Whitepaper

Database monitoring

MICRO FOCUS

Contents

Overview

This document provides Cloud Service Automation (CSA) deployment, monitoring, and maintenance guidelines for database administrators. In addition, the document includes best practices, database configuration for optimal performance, and database monitoring based on expected workloads.

You might experience different results than those described here because:

- These guidelines are based on test environments and tests conducted in R&D Performance labs.
- Recommended best practices for database optimizations suggested by vendors (such as VM optimizations recommended by Hypervisor vendors) might not have been followed.
- Tests were conducted with a database installed on a VM.
- SQLserver2012,Oracle 12c, and Postgres 9.1.4 have been tested in the CSA Performance Testing Lab

Workload profiles

Note: See the CSA sizing guide for more information on workload profiles.

Database configuration specifications

The following table lists application server and database server configuration settings that provide optimal performance when paired with specified workload conditions (see the CSA Sizing Guide for additional details on workload profiles used).

Configuration settings for MSSQL

MSSQL database configuration parameter	**Profile A***	**Profile B****	**Profile C*****
TempDB	4 GB	8 GB	8 GB
SQLServer Memory	12 GB	28 GB	28 GB
Disable parallelism	Yes	Yes	Yes
AWE memory manager (SQLserver 2008)	Yes	Yes	Yes
Snapshot Isolation	OFF	OFF	OFF
optimizer_mode	ALL_ROWS	ALL_ROWS	ALL_ROWS
Optimize for Adhoc Workload	Yes	Yes	Yes
Database transaction log file size	50 % of Database File size (50 GB)	50 % of Database File size (100 GB)	50 % of Database File size (100 GB)

*Profile A represents workload with the smaller-load profile of the two profiles outlined in the sizing guide.
**Profile B represents workload with the larger-load profile of the two profiles outlined in the sizing guide.
***Profile C represents workload exercising only Topology designs as outlined in the sizing guide.

Configuration settings for Oracle

Oracle database configuration parameter	Profile A*	Profile B**	Profile C***
cursor_sharing	EXACT	EXACT	EXACT
db_block_size	8192	8192	8192
memory_target	4 GB	6GB	6 GB
open_cursors	300	300	300
optimizer_mode	ALL_ROWS	ALL_ROWS	ALL_ROWS
Processes	300	600	600

Configuration settings for Postgress

Postgres database configuration parameter	Profile A*
cursor_sharing	EXACT
db_block_size	8192
memory_target	4 GB
open_cursors	300
optimizer_mode	ALL_ROWS
Processes	300

Database maintenance best practices

- Using this paper's recommendations as a basis, follow these best practices to deploy CSA:
- Allocate additional capacity for operating-system demands while sizing system resources for CSA database servers.
- Install the database server on a separate server, not the server where CSA is installed.
- Maintain database disk I/O wait times at low values (< 200 ms).
- Run scheduled database jobs on the CSA database schema to ensure optimal performance as the data volume grows. Increases in data volume can negatively impact the SQL execution path.
- Run gather_stats jobs regularly to keep database statistics current.
- Periodically rebuild indexes for tables with high data growth.
- Use the CSA database Purge Tool periodically to physically delete unused auditing subscriptions (and associated data) from the database. Purging will prevent indefinite data growth and save database storage space.
- Actively monitor CPU usage, database memory usage, and database IO latencies.

CSA Purge Tool

This tool is used to delete cancelled, expired, or failed subscriptions and their associated data (requests; request actions; approval processes and notifications; subscription actions; service instances and component actions; resource binding actions; resource subscriptions and actions) from the database.

To run the purge tool, see the section Deleting Service Subscriptions and Audit Data in the *CSA Configuration Guide*.

Database sizing – data growth projection

This section provides high-level, database-server guidelines for CSA data-growth projections. For OO data-growth projections, see OO sizing guidelines.

Two driving factors of disk usage in a CSA database are subscription data volume and complexity of service designs used (number of service components with properties and number of options).

CSA 3.2 sizing templates were reused in this guide for data-growth projections because differences in table data growth between CSA 3.2 and CSA 4.50 (or later versions) were negligible. These sizing templates are available on HPE connections and give detailed projections based on the complexity of service designs and volume of subscription data.

High-count tables

The following CSA database tables have high row, read, and write counts:

- `CSA_VALUE,CSA_PROPERTY,CSA_ACTION_PROPERTY,CSA_PROCESS_INSTANCE_PROPERTY,CSA_ACTION_INSTANCE_PROPERTY,CSA_PRICING`
- `CSA_INITIAL_PRICING,CSA_OPTION_PRICING,CSA_RECURRENT_PRICING,CSA_OPTION,CSA_PROPERTY_BINDING,CSA_ACTION,CSA_ARTIFACT`
- `TOKENSTOREOBJECT (IDM Database)`

Use vendor-recommended best practices, including these, for large-data tables:

- Gather table statistics
- Gather index statistics
- Rebuild Indexes with % fragmentation > 30 % to avoid fragmentation

The following table shows estimated required storage for database servers for the workload profiles listed in the sizing guide:

Estimated Data Growth	**Profile A***	**Profile B****	**Profile C*****
Oracle	100 GB (csadb) 1 GB (csa IDMDB)	240 GB (csadb) 2 GB (csa IDMDB)	200 GB (csadb) 2 GB (csa IDMDB)
MSSQL	100 GB (csadb) 1 GB (csa IDMDB)	240 GB (csadb) 2 GB (csa IDMDB)	200 GB (csadb) 2 GB (csa IDMDB)
Postgres	100 GB (csadb) 1 GB (csa IDMDB)	-	-

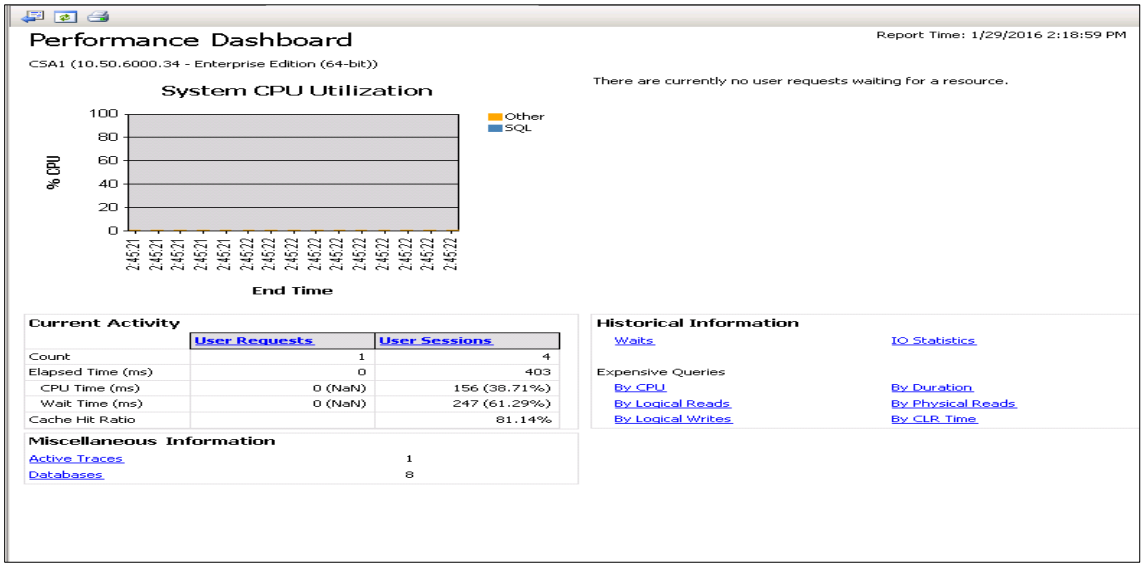
Database monitoring

This section discusses the top critical database server metrics that should be monitored. You can use further monitoring and other metrics to delve further into database issues.

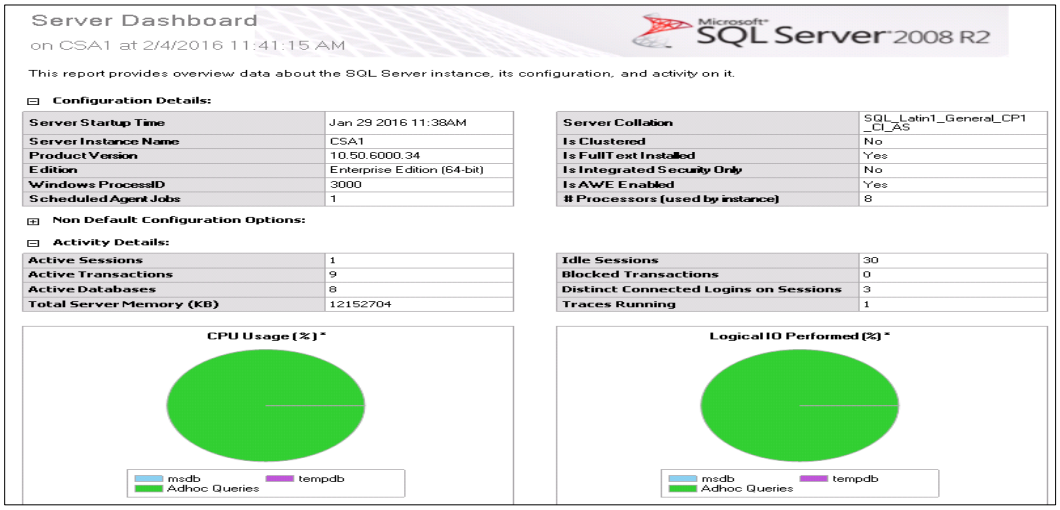
MSSQL

CPU Usage

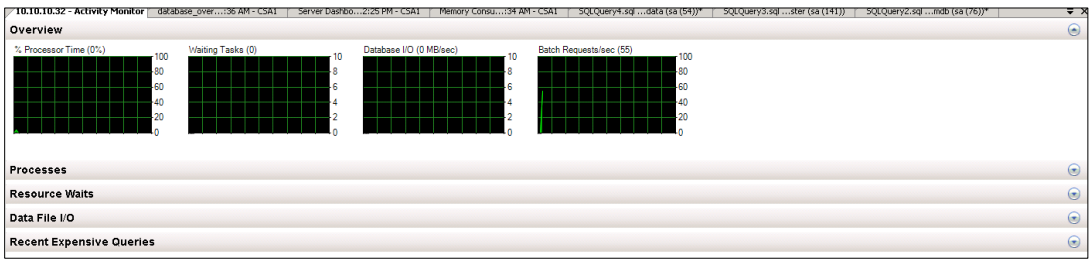
SQL server Performance Dashboard



Reports -> Standard Reports -> Server Dashboard

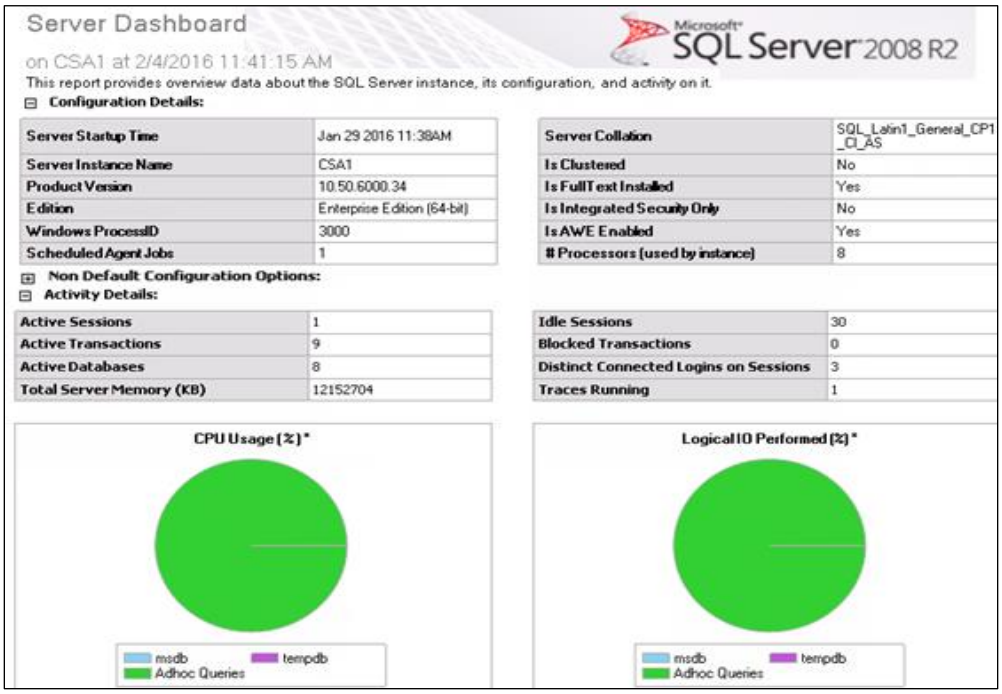


Activity Monitor



SQL Server Memory usage

Reports > Standard Reports > Server Dashboard > Total Server Memory



Server Dashboard

on CSA1 at 2/4/2016 11:41:15 AM

Microsoft SQL Server 2008 R2

This report provides overview data about the SQL Server instance, its configuration, and activity on it.

Configuration Details:

Server Startup Time	Jan 29 2016 11:38AM	Server Collation	SQL_Latin1_General_CP1_CI_AS
Server Instance Name	CSA1	Is Clustered	No
Product Version	10.50.6000.34	Is FullText Installed	Yes
Edition	Enterprise Edition (64-bit)	Is Integrated Security Only	No
Windows ProcessID	3000	Is AWE Enabled	Yes
Scheduled Agent Jobs	1	# Processors (used by instance)	8

Non Default Configuration Options:

Activity Details:

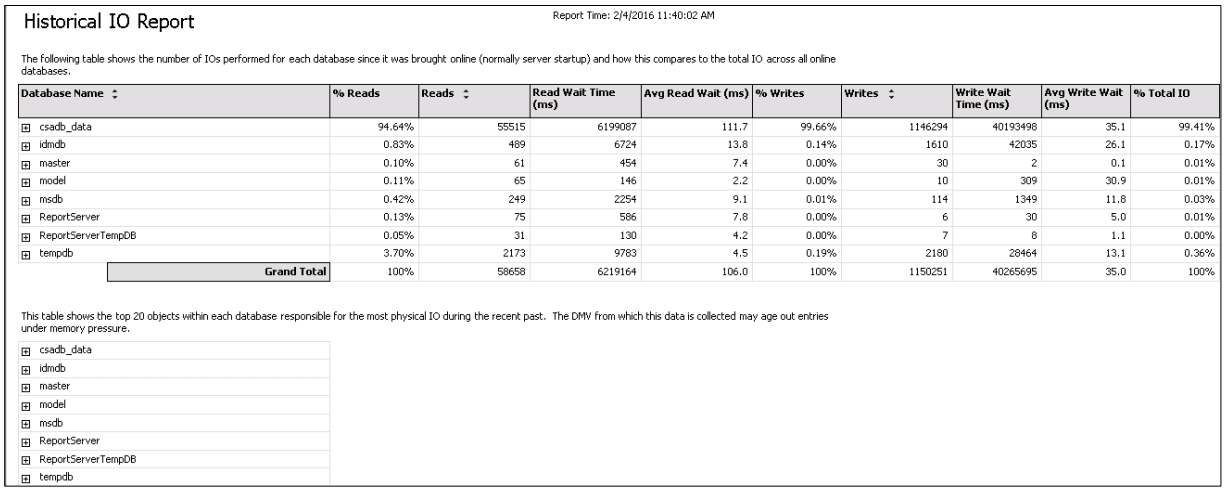
Active Sessions	1	Idle Sessions	30
Active Transactions	9	Blocked Transactions	0
Active Databases	8	Distinct Connected Logins on Sessions	3
Total Server Memory (KB)	12152704	Traces Running	1

CPU Usage (%) *

Logical IO Performed (%) *

Disk Latencies

SQLserver performance dashboard -> IO Statistics Report



Historical IO Report

Report Time: 2/4/2016 11:40:02 AM

The following table shows the number of IOs performed for each database since it was brought online (normally server startup) and how this compares to the total IO across all online databases.

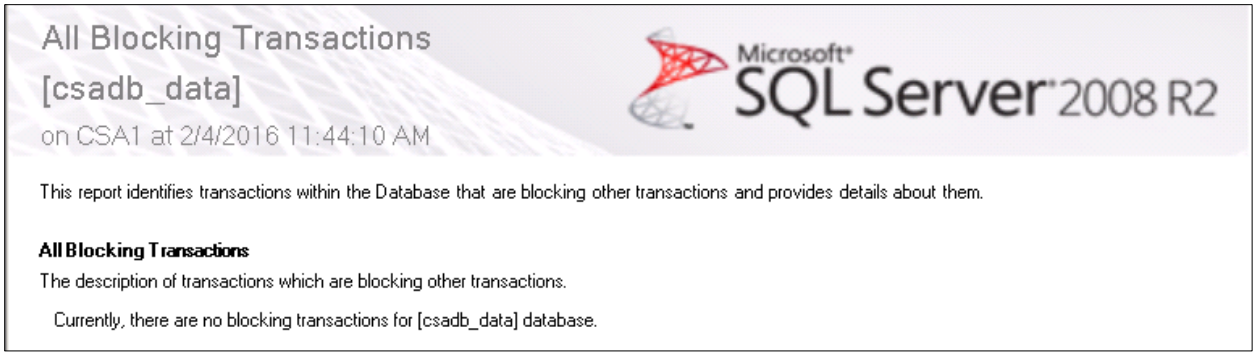
Database Name	% Reads	Reads	Read Wait Time (ms)	Avg Read Wait (ms)	% Writes	Writes	Write Wait Time (ms)	Avg Write Wait (ms)	% Total IO
csadb_data	94.64%	55515	6199087	111.7	99.66%	1146294	40193498	35.1	99.41%
idmdb	0.83%	489	6724	13.8	0.14%	1610	42035	26.1	0.17%
master	0.10%	61	454	7.4	0.00%	30	2	0.1	0.01%
model	0.11%	65	146	2.2	0.00%	10	309	30.9	0.01%
msdb	0.42%	249	2254	9.1	0.01%	114	1349	11.8	0.03%
ReportServer	0.13%	75	586	7.8	0.00%	6	30	5.0	0.01%
ReportServerTempDB	0.05%	31	130	4.2	0.00%	7	8	1.1	0.00%
tempdb	3.70%	2173	9783	4.5	0.19%	2180	28464	13.1	0.36%
Grand Total	100%	58658	6219164	106.0	100%	1150251	40265695	35.0	100%

This table shows the top 20 objects within each database responsible for the most physical IO during the recent past. The DMV from which this data is collected may age out entries under memory pressure.

- csadb_data
- idmdb
- master
- model
- msdb
- ReportServer
- ReportServerTempDB
- tempdb

Blocking Transactions

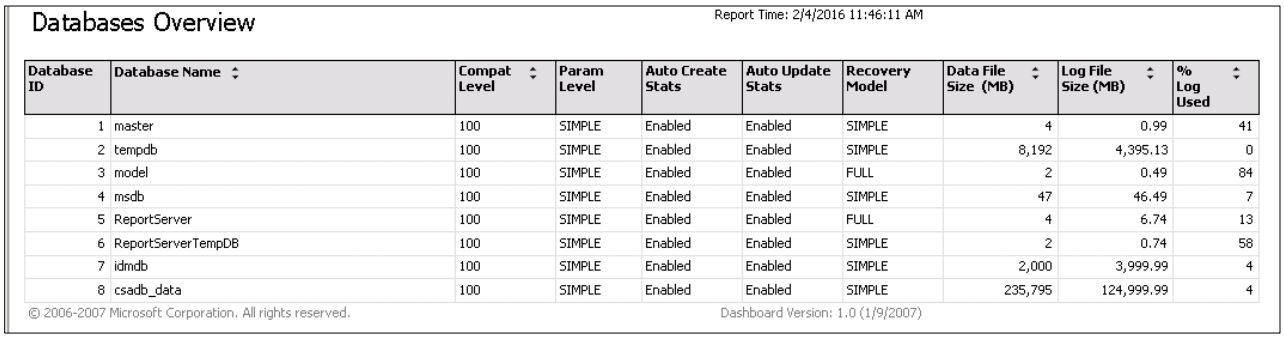
Reports -> Standard Reports -> All Blocking Transactions Report



Log File usage

SQLserver Performance Dashboard -> Databases report

Allocate sufficient initial Log file size to adequately limit the log-file dynamic growth.



Databases Overview

Report Time: 2/4/2016 11:46:11 AM

Database ID	Database Name	Compat Level	Param Level	Auto Create Stats	Auto Update Stats	Recovery Model	Data File Size (MB)	Log File Size (MB)	% Log Used
1	master	100	SIMPLE	Enabled	Enabled	SIMPLE	4	0.99	41
2	tempdb	100	SIMPLE	Enabled	Enabled	SIMPLE	8,192	4,395.13	0
3	model	100	SIMPLE	Enabled	Enabled	FULL	2	0.49	84
4	msdb	100	SIMPLE	Enabled	Enabled	SIMPLE	47	46.49	7
5	ReportServer	100	SIMPLE	Enabled	Enabled	FULL	4	6.74	13
6	ReportServerTempDB	100	SIMPLE	Enabled	Enabled	SIMPLE	2	0.74	58
7	idmdb	100	SIMPLE	Enabled	Enabled	SIMPLE	2,000	3,999.99	4
8	csadb_data	100	SIMPLE	Enabled	Enabled	SIMPLE	235,795	124,999.99	4

Dashboard Version: 1.0 (1/9/2007)

Oracle

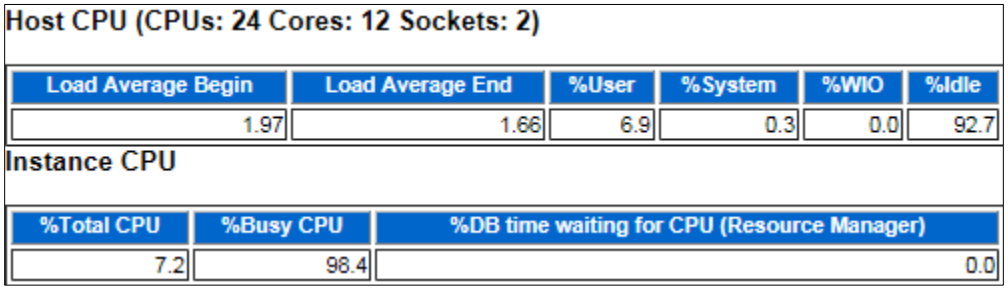
Use the Oracle AWR report to analyze the critical monitoring metrics in this section, and Oracle Enterprise manager to display live graphical monitoring of the Oracle database.

Run the following command from the sqlplus prompt to execute the Oracle-supplied script and generate the AWR report:

```
@$ORACLE_HOME\rdbms\admin\awrrpt.sql
```

CPU Use

AWR report -> Instance CPU usage



Host CPU (CPUs: 24 Cores: 12 Sockets: 2)

Load Average Begin	Load Average End	%User	%System	%WIO	%Idle
1.97	1.66	6.9	0.3	0.0	92.7

Instance CPU

%Total CPU	%Busy CPU	%DB time waiting for CPU (Resource Manager)
7.2	98.4	0.0

Database Memory usage (SGA)

AWR -> Memory Statistics -> SGA usage

Memory Statistics

	Begin	End
Host Mem (MB):	64,454.9	64,454.9
SGA use (MB):	7,872.0	7,872.0
PGA use (MB):	261.8	251.9
% Host Mem used for SGA+PGA:	12.62	12.60

AWR > SGA Target Advisory for the optimal SGA recommended by Oracle based on the workload. Choose a SGA target size from the following table that results in minimum Estimated Physical Reads:

SGA Target Advisory

SGA Target Size (M)	SGA Size Factor	Est DB Time (s)	Est Physical Reads
1,968	0.25	221,614,120	617,509,289,159
2,952	0.38	80,003,131	202,693,019,102
3,936	0.50	19,326,019	24,950,049,652
4,920	0.63	11,224,423	1,217,900,031
5,904	0.75	11,107,941	877,735,645
6,888	0.88	11,097,956	863,236,835
7,872	1.00	11,093,519	857,917,745
8,856	1.13	11,091,300	853,971,323
9,840	1.25	11,089,082	848,738,025
10,824	1.38	11,086,863	844,191,061
11,808	1.50	11,085,754	838,786,179
12,792	1.63	11,081,316	826,003,205
13,776	1.75	11,080,207	826,003,205
14,760	1.88	11,079,097	826,003,205
15,744	2.00	11,079,097	826,003,205

Disk Latencies (IO bottlenecks)

AWR -> Top Timed Foreground events -> Look for Database File type waits

Top 5 Timed Foreground Events

Event	Waits	Time(s)	Avg wait (ms)	% DB time	Wait Class
DB CPU		22,660		63.38	
direct path read	122,403	32	0	0.09	User I/O
SQL*Net message to client	30,711,443	31	0	0.09	Network
db file sequential read	13,285	27	2	0.08	User I/O
SQL*Net more data from client	366,665	6	0	0.02	Network

Postgres

Use the open source tool pgstatspack available from http://pgfoundry.org/projects/pgstatspack to monitor Postgres. This tool gives an overview of the top SQL-related statistics (CPU, memory, disk usage, and other statistics that are also reported in the Oracle AWR report).

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