Oracle Real Application Cluster (RAC) In The Oracle Cloud

Markus Michalewicz – Senior Director of Product Management, Database HA & Scalability
Sebastian Solbach – Consulting Member of Technical Staff, Oracle Cloud Infrastructure

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Safe Harbor Statement

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Program Agenda

1. Overview
2. RAC in OCI-C
3. RAC in OCI
4. Demo RAC in OCI
5. Conclusion
Program Agenda

1. Overview
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Three Reasons for Oracle RAC In The Oracle Cloud

**Scalability**
Currently, mostly 2-nodes. Exadata scales beyond 2 node

**High Availability**
Protection from cloud instance failures

**Online Maintenance**
Also an internal Cloud feature; e.g.: Exadata Express Service is RAC One Node based
No Oracle RAC on 3rd Party Public Clouds

Oracle RAC requires “natively provided shared storage” and certain network configurations that aren’t met by 3rd party clouds.

Amazon AWS & Microsoft Azure and others are subject to Oracle RAC Licensing restrictions.

Oracle RAC is fully supported in various flavors in the Oracle Cloud.

Oracle RAC in the Oracle Cloud

Oracle Cloud Infrastructure – Classic (OCI-C)

Oracle Cloud Infrastructure (OCI)

Infrastructure-based RAC DBCS

Platform RAC DBCS

Oracle Ravello

IaaS-based RAC

Your Oracle Database in the Cloud

Enterprise-proven database cloud service that supports any size workload from dev/test to large scale production deployment. Multi-layered, in depth security with encryption by default. A highly available and scalable service delivering speed, simplicity and flexibility for faster time to value and savings.

Oracle Database on demand and highly available - on high-performance bare metal servers, or Oracle Exadata

Deploy Oracle databases quickly and easily in a highly-available cloud environment, and benefit from the performance of dedicated hardware, proven RAC reliability, data security, and granular controls.

Enterprise VMware workloads on leading public clouds

Seamlessly deploy your existing VMware or KVM based data center workloads on Oracle Cloud Infrastructure, AWS, or GCP as-is, without any modification to the VMs, network, or storage. Get data-center-like network services with enterprise grade performance for production workloads, and on-demand and cost-effective scale for agile dev/test processes.
Currently Available RAC Shapes in the Oracle Cloud

• OCI-C
  – 2-nodes, VM-Based

• OCI
  – 2-nodes, VM-based

• Exadata Service
  – Incl. Exadata Cloud at customer
  – Excl. Oracle Cloud at Customer

• All services can be used with Universal Credits
• OR Bring Your Own License (BYOL)
Program Agenda

1. Overview
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Get Your RAC Service in the Oracle Cloud in 3 Quick Steps

Prepare

Create Service

Connect

~ 1 hour
Create an Oracle RAC Service in the Oracle Cloud

Step 1: Prepare SSH Key

http://www.oracle.com/webfolder/technetwork/tutorials/obe/cloud/javaservice/JCS/JCS_SSH/create_sshkey.html

MM-mac:- mmichale$
ssh-keygen -t rsa -N "" -b "2048" -C "CloudRAC" -f ./ssh/CloudRSAkey

Generating public/private rsa key pair.
Your identification has been saved in ./ssh/CloudRSAkey.
Your public key has been saved in ./ssh/CloudRSAkey.pub.
The key fingerprint is:
SHA256:S6AuKmY9nJE/8pAhwKEoU+I1E05WoOov0W1o+SOXj1I CloudRAC
Create an Oracle RAC Service in the Oracle Cloud

Step 2A: Create Instance

Create Instance

Provide basic service instance information.

- **Instance Name**: CloudRAC
- **Description**: My Cloud RAC
- **Notification Email**: Markus.Michalewicz@oracle.com
- **Region**: No Preference
- **Service Level**: Oracle Database Cloud Service
- **Metering Frequency**: Hourly
- **Software Release**: Oracle Database 18c
- **Software Edition**: Enterprise Edition - Extreme Performance
- **Database Type**: Database Clustering with RAC
Create an Oracle RAC Service in the Oracle Cloud

Step 2B: Create Instance

Create Instance

Instance

- Instance Name: CloudRAC
- Description: My Cloud RAC
- Bring Your Own License: No
- Service Level: Oracle Database Cloud Service
- Metering Frequency: Hourly
- Software Release: Oracle Database 18c
- Compute Shape: OC4 - 2.0 vCPU, 15.0 GB RAM
- SSH Public Key: ssh-ia AAAAB3INzaC1yc2EAA...
- Use High Performance Storage: No
- Assign Public IP: Yes

Database Configuration

- DB Name: McRAC
- PDB Name: POB1
- Usable Database Storage (GB): 15
- Total Data File Storage (GB): 77.5
- Timezone: (UTC) Coordinated Universal Time
- Character Set: AL32UTF8 - Unicode Univer...
- National Character Set: AL16UTF16 - Unicode UTF-1...
- Include GoldenGate: No
- Database Clustering with RAC: Yes

Backup and Recovery Configuration

- Backup Destination: None

Standby Database Configuration

- Standby Database with Data Guard: No

Notification

- Notification Email: Markus.Michalewicz@oracle.com
Create an Oracle RAC Service in the Oracle Cloud

Step 2C: Wait for creation

Oracle Database Cloud Service

Instances  Activity  SSH Access

Summary

1 4 30 GB 239 GB 2
Instances  OCPUs  Memory  Storage  Public IPs

CloudRAC

Status: Creating Instance ...
Version: 18.0.0.0
Edition: Enterprise Edition - Extr...

Submitted On: Mar 6, 2018 11:08:29 PM UTC
OCPUs: 4
Memory: 30 GB
Storage: 239 GB
Ready to go in approximately 1 hour
Enable Access by Adapting Access Rules

CloudRAC

Oracle Database Cloud Service / CloudRAC

Access Rules
You can use access rules to control network access to service components. On this page, you can manage your access rules.

<table>
<thead>
<tr>
<th>Status</th>
<th>Rule Name</th>
<th>Source</th>
<th>Destination</th>
<th>Ports</th>
<th>Protocol</th>
<th>Description</th>
<th>Rule Type</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ora_p2_ssh</td>
<td>PUBLIC-INTERNET</td>
<td>DB_1</td>
<td>22</td>
<td>TCP</td>
<td>Permit ssh access to nodes</td>
<td>DEFAULT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ora_p2_emconsole</td>
<td>PUBLIC-INTERNET</td>
<td>DB_1</td>
<td>5500</td>
<td>TCP</td>
<td>Permit access to EM Express</td>
<td>DEFAULT</td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td>ora_p2_db_listener</td>
<td>PUBLIC-INTERNET</td>
<td>DB_1</td>
<td>1522</td>
<td>TCP</td>
<td>Permit access for Oracle list...</td>
<td>DEFAULT</td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td>ora_p2_scan_listener</td>
<td>PUBLIC-INTERNET</td>
<td>DB_1</td>
<td>1521</td>
<td>TCP</td>
<td>Permit access for SCAN list...</td>
<td>DEFAULT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ora_p2_ons</td>
<td>PUBLIC-INTERNET</td>
<td>DB_1</td>
<td>6200</td>
<td>TCP</td>
<td>Permit access for RAC ONS</td>
<td>DEFAULT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sys_infra2db_ssh</td>
<td>PAAS-INFRA</td>
<td>DB_1</td>
<td>22</td>
<td>TCP</td>
<td>DO NOT MODIFY: Permit P...</td>
<td>SYSTEM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ora_trusted_hosts_sca...</td>
<td>127.0.0.1/32</td>
<td>DB_1</td>
<td>1521</td>
<td>TCP</td>
<td>DO NOT MODIFY: A secur...</td>
<td>SYSTEM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ora_trusted_hosts_db...</td>
<td>127.0.0.1/32</td>
<td>DB_1</td>
<td>1522</td>
<td>TCP</td>
<td>DO NOT MODIFY: A secur...</td>
<td>SYSTEM</td>
<td></td>
</tr>
</tbody>
</table>
Create an Oracle RAC Service in the Oracle Cloud

Step 3A: Connect to cloud instance and snoop around

```
MM-mac: ssh $ ssh opc@129.150.69.14 -i CloudRSAkey
[opc@cloudrac1 ~]$ sudo -s
[root@cloudrac1 opc]# su - grid
[grid@cloudrac1 ~]$ crsctl stat res -t
Name               Target  State        Server                   State details
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.ASMNET1LSNR_ASM.lsnr
  ONLINE  ONLINE       cloudrac1                STABLE
  ONLINE  ONLINE       cloudrac2                STABLE
...                                                                                     
Cluster Resources
--------------------------------------------------------------------------------
...                                                                                     
ora.mcrac.db
  1   ONLINE  ONLINE       cloudrac1              Open,HOME=/u01/app/oracle/product/18.0.0.0/dbhome_1,STABLE
  2   ONLINE  ONLINE       cloudrac2              Open,HOME=/u01/app/oracle/product/18.0.0.0/dbhome_1,STABLE
```

Create an Oracle RAC Service in the Oracle Cloud

Step 3B: SCAN configuration

```
[grid@cloudrac1 ~]$ srvctl config scan
SCAN name: cloudrac-scan-int, Network: 1
Subnet IPv4: 10.28.255.76/255.255.255.252/eth0, static
Subnet IPv6:
SCAN 1 IPv4 VIP: 10.28.255.78
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN 2 IPv4 VIP: 10.28.255.74
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
```

Two SCAN IPs / Listeners per cluster; 1 per node

```
[grid@cloudrac1 ~]$ srvctl config SCAN_Listener
SCAN Listener LISTENER_SCAN1 exists. Port: TCP:1521
Registration invited nodes:
Registration invited subnets:
SCAN Listener is enabled.
SCAN Listener is individually enabled on nodes:
SCAN Listener LISTENER_SCAN2 exists. Port: TCP:1521
Registration invited nodes:
Registration invited subnets:
SCAN Listener is enabled.
SCAN Listener is individually enabled on nodes:
```
Create an Oracle RAC Service in the Oracle Cloud

Step 3C: Create a service

```
[grid@cloudrac1 ~]$ srvctl status database -d mcrac
Instance mcrac1 is running on node cloudrac1
Instance mcrac2 is running on node cloudrac2

[grid@cloudrac1 ~]$ srvctl config service -d mcrac

[oracle@cloudrac1 ~]$ srvctl add service -d mcrac -s cloudytimes -pdb PDB1 -preferred mcrac1,mcrac2

[oracle@cloudrac1 ~]$ srvctl status service -d mcrac -s cloudytimes
Service cloudytimes is not running.

[oracle@cloudrac1 ~]$ srvctl start service -d mcrac -s cloudytimes

[oracle@cloudrac1 ~]$ srvctl status service -d mcrac -s cloudytimes
Service cloudytimes is running on instance(s) mcrac1,mcrac2
```
Create an Oracle RAC Service in the Oracle Cloud

Step 3D: Connect to the database from another cloud instance

[oracle@MyClient ~]$ sqlplus system/MyPassword@cloudrac-scan-int:1521/cloudytimes.uspm044.oraclecloud.internal

SQL*Plus: Release 18.0.0.0.0 Production on Thu Mar 8 23:52:36 2018
Version 18.1.0.0.0

Copyright (c) 1982, 2017, Oracle. All rights reserved.

Connected to:
Oracle Database 18c EE Extreme Perf Release 18.0.0.0.0 - Production
Version 18.1.0.0.0
Oracle RAC In the Cloud vs. On-Premises – Part 1

General management – raccli

[opc@cloudrac1 ~]$ raccli
Available Commands

------------------
apply patch          Apply bundle patch on either gi or db home
clean backup         Clean backup
create backup        Create backup
create recovery      Create recovery
describe job         Retrieve JSON formatted Response
describe system      Describes the current configured system with their version info
list backup          list backup
list backupconfig    list backupconfig
list jobs            Retrieve All jobs submitted
list recovery        list recovery
update backupconfig  update backupconfig
update netsec        updates net security rules for encryption and integrity
update rdk           Updates rdk kit
update server        Update server
update tde           update tde
Oracle RAC In the Cloud vs. On-Premises – Part 2

Simple VIP failover may not be sufficient to inform clients of disconnect

- It is best to use Fast Application Notification (FAN) for timely application notification of failures

- Paper to review:

- For OCI and ODP.NET unmanaged provider clients use the following TNS names structure:

```
(DESCRIPTION = (CONNECT_TIMEOUT=90) (RETRY_COUNT=30) (RETRY_DELAY=3)
 (TRANSPORT_CONNECT_TIMEOUT=30) (ADDRESS_LIST = (LOAD_BALANCE=on)
  (ADDRESS = (PROTOCOL = TCP)(HOST=cloudrac-scan-int)(PORT=1521))
  (CONNECT_DATA=(SERVICE_NAME = cloudytimes.uspm044.oraclecloud.internal)))
```
Oracle RAC In the Cloud vs. On-Premises – Part 3

Why a Simple VIP failover may not be sufficient – OCI-C only uses 1 IP address. Period.

```
[grid@cloudrac1 ~]$ srvctl config vip -n cloudrac1
VIP exists: network number 1, hosting node cloudrac1
VIP Name: cloudrac1.compute-uspm044.oraclecloud.internal
VIP IPv4 Address: 10.28.255.78
VIP IPv6 Address:
VIP is enabled.
VIP is individually enabled on nodes:
VIP is individually disabled on nodes:
```

```
[grid@cloudrac1 ~]$ srvctl config scan
SCAN name: cloudrac-scan-int, Network: 1
Subnet IPv4: 10.28.255.76/255.255.255.252/eth0, static
Subnet IPv6:
SCAN 1 IPv4 VIP: 10.28.255.78
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN VIP is individually disabled on nodes:
```

```
[grid@cloudrac1 ~]$ ifconfig -a
eth0      Link encap:Ethernet    HWaddr C6:B0:8E:23:86:9A
inet addr:10.28.255.78   Bcast:10.28.255.79  Mask:255.255.255.252
UP BROADCAST RUNNING MULTICAST  MTU:9000  Metric:1
RX packets:22771244 errors:0 dropped:0 overruns:0 frame:0
TX packets:22172318 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:26933671234 (25.0 GiB)  TX bytes:54646116976 (50.8 GiB)
```
Oracle RAC In the Cloud vs. On-Premises – Part 4

Connect to the database from the internet – **Use NAT address**

```bash
[MM-mac:$] $ORACLE_HOME/sqlplus system/MyCloudPswd@129.150.69.14:1521/pdb1.uspm044.oraclecloud.internal
```

SQL*Plus: Release 18.0.0.0.0 Production on Thu Mar 8 23:52:36 2018
Version 18.1.0.0.0

Copyright (c) 1982, 2017, Oracle. All rights reserved.

Connected to:
Oracle Database 18c EE Extreme Perf Release 18.0.0.0.0 - Production
Version 18.1.0.0.0

**Host Name:** cloudrac1
**Public IP:** 129.150.69.14
**SID:** McRAC1

Connects to one node only. Not using the SCAN name.
Oracle RAC In the Cloud vs. On-Premises – Part 5
SCAN is always pre-configured with Cloud-DNS for cloud-internal access

[oracle@MyClient ~]$ sqlplus system/MyPassword@cloudrac-scan-int:1521/
cloudytimes.uspm044.oraclecloud.internal

- From an Oracle Cloud-internal client:

  [opc@MyClient ~]$ nslookup cloudrac-scan-int
  Server: 10.19.56.221
  Address: 10.19.56.221#53

  Name: cloudrac-scan-int.compute-uspm044.oraclecloud.internal
  Address: 10.28.255.78
  Name: cloudrac-scan-int.compute-uspm044.oraclecloud.internal
  Address: 10.28.255.74
Configure SCAN in your own (cloud) DNS for access from the internet

• **One** Solution: [https://dyn.com/oracle/](https://dyn.com/oracle/)
  • Any reachable DNS would work

• More information:
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Oracle Cloud Infrastructure - Introduction

Built For Enterprise

Most Versatile
The only cloud designed for all workloads, from Enterprise IT to cloud-native

Optimized for Oracle
Runs Oracle applications and database best. Only cloud to offer Oracle RAC and Exadata

Predictable Savings
Simple & flexible pricing for all services

Consistently Fast
Predictable, fast performance for serious workloads

Comprehensive Control
Central visibility and governance, flexible provisioning

Bring your past, build your future
Oracle Cloud Infrastructure - Overview

High performance compute, storage, database on the same flexible virtual network
Oracle Cloud Infrastructure - Region / Availability Domain Topology

- Regions serve different geographies, provide Disaster Recovery
- Availability Domains provide a High Availability foundation in a Region
Get Your RAC Service in Oracle Cloud in 3 Quick Steps

Prepare

Create Service

Connect

Launch DB System

If the Virtual Cloud Network or Subnet is in a different Compartment than the DB System, selection for those resources.

**DB System Information**

<table>
<thead>
<tr>
<th>DISPLAY NAME</th>
<th>CloudRAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVAILABILITY DOMAIN</td>
<td>XXIT-PHX-AD-1</td>
</tr>
<tr>
<td>SHAPE TYPE</td>
<td>VIRTUAL MACHINE</td>
</tr>
</tbody>
</table>

~ 1 hour
Create Virtual Cloud Network (VCN)

- Create VCN with
  - DNS Hostnames for SCAN
  - Internet Gateway
- Choose to create all related resources
  - Subnet(s) per ADs
- Or do it manually to specify
  - DNS label, Subnet label etc.
- Custom DNS is in the works
  - Impact on SCAN resolution
Create an Oracle RAC Service in the Oracle Cloud

Step 1: Creating a SSH Key Pair

https://docs.us-phoenix-1.oraclecloud.com/Content/GSG/Tasks/creatingkeys.htm

SS-mac:~ ssolbach$ ssh-keygen -t rsa -N "" -b "2048" -C "CloudRAC" -f ./ssh/CloudRSAkey

Generating public/private rsa key pair.
Your identification has been saved in ./ssh/CloudRSAkey.
Your public key has been saved in ./ssh/CloudRSAkey.pub.
The key fingerprint is:SHA256:WOoZyerZDFPPFSM3xg362Y3gkxPkgBu09G5uv1xyIyo0 CloudRAC
Create an Oracle RAC Service in the Oracle Cloud

Step 2A: Create Instance

Launch DB System

If the Virtual Cloud Network or Subnet is in a different Compartment than the DB System, click here to enable Compartment selection for those resources.

DB System Information

<table>
<thead>
<tr>
<th>DISPLAY NAME</th>
<th>CloudRAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVAILABILITY DOMAIN</td>
<td>XX7-US-ASHBURN-AD-1</td>
</tr>
<tr>
<td>SHAPE TYPE</td>
<td>VM.Standard1.4</td>
</tr>
<tr>
<td>TOTAL NODE COUNT</td>
<td>2</td>
</tr>
<tr>
<td>ORACLE DATABASE SOFTWARE EDITION</td>
<td>Enterprise Edition Extreme Performance</td>
</tr>
<tr>
<td>AVAILABLE STORAGE SIZE (GB)</td>
<td>512</td>
</tr>
</tbody>
</table>

License Type

- LICENSE INCLUDED
  - The cost of the cloud services includes the Oracle licensing.
- BRING YOUR OWN LICENSE (BYOL)
  - You have bought the Oracle licenses directly from Oracle. The cloud provider is not responsible for charging or validating your licenses.

SSH Public Key

- CHOOSE SSH KEY FILES
- PASTE SSH KEYS

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

CloudRSAkey.pub
Create an Oracle RAC Service in the Oracle Cloud

Step 2B: Create Instance Continued

Create an Oracle RAC Service in the Oracle Cloud

Network Information

VIRTUAL CLOUD NETWORK
ssopub

CLIENT SUBNET
ssopub61ad1

HOSTNAME PREFIX
cloudrac

HOST NAME
ad1.ssopub.oraclevcn.com

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

HOST NAME URL
cloudrac.ad1.ssopub.oraclevcn.com

TAGS

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

Learn more about tagging

<table>
<thead>
<tr>
<th>TAG NAME/SPACE</th>
<th>TAG KEY</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (apply a free-form tag)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Database Information

DATABASE NAME
myrac

DATABASE VERSION
18.1.0.0

PODB NAME (Optional)
mypdb1

DATABASE ADMIN PASSWORD
************

Password must be 6 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.

AUTOMATIC BACKUP

Configure the service to automatically back up this database to Oracle Cloud Infrastructure Object Storage.

If you previously used RMAN or obc 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 no longer rely on your previously configured unmanaged backups to work.

DATABASE WORKLOAD

ONLINE 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
Create an Oracle RAC Service in the Oracle Cloud

Step 2C: Wait for creation
Ready to go in ~1 hour
Create an Oracle RAC Service in the Oracle Cloud

Step 3A: Connect to cloud instance and snoop around

SS-mac:.ssh $ ssolbach$ ssh opc@129.213.54.99 -i CloudRSAkey
[opc@cloudrac1 ~]$ sudo su - grid

[grid@cloudrac1 ~]$ crsctl stat res -t

<table>
<thead>
<tr>
<th>Name</th>
<th>Target</th>
<th>State</th>
<th>Server</th>
<th>State details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ora.ASMNET1LSNR_ASM.lsnr</td>
<td>ONLINE</td>
<td>ONLINE</td>
<td>cloudrac1</td>
<td>STABLE</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ora.myrac_iad18j.db</td>
<td>1</td>
<td>ONLINE</td>
<td>cloudrac1</td>
<td>Open, HOME=/u01/app/oracle/product/18.1/dbhome_1, STABLE</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>ONLINE</td>
<td>cloudrac2</td>
<td>Open, HOME=/u01/app/oracle/product/18.1/dbhome_1, STABLE</td>
</tr>
</tbody>
</table>
Create an Oracle RAC Service in the Oracle Cloud

Step 3B: SCAN configuration

[grid@cloudrac1 ~]$ srvctl config scan
SCAN name: cloudrac-scan.adl.ssopub.oraclevcn.com,
    Network: 1
Subnet IPv4: 10.168.61.0/255.255.255.0/eth0,
    static
Subnet IPv6: SCAN 1 IPv4 VIP: 10.168.61.14
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN VIP is individually disabled on nodes:
SCAN 2 IPv4 VIP: 10.168.61.15
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN VIP is individually disabled on nodes:
SCAN 3 IPv4 VIP: 10.168.61.13
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN VIP is individually disabled on nodes:

[grid@cloudrac1 ~]$ srvctl config SCAN_Listener
SCAN Listener LISTENER_SCAN1 exists. Port: TCP:1521
Registration invited nodes:
Registration invited subnets:
SCAN Listener is enabled.
SCAN Listener is individually enabled on nodes:
SCAN Listener is individually disabled on nodes:
SCAN Listener LISTENER_SCAN2 exists. Port: TCP:1521
Registration invited nodes:
Registration invited subnets:
SCAN Listener is enabled.
SCAN Listener is individually enabled on nodes:
SCAN Listener is individually disabled on nodes:
SCAN Listener LISTENER_SCAN3 exists. Port: TCP:1521
Registration invited nodes:
Registration invited subnets:
SCAN Listener is enabled.
SCAN Listener is individually enabled on nodes:
SCAN Listener is individually disabled on nodes:
Create an Oracle RAC Service in the Oracle Cloud

**Step 3C: Create a service**

```
[grid@cloudrac1 ~]$ srvctl status database -d myrac_iad18j
Instance myrac1 is running on node cloudrac1
Instance myrac2 is running on node cloudrac2
```

```
[grid@cloudrac1 ~]$ srvctl config service -d myrac_iad18j
```

```
[oracle@cloudrac1 ~]$ . oraenv
ORACLE_SID = [oracle] ? myrac1
ORACLE_HOME = [/home/oracle] ? /u01/app/oracle/product/18.1/dbhome_1
The Oracle base has been set to /u01/app/oracle
```

```
[oracle@cloudrac1 ~]$ export ORACLE_UNQNAME=myrac_iad18j
```

```
[oracle@cloudrac1 ~]$ srvctl add service -d myrac_iad18j -s cloudytimes -pdb mypdb1 - preferred myrac1,myrac2
```

```
[oracle@cloudrac1 ~]$ srvctl start service -d myrac_iad18j -s cloudytimes
```

```
[oracle@cloudrac1 ~]$ srvctl status service -d myrac_iad18j -s cloudytimes
Service cloudytimes is running on instance(s) myrac1,myrac2
```

**DB_UNIQUE_NAME is DBNAME_<Region>#number; see slide 51 for details**
Create an Oracle RAC Service in the Oracle Cloud

Step 3D: Connecting to the database – 3 Options

1. Local access on one of the DB hosting cloud instances
2. Access via another cloud instance in the same VCN or via VPN
3. Access from the (public) internet (without VPN)
Step 3D: Connecting to the Database

Option 1: Local access on one of the DB hosting cloud instances

[oracle@cloudrac1 ~]$ . oraenv
ORACLE_SID = [oracle] ? myrac1
ORACLE_HOME = [/home/oracle] ? /u01/app/oracle/product/18.1/dbhome_1
The Oracle base has been set to /u01/app/oracle

[oracle@cloudrac1 ~]$ export ORACLE_UNQNAME=myrac_iad18j

[oracle@cloudrac1 ~]$ sqlplus system/mypwd@cloudrac-scan.ad1.ssopub.oraclevcn.com:1521/cloudytimes.ad1.ssopub.oraclevcn.com

SQL*Plus: Release 18.0.0.0.0 Production on Thu Mar 8 23:52:36 2018
Version 18.1.0.0.0

Copyright (c) 1982, 2017, Oracle. All rights reserved.

Connected to:
Oracle Database 18c EE Extreme Perf Release 18.0.0.0.0 - Production
Version 18.1.0.0.0

Databases use DB_DOMAIN as default; see slide 51 for details
Step 3D: Connect to the database

Option 2: Access via another cloud instance in the same VCN or via VPN

- Internal SCAN IP Addresses or SCAN Name (10.168.61.13/14/15)
- Add 1521 to the Ingress Security List Rules of the subnet

```
[oracle@myclient ~]$ sqlplus system/mypwd@cloudrac-scan.adl.ssopub.oraclevcn.com:1521/cloudytimes.adl.ssopub.oraclevcn.com
```

SQL*Plus: Release 12.1.0.2.0 Production on Thu Apr 12 15:07:05 2018...

Last Successful login time: Thu Apr 12 2018 14:58:12 +00:00
Connected to: Oracle Database 18c EE Extreme Perf Release 18.0.0.0.0 - Production

- Check firewall settings on the DB hosting cloud instances if you have problems (1521)
Step 3D: Connect to the database

Option 3: Access from the (public) internet (without VPN) (sqlcl Example)

• Only possible if DB system uses a public IP address
• SCAN/VIP are only accessible within VPN or Cloud
  – Alternative: Use Cloud Load Balancer Service
• 2 Options:
  – SQL*Net via. SSH Tunnel with Public IP Address and VIP address
  – SQL*Net with Public IP Adress
    • Regard Ingress Rule on Security List for VCN
    • You can set it to 0.0.0.0/0 but that opens it to all internet...

```sql
ss-mac:~ ssolbach$ sql /nolog
SQL> sshtunnel opc@129.213.54.99 -i CloudRSAkey -L 8888:10.168.61.11:1521
Using port:22
SSH Tunnel connected
SQL> connect system/pwd@localhost:8888/cloudytimes.ad1.ssopub.oraclevcn.com
```

```sql
ss-mac:~ ssolbach$ sql system/pwd@129.213.54.99:1521/cloudytimes.ad1.ssopub.oraclevcn.com
SQLcl: Release 18.1 Production on Thu Apr 12 20:35:52 2018 ...
Connected to:
Oracle Database 18c EE Extreme Perf Release 18.0.0.0.0 - Production
```

Create an Oracle RAC Service in the Oracle Cloud

Full RAC stack support within an availability domain due to flexible network design

• VCN and subnets allow for separation of interconnect and public network
  – Public IP addresses are needed for public network to
    • Reach the Object Storage for backup/restore, to access patches,
      to reach YUM server for OS Upgrade

• Full VIP support
  – Floating IP Support (VIPs are on the same subnet and can fail over)
  – Additional VIPs for Applications (e.g. HANFS, Goldengate) can be created

• VIPs and SCAN addresses are automatically assigned
  – DNS Resolver is required

• Full support for applications with FAN/FCF/AC with SCAN and VIP failover
Full RAC Stack Support

Additional Virtual IP addresses in OCI for full failover capabilities and RAC support

• Additional VIPs are needed for HANFS, XAG, Goldengate

• OCI supports 2 types of IP addresses
  1. Primary and Secondary (Floating IPs)
  2. Public (Internet) and Private (VCN)

• IP Addresses in OCI have 2 dependencies
  – IP address in the Cluster itself (srvctl / appvipcfg)
  – Metadata information in OCI (and DNS Server in OCI)
Get VNIC Metadata

• Every OCI Instance has a Metadata Service

```bash
[ {
  "vnicId" : "ocid1.vnic.oc1.eu-frankfurt-1.abtheljsxvhe6...",
  "privateIp" : "10.170.3.2",
  "vlanTag" : 0,
  "macAddr" : "90:e2:ba:d6:f1:84",
  "virtualRouterIp" : "10.170.3.1",
  "subnetCidrBlock" : "10.170.3.0/24",
  "nicIndex" : 0
} ]
```
VIP(s) on the VNIC

• Read VNIC Metadata:

bmcs-curl $IAASHOST get "/20160918/privateIps?vnicId=$VNIC"
{
  "availabilityDomain" : "XXIT:EU-FRANKFURT-1-AD-3",
  "compartmentId" : "ocid1.compartment.oc1..aaaaaaaaevtkt...",
  "displayName" : "ssfyodal-vip",
  "hostnameLabel" : "ssfyodal-vip0",
  "id" : "ocid1.privateip.oc1.eu-frankfurt-1.abtheljs6datuoscigj...",
  "ipAddress" : "10.170.3.4",
  "isPrimary" : false,
  "subnetId" : "ocid1.subnet.oc1.eu-frankfurt-1.aaaaaaaa2tnk4nd...",
  "timeCreated" : "2017-11-16T10:30:15.323Z",
  "vnicId" : "ocid1.vnic.oc1.eu-frankfurt-1.abtheljsxvhe6i3t2z6...
}
Create additional Metadata for the VIP

• bmcs-curl $IAASHOST post ./createVip.json "/20160918/privateIps"

createVip.json:

```json
{
    "displayName": "'"${VIPHOST}'"",
    "hostnameLabel": "'"${VIPHOST}'"",
    "ipAddress": "'"${VIPADDR}'"",
    "vnicId": "'"${VNIC}'"
}
```

• Oci-curl:

[https://docs.us-phoenix-1.oraclecloud.com/Content/API/Concepts/signingrequests.htm?Highlight=curl#Bash](https://docs.us-phoenix-1.oraclecloud.com/Content/API/Concepts/signingrequests.htm?Highlight=curl#Bash)
Oracle RAC in OCI vs. On-Premises

General management – dbcli / OCI CLI / Terraform / API

• On the host: dbcli
  – Same cli for SI or RAC VMs/BM
  – Run as root
    • # dbcli -h
  – Some operations can only be performed using Controlplane:
    • Setup Data Guard
    • Patching older releases

  – https://docs.us-phoenix-1.oraclecloud.com/Content/Database/References/dbacli.htm

• With Controlplane
  – OCI CLI
    • https://docs.us-phoenix-1.oraclecloud.com/Content/API/Concepts/cliconcepts.htm
  – Terraform
    • https://docs.us-phoenix-1.oraclecloud.com/Content/API/SDKDocs/terraform.htm
  – API
    • https://docs.us-phoenix-1.oraclecloud.com/api/#/en/database/latest/
Create an Oracle RAC Service in the Oracle Cloud

Encryption & DB_Domain

• Databases are encrypted by default using an Autologin Wallet
• To work with tablespaces set ORACLE_UNQNAME (DB_UNIQUE_NAME)
• Hint: DB_UNIQUE_NAME is DBNAME_<Region>#number

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>db_unique_name</td>
<td>string</td>
<td>ssashdb_iad36c</td>
</tr>
</tbody>
</table>

• Databases use DB_DOMAIN as default:

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>db_domain</td>
<td>string</td>
<td>ad1.ssopub.oraclevcn.com</td>
</tr>
</tbody>
</table>

• Impact on service names (sspdb.ad1.ssopub.oraclevcn.com) & creation of a new service
Program Agenda

1. Overview
2. RAC in OCI-C
3. RAC in OCI
4. Demo RAC in OCI
5. Conclusion
Program Agenda

1. Overview
2. RAC in OCI-C
3. RAC in OCI
4. Demo RAC in OCI
5. Conclusion
Oracle RAC is ... RAC is ... RAC ...; also in the Oracle Cloud

On-Premises / Private Database Cloud

Oracle Cloud

Your Oracle Database in the Cloud

Enterprise-proven database cloud service that supports any size workload from dev/test to large scale production deployment. Multi-layered, in depth security with encryption by default. A highly available and scalable service delivering speed, simplicity and flexibility for faster time to value and savings.

Oracle Database on demand and highly available - on high-performance bare metal servers, or Oracle Exadata

Deploy Oracle databases quickly and easily in a highly-available cloud environment, and benefit from the performance of dedicated hardware, proven RAC reliability, data security, and granular controls.
The Oracle Cloud Benefits from ...

... Oracle’s expertise built in

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<tbody>
<tr>
<td>Oracle Cloud</td>
<td>Oracle Database</td>
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<tr>
<td>Oracle Exadata</td>
<td>Zero Data Loss Recovery Appliance</td>
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<tr>
<td>Oracle Sharding</td>
<td>Oracle Exalogic</td>
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<td>Oracle Exalytics</td>
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<td>Oracle Database Appliance</td>
<td>Oracle Fusion Middleware</td>
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<td>Oracle Applications Unlimited</td>
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<td>Oracle VM</td>
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<tr>
<td>Oracle Consulting and Support</td>
<td>Oracle Partners</td>
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Integrated Cloud
Applications & Platform Services