Do I have to learn new techniques to manage Oracle Database in the Cloud?

Biju Thomas
Principal Solutions Architect
OneNeck IT Solutions
www.OneNeck.com

@biju_thomas
About me!

- Principal Solutions Architect, with OneNeck IT Solutions
- Over 20 years of Oracle Database development and administration expertise
- Over 10 years of Oracle E-Business Suite Architecture & Tuning expertise
- DBA blog since 1997 - www.bijoos.com
- Oracle ACE Director
OneNeck IT Solutions at a Glance

• Backed by Fortune 500 strength of Telephone and Data Systems
• Hybrid IT, Multi-Cloud Management
• 550+ employees
• Coast to Coast Data Centers
Cloud is here to stay!

Cloud Infrastructure Services - Q2 2017
Market Share & Revenue Growth
(IaaS, PaaS, Hosted Private Cloud)

- Amazon
- Microsoft
- IBM
- Google
- Next 10
- Rest of Market

Market Share Gain - Last 4 Quarters
- Amazon: +1%
- Microsoft: +3%
- IBM: 0%
- Google: +1%
- Next 10: -1%
- Rest of Market: -5%

Source: Synergy Research Group
Why Cloud?

Just In Time Procurement & Provisioning

Purchase and pay for what you need and when you need. Stop paying when you no longer need!
Agenda

• IaaS Oracle Database Administrator

• PaaS Oracle DBA (managed DB)

• Oracle Database Cloud Service DBA

  • Oracle 18c Autonomous Database Service

  • Oracle Database Backup Cloud Service

• Cloud Migrations
Infrastructure as a Service (IaaS)
IaaS Options

- IaaS is closer to the metal in terms of running the database (and application).
- Full control on the (virtual) machine Operating System and database.

- Public Cloud IaaS (Hyperscale)
  - Shared, multi-tenant architecture
  - Hyper-scale, low cost, standard shapes & sizes.
  - Automated, self-service, metered
  - Amazon, Azure, Google, Oracle, Alibaba

- Private Cloud IaaS
  - On-premise (or)
  - Hosted Private Cloud Providers or Cloud Service Providers
    - Human interaction, Private Cloud
    - Better security & resource control
    - Complies with most Privacy & Security requirements

- Hybrid Cloud
  - Any Combination
IaaS – DBA Responsibilities!

On Premise
- Application Mgmt
- Database Mgmt
- Database Backups
- Database Patches
- OS Mgmt & Patches
- DB Software Install
- OS Installation
- Server Maintenance
- Rack & Stack
- Acquire Servers
- Network & Storage
- Power, HVAC

IaaS Hyperscale Cloud
- Application Mgmt
- Database Mgmt
- Database Backups
- Database Patches
- DB Software Install
- OS Mgmt & Patches

IaaS Hosted (Private) Cloud
- Application Mgmt
- Database Mgmt
- Database Backups
- Database Patches
- DB Software Install
Platform as a Service
(PaaS for Databases)
Platform as a Service (PaaS)

- Database as a Service (DBaaS) – Provider does Database Management

- Oracle Cloud
  - Exadata Express Service
  - Database Schema Service
  - Autonomous Database Cloud
  - License Included

- Amazon RDS
  - Partially managed by RDS team
  - “License Included” model (SE1, SE2 only)
  - “Bring-Your-Own-License (BYOL)” model (SE, SE2, EE)
Oracle DBaaS – Fully Managed

• Oracle Database Exadata Express Cloud Service
  • Oracle Database 12c Release 2 Enterprise Edition Pluggable Database (PDB) running on Exadata.
  • Network configuration, storage, database patching & upgrade and more. No customer DBA required.
  • Manage Exadata Express via an easy browser-based service console, SQL*Plus, SQLcl and other tools.
  • Use Oracle Application Express (APEX) for rapid development of web apps
  • Available in different shapes up to 1 TB of storage, 4 OCPUs, and 40 GB of memory (PGA/SGA)

• Oracle Database Schema Cloud Service
  • Schema Service runs Application Express (APEX)
  • Schema sizes 5G, 20G, 50G


<table>
<thead>
<tr>
<th>Shape</th>
<th>Pay As You Go (Hosted Environment Per Hour)</th>
<th>Monthly Flex (Hosted Environment Per Hour)</th>
<th>Part Number</th>
<th>Database Processor Maximum</th>
<th>Database Storage Maximum</th>
<th>Database Memory Maximum</th>
<th>Data Transfer Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exadata Express X20</td>
<td>$0.3528</td>
<td>$0.2352</td>
<td>B88408</td>
<td>1 OCPU</td>
<td>20GB</td>
<td>3.5GB PGA, 4GB SGA</td>
<td>120GB/month</td>
</tr>
<tr>
<td>Exadata Express X250</td>
<td>$0.8064</td>
<td>$0.5376</td>
<td>B88409</td>
<td>1 OCPU</td>
<td>250GB</td>
<td>3.5GB PGA, 4GB SGA</td>
<td>1500GB/month</td>
</tr>
<tr>
<td>Exadata Express X500</td>
<td>$1.613</td>
<td>$1.0753</td>
<td>B88410</td>
<td>2 OCPU</td>
<td>500GB</td>
<td>7.5GB PGA, 7.5GB SGA</td>
<td>3000GB/month</td>
</tr>
<tr>
<td>Exadata Express X1000</td>
<td>$3.2258</td>
<td>$2.1505</td>
<td>B88411</td>
<td>4 OCPU</td>
<td>1000GB</td>
<td>15GB PGA, 15GB SGA</td>
<td>6000GB/month</td>
</tr>
<tr>
<td>Exadata Express X1000IM</td>
<td>$8.0645</td>
<td>$5.3763</td>
<td>B88412</td>
<td>4 OCPU</td>
<td>1000GB</td>
<td>15GB PGA, 15GB SGA, 10GB RAM for use with Database In-Memory Column Store</td>
<td>6000GB/month</td>
</tr>
</tbody>
</table>
Exadata Express - Considerations

- PDB Lockdown profile
  - ALTER SYSTEM
  - ALTER SESSION
  - ALTER PLUGGABLE DATABASE
- Operating system access, common schema access are disabled.
- Network access is disabled, except when using APEX_WEB_SERVICE and APEX_MAIL PL/SQL APIs
- Resources controlled by Resource Manager (example Max CPU, max sessions)
Amazon RDS for Oracle

- Amazon Relational Database Service (Amazon RDS) makes it easy to set up, operate, and scale a relational database in the cloud.
- Managed Deployment, Easy to Scale & Highly Available options
  - Pre-configured set of parameters and configuration
  - Amazon CloudWatch metrics, AWS Management Console for monitoring and metrics
  - DB Event Notifications via SMS or email
  - Automatic Software Patching (optional control provided)
  - Automated backups and DB Snapshots
  - Easy to scale – compute, memory, storage & IOPS
  - Provision up to 6TB storage and 30,000 IOPS per database instance
  - Automatic host replacement (h/w failure) & Multi-AZ deployments (standby)

<table>
<thead>
<tr>
<th>Engine</th>
<th>Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Aurora</td>
<td>Oracle Database Enterprise Edition</td>
</tr>
<tr>
<td>MySQL</td>
<td>Oracle Database Standard Edition</td>
</tr>
<tr>
<td>MariaDB</td>
<td>Oracle Database Standard Edition One</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>Oracle Database Standard Edition Two</td>
</tr>
<tr>
<td>SQL Server</td>
<td></td>
</tr>
</tbody>
</table>

To get started, choose a DB Engine below and click Select.
AWS RDS – Administration Activities

• General Database Administration
  • Use API - rdsadmin.rdsadmin_util
  • Password verify function - rdsadmin.rdsadmin_password_verify.create_verify_function
  • Listing files: select * from table (rdsadmin.rds_file_util.listdir(p_directory => 'mydir'));

• Storage
  • Only add storage, up to 6TB. No downtime.
  • Apply immediately or during next maintenance.
  • Storage type change require downtime.

• Compute Capacity
  • Change DB Instance Class. Outage required.

• Init Parameter Changes
  • Update the parameter group. Change in DB occurs only when you reboot the DB instance for non-dynamic parameters.

• Tablespace
  • Create bigfile or smallfile tablespaces using CREATE TABLESPACE. Default autoextend with no size limit.
The following features are not supported for Oracle 12c on Amazon RDS:

- Automatic Storage Management
- Data Guard / Active Data Guard
- Database Vault
- Java Support
- Locator
- Multitenant Database
- Real Application Clusters (RAC)
- Spatial
- Unified Auditing

Use huge pages with any DB instance class that has 14 GB of memory

Support for OEM, TDE, APEX

Database upgrade is manual using AWS Management Console, API, or CLI

Enhanced monitoring using Agent (additional $$)

Tools
- AWS Management Console, CLI, API
- SQL*Plus, SQL*Developer, OEM
AWS RDS Provisioning

DBaaS (Managed) - Your Responsibilities!

On Premise
- Application Mgmt
- Database Mgmt
- Database Backups
- Database Patches
- OS Mgmt & Patches
- DB Software Install
- OS Installation
- Server Maintenance
- Rack & Stack
- Acquire Servers
- Network
- Power, HVAC

Exadata Express
- Application Mgmt

Amazon RDS
- Application Mgmt
- API DB Mgmt
- Upgrade / Patch / Resource Change

Hosted Cloud
- Application Mgmt
Oracle Database Cloud Service
Oracle Database Cloud Services

- **Oracle Database Cloud Service**
  - Automated provision and administer Oracle Database on Oracle Compute Cloud
  - Comes with an integrated Oracle Application Express environment

- **Oracle Database Cloud Service – Bare Metal**
  - Full power of a dedicated bare metal server without any noisy neighbor or virtualization overhead

- **Oracle Database Exadata Cloud Service**
  - Includes all the benefits of Exadata performance
  - Customer maintain control of database while Oracle manages the hardware, storage and networking infrastructure

- **Oracle Database Exadata Cloud Machine**
  - Database cloud to customers who require their databases to be located on-premises.

- **Oracle Database Exadata Express Cloud Service – Managed**
  - Oracle Database 12c Release 2 Enterprise Edition plus options running on Exadata – A PDB

- **Oracle Database Schema Cloud Service – Managed**
  - Runs Applilcation Express (APEX). Development env to create web apps.
## On-Premises

1. Procure Data Center Floor space
2. Procure Servers
3. Procure Storage Devices
4. Procure SSL Certificates & Keys
5. Procure HSM Devices (for encryption)
6. Procure OS Licenses
7. Procure Anti-Virus Licenses
8. Procure SIEM Licenses
9. Allocate Storage Admin
10. Allocate System Admin
11. Allocate Database Admin
12. Allocate Network Admin
13. Install Server
14. Cable Server to Network
15. Install SSL Certificates & Keys
16. Acquire Public/Private IP Addresses
17. Acquire Domain Name (from internal DNS)
18. Install Storage Devices
19. Acquire IP Addresses
20. Install SSL Certificates and Keys
21. Create Physical Storage Volumes
22. Register Storage Devices with Server
23. Install Operating System
24. Create System Administrator Accounts
25. Register with Corporate LDAP Directory
26. Register with Audit Software
27. Add Users to System Administration Accounts
28. Register Servers with Redhat Administrative Console
29. Install Hypervisor
30. Create Virtual LAN Partitions
31. Allocate IP Addresses (Private)
32. Carry out Network Address Translation (NAT)
33. Register Virtual LANs with Network Switch
34. Add Users to Hypervisor Administrator Accounts
35. Register Guests with VMWare ESX Console
36. Run Clusterware Pre-requisite checks
37. Run Oracle DBMS Install Pre-requisite checks
38. Read database installation guild
39. Stage Oracle Database software
40. Configure Oracle Database
41. Log in to the system as root
42. Check HW, Memory, System, Disk, software, OS, OS Kernel, package, compiler, and additional software requirements
43. Create required OS Groups and Users, Oracle Inventory group, oracle software owner, OSDBA group, OSOPER group
44. Synchronize groups with LDAP repository
45. Configure Kernel parameters and resource limits, create required directories, configure user
46. Install oracle database; select clusterware/grid installation, specify base installation pathname
47. Specify software location, choose file system or ASM, specify file location, specify ASNSNMP password, database edition, OSDBA group, global name
48. Specify database name, database name domain, administrative password, confirm password
49. Verify database is functioning properly
50. Email developers access credentials and configuration details

On-Premise Vs Database Cloud Comparison

**On-Premises**

1. Procure Data Center Floor space
2. Procure Servers
3. Procure Storage Devices
4. Procure SSL Certificates & Keys
5. Procure HSM Devices (for encryption)
6. Procure OS Licenses
7. Procure Anti-Virus Licenses
8. Procure SWS Licenses
9. Allocate StorageAdmin
10. Allocate System Admin
11. Allocate Database Admin
12. Allocate Network Admin
13. Install Server
14. Cable Server to Network
15. Install SSL Certificates & Keys
16. Acquire Public/Private IP Addresses
17. Acquire Domain/Name (from Internal DNS)
18. Install Storage Devices
19. Acquire IP Addresses
20. Install SSL Certificates and Keys
21. Create Physical Storage Informer
22. Register Storage Devices with Server
23. Install Operating System
24. Create System Administrator Account
25. Register with Corporate (SSP Directory)
26. Register with Audit Software
27. Install scripts to System Administration Accounts
28. Register Servers with Remote Administrative Console
29. Install Hypervisor
30. Create Virtual LAN Partitions
31. Allocate IP Address (Private)
32. Carry out Network Address Translation (NAT)
33. Register Virtual LANs with Network Switch
34. Add scripts to Remote Administration Accounts
35. Register Guest with VMWare ESXi Console
36. Run Checkmore Pre-installation Checks
37. Run Oracle DBMS Pre-installation checks
38. Add database installation path
39. Stage Oracle database software
40. Configure Oracle Database
41. Log in to the system as root
42. Check HW, Memory, System, Disk, software, OS, OS format, package, compiler, and additional software requirements
43. Create required DB Groups and Users, Oracle Inventory group, oracle software owner, OSDBA group, OSOPER group
44. Synchronize groups with LDAP repository
45. Configure normal parameters and repository limits, create required directories, configure user
46. Install oracle database, select installation directory, installation type, base installation pathnames
47. Specify database location, choose file system or ASM, specify file location, specify UNDO/redo password, database edition, OSDBA group, global name
48. Specify database name, database name domain, administrator password, confirm password
49. Verify database is functioning properly
50. Email developers issues abnormalities and configuration details

**Oracle Database Cloud**

1. Choose version of DBMS
2. Choose Edition SE, EE, EE High, EE Extreme
3. Choose Shape – storage, cores, memory
4. Choose Backup and Patching windows
5. Upload Public Key
6. Press Go

30 Minutes

Days or Weeks
High Availability & Security Options

- **Oracle RAC**
  - Limited to a two-node cluster
  - Database Storage is on Oracle ASM and ACFS. (non-RAC storage is on Linux LVM)

- **Data Guard**
  - One primary database and one standby database hosted on two independent compute nodes
  - Oracle Active Data Guard available (Extreme Performance option)

- **Oracle Golden Gate**
  - A virtual machine that provides Golden Gate replication services

- **Oracle Database Vault**
  - Use cloud tooling to configure and enable

- **Tablespace Encryption**
  - All user-created tablespaces are encrypted by default
Automated Provisioning & Management
Database Cloud Service – Edition Options

- Standard Edition
  - SE1 or SE2

- Enterprise Edition
  - EE with TDE
  - Data Guard

- EE High Performance
  - EE plus...
  - Multitenant
  - Partitioning
  - RAT, OLAP
  - Adv. Compression
  - Adv. Security
  - Adv. Analytics
  - Database Vault
  - Spatial & Graph
  - Diag + Tuning Pack
  - Lifecycle Mgmt Pack
  - Data Masking Pack
  - Cloud Mgmt Pack

- EE Extreme Performance
  - EE High Perf. plus...
  - Active Data Guard
  - RAC
  - In-Memory Database
Oracle Cloud – The Menu

- New generation cloud (default)
- Traditional cloud
- Compute cloud (OCI)
- Ravello
- Corente
Create Instance

- Analytics
- Big Data - Compute
- Exadata (OCI)
- Database (OCI)
- Storage Classic
- Event Hub - Dedicate
- Database
- GoldenGate
- Compute
- Database (OCI)
Example: Oracle Exadata Cloud

Create New Oracle Database Exadata Cloud Service Instance

Instance Details

Provide the instance details you want for your service.

* Name: ODECSI

* Data Center: US Commercial 2

* Plan: Exadata Cloud Service - Custom

* Rack size: Quarter Rack X6

Additional details:

- Additional number of OCPUs (Core):
- Exadata System Name: STEX01
- Database backups on Exadata Storage
- Create sparse disk group?

Administrator Details

* Email: byc.thomas@gmail.com
- Use email as username
* First Name: Bill
* Last Name: Thomas

Instance Details

* Name: ODECSI
* Data Center:
  - Full Rack
  - Full Rack X6
  - Half Rack
  - Half Rack X6
  - Quarter Rack
  - Quarter Rack X6

* Plan: Exadata Cloud Service - Custom
* Rack size: Quarter Rack X6
Example: Oracle Database Cloud
Example: Oracle Cloud Infrastructure (OCI)

Launch DB System

If the Virtual Cloud Network or Subnet is in a different Compartent, click here to enable Compartmentalization.

DB System Information

- **DISPLAY NAME**: DBOCI01
- **AVAILABILITY DOMAIN**: BPY-US-ASHBURN-AD-1
- **ORACLE DATABASE SOFTWARE EDITION**: Enterprise Edition
- **CPU CORE COUNT**: 2
- **LICENSE TYPE**: License Included

The number of CPU cores to enable on the DB System. Specify a multiple of 2, unless your volume library supports 1.

Oracle Database Software Edition: Enterprise Edition

Virtual Cloud Network: BTOCVCN

Client Subnet: Public Subnet BPY-US-ASHBURN-AD-1

Hostname Prefix: bmoc

License Type: License Included

OCID: ocid1cloudservice.ocloud.com

Created: Wed, 10 Jan 2018 22:16:56 GMT

DB System Version: 12.2.1.2.0

CPU Core Count: 2

Disk Redundancy: High

Port: 1521

Host Domain Name: sub01102310500.btoocvcn.oraclecloud.com

Resources

- Nodes (1)
- Databases (1)
- Patches (1)
- Patch History (0)

Nodes

- **Host Name**: bmoc
- **OCID**: ocid1cloudservice.ocloud.com
- **Private IP Address & DNS Name**: 10.0.0.2
- **Public IP Address**: 128.213.28.189

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

Launch DB System
Operating System or Server Access
Change Resources As Needed
Database Provisioning & Patching
Connecting to Cloud Database

http://bijooos.com/oraclenotes/2016/1808
DBaaS Monitor

- Using Access Rules, open port 443
- **Menu**
  - **Manage**: This is the only menu item where you can make any change to the instance. This is where you manage the PDBs.
  - **Listener**: Listener status and “lsnrctl status” output.
  - **Storage**: CDB and PDB storage summary.
  - **Backups**: RMAN backup status
  - **Alerts**: Alert log messages in an easy to filter framework.
  - **Sessions**: Database sessions from CDB and PDB.
  - **Waits**: Wait events and affected sessions.
  - **Parameters**: Database parameters
  - **Real Time SQL Monitor**: Status of SQL statements running in the database
  - **The OS menu shows Operating System metrics.**

http://bijoos.com/oracle-notes/2016/1879
OEM Database Express 12c

- Open port 5500 (if 11g, open port 1158)
Cloud Tooling – dbaascli & raccli

- Perform a variety of life-cycle and administration operations.
  - Start, Stop, Status database and listener
  - Changing the password of the SYS user
  - Checking the status of the Oracle Data Guard configuration
  - Switchover and failover in an Oracle Data Guard configuration
  - Patching the database deployment
  - Database recovery
  - Rotating the master encryption key
  - Configure Data Vault
  - Configure Golden Gate
- Remember to update cloud tooling to latest immediately after provisioning service

Database - bounce, start, status, stop, changepassword

Dataguard - failover, reinstate, status, switchover

Dbpatchm - apply, clonedb, list_patches, list_tools, prereq, rollback, switchback, toolsinst

Dv - on, off
Gg - setup, status

Listener - bounce, start, stop, status

Netsec - config, status

Orec - duplicate, latest, list, pitr, scn, keep list, keep tag

Tde - status, rotate masterkey

http://bijoos.com/oraclenotes/2016/1904
Cloud Tooling - dbpatchmdg

- Perform a variety of patching operations
  - List available patches
  - Check if nodes are ready for patching
  - Apply patches
  - Roll back patches

The oracle-dbcs-cli Utility

- Run on your Linux computer to connect to Oracle Cloud and perform a variety of life-cycle and administration operations
Oracle DB Cloud - Your Responsibilities!

On Premise
- Application Mgmt
- Database Mgmt
- Database Backups
- Database Patches
- OS Mgmt & Patches
- DB Software Install
- OS Installation
- Server Maintenance
- Rack & Stack
- Acquire Servers
- Network
- Power, HVAC

Oracle Database Cloud Service
- Application Mgmt
- Database Mgmt
- Database Backups
- Database Patches
- OS Mgmt & Patches

Using Tools & Automation
Oracle Database 18c
# Release Schedule of Current Database Releases (MOS 742060.1)

## Oracle Public Cloud Releases

<table>
<thead>
<tr>
<th>Platform</th>
<th>18</th>
<th>12.2.0.1</th>
<th>12.1.0.2</th>
<th>11</th>
<th>1</th>
</tr>
</thead>
</table>

### On-Premises Server Releases (includes client)

<table>
<thead>
<tr>
<th>Platform</th>
<th>Linux x86</th>
<th>Linux x86-64</th>
<th>Oracle Solaris SPARC (64-bit)</th>
<th>Oracle Solaris x86-64 (64-bit)</th>
<th>Microsoft Windows x64 (64-bit)</th>
<th>HP-UX Itanium</th>
<th>HP-UX PA-RISC (64-bit)</th>
<th>IBM AIX on POWER Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exadata Express Cloud Service</td>
<td>TBD</td>
<td>18-Sep-2016</td>
<td>N/A</td>
<td>2HCY2018</td>
<td>1-Mar-2017</td>
<td>22-Jul-2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-Premises Engineered Systems Same soft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oracle Database Appliance</td>
<td>1Q2018</td>
<td>17-Nov-2017</td>
<td>Apr 2014</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exadata</td>
<td>1Q2018</td>
<td>10-Feb-2017</td>
<td>Oct 2014</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supercluster</td>
<td>TBD</td>
<td>10-Feb-2017</td>
<td>Nov 2014</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MiniCluster (Solaris SPARC)</td>
<td>TBD</td>
<td>1HCY2017</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*See footnote 8 below*
Cloud Migration Options
VMWare Workloads on (Oracle) Public Cloud

Ravello brings data-center capabilities to public cloud

Enables running VMware or KVM workloads on public cloud without any changes
Same VMs, networking & storage

No workload changes → Data-center to cloud in **hours**, and **NOT months**
Data Migration – Deciding Factors

- Version – Source and Target
- Size
- If Target is Multitenant CDB
- Characterset
- Endian Format
- Downtime
Data Pump – Export & Import

• No concerns with:
  • Character set & Endianness
  • Version (mostly, data pump if source is 10g and above, legacy exp/imp if version lower than 10g)
  • Multitenant architecture

• Concerns:
  • Downtime required
  • Database size and dump file transfer (SFTP) time

Data Pump – Full Transportable

- On premise and cloud database must have same character set and compatible endianness
- Source database must be 11.2.0.3 and higher
- Can migrate NCDB → NCDB/PDB
- Downtime required
  - Tablespaces in RO mode during export and FTP of data files

Data Pump – Transportable Tablespace

- On premise and cloud database must have same character set and compatible endiannessness
- On premise must be little endian
- Suitable for migrating part of database
- Can migrate NCDB → CDB/PDB
- Downtime required
  - Tablespaces in RO mode during export and FTP of data files

Remote Cloning PDB or Non-CDB

• On-premise must be little Endian
• Version must be 12.1.0.2 or higher
• Must have compatible characterset

• Duration of clone, the source PDB must remain READ ONLY (PDB Clone)

• Duration of clone, the source non-CDB must remain READ ONLY (CDB to PDB Clone)

https://docs.oracle.com/database/121/ADMIN/ADMIN/cdb_plug.htm#ADMIN13593
12c Database – Unplug & Plug

• Plugging Non-CDB
  • Starting with Oracle Database 12c Release 1 (12.1.0.2), you can create a PDB by cloning a non-CDB.
  • Use the DBMS_PDB package on a non-CDB to enable you to plug the non-CDB into a CDB.

• Plugging PDB
  • Close and Unplug PDB
  • Copy compressed .pdb file to cloud and plug in

https://docs.oracle.com/database/122/ADMIN/creating-and-removing-pdbs-with-sqlplus.htm#ADMIN-GUID-60C23F96-6EF3-4BE3-B8CF-5AD6EC29954F
RMAN Migration Options

• Backup & Restore

• Cross-Platform Transportable PDB

• Cross-Platform Transportable Tablespace Backup Sets

• Transportable Tablespace with Datapump

• RMAN Convert Transportable Tablespace with Datapump
Other Migration Options

- SQL*Loader
- Database Links & Insert Statements
- Data Guard
- Golden Gate
- SQL Developer
  - Table Copy
  - Database Copy
### Traditional DBA Role

#### Generic Tasks
- (Contribute in the) configuration and tuning of systems, network, storage.
- Database provisioning, patching
- Database backups, HA, DR
- Database Optimization

#### Specific to business
- Architecture, design, data model
- Data security
- Change management
- Application tuning
- Service level management

#### DBA responsibility

<table>
<thead>
<tr>
<th>Category</th>
<th>DBA responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Designing schema, access patterns, locking strategy, SQL development, and tuning.</td>
</tr>
<tr>
<td></td>
<td>Modifying the database structure</td>
</tr>
<tr>
<td></td>
<td>Optimizing application and end-user queries (reactive tuning)</td>
</tr>
<tr>
<td></td>
<td>Archiving data</td>
</tr>
<tr>
<td></td>
<td>Generating needed ad hoc reports by querying from the database</td>
</tr>
<tr>
<td></td>
<td>Proactive performance tuning</td>
</tr>
<tr>
<td>Access</td>
<td>Enrolling users and maintaining system security</td>
</tr>
<tr>
<td></td>
<td>Controlling user access to the database</td>
</tr>
<tr>
<td></td>
<td>Locking down host access</td>
</tr>
<tr>
<td></td>
<td>Securing database privileged credentials (SYSDBA or SYSTEM for Oracle, sa for SQL Server)</td>
</tr>
<tr>
<td>Database</td>
<td>Parameter configuration and tuning</td>
</tr>
<tr>
<td></td>
<td>Cache management</td>
</tr>
<tr>
<td></td>
<td>Job scheduling</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Monitoring performance metrics, response times, and request rates</td>
</tr>
<tr>
<td></td>
<td>Alerting</td>
</tr>
<tr>
<td></td>
<td>Object access</td>
</tr>
<tr>
<td></td>
<td>Logs</td>
</tr>
<tr>
<td>Platform</td>
<td>Ensuring compliance with database vendor license agreement</td>
</tr>
<tr>
<td></td>
<td>Designing and implementing disaster recovery (DR) solutions</td>
</tr>
<tr>
<td></td>
<td>Allocating system storage and planning future storage requirements for the database system</td>
</tr>
<tr>
<td></td>
<td>Installing and upgrading the database software</td>
</tr>
<tr>
<td></td>
<td>Performing data backups</td>
</tr>
<tr>
<td></td>
<td>Creating, managing, and monitoring high-availability (HA) systems</td>
</tr>
<tr>
<td></td>
<td>Patching the software that powers your database</td>
</tr>
<tr>
<td></td>
<td>Troubleshooting DB errors and potentially contacting vendors for technical support</td>
</tr>
</tbody>
</table>
What’s DBA Role in the Cloud Era?

- Cloud Provider takes care of:
  - System, Network, Storage
  - Provisioning
  - Backups
  - Some level of patching & maintenance (few cloud models)
- DBA role:
  - Architecture, planning, data modeling
  - Understand data
  - Data and application security
  - Application tuning, database and SQL tuning – Help enhance application stability
  - Perform thorough RCA if something breaks
  - End-to-end service level management
  - Working with on-prem & cloud
  - Determine which applications are suitable for cloud
  - Network connectivity, VPN, Storage
  - Integration with different flavors of database
  - Critical thinking, communication skills, problem-solving
  - Read Documentation
  - Work less than 50 hours/wk, spend time with family & friends!

One way we look at this change is to think about the title without the “B” in DBA—moving them to a “DA” (data administrator or a data architect). A data administrator isn’t just keeping data in a database, but understands the importance of that data to key business stakeholders and in driving the business forward.

- Penny Avril, Oracle
Things to Consider

- Cloud is the direction
  - Dynamic Scalability.
  - Improved security, availability and compliance.
  - Enterprise-class performance.
  - Focus on strategic IT.
  - Lower total cost of ownership (TCO).
  - Increased agility to take advantage of new opportunities quickly.

- IaaS or PaaS or SaaS
  - Workload
  - Application supportability

- Managed or Full-Control
  - Patching & Configuration flexibility
  - IaaS / Private Cloud with Hosted Cloud Providers

- Hybrid IT
  - Cost effective
  - Combination of hyper scale public cloud IaaS or DBaaS (test / dev) with hosted private cloud (mission-critical production)
Don’t Forget Licensing

• Authorized Cloud Environments
  • Amazon Web Services – Amazon Elastic Compute Cloud (EC2), Amazon Relational Database Service (RDS)
  • Microsoft Azure Platform

• When counting Oracle Processor license requirements in Authorized Cloud Environments, the Oracle Processor Core Factor Table is not applicable

• Oracle Standard Edition One and Standard Edition 2 may only be licensed on Authorized Cloud Environment instances up to eight Amazon vCPUs or four Azure CPU Cores.

• Features like RAC, Multitenancy, In-memory, Active Data Guard may not be certified.

http://bijoos.com/oraclenotes/2017/2065
There are plenty of enhancements and automation in the Oracle Database and tools. Oracle DBAs have nothing to fear if you keep your skills current and focus on solving business problems.
Join me at the RMOUG Training Days where I’ll be presenting

Oracle Database 12c Features for Developers!
Thank you!

Daily #oratidbit on Facebook and Twitter. Follow me!

Tweets @biju_thomas
Facebook facebook.com/oraclenotes
Google+ +bijoosoraclenotes
Blog bijoos.com/oraclenotes