

# ORACLE 11G DATABASE REPLAY : ANALYZE THE WORKLOAD DATA

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## INTRODUCTION

In this part of the paper, I will provide details as how to analyze the data captured from Source database and then replayed on the Target Database.

In this paper, I will use db02pn as Source Database and db01pn as Target Database. Source Database is the database where Workload is captured and then the workload will be replayed at Target database.

**Step 1 :** Login to Enterprise Manager Database console of Target Database. Then select **Software and Support** tab and then click on **Database Replay**

The screenshot shows the Oracle Enterprise Manager 11g Database Control interface. At the top, it says 'ORACLE Enterprise Manager 11g Database Control' and 'Logged in As SYS'. The 'Database Instance: orcl' is selected. A navigation bar includes 'Home', 'Performance', 'Availability', 'Server', 'Schema', 'Data Movement', and 'Software and Support' (which is highlighted with a red box). Under the 'Software' section, there are three sub-sections: 'Configuration' (with links for Collection Status, Clone Oracle Home, Host Configuration, and Oracle Home Inventory), 'Real Application Testing' (with 'Database Replay' highlighted in a red box and a link for SQL Performance Analyzer), and 'Database Software Patching' (with links for Patch Advisor, View Patch Cache, Patch Prerequisites, Stage Patch, and Apply Patch). A 'Deployment Procedure Manager' section is also visible with links for Getting Started with Deployment Procedure Manager, Deployment Procedures, Procedure Completion Status, and Deployment and Provisioning Software Library.

**Step 2 : To view the Workload reports, Click on [Go to Task](#) against the Task Name **Replay Workload** as shown in RED below.**

ORACLE Enterprise Manager 11g Database Control

Database Instance: orcl >

### Database Replay

The Database Replay feature allows database workload to be captured on one system and replayed later on a different system. Replaying a captured workload can be useful to compare two different systems.

Task	Task Name	Description	Go to Task
1	Capture Workload	Choose this option to capture workload on this database.	
2	Preprocess Captured Workload	Preprocessing will prepare a captured workload for replay. This must be done once for every captured workload.	
3	Replay Workload	Choose this option to replay a preprocessed workload on this database.	

**Step 3 : Select the appropriate directory used that contains the Capture Workload files on the Target Database server.**

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: orcl > Database Replay >

### Replay Workload

Logged in As SYS

[Cancel](#) [Set Up Replay](#)

The captured workload must have been preprocessed and copied to the replay system. A directory object for the directory with the copied workload must exist in the replay system.

#### Directory

Select a directory object that contains a preprocessed workload.

\* Directory Object  [Create Directory Object](#)

- AUDIT\_DIR
- DATA\_FILE\_DIR
- DATA\_PUMP\_DIR
- IDR\_DIR
- LOG\_FILE\_DIR
- MEDIA\_DIR
- ORACLE\_OCM\_CONFIG\_DIR
- SUBDIR
- XMLDIR
- captdir

[Cancel](#) [Set Up Replay](#)

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atabase | Setup | Preferences | Help | Logout

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**Step 4 :** When you select the Directory objects from the drop-down list, it will show you Replay History information.

You can **Export AWR data** if required to analyze it later on as shown in RED below

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout Database

Database Instance: orcl > Database Replay > Logged in As SYS

**Replay Workload**  
 The captured workload must have been preprocessed and copied to the replay system.  
 A directory object for the directory with the copied workload must exist in the replay system. Cancel Set Up Replay

**Directory**  
 Select a directory object that contains a preprocessed workload.  
 \* Directory Object:  Create Directory Object

**▼ Capture Summary**

Name	<b>CAPTURE-orcl-20070719133228</b>	Captured Data Size (MB)	<b>0.03</b>
Status	<b>Completed</b>	Duration (hh:mm:ss)	<b>00:25:51</b>
Directory Object	<a href="#">captdir</a>	Start Time	<b>Jul 19, 2007 1:49:15 PM EDT</b>
Database Name	<b>ORCL</b>	End Time	<b>Jul 19, 2007 2:15:06 PM EDT</b>
Capture Database Version	<b>11.1.0.6.0</b>	Start SCN	<b>6771511559</b>
DBID	<b>1155348838</b>	End SCN	<b>6771515021</b>
Capture Error Code	<b>0</b>	Preprocessed Database Version	<b>11.1.0.6.0</b>
Capture Error Message	<b>None</b>		

**► Capture Details**

**Replay History**  
View Export AWR Data

Select Name	Status	Duration (hh:mm:ss)	Start Time	End Time	AWR Data Exported
<input checked="" type="radio"/> <a href="#">REPLAY-orcl-20070719155329</a>	Completed	00:23:52	Jul 19, 2007 4:02:48 PM EDT	Jul 19, 2007 4:26:40 PM EDT	<b>x</b>

Cancel Set Up Replay

[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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**Step 5 :** Click on **YES** to export the AWR data. A job will be submitted to scheduler.

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**Export AWR Data**

Do you want to export the relevant AWR (Automatic Workload Repository) data to the workload directory now?  
 Exporting the AWR data from this database enables in-depth capture and replay analysis. A database scheduler job will be created to perform the export immediately.

No Yes

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### Step 6 : Click on View Job to check the status of the Job

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout Database

Database Instance: orcl > Database Replay > Logged in As SYS

**Confirmation**  
Job 'EXPORT-AWR-20070719192727' to export the AWR data has been submitted to the database scheduler.  
**View Job**

**Replay Workload**  
The captured workload must have been preprocessed and copied to the replay system. A directory object for the directory with the copied workload must exist in the replay system. Cancel Set Up Replay

**Directory**  
Select a directory object that contains a preprocessed workload.  
\* Directory Object:  Create Directory Object

**▼ Capture Summary**

Name	<b>CAPTURE-orcl-20070719133228</b>	Captured Data Size (MB)	<b>0.03</b>
Status	<b>Completed</b>	Duration (hh:mm:ss)	<b>00:25:51</b>
Directory Object	<b>captdir</b>	Start Time	<b>Jul 19, 2007 1:49:15 PM EDT</b>
Database Name	<b>ORCL</b>	End Time	<b>Jul 19, 2007 2:15:06 PM EDT</b>
Capture Database Version	<b>11.1.0.6.0</b>	Start SCN	<b>6771511559</b>
DBID	<b>1155348838</b>	End SCN	<b>6771515021</b>
Capture Error Code	<b>0</b>	Preprocessed Database Version	<b>11.1.0.5.0</b>
Capture Error Message	<b>None</b>		

**► Capture Details**

**Replay History**

Select	Name	Status	Duration (hh:mm:ss)	Start Time	End Time	AWR Data Exported
<input checked="" type="radio"/>	REPLAY-orcl-20070719155329	Completed	00:23:52	Jul 19, 2007 4:02:48 PM EDT	Jul 19, 2007 4:26:40 PM EDT	x

Cancel Set Up Replay

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**Step 7 : A Job is successfully completed Click [Database](#) to go back to Home page**

ORACLE Enterprise Manager 11g Database Control [Setup](#) [Preferences](#) [Help](#) [Logout](#) **Database**

Database Instance: orcl > Scheduler Jobs > Logged in As SYS

### View Job: SYS.EXPORT-AWR-20070719192727 OK

**General**

Name **EXPORT-AWR-20070719192727**  
 Schema [SYS](#)

**Command**

**Operation Detail**

Select	Log ID	Log Date ▾	Operation	Status
<input checked="" type="radio"/>	<a href="#">893</a>	Jul 19, 2007 7:28:13 PM -04:00	RUN	SUCCEEDED

**Database** | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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**Step 8 : Follow Step 1-3 to go to the following screen to view the Workload Reports. You can see the AWR data is exported now.**

Click **View** to access the Reports

ORACLE Enterprise Manager 11g Database Control

Database Instance: orcl > Database Replay > Setup Preferences Help Logout Database

Database Instance: orcl > Database Replay > Logged in As SYS

**Replay Workload**

The captured workload must have been preprocessed and copied to the replay system. A directory object for the directory with the copied workload must exist in the replay system. Cancel Set Up Replay

**Directory**

Select a directory object that contains a preprocessed workload.

\* Directory Object:  Create Directory Object

**▼ Capture Summary**

Name	<b>CAPTURE-orcl-20070719133228</b>	Captured Data Size (MB)	<b>0.03</b>
Status	<b>Completed</b>	Duration (hh:mm:ss)	<b>00:25:51</b>
Directory Object	<b>captdir</b>	Start Time	<b>Jul 19, 2007 1:49:15 PM EDT</b>
Database Name	<b>ORCL</b>	End Time	<b>Jul 19, 2007 2:15:06 PM EDT</b>
Capture Database Version	<b>11.1.0.6.0</b>	Start SCN	<b>6771511559</b>
DBID	<b>1155348838</b>	End SCN	<b>6771515021</b>
Capture Error Code	<b>0</b>	Preprocessed Database Version	<b>11.1.0.6.0</b>
Capture Error Message	<b>None</b>		

**► Capture Details**

**Replay History**

View Export AWR Data

Select Name	Status	Duration (hh:mm:ss)	Start Time	End Time	AWR Data Exported
<input checked="" type="radio"/> <a href="#">REPLAY-orcl-20070719155329</a>	Completed	00:23:52	Jul 19, 2007 4:02:48 PM EDT	Jul 19, 2007 4:26:40 PM EDT	✓

Cancel Set Up Replay

[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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**Step 8 :** Click on Report Tab as show in Red below to view the reports

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout Database

Database Instance: orcl > Database Replay > Replay Workload > Logged in As SYS

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

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**Summary**

Replay Name <b>REPLAY-orcl-20070719155329</b> Status <b>Completed</b> Directory Object <b>captdir</b> Database Name <b>ORCL</b> DBID <b>1155348838</b> Replay Error Code <b>N/A</b> Replay Error Message <b>None</b>	Capture Name <b>CAPTURE-orcl-20070719133228</b> Duration (hh:mm:ss) <b>00:23:52</b> Prepare Time <b>Jul 19, 2007 3:58:38 PM EDT</b> Start Time <b>Jul 19, 2007 4:02:48 PM EDT</b> End Time <b>Jul 19, 2007 4:26:40 PM EDT</b>
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[Workload Profile](#)
[Connection Mappings](#)
[Replay Parameters](#)
Report

Network Time (hh:mm:ss) **00:00:00** Clients **1**  
 Think Time (hh:mm:ss) **00:00:00** Clients Finished **1**

**Elapsed Time Comparison**

Category	Elapsed Time (Minutes)
Capture	~26
Replay	~24

**Divergence**

	Number of Calls	Percentage of Total Calls
<b>Error Divergence:</b>		
Session Failures Seen During Replay	0	0.00
Errors No Longer Seen During Replay	0	0.00
Errors Mutated During Replay	0	0.00
New Errors Seen During Replay	0	0.00
<b>Data Divergence:</b>		
DMLs with Different Number of Rows Modified	0	0.00
SELECTs with Different Number of Rows Fetched	0	0.00

[View Workload Replay Report](#)

[Detailed Comparison](#)

**Step 8 :** You can run 4 Report to analyze the Workload. The most important one for comparing the workload is AWR compare Period Report. Click on **Run Report** to view **AWR compare Report**

ORACLE Enterprise Manager 11g Database Control

Database Instance: orcl > Database Replay > Replay Workload > View Workload Replay: REPLAY-orcl-20070719155329

Status **Completed** (OK)

**Summary**

Replay Name	REPLAY-orcl-20070719155329	Capture Name	CAPTURE-orcl-20070719133228
Directory Object	captdir	Duration (hh:mm:ss)	00:23:52
Database Name	ORCL	Prepare Time	Jul 19, 2007 3:58:38 PM EDT
DBID	1155348838	Start Time	Jul 19, 2007 4:02:48 PM EDT
Replay Error Code	N/A	End Time	Jul 19, 2007 4:26:40 PM EDT
Replay Error Message	None		

Workload Profile | Connection Mappings | Replay Parameters | **Report**

**1** Workload Replay Report (Run Report)

**2** AWR Compare Period Report  
First Workload Capture or Replay: CAPTURE-orcl-20070719133228 (Jul 19, 2007 1:49:15 PM)  
Second Workload Capture or Replay: REPLAY-orcl-20070719155329 (Jul 19, 2007 4:02:48 PM)  
(Run Report)

**3** AWR Report  
Workload Capture or Replay: REPLAY-orcl-20070719155329 (Jul 19, 2007 4:02:48 PM)  
(Run Report)

**4** ASH Report  
Workload Capture or Replay: REPLAY-orcl-20070719155329 (Jul 19, 2007 4:02:48 PM)  
Start Date: Jul-19-2007 (example: Jul-19-2007) | End Date: Jul-19-2007 (example: Jul-19-2007)  
Start Time: 4:02 AM | End Time: 4:26 PM  
Filter: SID  
(Run Report)

Workload Profile | Connection Mappings | Replay Parameters | **Report** (OK)



**Step 8 :** Select **SCHEMA** that can be used as a staging area and click **import AWR data** to load the data

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: orcl > Database Replay > Replay Workload > View Workload Replay: REPLAY-orcl-20070719155329 > Logged in As SYS

### Select Schema

The AWR data import requires a valid schema in the current database to be used as a staging area. Select a schema.

\* Schema

Cancel Import AWR Data

Cancel Import AWR Data

Database | Setup | Preferences | Help | Logout

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**Select Indy as Schema and click Import AWR data**

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: orcl > Database Replay > Replay Workload > View Workload Replay: REPLAY-orcl-20070719155329 > Logged in As SYS

### Select Schema

The AWR data import requires a valid schema in the current database to be used as a staging area. Select a schema.

\* Schema

Cancel Import AWR Data

Cancel Import AWR Data

Database | Setup | Preferences | Help | Logout

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### Step 9 : Job is submitted to Import AWR data and click on **View Job** to check the status of the Job

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. At the top, the breadcrumb navigation shows 'Database Instance: orcl > Database Replay > Replay Workload >'. The user is logged in as 'SYS'. A 'Confirmation' message states: 'Job 'IMPORT-AWR-20070719150058' to import the AWR data has been submitted to the database scheduler.' A 'View Job' button is highlighted with a red box. Below this, the 'View Workload Replay: REPLAY-orcl-20070719141753' section is shown with an 'OK' button. A 'Summary' section provides details for the replay job:

Replay Name	REPLAY-orcl-20070719141753	Capture Name	CAPTURE-orcl-20070719133228
Status	Completed	Duration (hh:mm:ss)	00:23:58
Directory Object	cap_dir	Prepare Time	Jul 19, 2007 2:18:12 PM EDT
Database Name	ORCL	Start Time	Jul 19, 2007 2:18:53 PM EDT
DBID	1156158659	End Time	Jul 19, 2007 2:42:51 PM EDT
Replay Error Code	N/A		
Replay Error Message	None		

Below the summary, there are tabs for 'Workload Profile', 'Connection Mappings', 'Replay Parameters', and 'Report'. The 'Workload Replay Report' section includes a 'Run Report' button. The 'AWR Compare Period Report' section has dropdowns for 'First Workload Capture or Replay' (CAPTURE-orcl-20070719133228 (Jul 19, 2007 1:49:15 PM)) and 'Second Workload Capture or Replay' (REPLAY-orcl-20070719141753 (Jul 19, 2007 2:18:53 PM)), with a 'Run Report' button. The 'AWR Report' section has a dropdown for 'Workload Capture or Replay' (REPLAY-orcl-20070719141753 (Jul 19, 2007 2:18:53 PM)) and a 'Run Report' button. The 'ASH Report' section has a dropdown for 'Workload Capture or Replay' (REPLAY-orcl-20070719141753 (Jul 19, 2007 2:18:53 PM)), and fields for 'Start Date' (Jul-19-2007), 'End Date' (Jul-19-2007), 'Start Time' (2:18 AM), and 'End Time' (2:42 AM), with a 'Run Report' button. A 'Filter' dropdown is set to 'SID'.

# Sample Comparison Report

## WORKLOAD REPOSITORY COMPARE PERIOD REPORT

Snapshot Set	DB Name	DB Id	Instance	Inst num	Release	Cluster	Host	Std Block Size
First (1st)	ORCL	1908040294	orcl	1	11.1.0.6.0	NO	db02pn	8192
Second (2nd)	ORCL	752664103	orcl	1	11.1.0.6.0	NO	db01pn	8192

Snapshot Set	Begin Snap Id	Begin Snap Time	End Snap Id	End Snap Time	Avg Active Users	Elapsed Time (min)	DB time (min)
1st	216	19-Jul-07 13:49:15 (Thu)	217	19-Jul-07 14:15:04 (Thu)	0.03	25.82	0.86
2nd	16	19-Jul-07 14:18:53 (Thu)	17	19-Jul-07 14:42:48 (Thu)	0.01	23.91	0.16
%Diff					-66.67	-7.40	-81.38

### Host Configuration Comparison

	1st	2 <sup>nd</sup>	Diff	%Diff
Number of CPUs:	4	4	0	0.00
Number of CPU Cores:	2	2	0	0.00
Number of CPU Sockets:	2	2	0	0.00
Physical Memory:	16238M	16238M	0M	0.00
Load at Start Snapshot:	.02	.4	.38	1,900.00
Load at End Snapshot:	.47	.17	-.3	-63.83
%User Time:	.64	.46	-.17	-28.13
%System Time:	.26	.08	-.18	-69.23
%Idle Time:	99.1	99.45	.35	0.35
%IO Wait Time:	.25	.03	-.22	-88.00

### System Configuration Comparison

	1st	2 <sup>nd</sup>	Diff	%Diff
SGA Target:	0	0	0M	0.00
Buffer Cache:	784M	1,504M	720M	91.84
Shared Pool Size:	352M	416M	64M	18.18
Large Pool Size:	16M	16M	0M	0.00
Java Pool Size:	16M	16M	0M	0.00
Streams Pool Size:	0M	0M	0M	0.00
Log Buffer:	11,372K	10,492K	-880K	-7.74
PGA Aggregate Target:	0	0	0M	0.00
Undo Management:	AUTO	AUTO		

### Load Profile

	1st per sec	2nd per sec	%Diff	1st per txn	2nd per txn	%Diff
DB time:	0.03	0.01	-66.67	0.07	0.05	-28.57
CPU time:	0.01	0.01	0.00	0.02	0.04	100.00
Redo size:	3,532.82	1,656.20	-53.12	7,456.10	12,640.09	69.53
Logical reads:	86.08	32.99	-61.68	181.68	251.81	38.60
Block changes:	22.22	6.84	-69.22	46.90	52.24	11.39
Physical reads:	0.17	0.57	235.29	0.37	4.37	1,081.08

Physical writes:	0.94	0.45	-52.13	1.98	3.47	75.25
User calls:	5.36	3.36	-37.31	11.31	25.68	127.06
Parses:	6.46	3.14	-51.39	13.64	23.94	75.51
Hard parses:	0.27	0.10	-62.96	0.56	0.79	41.07
Sorts:	2.36	1.49	-36.86	4.99	11.34	127.25
Logons:	0.05	0.01	-80.00	0.11	0.10	-9.09
Executes:	16.23	10.17	-37.34	34.26	77.60	126.50
Transactions:	0.47	0.13	-72.34			
				<b>1st</b>	<b>2nd</b>	<b>Diff</b>
% Blocks changed per Read:				25.81	20.75	-5.07
Recursive Call %:				92.51	92.92	0.40
Rollback per transaction %:				15.94	51.06	35.12
Rows per Sort:				13.66	7.05	-6.60
Avg DB time per Call (sec):				0.01	0.00	-0.00

## Top Timed Events

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

1st						2nd					
Event	Wait Class	Waits	Time(s)	Avg Time(ms)	%DB time	Event	Wait Class	Waits	Time(s)	Avg Time(ms)	%DB time
CPU time			13.97		27.13	CPU time			8.44		87.99
log buffer space	Configuration	4	4.00	1,000.06	7.77	db file sequential read	User I/O	478	0.68	1.42	7.05
control file parallel write	System I/O	552	2.29	4.15	4.45	control file parallel write	System I/O	509	0.59	1.16	6.17
os thread startup	Concurrency	36	1.17	32.40	2.26	db file scattered read	User I/O	106	0.29	2.72	3.00
log file sequential read	System I/O	352	1.12	3.19	2.18	log file parallel write	System I/O	654	0.24	0.36	2.45
-db file scattered read	User I/O	16	0.73	45.57	1.42	-os thread startup	Concurrency	3	0.09	29.23	0.91
-log file parallel write	System I/O	1,242	0.47	0.38	0.90	-					
-db file sequential read	User I/O	196	0.12	0.59	0.22	-					

Report Details

- Time Model Statistics
- Operating System Statistics
- Wait Events
- Service Statistics
- SQL 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

Supplemental Information

- init.ora Parameters
- SQL Statements

And So On....