

Inovação com dados em nuvem

Migração fácil para Cloud em 3
passos práticos: Zero Downtime
para o seu banco de dados

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Introdução

O Zero Downtime Migration usa o Oracle GoldenGate e o Oracle Data Pump para realizar uma migração lógica online.

Durante uma migração online lógica, o banco de dados de origem permanece online para conexões de clientes enquanto os dados são movidos para o banco de dados de destino, usando uma combinação de Oracle Data Pump e replicação Oracle GoldenGate.

O banco de dados de origem pode ser um banco de dados conectável (PDB) ou um banco de dados non-CDB.

O Oracle Data Pump extrai dados do banco de dados de origem e os carrega no banco de dados de destino.

Replicação de dados em tempo real entre os bancos de dados de origem e destino.

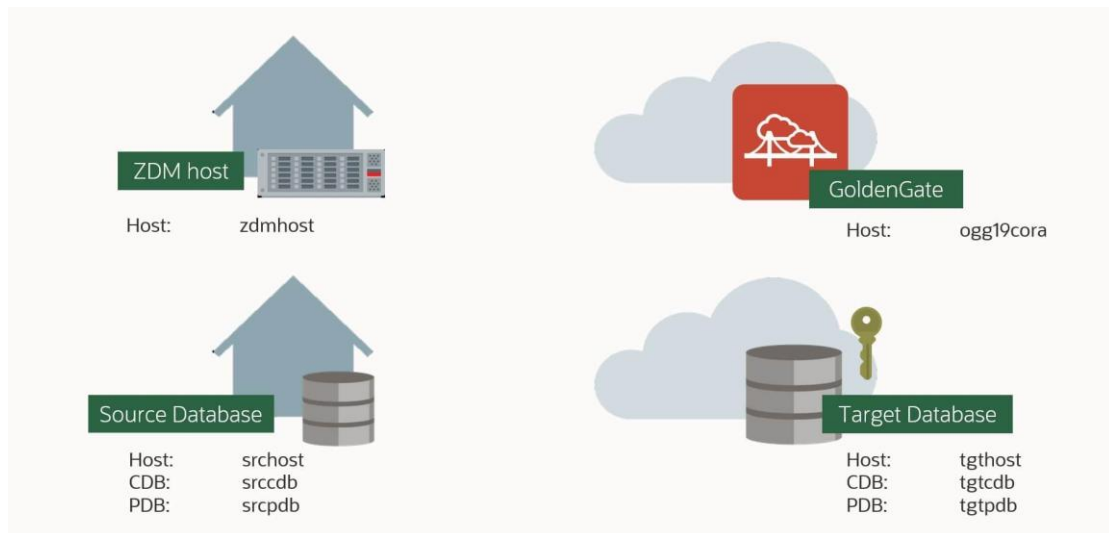
O Oracle GoldenGate replica os dados entre os bancos de dados de origem e destino em tempo real até que você opte por alterar os aplicativos para o banco de dados de destino.

A migração lógica online abordada neste documento envolve três etapas básicas:

1. **Provisionamento e instalação**
 - Instanciação do banco de dados de destino
 - Provisionamento do ZDM host
 - Instalação do ZDM
 - Provisionar o host do Golden Gate
 - E criação do seu banco de origem, caso ainda não o tenha.
2. **Estabelecer conectividade e iniciar a replicação**
 - Garantir conectividade entre os elementos envolvidos
 - Iniciar a replicação
3. **Migrar**
 - Executar um job de avaliação
 - Executar o job de migração

Lembre-se : que esse é um ambiente de testes. Em um ambiente produtivo o DBA deve revisar as orientações do Oracle Support para identificar quaisquer impactos e patches que precisem ser aplicados para as funções a seguir.

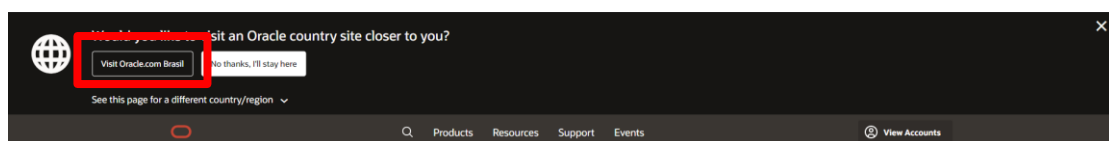
1. Provisionamento e instalação



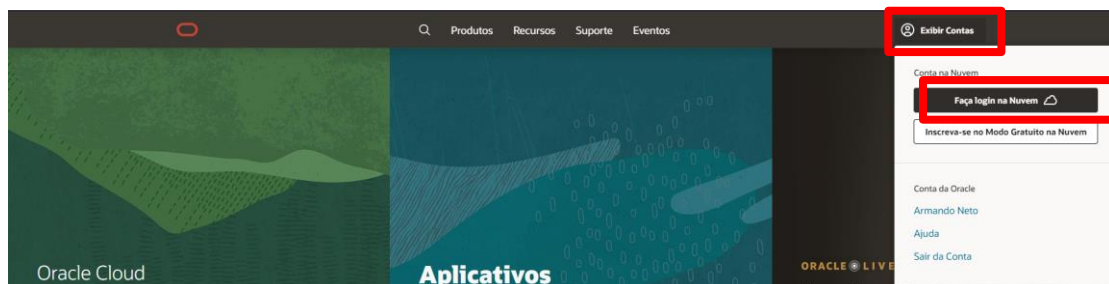
Acessando o ambiente

Nesta seção você aprenderá mais sobre o acesso inicial ao ambiente.

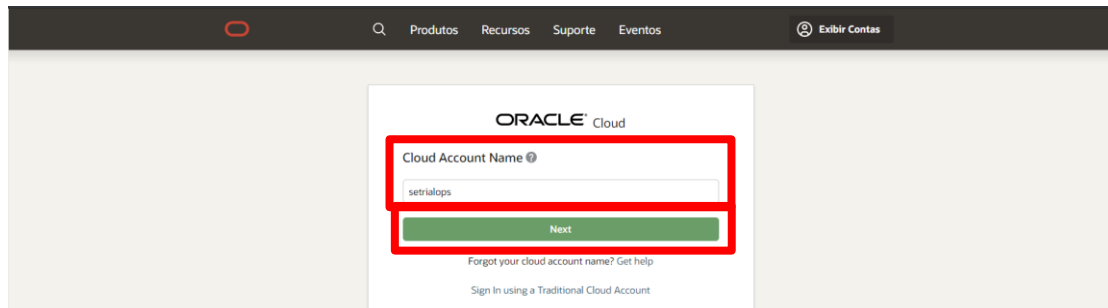
Vá para oracle.com. Você pode alterar o idioma desta página antes do acesso ao ambiente:



No site já em português, clique em Exibir Contas e depois em Faça Login na Nuvem:

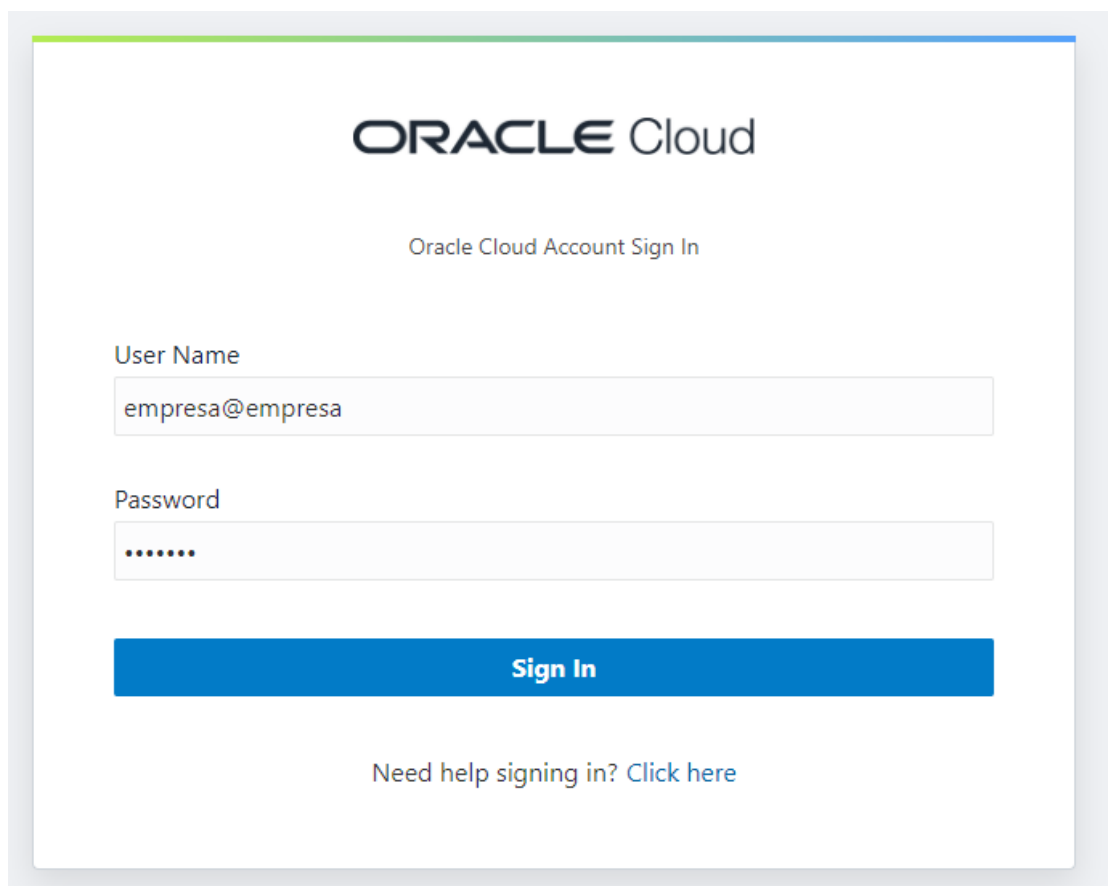


O login deve ser feito com o “Cloud Account Name”, onde somente é necessário informar o **nome da conta** (definido no momento de solicitação do trial ou do ambiente final).



The screenshot shows the Oracle Cloud login interface. At the top, there is a navigation bar with links for 'Produtos', 'Recursos', 'Suporte', and 'Eventos', along with a user icon and 'Exibir Contas'. The main content area features the 'ORACLE Cloud' logo. Below the logo, there is a form titled 'Cloud Account Name' with a text input field containing 'setrialops' and a green 'Next' button. A red rectangle highlights the input field and the button. Below the button, there are links for 'Forgot your cloud account name? Get help' and 'Sign In using a Traditional Cloud Account'.

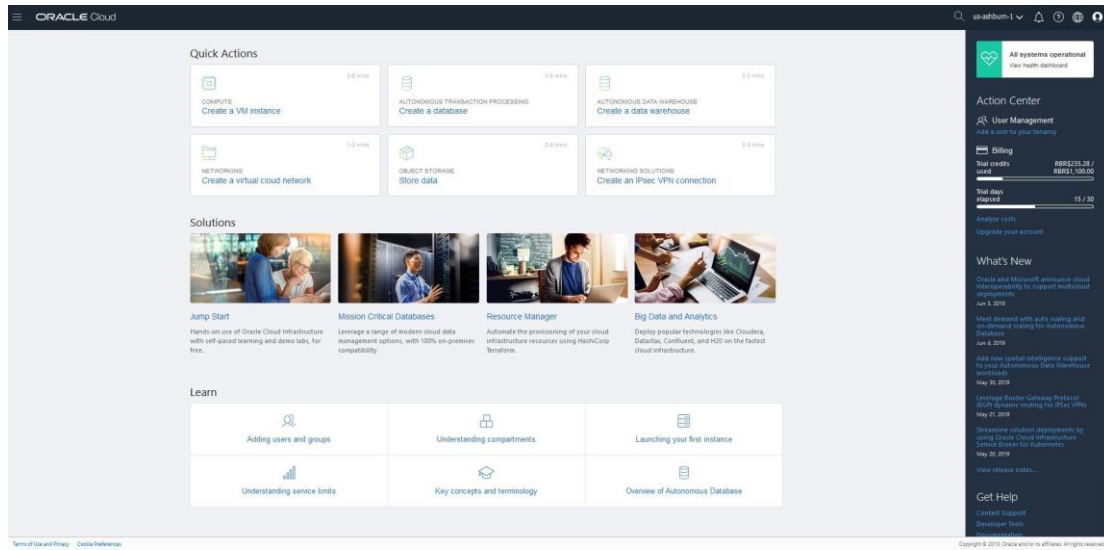
A tela de login para usuário é apresentada. O usuário administrador é identificado pelo e-mail utilizado no cadastro do ambiente.



The screenshot shows the Oracle Cloud Account Sign In page. The page has a white background with a light blue border. At the top, the 'ORACLE Cloud' logo is displayed. Below the logo, the text 'Oracle Cloud Account Sign In' is centered. The form consists of two input fields: 'User Name' with the value 'empresa@empresa' and 'Password' with masked characters. Below the password field is a blue 'Sign In' button. At the bottom, there is a link that says 'Need help signing in? Click here'.

No primeiro acesso é solicitado que sua senha seja alterada.

A tela principal do seu ambiente é apresentada. Nela, você consegue ver algumas ações rápidas para a criação de alguns recursos, alguns artigos de soluções dentro da nuvem da Oracle que podem ajudar, a parte de Learn que leva para a documentação, que é muito bem detalhada.



Provisionar seu host ZDM na cloud

No menu lateral navegue até compute > instances.

Create Compute Instance

NAME

zdm

Image or operating system ⓘ

ORACLE
Linux

Oracle Linux 7.8
Image Build: 2020.06.09-0

Change Image

Hide Shape, Network, Storage Options

AVAILABILITY DOMAIN

AD 1
OUGC:EU-FRANKFURT-1-AD-1

AD 2
OUGC:EU-FRANKFURT-1-AD-2 ✓

AD 3
OUGC:EU-FRANKFURT-1-AD-3

Shape ⓘ

intel

VM.Standard2.1
Virtual Machine, 1 core OCPU, 15 GB memory, 1 Gbps network bandwidth

Change Shape

Prepare o ZDM host:

```
[root@zdm]$ cp -r /home/opc/.ssh /home/zdmuser/.ssh ; chown -R zdmuser:zdm /home/zdmuser/.ssh

[root@zdm]$ mkdir /u01 ; chown zdmuser:zdm /u01

[root@zdm]$ echo -e "[ip address] srchost" >> /etc/hosts
[root@zdm]$ echo -e "[ip address] tgthost" >> /etc/hosts

[zdmuser@zdm]$ echo "INVENTORY_LOCATION=/u01/app/oraInventory; export INVENTORY_LOCATION" >> ~/.bashrc
[zdmuser@zdm]$ echo "ORACLE_BASE=/u01/app/oracle; export ORACLE_BASE" >> ~/.bashrc
[zdmuser@zdm]$ echo "ZDM_BASE=\$ORACLE_BASE; export ZDM_BASE" >> ~/.bashrc
[zdmuser@zdm]$ echo "ZDM_HOME=\$ZDM_BASE/zdm21; export ZDM_HOME" >> ~/.bashrc
[zdmuser@zdm]$ echo "ZDM_INSTALL_LOC=/u01/zdm21-inst; export ZDM_INSTALL_LOC" >> ~/.bashrc
[zdmuser@zdm]$ source ~/.bashrc
[zdmuser@zdm]$ mkdir -p $ORACLE_BASE $ZDM_BASE $ZDM_HOME $ZDM_INSTALL_LOC
```

[Download ZDM](#) na localização `$ZDM_INSTALL_LOC`

```
[zdmuser@zdm]$ ./zdminstall.sh setup \
  oraclehome=$ZDM_HOME \
  oraclebase=$ZDM_BASE \
  ziploc=./zdm_home.zip -zdm

[zdmuser@zdm]$ $ZDM_HOME/bin/zdmservice start

[zdmuser@zdm]$ $ZDM_HOME/bin/zdmservice status
```

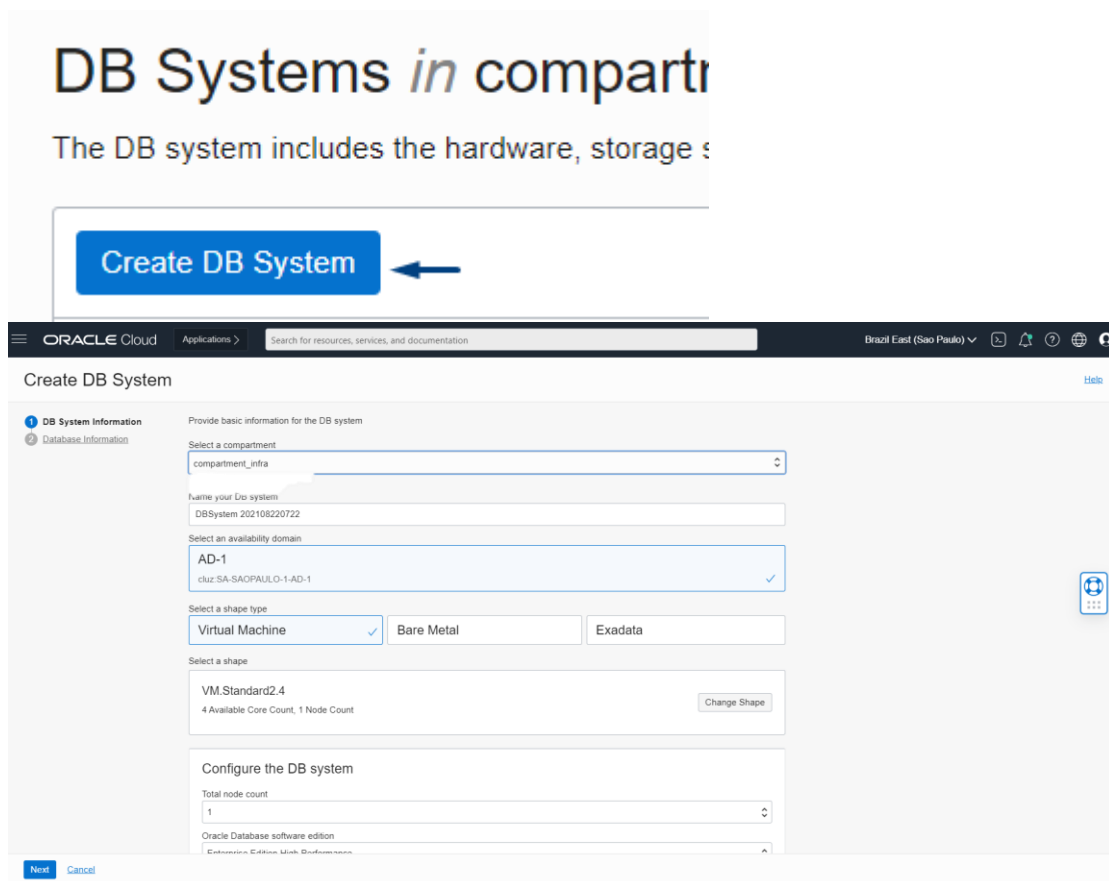
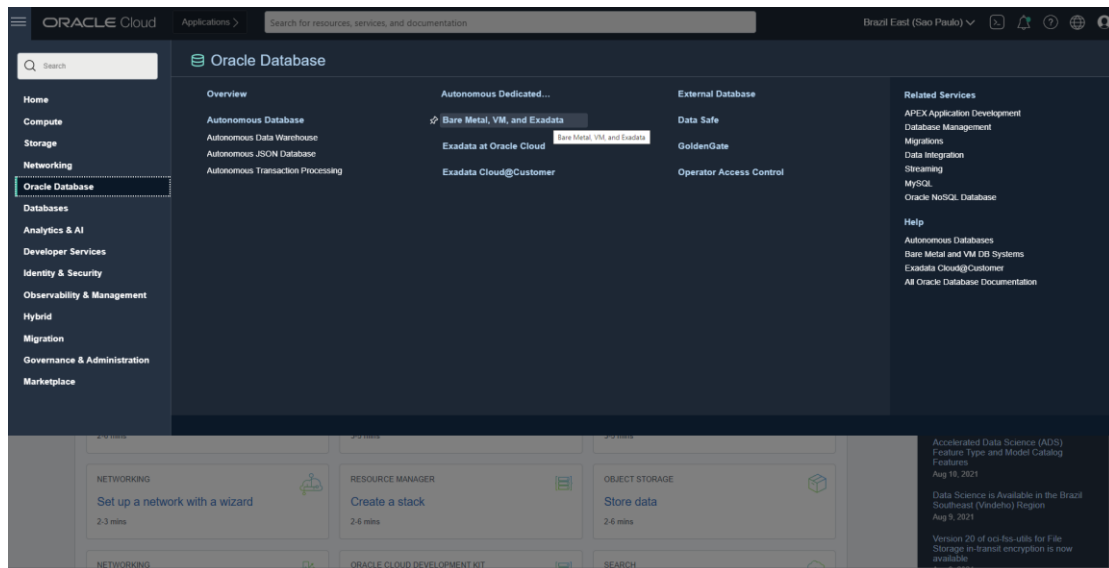
Se você já tiver informações da chave SSH e endereços de IP para sua origem e destino faça o seguinte passo agora, se não espere até o provisionamento e retorne para esse passo depois.

```
[zdmuser@zdm]$ chmod 400 /home/zdmuser/.ssh/srchost
[zdmuser@zdm]$ chmod 400 /home/zdmuser/.ssh/tgthost

[zdmuser@zdm]$ ssh -i /home/zdmuser/.ssh/srchost opc@srchost
[zdmuser@zdm]$ ssh -i /home/zdmuser/.ssh/tgthost opc@tgthost
```

Provisionamento de um banco Destino

Se você estiver usando esse documento como um treinamento e não tem um banco de dados de origem, repita os mesmos passos para criar um banco de origem.



ORACLE Cloud Applications > Search for resources, services, and documentation Brazil East (Sao Paulo) Help

Create DB System

1 DB System Information 2 Database Information

Provide information for the initial database

Database name
DB0822

Database unique name suffix Optional ⓘ

Database unique name Read-Only

Database image
Oracle Database 19c Change Database Image

POB name Optional

Create administrator credentials

Username Read-Only
sys

Password ⓘ

Confirm password

☒ I use the administrator password for the TDF wallet ⓘ

Previous Create DB System Cancel

Lembre-se de criar os bancos de dados de origem e destino com o mesmo character set para evitar problemas durante o procedimento.

ORACLE Cloud Applications > Search for resources, services, and documentation Brazil East (Sao Paulo) Help

Create DB System

1 DB System Information 2 Database Information

ards high volumes of random data access. ✓ orkload, with bias towards large data scanning operations.

Configure database backups

☒ Enable automatic backups ⓘ

Important: All [prerequisites](#) for backing up to Oracle Cloud Infrastructure Object Storage must be met for automatic backups to work.

Backup retention period
30 days
You can change the backup retention period after provisioning.

Backup scheduling (UTC) ⓘ
Anytime

[Hide Advanced Options](#)

Management Tags

Character set
AL32UTF8

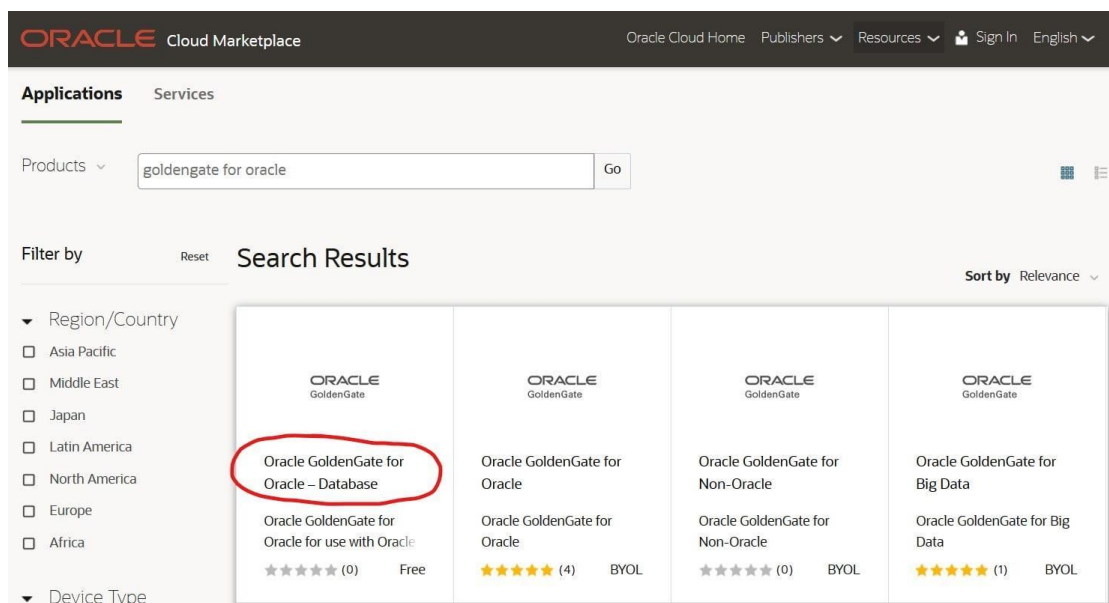
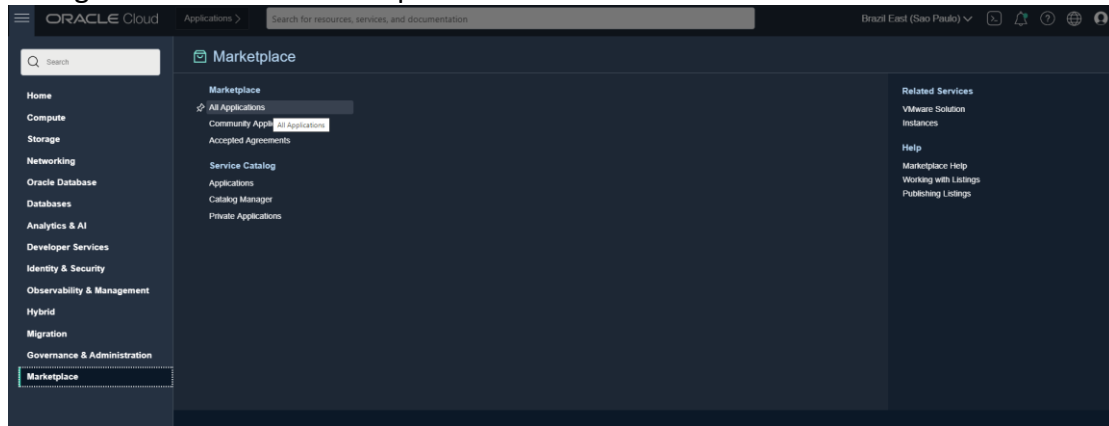
National character set
AL16UTF16

Previous Create DB System Cancel

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Provisionar o host do Golden Gate

Navegue no menu até Marketplace



ORACLE Cloud

Applications >

Germany Central (Frankfurt) v

Marketplace > Oracle GoldenGate for Oracle – Database Migrations

ORACLE GoldenGate

Oracle GoldenGate for Oracle – Database Migrations

Oracle GoldenGate for Oracle for use with Oracle Database Migration Tools

Oracle GoldenGate 19c for Oracle Database for use with Oracle Database Migration Tools (19.1.0.0.201013_MLR32153823)

Categories: Migration, Data Integration

Type Stack

Version19.1.0.0.201013 (MLR32153823)

CompartmentUpgradeTeam

Software Price per OCPU

\$0.00/hr

There are additional fees for the infrastructure usage. ⓘ

I have reviewed and accept the [Oracle Terms of Use](#).

Launch Stack

Reminder: Patch the instance once installed.

Deployment 1 - Name

Source

Name for OGG deployment 1

Deployment 1 - Database

Oracle 12c (12.1.0.2 / 12.2.0.x)

Oracle RDBMS Version for deployment 1

Deployment 2 - Name

Optional

Target

Name for OGG deployment 2

Deployment 2 - Database

Optional

Oracle 19c (19.x)

Oracle RDBMS Version for deployment 2

☐ Deployment 2 - Autonomous Database

Select if deployment 2 replicates to an Autonomous Database

ORACLE Cloud Applications > Germany Central (Frankfurt) >

Compute

Instances

Dedicated Virtual Machine Hosts

Instance Configurations

Instance Pools

Cluster Networks

Autoscaling Configurations

Instances in (root) Compartment

The [Compute service](#) helps you provision VMs and bare metal instances to meet your compute and API requirements. An [instance](#) is a compute host. Choose between virtual machines (VMs) and bare metal image that you use to launch an instance determines its operating system and other software.

Create Instance

Name	State	Public IP	Shape	OCPUs Count	Memory (GB)
OGG4DEMO	Running	193.122.52.34	VM.Standard2.4	4	60

Quando a instância estiver disponível acesse via SSH e sua senha estará disponível na home do usuário opc:

```
[/c/Temp]$ ssh -i ogg4demo opc@193.122.52.34
-bash-4.2$
-bash-4.2$
-bash-4.2$ cat ogg-credentials.json
{"username": "oggadmin", "credential": "h.5E8HA_EMeCRgev"}
-bash-4.2$
```

Agora você pode acessar o IP da sua VM com esse usuário e senha do seu navegador de preferência para gerenciar o oracle golden gate

ORACLE Oracle GoldenGate Service Manager 19.1.0.0.201013 (ServiceManager)

Services: Running 8 Failed 0 Other 0

Deployment: All

Deployment	Service	Port	Status	Action	Details
Source	Administration Server	9011	Running	Action	Settings
Source	Distribution Server	9012	Running	Action	Settings
Source	Performance Metrics Server	9014	Running	Action	Settings

Prepare o banco de Origem

Acesse o servidor do banco de dados de origem para verificar os pré requisitos, lembre-se que esse é um ambiente de testes. Em um ambiente produtivo o DBA deve revisar as orientações do My Oracle Support para identificar quaisquer impactos e patches que precisem ser aplicados para as funções a seguir

```
alter session set container=CDB$ROOT;
alter database force logging;
alter database add supplemental log data;
alter system set enable_goldengate_replication=true scope=both;
--At least 2GB
alter system set streams_pool_size=2g scope=both;
alter system set global_names=false;
alter session set container=CDB$ROOT;
create user c##ggadmin identified by <my_secret_pwd> default tablespace
users temporary tablespace temp;
grant connect, resource to c##ggadmin;
grant unlimited tablespace to c##ggadmin;
grant select any dictionary to c##ggadmin;
grant create view to c##ggadmin;
grant execute on dbms_lock to c##ggadmin;
exec dbms_goldengate_auth.grant_admin_privilege('c##ggadmin',container=>'
all');
alter session set container=SRCPDB;
select distinct tablespace_name
from (
    select distinct tablespace_name from dba_segments where owner in
('SH')
    union
    select distinct default_tablespace from dba_users where username in
('SH')
    union
    select distinct tablespace_name from dba_ts_quotas where dropped =
'NO' and username in ('SH')
);
exec dbms_stats.gather_dictionary_stats;

[oracle@srchost]$ mkdir -p /u01/app/oracle/datapump/mydirsrc
```

Prepare a base de dados de Destino

```
alter session set container=tgtpdb;
select * from v$timezone_file;
alter session set container=CDB$ROOT;
alter system set enable_goldengate_replication=true scope=both;
alter session set container=tgtpdb;
create user ggadmin identified by <my_secret_pwd> default tablespace users
temporary tablespace temp;
grant connect, resource to ggadmin;
grant unlimited tablespace to ggadmin;
grant select any dictionary to ggadmin;
grant create view to ggadmin;
grant execute on dbms_lock to ggadmin;
exec dbms_goldengate_auth.grant_admin_privilege('ggadmin')
alter session set container=tgtpdb;
```

```
grant insert any table to ggadmin;
grant update any table to ggadmin;
grant delete any table to ggadmin;

[oracle@tgthost]$ mkdir -p /u01/app/oracle/datapump/mydirtgt
```

2. Estabelecer conectividade e iniciar a replicação

Prepare seu ZDM Host

```
[root@zdmhost]$ echo "<source IP address> srchost" >> /etc/hosts
[root@zdmhost]$ echo "<target IP address> tgthost" >> /etc/hosts
[root@zdmhost]$ echo "<GoldenGate IP address> ogg19cora" >> /etc/hosts
-- I put my private SSH keys to the source and target database host into
~/ssh directory. Ensure permissions are set properly:

[zdmuser@zdmhost]$ cp srchost_key_file ~/.ssh
[zdmuser@zdmhost]$ chmod 400 ~/.ssh/srchost_key_file
[zdmuser@zdmhost]$ cp tgthost_key_file ~/.ssh
[zdmuser@zdmhost]$ chmod 400 ~/.ssh/tgthost_key_file
-- Test the connection. I connect as opc, but you might have a different
user. Read more about access to the database host in the documentation:

[zdmuser@zdmhost]$ ssh -i ~/.ssh/srchost_key_file opc@srchost date
[zdmuser@zdmhost]$ ssh -i ~/.ssh/tgthost_key_file opc@tgthost date
--If you have configured a proper certificate on your GoldenGate hub, you
can jump to the next chapter. If not, read on.

-- When deployed the GoldenGate hub comes with a self-signed certificate.
ZDM will complain about it, because it is considered insecure. For
migrations that involve real data, you should use a proper certificate on
your GoldenGate hub to ensure your migration is secure. But for tests and
demos you might want to disregard the security warning. If so, you can add
the self-signed certificate as a trusted one to the Java JDK's certificate
store ($ZDM_HOME/jdk/jre/lib/security/cacerts). You find instructions on
how to do so in the MOS support note Zero Downtime Migration - GoldenGate
Hub Certificate Known Issues (Doc ID 2768483.1). Use the same host that you
added to /etc/hosts.

-- For your reference, this is the error that ZDM will throw if the
certificate is not trusted:

Verifying status of Oracle GoldenGate Microservices at URL "https://..."
PRGZ-1136 : failed to verify configuration and status of Oracle GoldenGate
Microservices at URL "https://..."
PRGG-1008 : failed to retrieve detailed information for the health of the
Service Manager on Oracle GoldenGate hub "https://..."
PRGG-1001 : HTTP GET request "https://.../services/v2/config/health"
failed.
javax.net.ssl.SSLHandshakeException:
sun.security.validator.ValidatorException: PKIX path building failed:
```

```
sun.security.provider.certpath.SunCertPathBuilderException: unable to find
valid certification path to requested target
sun.security.validator.ValidatorException: PKIX path building failed:
sun.security.provider.certpath.SunCertPathBuilderException: unable to find
valid certification path to requested target
PKIX path building failed:
sun.security.provider.certpath.SunCertPathBuilderException: unable to find
valid certification path to requested target
unable to find valid certification path to requested target
```

Prepare o response file

Vamos utilizar um template que já está incluído nos binários do ZDM.

```
[zdmuser@zdmhost]$ cp $ZDM_HOME/rhp/zdm/template/zdm_logical_template.rsp
~/logical_online.rsp
[zdmuser@zdmhost]$ chmod 700 ~/logical_online.rsp

-- >>> RESPONSE FILE
MIGRATION_METHOD=ONLINE_LOGICAL
DATA_TRANSFER_MEDIUM=OSS

SOURCEDATABASE_ADMINUSERNAME=SYSTEM
SOURCEDATABASE_GGADMINUSERNAME=GGADMIN
SOURCEDATABASE_CONNECTIONDETAILS_HOST=srchost
SOURCEDATABASE_CONNECTIONDETAILS_PORT=1521
SOURCEDATABASE_CONNECTIONDETAILS_SERVICENAME=srcpdb...oraclevcn.com
SOURCECONTAINERDATABASE_ADMINUSERNAME=SYSTEM
SOURCECONTAINERDATABASE_GGADMINUSERNAME=C##GGADMIN
SOURCECONTAINERDATABASE_CONNECTIONDETAILS_HOST=srchost
SOURCECONTAINERDATABASE_CONNECTIONDETAILS_PORT=1521
SOURCECONTAINERDATABASE_CONNECTIONDETAILS_SERVICENAME=SRCCDB_fra3dd...orac
levcn.com

TARGETDATABASE_OCID=ocid1.database.oc1.eu-frankfurt-1...
TARGETDATABASE_ADMINUSERNAME=SYSTEM
TARGETDATABASE_GGADMINUSERNAME=GGADMIN
TARGETDATABASE_CONNECTIONDETAILS_HOST=tgthost
TARGETDATABASE_CONNECTIONDETAILS_PORT=1521
TARGETDATABASE_CONNECTIONDETAILS_SERVICENAME=tgtpdb...oraclevcn.com

OCIAUTHENTICATIONDETAILS_USERPRINCIPAL_TENANTID=ocid1.tenancy.oc1...
OCIAUTHENTICATIONDETAILS_USERPRINCIPAL_USERID=ocid1.user.oc1...
OCIAUTHENTICATIONDETAILS_USERPRINCIPAL_FINGERPRINT=58:b9:...
OCIAUTHENTICATIONDETAILS_USERPRINCIPAL_PRIVATEKEYFILE=/home/zdmuser/.oci/oc
i_api_key.pem
OCIAUTHENTICATIONDETAILS_REGIONID=eu-frankfurt-1

GOLDENGATEHUB_ADMINUSERNAME=oggadmin
GOLDENGATEHUB_URL=https://ogg19cora...oraclevcn.com
GOLDENGATEHUB_SOURCEDEPLOYMENTNAME=Source
GOLDENGATEHUB_TARGETDEPLOYMENTNAME=Target
GOLDENGATEHUB_COMPUTEID=ocid1.instance.oc1.eu-frankfurt-1...
```

```

DATAPUMPSETTINGS_JOBMODE=SCHEMA
DATAPUMPSETTINGS_DATAPUMPPARAMETERS_IMPORTPARALLELISMDEGREE=2
DATAPUMPSETTINGS_DATAPUMPPARAMETERS_EXPORTPARALLELISMDEGREE=2
DATAPUMPSETTINGS_IMPORTDIRECTORYOBJECT_NAME=MYDIRTGT
DATAPUMPSETTINGS_IMPORTDIRECTORYOBJECT_PATH=/u01/app/oracle/datapump/mydirtgt
DATAPUMPSETTINGS_EXPORTDIRECTORYOBJECT_NAME=MYDIRSRC
DATAPUMPSETTINGS_EXPORTDIRECTORYOBJECT_PATH=/u01/app/oracle/datapump/mydirsrc
DATAPUMPSETTINGS_DATABUCKET_BUCKETNAME=zdm-staging
DATAPUMPSETTINGS_DATABUCKET_NAMESPACENAME=oradbcclouducm
INCLUDEOBJECTS-1=owner:SH

```

3 . Migrar

Fazer uma rodada de avaliação

```

[zdmuser@zdmhost]$ $ZDM_HOME/bin/zdmcli migrate database \
  -rsp /home/zdmuser/logical_online.rsp \
  -sourcenode srchost \
  -sourcedb SRCCDB_fra3dd \
  -srcauth zdmauth \
  -srcarg1 user:opc \
  -srcarg2 identity_file:/home/zdmuser/.ssh/srchost_key_file \
  -srcarg3 sudo_location:/usr/bin/sudo \
  -targetnode tgthost \
  -tgtauth zdmauth \
  -tgtarg1 user:opc \
  -tgtarg2 identity_file:/home/zdmuser/.ssh/tgthost_key_file \
  -tgtarg3 sudo_location:/usr/bin/sudo \
  -eval

-- Use um dos seguintes comandos para acompanhar o progresso:

[zdmuser@zdmhost]$ while ;; do $ZDM_HOME/bin/zdmcli query job -jobid <job ID>; sleep 10; done

[zdmuser@zdmhost]$ tail -n 50 -f "`ls -td /u01/app/oracle/chkbase/scheduled/*log | head -1`"

```

Inicie a migração

```

[zdmuser@zdmhost]$ $ZDM_HOME/bin/zdmcli migrate database \
  -rsp /home/zdmuser/logical_online.rsp \
  -sourcenode srchost \
  -sourcedb SRCCDB_fra3dd \
  -srcauth zdmauth \
  -srcarg1 user:opc \
  -srcarg2 identity_file:/home/zdmuser/.ssh/srchost_key_file \
  -srcarg3 sudo_location:/usr/bin/sudo \

```



```
-targetnode tgthost \  
-tgtauth zdmauth \  
-tgtarg1 user:opc \  
-tgtarg2 identity_file:/home/zdmuser/.ssh/tgthost_key_file \  
-tgtarg3 sudo_location:/usr/bin/sudo \  
-pauseafter ZDM_MONITOR_GG_LAG
```

E quando estiver pronto, finalmente:

```
[zdmuser@zdmhost]$ $ZDM_HOME/bin/zdmcli resume job -jobid <job ID>
```



Parabéns!
Você completou o Laboratório