Oracle Database Performance Tuning: The No SQL Option

Daniel A. Morgan

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Daniel A. Morgan

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- Educator
  - Wrote Oracle curriculum and primary program instructor at University of Washington
  - Oracle Consultant: Harvard University
  - University Guest Lecturers
    - APAC: University of Canterbury (NZ)
    - EMEA: University of Oslo (Norway)
    - Latin America: Universidad Latina de Panama and Technologico de Costa Rica
- The Morgan behind Morgan's Library on the web
  www.morganslibrary.org
- 10g, 11g, and 12c Beta tester
- Retired chair Washington Software Assoc. Database SIG
- Co-Founder International GoldenGate Oracle Users Group

The Morgan's Library Web Site

Morgan's Library

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International Oracle Events 2015-2016 Calendar

Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan

The Library

The library is a spam-free on-line resource with code demos for DBAs and Developers.
If you would like to see new Oracle database funtionality added to the library ... just email us.
Oracle 12.1.0.2.0 has been released and new features will be showing up for many weeks.
The first updates have already been made.

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Presentations Map

MadDog Morgan

Training Events and Travels
- IOUG, Chicago, Illinois - Mar 10
- UTOUG, Salt Lake City, Utah - Mar 11-12
- OUGN, Oslo, Norway - Mar 12-14
- Collaborate, Las Vegas, Nevada - Apr 12-16
- NYOUG, New York, NY - May 19
- GLOC, Cleveland, Ohio - May 19-20

Next Event: 27 January, Redwood Shores, CA

Oracle Events

Click on the map to find an event near you

Morgan

aboard USA-71

ORACLE ACE Director

Library News
- Morgan's Blog
- Join the Western Washington OUG
- Morgan's Oracle Podcast
- US Govt. Mil. STIGs (Security Checklists)
- Bryn Llewellyn's PL/SQL White Paper
- Bryn Llewellyn's Editioning White Paper
- Explain Plan White Paper

MEDECINS SANS FRONTIERES DOCTORS WITHOUT BORDERS

ACE News

Would you like to become an Oracle ACE?

Learn more about becoming an ACE
- ACE Directory
- ACE Google Map
- ACE Program
- Stanley's Blog

Congratulations to our newest ACE Director Jim Czuprynski

IGGOUG: The New Users Group In The Neighborhood

GoldenGate Users Group Home Pa...

www.iggoug.org

DuckDuckGo | Google | Email | Humor | News | Oracle | Science | Headlines | 11.2 Updated Books | 12.1 Updated Books

International GoldenGate Oracle Users Group

Oracle GG Documentation

- 12c GoldenGate
- 11.2.1 GoldenGate
- 11.1.1.1 GoldenGate
- 11.1.1 GoldenGate
- 10.4 GoldenGate
- Oracle Database

Blogs & Links

Blogs, links, sample code, and tricks & traps focusing on GoldenGate.

SOS: Support Our Sponsors

We want to thank our supporters and sponsors for making this website possible. Please support them too.

Welcome to the GoldenGate Users Group. We are creating a technical community to provide a focus for the international community involved in deploying and configuring Oracle's GoldenGate software.

Please read our editor's page to find out more about our goals

Click Here

If you would like to become one of our community's founding members click on the "Members" link below. We will have application forms posted very soon that you can submit.

If you have links to content you have written, or content written by others that you think would be of value to the community, please email us the information so we can share it.

Our focus is GoldenGate Software not any specific database vendor's product we will be looking for information about projects with:

Oracle	Sybase ASE
DB2	Teradata
SQL Server	... and more ...

We look forward to meeting as many of you as possible at our first meeting in San Francisco at OpenWorld 2014.

2014 Organizational Meeting

If you will be in San Francisco for OpenWorld please plan to meet with us: details to be announced here soon.

Training Programs

IGGOUG provides independent hands-on classes focusing using Oracle, SQL Server and DB2.

Oracle ACE Programs
Find An Oracle ACE

Want to become an ACE too? Contact our leadership team.

Leadership Team

Our leadership team is here because of their dedication to the user community.

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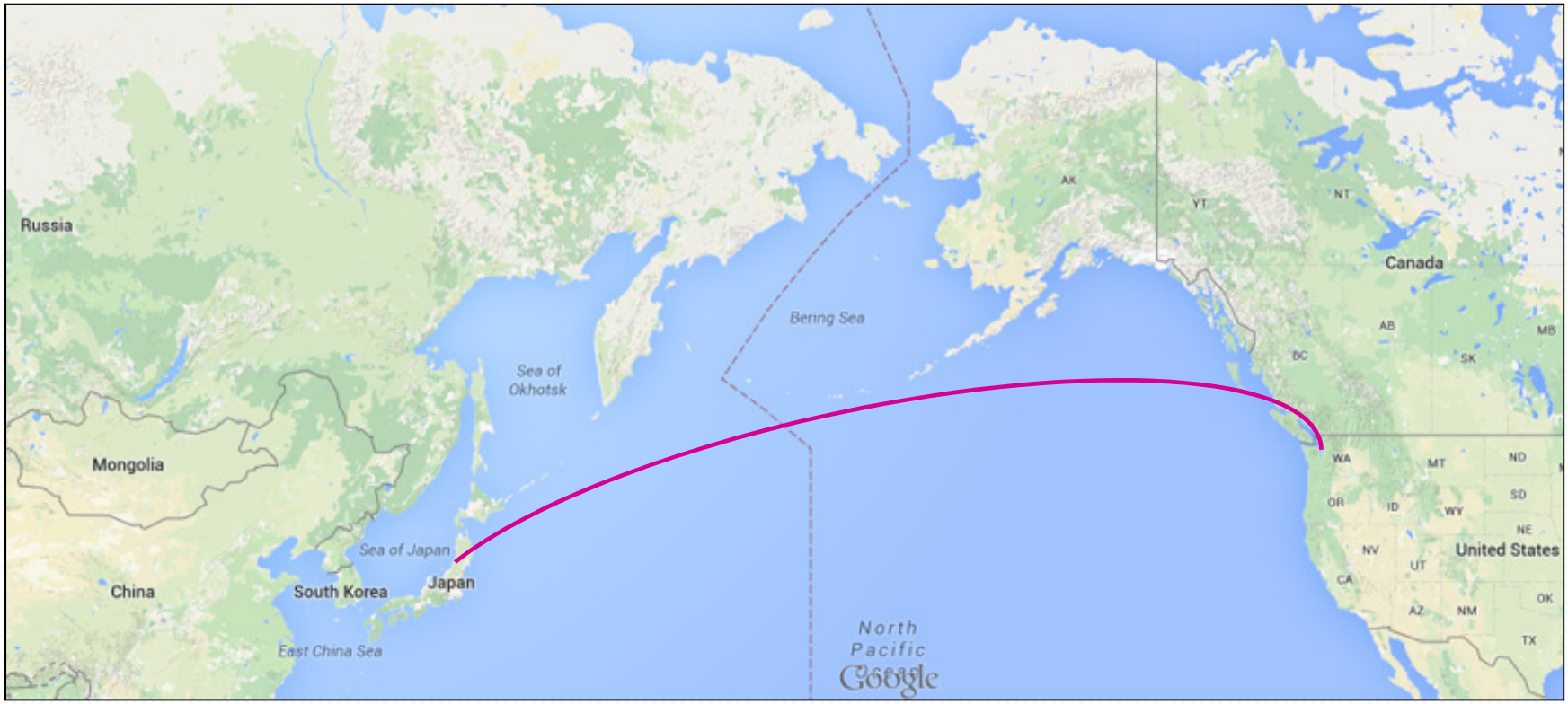
cd $ORACLE_BASE



Travel Log: OTN LAD Tour 2014

Travel Log: Tokyo 2006 / www.aozora.co.jp

Travel Log: Tokyo 2006 / www.aozora.co.jp/english

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FAQ

Aozora Asia Pacific Finance Limited

Releases related to the Great Eastern Japan Earthquake

News Releases

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June 1, 2015 Aozora Announces Relocation of Head Office (PDF:507KB)

May 29, 2015 Aozora Announces the Formation of a Syndicated Loan Related to Business Recovery (PDF:61KB)

May 26, 2015 Personnel Changes in the Executive Officers (PDF:92KB)

May 15, 2015 Aozora Reports Net Income of 43.7 billion for FY2014; Exceeds FY2013 Result and FY2014 Forecast; Announces FY2014 Dividend Payment, FY2015 Earnings and Dividend Forecast (PDF:273KB)

May 15, 2015 Aozora Announces Early and Full Repayment of Public Funds; Establishes Updated Business Model and Mid-term Financial Targets (PDF:726KB)

The #1 Database Performance Tuning Mythology

Instance Efficiency Percentages (Target 100%)

Buffer Nowait %:	99.80	Redo NoWait %:	100.00
Buffer Hit %:	97.34	In-memory Sort %:	99.99
Library Hit %:	99.97	Soft Parse %:	98.79
Execute to Parse %:	99.29	Latch Hit %:	99.57
Parse CPU to Parse Elapsd %:	0.00	% Non-Parse CPU:	96.60

This is from the worst performing Oracle Database I've seen since 2006

The #1 Database Performance Tuning Methodology

Guessing

One Solution

BAAG Party - Battle Against Any Guess

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SQL Server Performance Diagnostic — Still Guessing?
Welcome ASH Masters!
BAAG Members page change
Avoiding Guesswork in Complex Environments

Recent Comments

Alex Gorbachev on Avoiding Guesswork in Complex Environments
Graham Oakes on Avoiding Guesswork in Complex

About BAAG

Battle Against Any Guess

BAAG - what is it all about? The main idea is to eliminate guesswork from our decision making process — once and for all. It's not Oracle specific even though the roots lie in the area of Oracle database administration. So keep reading even if you don't know anything about Oracle or computers. Before we go any further I should say that the title was inspired by another fine BAA... site — BAARF. Just to avoid any guesses. 😉

After some mental fermentation the birth of BAAG had been finally triggered by an Oracle-L thread started as 10gR2 performance sux. Title of the post was a direct consequence of pure guess and, worse yet, uneducated guess. It's also interesting to see how the thread developed - guesswork. Another problem in the same thread was followed up by the same troubleshooting style. Perhaps, the author, inspired by previous responses, also hoped to find the magic solution from of Oracle-L powered (and often educated) guesses.

Database performance tuning is one of the most noticeable areas where guesswork is still flourishing. There were quite a few methodological techniques born recently, such as YAPP and Method R, and older guess-based methods such as Tuning by BCHR are going away. Nevertheless, people's mentality is very difficult to change and we keep relying on guesswork hoping to solve the issue faster. Hope-powered guess is the evil.

Performance tuning is just one example. Imagine that your Oracle database crushes with ORA-600 and guesswork starts powered my your experience. Depending how good your memory and experience are you might want to ask in an Oracle forum something like "My database x.x.x.x crashed with ORA-600. Anyone seen it?" It's fishing for a

MySQL

Baron Schwartz
Peter Zaitsev
Pythian Blog (MySQL)

Oracle

Anjo Kolk
ASH Masters
Cary Millsap
Daniel Fink
James Morle
Jonathan Lewis
Mogens Nørgaard
Niall Litchfield
Pythian Blog (Oracle)
Tanel Poder
Tom Kyte

PostgreSQL

BAAG Comrades

7-Sep-08	Mohammad Illiyaz http://	BAAG Member	Because i also want to BATTLE AGAINST ANY GUESSES
22-Sep-08	Ken Jordan http://	BAAG Member	Seeking THE truth!
27-Sep-08	Martin Berger http://berx.at	BAAG Member	I travel on a sea of wild guesses, with some islands of educated guesses. Knowledge is the stars which help me traveling on these seas. I need more light!
22-Nov-08	Daniel Morgan http://www.morganslibrary.org	BAAG Member	Too often a conclusion is simply the place where someone became tired of thinking. Then the "answer" becomes a guess, a prejudice, or a retreat to mythology. I prefer the application of synapses.
11-Feb-09	Fairlie Rego http://www.el-caro.blogspot.com	BAAG Member	becoz I have had enuff
3-Mar-09	Olivier NOEL http://	BAAG Member	Help me in my daily struggle against Oracle
16-Mar-09	Michael Erwin http://www.oracle.com/consulting/technology/grid-computing.html	BAAG Member	I like sharing what I know as actual fact vs. guessing as well.
18-Mar-09	Randolf Geist http://oracle-randolf.blogspot.com/	BAAG Member	I guess (!) it's time to join.
1-Apr-09	Kevin Fries http://	BAAG Member	I guess it cannot make things worse, I've tried everything else and the Magic 8-Ball broke.
13-Apr-09	Henrik Harsfort http://	BAAG Member	to guess is to not know.
24-Apr-09	Paul Clare http://	BAAG Member	Creative problem solving is evolving into an art form.

BAAG Membership

Christian Antognini
Karl Arao
Mark Bobak
Ronald Bradford
Wolfgang Breitling
Doug Burns
Andrew Clarke
Randolf Geist
Alex Gorbachev
Marco Gralike
Frits Hoogland
John Hurley
Anjo Kolk
David Kurtz
Jonathan Lewis
Robyn Sands
Jared Still
Jeremiah Wilton

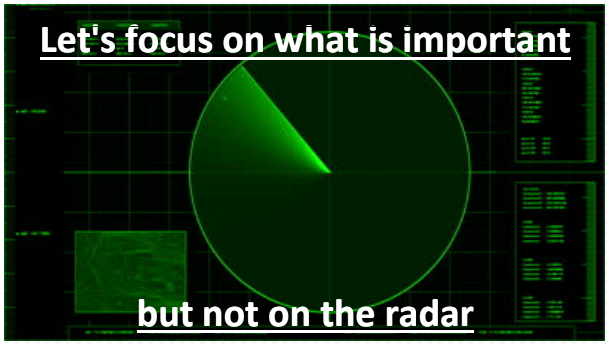
Clearly

- No surprise ... I do not endorse guessing
- Possibly a big surprise ... I do not like normal AWR reports
- I think the solutions to every performance issue is an Exadata
- And I am not attracted to all the tools with pretty GUIs
- So let us take a deep dive into performance tuning and address the root cause of the majority of issues I see in my work
- We will focus on what fixes <u>all</u> issues ... not just <u>one</u> issue
- We all know that 30+ years of doing it the way we have been
  - DBMS_SUPPORT introduced with version 7.2
  - DBMS_TRACE introduced with version 8.1.5
  - DBMS_MONITOR introduced with version 10.1

has not eliminated tuning problems

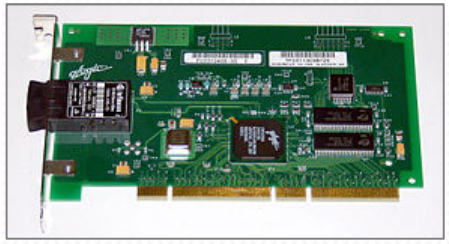
What Affects Performance

- Hardware
  - Servers
  - Storage Subsystems
  - Networks
- Software
  - Operating System Configuration
  - Virtual Machines
  - Drivers
- Database
  - Memory Allocation
  - Optimizer Configuration
  - SQL Quality
- Application
  - Web Servers
  - Application Servers
  - Middleware Caching
  - Application Code Quality



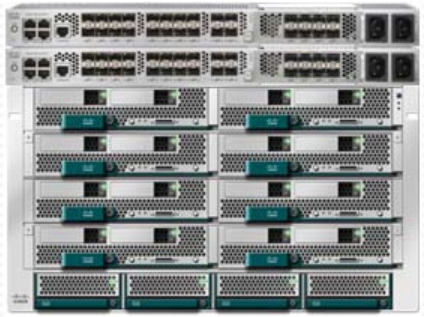
Hardware

- Servers and Operating Systems
  - Blade Servers
  - I/O Cards
  - NUMA Architecture
  - HugePages
  - Swapiness
- Virtual Machines
- Storage
  - Controllers
  - Read-Write Caches
  - LUN Size and Layout
- Networks
  - TCP/IP
  - UDP



Blade Servers (1:2)

- Suitable for web and application servers
- Possibly usable for small databases
- A meltdown waiting to happen with RAC



RAC: Frequently Asked Questions (Doc ID 220970.1)

Cluster interconnect network separation can be satisfied either by using standalone, dedicated switches, which provide the highest degree of network isolation, or Virtual Local Area Networks defined on the Ethernet switch, which provide broadcast domain isolation between IP networks. VLANs are fully supported for Oracle Clusterware interconnect deployments. Partitioning the Ethernet switch with VLANs allows for:
- Sharing the same switch for private and public communication.
- Sharing the same switch for the private communication of more than one cluster.
- Sharing the same switch for private communication and shared storage access.

The following best practices should be followed:

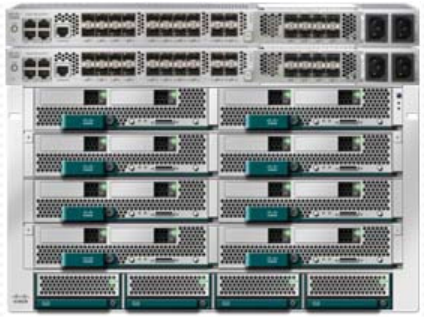
The Cluster Interconnect VLAN must be on a non-routed IP subnet.

All Cluster Interconnect networks must be configured with non-routed IPs. The server-server communication should be single hop through the switch via the interconnect VLAN. There is no VLAN-VLAN communication.

Oracle recommends maintaining a 1:1 mapping of subnet to VLAN.

The most common VLAN deployments maintain a 1:1 mapping of subnet to VLAN. It is strongly recommended to avoid multi-subnet mapping to a single VLAN. Best practice recommends a single access VLAN port configured on the switch for the cluster interconnect VLAN. The server side network interface should have access to a single VLAN.

Blade Servers (2:2)



- Blade servers, of which Cisco UCS is but one example, do not have sufficient independent network cards to avoid the networking becoming a single point of failure
- It is good when the public interface has a "keep alive" enabled but this is a fatal flaw for the cluster interconnect as fail-over will be delayed
- When different types of packets, public, storage, and interconnect are mixed low-level diagnostics are difficult ... if not impossible
- When different types of packets, public, storage, and interconnect are mixed the latency of one is the latency of all
- Traffic from any one blade can impact all blades

Troubleshooting gc block lost and Poor Network Performance in a RAC Environment (Doc ID 563566.1)

6. Interconnect LAN non-dedicated
Description: **Shared public IP traffic and/or shared NAS IP traffic, configured on the interconnect LAN will result in degraded application performance, network congestion and, in extreme cases, global cache block loss.**

Action: **The interconnect/clusterware traffic should be on a dedicated LAN defined by a non-routed subnet**. Interconnect traffic should be isolated to the adjacent switch(es), e.g. interconnect traffic should not extend beyond the access layer switch(es) to which the links are attached. **The interconnect traffic should not be shared with public or NAS traffic**. If Virtual LANs (VLANS) are used, the interconnect should be on a single, dedicated VLAN mapped to a dedicated, non-routed subnet, which is isolated from public or NAS traffic.

I/O (1:3)

- Not all HBA cards are the same
- NIC cards vary widely in capabilities and performance
  - TCP/IP Off-loading
  - Kernel Optimization of the TCP/IP stack

```
--enable TCP kernel auto-tuning
/proc/sys/net/ipv4/tcp_moderate_rcvbuf (1=on)

-- tune TCP max memory: tune to 2xBDP (Bandwidth x Delay Product)
-- For example, with 40 Mbits/sec bandwidth, 25 msec delay,
-- BDP = (40 x 1000 / 8 Kbytes/sec) x (0.025 sec) ~ 128 Kbytes
/proc/sys/net/ipv4/tcp_rmem and tcp_wmem 4096 87380 174760

-- tune the socket buffer sizes by setting to 2xBDP
/proc/sys/net/core/rmem_max and wmem_max

-- ensure that TCP Performance features are enabled
/proc/sys/net/ipv4/tcp_sack
/proc/sys/net/ipv4/tcp_window_scaling
/proc/sys/net/ipv4/tcp_timestamps

-- additionally be sure NIC cards have TCP off-loading capability
```

I/O (2:3)

- Optimize SQL*Net

```
--sqlnet.ora
NAMES.DIRECTORY_PATH= (TNSNAMES, EZCONNECT)
DEFAULT_SDU_SIZE=32767

-- listener.ora
DGLOGSHIPB =
  (DESCRIPTION =
    (SDU = 32767)
    (SEND_BUF_SIZE=9375000)
    (RECV_BUF_SIZE=9375000)
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = 10.0.7.2)(PORT = 1526))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = prodb)
    )
  )
```

I/O (3:3)

- Optimize for RAC
  - Read the Oracle installation documents with very careful attention to the advice given for kernel parameters
  - If on Linux and you don't know what rmem and wmem are ... read the docs
  - If on Solaris and you don't know what rsize and wsize are ... read the docs

NUMA Memory Allocation

- Non-Uniform Memory Access
  - A memory design used in multiprocessing, where the memory access time depends on the memory location relative to the processor
  - A processor can access its own local memory faster than non-local memory
  - The benefits of NUMA are limited to particular workloads, notably on servers where the data are often associated strongly with certain tasks or users

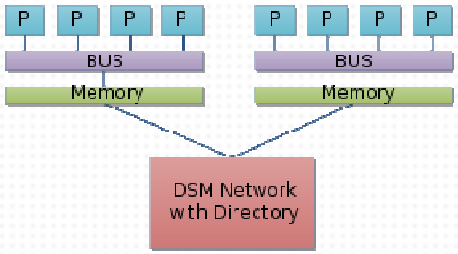


Diagram Source: Wikipedia

Detect NUMA Use

NUMA Not Configured

```
[oracle@alpha1 ~]$ numactl --hardware
available: 1 nodes (0)
node 0 size: 4095 MB
node 9 free: 648MB
node distances:
node   0
  0:  10

[oracle@alpha1 ~]$ numactl --show
policy: default
preferred node: current
physcpubind: 0
nodebind: 0
membind: 0
```

NUMA Configured

```
[dmorgan@lxorap1n5 ~]$ numactl --hardware
available: 2 nodes (0-1)
node 0 size: 48457 MB
node 0 free: 269 MB
node 1 size: 48480 MB
node 1 free: 47 MB
node distances:
node   0   1
  0:  10  20
  1:  20  10

[dmorgan@lxorap1n5 ~]$ numactl --show
policy: default
preferred node: current
physcpubind: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
cpubind: 0 1
nodebind: 0 1
membind: 0 1
```

Is Your Database NUMA Aware?

```
SQL> SELECT a.ksppinm PNAME, c.ksppstvl PVAL, a.ksppdesc PDESC
  2  FROM x$ksppi a, x$ksppcv b, x$ksppsv c
  3  WHERE a.indx = b.indx
  4  AND a.indx = c.indx
  5  AND LOWER(a.ksppinm) LIKE '%numa%'
  6* ORDER BY 1;

PNAME                       PVAL           PDESC
--------------------------- -------------- ------------------------------------------------------------------
_NUMA_instance_mapping      Not specified  Set of nodes that this instance should run on
_NUMA_pool_size             Not specified  aggregate size in bytes of NUMA pool
_db_block_numa              1              Number of NUMA nodes
_enable_NUMA_interleave     TRUE           Enable NUMA interleave mode
_enable_NUMA_optimization   FALSE          Enable NUMA specific optimizations
_enable_NUMA_support        FALSE          Enable NUMA support and optimizations
_numa_buffer_cache_stats    0              Configure NUMA buffer cache stats
_numa_shift_enabled         TRUE           Enable NUMA shift
_numa_shift_value           0              user defined value for numa nodes shift
_numa_trace_level           0              numa trace event
_px_numa_stealing_enabled   TRUE           enable/disable PQ granule stealing across NUMA nodes
_px_numa_support_enabled    FALSE          enable/disable PQ NUMA support
_rm_numa_sched_enable       FALSE          Is Resource Manager (RM) related NUMA scheduled policy enabled
_rm_numa_simulation_cpus    0              number of cpus for each pg for numa simulation in resource mgr
_rm_numa_simulation_pgs     0              number of PGs for numa simulation in resource manager
```

Enable Database NUMA Support

```
conn / as sysdba

ALTER SYSTEM SET "_enable_NUMA_support" = TRUE
COMMENT= 'NUMA Support Enabled 15-Mar-2015'
CONTAINER=ALL
SCOPE=SPFILE
SID='*';
```

HugePages

- Also known as "Large Memory Pages" or just "Large Pages"
- Each page table entry represents a “virtual to physical” translation of a process’s memory
- Can be as large as 64 KB in size per entry
- Can be huge for large memory systems
  - See PageTables in /proc/meminfo
  - As large a 1.5 GB
- The entire SGA must fit inside the HugePages. If it does not fit none of it will use the HugePage memory and you will essentially have walled your database off from using a large portion of the server's memory

Swapiness

- Swapping (aka Paging)
- In a sense the operating system's version of the Oracle Temp tablespace

Value	Strategy
vm.swapiness=0	The kernel will swap only to avoid an out of memory condition
vm.swapiness=60	The default value
vm.swapiness=100	The kernel will swap aggressively

Virtual Machines

- Leave sufficient cpu resources for the bare-metal operating system to perform I/O and manage network traffic
- Disable interrupt coalescing
- Disable chipset power management
- Read the docs
  http://www.vmware.com/pdf/Perf_Best_Practices_vSphere5.0.pdf
- VMs on NUMA machines should be configured to enhance memory allocation
  - This example is from vSphere where 0 and 1 are the processor sockets

```
numa.nodeAffinity=0,1
```

Storage Hardware

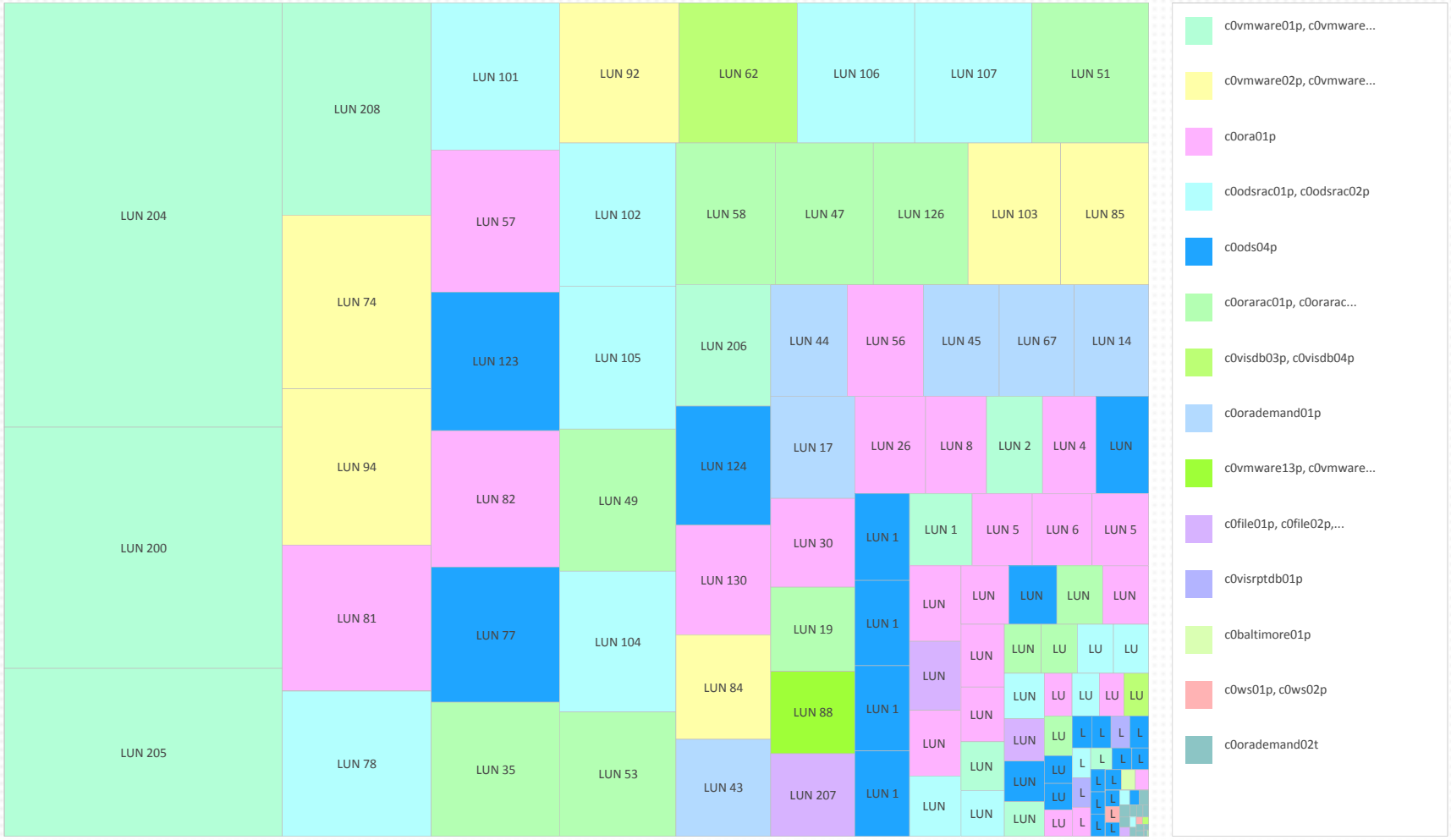
- Storage
  - Spinning Disk
  - Solid State Devices
  - Controllers
  - SAN Switches

Device	Type	IOPS	Interface	Notes
7,200 rpm SATA drives	HDD	~75-100 IOPS[2]	SATA 3 Gbit/s	
10,000 rpm SATA drives	HDD	~125-150 IOPS[2]	SATA 3 Gbit/s	
10,000 rpm SAS drives	HDD	~140 IOPS[2]	SAS	
15,000 rpm SAS drives	HDD	~175-210 IOPS[2]	SAS	

Kaminario K2	Flash/DRAM /Hybrid SSD	Up to 1,200,000 IOPS SPC-1 IOPS with the K2-D (DRAM)[41][42]	FC	
NetApp FAS6240 cluster	Flash/Disk	1,261,145 SPECsfs2008 nfsv3 IOPs using 1,440 15K disks, across 60 shelves, with virtual storage tiering.[43]	NFS, CIFS, FC, FCoE, iSCSI	SPECsfs2008 is the latest version of the Standard Performance Evaluation Corporation benchmark suite measuring file server throughput and response time, providing a standardized method for comparing performance across different vendor platforms. http://www.spec.org/sfs2008.
Fusion-io ioDrive2	SSD	Up to 9,608,000 IOPS[44]	PCIe	Only via demonstration so far.

Storage Heat Map

Storage Layout



Object Optimizations

- Oracle's default tablespace settings waste disk and create unnecessary I/O
  - Often a smallfile tablespace is a bad choice
- Default table creations are almost always inefficient
  - Often heap tables are a bad choice
- Not every index should be a default B*Tree
  - And poor choices lead to poor performance
- Oracle sequence object defaults are almost always inefficient
  - A default cache size of 20 is 99.9% of the time a bad choice
- The vast majority of PL/SQL I see written would have been valid in version 7.3.4
  - I've almost never seen constants declared properly
- Oracle optimizes data dictionary performance by clustering tables ... do you?

I'm Not Afraid To Show You Mine

Page One

Complete List of SQL Text

SQL Id	SQL Text
0cjpvvqy854kh	SELECT 'ERICSSON_CSCORE.EOS' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from (select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from ERICSSON_CSCORE.EOS where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60)rawt, (select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(s ysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_CSCORE.EOS_DY where datetime = trunc(sysdate)-1)sumt union all SELECT 'ERICSSON_CSCORE.MSCSTATS' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from (select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from ERICSSON_CSCORE.MSCSTATS where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60)rawt, (select max(datetime)sumday, count(dist inct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_CSCORE.MSCSTATS_DY where datetime = trunc(sysdate)-1)sumt union all SELECT 'ERICSSON_CSCORE.MTRAFTYPE' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from (select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end) ontime_count , count (*) num_of_rows from ERICSSON_CSCORE.MTRAFTYPE where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60)rawt, (select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_CSCORE.MTRAFTYPE_DY where datetime = trunc(sysdate)-1)sumt union all SELECT 'ERICSSON_GERAN.CELLGPRS' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from (select count(distinct case when trunc(d atetime_ins, 'mi') > trunc(sysdate)+3/24 then BSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then BSC end) ontime_count, count (*) num_of_rows from ERICSSON_GERAN.CELLGPRS where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60)rawt, (select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then BSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then BSC end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_GERAN.CELLGPRS_DY where datetime = trunc(sysdate)-1)sumt union all SELECT 'ERICSSON_GERAN.CELLSTATS' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_ count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from (select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then BSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then BSC end) ontime_count, count (*) num_of_rows from ERICSSON_GERAN.CELLSTATS where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60)rawt, (select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then BSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then BSC end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_GERAN.CELLSTATS_DY where datetime = trunc(sysdate)-1)sumt union all SELECT 'ERICSSON_PSCORE.MM' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count,

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(ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count,
2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count curr ent_raw_elements,
summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff,
percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then SGSNID end) late_count, count(distinct case when trunc(datetime_ins, 'mi') <
trunc(sysdate)+3/24 then SGSNID end) ontime_count, count (*) num_of_rows from ERICSSON_PSCORE.MM where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case
when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then SGSNID end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then SGSNID end) summarised_ontime_count, sum(entries)
num_of_sumrows from ERICSSON_PSCORE.MM_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'ERICSSON_PSCORE.SGSNSTAT' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count,
(ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0
else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+la te_count, 2)percentage_of_total_by5am,
percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count
current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2)
accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then SGSNID end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then SGSNID end) ontime_count,
count (*) num_of_rows from ERICSSON_PSCORE.SGSNSTAT where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') >
trunc(sysdate)+7/24 then SGSNID end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then SGSNID end) summarised_ontime_count, sum(entries) num_of_sumrows from
ERICSSON_PSCORE.SGSNSTAT_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'ERICSSON_UTRAN.RBS_CARRIER' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count),
2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count- late_count), 2) < 0 then 0 else
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am,
percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count
current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2)
accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then NODEB end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then NODEB end) ontime_count,
count (*) num_of_rows from ERICSSON_UTRAN.RBS_CARRIER where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') >
trunc(sysdate)+7/24 then NODEB end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then NODEB end) summarised_ontime_count, sum(entries) num_of_sumrows from
ERICSSON_UTRAN.RBS_CARRIER_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'ERICSSON_UTRAN.RBS_EDCHRES' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-l
ate_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am,
percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count
current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2)
accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then NODEB end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then NODEB end) ontime_count,
count (*) num_of_rows from ERICSSON_UTRAN.RBS_EDCHRES where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') >
trunc(sysdate)+7/24 then NODEB end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then NODEB end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_UT
RAN.RBS_EDCHRES_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'ERICSSON_UTRAN.RBS_HSDSCHRES' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100
THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am,
percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count
current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2)
accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then NODEB end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then NODEB end) ontime_count,
count (*) num_of_rows from ERICSSON_UTRAN.RBS_HSDSCHRES where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') >
trunc(sysdate)+7/24 then NODEB e nd) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then NODEB end) summarised_ontime_count, sum(entries) num_of_sumrows from
ERICSSON_UTRAN.RBS_HSDSCHRES_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'ERICSSON_UTRAN.RNC_IURLINK' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-
late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am,
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percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count
current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2)
accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then RNC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then RNC end) ontime_count, count (*)
num_of_rows from ERICSSON_UTRAN.RNC_IURLINK where dateti me between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24
then RNC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then RNC end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_UTRAN.RNC_IURLINK_DY
where datetime = trunc(sysdate)-1 )sumt union all SELECT 'ERICSSON_UTRAN.RNC_RNCFUNC' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE
percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count,
(ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count,
ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count
SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') >
trunc(sysdate)+3/24 then RNC end) late_c ount, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then RNC end) ontime_count, count (*) num_of_rows from ERICSSON_UTRAN.RNC_RNCFUNC where datetime
between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then RNC end) summarised_late_count, count(distinct case when
trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then RNC end) summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_UTRAN.RNC_RNCFUNC_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT
'ERICSSON_UTRAN.RNC_UCELL' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END
percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed,
percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count
current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-
late_count availabl e_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then RNC end) late_count, count(distinct case when
trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then RNC end) ontime_count, count (*) num_of_rows from ERICSSON_UTRAN.RNC_UCELL where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select
max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then RNC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then RNC end)
summarised_ontime_count, sum(entries) num_of_sumrows from ERICSSON_UTRAN.RNC_UCELL_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.BASE_OM' AS TABLENAME, sumday, CASE WHEN
percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count,
(ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count,
2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_
late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows,
num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end)
ontime_count, count (*) num_of_rows from NORTEL_CSCORE.BASE_OM where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') >
trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from
NORTEL_CSCORE.BASE_OM_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.C7SP' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN
100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_c
ount+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements,
summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select
count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from
NORTEL_CSCORE.C7SP where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end)
summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from NORTEL_CSCORE.C7SP_DY where datetime =
trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.CCS7' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count,
(ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end
percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2)
current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM,
late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end)
```

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late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from NORTEL_CSCORE.CCS7 where datetime between trunc(sysdate)-1 and
trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') <
trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from NORTEL_CSCORE.CCS7_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.LOCATIONAREACODE' AS
TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cut off, case when
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count,
ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements,
summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff,
percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') <
trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from NORTEL_CSCORE.LOCATIONAREACODE where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday,
count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_count,
sum(entries) num_of_sumrows from NORTEL_CSCORE.LOCATIONAREACODE_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.MSCCP_CP' AS TABLENAME, sumd ay, CASE WHEN
percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count,
(ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count,
2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements,
summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff,
percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') <
trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from NORTEL_CSCORE.MSCCP_CP where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct
case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_c ount, sum(entries)
num_of_sumrows from NORTEL_CSCORE.MSCCP_CP_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.MSCCP' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-
late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am,
percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count
current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2)
accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end) ontime_count, count (*)
num_of_rows from NORTEL_CSCORE.MSCCP where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(s ysdate)+7/24 then
MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from NORTEL_CSCORE.MSCCP_DY where datetime =
trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.TRKGRP' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count,
(ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end
percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2)
current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM,
late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end)
late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from NORTEL_CSCORE.TRKGRP where dateti me between trunc(sysdate)-1 and
trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') <
trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries) num_of_sumrows from NORTEL_CSCORE.TRKGRP_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_CSCORE.VLR6' AS TABLENAME,
sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count,
ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements,
summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff,
percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then MSC end) late_count, count(d istinct case when trunc(datetime_ins, 'mi') <
trunc(sysdate)+3/24 then MSC end) ontime_count, count (*) num_of_rows from NORTEL_CSCORE.VLR6 where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case
```

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when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then MSC end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then MSC end) summarised_ontime_count, sum(entries)
num_of_sumrows from NORTEL_CSCORE.VLR6_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_PSCORE.GSCGMM' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-
late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else
100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am,
percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count
current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumro ws, num_of_rows, 2)
accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then SGSN end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then SGSN end) ontime_count, count
(*) num_of_rows from NORTEL_PSCORE.GSCGMM where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24
then SGSN end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then SGSN end) summarised_ontime_count, sum(entries) num_of_sumrows from NORTEL_PSCORE.GSCGMM_DY where
datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_PSCORE.GSCSM_ACT' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE
percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count,
(ontime_count-late_count), 2) end percent_of_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count,
ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count
SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') >
trunc(sysdate)+3/24 then SGSN end) late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then SGSN end) ontime_count, count (*) num_of_rows from NORTEL_PSCORE.GSCSM_ACT where datetime
between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then SGSN end) summarised_late_count, count(distinct case when
trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then SGSN end) summarised_ontime_count, sum(entries) num_of_sumrows from NORTEL_PSCORE.GSCSM_ACT_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT
'NORTEL_PSCORE.GSCSM' AS TABLENAME, sumday, CASE WHEN percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END
percent_of_cutoff, case when 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_of_cutoff_not_summed,
percent(summarised_ontime_count, ontime_count+late_count, 2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count
current_raw_elements, summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-
late_count available_at_cutoff, percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then SGSN end) late_count, count(distinct case when
trunc(datetime_ins, 'mi') < trunc(sysdate)+3/24 then SGSN end) ontime_count, count (*) num_of_rows from NORTEL_PSCORE.GSCSM where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select
max(datetime)sumday, count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then SGSN end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then SGSN end)
summarised_ontime_count, sum(entries) num_of_sumrows from NORTEL_PSCORE.GSCSM_DY where datetime = trunc(sysdate)-1 )sumt union all SELECT 'NORTEL_PSCORE.GSDSTATS' AS TABLENAME, sumday, CASE WHEN
percent(summarised_ontime_count, (ontime_count-late_count), 2) > 100 THEN 100 ELSE percent(summarised_ontime_count, (ontime_count-late_count), 2) END percent_of_cutoff, case when 100-percent(summarised_ontime_count,
(ontime_count-late_count), 2) < 0 then 0 else 100-percent(summarised_ontime_count, (ontime_count-late_count), 2) end percent_o f_cutoff_not_summed, percent(summarised_ontime_count, ontime_count+late_count,
2)percentage_of_total_by5am, percent(summarised_ontime_count+summarised_late_count, ontime_count+late_count, 2) current_percentage, ontime_count+late_count current_raw_elements,
summarised_ontime_count+summarised_late_count current_summary_elements, summarised_ontime_count-summarised_late_count SUM_ELEMENTS_AT5AM, late_count late_raw_elements, ontime_count-late_count available_at_cutoff,
percent(num_of_sumrows, num_of_rows, 2) accuracy from ( select count(distinct case when trunc(datetime_ins, 'mi') > trunc(sysdate)+3/24 then SGSN end) late_count, count(distinct case when trunc(datetime_ins, 'mi') <
trunc(sysdate)+3/24 then SGSN end) ontime_count, count (*) num_of_rows from NORTEL_PSCORE.GSDSTATS where datetime between trunc(sysdate)-1 and trunc(sysdate)-1/24/60 )rawt, ( select max(datetime)sumday, count(distinct
case when trunc(datetime_ins, 'mi') > trunc(sysdate)+7/24 then SGSN end) summarised_late_count, count(distinct case when trunc(datetime_ins, 'mi') < trunc(sysdate)+7/24 then SGSN end) summarised_ontime_count, sum(entries)
num_of_sumrows from NORTEL_PSCORE.GSDSTATS_DY where datetime = trunc(sysdate)-1 )sumt
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Optimizer Plans (1:4)

```
SELECT DISTINCT E1_2.OBJECT_ID
   FROM PMCM.ELEMENT_DETAIL E1_1, PMCM.ELEMENT_DETAIL E1_2, PMCM.MARK_NETW_HIERARCHY H1,
        PMCM.ELEMENT_DETAIL E2_1, PMCM.ELEMENT_DETAIL E2_2, PMCM.MARK_NETW_HIERARCHY H2
   WHERE E1_1.OBJECT_ID = H1.PARENT_ID
     AND E1_2.OBJECT_ID = H1.OBJECT_ID
     AND E2_1.OBJECT_ID = H2.PARENT_ID
     AND E2_2.OBJECT_ID = H2.OBJECT_ID
     AND E1_1.CURRENT_IND = 'Y' AND E2_1.CURRENT_IND = 'Y'
     AND E2_1.CURRENT_IND = 'Y' AND E2_2.CURRENT_IND = 'Y'
     AND H1.CURRENT_IND = 'Y' AND H2.CURRENT_IND = 'Y'
     AND H1.HIERARCHY_TYPE = 'NETWORK' AND H2.HIERARCHY_TYPE = 'NETWORK'
     AND H1.PARENT_TYPE IN ('BSC','RNC')  AND H2.PARENT_TYPE IN ('BSC','RNC')
     AND E2_2.ELEMENT_TYPE = 'CELL' AND E1_2.ELEMENT_TYPE = 'CELL'
     AND H1.PARENT_TYPE IN ('BSC','RNC')
     AND E1_1.ELEMENT_NAME = E2_1.ELEMENT_NAME
     AND E1_1.ELEMENT_ID = E2_1.ELEMENT_ID
     AND E1_2.ELEMENT_NAME = E2_2.ELEMENT_NAME
     AND E1_2.ELEMENT_ID = E2_2.ELEMENT_ID
     AND E1_2.USEID LIKE '*%' AND E2_2.USEID NOT LIKE '*%';
```

```
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| Id  | Operation                  | Name                        | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     | Pstart| Pstop |
-----------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT           |                             |     1 |    78 |       |    74M (40)| 50:54:42 |       |       |
|   1 |  TEMP TABLE TRANSFORMATION |                             |       |       |       |            |          |       |       |
|   2 |   LOAD AS SELECT           |                             |       |       |       |            |          |       |       |
|   3 |    PARTITION RANGE ALL     |                             |   22M| 1111M|       | 38153  (11)| 00:01:34 |     1 |    29 |
|*  4 |     TABLE ACCESS FULL      | ELEMENT_DETAIL              |   22M| 1111M|       | 38153  (11)| 00:01:34 |       |       |
|   5 |   LOAD AS SELECT           |                             |       |       |       |            |          |       |       |
|   6 |    PARTITION HASH ALL      |                             |  337K| 9231K|       |  3514  (15)| 00:00:09 |     1 |    16 |
|*  7 |     TABLE ACCESS FULL      | MARK_NETW_HIERARCHY         |  337K| 9231K|       |  3514  (15)| 00:00:09 |       |       |
|   8 |   SORT AGGREGATE           |                             |     1 |    78 |       |            |          |       |       |
|*  9 |    HASH JOIN               |                             |  927G|   65T|  534M|    74M (40)| 50:53:00 |       |       |
|  10 |     VIEW                   |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  11 |      TABLE ACCESS FULL     | SYS_TEMP_0FDA7485F_6A66C42E |   22M| 1111M|       | 16808  (12)| 00       |       |       |
|* 12 |     HASH JOIN              |                             |   21G| 1272G|  534M|  1616K (43)| 01:06:04 |       |       |
|  13 |      VIEW                  |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  14 |       TABLE ACCESS FULL    | SYS_TEMP_0FDA7485F_6A66C42E |   22M| 1111M|       | 16808  (12)| 0        |       |       |
|* 15 |      HASH JOIN             |                             |  476M|   23G|  524M| 97327  (22)| 00:03:59 |       |       |
|* 16 |       HASH JOIN            |                             |   10M|  401M| 8704K| 34520  (10)| 00:01:25 |       |       |
|* 17 |        HASH JOIN           |                             |  234K| 5948K| 8256K|   783  (10)| 00:00:02 |       |       |
|  18 |         VIEW               |                             |  337K| 4286K|       |   142  (14)| 00:00:01 |       |       |
|  19 |          TABLE ACCESS FULL | SYS_TEMP_0FDA74860_6A66C42E |  337K| 3956K|       |   142  (14)| 00:00:01 |       |       |
|  20 |         VIEW               |                             |  337K| 4286K|       |   142  (14)| 00:00:01 |       |       |
|  21 |          TABLE ACCESS FULL | SYS_TEMP_0FDA74860_6A66C42E |  337K| 3956K|       |   142  (14)| 00:00:01 |       |       |
|  22 |        VIEW                |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  23 |         TABLE ACCESS FULL  | SYS_TEMP_0FDA7485F_6A66C42E |   22M| 1111M|       | 16808  (12)| 00:00:42 |       |       |
|  24 |       VIEW                 |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  25 |        TABLE ACCESS FULL   | SYS_TEMP_0FDA7485F_6A66C42E |   22M| 1111M|       | 16808  (12)| 0        |       |       |
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Optimizer Plans (2:4)

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| Id  | Operation                  | Name                        | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     | Pstart| Pstop |
-----------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT           |                             |     1 |    78 |       |    14T(100)|999:59:59 |       |       |
|   1 |  TEMP TABLE TRANSFORMATION |                             |       |       |       |            |          |       |       |
|   2 |   LOAD AS SELECT           |                             |       |       |       |            |          |       |       |
|   3 |    PARTITION RANGE ALL     |                             |   22M|  1111M|       | 38153  (11)| 00:01:34 |     1 |    29 |
|*  4 |     TABLE ACCESS FULL      | ELEMENT_DETAIL              |   22M|  1111M|       | 38153  (11)| 00:01:34 |       |       |
|   5 |   LOAD AS SELECT           |                             |       |       |       |            |          |       |       |
|   6 |    PARTITION HASH ALL      |                             |  337K|  9231K|       |  3514  (15)| 00:00:09 |     1 |    16 |
|*  7 |     TABLE ACCESS FULL      | MARK_NETW_HIERARCHY         |  337K|  9231K|       |  3514  (15)| 00:00:09 |       |       |
|   8 |   SORT AGGREGATE           |                             |     1 |    78 |       |            |          |       |       |
|   9 |    MERGE JOIN              |                             |  471P|   15E|       |    14T(100)|999:59:59 |       |       |
|  10 |     MERGE JOIN             |                             |   10P|  616P|       |   694G (81)|999:59:59 |       |       |
|  11 |      MERGE JOIN            |                             |  231T|   10P|       |   377G (64)|999:59:59 |       |       |
|  12 |       SORT JOIN            |                             |  334T|   11P|   28P|   377G (64)|999:59:59 |       |       |
|  13 |        MERGE JOIN CARTESIAN|                             |  334T|   11P|       |   140G (14)|999:59:59 |       |       |
|* 14 |         HASH JOIN          |                             |  989M|   23G|  534M| 96010  (38)| 00:03:56 |       |       |
|  15 |          VIEW              |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  16 |           TABLE ACCESS FULL| SYS_TEMP_0FDA7485B_6A66C42E |   22M|  1111M|       | 16808  (12)| 00:00:42 |       |       |
|  17 |          VIEW              |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  18 |           TABLE ACCESS FULL| SYS_TEMP_0FDA7485B_6A66C42E |   22M|  1111M|       | 16808  (12)| 00:00:42 |       |       |
|  19 |         BUFFER SORT        |                             |  337K|  4286K|       |   140G (14)|999:59:59 |       |       |
|  20 |          VIEW              |                             |  337K|  4286K|       |   142  (14)| 00:00:01 |       |       |
|  21 |           TABLE ACCESS FULL| SYS_TEMP_0FDA7485C_6A66C42E |  337K|  3956K|       |   142  (14)| 00:00:01 |       |       |
|* 22 |       SORT JOIN            |                             |  337K|  4286K|   12M|   844  (14)| 00:00:03 |       |       |
|  23 |        VIEW                |                             |  337K|  4286K|       |   142  (14)| 00:00:01 |       |       |
|  24 |         TABLE ACCESS FULL  | SYS_TEMP_0FDA7485C_6A66C42E |  337K|  3956K|       |   142  (14)| 00:00:01 |       |       |
|* 25 |      SORT JOIN             |                             |   22M|  277M|  855M| 65084  (16)| 00:02:40 |       |       |
|  26 |       VIEW                 |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  27 |        TABLE ACCESS FULL   | SYS_TEMP_0FDA7485B_6A66C42E |   22M|  1111M|       | 16808  (12)| 0        |       |       |
|* 28 |     SORT JOIN              |                             |   22M|  277M|  855M| 65084  (16)| 00:02:40 |       |       |
|  29 |      VIEW                  |                             |   22M|  277M|       | 16808  (12)| 00:00:42 |       |       |
|  30 |       TABLE ACCESS FULL    | SYS_TEMP_0FDA7485B_6A66C42E |   22M|  1111M|       | 16808  (12)| 0        |       |       |
-----------------------------------------------------------------------------------------------------------------------------------
```

Optimizer Plans (3:4)

```
WITH ed AS (SELECT object_id, element_id, element_name, element_type, useid
            FROM pmcm.element_detail
            WHERE element_type = 'CELL'
            AND current_ind = 'Y'),
     mnh AS (SELECT parent_id, object_id
             FROM pmcm.mark_netw_hierarchy
             WHERE current_ind = 'Y'
             AND hierarchy_type = 'NETWORK'
             AND parent_type IN ('BSC', 'RNC'))
SELECT COUNT(*)
FROM ed e1_1, ed e1_2, ed e2_1, ed e2_2, mnh h1, mnh h2
WHERE e1_1.object_id = h1.parent_id AND   e1_2.object_id = h1.object_id
AND   e2_1.object_id = h2.parent_id AND   e2_2.object_id = h2.object_id
AND   e1_1.element_name = e2_1.element_name
AND   e1_1.element_id = e2_1.element_id
AND   e1_2.element_name = e2_2.element_name
AND   e1_2.element_id = e2_2.element_id
AND   e1_2.useid LIKE '*%'
AND   e2_2.useid NOT LIKE '*%';
```

```
 ---------------------------------------------------------------------------------------------------------------------
| Id  | Operation                                  | Name                 | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     |
---------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                           |                      |     1 |   214 |       |   100K  (6)| 00:04:08 |
|   1 |  HASH UNIQUE                               |                      |     1 |   214 |       |   100K  (6)| 00:04:08 |
|*  2 |   HASH JOIN                                |                      |     1 |   214 |   12M|   100K  (6)| 00:04:08 |
|   3 |    PARTITION HASH ALL                      |                      |  337K|  9231K|       |  3514  (15)| 00:00:09 |
|*  4 |     TABLE ACCESS FULL                      | MARK_NETW_HIERARCHY  |  337K|  9231K|       |  3514  (15)| 00:00:00 |
|*  5 |    HASH JOIN                               |                      |  207K|    36M|   22M| 95860   (6)| 00:03:56 |
|   6 |     PARTITION RANGE ALL                    |                      |  586K|    15M|       | 16233   (2)| 00:00:40 |
|   7 |      TABLE ACCESS BY LOCAL INDEX ROWID     | ELEMENT_DETAIL       |  586K|    15M|       | 16233      | ??:??:?? |
|*  8 |       INDEX SKIP SCAN                      | ED_ET_TECH_CI        |  586K|       |       | 12791   (1)| 00:00:3? |
|*  9 |     HASH JOIN                              |                      |  207K|    31M|   22M| 77982   (7)| 00:03:12 |
|  10 |      PARTITION RANGE ALL                   |                      |  586K|    15M|       | 16233   (2)| 00:00:40 |
|  11 |       TABLE ACCESS BY LOCAL INDEX ROWID    | ELEMENT_DETAIL       |  586K|    15M|       | 16233      | ??:??:?? |
|* 12 |        INDEX SKIP SCAN                     | ED_ET_TECH_CI        |  586K|       |       | 12791   (1)| 00:00:?? |
|* 13 |      HASH JOIN                             |                      |  179K|    22M|   12M| 60372   (8)| 00:02:29 |
|  14 |       PARTITION HASH ALL                   |                      |  337K|  9231K|       |  3514  (15)| 00:00:09 |
|* 15 |        TABLE ACCESS FULL                   | MARK_NETW_HIERARCHY  |  337K|  9231K|       |  3514  (15)| 00:00:?? |
|* 16 |       HASH JOIN                            |                      |  184K|    17M|   10M| 55886   (8)| 00:02:18 |
|  17 |        PARTITION RANGE ALL                 |                      |  184K|  9008K|       | 37137   (8)| 00:01:32 |
|* 18 |         TABLE ACCESS FULL                  | ELEMENT_DETAIL       |  184K|  9008K|       | 37137   (8)| 00:01:32 |
|  19 |        PARTITION RANGE ALL                 |                      |  576K|    28M|       | 17383   (8)| 00:00:43 |
|* 20 |         TABLE ACCESS BY LOCAL INDEX ROWID| ELEMENT_DETAIL       |  576K|    28M|       | 17383   (8)| ??:??:?? |
|* 21 |          INDEX SKIP SCAN                   | ED_ET_TECH_CI        |  583K|       |       | 13939   (9)| 00:00:35 |
---------------------------------------------------------------------------------------------------------------------
```

Optimizer Plans (4:4)

```
-----------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                                        | Name                     | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                                 |                          |       |       |       |   264T(100)|          |
|*  1 |  VIEW                                            |                          |  156P|   15E|       |   264T (79)|999:59:59 |
|*  2 |   WINDOW SORT PUSHED RANK                        |                          |  156P|   15E|   15E|   264T (79)|999:59:59 |
|   3 |    MERGE JOIN CARTESIAN                          |                          |  156P|   15E|       |    68T (16)|999:59:59 |
|   4 |     MERGE JOIN CARTESIAN                         |                          |  220G|  205T|       |    96M (16)| 26:57:48 |
|   5 |      MERGE JOIN CARTESIAN                        |                          |  310K|  302M|       |   232  (11)| 00:00:01 |
|   6 |       MERGE JOIN CARTESIAN                       |                          |  779 |  777K|       |    22   (0)| 00:00:01 |
|   7 |        NESTED LOOPS                              |                          |       |       |       |            |          |
|   8 |         NESTED LOOPS                             |                          |    2 | 2044 |       |    20   (0)| 00:00:01 |
|   9 |          NESTED LOOPS OUTER                      |                          |    2 | 1990 |       |    18   (0)| 00:00:01 |
|  10 |           NESTED LOOPS                           |                          |    2 | 1868 |       |    17   (0)| 00:00:01 |
|  11 |            NESTED LOOPS                          |                          |    2 | 1712 |       |    15   (0)| 00:00:01 |
|  12 |             NESTED LOOPS                         |                          |    2 | 1564 |       |    13   (0)| 00:00:01 |
|  13 |              MERGE JOIN CARTESIAN                |                          |    2 | 1442 |       |    11   (0)| 00:00:01 |
|  14 |               NESTED LOOPS OUTER                 |                          |    1 |  625 |       |     8   (0)| 00:00:01 |
|  15 |                NESTED LOOPS OUTER                |                          |    1 |  613 |       |     7   (0)| 00:00:01 |
|  16 |                 NESTED LOOPS                     |                          |    1 |  580 |       |     6   (0)| 00:00:01 |
|  17 |                  NESTED LOOPS OUTER              |                          |    1 |  539 |       |     5   (0)| 00:00:01 |
|  18 |                   NESTED LOOPS OUTER             |                          |    1 |  340 |       |     5   (0)| 00:00:01 |
|  19 |                    TABLE ACCESS BY INDEX ROWID| PA_STUDENT               |    1 |  316 |       |     3   (0)| 00:00:01 |
|* 20 |                     INDEX UNIQUE SCAN            | PK_STUDENT               |    1 |       |       |     2   (0)| 00:00:01 |
|  21 |                    TABLE ACCESS BY INDEX ROWID| PA_STUD_USER             |    1 |   24 |       |     2   (0)| 00:00:01 |
|* 22 |                     INDEX UNIQUE SCAN            | PK_STUD_USER             |    1 |       |       |     1   (0)| 00:00:01 |
|  23 |                   TABLE ACCESS BY INDEX ROWID | PA_ORG                   |    1 |  199 |       |     0   (0)|          |
|* 24 |                    INDEX UNIQUE SCAN             | PK_ORG                   |    1 |       |       |     0   (0)|          |
|  25 |                  TABLE ACCESS BY INDEX ROWID  | PA_DOMAIN                |   13 |  533 |       |     1   (0)| 00:00:01 |
|* 26 |                   INDEX UNIQUE SCAN             | PK_DOMAIN                |    1 |       |       |     0   (0)|          |
|  27 |                 TABLE ACCESS BY INDEX ROWID    | PA_USRRF_STUD            |  100 | 3300 |       |     1   (0)| 00:00:01 |
|* 28 |                  INDEX UNIQUE SCAN             | PK_USRRF_STUD            |    1 |       |       |     0   (0)|          |
|  29 |                VIEW PUSHED PREDICATE           | PV_STUD_USER             |    1 |   12 |       |     1   (0)| 00:00:01 |
|* 30 |                 FILTER                         |                          |       |       |       |            |          |
|  31 |                  NESTED LOOPS OUTER            |                          |    1 |   22 |       |   264  (11)| 00:00:01 |
|* 32 |                   INDEX UNIQUE SCAN            | PK_STUDENT               |    1 |   10 |       |     2   (0)| 00:00:01 |
|* 33 |                   MAT_VIEW ACCESS FULL         | PV_AP_STUD_USER          |    1 |   12 |       |   262  (11)| 00:00:01 |
|  34 |               BUFFER SORT                      |                          |    2 |  192 |       |    10   (0)| 00:00:01 |
|  35 |               TABLE ACCESS BY INDEX ROWID      | PA_CPNT_COMPLIANCE_DATA  |    2 |  192 |       |     3   (0)| 00:00:01 |
|* 36 |                INDEX RANGE SCAN                | IX_CPNT_CD__EVTHST       |    2 |       |       |     1   (0)| 00:00:01 |
|  37 |              TABLE ACCESS BY INDEX ROWID       | PA_CPNT_TYPE             |    1 |   61 |       |     1   (0)| 00:00:01 |
|* 38 |               INDEX UNIQUE SCAN                | PK_CPNT_TYPE             |    1 |       |       |     0   (0)|          |
|  39 |             TABLE ACCESS BY INDEX ROWID        | PA_RQMT_TYPE             |    1 |   74 |       |     1   (0)| 00:00:01 |
|* 40 |              INDEX UNIQUE SCAN                 | PK_RQMT_TYPE             |    1 |       |       |     0   (0)|          |
|  41 |            TABLE ACCESS BY INDEX ROWID         | PA_CMPL_STAT             |    1 |   78 |       |     1   (0)| 00:00:01 |
|* 42 |             INDEX UNIQUE SCAN                  | PK_CMPL_STAT             |    1 |       |       |     0   (0)|          |
|  43 |           TABLE ACCESS BY INDEX ROWID          | PA_QUAL                  |    1 |   61 |       |     1   (0)| 00:00:01 |
|* 44 |            INDEX UNIQUE SCAN                   | PK_QUAL                  |    1 |       |       |     0   (0)|          |
|* 45 |          INDEX UNIQUE SCAN                     | PK_CPNT                  |    1 |       |       |     0   (0)|          |
|  46 |         TABLE ACCESS BY INDEX ROWID            | PA_CPNT                  |    1 |   27 |       |     1   (0)| 00:00:01 |
|  47 |        BUFFER SORT                             |                          |  399 |       |       |    21   (0)| 00:00:01 |
|  48 |         INDEX FAST FULL SCAN                   | PK_USRRF_STUD            |  399 |       |       |     1   (0)| 00:00:01 |
|  49 |       BUFFER SORT                              |                          |  399 |       |       |   231  (11)| 00:00:01 |
|  50 |        INDEX FAST FULL SCAN                    | PK_USRRF_STUD            |  399 |       |       |     0   (0)|          |
|  51 |      BUFFER SORT                               |                          |  710K|       |       |    96M (16)| 26:57:48 |
|  52 |       INDEX FAST FULL SCAN                     | IX_STUD_USER__STUDENT    |  710K|       |       |   309  (16)| 00:00:01 |
|  53 |     BUFFER SORT                                |                          |  710K|       |       |   264T (79)|999:59:59 |
|  54 |      INDEX FAST FULL SCAN                      | IX_STUD_USER__STUDENT    |  710K|       |       |   309  (16)| 00:00:01 |
-----------------------------------------------------------------------------------------------------------------------------------
```

Poorly Written Applications

SQL ordered by Executions

- Total Executions: 29,717,627
- Captured SQL account for 77.4% of Total

Executions	Rows Processed	Rows per Exec	CPU per Exec (s)	Elap per Exec (s)	SQL Id	SQL Module	SQL Text
10,128,178	2,506,529	0.25	0.00	0.00	932srzg1krc33	ASN_07B_DIP(004110016)	SELECT NE_TIMEZONE FROM CMPM.E...
7,576,759	7,579,197	1.00	0.00	0.00	1h698sb62un99	asci_56_RANAPProtocolStats(01611000E)	SELECT DISTINCT NE_TIMEZONE FR...
3,914,621	3,848,268	0.98	0.00	0.00	5tbzddgguu8cc	asci_56_RANAPProtocolStats(01611000E)	SELECT SYS_VERSION FROM CMPM.T...
311,645	311,604	1.00	0.00	0.00	7gtztzv329wq0		select c.name, u.name from co...
301,428	301,325	1.00	0.00	0.00	36s446f9cnwhw		SELECT C.NAME FROM COL$ C WHER...
200,692	200,669	1.00	0.00	0.00	4vs91dcv7u1p6	OMS	insert into sys.aud$(sessioni...
65,044	65,035	1.00	0.00	0.00	fz9xwpt2cvt0k		SELECT par_type, param_clob, ...
64,949	3,945,482	60.75	0.00	0.00	f5ra7dru5fk5n	XML_P7R_RNC_RCS(003110008)	SELECT NAME, PATH, READ, WR...
64,801	64,807	1.00	0.00	0.00	fhzj09a7fnrnb	XML_V7I_IN_LP_DC(00811000V)	SELECT DBTIMEZONE, LENGTH(DBT...
64,632	64,542	1.00	0.00	0.00	15jnrrb6016nd	XML_V7I_IN_LP_DC(00811000V)	SELECT SESSIONTIMEZONE, LENGT...

```
SELECT /*+ RESULT_CACHE */ srvr_id
FROM (
  SELECT srvr_id, SUM(cnt) SUMCNT
  FROM (
    SELECT DISTINCT srvr_id, 1 AS CNT
    FROM servers
    UNION ALL
    SELECT DISTINCT srvr_id, 1
    FROM serv_inst)
  GROUP BY srvr_id)
WHERE sumcnt = 2;
```

Optimizer Settings

- Default Oracle install favors data warehouse not OLTP

```
NAME                                 TYPE        VALUE
------------------------------------ ----------- -----------
optimizer_adaptive_features          boolean     TRUE
optimizer_adaptive_reporting_only    boolean     FALSE
optimizer_capture_sql_plan_baselines boolean     FALSE
optimizer_dynamic_sampling           integer     2
optimizer_features_enable            string      12.1.0.2
optimizer_index_caching              integer     0
optimizer_index_cost_adj             integer     100
optimizer_mode                       string      ALL_ROWS
optimizer_secure_view_merging        boolean     TRUE
optimizer_use_invisible_indexes      boolean     FALSE
optimizer_use_pending_statistics     boolean     FALSE
optimizer_use_sql_plan_baselines     boolean     TRUE
```

```
SQL> show parameter optimizer_mode

NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------
optimizer_mode                       string      ALL_ROWS

SQL> ALTER SYSTEM SET OPTIMIZER_MODE='FIRST_ROWS_10';

System altered.

SQL> show parameter optimizer_mode

NAME                      TYPE        VALUE
------------------------- ----------- --------------
optimizer_mode            string      FIRST_ROWS_10
```

Best for Data Warehouse

Best for OLTP

Optimizer Statistics

- Gather System Stats
- Gather Fixed Object Stats
- Gather Dictionary Stats
- Gather Table Stats
- Gather Column Stats
- Gather Index Stats
- Gather Extended Stats
- Stat Generation
  - Copy Stats
  - Set Stats
  - Fixing Stats

```
Terminal
Window  Edit  Options
MAXTHR
MBRC
MREADTIM
SLAVETHR
SREADTIM

9 rows selected.

SQL> /

PNAME                                  PVAL1
------------------------------ ----------
CPUSPEED
CPUSPEEDNW                        680.062427
IOSEEKTIM                                 10
IOTFRSPEED                              4096
MAXTHR
MBRC
MREADTIM
SLAVETHR
SREADTIM

9 rows selected.

SQL> exec dbms_stats.gather_system_stats('STOP');

PL/SQL procedure successfully completed.

SQL> select pname, pval1
  2  from aux_stats$
  3  where sname = 'SYSSTATS_MAIN';

PNAME                                  PVAL1
------------------------------ ----------
CPUSPEED                                1081
CPUSPEEDNW                        680.062427
IOSEEKTIM                                 10
IOTFRSPEED                              4096
MAXTHR
MBRC                                       9
MREADTIM                                .107
SLAVETHR
SREADTIM                                .029

9 rows selected.

SQL> ■
```

```
SQL> select type, count(*)
  2  from v$fixed_table
  3  group by type
  4  order by 1;

TYPE    COUNT(*)
----- ----------
TABLE       1144
VIEW        1261

SQL> select name
  2  from v$fixed_table
  3  where rownum < 11;

NAME
--------------------------
X$KQFTA
X$KQFVI
X$KQFVT
X$KQFDT
X$KQFCO
X$KQFOPT
X$KYWMPCTAB
X$KYWMWRCTAB
X$KYWMCLTAB
X$KYWMNF
```

Gathering Optimizer Statistics

```
exec dbms_stats.set_table_prefs(USER, 'SERVERS', 'ESTIMATE_PERCENT','90');

exec dbms_stats.set_table_prefs(USER, 'SERVERS', 'DEGREE','8');
```

```
exec dbms_stats.gather_table_stats(USER, 'SERVERS',
'P2010103106',
estimate_percent => dbms_stats.auto_sample_size,
block_sample=>TRUE,
method_opt=>'FOR ALL INDEXED COLUMNS',
degree=>2,
cascade=>TRUE
force=>TRUE);
```

```
SELECT dbms_stats.create_extended_stats(USER, 'SERV_INST', '(srvr_id, si_status)')
FROM dual;
```

Manufacturing Optimizer Statistics

```
exec dbms_stats.set_table_stats(USER, 'EMP', numrows=>1000000, numblks=>10000, avgrlen=>74);

exec dbms_stats.set_index_stats(USER, 'ix_emp_deptno', numrows=>1000000, numlblks=>1000,
     numdist=>10000, clstfct=>1);

exec dbms_stats.set_column_stats(USER, 'emp', 'deptno', distcnt=>10000);

exec dbms_stats.set_table_stats(USER, 'dept', numrows=>100, numblks=>100);
```

Root Cause Analysis by Sophisticated Guessing

- Check data dictionary for collected stats
- Explain Plans
  - Very few people can read them ... I will prove it next
- AWR Reports
  - Data <> Information
  - If you want value from AWR ... create **AWR Difference** reports with **DBMS_WORKLOAD_REPOSITORY.AWR_DIFF_REPORT_HTML**
- ASH Reports
- SQL Tuning Advisor
- SQL Trace and TKPROF
- Baselines and Evolving Baselines
- DBMS_TRACE, DBMS_MONITOR, TRCSESS, TRACE ANALYZER, SQLTXPLAIN

Reading Explain Plans

- Very few people can read an explain plan
- Here are two plans from identical tables with identical stats
- Which one would you rely on?

The SQL Statement

```
SELECT srvr_id
FROM servers
INTERSECT
SELECT srvr_id
FROM serv_inst;
```

Database 11gR2

```
-----------------------------------------------------------------------
| Id | Operation                | Name         | Rows | Bytes | Cost (%CPU)|
-----------------------------------------------------------------------
|  0 | SELECT STATEMENT         |              |  141 | 4560  |     6  (84)|
|  1 |  INTERSECTION            |              |      |       |            |
|  2 |   SORT UNIQUE NOSORT     |              |  141 |  564  |     2  (50)|
|  3 |    INDEX FULL SCAN       | PK_SERVERS   |  141 |  564  |     1   (0)|
|  4 |   SORT UNIQUE            |              |  999 | 3996  |     4  (25)|
|  5 |    INDEX FAST FULL SCAN| IX_SERV_INST |  999 | 3996  |     3   (0)|
-----------------------------------------------------------------------
```

```
-----------------------------------------------------------------------
| Id  | Operation                | Name         | Rows | Bytes | Cost (%CPU)|
-----------------------------------------------------------------------
|   0 | SELECT STATEMENT         |              |  141 |  4560 |    20  (10)|
|   1 |  INTERSECTION            |              |      |       |            |
|   2 |   SORT UNIQUE            |              |  141 |   564 |    10  (10)|
|   3 |    TABLE ACCESS FULL     | SERVERS      |  141 |   564 |     9   (0)|
|   4 |   SORT UNIQUE            |              |  999 |  3996 |    10  (10)|
|   5 |    TABLE ACCESS FULL     | SERV_INST    |  999 |  3996 |     9   (0)|
-----------------------------------------------------------------------
```

Database 12gR1

```
SQL> SELECT table_name, blocks
  2  FROM user_tables
  3* WHERE table_name IN ('SERVERS', 'SERV_INST');

TABLE_NAME                       BLOCKS
------------------------------ ----------
SERVERS                              28
SERV_INST                            28
```

This Adds To The Confusion

```
SQL> SELECT blocks
  2  FROM dba_tables
  3  WHERE owner = 'UWCLASS'
  4  AND table_name = 'SERVERS';

    BLOCKS
----------
        28

SQL> SELECT blocks
  2  FROM dba_segments
  3  WHERE owner = 'UWCLASS'
  4  AND segment_name = 'SERVERS';

    BLOCKS
----------
        32
```

This Makes It Even Worse

```
SQL> DECLARE
  2   uf   NUMBER;
  3   ub   NUMBER;
  4   f1   NUMBER;
  5   f1b  NUMBER;
  6   f2   NUMBER;
  7   f2b  NUMBER;
  8   f3   NUMBER;
  9   f3b  NUMBER;
 10   f4   NUMBER;
 11   f4b  NUMBER;
 12   fbl  NUMBER;
 13   fby  NUMBER;
 14  BEGIN
 15    dbms_space.space_usage('UWCLASS','SERVERS', 'TABLE', uf, ub, f1, f1b, f2, f2b, f3, f3b, f4, f4b, fbl, fby);
 16
 17    dbms_output.put_line('unformatted blocks:  ' || TO_CHAR(uf));
 18    dbms_output.put_line('unformatted bytes:   ' || TO_CHAR(ub));
 19    dbms_output.put_line('blocks 0-25% free:   ' || TO_CHAR(f1));
 20    dbms_output.put_line('bytes 0-25% free:    ' || TO_CHAR(f1b));
 21    dbms_output.put_line('blocks 25-50% free:  ' || TO_CHAR(f2));
 22    dbms_output.put_line('bytes 25-50% free:   ' || TO_CHAR(f2b));
 23    dbms_output.put_line('blocks 50-75% free:  ' || TO_CHAR(f3));
 24    dbms_output.put_line('bytes 50-75% free:   ' || TO_CHAR(f3b));
 25    dbms_output.put_line('blocks 75-100% free: ' || TO_CHAR(f4));
 26    dbms_output.put_line('bytes 75-100% free:  ' || TO_CHAR(f4b));
 27    dbms_output.put_line('full blocks:         ' || TO_CHAR(fbl));
 28    dbms_output.put_line('full bytes:          ' || TO_CHAR(fby));
 29  END;
 30  /
unformatted blocks:  16
unformatted bytes:   131072
blocks 0-25% free:   0
bytes 0-25% free:    0
blocks 25-50% free:  1
bytes 25-50% free:   8192
blocks 50-75% free:  0
bytes 50-75% free:   0
blocks 75-100% free: 11
bytes 75-100% free:  90112
full blocks:         0
full bytes:          0
```

only 12 blocks are formatted

Summary

- Do not guess
  - If your problem is not caused by slow hardware then faster hardware will just create a problem faster
  - Gather information from a date-time range when everything was good and compare with the date-time range when the problem was observed
  - If the problem is slow SQL ... is the SQL statement itself slow or is it the entire environment that should be examined?
  - If the problem is related to CPU ... do you need more/faster CPUs or a better design?
  - If the problem is related to I/O ... do you need a new SAN or better indexing?
  - If the problem is related to network bandwidth ... do you need new NIC cards and to stop network virtualization? Yes you probably do

Conclusion

- The No SQL approach to tuning is to stop guessing
- And stop blaming everything on SQL statements
- Until you can prove that the root cause is the SQL
- Use the scientific method
  - Construct a hypothesis
  - Test the hypothesis by doing experiments
  - Validate your conclusion
- Only rewrite SQL after you have established conclusively that the root cause is the way a statement has been written

- Most likely you will find yourself rewriting very little SQL

ERROR at line 1:
ORA-00028: your session has been killed

Thank you

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