



SAP on Oracle Development Update

February 2025

PUBLIC



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CHAPTER 1

Database Support Timelines



Oracle Database 12c Release 1

End of Extended Support!

SUPPORT TIMELINE ORACLE DATABASE 12.1.0.2

Extended Support

Start	1 August 2019
End	31 July 2022

- Extended Support ended 31 July 2022!
- Sustaining Support as of 1 August 2022
 - No more patches nor SBPs
 - No support for new OS versions

Oracle Database 19c^{1,2}

Premier Support extended into 2029!

SUPPORT TIMELINE ORACLE DATABASE 19c

Premier Support

Start	1 March 2019
End	31 December 2029

Extended Support

Start	1 January 2030
End	31 December 2032

- HEADS-UP: Entire 19c ES will be subject to **charges!**

¹ Oracle 19c is a Long Term Support Release

² Oracle 19c is last release to support Solaris x64, see SAP Hot News 3366854

CHAPTER 2

Oracle Database 23ai [and beyond]



SAP Certification Roadmap for Oracle Database 23ai

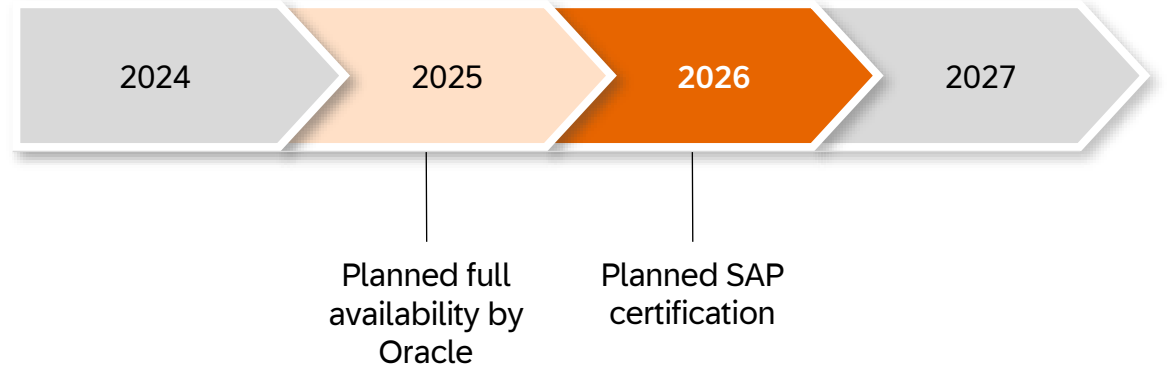
SAP certification for Oracle Database 23ai...

- ...starts with availability from Oracle on ALL on-premise OS platforms supported by SAP¹
 - Full availability is planned for CY2025
- ...is planned within 6 months after the on-premise platform availability
 - Certification is planned for CY2026
- ...will cover all platforms²

REGULARLY CHECK OUR ROADMAP NOTES FOR UPDATES:

- SAP 23ai Roadmap Notes 2799958 and 2606828

ORACLE DATABASE 23ai CERTIFICATION ROADMAP



¹ Linux, Windows, Solaris SPARC, AIX, HP-UX ² Oracle Cloud Infrastructure, Engineered Systems, supported IaaS platforms, on-premise platforms

Upcoming Tenant Architecture

Non-container architecture no longer available

Oracle Multitenant architecture mandatory

- Non-container database becomes Single Tenant database
- Existing databases must be migrated

NEW INSTALLATIONS

- SWPM automatically creates Single Tenant

EXISTING INSTALLATIONS

- Migration to Single Tenant **must** happen in 19c¹
 - Based on Oracle AutoUpgrade Tool
 - One-step migration within database upgrade to 23ai supported
- 19c **mandatory** stage for upgrade to any version beyond

¹ No simultaneous migration from Single Instance to RAC, File System to ASM, and vice versa. Manual migration supported

Upcoming Tenant Architecture

Operating System User Concepts

Switch to Multitenant requires new concept:

- Deprecated user concept “SAP Classic” no longer supported
- Tenant architecture requires SAP user concept “Oracle Standard”
 - Software owner is ‘oracle’

FOR DETAILS SEE

- SAP Note 1915323

Licensing

Three tenants included for free

- CAUTION: Oracle Multitenant option is **cost-liable**
- No Multitenant option required for up to 3 tenants per container database

CHAPTER 3

Infrastructure as a Service



Oracle Cloud Infrastructure Compute (OCI)

RUN ENTERPRISE WORKLOADS IN THE CLOUD

Oracle Cloud Infrastructure Compute

is supported as follows:

- Oracle Database 19c
- All features/options¹ supported for SAP on premise are available with OCI
- Oracle Linux 6 through 9²

SUPPORTED SAP PRODUCTS (EXCERPT)

- SAP NetWeaver 7.0X³, 7.X^{4,5} and products/solutions based hereupon
- SAP BusinessObjects BI Platform
- SAP JCo, ...

FOR DETAILS SEE

- SAP Notes 2474949 and 2520061
- Knowledge Base Article 2650732
- Oracle technical briefs on www.oracle.com/sap/cloud

¹ except RAC, except ASM ² Oracle Linux 8 requires UEKR6 ³ AS ABAP only

⁴ Unicode only ⁵ Minimum SAP Host Agent 7.21 patch level 30 for Bare Metal and patch level 35 for Virtual Machine shapes

Oracle Cloud Infrastructure Compute (OCI)

CERTIFIED VIRTUAL MACHINE SHAPES

Shape	OCPU	Memory	Database Storage	SAPS
VM.Standard.E5.Flex	$2 \leq N \leq 94$	$N * 16 \text{ GB}^1$	512 TB Block Storage	$274,320 * N / 94$
VM.Standard.E4.Flex	$33 \leq N \leq 64$	$N * 16 \text{ GB}$	512 TB Block Storage	$125,630 * N / 64$
VM.Standard.E4.Flex	$2 \leq N \leq 32$	$N * 16 \text{ GB}$	512 TB Block Storage	$74,930 * N / 32$

CERTIFIED BARE METAL MACHINE SHAPES ²

Shape	OCPU	Memory	Database Storage	SAPS
BM.Standard.E5.192	192	2304 GB	1 PB Block Storage	559,580
BM.Standard.E4.128	128	2048 GB	1 PB Block Storage	258,650
BM.Standard3.64	64	1024 GB	1 PB Block Storage	147,680

¹ max. 1,049 GB ² No support for any virtualization technology on Oracle Cloud Infrastructure Bare Metal Compute instances

Oracle Database Exadata Cloud Service (ExaCS)

EXADATA DATABASE MACHINE IN THE ORACLE CLOUD

Oracle Database Exadata Cloud Service

Support for ExaCS 6 through X9M

- Oracle Database 19c
- All features/options supported for SAP on premise are available with ExaCS¹
 - including RAC
- Oracle Linux 8

SUPPORTED SAP PRODUCTS (DATABASE ONLY)

- SAP NetWeaver 7.0X², 7.X^{3,4} and products/solutions based hereupon
- SAP BusinessObjects BI Platform 4.2 and above

FOR DETAILS SEE

- SAP Note 2614028
- Oracle technical briefs on www.oracle.com/sap/cloud

¹ Minimum ExaCS 17.4.2.2 ² AS ABAP only ³ Unicode only ⁴ Minimum SAP Host Agent 7.21 patch level 35

Oracle Database Exadata Cloud Service (ExaCS)

SUPPORTED ORACLE EXA-CS SHAPES AND MACHINE TYPES (EXCERPT)

Shape	Number of Cores	Memory	Database Storage	SAPS
Exadata.X9M/Half Rack X9M	$8 \leq N \leq 504$	5,560 GB	381 TB – 4 PB on Storage Servers	$856,520 * N / 504$
Exadata.X9M/Quarter Rack X9M	$4 \leq N \leq 252$	2,780 GB	190 TB – 4 PB on Storage Servers	$444,370 * N / 252$
Exadata.X9M (Elastic)	$4 \leq N \leq 504$	2,780 GB – 5,560 GB	190 TB – 4 PB on Storage Servers	$214,130 * N / 126$
Exadata.X8M/Half Rack X8M	$16 \leq N \leq 200$	5,560 GB	299 TB on Storage Servers	$298,600 * N / 200$
Exadata.X8M/Quarter Rack X8M	$8 \leq N \leq 100$	2,780 GB	149 TB on Storage Servers	$149,300 * N / 100$
Exadata.X8M (Elastic)	$8 \leq N \leq 200$	2,780 GB – 5,560 GB	149 TB – 3 PB on Storage Servers	$74,650 * N / 50$
Exadata Base System	$8 \leq N \leq 48$	720 GB	74 TB on Storage Servers	$149,300 * N / 48$

Oracle Database Exadata Cloud@Customer (ExaCC)

EXADATA CLOUD SERVICE IN CUSTOMER DATA CENTER

Oracle Database Exadata Cloud@Customer Support for ExaCC X8M Gen 2¹ up to X11M^{NEW!}

- Oracle Database 19c
- All features/options supported for SAP on premise are available with ExaCC²
 - including RAC
- Oracle Linux 7 and 8³

SUPPORTED SAP PRODUCTS (DATABASE ONLY)

- SAP NetWeaver 7.0X⁴, 7.X^{5,6} and products/solutions based hereupon
- SAP BusinessObjects BI Platform 4.2 and above

FOR DETAILS SEE

- SAP Note 2956661
- Oracle technical briefs on www.oracle.com/sap/cloud

¹ No support for ExaCC X6, X7, X8 and X8 Gen 1 ² Minimum ExaCC 19.4.3.3.0 ³ ExaCC X10M, X11M: Oracle Linux 8 only ⁴ AS ABAP only

⁵ No non-Unicode SAP instance on ExaCC nor on Oracle Linux ⁶ Minimum SAP Host Agent 7.21 patch level 35

Oracle Database Exadata Cloud@Customer (ExaCC)

SUPPORTED ORACLE EXA-CC SHAPES AND MACHINE TYPES

Shape	Number of Cores	Memory	Database Storage
ExadataCC.X11M (. / -L / -XL) NEW!	4 ≤ N ≤ 6,080	1,390 GB / 2,090 GB / 2,800 GB ¹	240 TB – 5,120 TB on Storage Servers
ExadataCC.X10M (. / -L / -XL)	4 ≤ N ≤ 6,080	1,390 GB / 2,090 GB / 2,800 GB ¹	240 TB – 5,120 TB on Storage Servers
ExadataCC.FullX9M.496	16 ≤ N ≤ 496	11,120 GB	769 TB on Storage Servers
ExadataCC.HalfX9M.248	8 ≤ N ≤ 248	5,560 GB	384 TB on Storage Servers
ExadataCC.QuarterX9M.124	4 ≤ N ≤ 124	2,780 GB	192 TB on Storage Servers
ExadataCC.BaseX9M.48	4 ≤ N ≤ 48	656 GB	74 TB on Storage Servers
ExadataCC.FullX8M.400	32 ≤ N ≤ 400	11,120 GB	598 TB on Storage Servers
ExadataCC.HalfX8M.200	16 ≤ N ≤ 200	5,560 GB	299 TB on Storage Servers
ExadataCC.QuarterX8M.100	8 ≤ N ≤ 100	2,780 GB	149 TB on Storage Servers
ExadataCC.BaseX8M.48	8 ≤ N ≤ 48	656 GB	74 TB on Storage Servers

¹ Per node. Minimum 2 nodes, up to 32 nodes

Google Cloud Platform (GCP)

Google Cloud Platform

is supported with SAP as follows:

- Oracle Database 19c
- Single Instance only (no RAC)
- Unicode only

SUPPORTED OPERATING SYSTEM VERSIONS

- Oracle Linux 8 and 9

FOR DETAILS SEE

- SAP Note 3559536

Microsoft Azure

Microsoft Azure

is supported with SAP as follows:

- Oracle Database 19c
- Single Instance only (no RAC)

SUPPORTED OPERATING SYSTEM VERSIONS

- Microsoft Windows Server
 - 2012 R2
 - 2016, 2019 and 2022
- Oracle Linux 7, 8 and 9
 - Including Oracle ASM support

FOR DETAILS SEE

- SAP Notes 1928533 and 2039619

Amazon Web Services (AWS)

Amazon Web Services

are supported with SAP as follows:

- Oracle Database 19c
- Single Instance only (no RAC)
- Unicode only
- Amazon Web Services EC2 only
 - No support for AWS RDS

SUPPORTED OPERATING SYSTEM VERSIONS

- Oracle Linux 8 and 9

FOR DETAILS SEE

- SAP Notes 2358420 and 1656099

CHAPTER 4

Engineered Systems



ENGINEERED SYSTEMS

Exadata

CLUSTERED DATABASE AND STORAGE SERVER

Oracle Exadata Database Machine

Support for X2-2|8 through X11M **NEW!**

- X11M certified for SAP in February 2025

FOR DETAILS SEE

- SAP Note 1590515
- Oracle Exadata technical briefs on www.oracle.com/sap/cloud

ENGINEERED SYSTEMS

Exalogic

CLUSTERED APPLICATION SERVER

Oracle Exalogic

Support for X2-2 through X5-2

- Only in combination with Exadata

FOR DETAILS SEE

- SAP Note 1617188

ENGINEERED SYSTEMS

Database Appliance (ODA)

TWO-NODE CLUSTERED DATABASE SERVER

Oracle Database Appliance Support for V1, X3-2 through X10

- X10 certified for SAP in August 2024

FOR DETAILS SEE

- SAP Notes 2664704, 2929109 and 3250840
- Oracle ODA technical briefs on www.oracle.com/sap/cloud

ENGINEERED SYSTEMS

Private Cloud Appliance (OPCA)

ENGINEERED SYSTEM DESIGNED FOR VIRZUALIZATION

Oracle Private Cloud Appliance Support for X3-2 through X8-2

- X8 certified for SAP in October 2020

FOR DETAILS SEE

- SAP Note 2052912

CHAPTER 5

Miscellaneous Topics



Application Continuity (AC)

EARLY CUSTOMER AVAILABILITY

Oracle Application Continuity Hides Interruptions in Data Tier

- Intended to mask planned maintenance activities only, on following levels:
 - Oracle database
 - operating system
 - system software and hardware
- Automatic replay of interrupted database requests
 - No data loss!
 - No data inconsistency!

PREREQUISITES

- SAP NetWeaver Application Server 7.50¹
 - SAP Kernels 7.53 and 7.54
 - Special version of SAP DBSL for Oracle
- SAP Oracle Database Instant Client
- Oracle Real Application Clusters 19c²

FOR DETAILS SEE

- SAP Note 3234354

¹ Both SAP NetWeaver AS ABAP and AS Java ² On Linux platform (Exadata preferred)

SAP Kernel 7.54

SAP Kernel 7.54 now available

To replace older kernels 7.40 through 7.53

- 7.54 is a downward-compatible kernel

MOTIVATION

- SAP able to use more recent OS and compiler versions in 7.54
- Minimum OS and DB versions have been raised accordingly!

KERNEL 7.54 ON ORACLE

- Oracle minimum version for 7.54 is **19.5**¹

FOR DETAILS SEE

- SAP Product Availability Matrix
- SAP Note 3156866

¹ Oracle minimum client version is 19, too

New Oracle Software Download Policy

HEADS-UP FOR ORACLE DIRECT CUSTOMERS

Downloads from SWDC may get blocked!

Starting March 1, 2024

- Affects all Oracle software
- including SAP Bundle Patches!

FOR DETAILS SEE

- SAP Hot News Note 3406108

WHICH CUSTOMER LICENSES ARE AFFECTED?

- Any SAP Runtime License
switched to Oracle Full Use License
after June 1, 2022
- Including all future switches!

HOW TO RESOLVE?

- Re-submit your
Oracle Customer Support Identifier (CSI)
number to SAP.

SAP on Oracle Community

SAP on Oracle Community Page

Find news, discussions and resources related to SAP on Oracle at

community.sap.com/topics/oracle

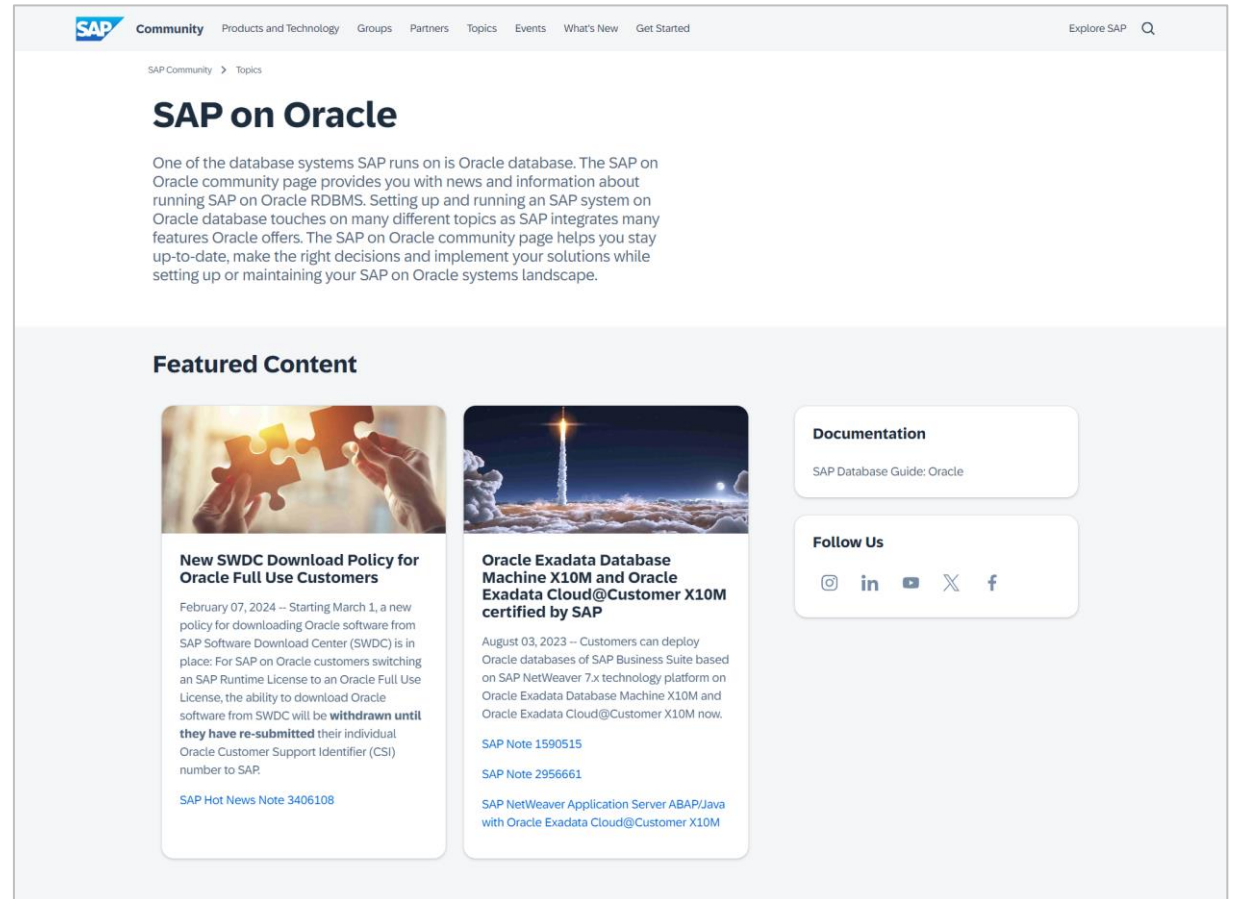
NAVIGATION FROM SAP COMMUNITY HOME PAGE

go.sap.com

→ Community

→ Browse Topics

→ Search for “SAP on Oracle”



A P P E N D I X

Legacy Slides

The following chapters refer to older SAP on Oracle topics but are kept in this presentation for your kind reference.

These slides may refer to outdated SAP or Oracle versions, however.

CHAPTER 6

Oracle Multitenant



Certification

Oracle Multitenant

Certified for SAP since February 2017

MINIMUM REQUIREMENTS AND LIMITATIONS

- Oracle Database 12c Release 12.1.0.2¹
- SAP NetWeaver 7.40 with Kernel 7.45² (210)
- SWPM 1.0 SP19, SUM 1.0 SP19³
- BR*Tools 7.40 Patch 30
- SAP notes to apply

FOR DETAILS SEE

- SAP Note 2336881

REQUIRED LICENSES

- Oracle Multitenant comes at a cost for both Oracle direct and SAP ASFU customers
 - No license required when using up to 3 PDBs per CDB⁴
- Oracle Full Use customers need to purchase:
 - Oracle Multitenant Option
- SAP ASFU customers need to purchase:
 - SAP “Oracle Multitenant License Package”

¹ plus specific SAP Database Bundle Patch ² Unicode only ³ Contained in SAP Software Logistics (SL) Tool Set 1.0 SP 19 ⁴ not for Oracle 12

Restrictions

Oracle Multitenant with SAP

is subject to the following restrictions:

- Unix: User concept “Oracle Standard” only
- No mix of OLTP and OLAP PDBs in same CDB

FOR DETAILS SEE

- SAP Note 2336881

Restrictions planned to be **lifted**:

- No RAC Support. SI/FS and SI/ASM only
- Limited support for Engineered Systems:
 - SI/ASM only
- No support for
 - Windows Cluster
 - Transparent Data Encryption (TDE)
- Limitations regarding SAP Host Agent

CHAPTER 7

Oracle Database In-Memory



Certification

Oracle Database In-Memory Certified for SAP since 30 June 2015

MINIMUM REQUIREMENTS

- Oracle Database 12c Release 12.1.0.2¹
 - including RAC 12c and Engineered Systems
- SAP NW 7.X with kernel 7.21_EXT
 - DDIC < 7.40 SP12 has limited IM support

FOR DETAILS SEE

- SAP Note 2178980
- Oracle technical briefs on www.oracle.com/sap/cloud

SUPPORTED SAP PRODUCTS

- Business Suite based on SAP NetWeaver
 - ERP, CRM, SRM, SCM, BW, PI, ...
 - Industry solutions
- Check SAP Product Availability Matrix (PAM) for full list

¹ with June 2015 SAP Bundle Patch (Unix) or Database Bundle Patch 12.1.0.2.6 (Windows)

Two Approaches

APPROACH 1

Using the Database In-Memory Advisor

SITUATION

- Tables/partitions recommended/suitable for In-Memory are yet unknown

ACTION¹

- Run IM Advisor for recommendations
 - Adjusted to SAP specifications
- Relies on 2–3 days of Automatic Workload Repository (AWR) data

APPROACH 2

Object candidates for In-Memory are known

SITUATION

- Reports with long running queries processing large amounts of data have already been identified

ACTION¹

- Put these tables/partitions in IM column store
- Use SAP_IM_ADV package² for proper column store sizing

¹ See Oracle In-Memory technical briefs on www.oracle.com/sap/cloud for detailed procedure ² included in SAP Bundle Patch

Conventions

Index Design

Changes to SAP standard¹ index design are not allowed:

- No dropping
- No setting invisible or unusable

Individual Columns

All columns of standard tables must be loaded into In-Memory column store

- No loading of individual columns
- No exclusion of individual columns

Database Buffer Cache

Reducing buffer cache size in favor of IM column store is not allowed

- Always use additional memory for IM

SAP BW Aggregates

Dropping all aggregates from an existing BW system is not recommended

- Aggregates are designed for providing good throughput in concurrent user environments

¹ Custom indices in customer namespace are not affected, changes are allowed

Licenses

Oracle Database In-Memory requires the following licenses:

- Oracle Full Use customers:
 - Oracle Database In-Memory Option
- SAP ASFU customers:
 - SAP “Oracle In-Memory License Package”See SAP price list for details
- 16 GB of In-Memory Column Store are free!^{1,2}

Oracle Database In-Memory Advisor requires the following licenses:

- Oracle Full Use customers:
 - Oracle Tuning Pack
 - Oracle Diagnostics Pack
- These packs are contained in SAP ASFU license

¹ i.e. no In-Memory license required for both Oracle Full Use and SAP ASFU customers ² Oracle Database 19.8 or higher

CHAPTER 8

Oracle Advanced Data Optimization



Certification

Oracle Advanced Data Optimization Certified for SAP since 31 December 2015

MINIMUM REQUIREMENTS AND LIMITATIONS

- Oracle Database 12c Release 12.1.0.2¹
- SAP NetWeaver 7.40 SP12, 7.50 SP2
- Oracle Hybrid Columnar Compression (HCC):
 - only in combination with ADO
 - limited to row level locking

REQUIRED LICENSES

- **Oracle Full Use** customers need to purchase:
 - Oracle Advanced Compression Option (ACO)
- This option is **included** in **SAP ASFU** license

FOR DETAILS SEE

- SAP Note 2254866
- Oracle technical briefs on www.oracle.com/sap/cloud

¹ with May 2016 SBP for Unix/Windows Patch Bundle 1608

CHAPTER 9

SAP NetWeaver Business Intelligence



Recent Optimizations

Recent Optimizations in SAP NW BI

Introducing Flat InfoCubes, FEMS PushDown and In-Memory Dynamic Scans:

FLAT INFOCUBES

- Standard InfoCubes

SAP Note 2335159, 7.40 SP15, 7.50 SP04

- Semantically Partitioned Objects (SPOs)

SAP Note 2711358, 7.40 SP22, 7.50 SP15

- Mass Conversion

SAP Note 2523154, 7.40 SP18, 7.50 SP10

FEMS PUSHDOWN

SAP Note 2816467, 7.50 SP15

- Flat Cubes

- Data Store Objects (DSOs)

IN-MEMORY DYNAMIC SCANS (18c)

SAP Note 2335159, 7.40 SP15, 7.50 SP04

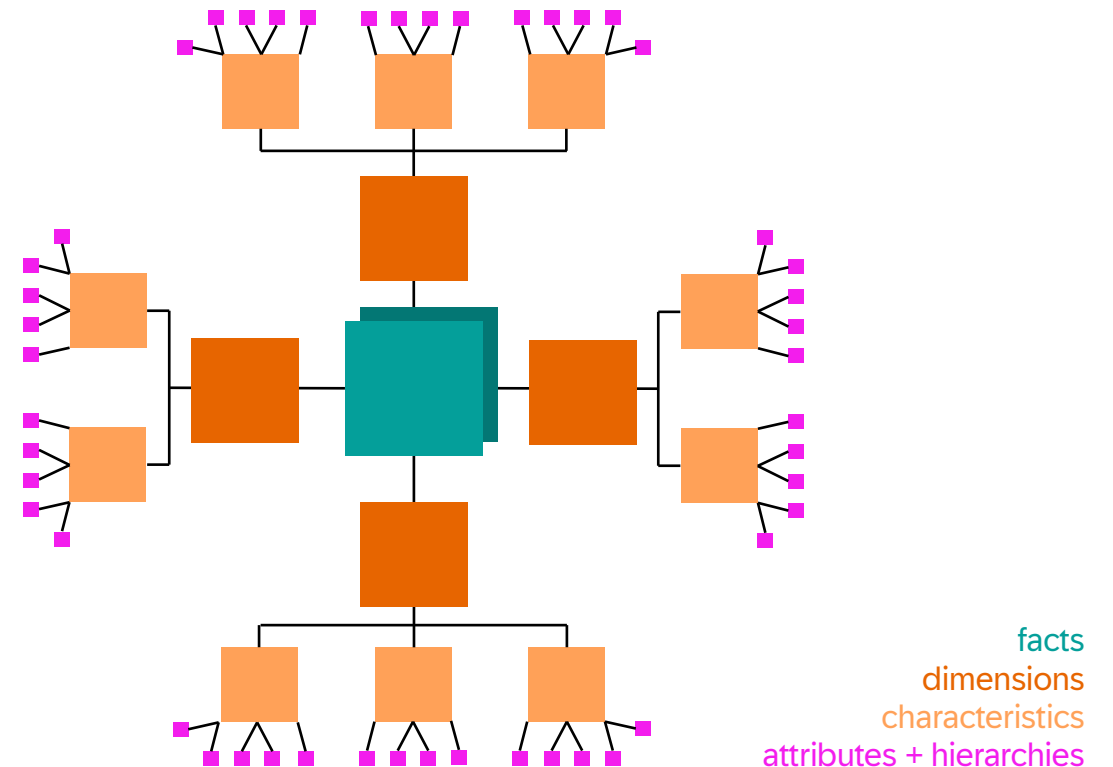
ALL THESE OPTIMIZATIONS ARE BASED ON ORACLE DATABASE IN-MEMORY

Classic InfoCubes

Classic InfoCubes follow SAP's proprietary, extended Star scheme

Optimized for row-based, classic RDBMS

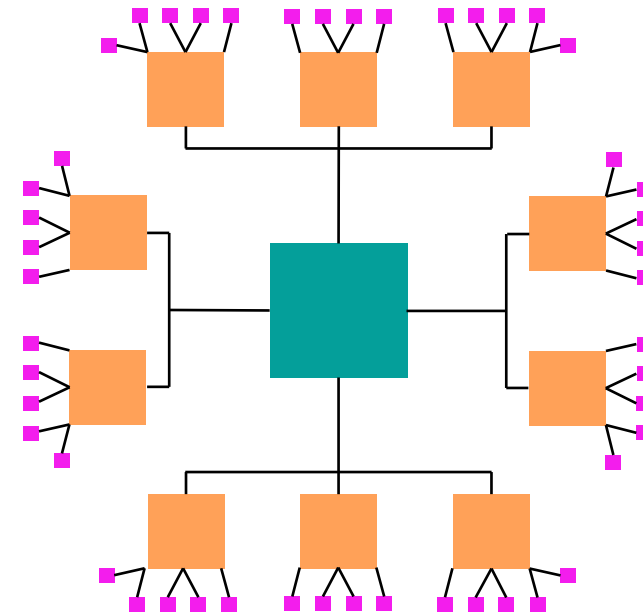
- 2 fact tables
 - E fact table: Read-optimized partitioning
 - F fact table: Write/Delete-optimized partitioning
- Dimension tables
 - as grouping sets of characteristics
- Shared master tables



Flat InfoCubes

Flat InfoCubes are simplification of classic scheme
Optimized for columnar and hybrid RDBMS

- 1 fact tables
 - Write/Delete no longer harms read performance
 - No separation into E and F fact tables
 - Two-dimensionally partitioned using sub-partitioning
- No dimension tables¹
 - Dimensions become pure meta data
 - Obsolete need to look-up/create DIMIDs strongly boosts update performance
- Much higher query and load performance
 - Due to in-memory technology
 - Less joins; no indices on fact tables



facts
characteristics
attributes + hierarchies

¹ SAP package dimension remains

Flat InfoCubes with SAP on Oracle

Available from SAP NetWeaver Business Intelligence 7.40

Relies on Oracle Database In-Memory technology

- Supported from...
 - SAP NW BI 7.40 SP15
 - SAP NW BI 7.50 SP04
- Oracle Database 12c Release 1 (12.1.0.2)¹ and higher
- Oracle Database In-Memory mandatory
- Automatic mass conversion available
- Support for Semantically Partitioned Objects (SPOs)

FOR DETAILS SEE

- SAP Notes 2335159, 2523154 and 2711358

¹ requires May 2016 SAP Bundle Patch for Oracle Database, or higher

Flat InfoCubes – Real Customer Scenario

Data Volume: 9,000,000 Rows

STAR SCHEMA

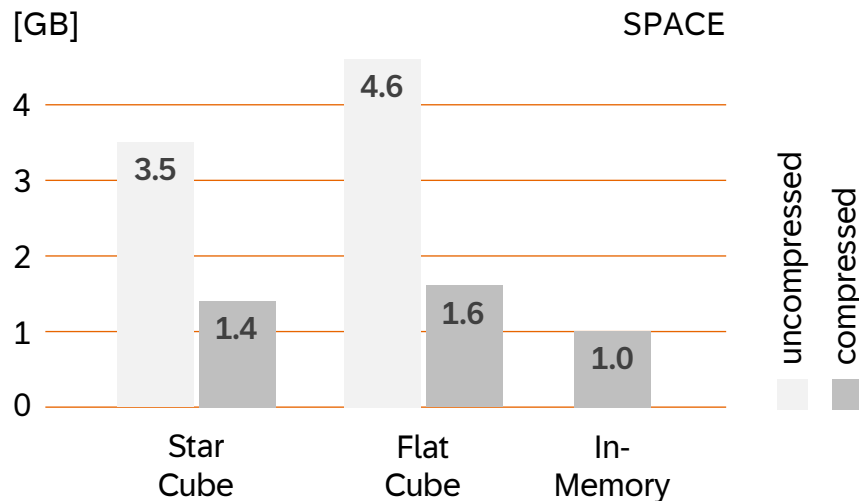
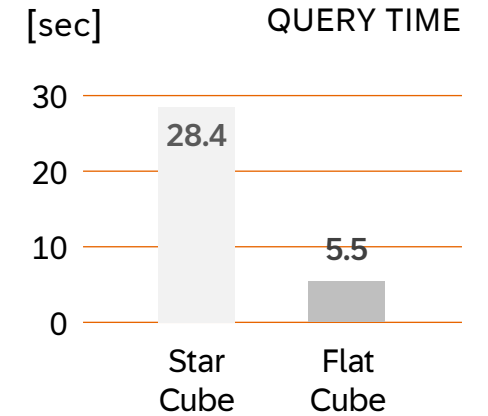
- 12 Dimensions
- 129 Measurements
- 11 Join Dimensions

FLAT SCHEMA

- 46 Key Values
- 129 Measurements
- 1 Join Dimension

Query:

- Many result columns
- 3 attribute tables



In-Memory Flat Cube Query Characteristics:

- The more data,...
 - The less number of result columns,...
 - The more joins,...
 - The more complex the predicates,...
- ...the higher the improvement!

FEMS PushDown

What is FEMS (Form Element Selection)?

Converts a row-based database result into a cell-formatted (“spreadsheet-like”) BI client result

- Existing problem:
 - Time and I/O consuming processing on standard InfoCubes and DSOs in database
 - Large amount of data transferred between database and BW application servers
 - Complex and time-consuming processing of large dataset within BW application server
- New solution with PushDown:
 - Perform all required processing and formatting on Flat InfoCubes and DSOs within database in-memory

Performance Improvement:

10x

for BW FEMS queries

Oracle Database 18c In-Memory Dynamic Scans

What are In-Memory Dynamic Scans?

Parallelization of in-memory scan using light-weight threads

- Number of active threads controlled by resource manager
- Efficient utilization of CPU resources to maximize in-memory scan performance

Performance Improvement:

2x–3x

for BW queries using in-memory

CHAPTER 10

ABAP Core Data Services



Change in Paradigm

Application server's purpose is to relieve the database server, but:
Today the database server is no longer the critical resource!

NEW PARADIGM:

Data-Centric Approach

Push calculations/business logic from the application server
down to the database server

- Eliminates data traffic...
- ...and allows for local data access optimization

“Bring the Algorithm
to the Data.”

The ABAP Core Data Services (CDS)

Dynamic, database-side objects,
comprising...

- views
- views with parameters
 - e.g. database table functions
- scalar functions

and implementing simple to most complex
business logic.

AVAILABLE FROM SAP NETWEAVER 7.40 SP8
EXTENDED IN SAP NETWEAVER 7.50 | AS ABAP 7.51

¹ as of SAP NetWeaver 7.50 ² as of AS ABAP 7.51

EXAMPLES

- Functions:
 - CONCAT, REPLACE, SUBSTRING, LPAD
 - UNIT_CONVERSION
 - CURRENCY_CONVERSION
- Global Temporary Tables¹
- Session variables¹
- Time¹ and Timezone² functions
- ...

SEE THE ABAP DOCUMENTATION FOR A FULL LIST OF
CDS FUNCTIONALITY