Como Usar Oracle RAT no Autonomous Database

Testando uma carga de trabalho no banco de dados 100% gerenciado pela OCI

Maicon Carneiro

Oracle ACE Pro

accenture

GUOB Tech Day 2023 | FIAP School – São Paulo, SP | 12/08/2023

Sobre mim

Feira de Santana → Salvador, Bahia

Consultor de Oracle Database & Exadata na Accenture

- *Projetos de migração de Oracle Database para Oracle Cloud (ExaCS, DBCS, OCVS, Autonomous)*
- *Administração de Exadata X7 / X8M*
- *Performance Tuning (Troubleshooting / Otimização)*

Trajetória com tecnologia Oracle

- ***Bacharel em Sistemas de Informação – UniFTC (2015 ~2019)***
- ***Autodidata em Oracle Database desde 2015***
- ***DBA de Laboratório por 4 anos (2015 ~ 2019)***
- ***DBA de Produção desde 2019***
- ***Escreve posts técnicos no Blog do Dibiei desde 2019 (dibiei.blog)***
- ***Membro do conselho do Grupo de Usuários Oracle do Brasil (GUOB)***
- ***Reconhecido como Oracle ACE (Advocate Community Expert)***

Blog do Dibiei

DBA Maicon Carneiro – Aprender e compartilhar !

Blog: dibiei.blog
LinkedIn: linkedin.com/in/maiconcarneiro
Twitter: twitter.com/_maiconcarneiro

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Certificações

Database

Certified Associate	Certified Professional	Certified Expert	Certified Expert	Certified Expert
Oracle Database 12*c* Administrator		Oracle Database 12*c* Data Guard Administrator	Oracle Database 12*c*: Oracle RAC and Oracle Grid Infrastructure Administrator	Oracle Database 12*c* Maximum Availability Architecture

Oracle Cloud + Oracle Database

Blog do Dibiei

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Blog: dibiei.blog
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Introdução

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O que é Oracle RAT ?

ORACLE

ORACLE REAL APPLICATION TESTING

The industry's leading Solution for proactive performance management and real workload capacity planning

- **Oracle RAT Features**
  - **Database Replay**
  - **SQL Performance Analyzer**

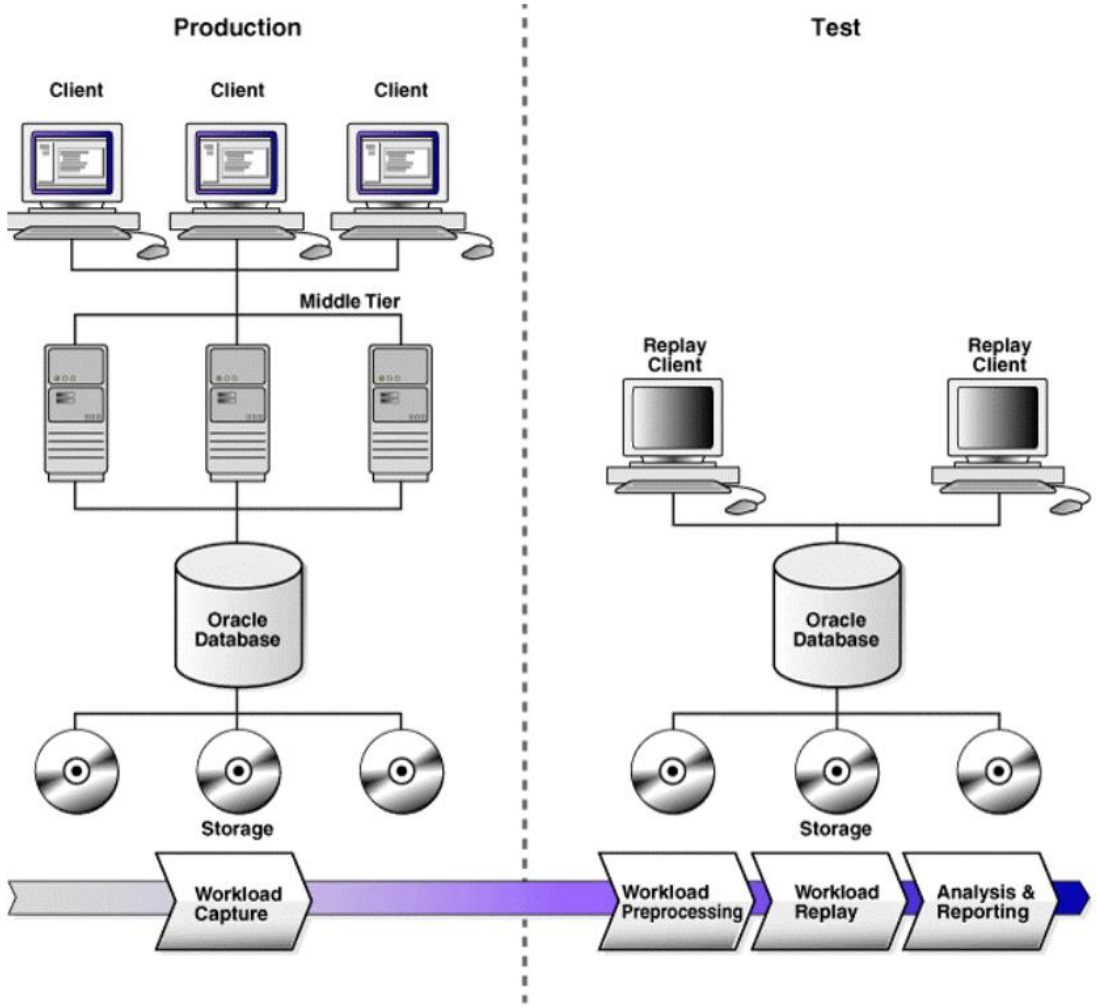

Figure 2. Database Replay Workflow

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O que é o Autonomous Database?

Database as Service – 100% Gerenciado pela OCI

Autonomous Vision: Effortless, Limitless, Unbreakable Data Cloud

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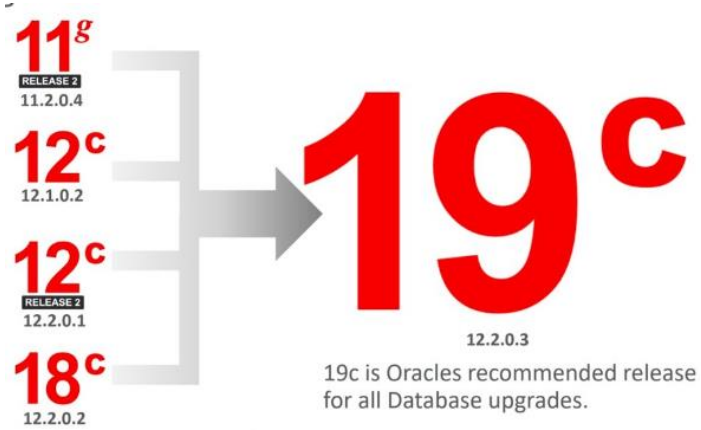
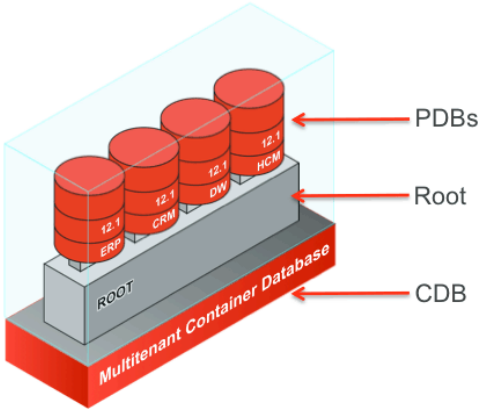
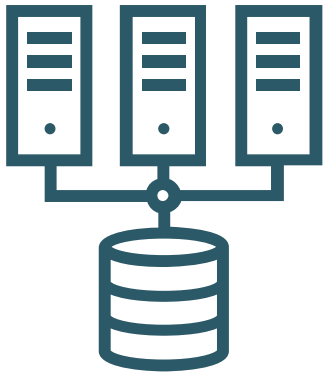
O que é o Autonomous Database?

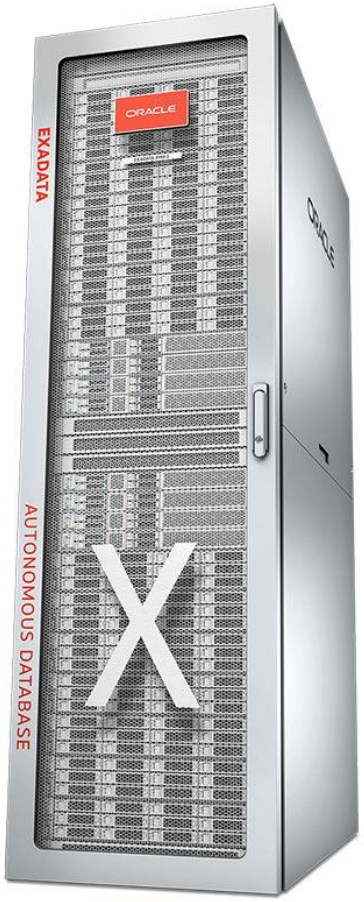
Na visão do DBA

- Exadata
- Versão 19c +
- Container Database (CDB)
- Real Application Clusters (RAC)
- Auto-Scaling Online









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Por que usar Oracle RAT no Autonomous?

Determinar a capacidade ideal pode ser um desafio …

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Por que usar Oracle RAT no Autonomous ?

Determinar a capacidade ideal pode ser um desafio...

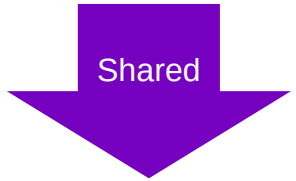
Oracle diz:

> Controlling the number of configured OCPUs is the primary way users control overall performance of an autonomous database. Other performance settings are automatically scaled up and down as the number of CPUs are scaled keeping the system's CPU, I/O, and Memory balanced as performance needs vary.

O que depende do número de OCPUs ?

Automatically Derrived Scale Settings	
SGA Memory Allocation	
PGA Memory Allocation	
Database Session Limits	
Parallel Query Process Limits	
I/O Operations Per Second	OCPU e Storage
I/O Bandwidth	OCPU e Storage
Flash Cache Space	Proporcional ao Storage

"For Autonomous Serverless, space in the Exadata Smart FlashCache is allocated as a percentage of the storage space allocated to the database, and I/O Operations Per Second (IOPS) and I/O Bandwidth are effectively a function of both CPU and Storage"



IOPS e Throughput são derivados de OCPU + Storage

Flash Cache é derivado de um % do Storage

Fonte: Oracle Autonomous Database Technical Overview
https://www.oracle.com/a/ocom/docs/database/oracle-autonomous-database-technical-overview.pdf

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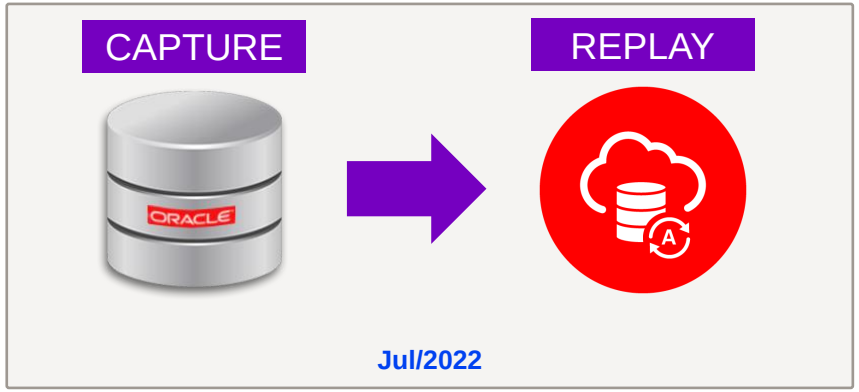
Cenários possíveis

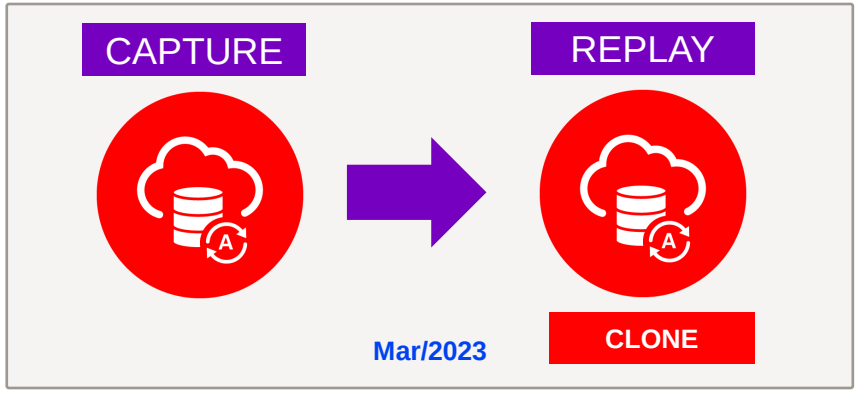
O que dá para fazer com Oracle RAT no Autonomous Database

Database Replay

De Onpremise para Autonomous

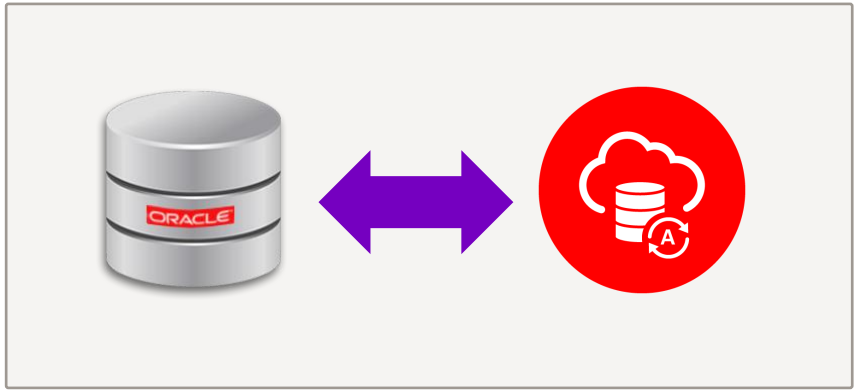


De Autonomous para Autonomous - Unidirecional

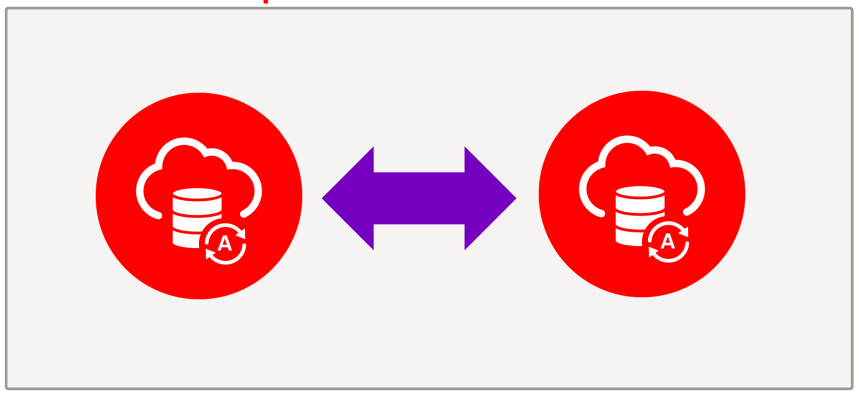


SQL Performance Analyzer

Do Onpremise para Autonomous e vice versa



De Autonomous para Autonomous - Bidirecional



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Database Replay

Reproduzindo um Workload completo

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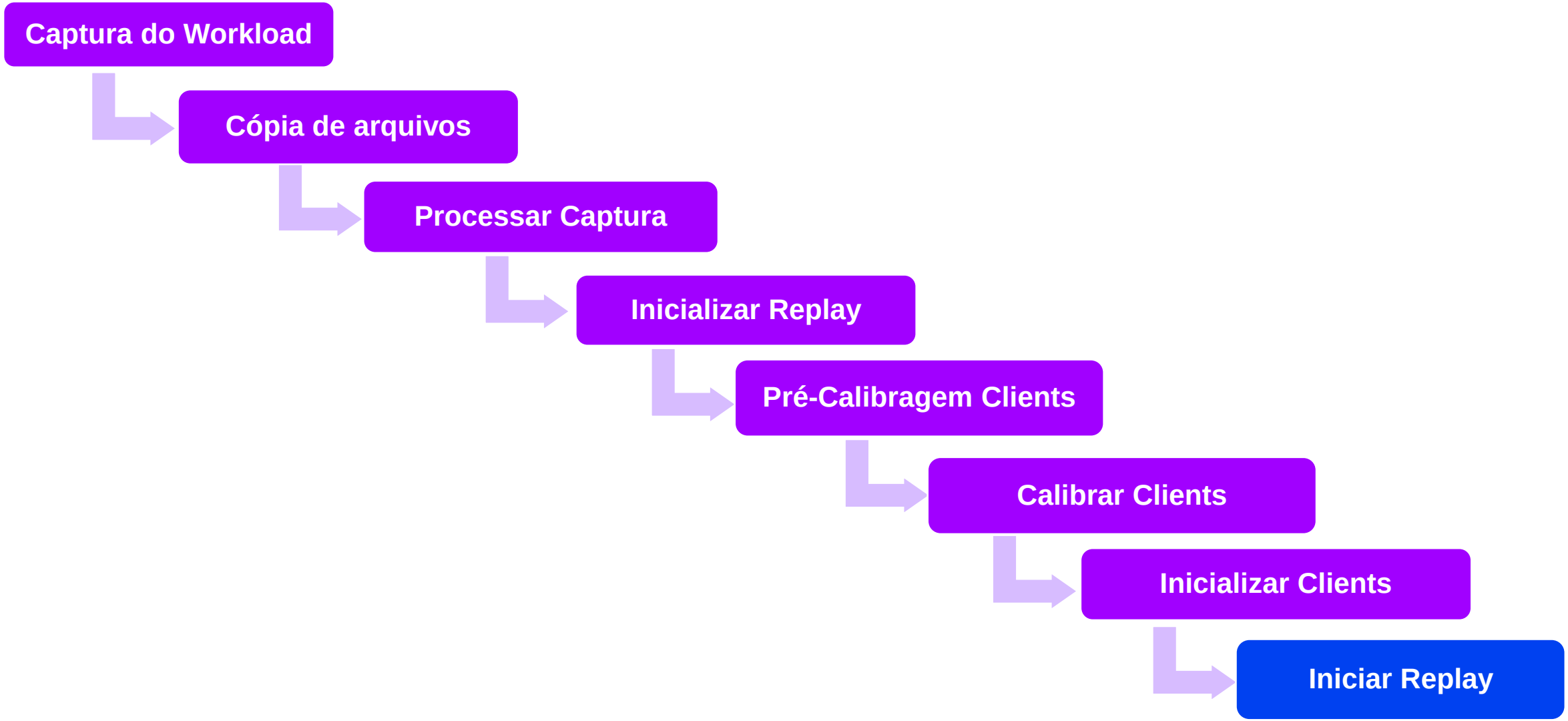
Etapas do Oracle RAT: Convencional

Assumindo que você já tem um clone da base de origem…



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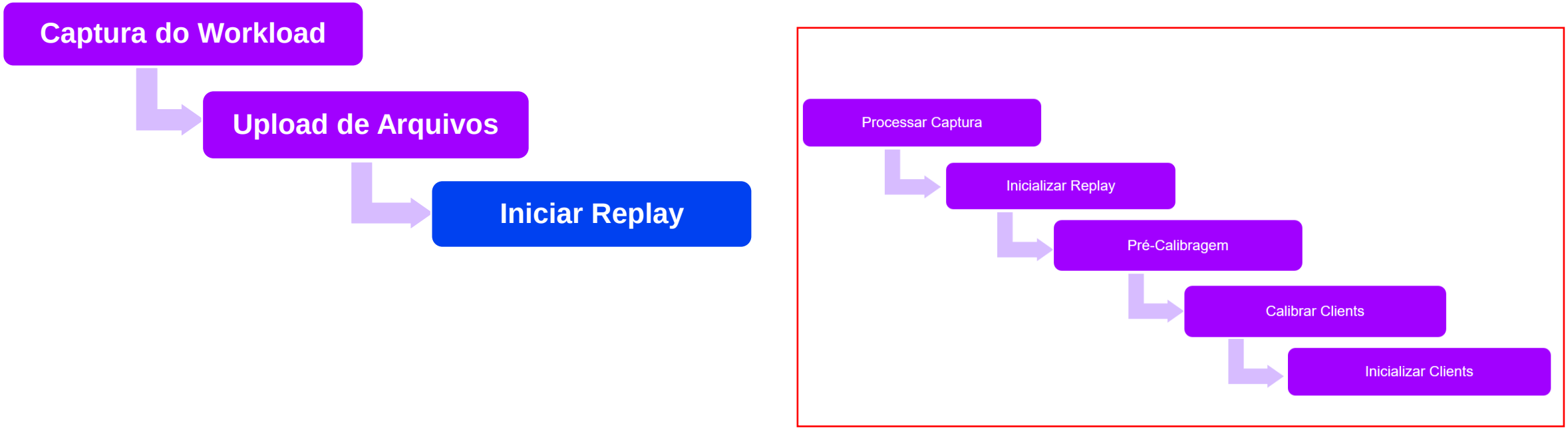
Etapas do Oracle RAT: Autonomous

Assumindo que você já tem um clone da base de origem…




```
SQL> EXEC DBMS_CLOUD_ADMIN.replay_workload
```

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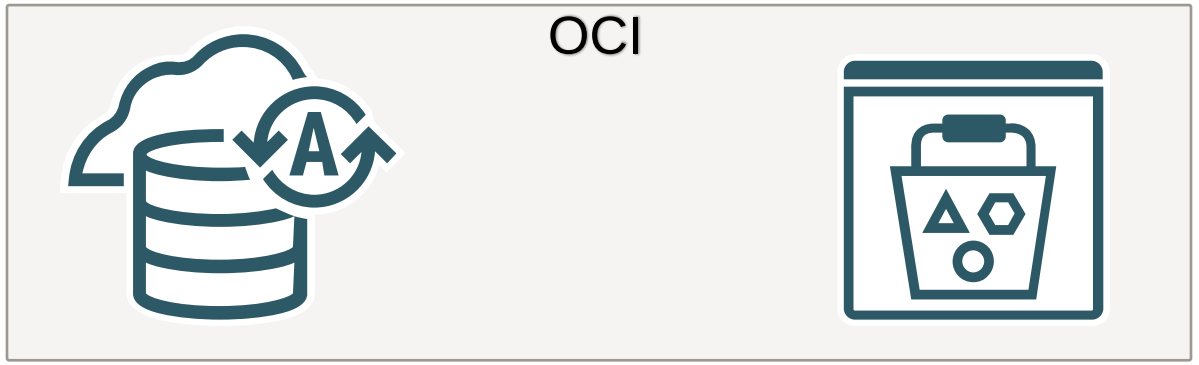
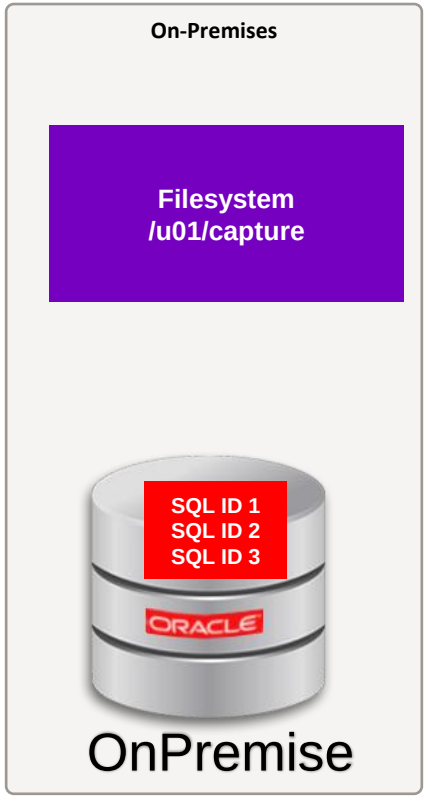
Fluxo do Database Replay





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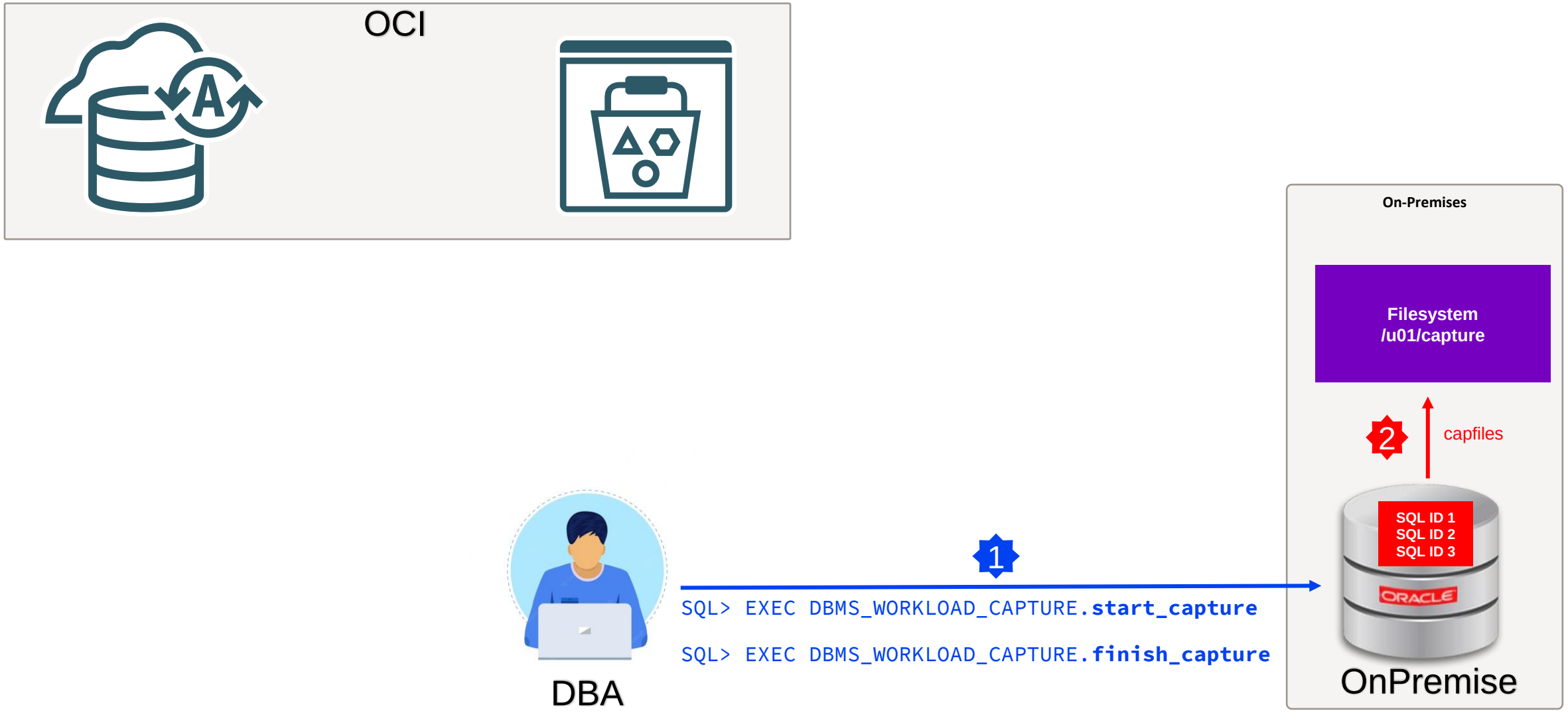
Fluxo do Database Replay 1/3



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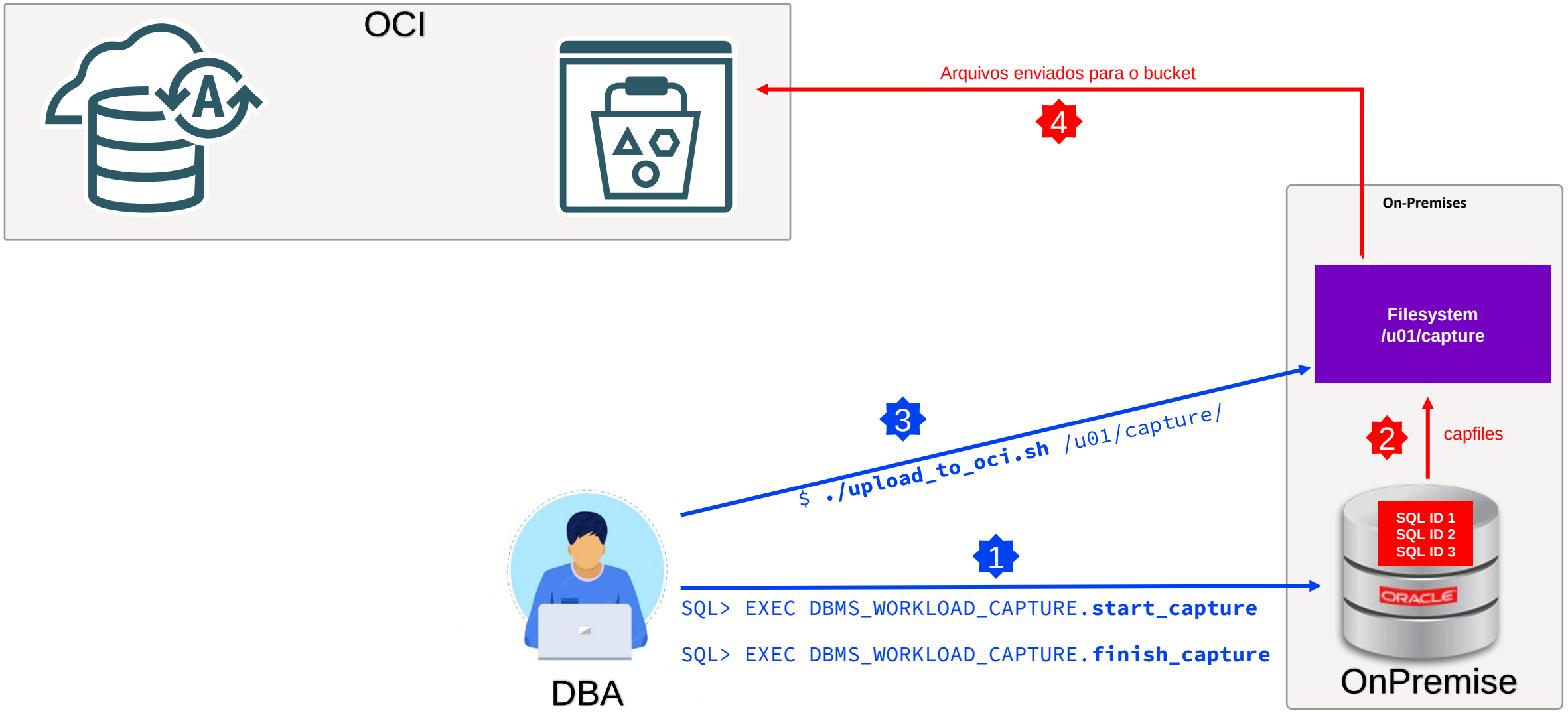
Fluxo do Database Replay 2/3



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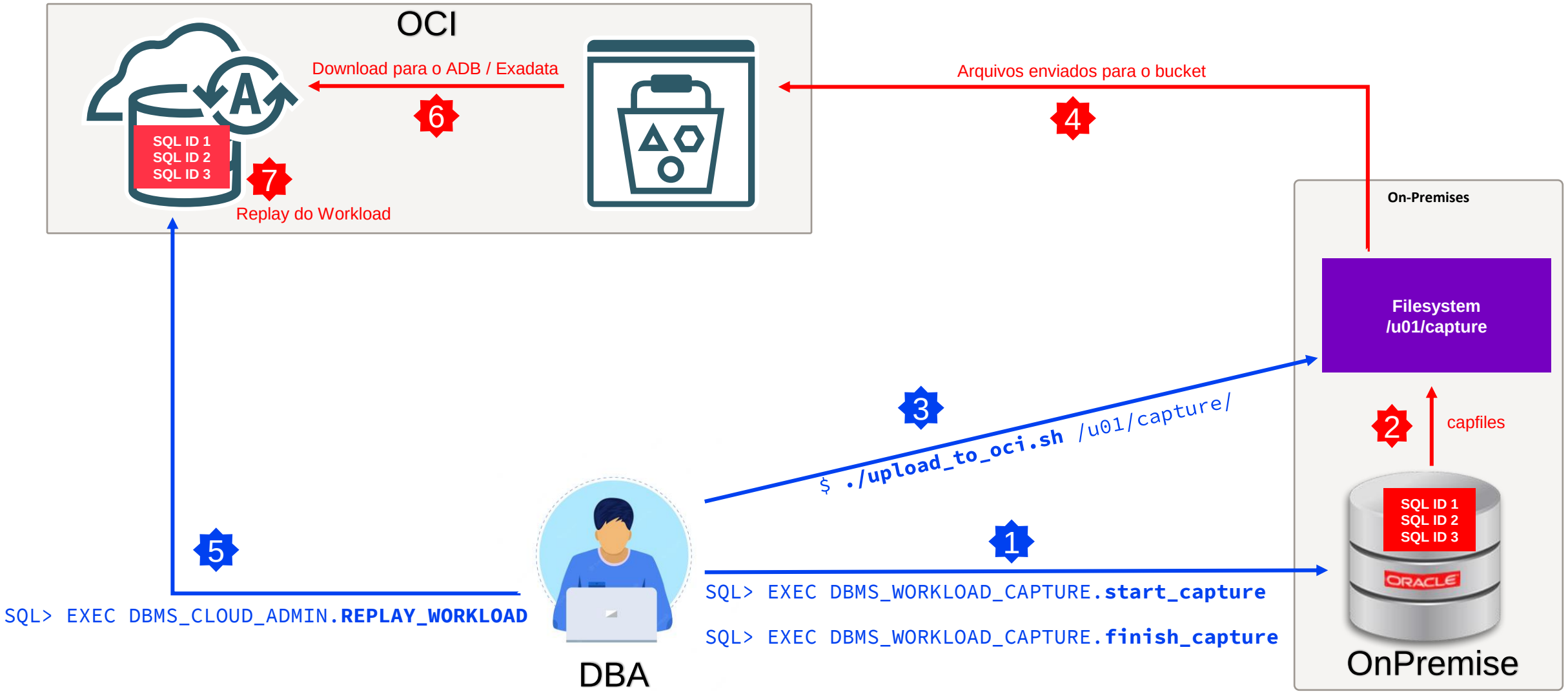
Fluxo do Database Replay 3/3



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DBMS_CLOUD_ADMIN.REPLAY_WORKLOAD
Como Isso Funciona ?

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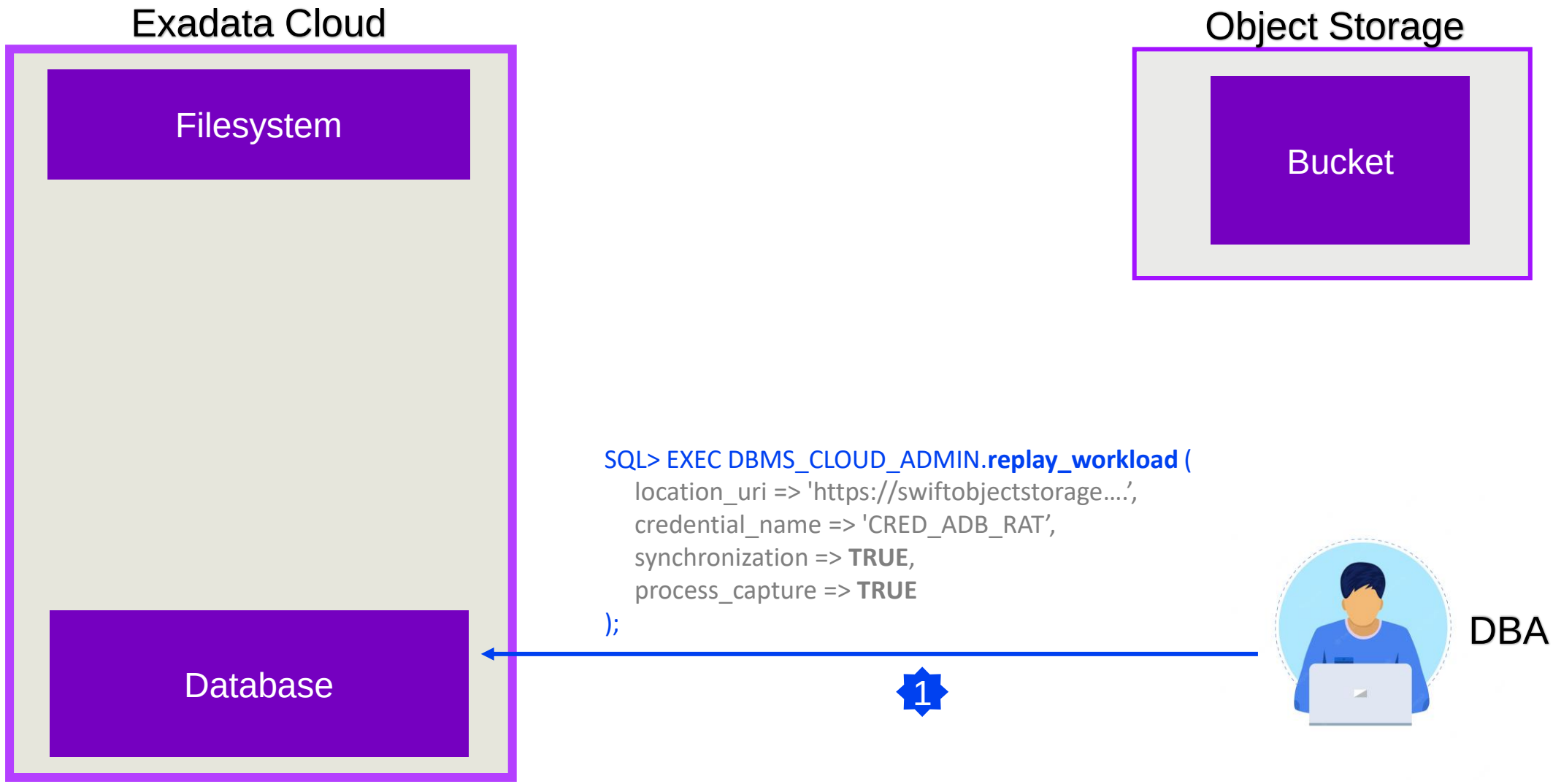
DBMS_CLOUD_ADMIN.replay_workload 1/4

DBA Inicia o Replay



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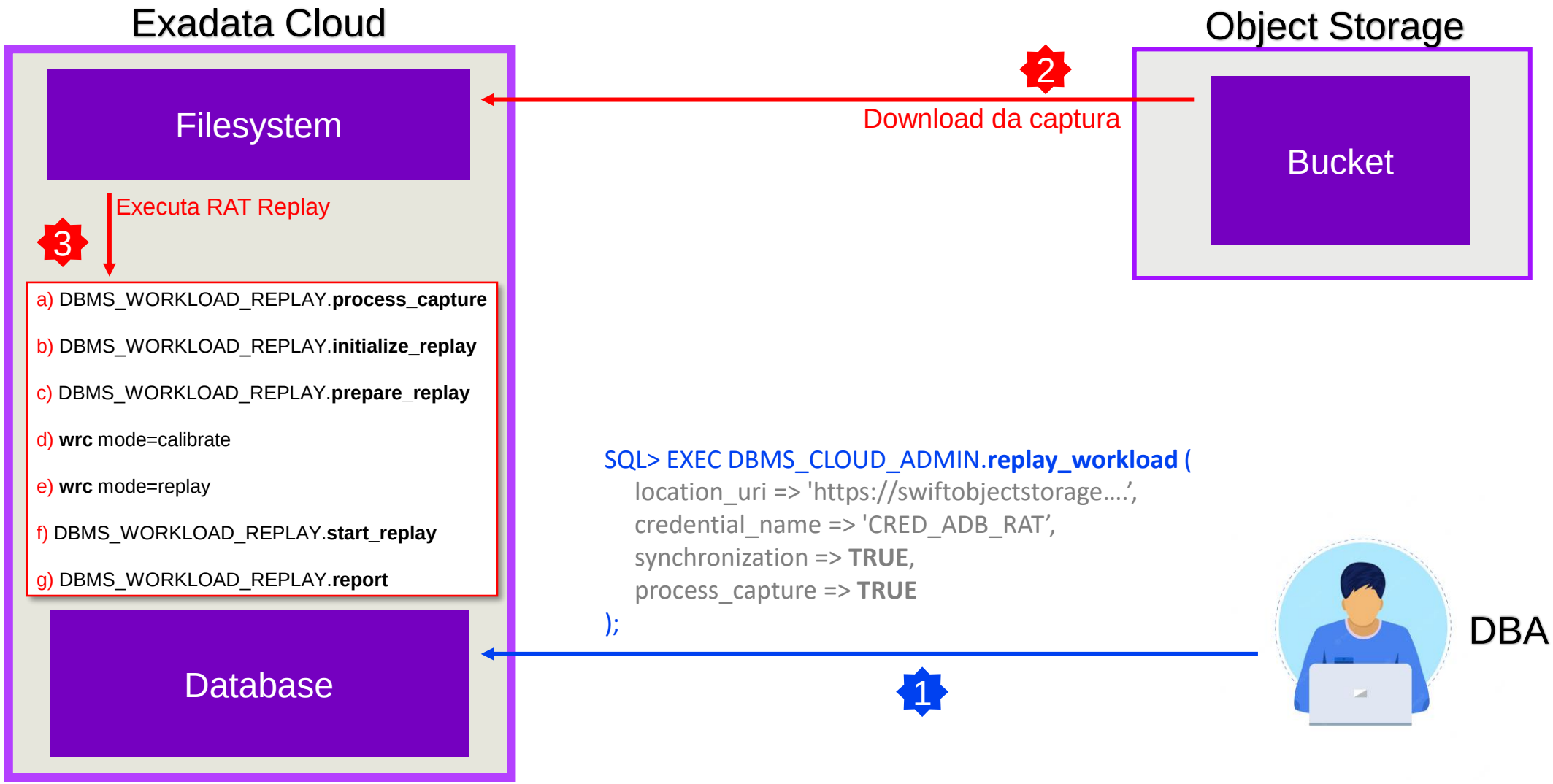
DBMS_CLOUD_ADMIN.replay_workload 2/4

Download e Replay da Captura



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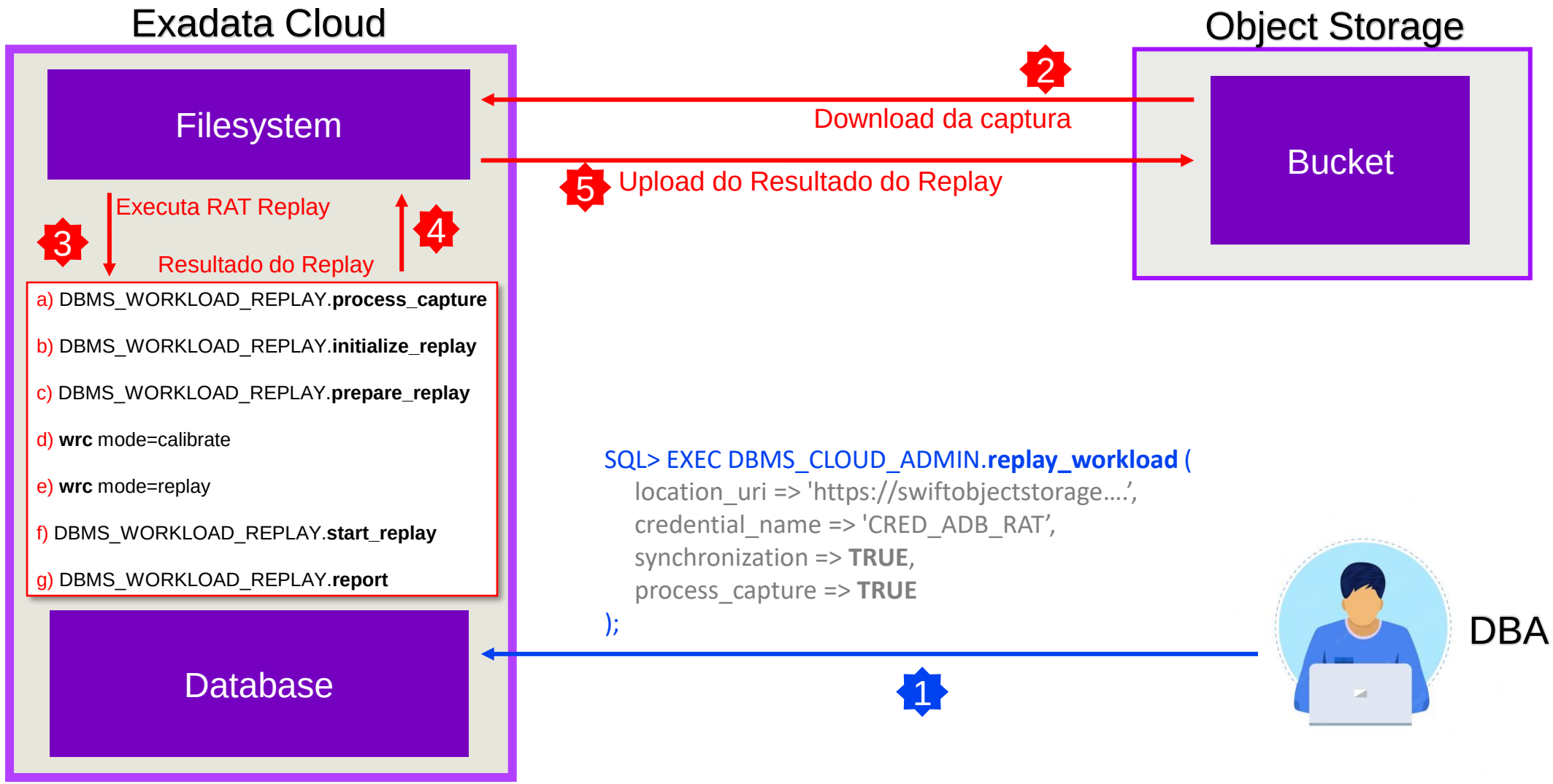
DBMS_CLOUD_ADMIN.replay_workload 3/4

Resultado do Replay é Carregado de volta no Bucket



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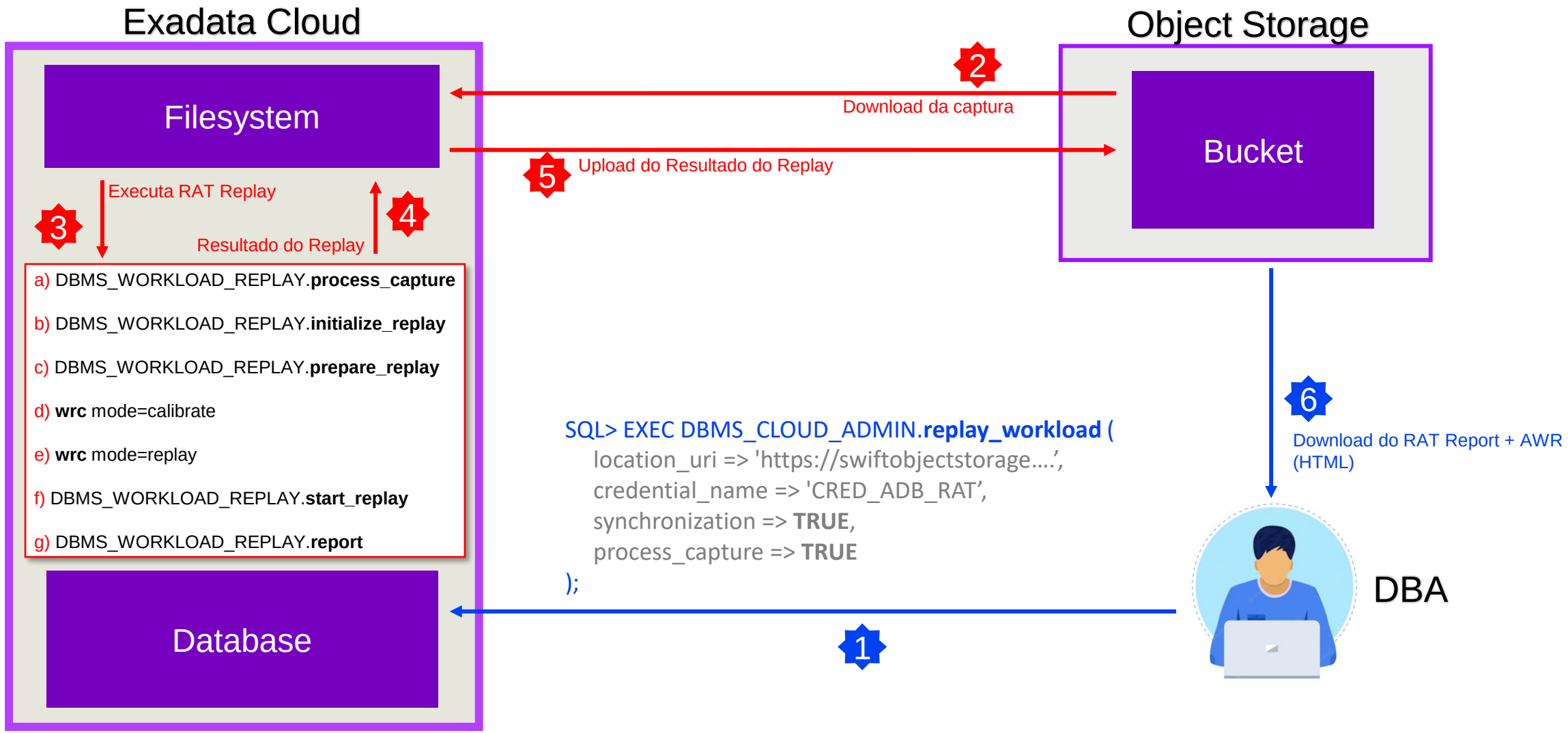
DBMS_CLOUD_ADMIN.replay_workload 4/4

DBA faz download do relatório



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Database Replay Passo a Passo

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Inicie a Captura do Workload

Etapa executada no banco de origem

```
[oracle@lab01 ~]$ mkdir -p /u01/capture/
```

```
SQL> CREATE OR REPLACE DIRECTORY CAPTURE_DIR AS '/u01/capture/';
```

```
BEGIN
DBMS_WORKLOAD_CAPTURE.start_capture (
  name => 'captura_adb',
  dir => 'CAPTURE_DIR',
  duration => NULL
);
END;
/
```

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Finalize a Captura do Workload

Depois de aguardar algumas horas de operação normal da aplicação …

```
SQL> EXEC DBMS_WORKLOAD_CAPTURE.finish_capture;
```

```
SQL> SELECT DBMS_WORKLOAD_CAPTURE.GET_CAPTURE_INFO('CAPTURE_DIR') AS ID FROM DUAL;

ID
----------
21
```

```
SQL> SELECT START_SCN FROM DBA_WORKLOAD_CAPTURES WHERE ID = 21;

START_SCN
----------
548994
```

Anote este SCN

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Gere um DUMP da origem

Export consistente com a captura usando DataPump

```
exclude=cluster,indextype,db_link
directory=EXPORT_ADB
parallel=4
schemas=replay_user
dumpfile=adbrat%u.dmp
encryption_pwd_prompt=yes
flashback_scn=548994
```

Recomendado para Autonomous

```
[oracle@lab01 ~]$ expdp system/dibiei@pdbsoe parfile=exp_adb.par

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Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production

Encryption Password:
Starting "SYSTEM"."SYS_EXPORT_SCHEMA_01":  system/********@pdbsoe parfile=exp_adb.par
Processing object type SCHEMA_EXPORT/TABLE/STATISTICS/TABLE_STATISTICS
Processing object type SCHEMA_EXPORT/TABLE/INDEX/STATISTICS/INDEX_STATISTICS
........
```

Crie uma senha e anote para uso posterior

Lembra daquele SCN ?

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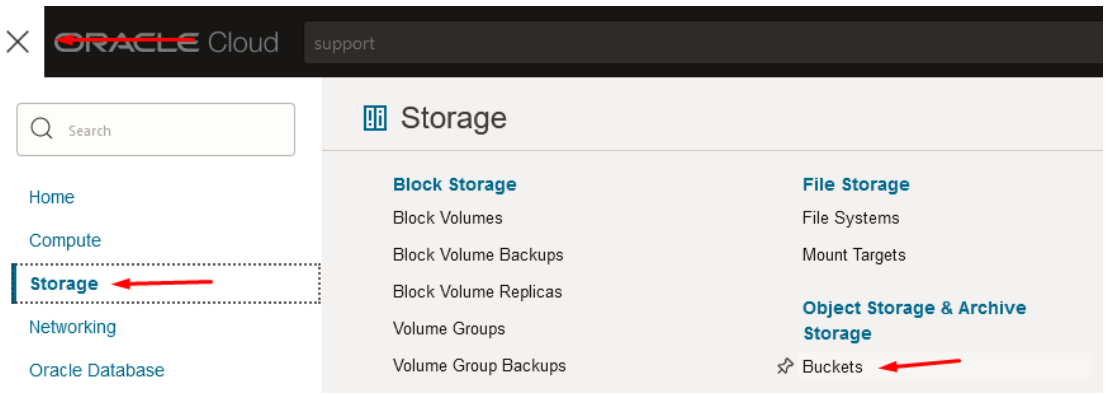
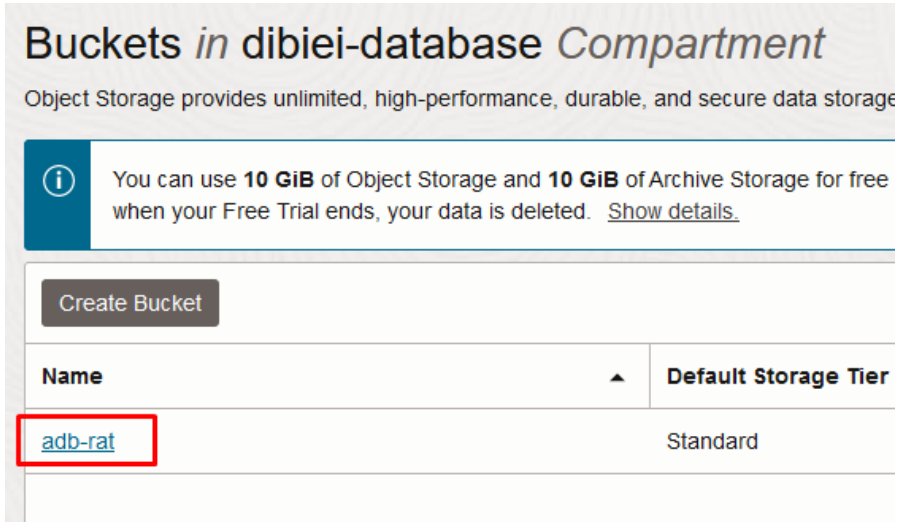
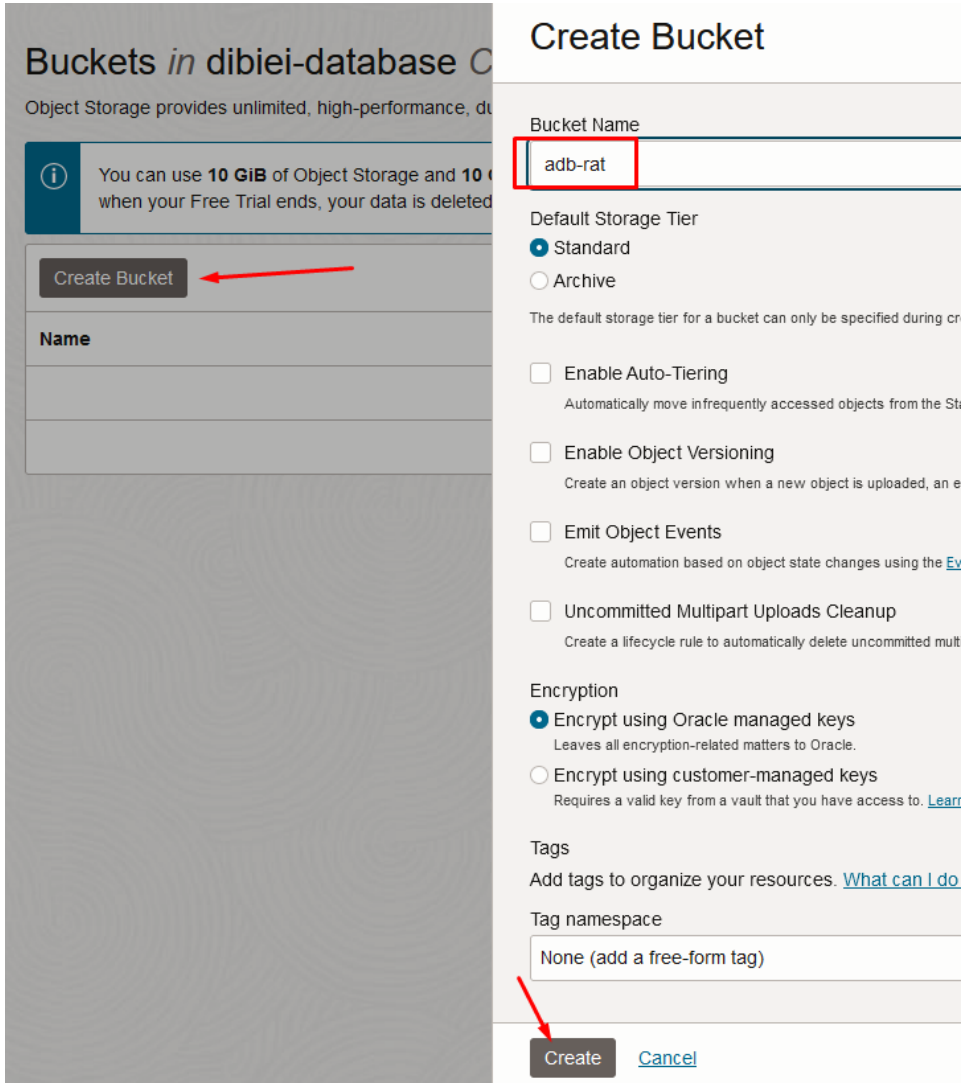
Criando o Bucket no OCI Object Storage

Onde serão armazenados o Dump do DataPump + Arquivos do RAT







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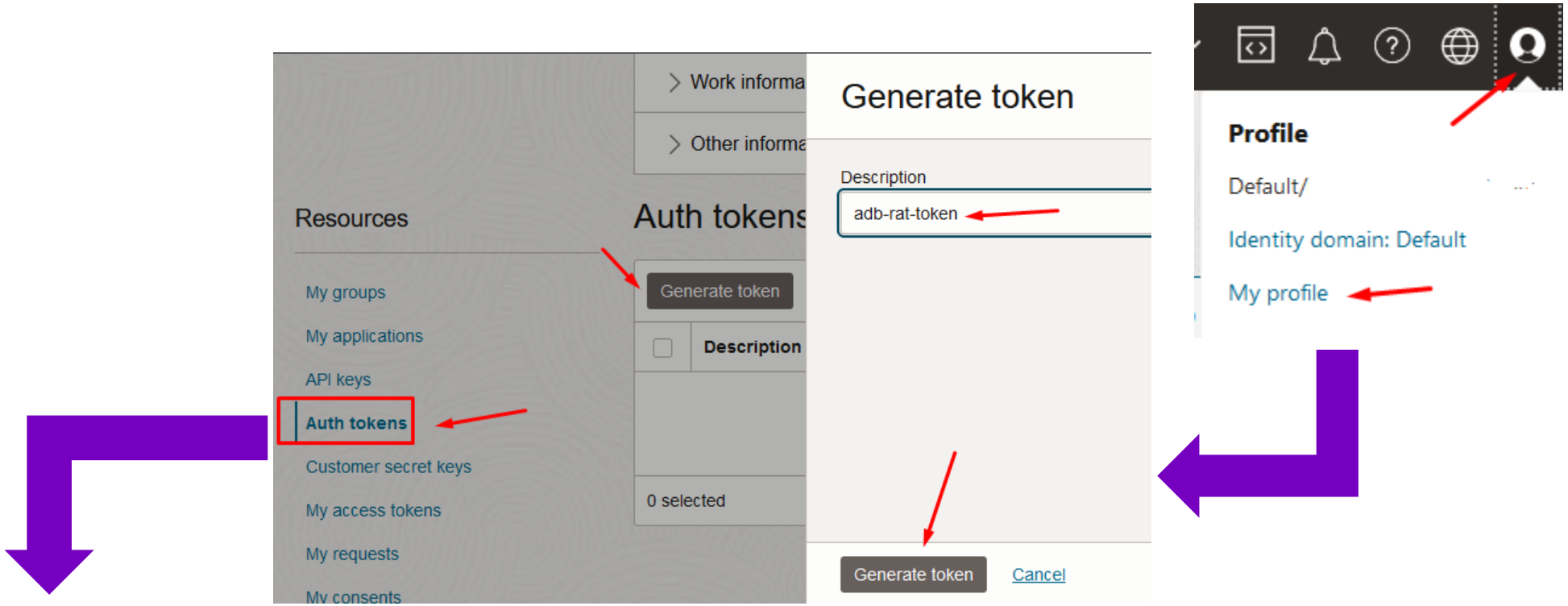
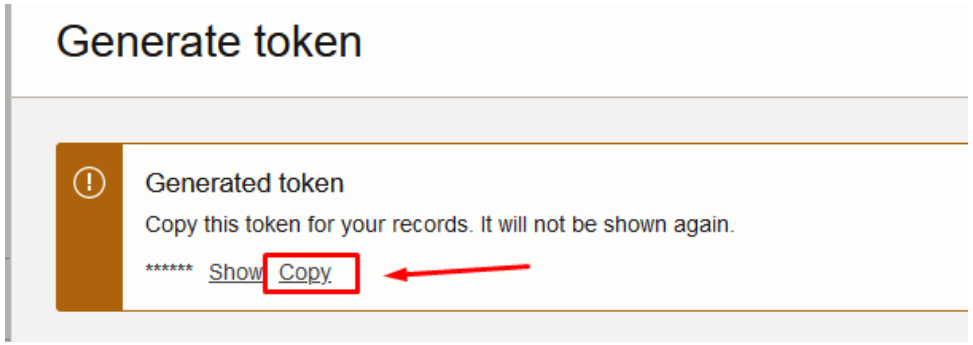
Gerando um Token

Método de autenticação para acessar o Bucket via API / HTTPS





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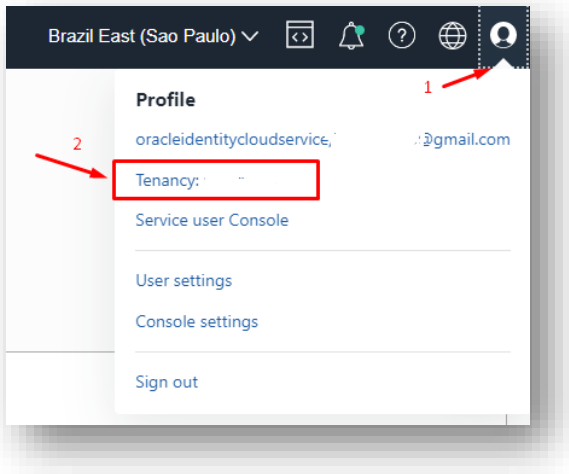
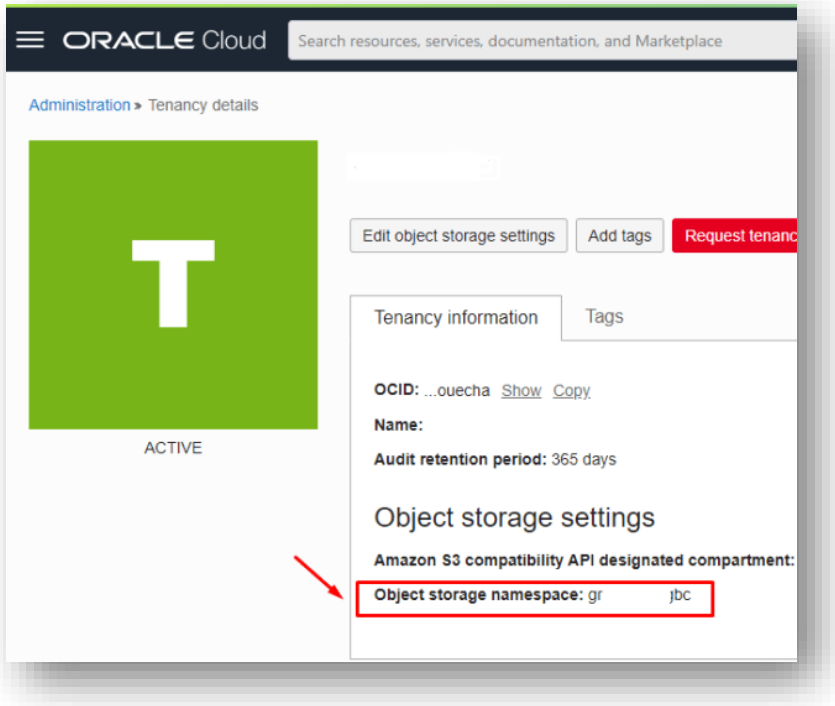
URL modelo com Object Storage Namespace

URL base usada pelo DataPump impdp e DBMS_CLOUD_ADMIN





Template:

`https://swiftobjectstorage.<OCI_REGION>.oraclecloud.com/v1/<OCI_NAMESPACE>/<OCI_BUCKET>`

Exemplo com região de **sa-saopaulo-1**, namespace **abcdefghij** e bucket **adb-rat** :

`https://swiftobjectstorage.sa-saopaulo-1.oraclecloud.com/v1/abcdefghij/adb-rat`

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Como carregar vários arquivos no Bukect ?

Script upload_to_oci.sh

```
#!/bin/bash
# upload_to_oci.sh v2
# Maicon Carneiro - 10/02/2023
# Maicon Carneiro - 22/06/2023 - Added support for single file upload

######### User & Object Storage Information ###########
export OCI_USER="oracleidentitycloudservice/account@example.com"
export OCI_TOKEN="XXXYYYZZZWWWW@#$%"
export OCI_REGION="sa-saopaulo-1"
export OCI_NAMESPACE="abcdefghij"
export OCI_BUCKET="adb-rat"
#######################################################

export LOCAL_DIR=$1
export IS_OK="NO"

if [ -z $LOCAL_DIR ]; then
 LOCAL_DIR=$(pwd)
fi

if [ -d $LOCAL_DIR ] || [ -f $LOCAL_DIR ]; then
 IS_OK="YES"
fi

if [ "$IS_OK" == "NO" ] || [ "$LOCAL_DIR" == "/" ]; then
echo "Source file or directory is not valid."
exit 1
fi

# get the folder name to be created in the Bucket
if [ -d $LOCAL_DIR ]; then
 export LOCAL_DIR_TYPE='FOLDER'
 export FOLDER_NAME=$(basename "$LOCAL_DIR")
else
 export LOCAL_DIR_TYPE="FILE"
 export FOLDER_NAME=$(basename $(dirname "$LOCAL_DIR") )
fi

# generate the URL template for OCI Bucket
export
URL_BASE="https://swiftobjectstorage.$OCI_REGION.oraclecloud.com/v1/$OCI_NAMESPACE/$OCI_BUCKET/$FOLDER

echo "Mode: $LOCAL_DIR_TYPE"
echo "";
echo "URL template:"
echo $URL_BASE
echo "";

for FILE_NAME in $(find $LOCAL_DIR); do
```

Shell Script

```
######### User & Object Storage Information ###########
export OCI_USER="oracleidentitycloudservice/account@example.com"
export OCI_TOKEN="XXXYYYZZZWWWW@#$%"
export OCI_REGION="sa-saopaulo-1"
export OCI_NAMESPACE="abcdefghij"
export OCI_BUCKET="adb-rat"
#######################################################
```

https://dibiei.blog/en/2023/02/11/script-upload_to_oci-sh-simplificando-o-upload-de-multiplos-arquivos-para-um-bukect-oci-usando-curl/

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Upload dos Arquivos

Carregando os Arquivos Para o Bucket na OCI

DataPump export

```
[oracle@lab01 ~]$ ./upload_to_oci.sh /u01/export_adb/
```

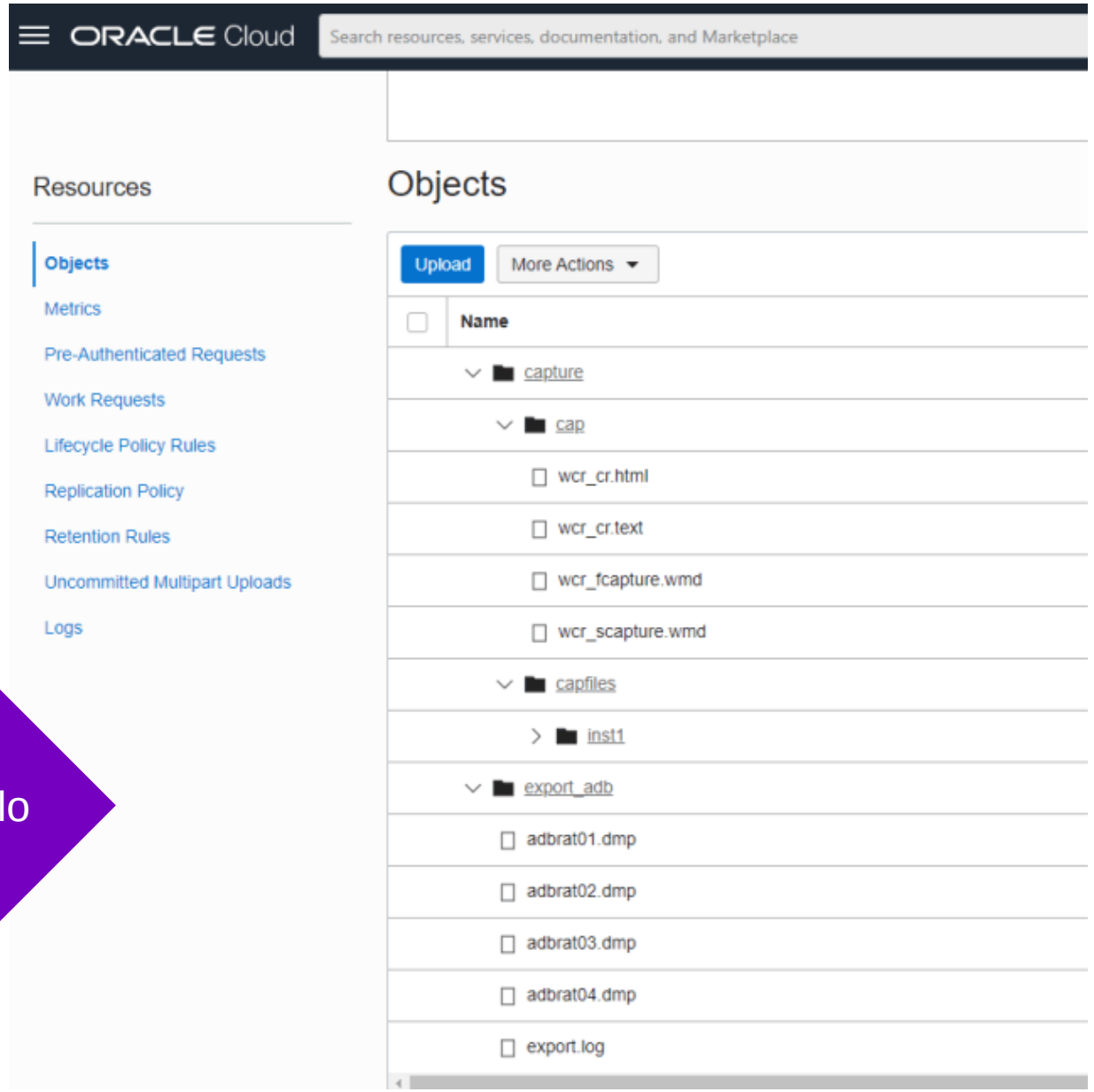
RAT Captura

```
[oracle@lab01 ~]$ ./upload_to_oci.sh /u01/capture/
```

```
[oracle@lab01 ~]$ ./upload_to_oci.sh /u01/capture/

URL template:
https://swiftobjectstorage.sa-saopaulo-1.oraclecloud.com/v1/grupbuuadgbc/adb-rat/capture
11/02/2023 20:10:52 -> Uploading file /u01/capture/cap/wcr_scapture.wmd ...
11/02/2023 20:10:53 -> Uploading file /u01/capture/cap/wcr_fcapture.wmd ...
11/02/2023 20:10:53 -> Uploading file /u01/capture/cap/wcr_cr.html ...
11/02/2023 20:10:54 -> Uploading file /u01/capture/cap/wcr_cr.text ...
11/02/2023 20:10:54 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2dwh0000000.rec ...
11/02/2023 20:10:55 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2dyh0000001.rec ...
11/02/2023 20:10:55 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2fph0000002.rec ...
11/02/2023 20:10:55 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2ghh0000004.rec ...
11/02/2023 20:10:56 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2hxh0000005.rec ...
11/02/2023 20:10:56 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2qah0000007.rec ...
11/02/2023 20:10:56 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2frh0000003.rec ...
11/02/2023 20:10:57 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2vzh0000008.rec ...
11/02/2023 20:10:57 -> Uploading file /u01/capture/capfiles/inst1/aa/wcr_fb2jhh0000006.rec ...
```

Exemplo



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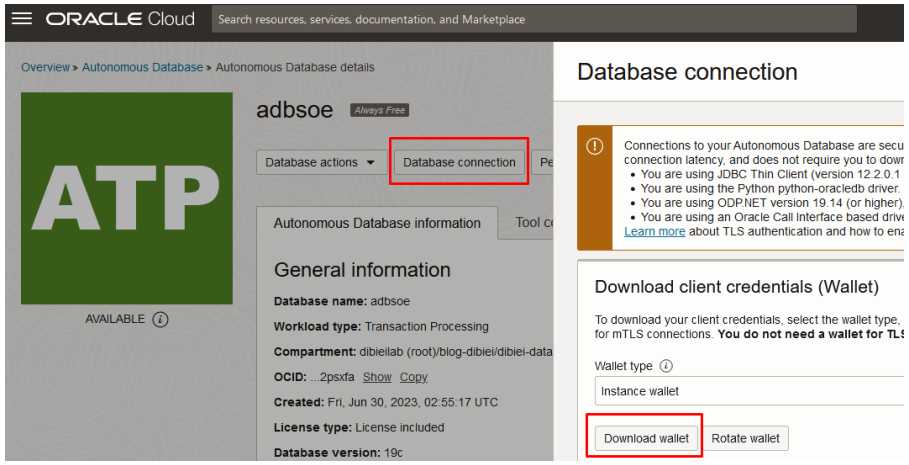
Como Conectar no Autonomous

Configurando a Conexão usando Wallet



Download da wallet (.zip)

```
[oracle@lab01 ~]$ mkdir -P ~/tns_adb
[oracle@lab01 ~]$ unzip Wallet_test.zip -d ~/tns_adb/
[oracle@lab01 ~]$ export TNS_ADMIN=/home/oracle/tns_adb/
```

Diretório para a wallet + tnsnames do ADB

```
[oracle@lab01 ~]$ cat ~/tns_adb/sqlnet.ora
WALLET_LOCATION = (SOURCE = (METHOD = file) (METHOD_DATA = (DIRECTORY="$TNS_ADMIN")))
SSL_SERVER_DN_MATCH=yes
```

Ajuste do SQLNET.ORA

```
[oracle@lab01 ~]$ sqlplus admin/"ADB_Admin_Password"@test_high
```

Teste de conexão

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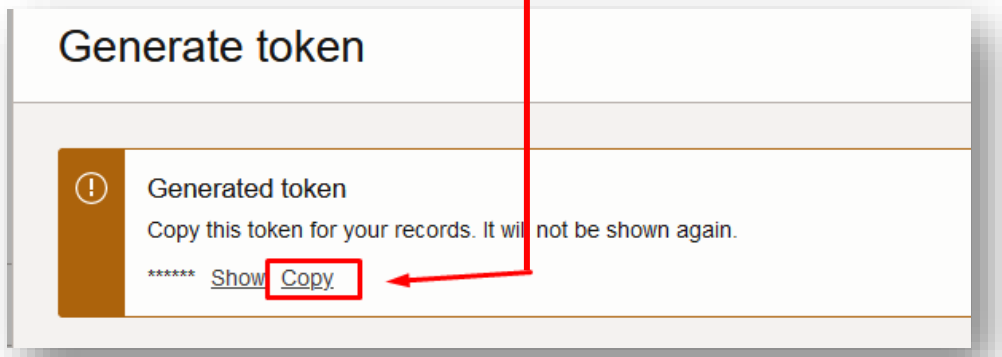
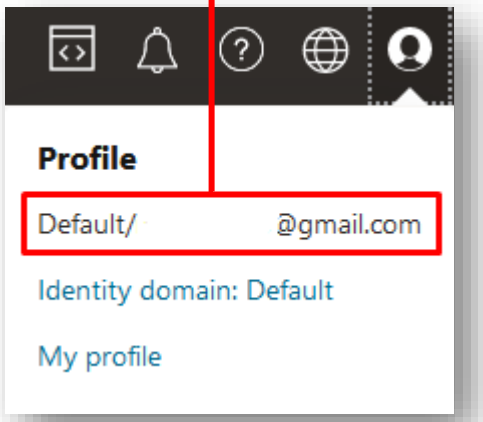
Credencial no Autonomous

Usada no DataPump e Oracle RAT

```
BEGIN
 DBMS_CLOUD.CREATE_CREDENTIAL(
  credential_name => 'CRED_ADB_RAT',
  username => 'Default/dibiei@example.com',
  password => 'SeuTokenAqui'
 );
END;
```





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Carga Inicial no Autonomous

Importando o Dump do Object Storage para o Autonomous

```
[oracle@lab01 ~]$ impdp admin/"ADB_Admin_Password"@adb1_high parfile=imp_adb.par

Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production

Encryption Password:
Master table "ADMIN"."SYS_IMPORT_FULL_01" successfully loaded/unloaded
import done in AL32UTF8 character set and AL16UTF16 NCHAR character set
export done in US7ASCII character set and AL16UTF16 NCHAR character set
Starting "ADMIN"."SYS_IMPORT_FULL_01":  admin/********@adb1_high parfile=imp_rat.par
Processing object type SCHEMA_EXPORT/USER
Processing object type SCHEMA_EXPORT/SYSTEM_GRANT
```

A senha que você criou no expdp

Recomendado para Autonomous

```
directory=DATA_PUMP_DIR
credential=CRED_ADB_RAT
dumpfile= https://objectstorage.sa-saopaulo-1.oraclecloud.com/n/grupbuuadgbc/b/adb-rat/o/export_adb/adbrat%u.dmp
parallel=4
encryption_pwd_prompt=yes
exclude=cluster,indextype,db_link
```

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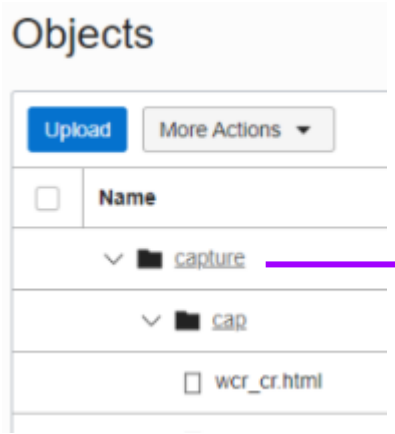
Executando o RAT Replay

Iniciando a reprodução do workload no Autonomous Database




```
BEGIN
 DBMS_CLOUD_ADMIN.replay_workload(
  location_uri => 'https://swiftobjectstorage.sa-saopaulo-1.oraclecloud.com/v1/grupbuuadgbc/adb-rat/capture',
  credential_name => 'CRED_ADB_RAT',
  synchronization => TRUE,
  process_capture => TRUE
 );
END;
```

OCI Region

Tenancy Namespace

Bucket Name

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Monitorando o Database Replay

Views para acompanhar o progresso do replay

DBA_CAPTURE_REPLAY_STATUS → Monitorar as etapas da automação (específico do Autonomous)

```
SELECT * FROM DBA_CAPTURE_REPLAY_STATUS;
```

```
STATE                                                                                             PROGRESS
------------------------------------------------------------------------------------------------- ----------
Exception encountered: -27369, ORA-27369: job of type EXECUTABLE failed with exit code: 1 cp: cannot
 stat '/u02/nfsad1/ext_data/db_replay_capture//*': No such file or
```

DBA_WORKLOAD_REPLAYS → Monitorar a execução do Oracle RAT (igual em qualquer outro Oracle Database)

```
SQL> SELECT ID,
NAME,
STATUS,
TO_CHAR(START_TIME,'DD/MM/YYYY HH24:MI:SS') AS START_TIME,
TO_CHAR(END_TIME,'DD/MM/YYYY HH24:MI:SS') AS END_TIME
FROM DBA_WORKLOAD_REPLAYS
ORDER BY 1;
```

```
ID NAME                                     STATUS                   START_TIME            END_TIME
--- ---------------------------------------- ------------------------ --------------------- ---------------------
 1 REPLAY_1676150124                        IN PROGRESS              11/02/2023 21:16:10
```

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Resultado do Replay

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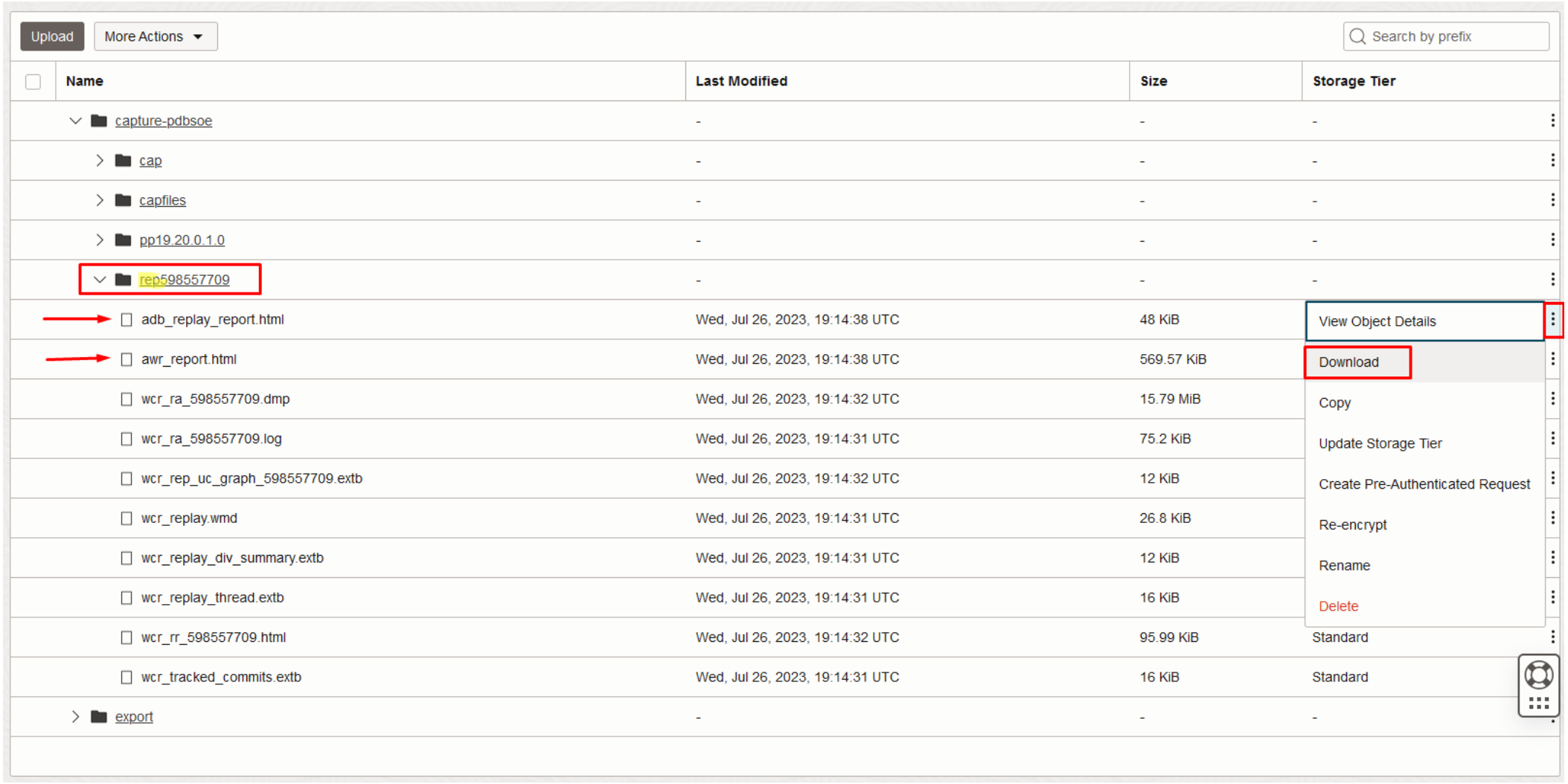
Download do Replay Report

Acessível facilmente via Browser



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Database Replay - Relatório

Exemplo do relatório do RAT Replay

Ganho de **25%** (Tempo decorrido)

DB Replay Report for REPLAY_1689037019

DB Name	DB Id	Release	RAC	Replay Name	Replay Status
G25449697B7DBCD_ADBSOE	4246441707	19.20.0.1.0	YES	REPLAY_1689037019	COMPLETED

Replay Information

Information	Replay	Capture
Name	REPLAY_1689037019	captura_adb_1
Status	COMPLETED	COMPLETED
Database Name	G25449697B7DBCD_ADBSOE	CDBARM
Database Version	19.20.0.1.0	19.19.0.0.0
Start Time	11-07-23 01:00:30	10-07-23 22:51:09
End Time	11-07-23 01:07:16	10-07-23 22:59:14
Duration	6 minutes 46 seconds	8 minutes 5 seconds
Directory Object	DB_REPLAY_CAPTURE_DIR	DB_REPLAY_CAPTURE_DIR
Directory Path	/u03/dbfs/FF23EE5A50006102E0532F10000A10CE/data/db_replay_capture/replay_1689037019_bee06	/u03/dbfs/FF23EE5A50006102E0532F10000A10CE/data/db_replay_capture/replay_1689037019_bee06
AWR DB Id	4246441707	
AWR Begin Snap Id	266	
AWR End Snap Id	267	
PL/SQL Mode	TOP_LEVEL	TOP_LEVEL
Encryption Algorithm		
Replay Directory Number	249269356	N/A
DB Replay Patch Info		

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Database Replay - Relatório

Exemplo do relatório do RAT Replay

Ganho de **25%** (DB Time)

Replay Statistics

Statistic	Replay	Capture
DB Time	9 minutes 46.29 seconds	12 minutes 19.53 seconds
PL/SQL DB Time	9 minutes 37.08 seconds	11 minutes 56.05 seconds
User calls	47530	47543
PL/SQL user calls	15961	15963
PL/SQL subcalls	N/A	0
Average Active Sessions	1.44	1.52
Capture Files	4	4
Finished Replay Sessions	4	4

Replay Divergence Summary

Divergence Type	Count	% Total
Session Failures During Replay	0	0.00
Errors No Longer Seen During Replay	0	0.00
New Errors Seen During Replay	0	0.00
Errors Mutated During Replay	0	0.00
DMLs with Different Number of Rows Modified	0	0.00
SELECTs with Different Number of Rows Fetched	0	0.00

Workload Profile

Top Events

(-) Hide

Event	Instance ID	Total Wait Time
CPU	2	480 seconds
cell smart table scan	2	120 seconds
reliable message	2	20 seconds
latch free	2	10 seconds

Top SQL with Top Events

(-) Hide

SQL ID	Instance ID	Event	Total Wait Time
7ws837zynp1zv	2	CPU	170 seconds
8zz6y2yzdqjp0	2	CPU	150 seconds
g81cbrq5yamf5	2	cell smart table scan	110 seconds
g81cbrq5yamf5	2	CPU	40 seconds
7t0959msvyt5g	2	CPU	20 seconds
g8j92a5jnkpxb	2	CPU	20 seconds
147a57cxq3w5y	2	CPU	10 seconds
63rrbc2dwmwnq	2	CPU	10 seconds
7t0959msvyt5g	2	cell smart table scan	10 seconds

Top Service/Module

(-) Hide

Service	Module	Instance ID	Total Wait Time
G25449697B7DBCD_ADBSOE	New Order	2	270 seconds
G25449697B7DBCD_ADBSOE	Update Customer Details	2	170 seconds
G25449697B7DBCD_ADBSOE	Browse and Update Orders	2	120 seconds
G25449697B7DBCD_ADBSOE	Browse Products	2	20 seconds
G25449697B7DBCD_ADBSOE	DBPERF_GET_DBMS_REPORT	2	20 seconds
G25449697B7DBCD_ADBSOE	REPLAY_WORKLOAD_JOB	2	10 seconds
NULL	DBMS_SCHEDULER	2	10 seconds
NULL	SYS_AUTO_STS_MODULE	2	10 seconds

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SQL Peformance Analyzer (SPA)

Testando desempenho de queries específicas

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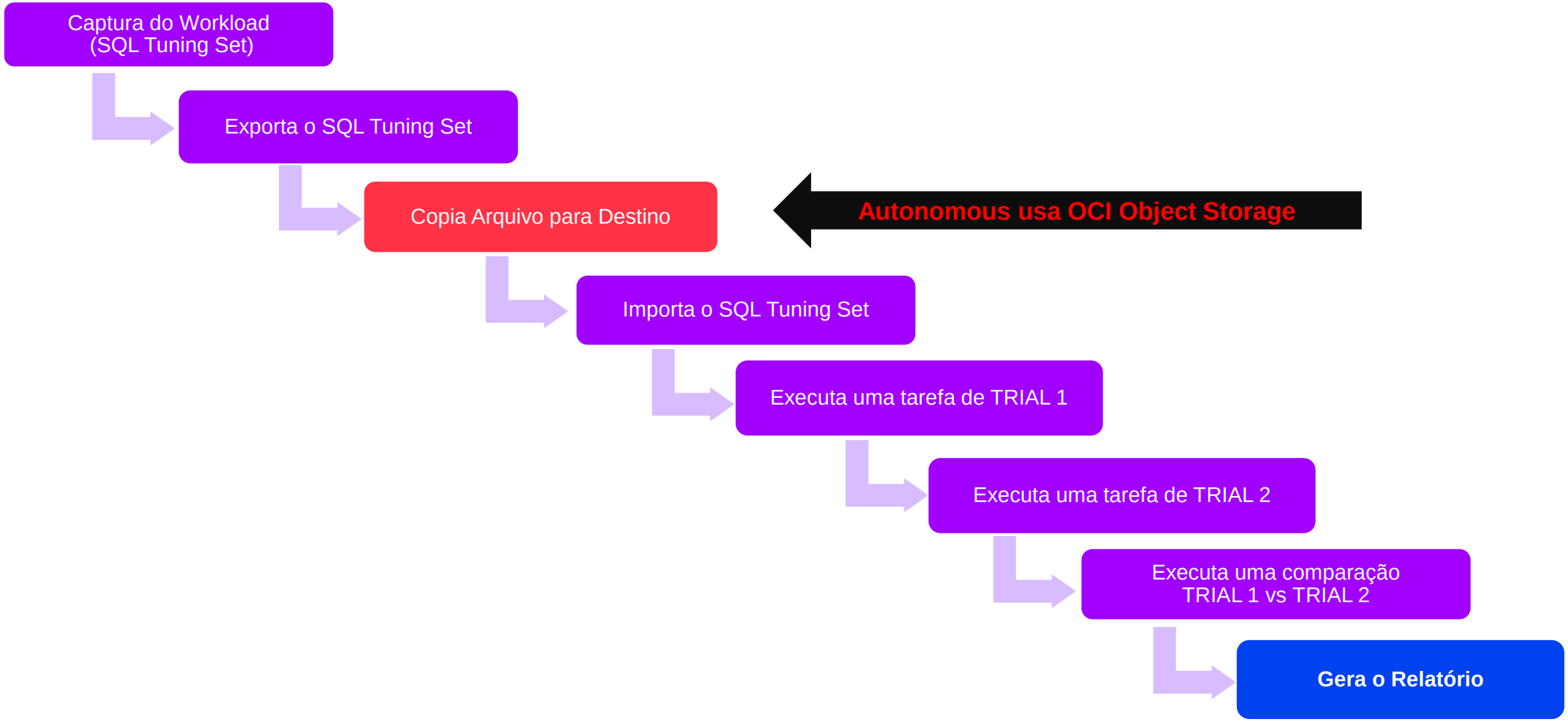
Etapas do SPA

Mesmo funcionamento entre OnPremise e Autonomous



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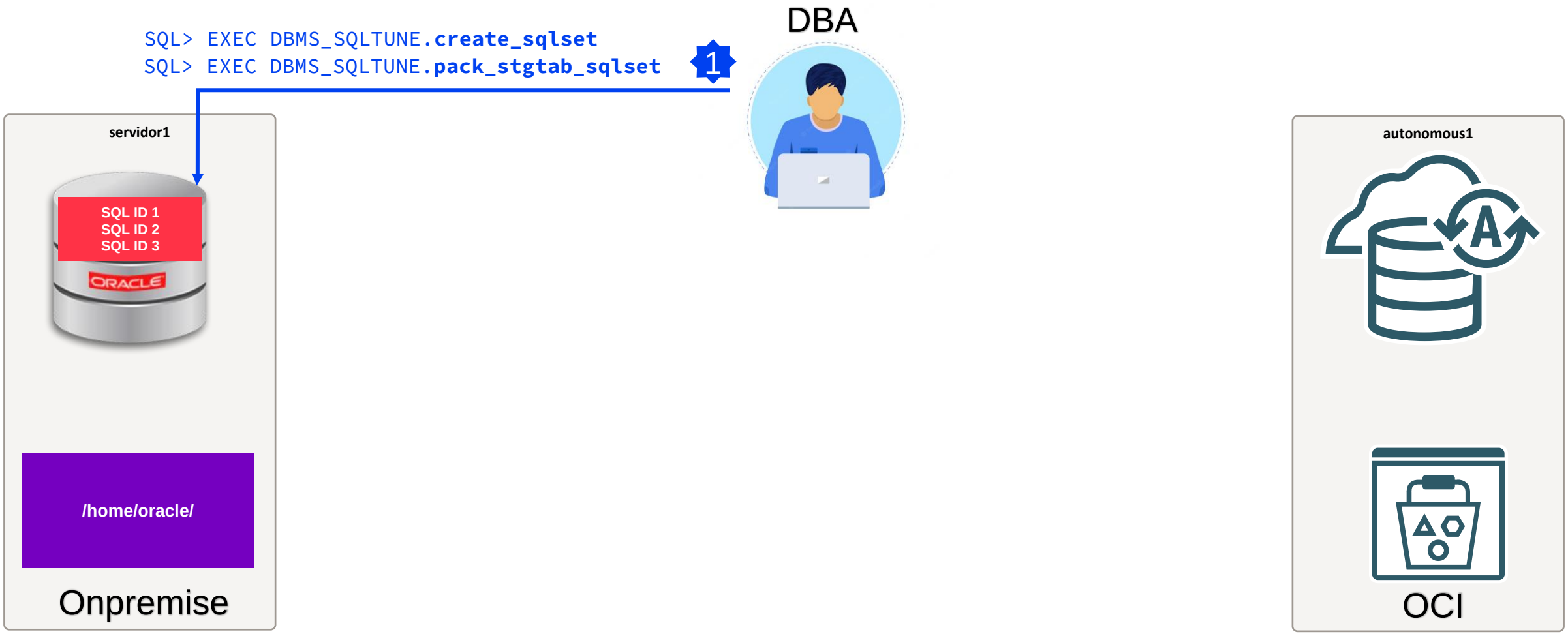
Fluxo do SPA no Autonomous

Criando o SQL Tuning Set na Origem



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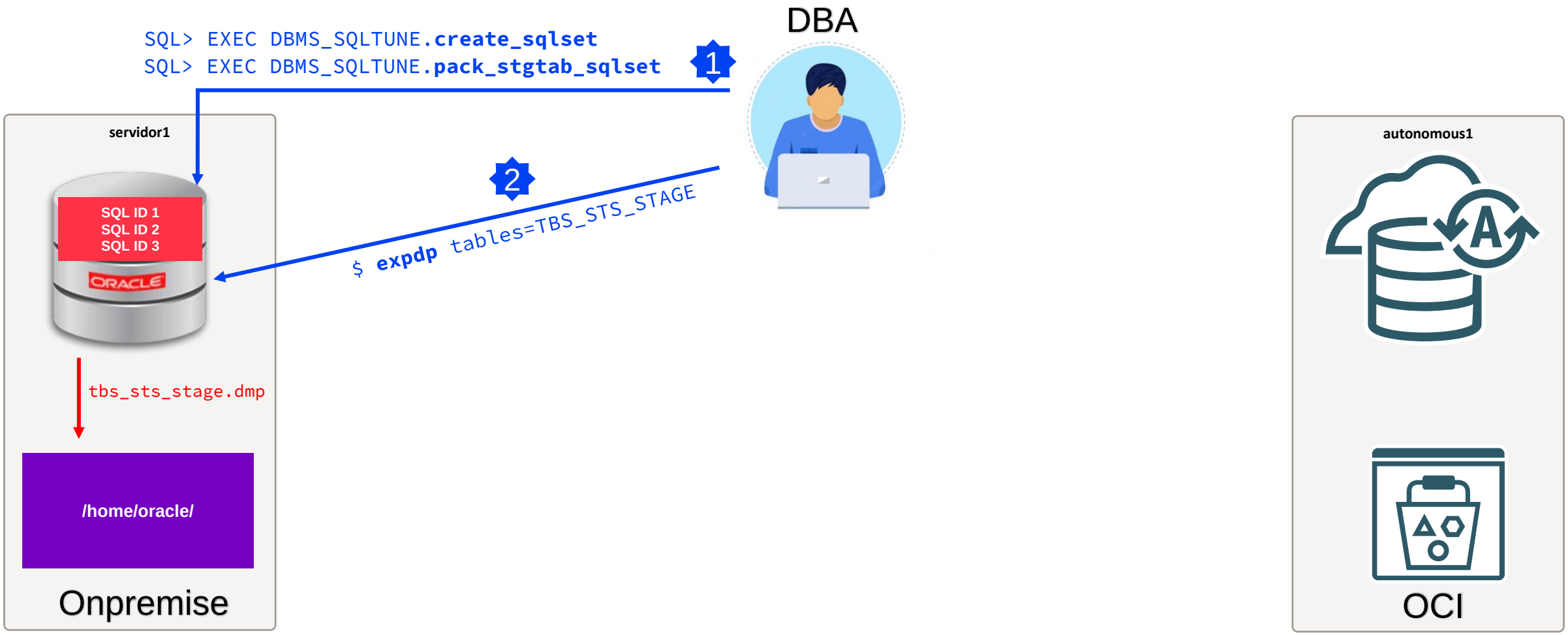
Fluxo do SPA no Autonomous

Exportando a tabela auxiliar com expdp



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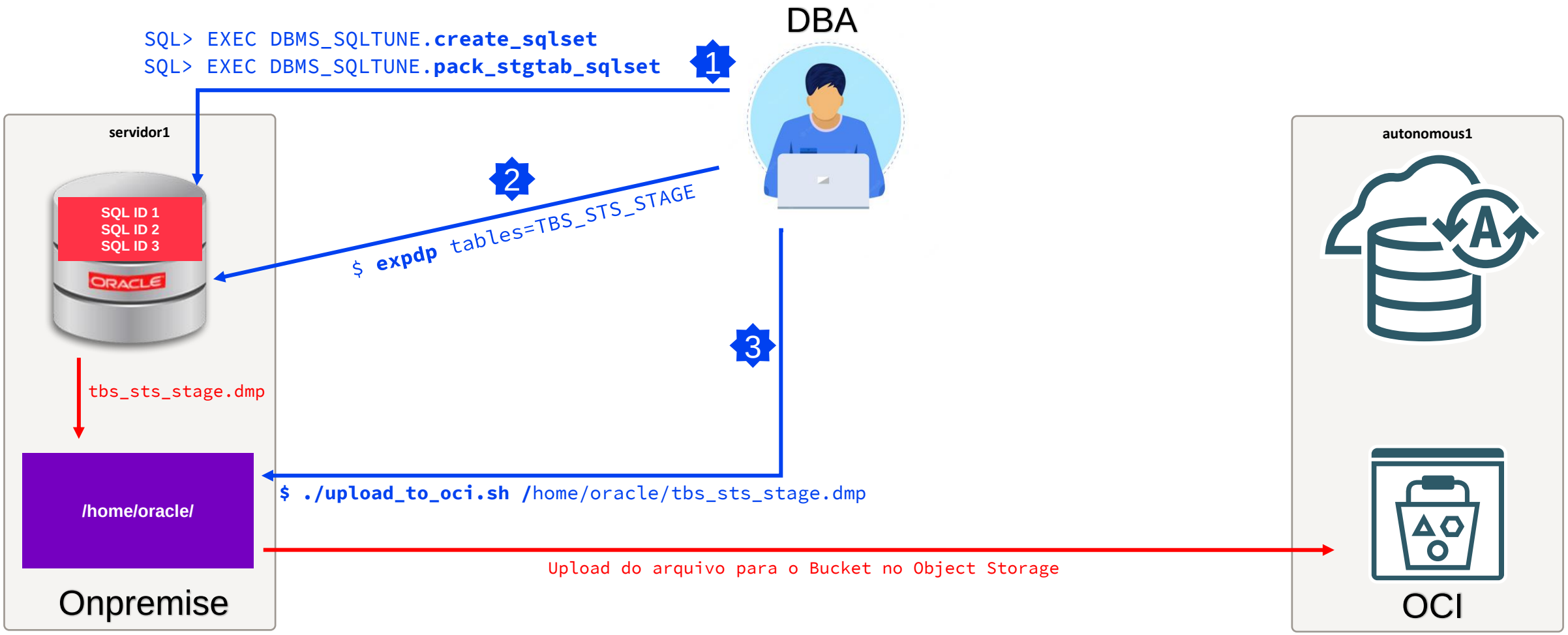
Fluxo do SPA no Autonomous

Upload do DUMP para o Bucket na OCI



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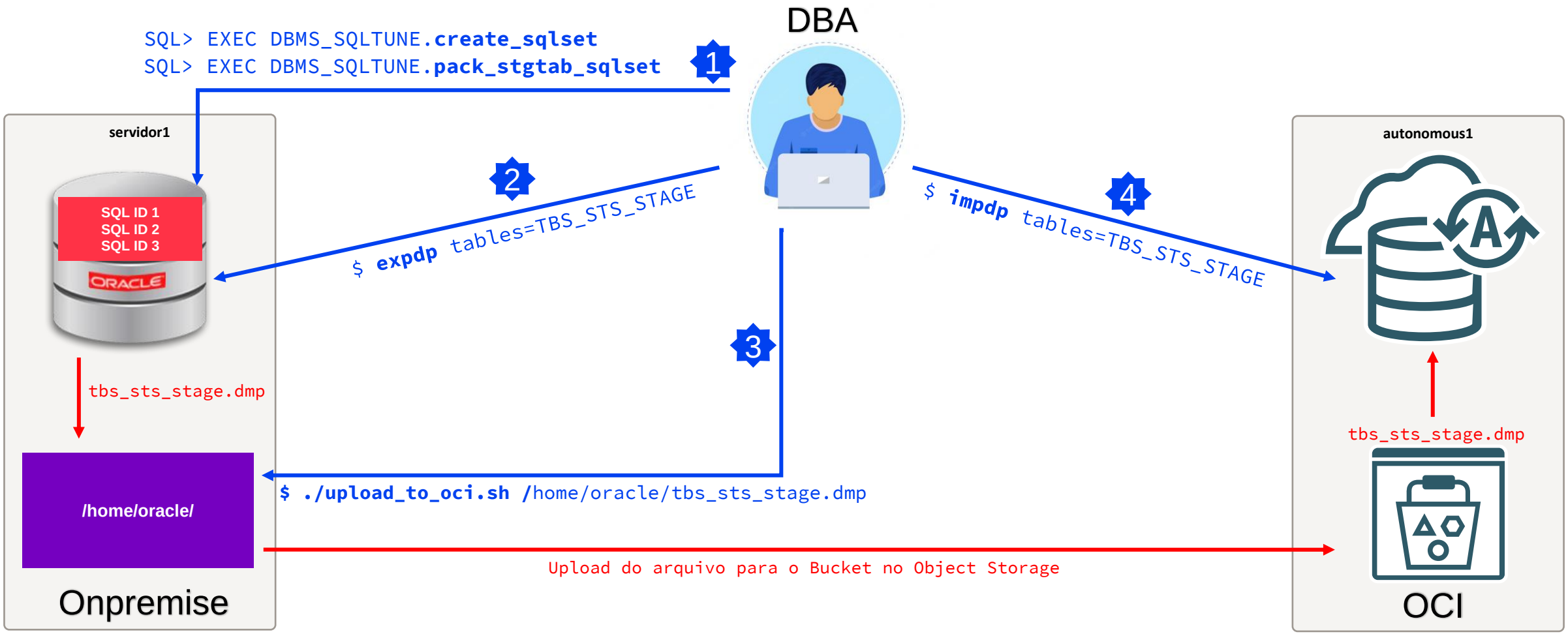
Fluxo do SPA no Autonomous

Importando a tabela auxiliar no Autonomous com o impdp



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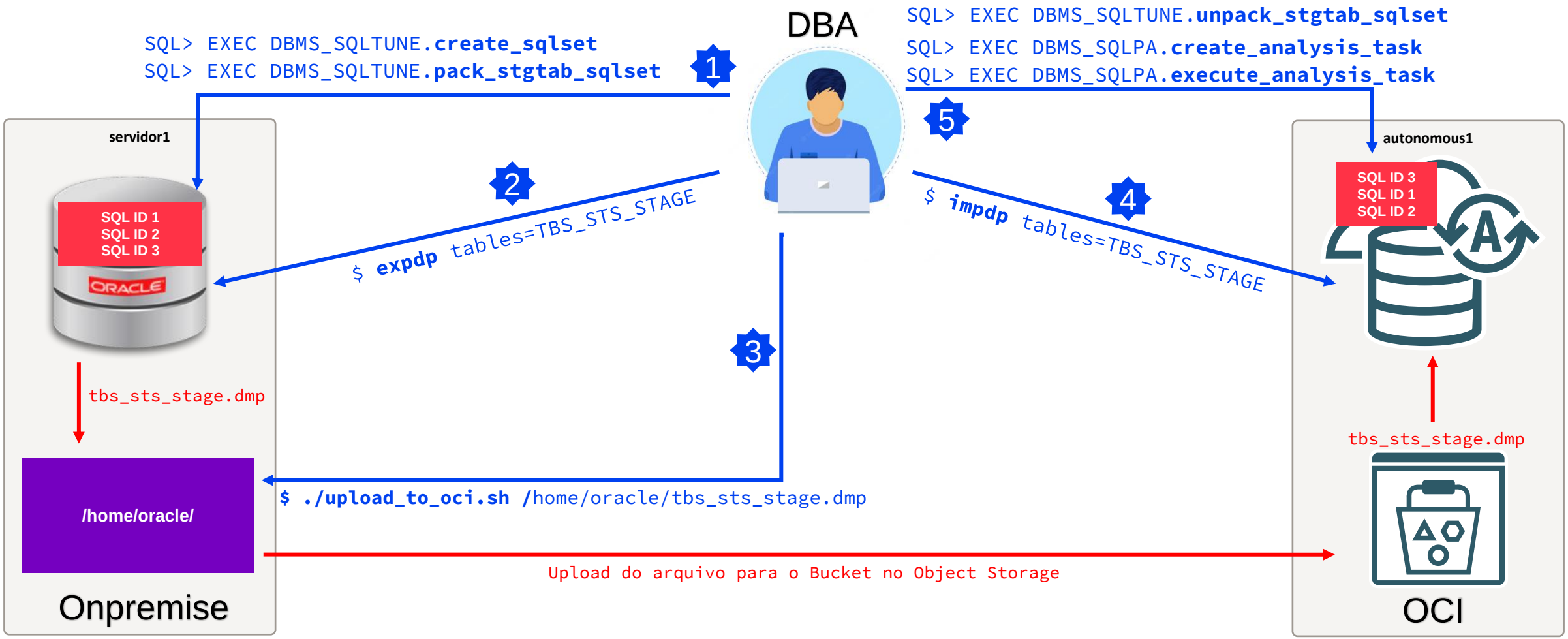
Fluxo do SPA no Autonomous

Importando o SQL Tuning Set e executando o SPA no Autonomous



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SQL Performance Analyzer Passo a Passo

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Capture as Queries na Origem

Exemplo criando um SQL Tuning Set e Importando SQL da Shared Pool

```
BEGIN
 DBMS_SQLTUNE.CREATE_SQLSET (
  sqlset_name => 'STS_SPA1' ,
  description => 'Teste da aplicacao SOE com SQL Performance Analyzer'
);
END;
```

```
DECLARE
 cur DBMS_SQLTUNE.SQLSET_CURSOR;
BEGIN
 OPEN cur FOR
 SELECT VALUE(p) FROM TABLE( DBMS_SQLTUNE.SELECT_CURSOR_CACHE(' parsing_schema_name in (''SOE_USER'') ') ) p;
 DBMS_SQLTUNE.LOAD_SQLSET (sqlset_name => 'STS_SPA1', populate_cursor => cur );
END;
```

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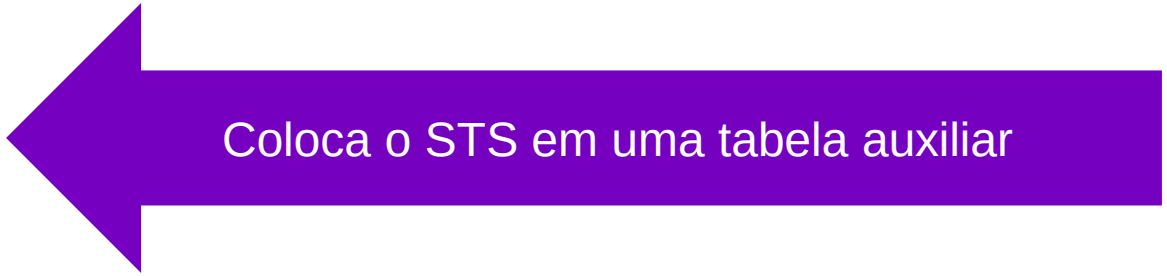
Exportando o SQL Tuning Set na Origem

Essa etapa permite transportar o SQL Tuning Set via DataPump (expdp)

```
SQL> exec dbms_sqltune.create_stgtab_sqlset(table_name => 'TB_STS_STAGE');
```

```
BEGIN
 dbms_sqltune.pack_stgtab_sqlset(
  sqlset_name => 'STS_SPA1',
  sqlset_owner => 'SYSTEM',
  staging_table_name => 'TB_STS_STAGE'
);
END;
```




```
SQL> create or replace directory STS_EXP_DIR as '/home/oracle/';
```

```
expdp system@pdbsoe \
 tables=TB_STS_STAGE \
 directory=STS_EXP_DIR \
 dumpfile=sts_stage_soe.dmp
```

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Importando o SQL Tuning Set no Destino

Essa etapa permite transportar o SQL Tuning Set via DataPump (impdp)

```
./upload_to_oci.sh /home/oracle/sts_stage_soe.dmp
```

```
impdp admin@adbsoe_high \
 directory=DATA_PUMP_DIR \
 credential=CRED_ADB_RAT \
 dumpfile=https://objectstorage.sa-vinhedo-1.oraclecloud.com/n/axai3hjvkzzf/b/oracle-rat-spa/o/oracle/sts_stage_soe.dmp \
 remap_schema=SYSTEM:ADMIN
```

```
BEGIN
 DBMS_SQLTUNE.unpack_stgtab_sqlset(
   sqlset_name => 'STS_SPA1',
   sqlset_owner => 'SYSTEM',
   replace => TRUE,
   staging_schema_owner => 'ADMIN',
   staging_table_name => 'TB_STS_STAGE');
END;
```

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Executando o SQL Performance Analyzer

Criando uma tarefa no SPA (uma única vez)

```
DECLARE
t_name VARCHAR2(100);
BEGIN
 t_name := DBMS_SQLPA.CREATE_ANALYSIS_TASK(
 sqlset_name => 'STS_SPA1',
 sqlset_owner => 'SYSTEM',
 task_name => 'SPA_TASK1'
);
END;
```

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Executando o teste

TRIAL 1: Converte as métricas de execução do banco de origem

```
BEGIN
dbms_sqlpa.execute_analysis_task(
task_name => 'SPA_TASK1',
execution_type => 'convert sqlset',
execution_name => 'onpremise_before',
execution_params => DBMS_ADVISOR.ARGLIST('sqlset_name', 'STS_SPA1', 'sqlset_owner', 'SYSTEM')
);
END;
```

Simulação

TRIAL 2: Execução real de teste no Autonomous

```
BEGIN
 dbms_sqlpa.execute_analysis_task(
 task_name => 'SPA_TASK1',
 execution_type => 'test execute',
 execution_name => 'autonomous_after'
);
END;
```

Query executada 10x

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Gerando o Relatório

Executando uma comparação entre o TRIAL 1 e o TRIAL 2

```
BEGIN
dbms_sqlpa.execute_analysis_task(
task_name => 'SPA_TASK1',
execution_type => 'compare',
execution_params => DBMS_ADVISOR.ARGLIST('execution_name1', 'onpremise_before', 'execution_name2', 'autonomous_after',
'workload_impact_threshold', 0, 'sql_impact_threshold', 0)
);
END;
```

Gerando relatório interativo em HTML

```
SET FEEDBACK OFF
SET TERMOUT OFF
SET HEADING OFF
SET TRIM ON
SET TRIMSPOOL ON
SET PAGESIZE 0
SET LINESIZE 1000
SET LONG 5000000
SET LONGCHUNKSIZE 5000000

SPOOL spa_active_report.html
SELECT DBMS_SQLPA.report_analysis_task('SPA_TASK1', 'ACTIVE', 'ALL') FROM dual;
```

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Resultado do SQL Performance Analyzer

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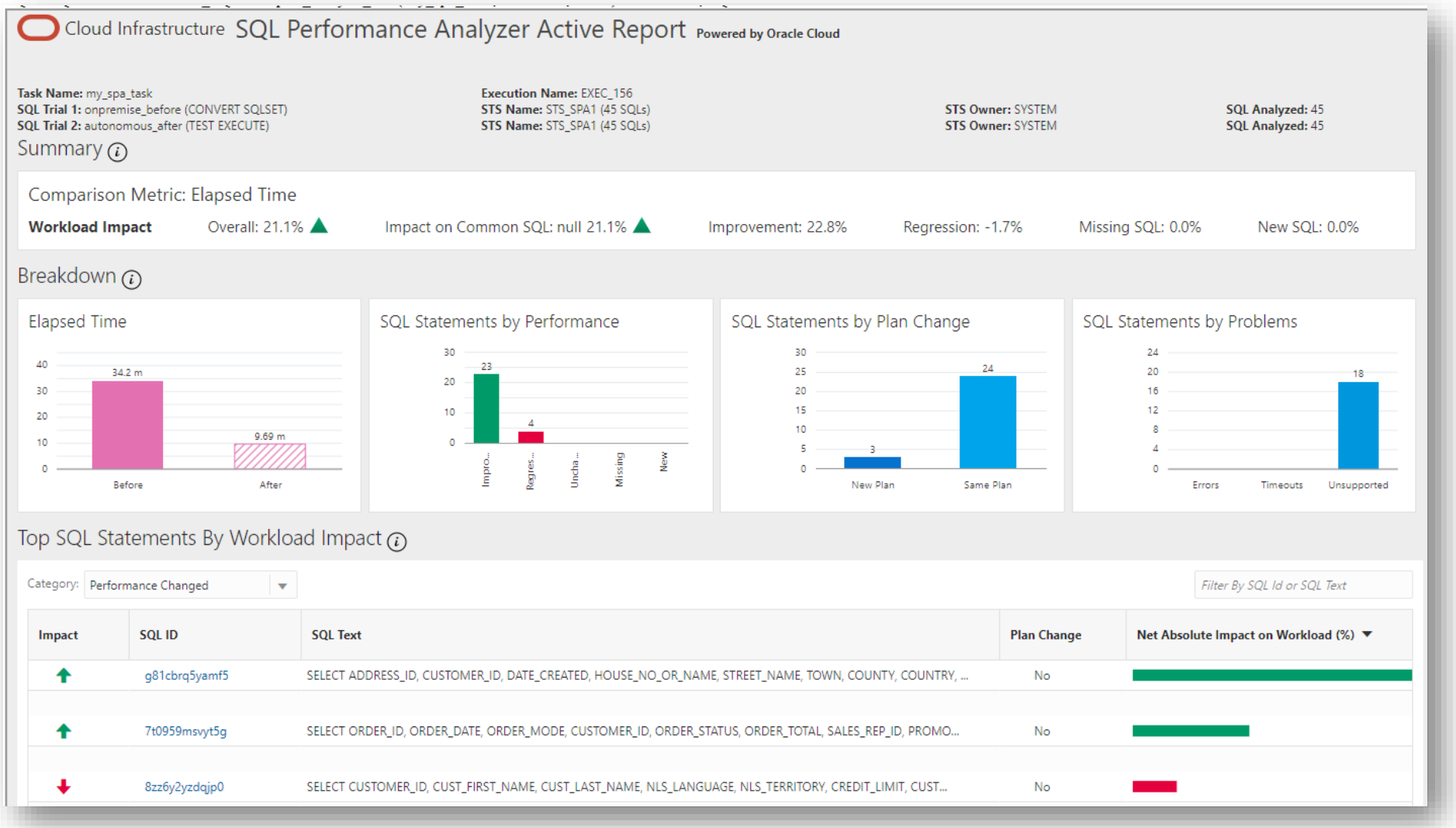
Relatório do SPA - Interativo



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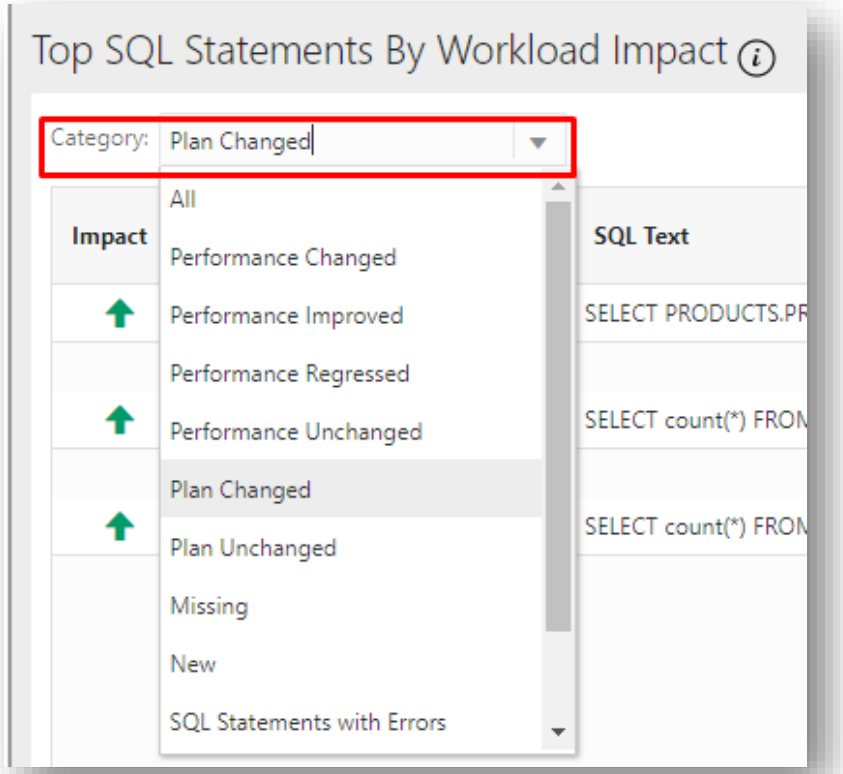
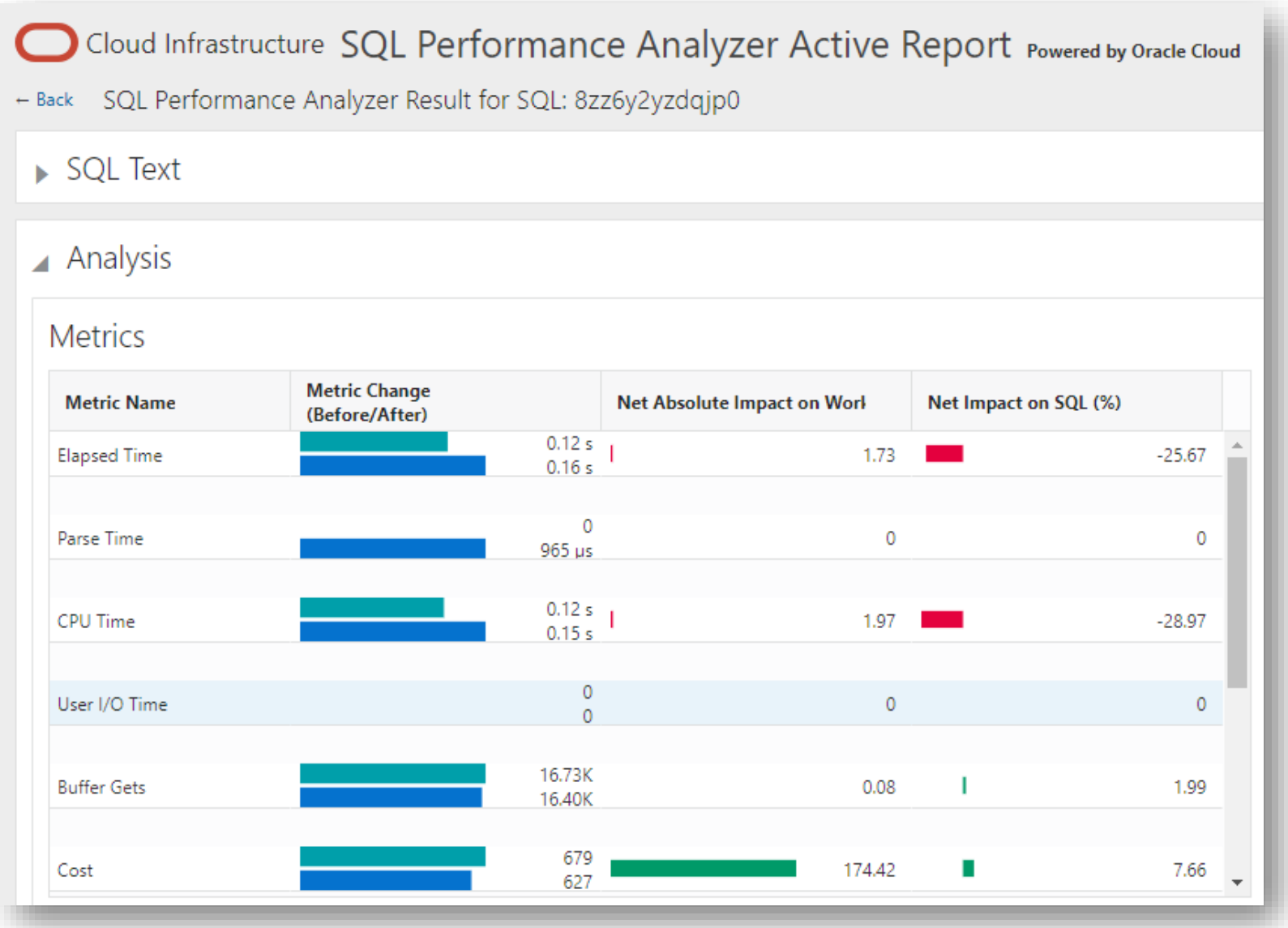
Relatório do SPA - Interativo





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Relatório do SPA - Estático

Report Summary

Projected Workload Change Impact:

Overall Impact : **21.09%**
Improvement Impact : **22.82%**
Regression Impact : **-1.73%**

SQL Statement Count

SQL Category	SQL Count	Plan Change Count
Overall	45	3
Improved	23	3
Regressed	4	0
Unsupported	18	0

Execution Plan Before Change:

Plan Hash Value : 1286489376

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT				4618	
1	COUNT STOPKEY					
2	TABLE ACCESS FULL	ADDRESSES	5	370	4618	00:00:01

Execution Plan After Change:

Plan Id : 42
Plan Hash Value : 1286489376

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT		5	370	4577	00:00:01
* 1	COUNT STOPKEY					
* 2	TABLE ACCESS STORAGE FULL	ADDRESSES	5	370	4577	00:00:01

Predicate Information (identified by operation id):

- 1 - filter(ROWNUM<:B1)
- 2 - storage("CUSTOMER_ID"=:B2) ← Exadata Smart Scan
- 2 - filter("CUSTOMER_ID"=:B2)

Top 27 SQL Sorted by Absolute Value of Change Impact on the Workload

object_id	sql_id	Impact on Workload	Execution Frequency	Metric Before	Metric After	Impact on SQL	Plan Change
89	g81cbrq5yamf5	15.39%	6200	76199.2158064516	25263	66.85%	n
68	7t0959msvyt5g	4.58%	1695	78239.9061946903	22768	70.9%	n
73	8zz6y2yzdqjp0	-1.73%	1105	124901.770135747	156969	-25.67%	n
70	7ws837zynp1zv	.89%	4459	46794.8921282799	42701	8.75%	n
57	29qp10usqkqh0	.87%	234	98602.7820512821	22681	77%	n
63	56pwkjspvmg3h	.43%	117	100079.025641026	24845	75.17%	n
91	gkxxkghxubh1a	.4%	109	97999.0275229358	22649	76.89%	n
52	0y1prvxqc2re9	.12%	122654	41.2200580494725	21	49.05%	n
55	1qf3b7a46jm3u	.06%	529	2150.80718336484	13	99.4%	n
81	c13sma6rkr27c	.03%	54601	138.678595630117	126	9.14%	y
64	5ckxyqfvu60pj	.03%	36149	29.1848460538327	13	55.46%	n
65	5mddt5kt45rg3	.01%	4504	46.9771314387211	14	70.2%	n
72	8z3542ffmp562	.01%	15160	18.9839050131926	10	47.32%	n
67	7r7636982atn9	0%	4251	34.2378263937897	11	67.87%	n
59	3hatpjzrqvfn7	0%	529	163.432892249527	15	90.82%	n
87	f9u2k84v884y7	0%	581	84.4664371772806	14	83.43%	n
66	7hk2m2702ua0g	0%	581	2030.42857142857	1976	2.68%	n
60	4065gwcf6n8ck	0%	1	26434	128	99.52%	n
54	1b3utaf6tfhfy	0%	529	53.7504725897921	13	75.81%	n
82	c749bc43qqfz3	0%	6093	7.84523223371082	5	36.27%	n
75	a7q96p26uzq9a	0%	1726	6.90440324449594	16	-131.74%	n
69	7tjt0k6pynsq3	0%	1	13452	567	95.79%	y
49	0j95qvym9s35u	0%	1725	6.5663768115942	13	-97.98%	n
85	ct25vr1d8nrt4	0%	1	8187	161	98.03%	y
62	4z3ktqk9zq1j9	0%	1724	15.3886310904872	20	-29.97%	n
80	buffkg6cm7uay	0%	1	952	13	98.63%	n
56	24x89gq2qg90v	0%	1	898	13	98.55%	n

Note: time statistics are displayed in microseconds

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Dicas finais

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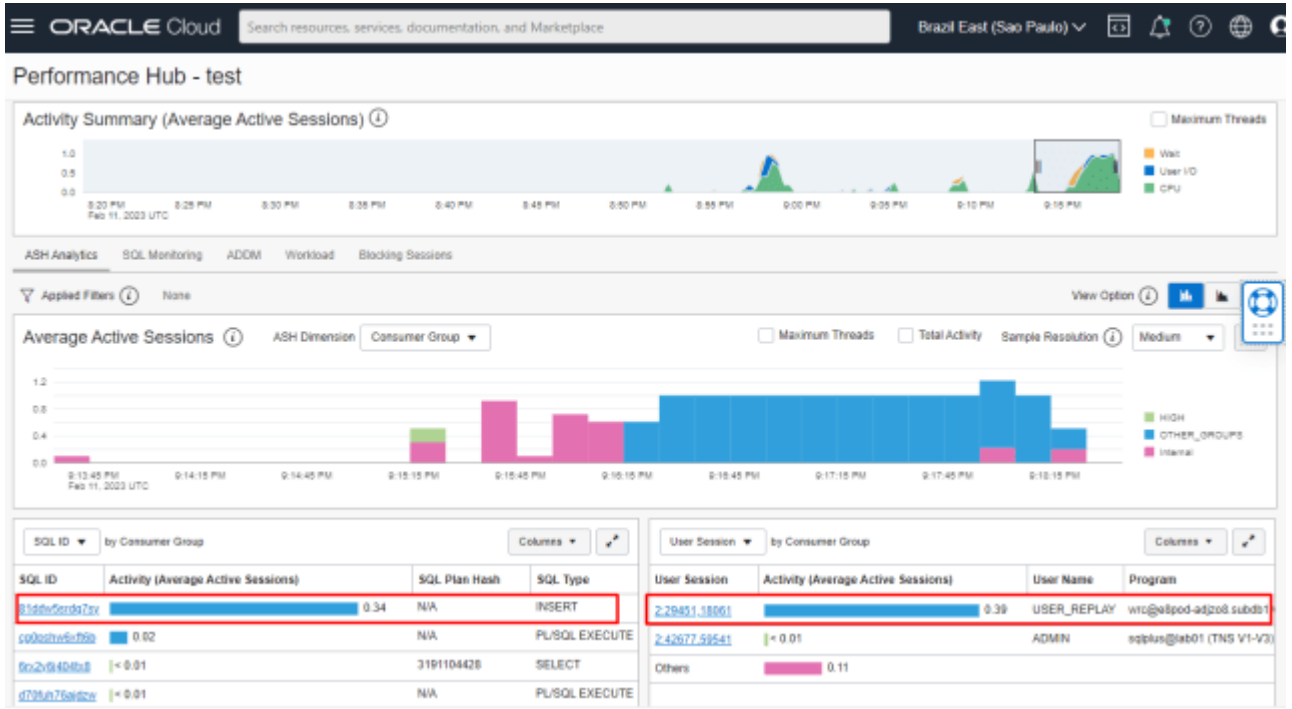
Dicas Finais

Podem ser úteis durante a sua jornada para o Autonomous

- Crie um backup físico do ADB antes do Replay
- Use o Performance Hub durante o Replay
- Use o Advisor para SQL que apresentam regressão de performance
- Volte backup e execute o RAT Replay novamente após ajustes de plano de execução



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Links

Blog

Como Executar o Oracle Real Application Testing (RAT) Database Replay no Autonomous Database (OCI)

https://dibiei.blog/2023/02/16/como-executar-o-oracle-real-application-testing-rat-database-replay-no-autonomous-database-oci/

Testando o Desempenho de Consultas SQL no OCI Autonomous Database Utilizando SQL Performance Analyzer (SPA)

https://dibiei.blog/2023/07/17/testando-o-desempenho-de-consultas-sql-no-oci-autonomous-database-utilizando-sql-performance-analyzer-spa/

Documentação

Using Oracle Autonomous Database Serverless:

https://docs.oracle.com/en/cloud/paas/autonomous-database/adbsa/autonomous-real-application-testing.html#GUID-EB8F065E-5FBB-480D-BAF6-5A0446740073

REPLAY_WORKLOAD Procedure

https://docs.oracle.com/en/cloud/paas/autonomous-database/adbsa/dbms-cloud-admin.html#GUID-0007CA51-EAB8-4C4B-971D-B3FC3FCDF186

Oracle Database Testing Guide 19c

https://docs.oracle.com/en/database/oracle/oracle-database/19/ratug/index.html#Oracle%C2%AE-Database

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Obrigado