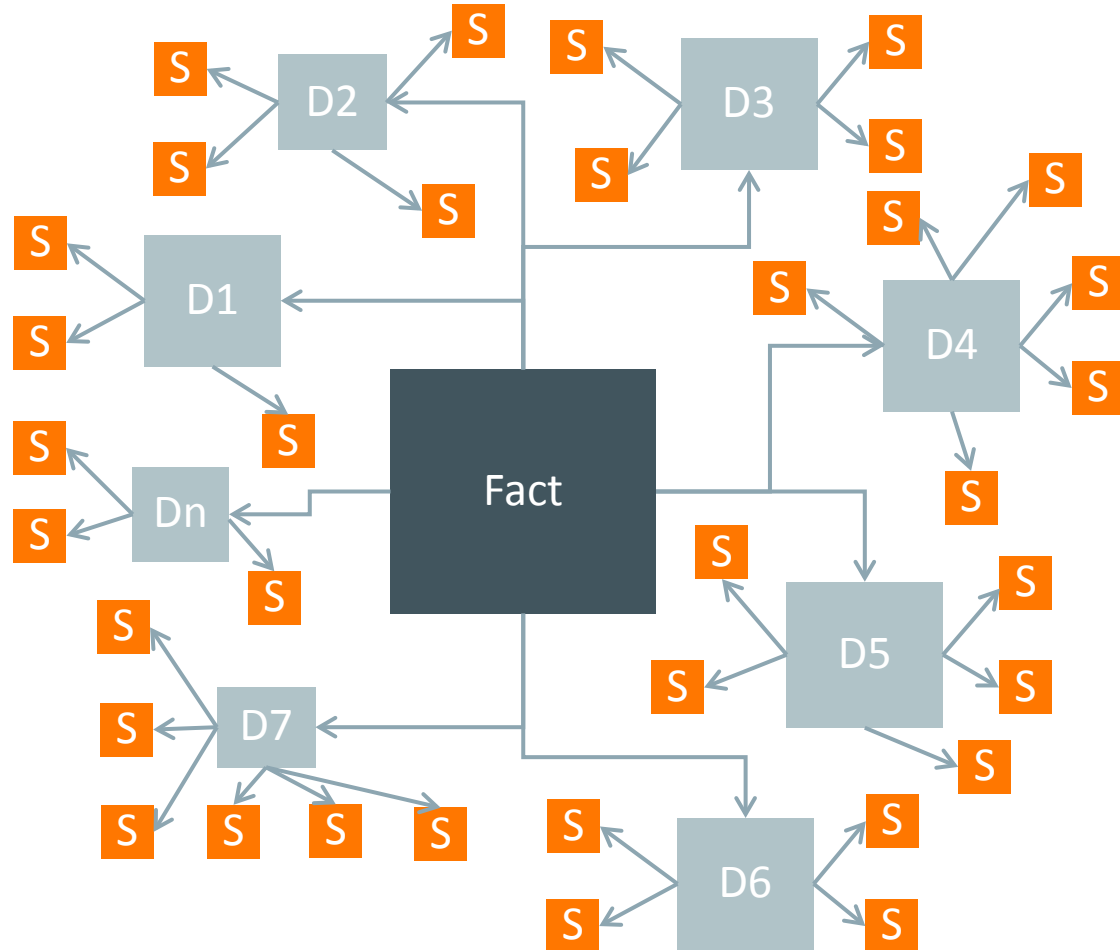
Generated scripts:



```
-----  
-rw-r--r--+ 1 oracle oinstall 15311 Sep  8 14:00 B49_IC13_exe_stat.sql  
-rw-r--r--+ 1 oracle oinstall  9789 Sep  8 14:00 B49_IC13.lst  
-rw-r--r--+ 1 oracle oinstall  5773 Sep  8 14:00 B49_IC13_off.sql  
-rw-r--r--+ 1 oracle oinstall  5773 Sep  8 14:00 B49_IC13_on.sql  
[B49_IC13_off.sql]
```

Oracle 12c In-Memory Toolkit for SAP BW

Why Materialized View In-Memory?



- MV presentation de-normalizes extended Star
 - in one Table and Columnar Format
- Most efficient Data Access via optimized Column Store
- MV makes custom Indexes obsolete
 - Save Storage
 - Index Maintenance Overhead

Oracle 12c In-Memory for SAP BW

Test Results

Object / Query / Rows processed	No In-Memory Elapsed Time [s]	In-Memory Elapsed Time [s]	Improvement
FIGL / Q1 / 68,519,427	303.00	146.80	2x
FIGL / Q2 / 6,224,938	45.45	13.5	3x
FIGL / Q3 / 68,519,427	141.63	4.46	32x
FIGL / Q4 / 6,224,938	35.26	0.48	73x
FIGL / Q5 / 465,269	31.03	11.05	3x
COPA / Q1 / 473,488	32.27	.66	49x
COPA / Q2 / 7,652,596	291.87	9.48	31x
COPA / Q / 6,353,578	339.10	8.63	39x

Customer: US based Food manufacturer

Summary

Oracle Database In-Memory for SAP

Summary

- Oracle Database In-Memory can improve SAP application performance even with traditional data model (optimized for disk-based computing).
 - For analytical workload
- However, it is more efficient, if it can be combined with a data model optimization (for in-memory)
 - Oracle/SAP: Enable optimization support for Oracle generally.
 - Customers: Find specific use cases.

Information Resources

- **Look for Analytical Workload**

- 📄 SAP Note 2178980 - Using Oracle Database In-Memory with SAP NetWeaver-based Products

- 📄 White Paper: Using SAP NetWeaver with Oracle Database In-Memory

- <https://www.sap.com/docs/download/2016/06/ca779ef1-747c-0010-82c7-eda71af511fa.pdf>
 - <http://www.oracle.com/us/solutions/sap/using-sap-netweaver-with-dbim-2594359.pdf>


Information Resources

- **Data Model Optimization Example 1**

-  Customer Story: Major Improvement in SAP CRM Use with Oracle Database In-Memory

- <http://www.oracle.com/us/solutions/sap/nl26-44-45-oradb4sap-inmemory-bosch-3716671.pdf>

- **Data Model Optimization Example 2**

-  Customer Story: Tremendous SAP BW Performance Improvement with Oracle Database In-Memory and Flat Cubes

- <http://www.oracle.com/us/solutions/sap/nl26-oradb4sap-inmemory-vb-3666337.pdf>


- **Data Model Optimization Example 3**

-  Customer Presentation: Oracle Database In-Memory: Customer Proof Points with Oracle 12c

- <http://events.sap.com/sapandasug/en/session/32189>

Information Resources

- **Data Model Optimization Example 4**

-  Customer Story: Cost Savings and Many Other Improvements with Oracle 12c and Oracle Database In-Memory

- <http://www.oracle.com/us/solutions/sap/nl26-37-39-oradb4sap-toolkit-kivbf-3716669.pdf>

-  Newsletter Article: Oracle Database In-Memory Toolkit for SAP BW

- <http://www.oracle.com/us/solutions/sap/nl26-49-oradb4sap-imtoolkit-3716674.pdf>

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