Agenda

- Why DB Replay
- DB Replay Overview
- System Architecture
- Supported Workloads
- Capture the Workload
- Pre-Processing the Capture Workload
- Replay the Workload
- Analyze the Data
- Replay Setup using Enterprise Manager
- Replay Setup using API’s
- Q&A
Why Database Replay

- System changes
  - Need Hardware Upgrade like CPU, Memory
  - Need Database/Operating System Upgrades
  - Storage Changes like filesystem to ASM or vice-versa
  - Microsoft to Linux or OS migrations

- Configuration changes
  - Single Instance to Multi-node RAC
  - Schema/Parameters
  - Patches

- Identify, analyze and fix potential instabilities before making changes to production

- Save Time and Money

- More thorough testing which is missed in most of the testing

- Provide Real world testing without real-life testers
DB Replay Overview

- Recreate actual production database workload in QA environment
- DB Replay components or Phases
  - Backup the Production/Source Database
    -> User RMAN or other Backup Approach
  - Configure EM Console as it is recommended option
    -> emca -config dbcontrol db -repos recreate
  - Capturing Phase
    -> Start the Capture process
    -> Apply/start the Load/Apps
    -> Stop the Capture Process
  - Move the Captured Workload on OS to Test Server
  - Pre-processing Phase
  - Restore the backup on Test Database
  - Replay Phase
  - Analysis
    -> Error or Data Divergence
Prerequisites for Capturing Database Workload

- Backup the Database
  - RMAN
  - Imp/exp
  - Snapshot Standby
  - Point-in-time recovery using a target SCN
- Allocate physical space for Recording
  
  $ mkdir -p /home/capture_dir
  
  SQL> CREATE DIRECTORY "captdir" AS '/home/capture_dir'
  
  - Make sure you have enough space to store the Captured Workload files
- Configure Enterprise Manager DB Console

Points of Consideration before Capturing Database Workload

- Disk Storage based on time of Recoding
- Performance Overhead
- Memory Overhead : 64K per session
Capture the Workload in Production

- Start the Capturing process
  - Using Enterprise Manager
  - Using APIs
  
  `DBMS_WORKLOAD_CAPTURE.START_CAPTURE`

- Start the Application to apply real Load on the System

- Stop the Capturing process
  - Using Enterprise Manager
  - Using APIs
  
  `DBMS_WORKLOAD_CAPTURE.FINISH_CAPTURE`

- Transfer the Data for processing to test system
### DB Replay – Workload Capture

**SQL>** select name, directory, status, start_time, end_time, duration_secs, dir_path
from dba_workload_captures

<table>
<thead>
<tr>
<th>NAME</th>
<th>DIRECTORY</th>
<th>STATUS</th>
<th>START_TIME</th>
<th>END_TIME</th>
<th>DURATION</th>
<th>DIR_PATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>capture07</td>
<td>API_DIR</td>
<td>IN PROGRESS</td>
<td>26-JUL-07</td>
<td></td>
<td></td>
<td>/home/oracle/api_dir</td>
</tr>
</tbody>
</table>

You will see the END_TIME is null as Capture is still running as shown by STATUS column.

**SQL>** select name, directory, status, start_time, end_time, duration_secs, dir_path
from dba_workload_captures

<table>
<thead>
<tr>
<th>NAME</th>
<th>DIRECTORY</th>
<th>STATUS</th>
<th>START_TIME</th>
<th>END_TIME</th>
<th>DURATION</th>
<th>DIR_PATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>capture07</td>
<td>API_DIR</td>
<td>COMPLETED</td>
<td>26-JUL-07</td>
<td>26-JUL-07</td>
<td>6913</td>
<td>/home/oracle/api_dir</td>
</tr>
</tbody>
</table>
$ mkdir -p /home/c_dir
SQL> create directory "cdir" AS '/home/c_dir'
$ cd /home/c_dir
$ ls –lr
Total 0
Shadow Process
Shadow Process
Shadow Process
11g RDBMS built-in Recording Infrastructure
Background Process/Jobs
Replay
Shadow Process
Shadow Process
Shadow Process
...
Shadow Process
wcr_4d7x440002mup.rec
wcr_4d7x440002jx0.rec
wcr_4d7x4440002mqs.rec
wcr_4d7x448002jy8.rec
What is supported for Workload

- All DDL, DML and PL/SQL statements along with binds
- Lobs
- Login and Logoffs
- Local Transactions

What is supported for Workload

- Direct Path Load using Sql*Loader
- Export and Import
- Oracle Streams
- Flashback
- Distributed Transactions (these transactions are replayed as Local transaction)
DB Replay – Workload Capture-EM......Contd.

Oracle 11g Database Replay

Database Instance: orcl

Software

Database Software Patching
- Patch Advisor
- View Patch Cache
- Patch Prerequisites
- Stage Patch
- Apply Patch

Real Application Testing
- Database Replay
- SQL Performance Analyzer

ORACLE Enterprise Manager 11g
Database Control

Logged in As SYS

Workload Capture and Replay
Specify the type of workload capture and replay operation.

Manage workload capture operations
- Choose this option to capture workload or view workload capture history on this database.
- View or preprocess captured workload
  - Preprocessing will prepare a captured workload for replay. This must be done once for every view.
- Manage workload replay operations
  - Choose this option to replay a preprocessed workload on this database or view a captured workload.
  - View or stop active capture or replay
  - Choose this option to view the active capture or replay.
DB Replay – Workload Capture-EM.......Contd.
Starting a Workload Capture

```
[db02pn]$ mkdir /home/oracle/api_dir
```

```
SQL> create directory api_dir as '/home/oracle/api_dir';
```

Directory created.

```
SQL> BEGIN
  2  DBMS_WORKLOAD_CAPTURE.START_CAPTURE (name => 'capture07',
  3    dir => 'API_DIR',
  4    NO_RESTART_MODE => TRUE);
  5 END;
  6 /
```

Stopping a Workload Capture

```
SQL> BEGIN
  2  DBMS_WORKLOAD_CAPTURE.FINISH_CAPTURE ();
  3 END;
  4 /
```

PL/SQL procedure successfully completed
```
[oracle@capture_dir]$ ls -ltr
total 13492
-rw-r----- 1 oracle oinstall 0 Jul 19 13:49 wcr_rec_00001.start
-rw-r----- 1 oracle oinstall 1348 Jul 19 13:49 wcr_4d7x440002mup.rec
-rw-r----- 1 oracle oinstall 928 Jul 19 13:49 wcr_4d7x440002jx0.rec
-rw-r----- 1 oracle oinstall 1140 Jul 19 13:49 wcr_4d7x444002mqs.rec
-rw-r----- 1 oracle oinstall 928 Jul 19 13:49 wcr_4d7x448002jy8.rec
-rw-r----- 1 oracle oinstall 1127 Jul 19 13:49 wcr_4d7x448002k49.rec
-rw-r----- 1 oracle oinstall 1128 Jul 19 13:49 wcr_4d7x44h002k2m.rec
-rw-r----- 1 oracle oinstall 1126 Jul 19 13:49 wcr_4d7x45s002k84.rec
-rw-r----- 1 oracle oinstall 913 Jul 19 13:49 wcr_4d7x460002ksw.rec
-rw-r----- 1 oracle oinstall 1126 Jul 19 13:49 wcr_4d7x460002ksw.rec
-rw-r----- 1 oracle oinstall 1128 Jul 19 13:49 wcr_4d7x460002km0.rec
-rw-r----- 1 oracle oinstall 1128 Jul 19 13:49 wcr_4d7x460002k4c.rec
-rw-r----- 1 oracle oinstall 1140 Jul 19 13:49 wcr_4d7x46w002k4g.rec
-rw-r----- 1 oracle oinstall 2604 Jul 19 13:50 wcr_4d7x49n002mxp.rec
-rw-r----- 1 oracle oinstall 2402 Jul 19 13:50 wcr_4d7x49s002mxt.rec
-rw-r----- 1 oracle oinstall 1128 Jul 19 13:50 wcr_4d7x49s002k9p.rec
-rw-r----- 1 oracle oinstall 1128 Jul 19 13:50 wcr_4d7x4ah002k47.rec
-rw-r----- 1 oracle oinstall 1835 Jul 19 13:53 wcr_4d7x54c002n60.rec
-rw-r----- 1 oracle oinstall 2501 Jul 19 13:58 wcr_4d7x65h002nb7.rec
-rw-r----- 1 oracle oinstall 2925 Jul 19 13:58 wcr_4d7x65h002nba.rec
-rw-r----- 1 oracle oinstall 1836 Jul 19 13:58 wcr_4d7x69s002nd3.rec
-rw-r----- 1 oracle oinstall 1751 Jul 19 13:58 wcr_4d7x6an002nf9.rec
-rw-r----- 1 oracle oinstall 1833 Jul 19 14:03 wcr_4d7x7gc002np1.rec
-rw-r----- 1 oracle oinstall 1836 Jul 19 14:08 wcr_4d7x8ns002nzz.rec
```

Client → Middle Tier → Oracle 11g Database Replay

Middle Tier → Middle Tier → Oracle 11g Database Replay

Oracle 11g Database Replay

STORAGE

PRE-PROCESSING the WORKLOAD

STORAGE
**DB Replay – PreProcessing Workload**

- It transforms the captured workload data into Replay files
- It will create all necessary metadata for Replay
- Only required once for every captured workload
- This is resource intensive process and so avoid it in production system
- It should be done on system running same DB version as of Replay system
- Make sure Files are moved to the Instance directory where it is processed.
  - For RAC - Move captured workload from all instances to single place for preprocessing
  - Use single instance for Preprocessing in RAC environment
- It is recommended to use Replay system for preProcessing else you need to move all processed files to Replay system
- EM is recommended tool for preProcessing or use APIs
**Oracle 11g Database Replay**

**PreProcessing Workload...Contd.**

**Database Instance: orcl**

**Software**
- Configuration
  - Collection Status
  - Clone Oracle Home
  - Host Configuration
  - Oracle Home Inventory
- Database Software Patching
  - Patch Advisor
  - View Patch Cache
  - Patch Prerequisites
  - Stage Patch
  - Apply Patch

**Real Application Testing**
- Database Replay
- SQL Performance Analyzer

**Workload Capture and Replay**

- **View or preprocess captured workload**
  - Preprocessing will prepare a captured workload for replay. This must be done once for every captured workload.

**Manage workload capture operations**
- Choose this option to capture workload or view workload capture history on this database.

**Manage workload replay operations**
- Choose this option to replay a preprocessed workload on this database or view a captured workload's replay history.
- **View or stop active capture or replay**
  - Choose this option to view the active capture or replay.
Preprocess Captured Workload

Directory
Select a directory object that contains a captured workload.

- Directory Object: captdir

Capture Summary
- Name: CAPTURE-orcl-20070719133228
- Status: Completed
- Duration (hh:mm:ss): 00:25:51
- Start Time: Jul 19, 2007
- End Time: Jul 19, 2007
- Start SCN: 6771511559
- End SCN: 6771515021

Preprocessed Database Version: N/A
Preprocessing Workload... Contd.

Oracle 11g Database Replay

Database Version

Preprocess Captured Workload: Database Version
- Database: orcl
- Version: 11.1.0.5

Schedule

Preprocess Captured Workload: Schedule
- Job Parameters:
  - Job Name: PREPROCESS
  - Start: Immediately
- Date: Jul-19-2007
- Time: 3:30

Review

Preprocess Captured Workload: Review
- Logged In As: SYS
- Workload: CAPTURE-orcl-20070719133228 will be preprocessed on database 'orcl'.
- Preprocessed Database Version: 11.1.0.5
- Directory Object: captdir
- Capture Name: CAPTURE-orcl-20070719133228
- Captured Data Size (MB): 0.03
- Start Time: Immediately
**Preprocessing a Captured Workload Using APIs**

To preprocess a captured workload, use the `PROCESS_CAPTURE` procedure:

```sql
SQL> BEGIN
  2 DBMS_WORKLOAD_REPLAY.PROCESS_CAPTURE (capture_dir => 'API_DIR');
  3 END;
  4 /

PL/SQL procedure successfully completed.
```
DB Replay Phases

- Backup the Production/Source Database
- Configure EM Console as it is recommended option
- Capturing Phase
- Move the Captured Workload on OS to Test Server
- Pre-processing Phase
- Restore the backup on Test Database
- Replay Phase
- Analysis
When the captured workload is processed, it can be replayed in any database running the same or higher Oracle version

**Replay Process Steps**

- Set up the Test System
  - Restore the Database taken before the start of Capture process
  - Reset the System time as it was at the start of Capture process
- Perform the change that prompted the replay usage
  - Upgrade OS or Database
  - Apply Patches
  - Make OS change
  - Move to RAC or vice-versa
- Replay the Processed Capture Workload
  - Using EM / APIs
**DB Replay – Replay Workload**

```bash
calibrate
```

```
list_hosts
```

- **Client**
- **Client**
- **Client**

- **Shadow Process**
- **Shadow Process**
- **Shadow Process**
- **Shadow Process**
- **...**
- **Shadow Process**

- **Restore Copy of Production Database**
- **Set the System Time**

![Oracle 11g Database Replay](image)
DB Replay – Replay Workload - EM..... Contd.

Oracle Enterprise Manager 11g Database Control

Database Instance: orcl

Software
- Configuration
  - Collection Status
  - Clone Oracle Home
  - Host Configuration
  - Oracle Home Inventory

Real Application Testing
- Database Replay
  - SQL Performance Analyzer

Database Software Patching
- Patch Advisor
- View Patch Cache
- Patch Prerequisites
- Stage Patch
- Apply Patch

Database Instance: orcl >

Workload Capture and Replay
Specify the type of workload capture and replay operation.

- Manage workload capture operations
  - Choose this option to capture workload or view workload capture history on this database.

View or preprocess captured workload
Preprocessing will process captured workload for replay. This must be done once for every captured workload.

Manage workload replay operations
- Choose this option to replay a preprocessed workload on this database or view a captured workload's replay history.

View or stop active capture or replay
Choose this option to view the active capture or replay.
**DB Replay – Replay Workload - EM**

**Replay Workload**
The captured workload must have been preprocessed and copied to the replay system. The workload must exist in the replay system.

**Directory**
Select a directory object that contains a preprocessed workload.

- **Directory Object**: captdir

**Capture Summary**
- **Name**: CAPTURE-orcl-2007071913
- **Status**: Completed
- **Directory Object**: captdir
- **Database Name**: ORCL
- **Capture Database Version**: 11.1.0.5.0
- **DBID**: 1155348838
- **Capture Error Code**: 0
- **Capture Error Message**: None

**Replay Workload: Prerequisites**
The following items should be completed before setting up a replay:

- Restore Database
- Perform System Changes
- Resolve References to External Systems
- Set Up Replay Clients
Replay Workload: Wait for Client Connections

The database is waiting for connections from the Replay Clients. Start the Replay Clients now.

When all the Replay Clients have connected, proceed to the next step to continue the replay setup.

- At least one Replay Client is connected. You may start more connections or continue to the next step.

This operation may take some time to complete. If you close this browser window or navigate to a different page, your place in the replay will be lost.

<table>
<thead>
<tr>
<th>SID</th>
<th>Host</th>
<th>OS Process ID</th>
<th>OS User Name</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>db01pn</td>
<td>12089</td>
<td>oracle</td>
<td>wrc@db01pn (TNS V1-V3)</td>
</tr>
<tr>
<td>121</td>
<td>db01pn</td>
<td>12169</td>
<td>oracle</td>
<td>wrc@db01pn (TNS V1-V3)</td>
</tr>
</tbody>
</table>
One Window

[oracle@db01pn capture_dir]$ wrc REPLAYDIR=/home/oracle/capture_dir USERID=sys
tem PASSWORd=welcome1

Workload Replay Client: Release 11.1.0.6.0 - Beta on Fri Jul 20 11:01:12 2007
Copyright (c) 1982, 2007, Oracle. All rights reserved.

Wait for the replay to start (16:00:21)
Replay started (16:02:49)

Second Window

[oracle@db01pn capture_dir]$ wrc REPLAYDIR=/home/oracle/capture_dir USERID=sys
tem PASSWORd=welcome1

Copyright (c) 1982, 2007, Oracle. All rights reserved.

Wait for the replay to start (16:01:11)
Replay started (16:03:19)
DB Replay – Replay Workload-EM

**View Workload Replay: REPLAY-orcl-20070719155329**

**Summary**
- **Replay Name**: REPLAY-orcl-20070719155329
- **Directory Object**: captdir
- **Database Name**: ORCL
- **DBID**: 1155348838
- **Replay Error Code**: N/A
- **Replay Error Message**: None

**Workload Profile**
- **Network Time (hh:mm:ss)**: N/A
- **Think Time (hh:mm:ss)**: N/A

**Elapsed Time Comparison**

- **Capture**
- **Replay**

---

**View Workload Replay: REPLAY-orcl-20070719155329**

**Summary**
- **Status**: Completed
- **Replay Name**: REPLAY-orcl-20070719155329
- **Directory Object**: captdir
- **Database Name**: ORCL
- **DBID**: 1155348838
- **Replay Error Code**: N/A
- **Replay Error Message**: None

**Workload Profile**
- **Network Time (hh:mm:ss)**: 00:00:00
- **Think Time (hh:mm:ss)**: 00:00:00

**Elapsed Time Comparison**

- **Capture**
- **Replay**
**INITIALIZING REPLAY DATA**

To initialize replay data, use the INITIALIZE_REPLAY procedure:

```sql
SQL> BEGIN
  2  DBMS_WORKLOAD_REPLAY.INITIALIZE_REPLAY (replay_name => 'REPLAY07',
  3  replay_dir => 'API_DIR');
  4 END;
  5 /
PL/SQL procedure successfully completed
```

**SETTING WORKLOAD REPLAY OPTIONS**

After the replay data is initialized, you need to prepare the workload replay on the replay system.

```sql
SQL> BEGIN
  2  DBMS_WORKLOAD_REPLAY.PREPARE_REPLAY (replay_name => 'REPLAY07',
  3  replay_dir => 'API_DIR',
  4  synchronization => TRUE);
  5 END;
  6 /
PL/SQL procedure successfully completed
```

```sql
SQL>select id,name,directory,status,prepare_time,start_time,end_time,dir_path from dba_workload_replays where id=22 ;
```

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>DIRECTORY</th>
<th>STATUS</th>
<th>PREPARE_TIME</th>
<th>START_TIME</th>
<th>END_TIME</th>
<th>DIR_PATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>REPLAY07</td>
<td>API_DIR</td>
<td>PREPARE</td>
<td>26/07/2007</td>
<td>22:46:58</td>
<td></td>
<td>/home/oracle/api_dir</td>
</tr>
</tbody>
</table>
START THE AGENT

[db01pn]$ wrc REPLYDIR=/home/oracle/api_dir USERID=system PASSWORD=welcome1

Copyright (c) 1982, 2007, Oracle. All rights reserved.
Wait for the replay to start (22:48:36)

SQL> select sid, logon_user, Logon_time, event, program
from V$WORKLOAD_REPLAY_THREAD

<table>
<thead>
<tr>
<th>SID</th>
<th>LOGON_USER</th>
<th>LOGON_TIME</th>
<th>EVENT</th>
<th>PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>124</td>
<td>SYSTEM</td>
<td>26/07/2007 22:48:36</td>
<td>WRR: replay client notify</td>
<td>wrc@db01pn(TNS_V1-V3)</td>
</tr>
</tbody>
</table>

STARTING A WORKLOAD REPLAY

SQL> BEGIN
  2  DBMS_WORKLOAD_REPLAY.START_REPLAY ();
  3  END;
  4  /

SQL> select id,name,directory,status,prepare_time,start_time,end_time,dir_path from dba_workload_replays where id=22;

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>DIRECTORY</th>
<th>STATUS</th>
<th>PREPARE_TIME</th>
<th>START_TIME</th>
<th>END_TIME</th>
<th>DIR_PATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>REPLAY07 API_DIR</td>
<td>IN PROGRESS</td>
<td>26/07/07 22:46:58</td>
<td>26/07/07 23:00:15</td>
<td>26/07/07 23:00:15</td>
<td>/home/oracle/api_dir</td>
<td></td>
</tr>
</tbody>
</table>
DB Replay – Analyze Workload-EM...... Contd.
### Import AWR Data

The selected report requires AWR (Automatic Workload Repository) data to be imported into the created to perform the import immediately. Run the report again when the import is completed.

Do you want to import the relevant AWR data now?

- [ ] No
- [x] Yes
## WORKLOAD REPOSITORY COMPARE PERIOD REPORT

<table>
<thead>
<tr>
<th>Snapshot Set</th>
<th>DB Name</th>
<th>DB Id</th>
<th>Instance</th>
<th>Inst num</th>
<th>Release</th>
<th>Cluster</th>
<th>Host</th>
<th>Std Block Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>First (1st)</td>
<td>ORCL</td>
<td>1908040294</td>
<td>ord</td>
<td>1</td>
<td>11.1.0.6.0 NO</td>
<td>db02pn</td>
<td>8192</td>
<td></td>
</tr>
<tr>
<td>Second (2nd)</td>
<td>ORCL</td>
<td>752664103</td>
<td>ord</td>
<td>1</td>
<td>11.1.0.6.0 NO</td>
<td>db01pn</td>
<td>8192</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Snapshot Set</th>
<th>Begin Snap Id</th>
<th>Begin Snap Time</th>
<th>End Snap Id</th>
<th>End Snap Time</th>
<th>Avg Active Users</th>
<th>Elapsed Time (min)</th>
<th>DB time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>216</td>
<td>19-Jul-07 13:49:15 (Thu)</td>
<td>217</td>
<td>19-Jul-07 14:15:04 (Thu)</td>
<td>0.03</td>
<td>25.82</td>
<td>0.86</td>
</tr>
<tr>
<td>2nd</td>
<td>16</td>
<td>19-Jul-07 14:18:53 (Thu)</td>
<td>17</td>
<td>19-Jul-07 14:42:48 (Thu)</td>
<td>0.01</td>
<td>23.91</td>
<td>0.16</td>
</tr>
<tr>
<td>%Diff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-66.67</td>
<td>-7.40</td>
<td>-81.38</td>
</tr>
</tbody>
</table>
# DB Replay – Analyze Workload Report

## Host Configuration Comparison

<table>
<thead>
<tr>
<th></th>
<th>1st</th>
<th>2nd</th>
<th>Diff</th>
<th>%Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of CPUs</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Number of CPU Cores</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Physical Memory</td>
<td>16238M</td>
<td>16238M</td>
<td>0M</td>
<td>0.00</td>
</tr>
</tbody>
</table>

## System Configuration Comparison

<table>
<thead>
<tr>
<th></th>
<th>1st</th>
<th>2nd</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGA Target:</td>
<td>0</td>
<td>0</td>
<td>0M</td>
</tr>
<tr>
<td>Buffer Cache</td>
<td>784M</td>
<td>1504M</td>
<td>720M</td>
</tr>
</tbody>
</table>

## Top Timed Events

- Events with a "-" did not make the Top list in this set of snapshots, but are displayed.

### 1st

<table>
<thead>
<tr>
<th>Event</th>
<th>Wait Class</th>
<th>Waits</th>
<th>Time(s)</th>
<th>Avg Time(ms)</th>
<th>%DB time</th>
<th>Event</th>
<th>Wait Class</th>
<th>Waits</th>
<th>Time(s)</th>
<th>Avg Time(ms)</th>
<th>%DB time</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log buffer space</td>
<td>Configuration</td>
<td>4</td>
<td>4.00</td>
<td>1000.06</td>
<td>7.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control file parallel write</td>
<td>System I/O</td>
<td>552</td>
<td>2.29</td>
<td>4.15</td>
<td>4.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>os thread startup</td>
<td>Concurrency</td>
<td>36</td>
<td>1.17</td>
<td>32.40</td>
<td>2.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Report Details**

- Time Model Statistics
- Operating System Statistics
- Wait Events
- Service Statistics
- SGL Statistics
- Instance Activity Statistics
- IO Stats
- Advisory Statistics
- Wait Stats
- Undo Statistics
- Latch Statistics
- Segment Statistics
- Dictionary Cache Statistics
- Library Cache Statistics
- Memory Statistics
- Streams Statistics
QUESTIONS & ANSWERS
THANKS

indy.johal@datasoftech.com