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Joined Compression Proof of Concept (PoC) Siemens Healthcare, ISE and Oracle

SIEMENS

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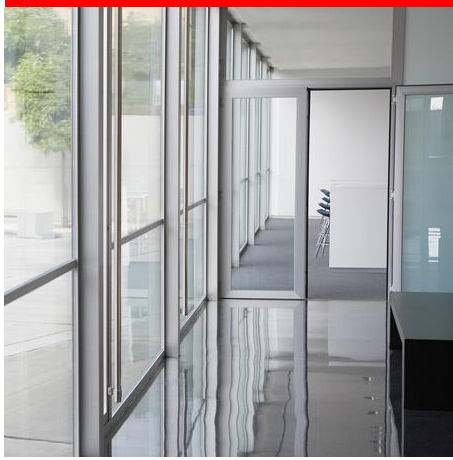
Heinz Mielimonka – Oracle Germany

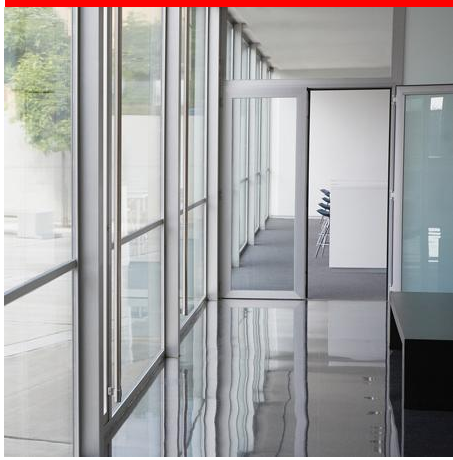
ise®

Agenda



- Context
- EXADATA Proof of Concept (PoC)
- Results
- Summary

Agenda



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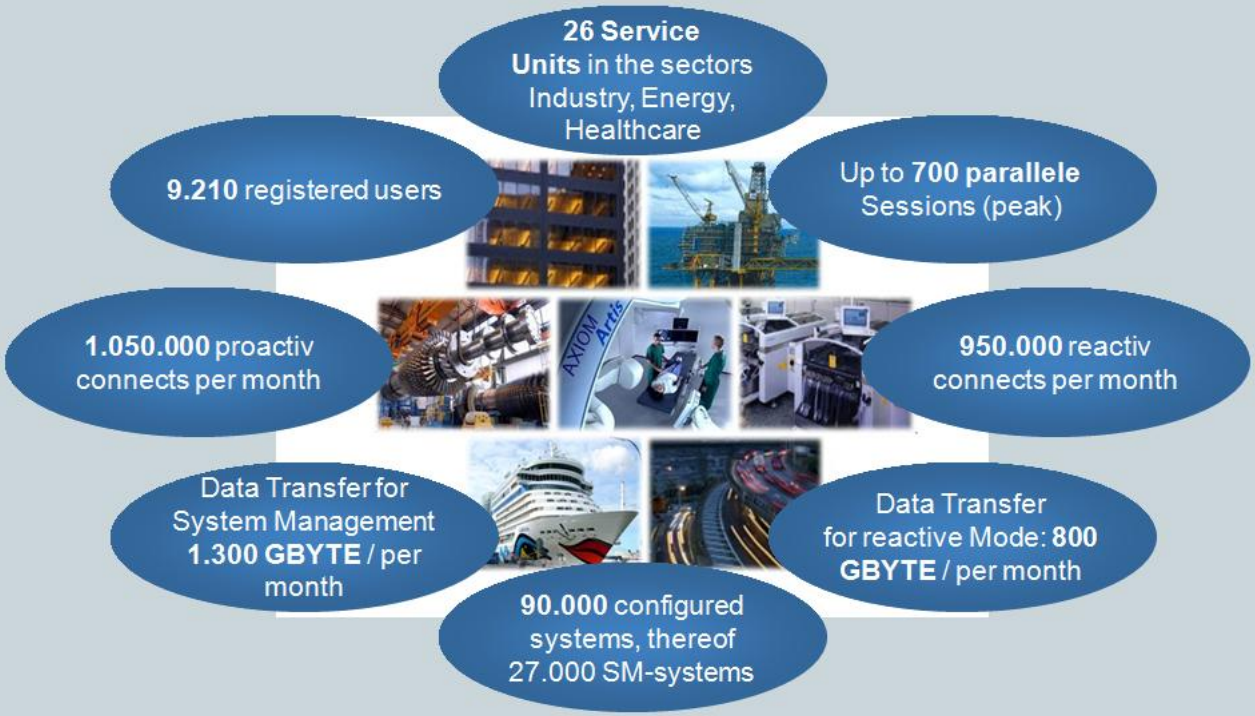
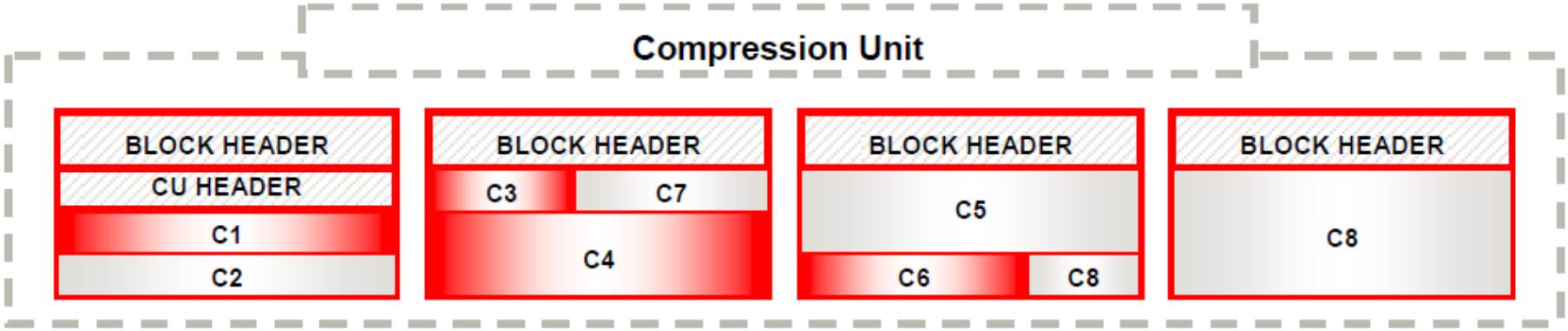
Remote Service @ Siemens

A Solution which is in place since 2007 in all Siemens Sectors

SIEMENS



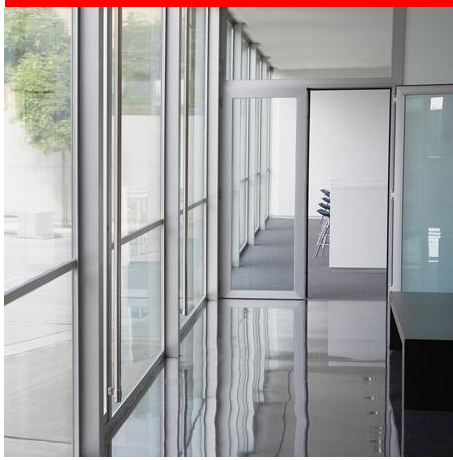
Hybrid Columnar Compression (HCC)



Oracle's Exadata Hybrid Columnar Compression technology is a new method for organizing data within a database block. As the name implies, this technology utilizes a combination of both row and columnar methods for storing data. This hybrid, or best of both worlds, approach achieves the compression benefits of columnar storage, while avoiding the performance shortfalls of a pure columnar format. A logical construct called the compression unit is used to store a set of Exadata Hybrid Columnar-compressed rows. When data is loaded, column values are detached from the set of rows, ordered and grouped together and then compressed. After the column data for a set of rows has been compressed, it is fit into the compression unit.

Source: Exadata Hybrid Columnar Compression

Agenda



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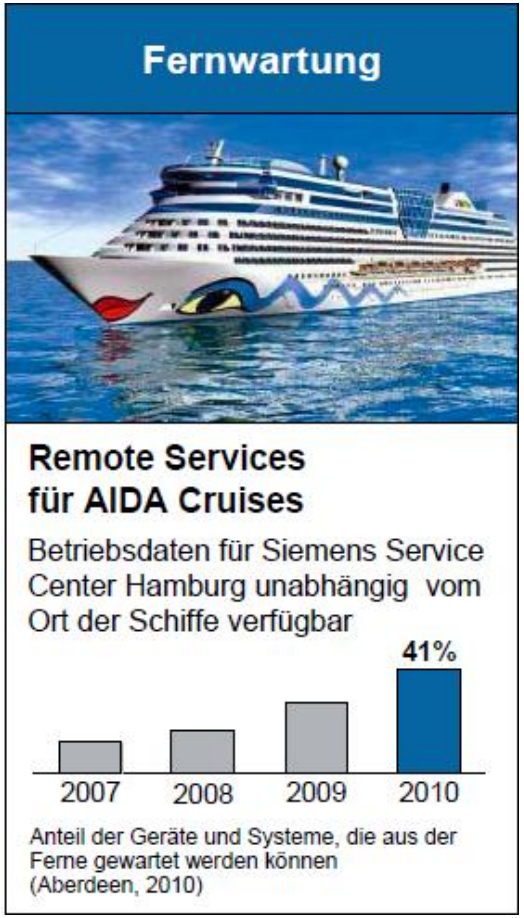
Test set-up
Hardware and Database

- EXADATA V2 Quarter Rack
  - 2 Compute Nodes (Database Server)
    - 4*Intel Xeon E5540 2.53GHz CPUs with 4 cores each
    - 72GB RAM
  - 2 x Infiniband QDR 40Gbit Connection
  - 3 Exadata Storage Cells (Storage Server)
    - 4*Intel Xeon E5540 2.53GHz CPUs with 4 cores each
    - 24GB RAM
    - 12 disks, 600GB 15k rpm
    - 4*F20 Smart Flash Cache PCI Cards 96GB
- Software
  - Oracle Database Enterprise Edition 11.2.0.2 Bundle Patch 11 (24 GB sga_target)
  - Oracle Advanced Compression option, Real Application Cluster, Archive Log ON
  - Exadata Storage Cell Version 11.2.2.4.0

Test set-up
Representative Test data

- Complete Dataset
  - 8.026.398.615 records
    in thousands of files and hundreds of directories
  - 61 GB data on disk (compressed)
  - 1,3 TB data on disk (uncompressed)
- Dataset of one single day
  - 15 GB data on disk (uncompressed)
- Record structure
  - Serial
  - severity flag
  - log_date
  - log_time
  - Component1
  - Component2
  - log_message



Test plan
setup

- Create user (testhc)
- Create tablespaces
  - No compression
  - Low compression level for query operations
  - High compression level for query operations
  - Low compression level for archive operations
  - High compression level for archive operations
- Create tables
  - No compression
  - Low compression level for query operations
  - High compression level for query operations
  - Low compression level for archive operations
  - High compression level for archive operations

Test plan
acting on complete dataset

- Load 1,3 TB into uncompressed Table using sql*loader
- Compress (use create table as select - CTAS)
  - Low compression level for query operations
  - High compression level for query operations
  - Low compression level for archive operations
  - High compression level for archive operations
- Run reference select on
  - No compression
  - Low compression level for query operations
  - High compression level for query operations
  - Low compression level for archive operations
  - High compression level for archive operations

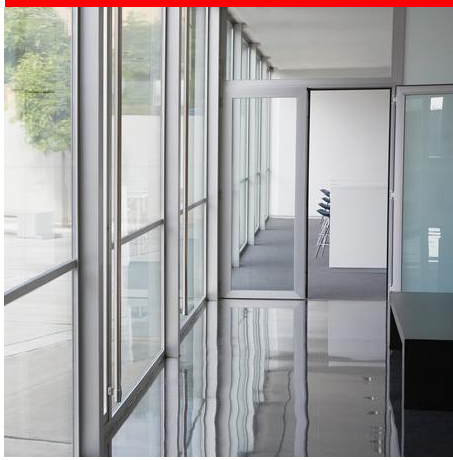
Test plan
acting on dataset of one single day

- Load 15 GB into Tables using sql*loader
  - Low compression level for query operations
  - High compression level for query operations
  - Low compression level for archive operations
  - High compression level for archive operations

Test plan
Measured values

- Values
  - Disk space
  - CPU
  - Memory
  - I / O
  - Performance
- Tools
  - Oracle Grid Control
  - Oracle AWR Report

Agenda



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Create Tablespaces

		mi:ss.ms
• Create Tablespace	2.097.152 MB	32:14.23
• Create Tablespace	204.800 MB	02:57.53

Data loading

	hh:mi:ss
• Initial loading (1,4 TB) into uncompressed table	06:55:56
• Daily load (15 GB) Low compression level for query operations	00:01:45
• Daily load (15 GB) High compression level for query operations	00:02:05
• Daily load (15 GB) Low compression level for archive operations	00:02:10
• Daily load (15 GB) High compression level for archive operations	00:04:32

Reference Query Results (8.026.398.615 records)

	mi:ss.ms
• No compression	05:32.82
• Low compression level for query operations	00:56.70
• High compression level for query operations	00:24.61
• Low compression level for archive operations	00:22.71
• High compression level for archive operations	00:16.61

Compression volume
numbers

• Compression (disk)	62.464,00 MB
• No compression (disk)	1.363.148,80 MB
• No compression (database)	1.412.353,80 MB
• Low compression level for query operations	193.891,20 MB
• High compression level for query operations	81.604,10 MB
• Low compression level for archive operations	71.956,20 MB
• High compression level for archive operations	52.871,10 MB

Compression volume
Screenshot Enterprise manager

Name	Allocated Size (MB)	Space Used (MB)	Allocated Space Used (%)
HC_NORMAL	2,097,152.0	1,412,353.8	67.3
HC_COMPRESS1	204,800.0	193,891.2	94.7
HC_COMPRESS2	204,800.0	81,604.1	39.8
HC_COMPRESS3	204,800.0	71,956.2	35.1
HC_COMPRESS4	204,800.0	52,871.1	25.8

Compression rates
estimate 40 GB vs. real 1,4 TB

- Low compression level for query operations 82 % vs. 86 %
- High compression level for query operations 92 % vs. 94 %
- Low compression level for archive operations 93 % vs. 95 %
- High compression level for archive operations 96 % vs. 96 %

Reference Query (8.026.398.615 records)
uncompressed

Overview

SQL ID	fuduxddn5c9xz
Parallel	32 2
Execution Started	Wed Oct 12, 2011 4:41:38 PM
Last Refresh Time	Wed Oct 12, 2011 4:45:08 PM
Execution ID	16777216
User	SYS
Fetch Calls	0

Time & Wait Statistics

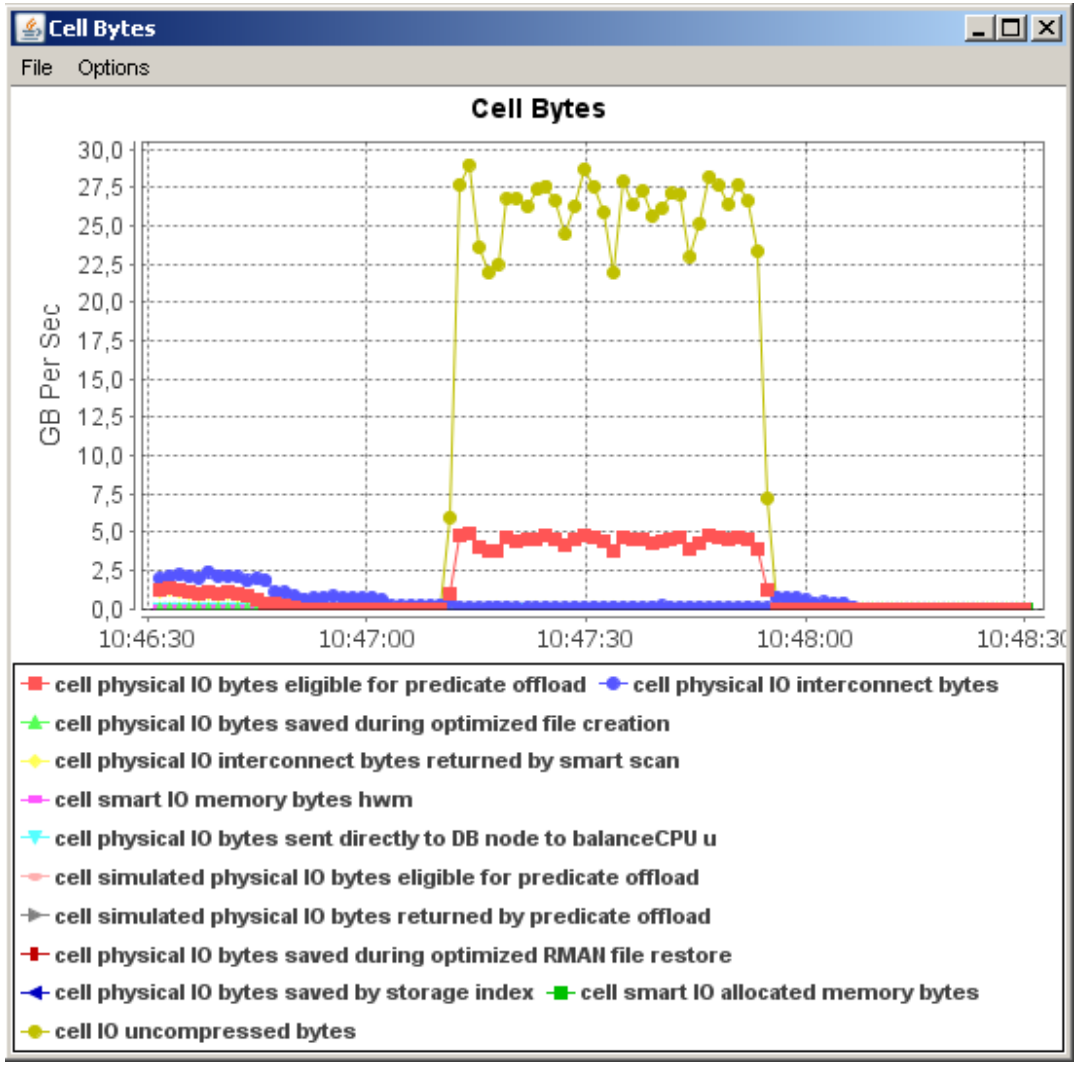
Duration	3.5m
Database Time	1.8h
PL/SQL & Java	0.0s
Wait Activity %	100

IO Statistics

Buffer Gets	141M
IO Requests	967K
IO Bytes	851GB
Cell Offload Efficiency	93%

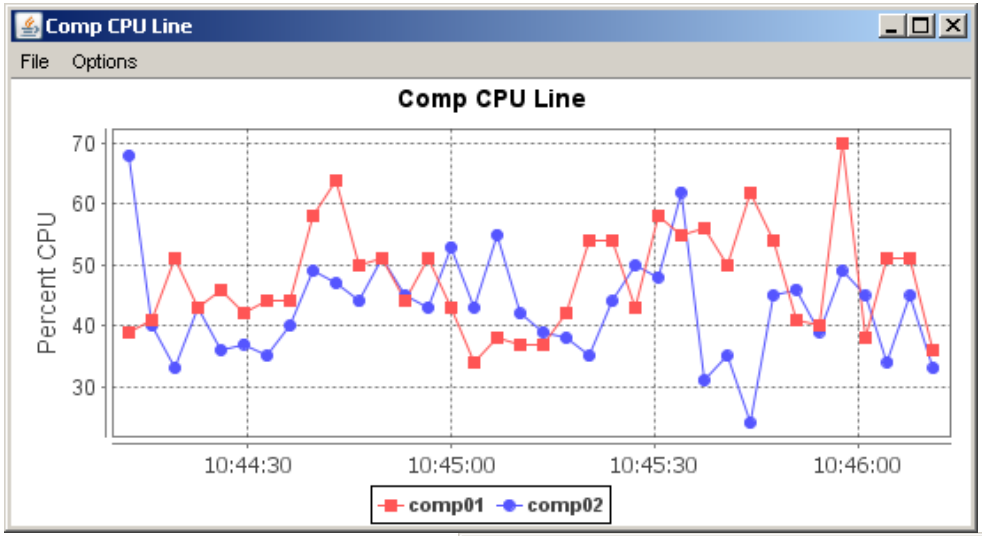
Parallel Server	Database Time	Wait Activity %	IO Requests	Cell Offload Efficiency	Buffer Gets
All Parallel Servers					
Instance 1					
Parallel Coordinator	2.6s				9,065
Parallel Set 1					
Parallel Server 1 (p000)	3.5m	3.1	34K	93	4,927K
Parallel Server 2 (p001)	3.4m	3.11	29K	93	4,245K
Parallel Server 3 (p002)	3.5m	3.11	32K	93	4,750K
Parallel Server 4 (p003)	3.5m	3.06	29K	93	4,266K
Parallel Server 5 (p004)	3.5m	3.14	32K	93	4,742K
Parallel Server 6 (p005)	3.5m	3.14	29K	93	4,295K
Parallel Server 7 (p006)	3.5m	3.13	29K	93	4,251K
Parallel Server 8 (p007)	3.4m	3.14	29K	93	4,275K
Parallel Server 9 (p008)	3.5m	3.18	32K	93	4,617K

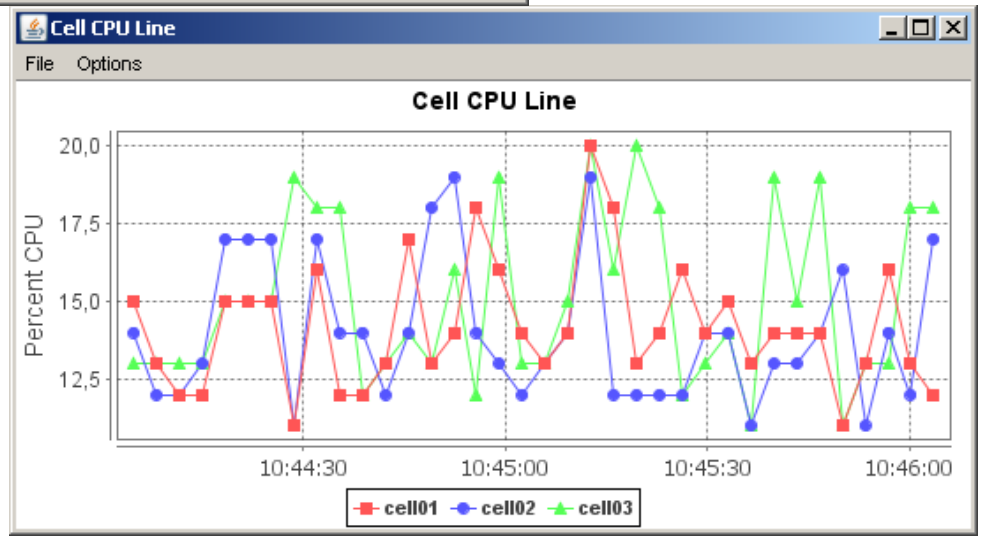
Reference Query (8.026.398.615 records)
Low compression level for query operations



Compression of 8.026.398.615 records

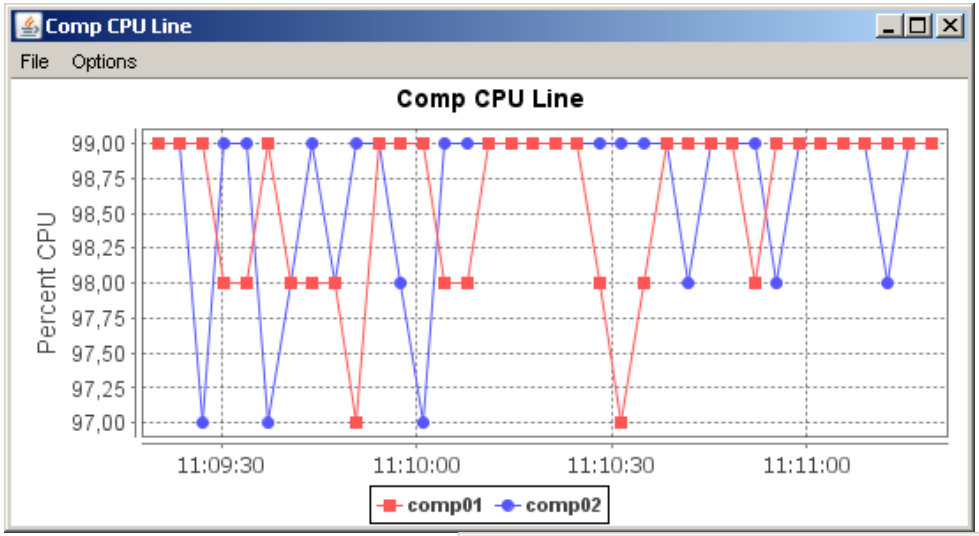
Low compression level for query operations

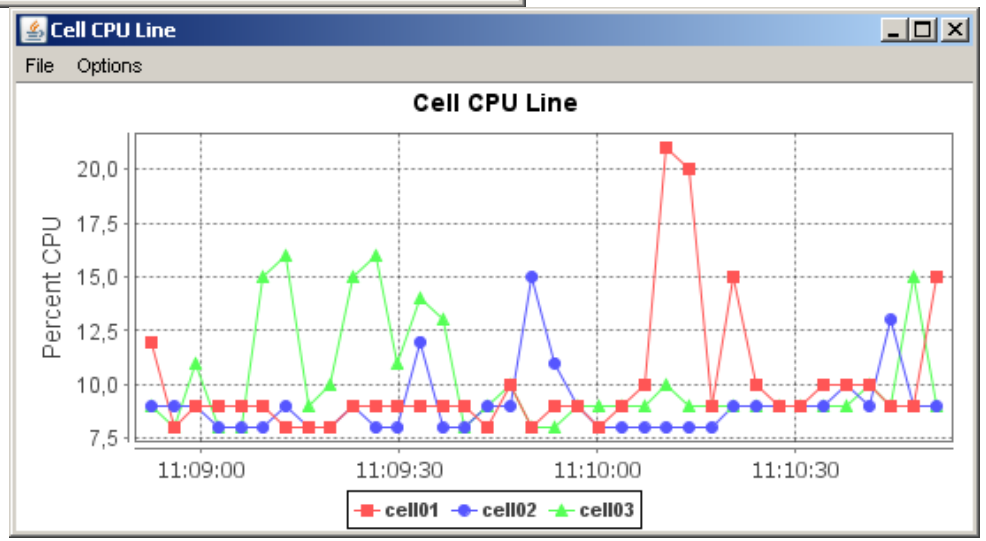




Compression of 8.026.398.615 records

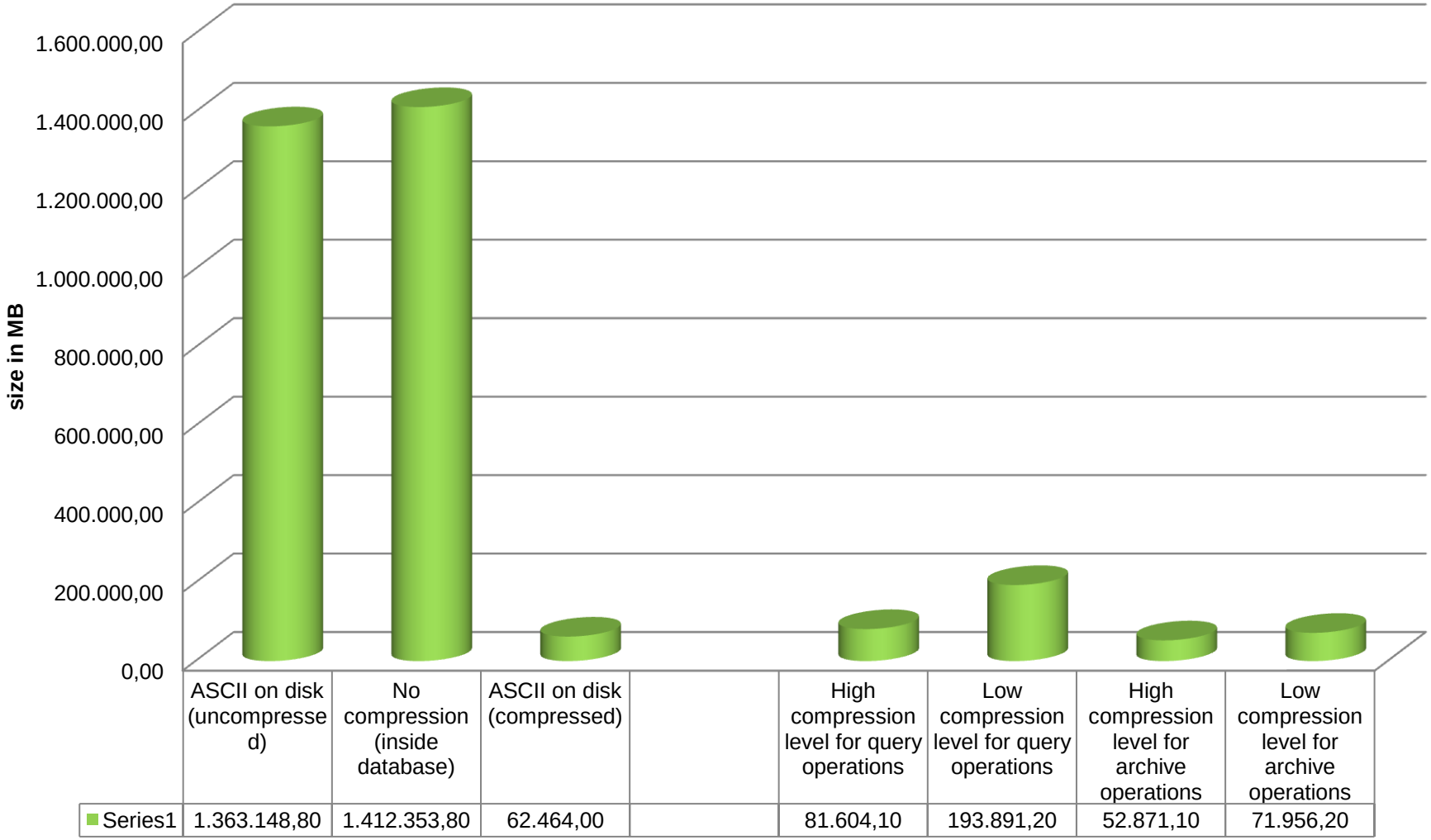
High compression level for query operations





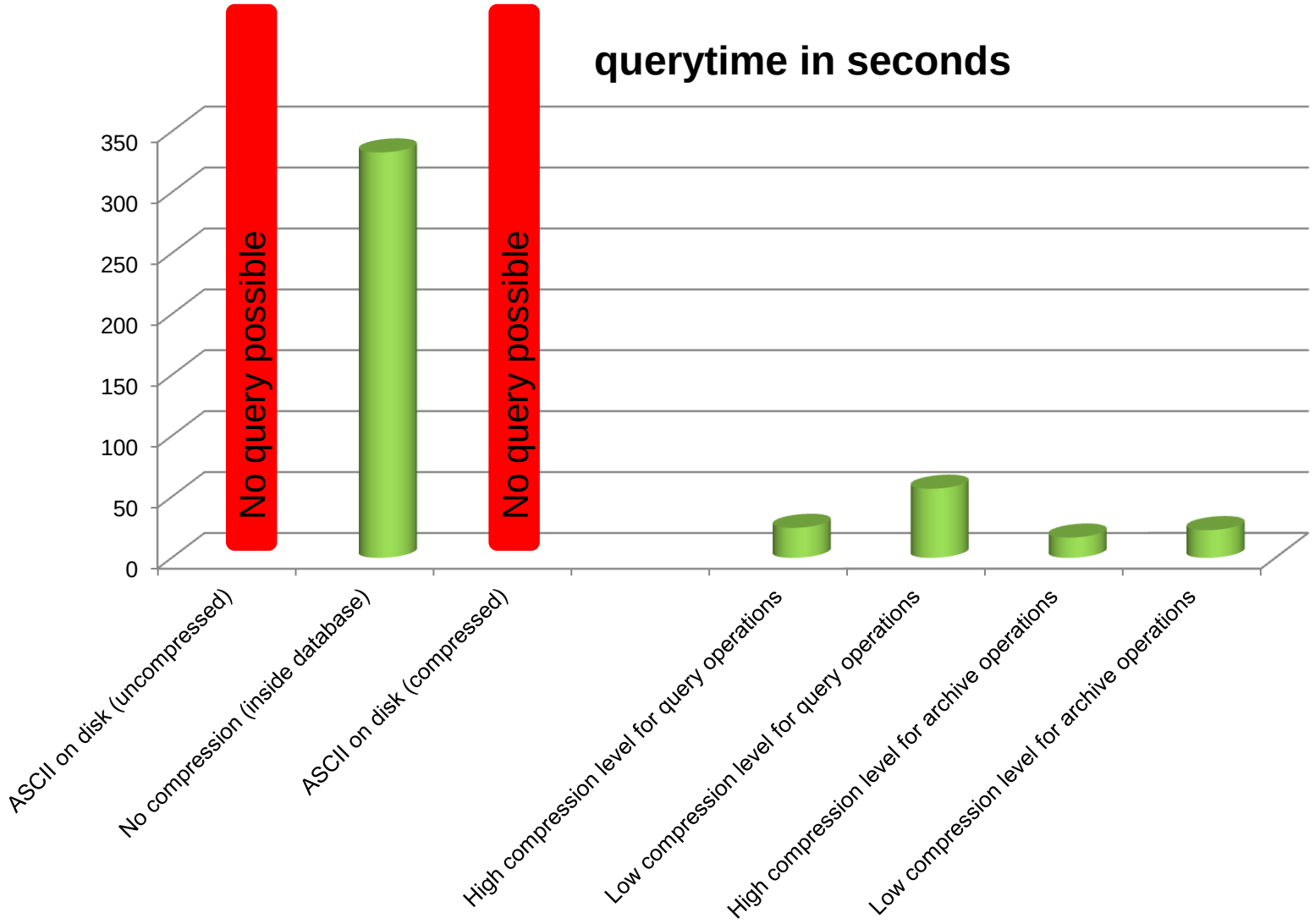
Disk volume in MB

see also slide 19

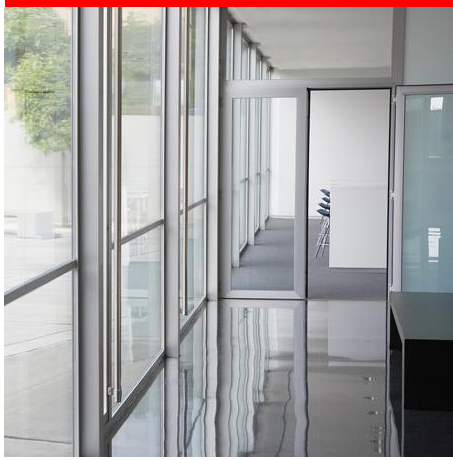


Reference Query (8.026.398.615 records)

see also slide 18



Agenda



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Summary

Goals	Result
Compression goals	
Performance (create, insert)	
Performance (select)	


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