



High Availability

Oracle Database HA Features- L200

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Database High Availability - Objectives

After completing this lesson, you should be able to:

- Describe the options of database high availability available with Oracle Cloud Infrastructure
- Features of Active Data Guard
- Network Preparation for DataGuard Setup
- Launch a Data Guard for Database Cloud Service Virtual Machines
- Launch a Data Guard for Database Cloud Service Bare Metal
- Switch Over/Failover/Reinstate in Data Guard setup
- Delete Standby Database
- Autonomous Database(ATP/ADW) Cloning
- Demo

Part 1. High Availability- Using A/DataGuard

Data Guard & Active DataGuard on VMDB, BMDB

DataGuard on Database Cloud Service- VM/BM

- Data Guard and Active Data Guard provide disaster recovery (DR) for databases with recovery time objectives (RTO) that cannot be met by restoring from backup.
- Active Data Guard extends Data Guard capabilities by providing advanced features for data protection and availability as well as offloading read-only workload and fast incremental backups from a production database. Active Data Guard is included in the Extreme Performance Edition and Exadata Service.
- Once Data Guard is instantiated, it maintains synchronization between the primary database and the standby database.
- To configure a Data Guard system across regions or between on-premises and Oracle Cloud Infrastructure DB systems, you must access the database host directly and use the DGMGRL utility.
- Oracle recommends that the DB system of the standby database be in a different availability domain.
- The standby databases in Oracle Cloud Infrastructure Database are physical standbys.

Currently 3 major operations are supported on OCI DbaaS VM.

- SetupDataguard
- SwitchOvar/Failover/Reinstate
- DeleteStandbyDatabase

Note: You can't terminate a primary database that has a Data Guard association with a peer (standby) database. Delete the standby database first. Alternatively, you can perform a switchover to the standby database, and then terminate the primary database. You can't terminate a DB system that includes Data Guard enabled databases. To remove the Data Guard association: For a bare metal DB system database - terminate the standby database. For a virtual machine DB system database - terminate the standby DB system.



DataGuard on Database Cloud Service-Prerequisites

A Data Guard implementation requires two DB systems, one containing the primary database and one containing the standby database. When you enable Data Guard for a virtual machine DB system database, a new DB system with the standby database is created and associated with the primary database. For a bare metal DB system, the DB system with the database to be used as the standby must already exist before you enable Data Guard([Create a database in the required AD and subnet before you attempt DG association](#)).

Note: A Data Guard configuration on the Oracle Cloud Infrastructure is limited to one standby database per primary database.

- Both DB systems must be in the same compartment, and they must be the same shape.
- The database versions and editions must be identical. Data Guard does not support Standard Edition. (Active Data Guard requires Enterprise Edition - Extreme Performance.)
- The database version determines whether Active Data Guard is enabled. If you are using the BYOL licensing model and if your license does not include Active Data Guard, you must either use Enterprise Edition - High Performance or set up Data Guard manually. See [Using Oracle Data Guard with the Database CLI](#).
- Both DB systems must use the same VCN, and port 1521 must be open.



Data Guard Networking Requirement

- Properly configure the security list ingress and egress rules for the subnets of both DB systems in the Data Guard association to allow TCP traffic to flow between the applicable ports. Ensure that the rules you create are stateful (the default). For example, if the subnet of the primary DB System uses the source CIDR 10.0.0.0/24 and the subnet of the standby DB system uses the source CIDR 10.0.1.0/24, create rules as shown in the following example.
- The egress rules in the example show how to enable TCP traffic only for port 1521, which is a minimum requirement for Data Guard to work. If TCP traffic is already enabled on all of your outgoing ports (0.0.0.0/0), then you need not explicitly add these specific egress rules. Service Gateway can provide NW connectivity.

Security List for Primary DB System's Subnet

Rules(Prod)	Stateless	Source	IP Protocol	Source Port	Dest Port
Ingress	No	10.0.01.0/24	TCP	All	1521
Egress	No	10.0.1.0/24	TCP	All	1521
Rules(Sby)	Stateless	Source	IP Protocol	Source Port	Dest Port
Ingress	No	10.0.0.0/24	TCP	All	1521
Egress	No	10.0.0.0/24	TCP	All	1521



Data Guard Configuration supported from Console

The Console allows you to enable a Data Guard association between databases, change the role of a database in a Data Guard association using either a *switchover* or a *failover* operation, and *reinstate* a failed database.

When you enable Data Guard, a separate Data Guard association is created for the primary and the standby database.

You can use console to perform following operations

- To enable Data Guard on a bare metal DB system
- To enable Data Guard on a virtual machine DB system
- To perform a database switchover
- To perform a database failover
- To reinstate a database
- To terminate a Data Guard association on a bare metal DB system
- To terminate a Data Guard association on a virtual machine DB system

Note: Data Guard Fast Start Failover as well across region DR is manual as of today-No cloud tooling.



Enabling Data Guard on a bare metal DB system

- Open the navigation menu. Under **Database**, click **Bare Metal**, **VM**, and **Exadata**.
- Choose the **Compartment** that contains the DB system with the database for which you want to enable Data Guard.
- Click the name of the DB system that contains the database you want to assume the primary role, and then click the name of that database.
- Under **Resources**, click **Data Guard Associations**.
- Click **Enable Data Guard**.
- In the **Enable Data Guard** dialog box, configure your Data Guard association.
 - **Peer Database Availability Domain:** Shows the availability domain of the selected peer DB system. Select the Availability Domain and Fault Domains based on requirement.
 - **Peer DB System:** Select the DB system that will contain the peer (standby) database.
 - **Protection Mode:** Console Supports Max Performance Mode at the moment.
 - **Transport Type:** The redo transport type used. The Console supports only **Async**.
 - **Database Admin Password:** Enter the primary database admin password.
 - The same password is used for the standby database.
- **Confirm Database Admin Password:** Re-enter the Database Admin Password you specified.
- Click **Enable**.

When the association is created, a shield icon appears next to the name of this database and its peer, and their respective roles (primary or standby) are displayed.

Note: Peer database should exist before you try creating DG association.



Enabling Data Guard on a VM DB system

- Open the navigation menu. Under **Database**, click **Bare Metal, VM, and Exadata**.
- Choose the **Compartment** that contains the DB system with the database for which you want to enable Data Guard.
- Click the name of the DB system that contains the database you want to assume the primary role, and select database.
- Under **Resources**, click **Data Guard Associations**.
- Click **Enable Data Guard**.
- In the **Enable Data Guard** dialog box, configure your Data Guard association.
- **Display Name:** A friendly, display name for the DB system. The name doesn't need to be unique.
- **Availability Domain:** The availability domain in which the DB system resides.
 - **Virtual Cloud Network:** Shows the VCN. The VCN of the standby database must be the same.
 - **Client Subnet:** The subnet to which the DB system should attach. Do not use a subnet that overlaps with 192.168.16.16/28, which is used by the Oracle Clusterware private interconnect on the database instance.
 - **Hostname Prefix:** Your choice of host name for the DB system. Must begin with an alphabetic character, and can contain only alphanumeric characters and hyphens (-). The maximum length should not exceed 16.

Note: The host name must be unique within the subnet.

- **Host Domain Name:** The domain name for the DB system.
- **Host and Domain URL:** FQDN of Host
- **Protection Mode:** The protection mode used. The Console supports only **Maximum Performance**.
- **Transport Type:** The redo transport type used for this Data Guard association. The Console supports only **Async**.
- **Database Admin Password:** Enter the primary database admin password, same will be used for standby database.
- **Confirm Database Admin Password:** Re-enter the Database Admin Password you specified.
- **Click Enable.**

Upon completion a shield icon appears next to the name of this database and its peer, and their respective roles are displayed.



Switch Over Operation in Data Guard Configuration

You initiate a switchover operation by using the Data Guard association of the primary database.

- Open the navigation menu. Under **Database**, click **Bare Metal, VM, and Exadata**.
- Choose the **Compartment** that contains the DB system with the primary database you want to switch over.
- Click the DB system name, and then click the name of the primary database.
- Under **Resources**, click **Data Guard Associations**.
- For the Data Guard association on which you want to perform a switchover, click the Actions icon (three dots), and then click **Switchover**.
- In the **Switchover Database** dialog box, enter the database admin password, and then click **OK**.
- This database should now assume the role of the standby, and the standby should assume the role of the primary in the Data Guard association.

Failover of Database in Data Guard Configuration

You initiate a failover operation by using the Data Guard association of the standby database.

- Open the navigation menu. Under **Database**, click **Bare Metal, VM, and Exadata**.
- Choose the **Compartment** that contains the DB system with the primary database's peer standby you want to fail over to.
- Click the DB system name, and then click the name of the standby database.
- Under **Resources**, click **Data Guard Associations**.
- For the Data Guard association on which you want to perform a failover, click **Failover**.
- In the **Failover Database** dialog box, enter the database admin password, and then click **OK**.
- This database should now assume the role of the primary, and the old primary's role should display as **Disabled Standby**.

Reinstate of database in Data Guard Configuration

- After you fail over a primary database to its standby, the standby assumes the primary role and the old primary is identified as a disabled standby. After you correct the cause of failure, you can reinstate the failed database as a functioning standby for the current primary by using its Data Guard association.
- Before you can reinstate a version 12.2 database, you must perform some steps on the database host to stop the database or start it in MOUNT mode.

- Set your ORACLE_UNQNAME environment variable to the value of the Database Unique Name (as seen in the Console), and then run these commands:

```
srvctl stop database -d db-unique-name -o abort  
srvctl start database -d db-unique-name -o mount
```

- Open the navigation menu. Under **Database**, click **Bare Metal, VM, and Exadata**.
- Choose the **Compartment** that contains the DB system with the failed database you want to reinstate.
- Click the DB system name, and then click the database name.
- Under **Resources**, click **Data Guard Associations**.
- For the Data Guard association on which you want to reinstate this database, click the Actions icon (three dots), and then click **Reinstate**.
- In the **Reinstate Database** dialog box, enter the database admin password, and then click **OK**.
- This database should now be reinstated as the standby in the Data Guard association.



Terminate Data Guard Association in VMDB/BM DB

On a **Bare metal DB system**, you remove a Data Guard association by terminating the standby database.

- Open the navigation menu. Under **Database**, click **Bare Metal, VM, and Exadata**.
- Choose the **Compartment** that contains the DB system that includes the standby database you want to terminate.
- Click the DB system name.
- For the standby database you want to terminate, click the Actions icon (three dots), and then click **Terminate**.
- In the **Terminate Database** dialog box, enter the name of the database, and then click **OK**.

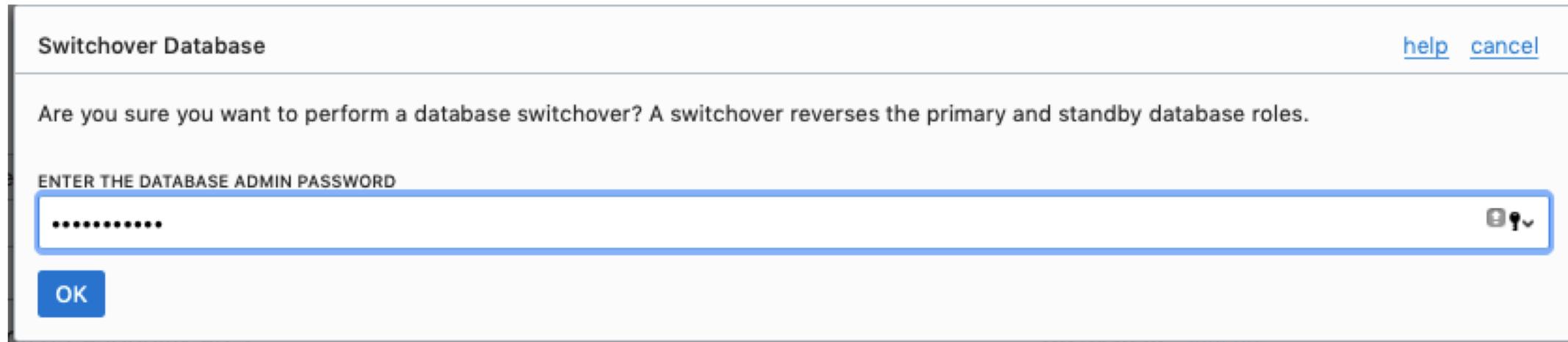
On a **virtual machine DB system**, you remove a Data Guard association by terminating the standby DB system.

- Open the navigation menu. Under **Database**, click **Bare Metal, VM, and Exadata**.
- Choose the **Compartment** that contains the standby DB system that you want to terminate.
- Click the DB system name, click the Actions icon (three dots), and then click **Terminate**.
- Confirm when prompted.
- The DB system's icon indicates Terminating.

Supported Operation for Data Guard- "SwitchOver"

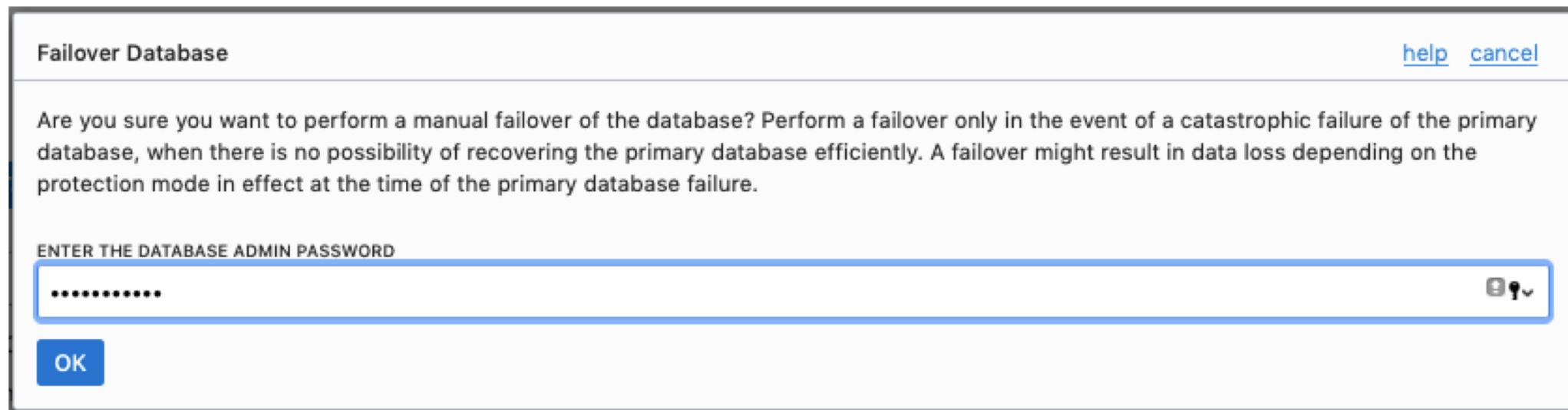
The following actions are supported for Data Guard configurations to support easier planned maintenance and also to recover from any type of failures or DR scenario.

Switchover - A switchover is a role reversal between the primary database and one of its standby databases. A switchover guarantees no data loss. This is typically done for planned maintenance of the primary system. During a switchover, the primary database transitions to a standby role, and the standby database transitions to the primary role. The transition occurs without having to reenable either database.



Data Guard-FailOver

Failover - A **failover** is when the primary database (all instances of a RAC primary database) fails and one of the standby databases is transitioned to take over the primary role. Failover is performed only in the event of a catastrophic failure of the primary database, and there is no possibility of recovering the primary database in a timely manner. Failover may or may not result in data loss depending on the protection mode in effect at the time of the failover. This operation is supported from the Standby database.



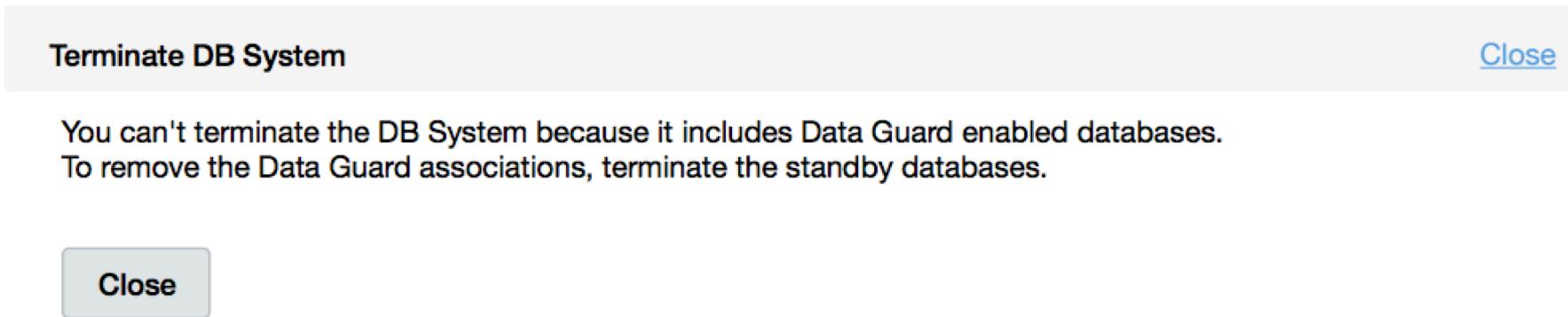
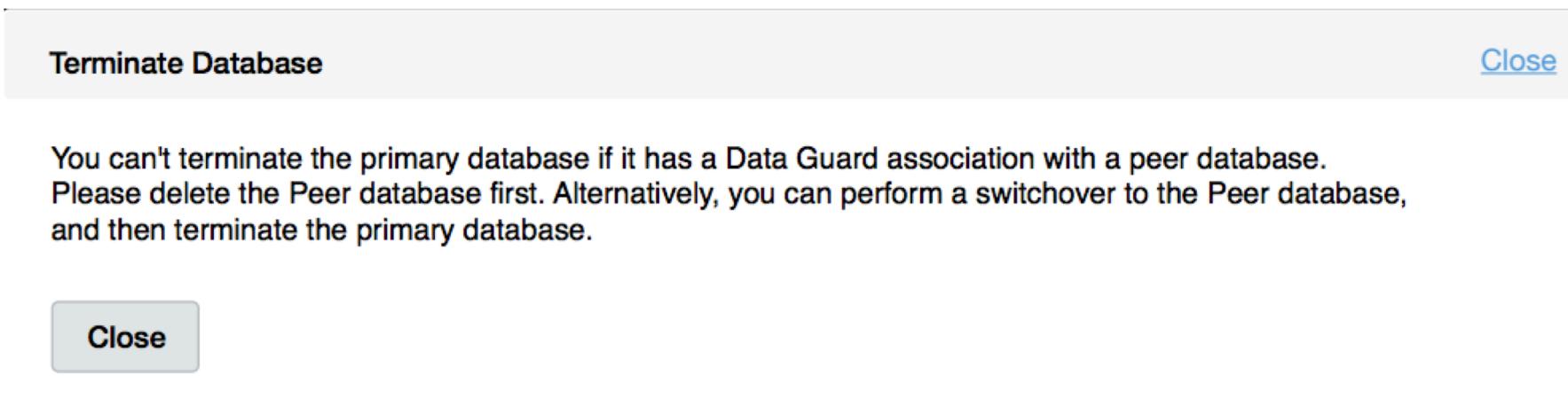
Data Guard- Reinstate

Reinstate – In some situations, the primary database can go into a failed state, which becomes irrecoverable. The reinstate allows customers to reinstate a failed primary database as a standby database after repair.



Terminating Databases/Db System in Data Guard Configuration

You need to explicitly remove Data Guard associations by deleting the Standby Database before the Primary Database or the DB System can be terminated.



Part2. High Availability-Demo

Creation of Standby & Data Guard operation

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Demo: Creating Data Guard for VM DB

Step1: Login to Console and locate the database for which you want to enable Data Guard

Database » DB Systems » DB System Details » Database

suncore

DB Connection Restore Apply Tag(s)

Database Information Tags

Database Home: dbhome20190314133711 **OCID:** ...slo6pq Show Copy
Launched: Thu, 14 Mar 2019 13:37:11 GMT **Database Version:** 18.3.0.0.180717
Database Workload: OLTP **Database Unique Name:** suncore_iad15x
Character Set: AL32UTF8 **Automatic Backup:** Enabled
National Character Set: AL16UTF16

AVAILABLE

Resources

Backups Displaying 31 Backups

Create Backup Disable Automatic Backup

	Automatic Backup OCID: ...box2la <a>Show <a>Copy Type: Incremental	Started: Sun, 05 May 2019 09:10:38 GMT Ended: Sun, 05 May 2019 09:31:29 GMT
	• • •	

Backups (31)

Patches (4)

Patch History (0)

Data Guard Associations (0)

Creating Data Guard for VM DB continued

Step2. Go to Data Guard Association Page-Click on Enable Data Guard

Database » DB Systems » DB System Details » Database » Data Guard Associations

suncore

DB Connection Restore Apply Tag(s)

Database Information Tags

Database Home: dbhome20190314133711 OCID: ...slo6pq Show Copy
Launched: Thu, 14 Mar 2019 13:37:11 GMT Database Version: 18.3.0.0.180717
Database Workload: OLTP Database Unique Name: suncore_iad15x
Character Set: AL32UTF8 Automatic Backup: Enabled
National Character Set: AL16UTF16

AVAILABLE

Data Guard Associations

No Data Guard Association

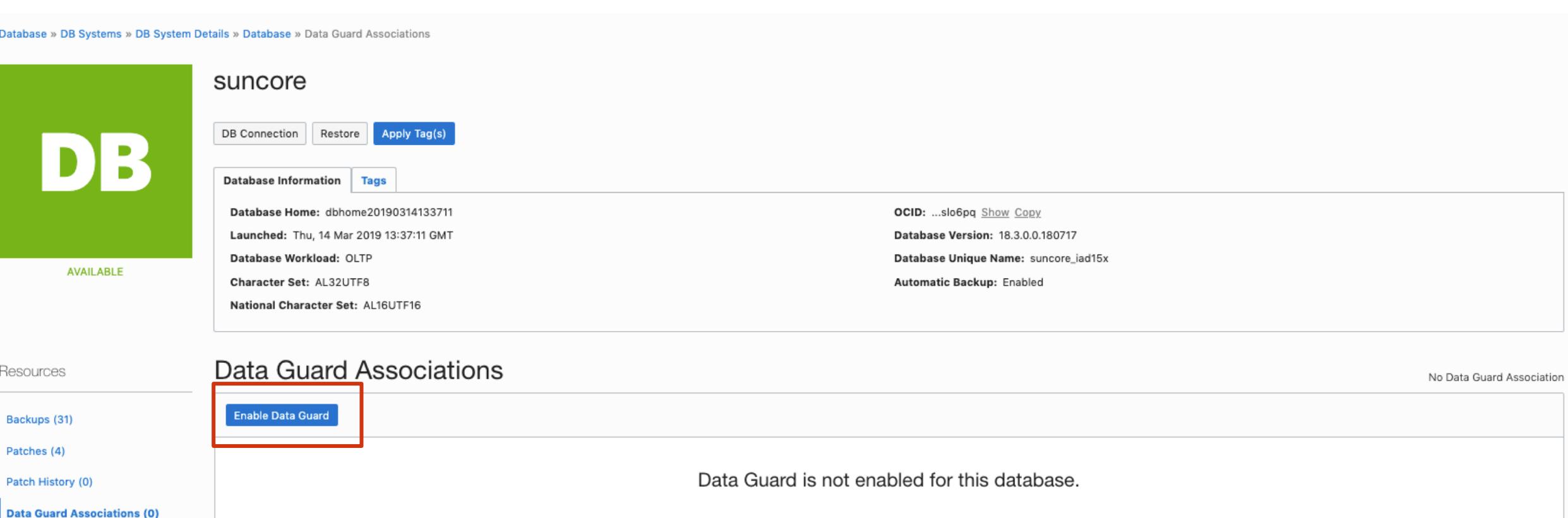
Enable Data Guard

Data Guard is not enabled for this database.

Resources

Backups (31) Patches (4) Patch History (0) Data Guard Associations (0)

0



Creating Data Guard for VM DB continued

Step3. Input Enable Data Guard Association page

Enable Data Guard

If the Virtual Cloud Network or Subnet is in a different Compartment than the DB System, enable Compartment selection for those resources: [Click here.](#)

DB System Information

A new virtual machine DB system must be created for the standby database when the primary database belongs to a virtual machine DB system. The DB system created will have the same properties (edition, shape, etc.) as the DB system of the primary database.

DISPLAY NAME
stdbydg

AVAILABILITY DOMAIN
GrCh:US-ASHBURN-AD-3

VIRTUAL CLOUD NETWORK
vcn_bal

CLIENT SUBNET
sub_vmdb_reg (regional)

HOSTNAME PREFIX
stdby

HOST DOMAIN NAME
subvmbreg.vcnbal.oraclevcn.com

HOST AND DOMAIN URL
stdby.subvmbreg.vcnbal.oraclevcn.com

PROTECTION MODE
Maximum Performance

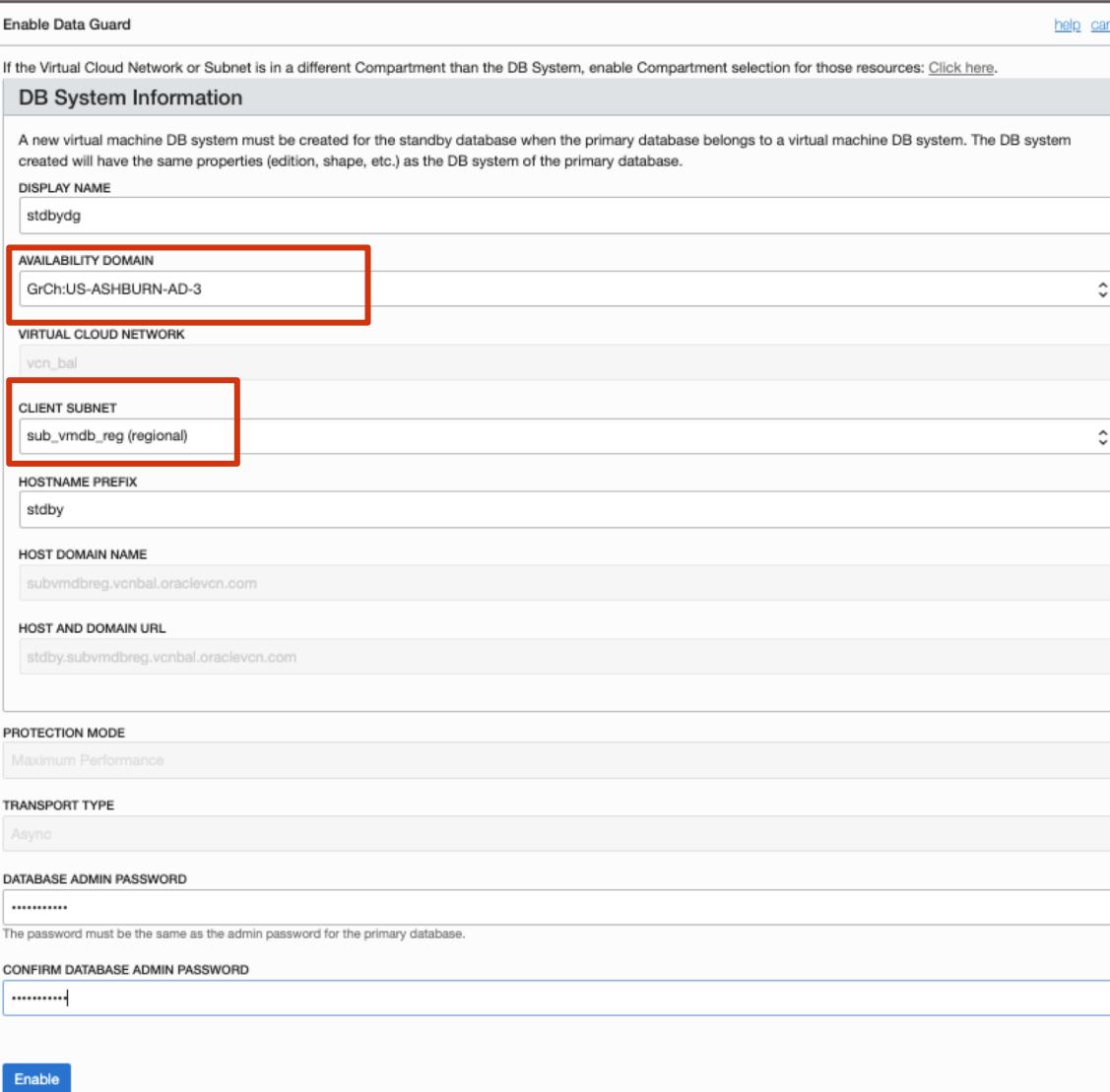
TRANSPORT TYPE
Async

DATABASE ADMIN PASSWORD
.....

The password must be the same as the admin password for the primary database.

CONFIRM DATABASE ADMIN PASSWORD
.....

Enable



- Input Availability Domain you want DG to be created as well Subnet associated
- Provide password for Admin user same as that of Actual Production database
- Make sure port 1521 port is enabled between subnets and security list is modified as per steps before.
- Make sure Security List having security rules are associated to subnet containing prod and Standby(DG) databases you are creating.



Creating Data Guard for VM DB continued

Step4: Data Guard Association VM DB-Status

Database » DB Systems » DB System Details » Database » Data Guard Associations

suncore

Database » DB Systems » DB System Details

suncore

DB UPDATING.. DBS AVAILABLE

Resources

Backups (31)

Patches (4)

Patch History (0)

Data Guard Associations

Scale Storage Up Add SSH Keys Apply Tag(s) Terminate

DB System Information Tags

Availability Domain: GrCh:US-ASHBURN-AD-1 OCID: ...lvmk7a [Show](#) [Copy](#)
Shape: VM.Standard2.1 Created: Thu, 14 Mar 2019 13:37:11 GMT
Compartment: ociobenablement (root)/balsharma DB System Version: 18.3.0.0.180717
Oracle Database Software Edition: Enterprise Edition Virtual Cloud Network: [vcn_bal](#)
Available Data Storage: 256 GB Client Subnet: sub_priv_data_bal
Total Storage Size: 712 GB Port: 1521
Hostname Prefix: suncore Host Domain Name: subprivdatabal.vcnbal.oraclevcn.com
Scan DNS Name: suncore-scan... [Show](#) [Copy](#) License Type: License Included

Resources

Displaying 1 Databases

Databases

suncore

DB AVAILABLE

Nodes (1)

Databases (1)

Patches (1)

Patch History (1)

Database Home: dbhome20190314133711 Database Version: 18.3.0.0.180717
Launched: Thu, 14 Mar 2019 13:37:11 GMT Database Workload: OLTP
Database Unique Name: suncore_iad15x Database Role: Primary
[Connection String \(Admin Service\)](#): [\(i\)](#) ...cn.com [Show](#) [Copy](#)
Automatic Backup: Enabled

...

Data Guard Switch Over operation VM DB

Database » DB Systems » DB System Details » Database » Data Guard Associations

suncore

DB Connection Restore Apply Tag(s)

Database » DB Systems » DB System Details » Database » Data Guard Associations

suncore

DB Connection Restore Apply Tag(s)

Database Information Tags

Availability Domain: GrCh:US-ASHBURN-AD-3
Database Home: dbhome20190314133711
Launched: Sun, 05 May 2019 19:58:14 GMT
Database Workload: OLTP
Character Set: AL32UTF8
Automatic Backup: Disabled

DB System: [ymsby](#)
OCID: ...uw3jq [Show](#) [Copy](#)
Database Version: 18.0.0.0
Database Unique Name: suncore_iad3p5
Database Role: Primary
National Character Set: AL16UTF16

Resources

Backups (31) AVAILABLE

Patches (4)

Patch History (0)

Data Guard Association

Switchover Database

Are you sure you want
ENTER THE DATABASE ADM

OK

Displaying 1 Data Guard Association

Data Guard Associations

Enable Data Guard

Peer Database: [suncore](#)
Peer Role: Standby
Peer DB System: [suncore](#)

Launched: Sun, 05 May 2019 21:25:22 GMT
Protection Mode: Maximum Performance
Availability Domain: GrCh:US-ASHBURN-AD-3

Apply Lag: 0 seconds
Apply Rate: 7.00 KByte/s
Transport Type: Async

...

Data Guard Backup Configuration on VM DB

Database » DB Systems » DB System Details » Database » Data Guard Associations

The screenshot shows the Oracle Cloud Infrastructure (OCI) console interface for managing database backups. A modal dialog box is open in the center, prompting the user to confirm enabling Automatic Backup. The dialog includes a warning message about prerequisites for Oracle Cloud Infrastructure Object Storage.

Confirm

Are you sure you want to enable Automatic Backup?

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

If you previously used RMAN or dbcli to configure backups and then you switch to using the Console or the API for backups, a new backup configuration is created and associated with your database. This means that you can no longer rely on your previously configured unmanaged backups to work.

OK **Cancel**

Resources

Backups (0) **Patches** (4) **Patch History** (0) **Data Guard Associations** (1)

Availability Domain: GrCh:US-ASHBURN-AD-3
Database Home: dbhome20190314133711
Launched: Sun, 05 May 2019 19:58:14 GMT
Database Workload: OLTP
Character Set: AL32UTF8
Automatic Backup: Disabled

DB System: [vmsby](#)
OCID: ...uw3jeq [Show](#) [Copy](#)
Database Version: 18.0.0.0
Database Unique Name: suncore_iad3p5
Database Role: Primary
National Character Set: AL16UTF16

Backups

Create Backup **Enable Automatic Backup**

No items found.

Data Guard Failover operation VM DB

Database » DB Systems » DB System Details » Database » Data Guard Associations

suncore

[DB Connection](#) [Apply Tag\(s\)](#)

[Database Information](#) [Tags](#)

Availability Domain: GrCh:US-ASHBURN-AD-1
Database Home: dbhome20190314133711
Launched: Thu, 14 Mar 2019 13:37:11 GMT
Database Workload: OLTP
Character Set: AL32UTF8
Automatic Backup: Enabled

DB System: [suncore](#)
OCID: ...slo6pq [Show Copy](#)
Database Version: 18.3.0.0.180717
Database Unique Name: suncore_jad15x
Database Role: Standby
National Character Set: AL16UTF16

Resources

[Backups \(31\)](#)
[Patches \(4\)](#)
[Patch History \(0\)](#)
Data Guard Associations (1)

Data Guard Associations Displaying 1 Data Guard Association

[Enable Data Guard](#)

Primary Database:	Launched:	Apply Lag:	Failover
suncore Peer Role: Primary Peer DB System: vmsby	Sun, 05 May 2019 19:56:17 GMT	0 seconds	Failover

Appendix: Data Guard Association- Ingress and egress rules-VM DB

Source Database Ingress and egress rules in Security List

Add Ingress Rules

Ingress Rule 1

Allows TCP traffic 1521

STATELESS i

SOURCE TYPE
CIDR
Specified IP addresses: 10.0.0.0-10.0.31.255 (8,192 IP addresses)

IP PROTOCOL i

SOURCE PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

+ Additional Ingress Rule

Add Ingress Rules **Cancel**

Add Egress Rules

Egress Rule 1

Allows TCP traffic 1521

STATELESS i

DESTINATION TYPE
CIDR
Specified IP addresses: 10.0.0.0-10.0.31.255 (8,192 IP addresses)

IP PROTOCOL i

SOURCE PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

+ Additional Egress Rule

Add Egress Rules **Cancel**

Target(Stdby) Database Ingress and egress rules in security List

Add Ingress Rules

Ingress Rule 1

Allows TCP traffic 1521

STATELESS i

SOURCE TYPE
CIDR
Specified IP addresses: 10.0.128.0-10.0.128.255 (256 IP addresses)

IP PROTOCOL i

SOURCE PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

+ Additional Ingress Rule

Add Ingress Rules **Cancel**

Add Egress Rules

Egress Rule 1

Allows TCP traffic 1521

STATELESS i

DESTINATION TYPE
CIDR
Specified IP addresses: 10.0.128.0-10.0.128.255 (256 IP addresses)

IP PROTOCOL i

SOURCE PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL

Examples: 80, 20-22 or All

+ Additional Egress Rule

Add Egress Rules **Cancel**

Appendix: Modifying egress ingress rules for Service Gateway.

Incase you use Service Gateway and no NAT/IGW, configure rules for Service GW- Make sure your SGW is created using “All IAD Services in Oracle Service Network”

Add Egress Rules

Egress Rule 1

Allows TCP traffic 1521

STATELESS i

DESTINATION TYPE

Service i

DESTINATION SERVICE i

All IAD Services In Oracle Services Network

IP PROTOCOL i

TCP

SOURCE PORT RANGE i OPTIONAL

All

Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL

1521

Examples: 80, 20-22 or All

+ Additional Egress Rule

Add Egress Rules Cancel

Edit Ingress Rule

TCP traffic for ports: 1521

STATELESS i

SOURCE TYPE

Service i

SOURCE SERVICE

All IAD Services In Oracle Services Network

IP PROTOCOL i

TCP

SOURCE PORT RANGE i OPTIONAL

All

Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL

1521

Examples: 80, 20-22 or All

Save Changes Cancel

Add Ingress Rules

Ingress Rule 1

Allows TCP traffic 1521

STATELESS i

DESTINATION TYPE

Service i

SOURCE SERVICE

All IAD Services In Oracle Services Network

IP PROTOCOL i

TCP

SOURCE PORT RANGE i OPTIONAL

All

Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL

1521

Examples: 80, 20-22 or All

+ Additional Ingress Rule

Add Ingress Rules Cancel

Add Egress Rules

Egress Rule 1

Allows TCP traffic 1521

STATELESS i

DESTINATION TYPE

Service i

DESTINATION SERVICE

All IAD Services In Oracle Services Network

IP PROTOCOL i

TCP

SOURCE PORT RANGE i

All

Examples: 80, 20-22 or All

Edit Route Rule

Important: For a route rule that targets a Private IP, you must first enable "Skip Source/Destination Check" on the VNIC that the Private IP is assigned to.

TARGET TYPE

Service Gateway

DESTINATION SERVICE

All IAD Services In Oracle Services Network

COMPARTMENT

balsharma

ociobenablement (root)/balsharma

TARGET SERVICE GATEWAY

sg_bal

Save Changes Cancel

Demo: Data Guard BM-Prepare Peer Database

Launch DB System

If the Virtual Cloud Network or Subnet is in a different Compartment than the DB System, enable Compartment selection for those resources: [Click here](#).

DB System Information

DISPLAY NAME
bmstdbydb

AVAILABILITY DOMAIN
GrCh:US-ASHBURN-AD-3

SHAPE TYPE
 VIRTUAL MACHINE BARE METAL EXADATA

SHAPE
BM.DenseIO2.52

TOTAL NODE COUNT
1

ORACLE DATABASE SOFTWARE EDITION
Enterprise Edition Extreme Performance

CPU CORE COUNT
2

The number of CPU cores to enable on the DB System. Specify a multiple of 2, up to 52.

LICENSE TYPE
 LICENSE INCLUDED
Includes the cost of Oracle Cloud Infrastructure and Oracle Database licenses.

BRING YOUR OWN LICENSE (BYOL)
Includes the cost of Oracle Cloud Infrastructure but excludes Oracle Database licenses. You purchased your Database licenses directly from Oracle.

SSH PUBLIC KEY
 CHOOSE SSH KEY FILES
 PASTE SSH KEYS

Choose SSH Key files (.pub) from your computer:

xdkey.pub

Browse

DATA STORAGE PERCENTAGE
80%

Show Advanced Options



bmstdbydb
Availability Domain: GrCh:US-ASHBURN-AD-3
OCID: ...ij65ma [Show](#) [Copy](#)

Oracle Database Software Edition: Enterprise Edition Extreme Performance
CPU Core Count: 2
Shape: BM.DenseIO2.52

Virtual Cloud Network: [vcn_bal](#)
Client Subnet: sub_vmdb_reg
Private IP: Loading...
Public IP: Loading...

Launched: Sun, 05 May 2019 20:07:48 GMT

Network Information

VIRTUAL CLOUD NETWORK
vcn_bal

CLIENT SUBNET
sub_vmdb_reg (regional)

HOSTNAME PREFIX
bmstdby

HOST DOMAIN NAME
bmstdby.baremetalreg.vcnbal.oraclecloud.com

Each part must contain only letters and numbers, starting with a letter. 63 characters max.

HOST AND DOMAIN URL
bmstdby.baremetalreg.vcnbal.oraclecloud.com

Database Information

DATABASE NAME
bmsprod

DATABASE VERSION
 DISPLAY ALL AVAILABLE VERSIONS ⓘ
18.0.0.0

PDB NAME (optional)
bmspdb

DATABASE ADMIN PASSWORD

Password must be 9 to 30 characters and contain at least 2 uppercase, 2 lowercase, 2 special, and 2 numeric characters. The special characters must be _, #, or -.

CONFIRM DATABASE ADMIN PASSWORD

Confirmation must match password above.

ENABLE AUTOMATIC BACKUP ⓘ

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

DATABASE WORKLOAD
 ON-LINE TRANSACTION PROCESSING (OLTP)
Configure the database for a transactional workload, with bias towards high volumes of random data access.

DECISION SUPPORT SYSTEM (DSS)
Configure the database for a decision support or data warehouse workload, with bias towards large data scanning operations.

Show Advanced Options

TAGS

Tagging is a metadata system that allows you to organize and track resources within your tenancy. Tags are composed of keys and values that can be attached to resources.

[Learn more about tagging](#)

TAG NAMESPACE

None (apply a free-form tag)

TAG KEY

VALUE

+ Additional Tag

[Launch DB System](#)

Bare Metal DB -Enabling DG after peer database created

Database » DB Systems » DB System Details



vmdbprod

Scale Up/Down Add SSH Keys Apply Tag(s) Terminate

DB System Information Tags

Availability Domain: GrCh:US-ASHBURN-AD-1 **OCID:** ...d6sc7a [Show](#) [Copy](#)
Shape: BM.DenseIO2.52 **Created:** Fri, 03 May 2019 22:03:25 GMT
Compartment: ociobenablement (root)/balsharma **DB System Version:** 18.5.0.0.190115
Oracle Database Software Edition: Enterprise Edition Extreme Performance **CPU Core Count:** 2
Virtual Cloud Network: [vcn_bal](#) **Disk Redundancy:** High
Client Subnet: sub_vmdb_reg **Port:** 1521
Hostname Prefix: bmdb **Host Domain Name:** subvmdreg.vcnbal.oraclevcn.com
License Type: Bring Your Own License (BYOL)

Resources

Databases

Displaying 1 Databases

Nodes (1)

Databases (1)

Patches (1)

Patch History (0)

Create Database

bmdbprod Database Home: dbhome20190503220325 Launched: Fri, 03 May 2019 22:03:25 GMT AVAILABLE	Database Version: 18.5.0.0.190115 Database Workload: OLTP Database Unique Name: bmdbprod_iad1hj	Connection String (Admin Service): ...cn.com Show Copy Automatic Backup: Enabled	View Create Backup Restore Enable Data Guard Apply Tag(s) Terminate
--	--	---	--

Bare Metal DB -Enabling DG

Enable Data Guard

PROTECTION MODE
Maximum Performance

AVAILABILITY DOMAIN
GrCh:US-ASHBURN-AD-3
Primary database is in availability domain GrCh:US-ASHBURN-AD-1

PEER DB SYSTEM
bmstdbydb

TRANSPORT TYPE
Async

DATABASE ADMIN PASSWORD
.....|

Password must be 9 to 30 characters and contain at least 2 uppercase, 2 lowercase, 2 special, and 2 numeric characters. The special characters must be _, #, or -.

Enable

- Select Availability Domain and Peer database Created.
- Specify password for Admin(SYS)- Same as that of Production
- Click Enable-Database will show as “Updating”.

Databases			
Displaying 1 Databases			
Create Database			
bmdbprod	Database Home: dbhome20190503220325 Launched: Fri, 03 May 2019 22:03:25 GMT UPDATING...	Database Version: 18.5.0.0.190115 Database Workload: OLTP Database Unique Name: bmdbprod_jad1hj	Database Role: Primary Connection String (Admin Service): ...cn.com Show Copy Automatic Backup: Enabled

Demo: Bare Metal DB -Enabling DG tracking in console

Database » DB Systems » DB System Details » Database » Data Guard Associations

bmdbprod

DB UPDATING...

DB Connection Restore Apply Tag(s) Terminate

Database Information Tags

Availability Domain: GrCh:US-ASHBURN-AD-1 **DB System:** vmdbprod
Database Home: dbhome20190503220325 **OCID:** ...3jp5wq [Show](#) [Copy](#)
Launched: Fri, 03 May 2019 22:03:25 GMT **Database Version:** 18.5.0.0.190115
Database Workload: OLTP **Database Unique Name:** bmdbprod_iad1hj
Character Set: AL32UTF8 **Database Role:** Primary
Automatic Backup: Enabled **National Character Set:** AL16UTF16

Data Guard Associations

Displaying 1 Data Guard Association

Resources

Backups (4) Patches (2) Patch History (0) Data Guard Associations (1)

Enable Data Guard

PROVISIONING... **Peer Database:** [bmdbprod](#) **Launched:** Mon, 06 May 2019 13:54:48 GMT **Apply Lag:** –
Peer Role: Standby **Protection Mode:** Maximum Performance **Apply Rate:** –
Peer DB System: [bmstdbydb](#) **Availability Domain:** GrCh:US-ASHBURN-AD-1 **Transport Type:** Async

DG Association-BM DB.. Continued

Database » DB Systems » DB System Details » Database » Data Guard Associations

bmdbprod

[DB Connection](#) [Restore](#) [Apply Tag\(s\)](#) [Terminate](#)

[Database Information](#) [Tags](#)

Availability Domain: GrCh:US-ASHBURN-AD-1	DB System: vmbdbprod
Database Home: dbhome20190503220325	OCID: ...3jp5wq Show Copy
Launched: Fri, 03 May 2019 22:03:25 GMT	Database Version: 18.5.0.0.190115
Database Workload: OLTP	Database Unique Name: bmdbprod_iad1hj
Character Set: AL32UTF8	Database Role: Primary
Automatic Backup: Enabled	National Character Set: AL16UTF16

Resources

[Backups \(4\)](#)

[Patches \(2\)](#)

[Patch History \(0\)](#)

[Data Guard Associations \(1\)](#)

Data Guard Associations

Displaying 1 Data Guard Association

[Enable Data Guard](#)

 AVAILABLE	Peer Database: bmdbprod Peer Role: Standby Peer DB System: bmstdbydb	Launched: Mon, 06 May 2019 13:54:48 GMT Protection Mode: Maximum Performance Availability Domain: GrCh:US-ASHBURN-AD-1	Apply Lag: 0 seconds Apply Rate: 0 Byte/s Transport Type: Async	Switchover Reinstate 
--	---	---	--	---

Demo: DG Switchover-BM DB

Database » DB Systems » DB System Details » Database » Data Guard Associations

bmdbprod 

DB 
AVAILABLE

DB Connection Restore Apply Tag(s) Terminate

Database Information Tags

Availability Domain: GrCh:US-ASHBURN-AD-1
Database Home: dbhome20190503220325
Launched: Fri, 03 May 2019 22:03:25 GMT
Database Workload: OLTP
Character Set: AL32UTF8
Automatic Backup: Enabled

DB System: vmdbprod
OCID: ...3jp5wq [Show Copy](#)
Database Version: 18.5.0.0.190115
Database Unique Name: bmdbprod_iad1hj
Database Role: Primary
National Character Set: AL16UTF16

Resources

Backups (4)

Patches (2)

Patch History (0)

Data Guard Associations (1)

Data Guard Associations

Displaying 1 Data Guard Association

Enable Data Guard				
 AVAILABLE	Peer Database: bmdbprod Peer Role: Standby Peer DB System: bmstdbydb	Launched: Mon, 06 May 2019 13:54:48 GMT Protection Mode: Maximum Performance Availability Domain: GrCh:US-ASHBURN-AD-1	Apply Lag: 0 seconds Apply Rate: 1.00 KByte/s Transport Type: Async	Switchover Reinstate 

Switcher Database

[help](#) [cancel](#)

Are you sure you want to perform a database switchover? A switchover reverses the primary and standby database roles.

ENTER THE DATABASE ADMIN PASSWORD

OK

Data Guard Associations

Displaying 1 Data Guard Association

Enable Data Guard				
 UPDATING...	Peer Database: bmdbprod Peer Role: Standby Peer DB System: bmstdbydb	Launched: Mon, 06 May 2019 13:54:48 GMT Protection Mode: Maximum Performance Availability Domain: GrCh:US-ASHBURN-AD-1	Apply Lag: 0 seconds Apply Rate: 1.00 KByte/s Transport Type: Async	

DG Switchover-BM DB Role transition

Database » DB Systems » DB System Details



vmdbprod

Scale Up/Down Add SSH Keys Apply Tag(s) Terminate

DB System Information

Tags

Availability Domain: GrCh:US-ASHBURN-AD-1
Shape: BM.DenseLO2.52
Compartment: ociobenablement (root)/balsharma
Oracle Database Software Edition: Enterprise Edition Extreme Performance
Virtual Cloud Network: vcn_bal
Client Subnet: sub_vmdb_reg
Hostname Prefix: bmdb
License Type: Bring Your Own License (BYOL)

OCID: ...d6sc7a Show Copy
Created: Fri, 03 May 2019 22:03:25 GMT
DB System Version: 18.5.0.0.190115
CPU Core Count: 2
Disk Redundancy: High
Port: 1521
Host Domain Name: subvmbreg.vcnbal.oraclevcn.com

Resources

Databases

Displaying 1 Databases

Nodes (1)

Databases (1)

Patches (1)

Patch History (0)

Create Database



bmdbprod

Database Home: dbhome20190503220325
Launched: Fri, 03 May 2019 22:03:25 GMT

Database Version: 18.5.0.0.190115

Database Workload: OLTP

Database Unique Name: bmdbprod_jad1hj

Database Role: Standby

Connection String (Admin Service): [...cn.com](#) Show Copy

Automatic Backup: Enabled



Appendix: Create Peer database for BM DB

Database » DB Systems » DB System Details » Database » Data Guard Associations

bmdbprod

DB Connection Restore Apply Tag(s) Terminate

Database Information Tags

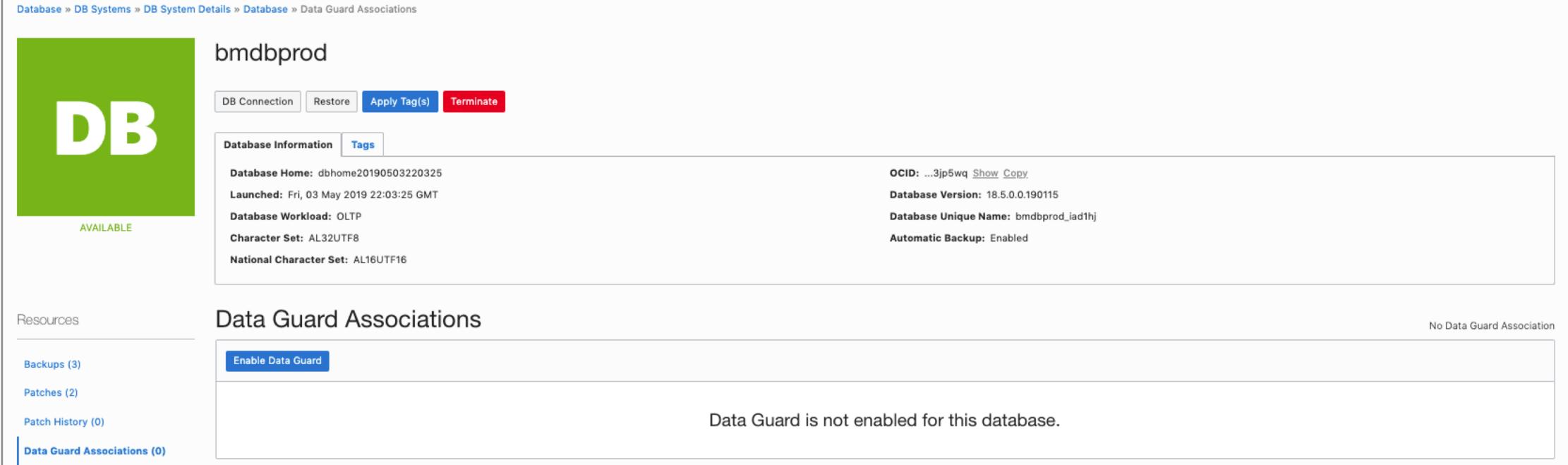
Database Home: dbhome20190503220325 OCID: ...3jp5wq Show Copy
Launched: Fri, 03 May 2019 22:03:25 GMT Database Version: 18.5.0.0.190115
Database Workload: OLTP Database Unique Name: bmdbprod_iad1hj
Character Set: AL32UTF8 Automatic Backup: Enabled
National Character Set: AL16UTF16

AVAILABLE

Resources Data Guard Associations No Data Guard Association

Backups (3) Enable Data Guard
Patches (2)
Patch History (0)
Data Guard Associations (0)

Data Guard is not enabled for this database.



Enable Data Guard

PROTECTION MODE Maximum Performance

AVAILABILITY DOMAIN GrCh:US-ASHBURN-AD-3

Primary database is in availability domain GrCh:US-ASHBURN-AD-1

PEER DB SYSTEM bmstdbydb

TRANSPORT TYPE Async

DATABASE ADMIN PASSWORD *****

Password must be 9 to 30 characters and contain at least 2 uppercase, 2 lowercase, 2 special, and 2 numeric characters. The special characters must be _, #, or ~.

Enable



Note: Before attempting Data Guard association make sure you have created the peer Db system in advance in required AD

Appendix: Not supported across VCN

Networking » Virtual Cloud Networks » Virtual Cloud Network Details » Local Peering Gateways



vcn_bal

Add Tag(s) Terminate

VCN Information Tags

CIDR Block: 10.0.0.0/16

Compartment: balsharma

Created: Tue, Jan 8, 2019, 9:28:56 PM UTC

OCID: ...jefqya Show Copy

Default Route Table: [Default Route Table for vcn_bal](#)

DNS Domain Name: vcnbal.oraclevcn.com

Resources

Local Peering Gateways *in balsharma Compartment*

Create Local Peering Gateway

Name	State	Peering Status	Route Table <i>i</i>	Peer Advertised CIDR	Cross-Tenancy	Created
No items found.						

Showing 0 Item(s) < Page 1 >

Subnets (5)

Route Tables (3)

Internet Gateways (1)

Dynamic Routing Gateways (0)

Security Lists (4)

DHCP Options (1)

Local Peering Gateways (0)

NAT Gateways (1)

Service Gateways (1)



Appendix: Modifying Security List, Routing for BM DB DataGuard

Edit Subnet

NAME
sub_vmdb_reg

DHCP Options

DHCP OPTIONS COMPARTMENT
balsharma
ociobenablement (root)/balsharma

DHCP OPTIONS
Default DHCP Options for vcn_bal

Route Table

ROUTE TABLE COMPARTMENT
balsharma
ociobenablement (root)/balsharma

ROUTE TABLE
rt_vmdb

Security Lists

SECURITY LIST COMPARTMENT
balsharma
ociobenablement (root)/balsharma

SECURITY LIST
priv_vmdb_sg

SECURITY LIST COMPARTMENT
balsharma
ociobenablement (root)/balsharma

SECURITY LIST
Default Security List for vcn_bal

+ Add Security List

Update

Add Ingress Rules

Ingress Rule 1

Allows TCP traffic for ports: all

STATELESS i

SOURCE TYPE
CIDR i

SOURCE CIDR
10.0.128.0/24
Specified IP addresses: 10.0.128.0-10.0.128.255 (256 IP addresses)

IP PROTOCOL i
TCP

SOURCE PORT RANGE i OPTIONAL
All
Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL
All
Examples: 80, 20-22 or All

+ Additional Ingress Rule

Add Ingress Rules Cancel

Add Ingress Rules

Ingress Rule 1

Allows TCP traffic for ports: all

STATELESS i

SOURCE TYPE
CIDR i

SOURCE CIDR
10.0.128.0/24
Specified IP addresses: 10.0.128.0-10.0.128.255 (256 IP addresses)

IP PROTOCOL i
TCP

SOURCE PORT RANGE i OPTIONAL
All
Examples: 80, 20-22 or All

DESTINATION PORT RANGE i OPTIONAL
All
Examples: 80, 20-22 or All

+ Additional Ingress Rule

Add Ingress Rules Cancel

Data Guard- CLI Options

```
[opc@bmdb ~]$ sudo /opt/oracle/dcs/bin/dbcli list-dgconfigs
```

ID	Name	Database Name	Role	Protection Mode	Apply
Lag	Transport Lag	Apply Rate	Status		

3dc0ff71-66d2-41e4-94b5-9f8552fa0e7a	bmdbprod_iad1hj_bmdbprod_iad2zn	bmdbprod	Standby	MaxPerformance	0
seconds	0 seconds	3.00 KByte/s	Configured		



ORACLE

High Availability Autonomous Database Cloning

Autonomous Database(ATP/ADW) Cloning

- Cloned databases can be used for multiple purposes such as Testing/development, experimentation, analytics, and others.
- Customers have an ability to quickly create point-in-time copy of a particular autonomous database using OCI Console, API, CLI, SDK, and Terraform.
- Creating clone of an existing ATP/ADW is easy. To clone a database using OCI console, go to OCI Console -> Autonomous Transaction Processing OR OCI Console → Autonomous Data Warehouse → List of Autonomous Database -> View Details of Selected Autonomous Database -> Actions -> Create Clone

The image shows two side-by-side screenshots of the Oracle Cloud Autonomous Database Details page. Both screens feature a large green banner at the top with the letters 'ADW' or 'ATP' in white, followed by the word 'AVAILABLE'.

Left Screen (RS2ADWC):

- General Information:** Database Name: RS2ADWC, Workload Type: Data Warehouse, Compartment: oclobenablement (root)/balsharma, OCID: ...y7cooc, Created: Wed, Jul 17, 2019, 5:15:21 PM UTC, CPU Core Count: 1, Storage (TB): 1, License Type: Bring Your Own Licence (BYOL), Database Version: 18c, Auto Scaling: Enabled, Lifecycle State: Available.
- Actions:** DB Connection, Performance Hub, Service Console, Scale Up/Down, Stop, Actions (dropdown menu: Restore, Create Clone, Access Control List, Admin Password, Update Licence Type, Move Resource, Add Tags, Terminate).
- Infrastructure:** Dedicated Infrastructure: No.
- Backup:** Last Automatic Backup: Fri, Aug 30, 2019, 2:18:45 PM UTC.
- Resources:** Backups (50), Create Manual Backup.

Right Screen (mritdb):

- General Information:** Database Name: proddb, Workload Type: Transaction Processing, Compartment: oclobenablement (root)/balsharma, OCID: ...2rjafq, Created: Tue, Jun 25, 2019, 3:41:11 PM UTC, CPU Core Count: 1, Storage (TB): 1, License Type: Bring Your Own Licence (BYOL), Database Version: 18c, Auto Scaling: Disabled, Lifecycle State: Available.
- Actions:** DB Connection, Performance Hub, Service Console, Scale Up/Down, Stop, Actions (dropdown menu: Restore, Create Clone, Access Control List, Admin Password, Update Licence Type, Move Resource, Add Tags, Terminate).
- Infrastructure:** Dedicated Infrastructure: No.
- Backup:** Last Automatic Backup: Thu, Aug 29, 2019, 6:51:30 PM UTC.

Autonomous Database(ATP/ADW) Cloning Demo

ORACLE Cloud

Create Autonomous Database Clone

Choose Clone Type

Full clone Creates a new database with source database's data and metadata.

Metadata clone Creates a new database that includes all source database schema metadata, but not the source database data.

Provide basic information for the Autonomous Database

Create In Compartment oclobenlement (root/balsharma)

Origin Database Name READ-ONLY

Display Name

Database Name The name must contain only letters and numbers, starting with a letter. 14 characters max.

Configure the database

CPU core count Storage (TB) The amount of storage to allocate.

Auto scaling Allows system to use up to three times the provisioned number of cores as the workload increases. [Learn more](#).

Choose a license type

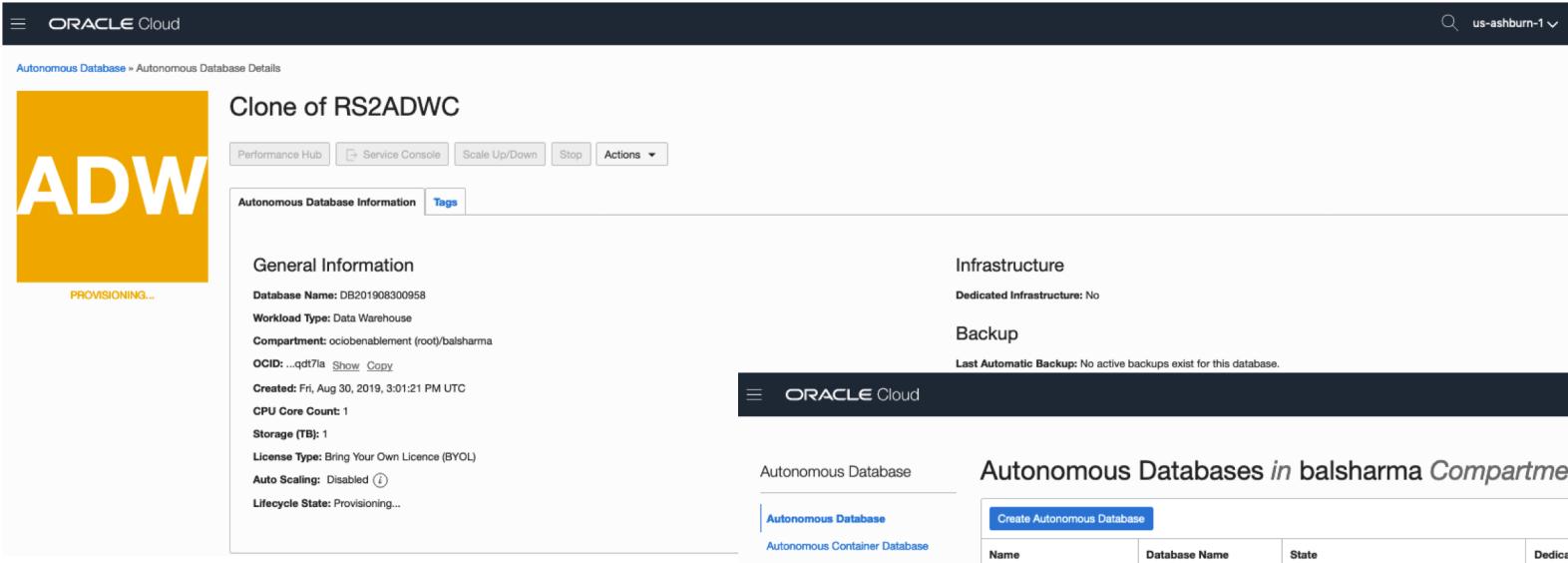
Bring Your Own Licence (BYOL) Bring my organization's Oracle Database software licenses to the Database service. [Learn more](#)

License Included Subscribe to new Oracle Database software licenses and the Database service.

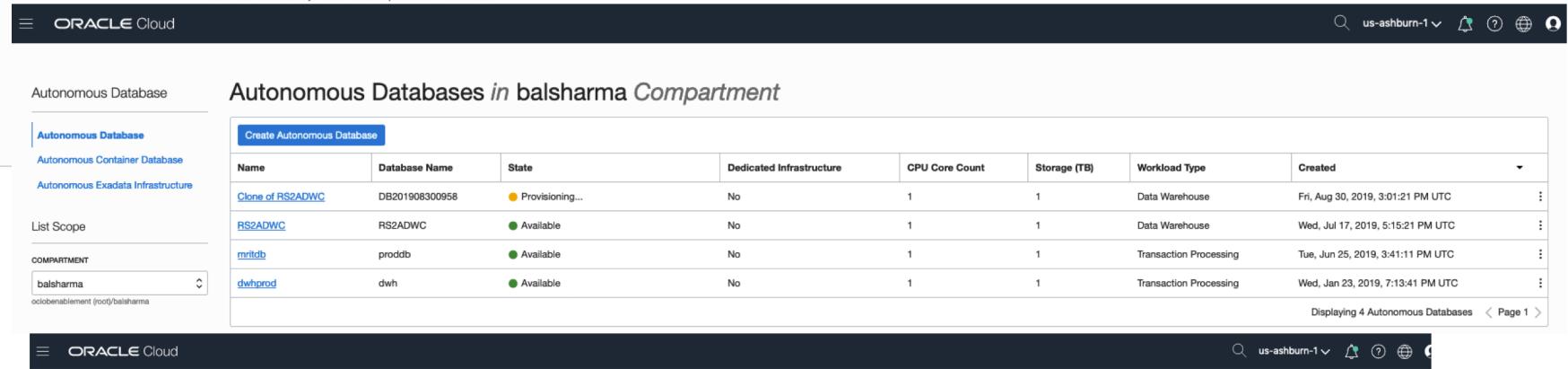
[Show Advanced Options](#)

Create Autonomous Database Clone

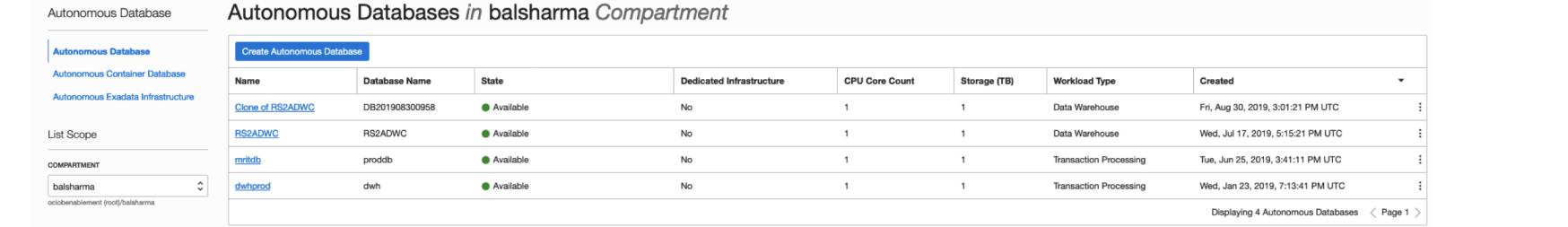
Autonomous Database(ATP/ADW) Cloning Demo Cont.



The screenshot shows the Oracle Cloud Autonomous Database Details page for 'Clone of RS2ADWC'. The page has a yellow header with 'ADW' and 'PROVISIONING...' text. It includes tabs for 'Autonomous Database Information' and 'Tags'. The 'Autonomous Database Information' tab is selected, displaying details like Database Name (DB201908300958), Workload Type (Data Warehouse), Compartment (ocibenbenamiento (root)/balsharma), and Creation Date (Fri, Aug 30, 2019, 3:01:21 PM UTC). The 'Infrastructure' section indicates No Dedicated Infrastructure. The 'Backup' section notes 'No active backups exist for this database.'



The screenshot shows the Oracle Cloud Autonomous Database list page for the 'balsharma' compartment. It displays four databases: 'Clone of RS2ADWC' (Provisioning...), 'RS2ADWC' (Available), 'mrldb' (Available), and 'dwhprod' (Available). The table includes columns for Name, Database Name, State, Dedicated Infrastructure, CPU Core Count, Storage (TB), Workload Type, and Created date.



The screenshot shows the Oracle Cloud Autonomous Database list page for the 'balsharma' compartment, identical to the one above it, displaying the same four databases and their details.

Summary

After completing this training you should have learnt :

- Database service offers High availability options such as Data Guard, Active Data Guard
- Offers complete lifecycle automation – Data Guard creation, Switch Over, Failover, Reinstate
- Manual Data Guard can be created using API/CLI
- Autonomous Database Cloning.



Oracle Cloud always free tier:

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OCI training and certification:

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education.oracle.com/oracle-certification-path

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ocitraining.qloudable.com/provider/oracle

Oracle learning library videos on YouTube:

youtube.com/user/OracleLearning