ORACLE

Autonomous Database

Serverless & Dedicated– L200

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Oracle Cloud Infrastructure

October 2019

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Objectives

After completing this lesson, you should be able to:

- Autonomous Database in OCI & Deployment Considerations
- DB Cloud Service Comparison
- Architecture & Best Practices for Autonomous Database Dedicated
- Understand ATPD Client Connections
- Describe the security Option in ATPD
- Describe High Availability option in ATPD
- Describe customized software Updates & Patching in Autonomous Database-Dedicated
- Describe developer tools and productivity in Autonomous Database
- Describe How to Migrate to Autonomous Database.
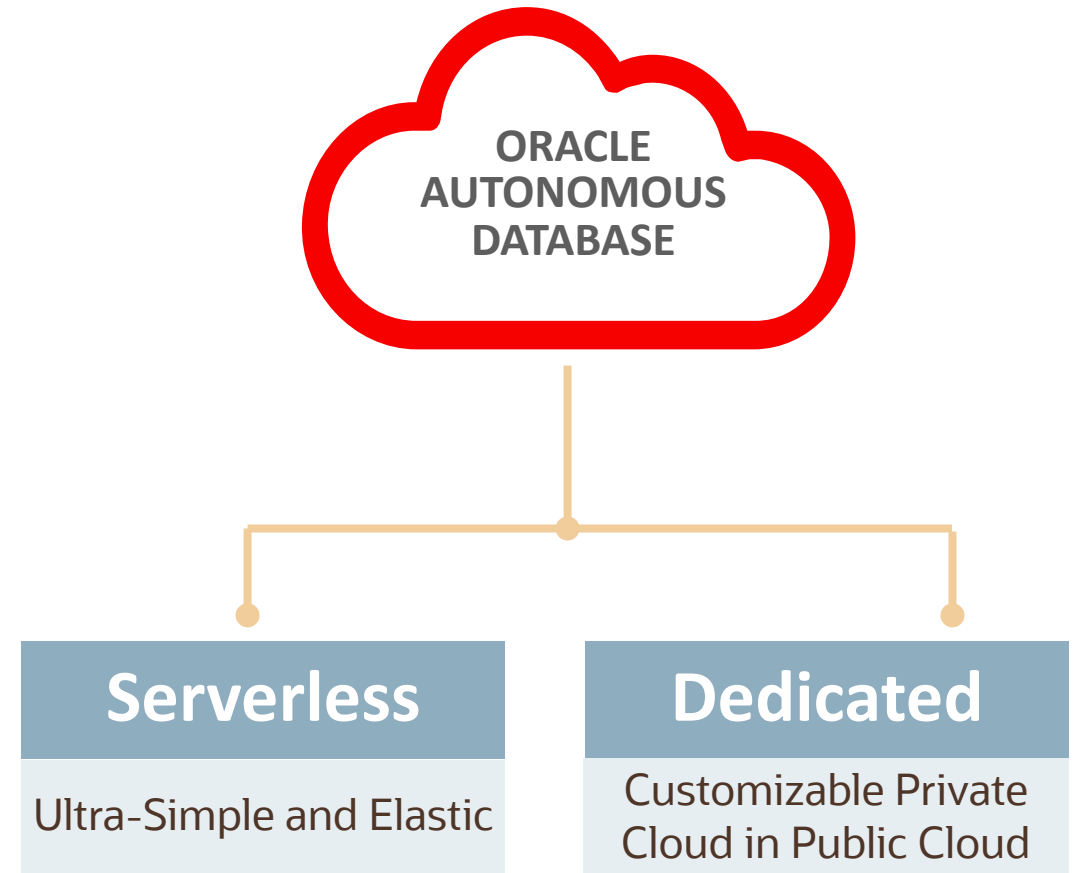- Management & Monitoring Options for Autonomous Database
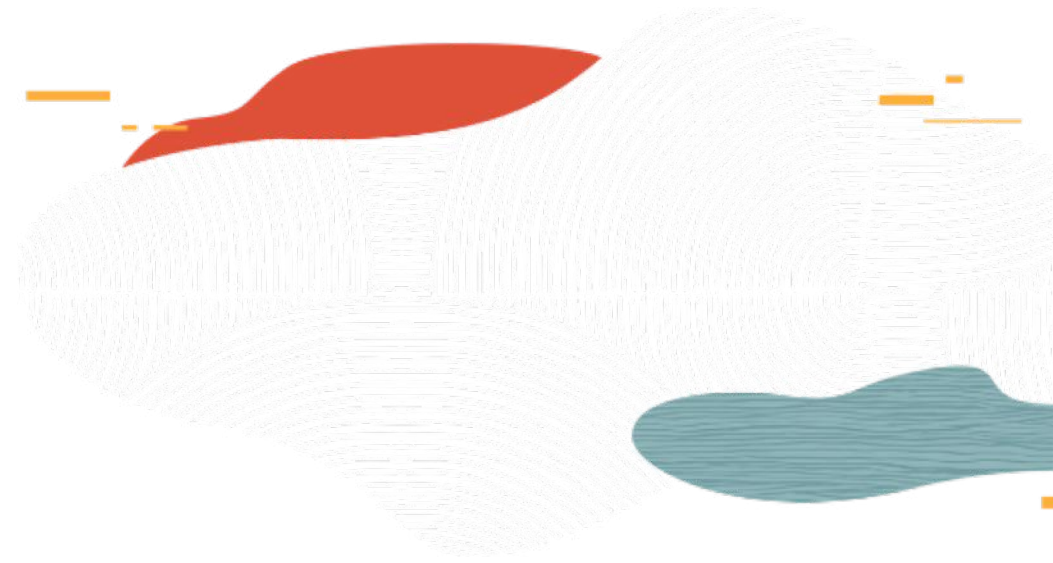
Part 1. Autonomous Database in OCI

Deployment Considerations

Autonomous Database in OCI & Deployment Considerations

- Oracle Autonomous Database is a family of products with each member of the family optimized by workload.

- Autonomous Data Warehouse (ADW), has been optimized for analytic workloads, such as data warehouse, data marts or as part of a data lake.

- ATP is optimized for transaction processing or mixed workload environments and makes an excellent platform for new application development.

ORACLE AUTONOMOUS DATABASE

Serverless

Ultra-Simple and Elastic

Dedicated

Customizable Private Cloud in Public Cloud

@ 2019 Oracle

Autonomous Database Serverless vs Dedicated

Serverless – Primary Goals/Benefits

Simple
- Oracle automates and manages everything
  - Deployment, lifecycle, software updates, etc.
- Customer just chooses database compute, storage, and region

Elastic
- Low minimum size - 1 OCPU and 1 TB of storage
- Low minimum time commitment - 1 hour
- Instantly grow or shrink online, pay for what you use

Dedicated – Primary Goals/Benefits

- Provides a **Private Database Cloud** running on dedicated Exadata Infrastructure in the Public Cloud
  - Runs all your databases - any size, scale, or criticality

- Highest **Isolation**
  - Multiple levels of isolation protect from noisy or hostile neighbors

- Customizable **Operational Policies**
  - Control of provisioning, software updates, availability, density

Serverless Exadata Cloud Infrastructure
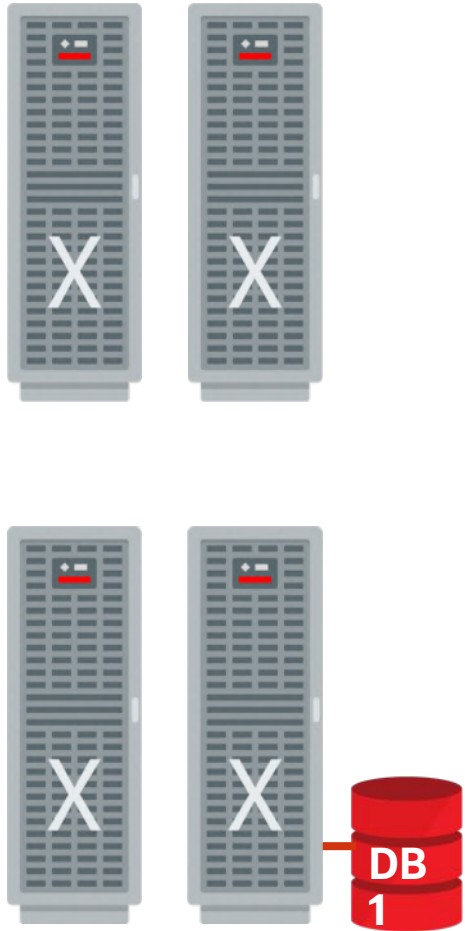
- Database is placed on Exadata Cloud Infrastructure based on Region
- Oracle completely manages and controls all placement, patching, software versions, and isolation
  - Zero customer administration required
- RAC cluster enables rolling upgrades and fast failover
- Low minimum size/cost - 1 OCPU and 1 TB of storage
- Low minimum time commitment – 1 hour
- Designed for Common compliance apps or Public cloud apps

DB 1

Autonomous Transaction Processing-Dedicated(ATPD)

Physical characteristics and constraints

- Quarter rack X7 Exadata Infrastructure
    - 2 Compute Severs(92 OCPU, 1.44TB RAM)
    - 3 Storage Servers (76.8TB Flash, 107TB Disk)

- Cluster / Virtual Cloud Network
    - 1 Cluster per quarter rack

- Autonomous Container Database
    - Maximum of 4 per Cluster

- Autonomous Database
    - High Availability SLA – Maximum 200 DBs
    - Extreme Availability SLA – Maximum 25 DBs
    - Placement Logic - Open on 1 server < 16 OCPU

- Overprovisioning in V1 – race to the top at CDB level for physical cores, then over provision

    - Maximum of 10 Autonomous Databases per OCPU

SHOP .... SHIP

WEB STORE

RAC CLUSTER
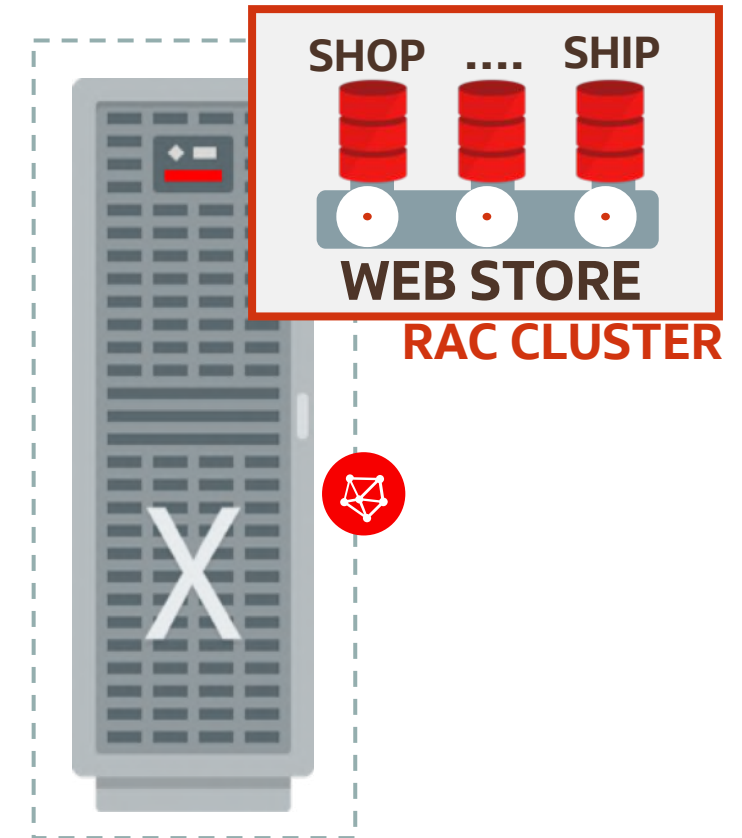
Autonomous Database – Selection Considerations

Serverless

- The easiest to get started with as its only 1 core, 1 hour minimum
    - Can test ideas out quickly and terminate when complete with no ongoing costs
- No need to worry about placement, no Availability Domain placement controls
    - Response latency variations constrained by Oracle Virtual Cloud Network < 500us between Ads
- No bothering with patch scheduling or software versioning
    - Oracle completely deals with all service / database patching
    - Can configure Oracle Application Continuity to minimize downtime impact to maintenance
- Cloning capability available today, for easiest test database creation
- Auto-Scaling capability available today, for hands free scaling of variable workloads
- Functionally, ready for any need to upgrade from Serverless to Dedicated for production

Autonomous Database – General Selection Considerations

Dedicated

- Higher cost entry, must subscribe to minimum 1 month Exadata Infrastructure

  Once subscribed, can test ideas out quickly and terminate when complete, no ongoing software costs

- Includes Availability Domain placement controls for latency sensitive apps

  Response latency in the microseconds and consistent over time, no placement changes

- Policy controls for patch scheduling and software versioning

  Oracle completely deals with all patching, but you can control what version and when

  Allows to stage a specific version to your Dev-Test or Pre-Production, before Production

  Oracle Transparent Application Continuity automatically minimizes downtime impact to maintenance

- Test Database creation requires an export to and import from Object Store

- Cloning and Auto-Scaling capability available.

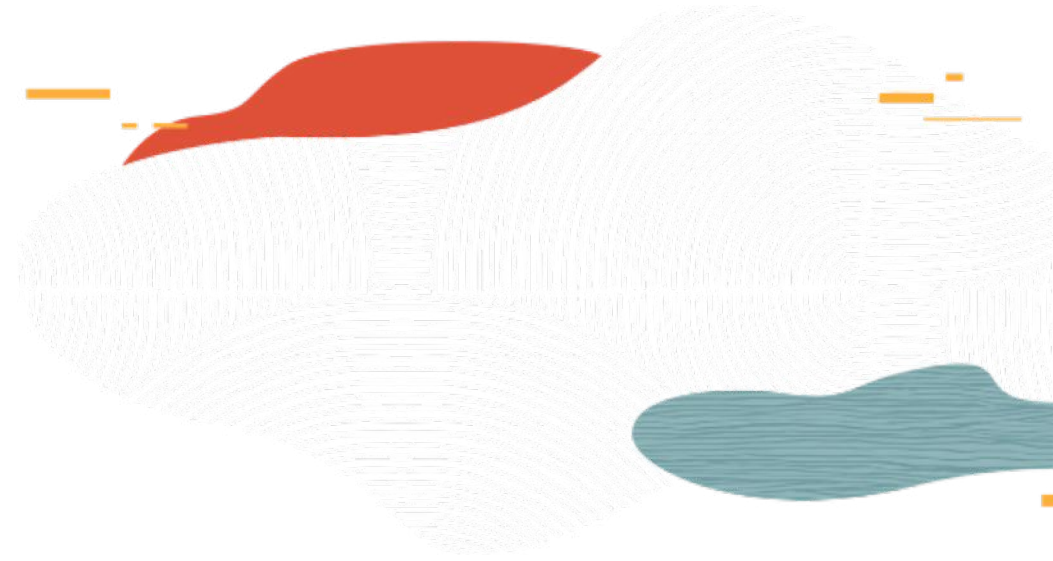# Autonomous Database Feature Considerations

Database feature comparison for detailed selection criteria

Feature	ATP-D	ATP-S
CREATE TABLESPACE	Yes	No
Transparent Application Continuity	Yes	No (Application Continuity Only)
Clone Support	No	Yes
Database Vault	Yes	No
PROFILE	Yes	No
Database version 19c	Yes	Preview only, no convert to GA
Auto-Scaling	No	Yes
Auto-Indexing	Yes	Preview only, no convert to GA
Documented RTO / RPO	Yes	No
OCI Notifications Service integrated	Yes	No (Classic Admin Notifications)
Maintenance History Reporting	Yes	No

https://docs.oracle.com/en/cloud/paas/atp-cloud/atpug/experienced-database-users.html#GUID-58EE6599-6DB4-4F8E-816D-0422377857E5

Autonomous Database Feature Considerations

Service feature comparison for detailed selection criteria

Feature	ATP-D	ATP-S
VCN, Private IP, Azure Secure Connect	Yes	No
Backup Retention Configuration	Yes	No
Private - Single Tenant IaaS	Yes	No
Controllable Software Update Version	Yes	No
Controllable Software Update Schedules	Yes	No
Availability Domain placement choice	Yes	No
Separate Development, Test & Prod LCM	Yes	No
Consolidation / Overprovisioning control	Yes	No
SQL Dev – web / EM Monitoring	Yes	SQL Dev-web, no EM Monitoring
Non-TLS SQL *Net	Yes	No
RAC session co-location tagging	Yes	No
Skip Updates during critical business periods	Yes	No

DB Cloud Service Comparison

Deployment Considerations-Autonomous vs Automated

Autonomous vs Automated Database Services

ORACLE CLOUD

Autonomous Database

- All database operations fully automated
- User runs SQL, no access to OS or CDB
- Exadata Performance and Availability
- Customizable for DW or TP Workload

Automated DB Services

- Database lifecycle automation provided
- User operates, has DBA and OS root access
- Runs older database versions
- ALL database features (e.g. Java, etc)

Serverless
Ultra-Simple & Elastic

Dedicated
Customizable Private Cloud

ExaCS
Scale, Performance, Availability

DBCS
VM or bare metal, single server or RAC

Oracle Database – Choice of Deployment

DB installed on Generic HW on premises

DB installed on Oracle Exadata on premises

DB on Oracle Cloud Infrastructure

DBaaS – BM/VM

Exadata Cloud Service or Exadata Cloud at Customer

Oracle Autonomous Database

Most Manual
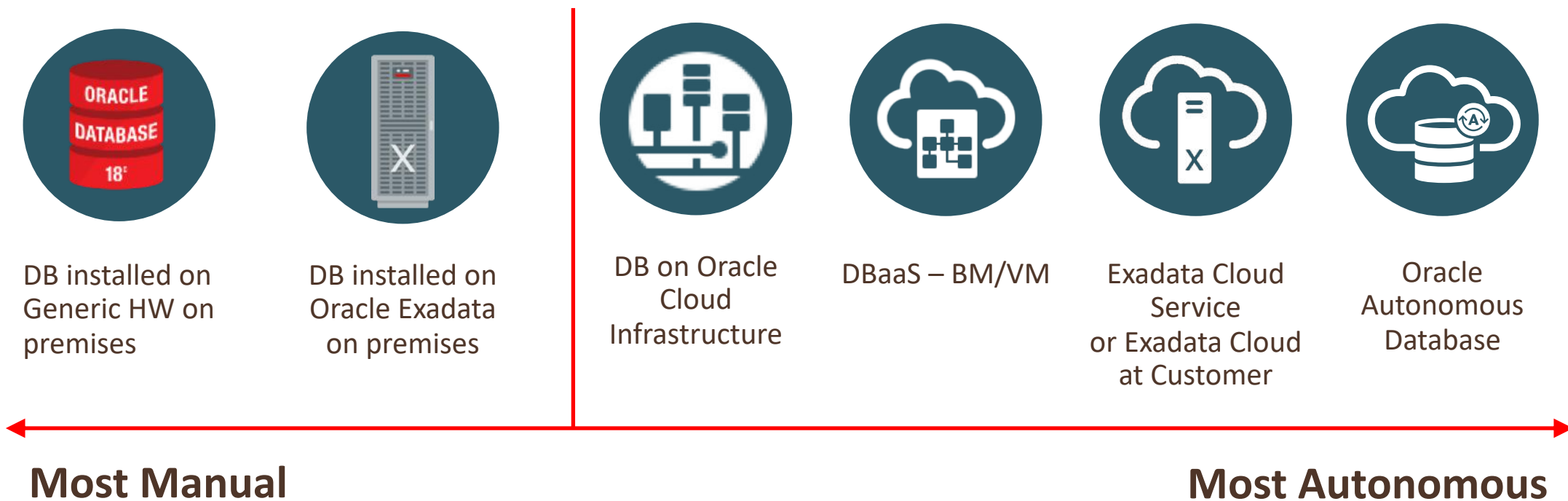
Most Autonomous

Autonomous Database – Choice of Cloud Deployment

	DBaaS VM or Bare Metal	Exadata Cloud Service or Cloud @ Customer	Autonomous Serverless	Autonomous Dedicated
Management	Customer	Customer	Oracle	Oracle
Private Network	Yes	Yes	No	Yes
Single/Multi Tenant	Single/Multi	Single/Multi	Single	Single/Multi
Software Updates	Customer Initiated	Customer Initiated	Automatic	Customer Policy Control
Private Cloud	No	Yes	No	Yes
Offers Availability SLA	No	99.95%	SLO	SLO
Database Versions	11g,12c,18c,19c	11g,12c,18c,19c	18c	19c
Disaster Recovery	Yes Across Ads & Regions	Yes Across Ads & Regions	No	No
Hybrid DR	Yes	Yes	No	No
Consolidation	Yes	Yes	No	Yes

Autonomous vs Automated Database Services Cont..

Autonomous Database
Fully Self-Driving Database
Oracle Builds and Operates Exadata Infrastructure and Databases
User runs SQL, no Access to OS or Container DB

Cloud elasticity, Machine Learning, Self driving
Instant Provisioning, Always online operation
All workloads, JSON Documents,
Graphs, and more

Oracle Database Cloud Services
Automated Database Cloud
Oracle Builds and Operates Infrastructure
User Operates Databases Using Provided Lifecycle Automation
User Has Full Control, including DBA and Root Access

Availability, Flexible Version and Features,
Small to Large DB deployment,
Single Instance or RAC, Automated Backup,
Patching, Customer controls

Exadata
World's Best Database Platform
Oracle Builds, Optimizes, and Automates Infrastructure
All In-Database Automation Features Included

Private/Public Cloud on-premise, Consolidation,
Highest Performance, Scalability for Mission
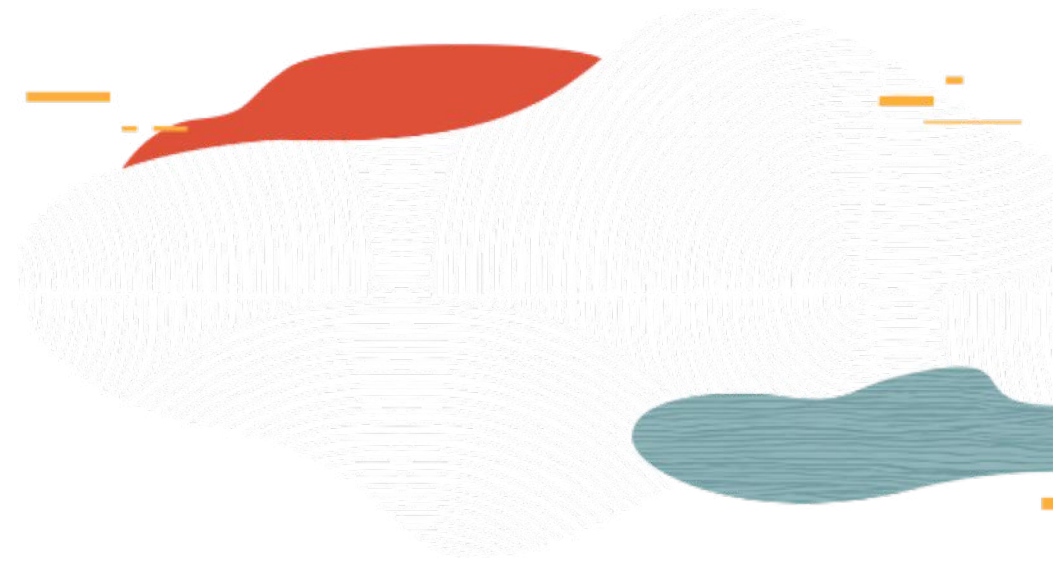Critical Workload , Customer Controls.

Oracle Database
World's Best Database
Runs Anywhere
User Builds and Operates Databases and Infrastructure

Small to Big Database transactional need
as well DWH needs, Customer Data Center,
DIY model

Part 2. Autonomous Database Dedicated

Deployment Considerations-Architecture & Best Practices

# Network Architecture –Dedicated Autonomous Database

- Full Virtual Cloud Network support
  - Public and Private Subnets
- Private IP at the Cluster level (combined with Exadata Infrastructure)
- Cloud compute native connections
  - OCI Subnets, VCN Peering
- Customer corporate network connections
  - VPN Connection – using DRG for IPSec tunneling from corp network edge
  - FastConnect for high speed - keeps traffic completely off the internet

Microsoft Azure secure connections

Network Architecture-Autonomous Database Dedicated

Best Practices Customer VCN setup

- Production Setup Common Isolation
  - Single VCN, AEI/Cluster in Private Subnet
  - Client tier in separate Private Subnet
  - Web tier in Public Subnet
- Production Setup High Isolation
  - Peered VCNs, AEI in Private Subnet
  - Client tier in separate VCN, Private Subnet
- Development Setup
  - Single VCN, Bastion Host in Public Subnet
    - DRG with VPN endpoints
  - AEI in Private Subnet, bastion routing rules
  - Easy developer connections from Laptop
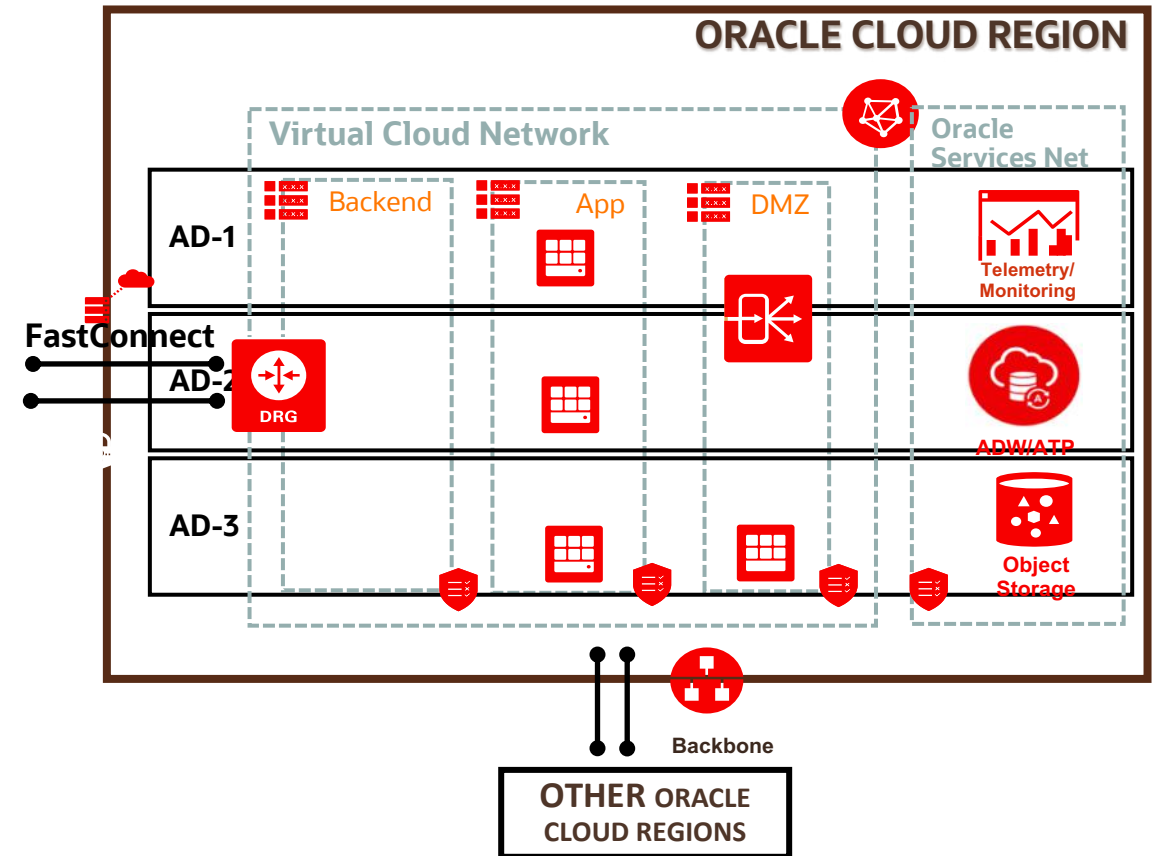
Autonomous Database – Dedicated

Getting Started with Private Cloud Setup

Request Service Limit Increase for Exadata Quarter Rack

Results in a CAM / JIRA ticket that must get approved by PM before can use Dedicated

Fleet and DBA user role setup

OCI Policies created to separate service user responsibilities and create private cloud isolation

Private Cloud setup

OCI Compartments assigned to IT and End Users based on organizational structure

Create Private Networking overlay for organizational structure

Create Autonomous Exadata Infrastructure and Containers into IT Compartments

Different shapes are available to choose from like –Quarter, Half, Full etc.

Provide self-service access to end users to create and use Autonomous Databases

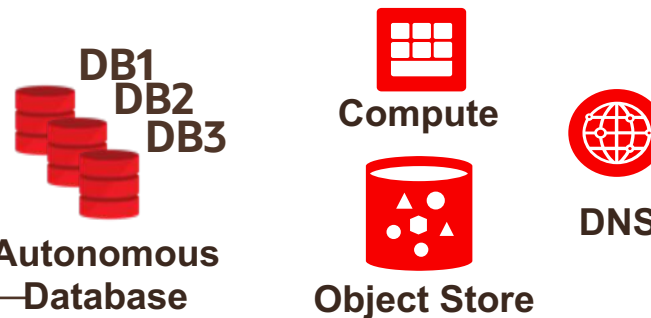# Autonomous Database – Dedicated Private Cloud

Group of Users

Self-Service Developers or DBAs

I.T. Fleet Admin

Business Structure

Manufacturing

I.T.

Logical Grouping

DB1
DB2
DB3

Compute

DNS

DNS

RAC CLUSTER
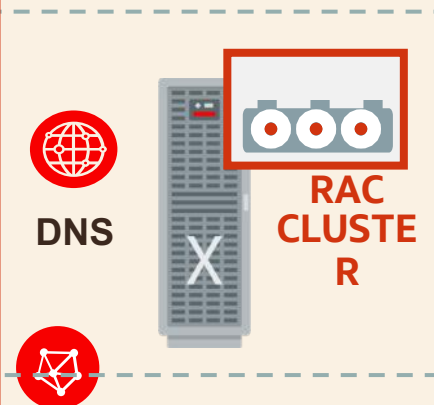
Physical Resources

Autonomous Database

Object Store

Autonomous Database - Dedicated Private Cloud – IAM setup

Create separation of responsibility for Fleet vs Database Administration

An OCI Autonomous RESOURCE can be one of:

- **autonomous-exadata-infrastructures** – dedicated hardware resources
- **autonomous-container-databases** – runtime environments that meet specific SLAs
- **autonomous-databases** – application databases
- **autonomous-backups** – data archives

Policy statements:
allow group <**GROUP**> to <**VERB** > <RESOURCE> in compartment <**COMPARTMENT**>

Where **VERB** is one of: INSPECT,READ,USE,MANAGE
- INSPECT – is a limited use read-only grant intended for auditors
- READ – is a read-only grant, allowing a user to see details of existing resources
- USE – is a grant to allow a user to take all actions on existing resources
- MANAGE – is a grant to allow a user to both create new and take all actions on resources

- **GROUP** is a set of users with the same privileges.

- **POLICY** is used to bind privileges for a GROUP to a specific set of resources in a COMPARTMENT.

- **COMPARTMENT** is an operating context for a specific set of service resources only accessible to GROUPs who are explicitly granted access.

Autonomous Database - Dedicated Private Cloud– Policy Example

Acme Company, Project Teams Coyote & Roadrunner

Group abbreviations: AcmeFA, RoadrunnerDBA, CoyoteDBA.
Compartment abbreviations: FACompartment, RoadrunnerCompartment, CoyoteCompartment

CoyoteDBA group policy (CoyoteDBAPolicy):
Allow group CoyoteDBA to MANAGE autonomous-databases in compartment CoyoteCompartment
Allow group CoyoteDBA to MANAGE autonomous-backups in compartment CoyoteCompartment

RoadrunnerDBA group policy (RoadrunnerDBAPolicy):
Allow group RoadrunnerDBA to MANAGE autonomous-databases in compartment RoadrunnerCompartment
Allow group RoadrunnerDBA to MANAGE autonomous-backups in compartment RoadrunnerCompartment

AcmeFA group policy (FAPolicy):
Allow group AcmeFA to MANAGE autonomous-exadata-infrastructures in compartment FACompartment
Allow group AcmeFA to MANAGE autonomous-container-databases in compartment FACompartment
Allow group RoadrunnerDBA to READ autonomous-container-databases in compartment FACompartment
Allow group CoyoteDBA to READ autonomous-container-databases in compartment FACompartment

Quick Start Setup Script: Download from Github

Autonomous Database - Dedicated Private Cloud– IAM example

Group of Users

Self-Service Developers or DBAs

I.T. Fleet Admin

IAM Service Limits at the Compartment level

Manufacturing

- Policy: Allow Developers to **Manage** autonomous-databases in Compartment **Manufacturing**

- Policy: Allow Developers to **Read** autonomous-container-databases in Compartment **I.T.**

I.T.

- Policy: Allow Fleet to **Manage** autonomous-exadata-infrastructures in Compartment **I.T.**
- Policy: Allow Fleet to **Manage** autonomous-container-databases in Compartment **I.T.**

Autonomous Database – Dedicated Private Database Cloud in Public Cloud

SHOP .... **SHIP**

WEB STORE

RAC CLUSTER
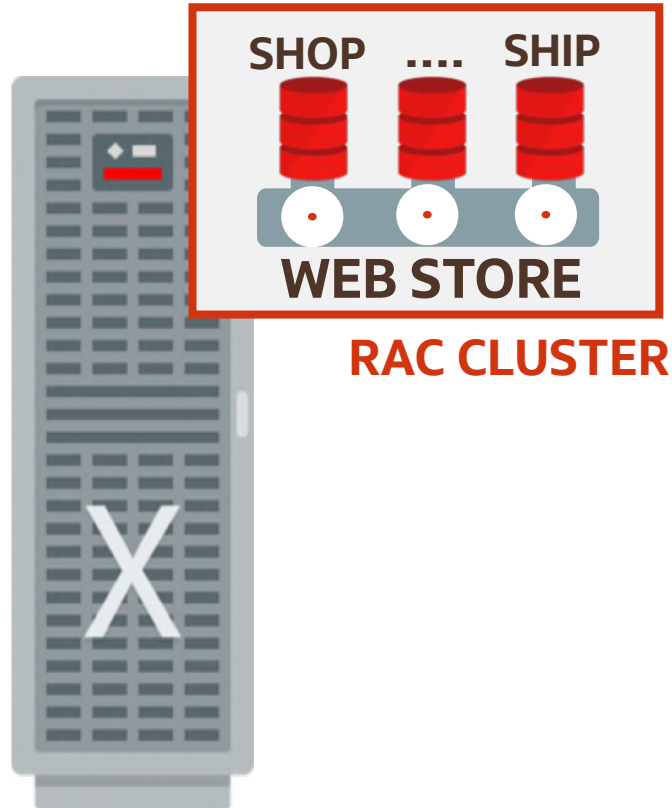
- Administrator specifies size, region, and availability domain of desired dedicated Exadata Infrastructure
- Administrator then partitions the system by specifying desired clusters and container databases
- Database users provision databases within container databases
  - Users just specify DB compute (OCPUs) and max storage
  - CPU and storage can elastically grow or shrink online
- Billing is based on size of Exadata Infrastructure and number of CPUs used by the databases
  - Can bring existing database licenses to lower costs

Autonomous Database – Dedicated Security -Isolation

SHOP .... SHIP

WEB STORE

RAC CLUSTER
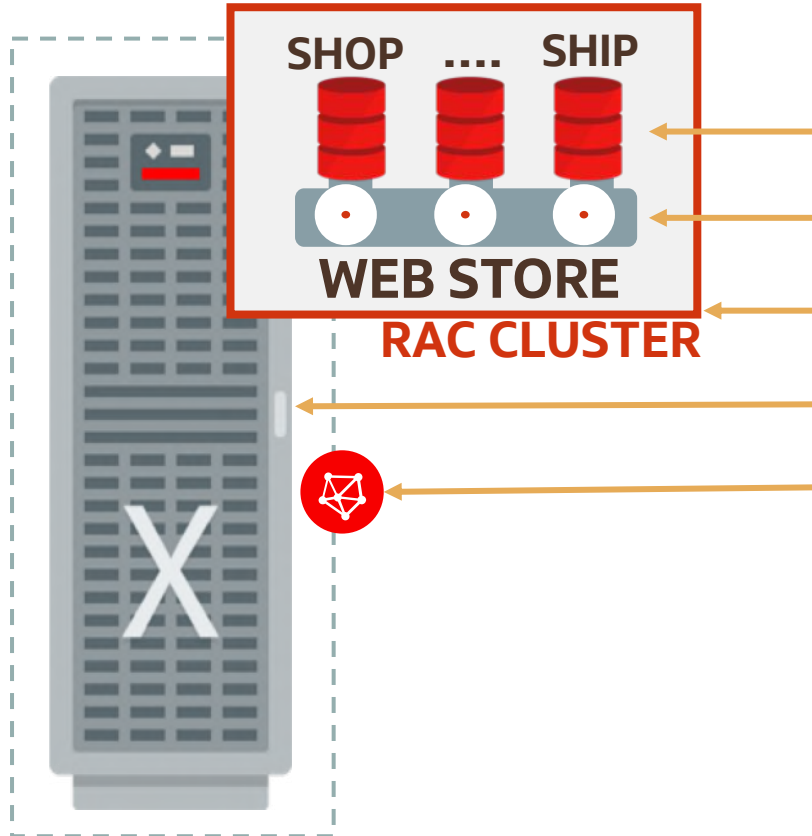
Dedicated allows multiple levels of isolation

- •Database (DB)
- •Container database (CDB)
- •Cluster of VMs
- •Separate Hardware (Exadata Infrastructure)
- •Hardware Enforced Private Network (VCN)

The level of security and performance isolation can be tailored to the needs of each database

Implementing isolation is normally complex but in autonomous you just specify what you want

Autonomous Dedicated – Customizable Operational Policies
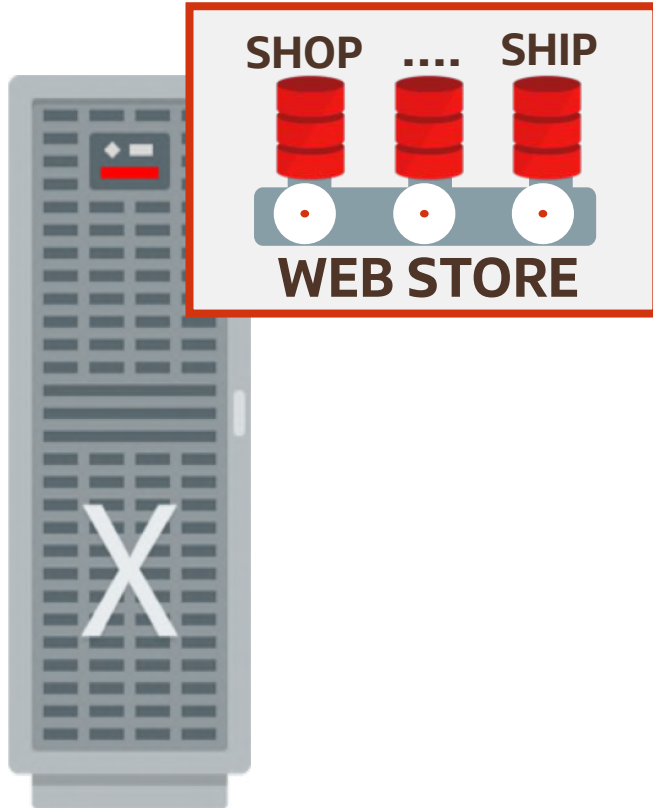
- Customizable database separation policies:
  - Separate critical, general purpose, and test databases
  - Separate databases by organization (sales, HR, marketing)
- Customizable software update and upgrade policies:
  - Deploy new versions on test/dev database before production
  - Avoid updates during peak periods (e.g. sale, quarter close)
  - Control upgrade to conform to application certified version
- Customizable availability policies (SLA):
  - Specify level of HA and DR needed for each container DB
- Customizable overprovisioning and peak usage policies

Autonomous Dedicated – Administrative Roles-Unique to ATPD

Fleet Admin activities separated from DB Admin using IAM privileges

- Fleet ADMIN allocates resources (infrequently) using GUI or APIs
  - Chooses Cloud Compartment and tag for Resources
  - Configures software version and maintenance timing for resources
- Provisions Exadata Infrastructure
  - Just specifies Name, Region, AD, Size (quarter, half, full rack)
- Provisions Clusters (merged with Infrastructure in first version) in Exadata
  - Just specifies cluster name, size (CPUs), software version, VCN, License Model (BYOL)
- Provisions Container Databases (CDB) in Clusters
  - Just specifies Name, Version, SLA (e.g. Data Guard)

Fleet Admin

Autonomous Database- Database Admin

- DB Admin easily creates new databases. Same as serverless, just select:
  - DB type - ATP or ADW
  - DB CPU count - really performance
  - DB storage size limit
  - Container DB that contains the DB – specific to dedicated

  Then creates database users and schemas

  DB Admin

- Performance resources allocated proportionally to number of CPUs chosen

  Example – if a DB gets 15% of CPUs in Exadata servers, then it gets 15% of memory

  Same for IOs per second, Storage CPUs, Flash Cache

  CPU and Memory allocated to a CDB grows dynamically as PDB CPUs are added to it

  No need to specify sessions, files, processes, buffer cache, PGA, etc. - all are automatic

Database Operations Available on Cloud Control Plane

- All administrative database actions are exposed through UI and REST APIs
  - Database, CDB, Cluster, or Exadata create/delete/start/stop
  - On demand backup and restore
  - Scale CPU, storage, or other resources
  - Download connection information including wallet for encrypted connections
  - Schedule updates for Exadata Infrastructure, VM Cluster, or Container Database
- Sophisticated performance monitoring, scripting, and schema design are available through web-based SQL Developer tool
  - Performance Hub in Native Oracle Cloud Console.
  - Can also monitor databases using existing Enterprise Manager Grid Control deployments

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Autonomous Database Dedicated

Deployment Considerations-Understand ATPD Client Connections

Autonomous Database- Dedicated-Client Connections

- Full Virtual Cloud Network support
- Public and Private Subnets
  - Private IP at the cluster level
- Oracle Cloud Native connections
  - Compute running on subnet in cluster's VCN or in a peered VCN
- Customer corporate network connections
  - VPN Connection – using DGR for IPSec tunneling from corporate network edge
  - FastConnect – for high speed high bandwidth& traffic completely off the internet
- Microsoft Azure secure connections
  - Cross cloud SSO, Azure Cognitive Services, Custom Apps, etc

Autonomous Dedicated Client Connections Continued

Secure and Highly Available Client Connectivity

Secure Connections
    Wallet based TLS Certificates, normal SQL *NET

Connection Services
    Priority based, workload specific
        Transaction Processing, Reporting

Transparent Application Continuity
    Tracks and records session and transaction state
        Recovers and replays in the event of unplanned outage
    Proactively drains services before maintenance
    Hides planned switchover and/or failure events

1. Database Request
5. Response
2. DB Calls
4. Transparent Application Continuity
3. Errors or Timeouts
19c Oracle Database
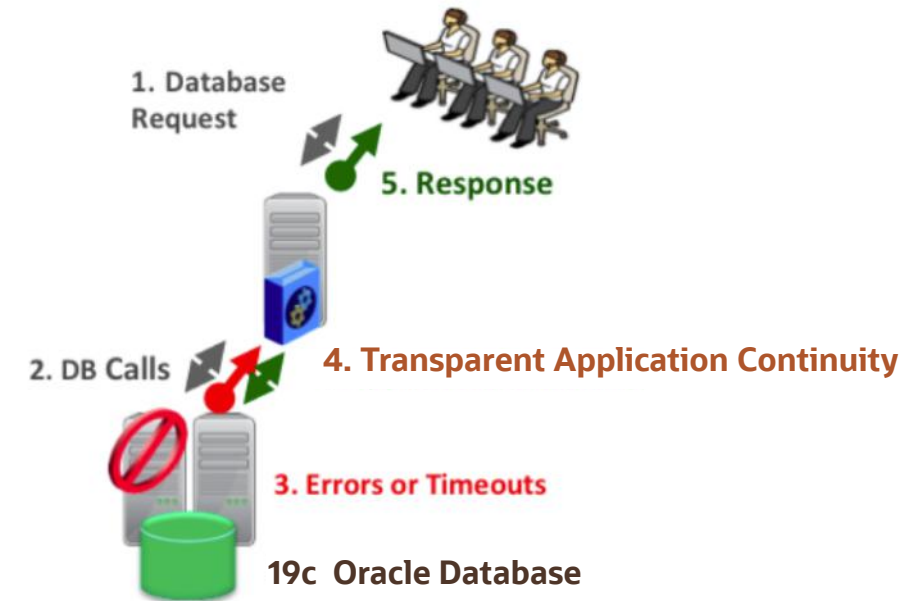
Autonomous Dedicated Client Connections Continued

- Services to Control Workload Priority (TLS and Non-TLS pairs)

- Applications connect to a pre-defined database service to control:
  - SQL parallelism, relative priority, max concurrently executing users
  - Most OLTP applications connect to "TP" service, most Batch to "LOW" service

	SERVICE	DEFAULT SQL PARALLELISM	SHARE OF RESOURCES	CONCURRENCY BEFORE QUEUING
OLTP	TPURGENT	MANUAL	12	100 X CPUs
	TP	1	8	100 X CPUs
DW, Batch, Reporting	HIGH	CPUs	4	3
	MEDIUM	4	2	1.25 X CPUs
	LOW	1	1	100 X CPUs

Currently, unique to Dedicated

Autonomous Dedicated Client Connections- Best Practices

- OLTP apps use 'TP', with Batch Reporting using 'LOW'

  Maximizes concurrent requests while scheduling reporting requests on low priority

  Keeps parallelism to 1 to minimize grid cache activity impact to transactional requests

  When to change this common configuration

  - Extremely sensitive TX requests can run in a session with TPURGENT, gets the highest priority
  - Reporting Analytics are slightly time sensitive and/or done off-hours from inline TX, use Medium
  - Gives more resources, parallelism so query can return faster, marginal impact if heavy TX load
  - Rarely if ever would you use HIGH with OLTP apps

- DW apps use Medium, good balance between parallelism and concurrency

  When to change this common configuration

  - If you have a DW with a lot of real end users, relatively small, need more concurrency, use 'LOW'
  - Time critical reports which are system driven and run infrequently

Autonomous Dedicated Client Connections- Credential Wallet

Autonomous Dedicated Client Connections Cont..

- Customer VCN for Database Users
  - SCAN leverages OCI VCN (3 IPs) & DNS
  - DNS automatically adjusts on service move using GARP messaging
  - Services open on only 1 node if < 16 OCPU – best OOB performance

- Co-location Tagging, to enable request routing to specific RAC nodes

  Useful when running with >16 OCPU, which opens a database on more than 1 node

  COLOCATION_TAG parameter, an alphanumeric string in CONNECT_DATA parameter of TNS connect string.

  Example:
  ATPDB1= (DESCRIPTION= (ADDRESS=(PROTOCOL=tcp)(HOST=sales-server)(PORT=1521))
     (CONNECT_DATA=(SERVICE_NAME=ATPDB1_tp.atp.oraclecloud.com)(COLOCATION_TAG=interactive)))

  Currently, unique to Dedicated

Autonomous Dedicated Client Connections Cont..

- Transparent Application Continuity control

  Enabled in server by default for client drivers 19c and above

  Enabled per session using TSNAMES.ORA parameters, do not use EZCONNECT naming

  Example:

  ```
  sales.us.example.com= (DESCRIPTION=
       (CONNECT_TIMEOUT=120)(RETRY_COUNT=20)(RETRY_DELAY=3)
       (TRANSPORT_CONNECT_TIMEOUT=3)
       (ADDRESS_LIST=(LOAD_BALANCE=on)(PROTOCOL=tcp)(HOST=sales-server)(PORT=1521))
       (CONNECT_DATA=(SERVICE_NAME=sales.us.example.com)(COLOCATION_TAG=interactive))
       )
  ```

  To disable: execute DBMS_APP_CONT.DISABLE_FAILOVER('HIGH');

  Where 'HIGH' can be replaced with any service name

  See Developer Guide for older driver details, supports 12.1 and above

Currently, unique to Dedicated
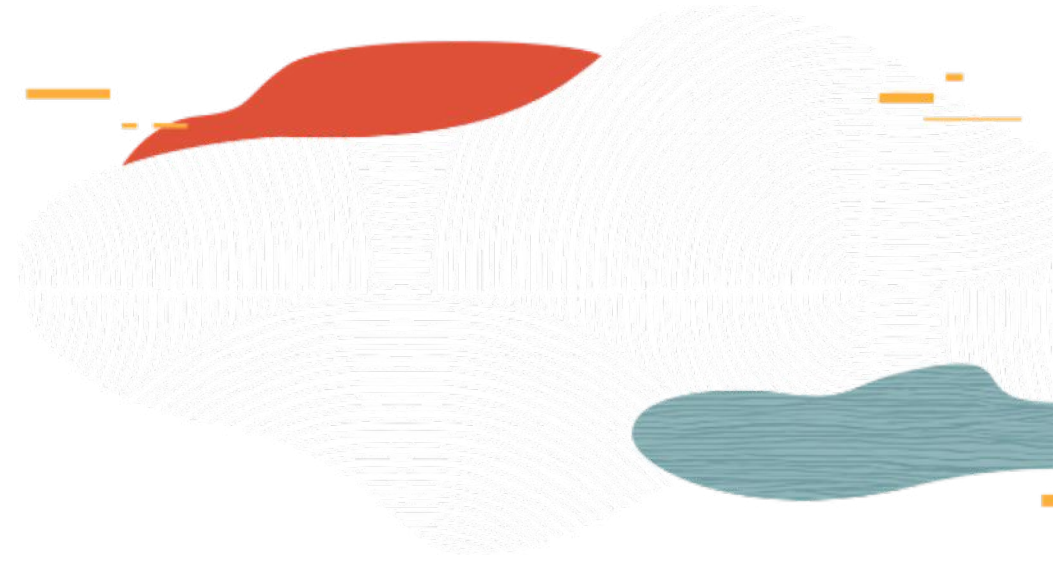
Part 3. Autonomous Database Dedicated

Deployment Considerations- Security Option in ATPD

Security in ATPD

- No highly privileged access - no Root or SYSDBA that means No login allowed to OS or CDB
    - No callouts to OS allowed
    - Prevents installing or modifying any software on system
- Secure Configuration deployed at all levels – Network, OS, DB, storage, etc.
- Databases run in customer's Virtual Cloud Network where ATPD can be deployed in Private subnet.
- Databases always encrypted, additionally Network encryption is available.
- Automatic protection of customer data from Oracle operations staff
    - Database Vault's new Operations Control feature
- Oracle automatically applies security updates for the entire stack
    - Quarterly, or off-cycle for high-impact security vulnerability
    - Customer can separately use Database Vault for their own user data isolation
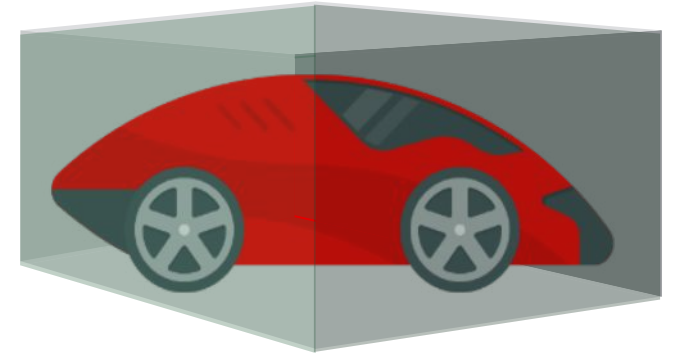
Currently, unique to Dedicated

Autonomous Database Dedicated

Deployment Considerations- High Availability option in ATPD

Autonomous Database is Highly Available

- Automatically protects from **all** types of downtime

- Features unique to Oracle

|	
Failures	– Exadata, RAC
Site Outages	– Active Data Guard **(not available in current release)**
Maintenance	– RAC Rolling Updates, Transparent App Continuity
Changes	– Auto-Indexing, Edition Based Redefinition
User Errors	– Flashback Database , Table , Query

No ridiculous exclusions to availability in fine print

Amazon excludes planned downtime, database bugs, regional outages, etc.

Currently, unique to Dedicated

Dedicated Backup Policy
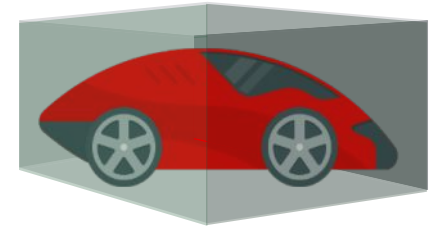
Serverless

Fully automated daily backups to OSS, on demand backups, Flashback to 24 hours, etc
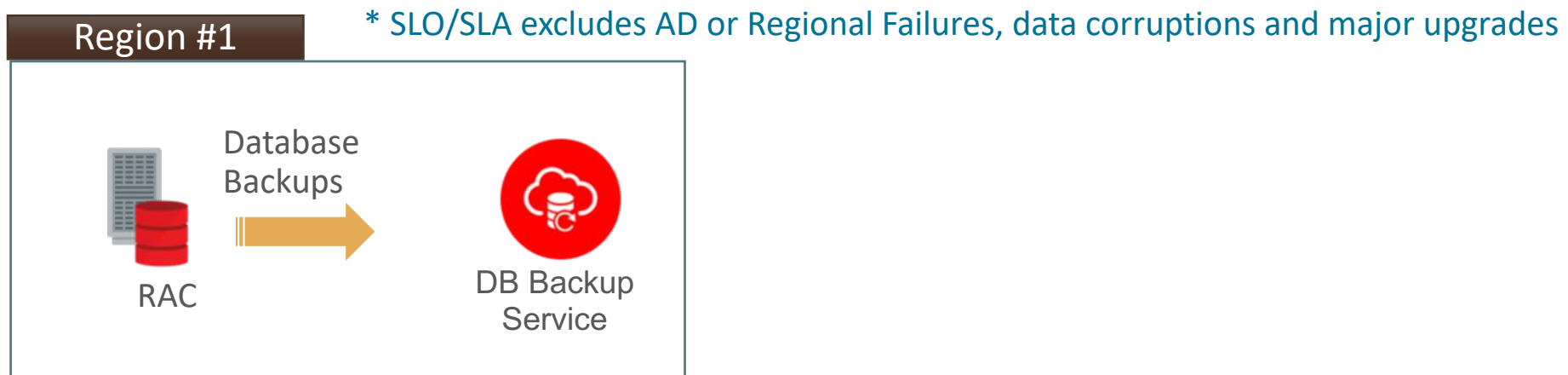
Dedicated adds ….

- Backup of archive logs performed every hour (will be 15 minutes in v2)
- Retention time for CDB backups is configurable (7-60 days)
- Currently, on demand backup retention same as CDB -indefinite retention would be supported.
- Zero Data Loss Recovery Cloud Service will be used for backups in future

Currently, unique to Dedicated

High Availability Policy

- RAC Database, redundant networking and storage with backup to separate AD

- Protection from hardware failures, crashes, patches **–** most common sources of downtime

- Uptime Service Level Objective SLO per Month: **99.95% NRX**
    - Move to an SLA expected in Q3FY20
    - 99.95% Uptime = less than 22 minutes of downtime per month
    - Goal is for application impact to be well **under 30 seconds** from any given availability event

- Suitable for Test, Development, Non-Mission Critical production databases

Region #1

* SLO/SLA excludes AD or Regional Failures, data corruptions and major upgrades

Database Backups

RAC

DB Backup Service

High Availability RTO/RPO Matrix

High Availability Policy Recovery Time (RTO) and Potential Data Loss (RPO) Service SLO

Event	Downtime- RTO	Potential Data Loss -RPO
Disk, network or storage failure	Zero	Zero
RAC instance failure	Seconds	Zero
RAC server failure	Seconds	Zero
Data corruptions, unrecoverable database, Availability Domain or Regional failure	Time to restore and recover from cloud object storage	Since last backup **Max** 45 minutes based on archive backup frequency
Hardware and software maintenance and updates	Zero	Zero
Major Database upgrades	Hours	Zero

Autonomous Database Dedicated

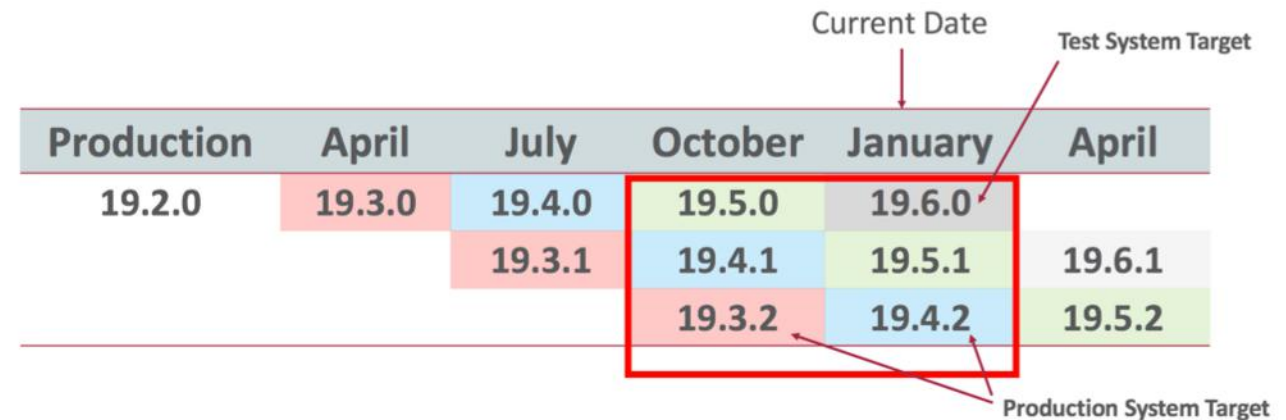**Deployment Considerations- Customized software Updates & Patching in ATPD**

Dedicated Patching
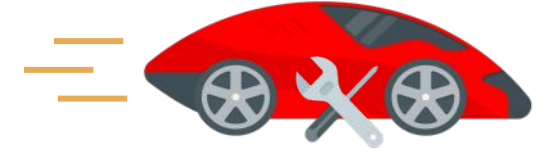
- Oracle is Responsible and Accountable

- Optionally Tenant can cooperate on:
  - Schedule and version controls

- Infrastructure and Software updates
  - Single pass patching (GA)

- Can change up to 30 minutes before (v2)

- RU/RUR set at the CDB

- Allow a gold image selection (v2)

- Can Skip up to 2 quarterly patches

- Notification services integrated (when GA ~July)
  - CNS integrated at GA, 4 Notifications: New, Pre-Check, Start, Finish - status

Core Principles:

- Allow development staging before production

- Accommodate critical business periods

- Allow one-off & app specific gold images

Production	April	July	October	January	April
19.2.0	19.3.0	19.4.0	19.5.0	19.6.0	
	19.3.1	19.4.1	19.5.1	19.6.1	
		19.3.2	19.4.2	19.5.2	

Current Date · Test System Target · Production System Target

us-ashburn-1 ∨

Automatic Maintenance Schedule

Close

Automatic maintenance occurs each quarter. Oracle will notify you of the exact date and time of your maintenance a few weeks in advance. You can specify your preferences for the month, week, weekday, and start time of your maintenance. You can change the automatically chosen date and time at any time before the maintenance starts.

Configure the automatic maintenance schedule

○ NO PREFERENCE
The system assigns a date and start time for infrastructure maintenance.

● SPECIFY A SCHEDULE
Choose your preferred month, week, weekday, and start time for infrastructure maintenance.

Maintenance months ⓘ

QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
☑ JANUARY	☑ APRIL	☑ JULY	☑ OCTOBER
☐ FEBRUARY	☐ MAY	☐ AUGUST	☐ NOVEMBER
☐ MARCH	☐ JUNE	☐ SEPTEMBER	☐ DECEMBER

WEEK OF THE MONTH

Week 4 ✕ ⌄

DAY OF THE WEEK

Sunday ✕ ⌄

START HOUR (UTC) ⓘ

0:00 - 3:59 UTC ✕ ⌄

Update Maintenance Schedule   Cancel

Create Au...

Subnet co...

FleetCo...
atpdpreview...

Subnet

Private S...

Configure the...

No sched...

Choose a lic...

Bring y...
Bring my...
service.

Show A...

Autonomous Database Maintenance

Maintenance

Maintenance History

List Scope

COMPARTMENT

| FleetCompartment | ⇕ |

atpdpreview7 (root)/FleetCompartment

AUTONOMOUS EXADATA INFRASTRUCTURE

| Exadata Infrastructure (FCBX:US-ASHBURN-AD-3) | ⇕ |

AUTONOMOUS CONTAINER DATABASE

| Container DB2 | ⇕ |

Filters

MAINTENANCE TYPE

| All | ⇕ |

# Maintenance History *in* FleetCompartment *Compartment*

Autonomous Exadata Infrastructure: Exadata Infrastructure

Title	Scheduling	Type	State	Start Time	End Time
There is no planned maintenance in the next 15 days.					

Showing 0 Item(s)

Autonomous Container Database: Container DB2

| Title	Scheduling	Type	State	Start Time	End Time
There is no planned maintenance in the next 15 days.					

Showing 0 Item(s)

@ 2019 Oracle
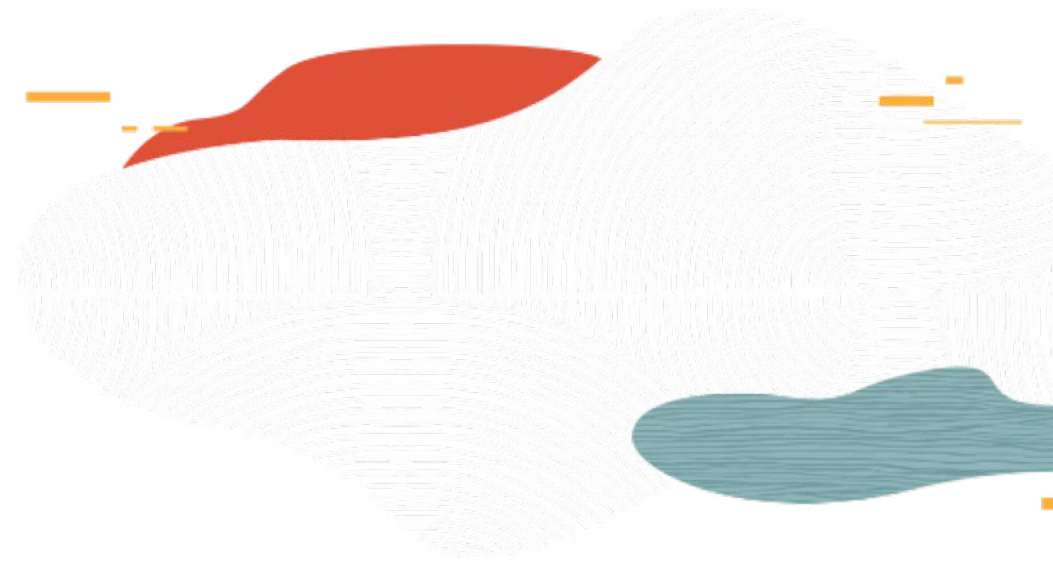
Part 4. Autonomous Database Dedicated

Deployment Considerations- Developer tools and productivity in ATPD

Autonomous Database empowers Developers

- **Fastest and simplest** creation of database
  - Just specify capacity and name

- **No database management**, no support from DBA required
  - Fully automated tuning, scaling, updating, upgrading, etc.

- **Most Flexible and Productive** development
  - Single database for Relational, JSON, Spatial, Graph, Text, etc.
  - Full set of SDKs - Java, Python, Node, Go, .NET, Ruby, C
  - Industry standard compliant; ISO SQL, JDBC, PEP249 etc.
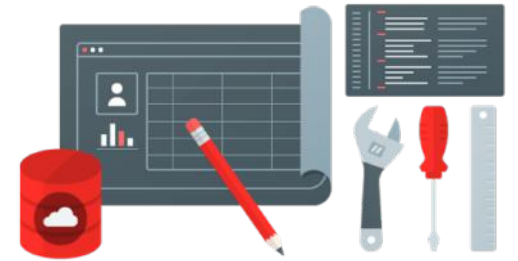
Developer ready with APEX & ORDS

- APEX & ORDS
  - Limitations at GA
    - No APEX Mail or Outbound REST Endpoints

- SQL Dev-web
  - Developer workbench and modeling
  - Performance Hub SQL analysis

- Service SDKs
  - Java, Python, Node, Go, .NET, Ruby
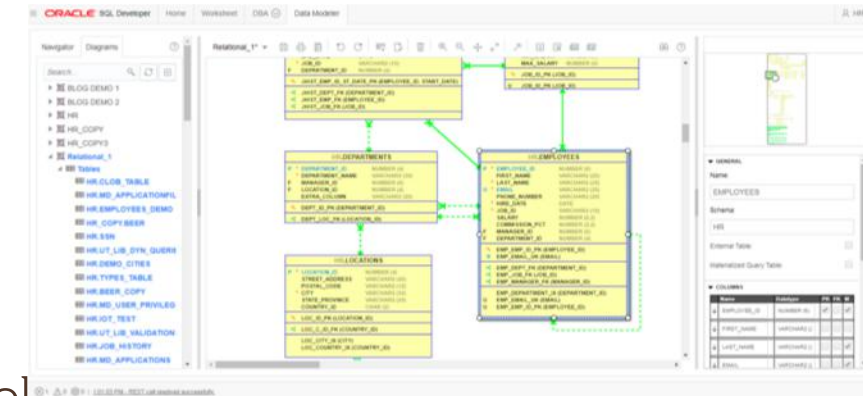 - See Developer Guide for TAC setup
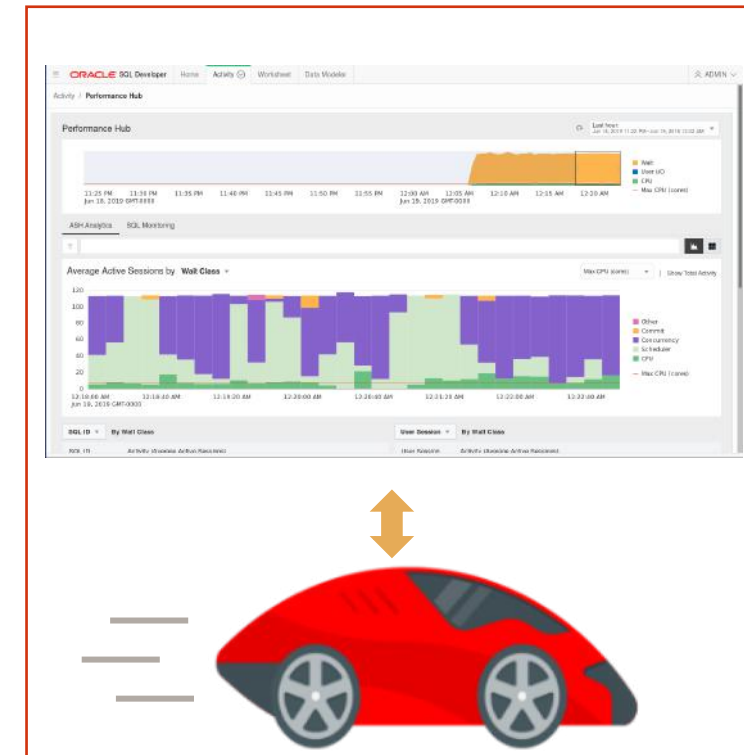
Currently, unique to Dedicated

Service Tooling Access

- APEX & SQL Dev-web access requirements

  - Must be inside the customer VCN

  - Service user Database Admin is automatically granted use of tooling

  - Database users must be enabled to use tooling

    ```
    BEGINORDS.ENABLE_SCHEMA (p_enabled => TRUE,
    p_schema => 'HR', -- the database username
    p_url_mapping_type => 'BASE_PATH',
    p_url_mapping_pattern => 'hr_alias', -- determines URI template to access HR schema RESTful Services
    p_auto_rest_auth => TRUE ); -- request must be authenticated before any request can be serviced
    commit; END;
    ```

  - Access URI for Browser that is inside the VCN

    - Found in the DB Connections dialog, Application Connections

  - DBA actions e.g. Performance Hub & Session metrics

    - Grant database user role PDB_DBA

Currently, unique to Dedicated

Autonomous Database » Autonomous Database Details

ATP

AVAILABLE

DB Co

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Dat

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Cor   e: Container DB2

OCI

Cre   Jun 2019 05:34:19 GMT

CPU

Sto

Dat

Life

Resources   @ 2019 Oracle

Backups

Backups are automatically created daily.

Database Connection

help   close

○ DB CONNECTION   ● APPLICATION CONNECTION

Use the applicable URL to access the target application from within your VCN.

Oracle Application Express

Oracle Application Express (APEX) is a rapid web application development tool for Oracle Database. Using only a web browser and limited programming experience, you can quickly develop and deploy secure, professional-looking applications. Learn more.

Access URL: https://host-qwiq5-scan.exadatasubnet.ocivcn.oraclevcn.com/ords/ATPDB1/apex   Hide

Copy

Oracle SQL Developer Web

Oracle SQL Developer Web provides an integrated development environment and a database administration interface for Oracle Database in Oracle Cloud. This web interface for Oracle SQL Developer provides a subset of the features available for the desktop product and is bundled with various database services available in Oracle Cloud. Learn more.

Access URL: https://host-qwiq5-scan.exadatasubnet.ocivcn.oraclevcn.com/ords/ATPDB1/admin/_sdw/?na v=worksheet   Hide   Copy

Close

Automatic Indexing
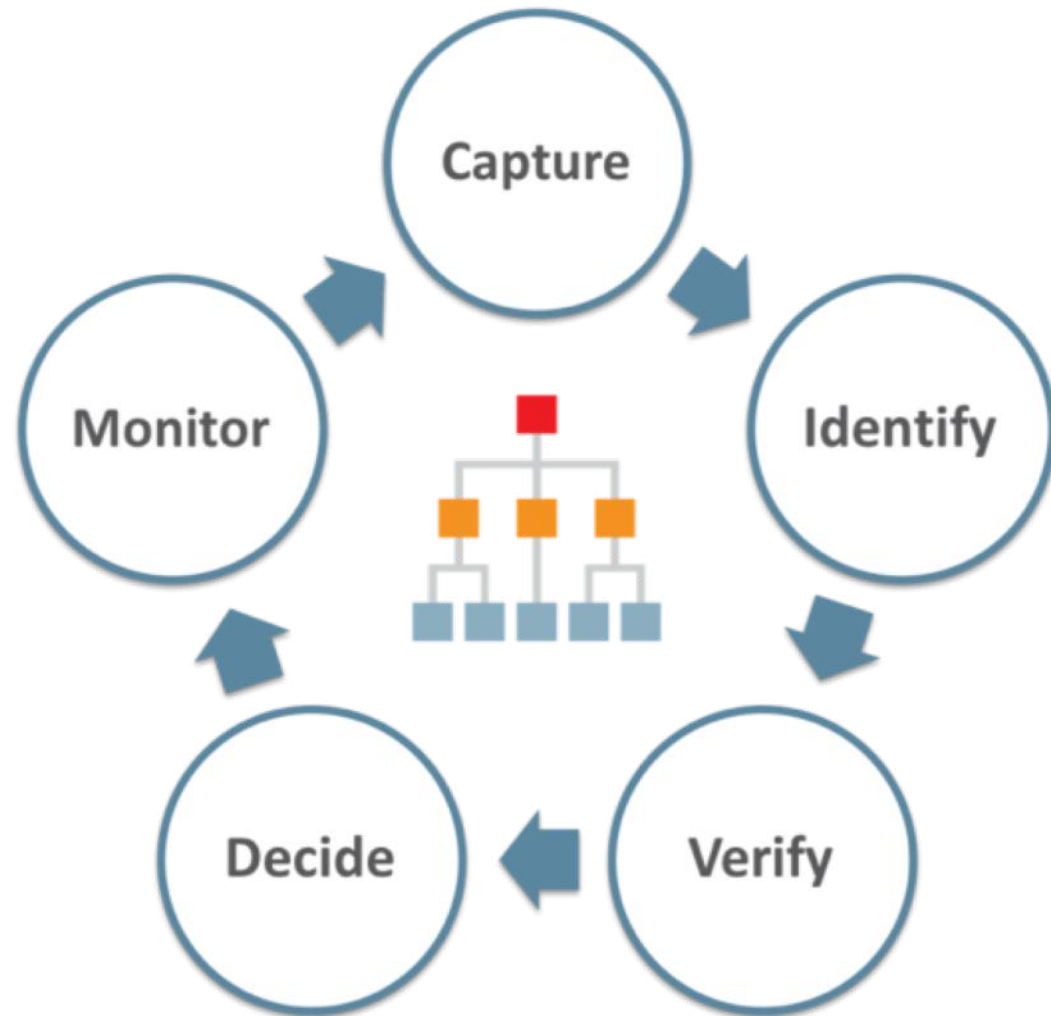
- Indexes implemented using Machine Learning
- Reinforcement Learning allows it to learn from its own actions as all candidate indexes are validated before being implementing
- The entire process is continuous and fully automatic
- Indexing activities are viewable, controllable, and auditable
- Real-time optimizer statistics gathering ensures plans stay current

Orchestration & Developer SDKs

- Terraform Orchestration

  - OCI Provider: https://www.terraform.io/downloads.html

- Language SDKs and IDE toolkits

  Java, Python, Ruby, & Go:
  https://docs.cloud.oracle.com/iaas/Content/API/Concepts/sdks.htm

  Eclipse Toolkit:: https://docs.cloud.oracle.com/iaas/Content/API/SDKDocs/eclipsetoolkit.htm

- Containers

  - Using Docker with ATP example:

  https://github.com/oracle/learning-library/blob/master/workshops/autonomous-transaction-processing/LabGuide800BuildingMicroservicesOnATP.md

- Client Compute for Database in Oracle Cloud Marketplace

  - Oracle demo client image, configured during OCI Compute Provisioning

ORACLE Linux

Oracle Cloud Developer Image

Oracle Cloud Developer Image
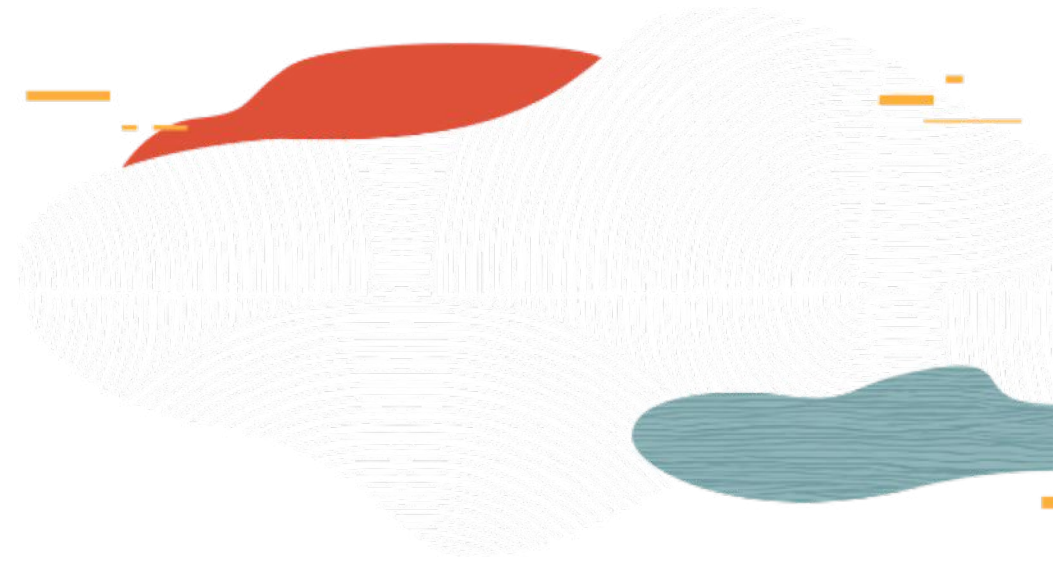
Autonomous Database

Deployment Considerations- Migrating to Autonomous Database

Dedicated Migration

- Autonomous Database is an Oracle Managed and Secure environment
- A physical database can't simply be migrated to autonomous because:
  - Database must be converted to PDB, upgraded to 19c, and encrypted
  - Any changes to Oracle shipped privileges, stored procedures or views must be removed
  - All legacy structures and unsupported features must be removed (e.g. legacy LOBs)
- Migration uses Data Pump to move database **data** into **new** Autonomous DB
  - Old car can't be made self-driving, must move passengers into new autonomous car
  - GoldenGate replication can be used to keep database online during migration

Note: As of GA Release – no DBMS_CLOUD support, so DBMS_CREDENTIALS used with impdp/expdp

Autonomous Data Migration & Test Master

- Move data into the Oracle Cloud Object Store
    - There are ways to directly load small data files, but OSS is really the best practice
    - Easy to do, goto OCI Console and create an OSS Bucket and load files
- Serverless – use DBMS_CLOUD PL/SQL package
  CREATE_CREDENTIAL, COPY_DATA
    - This will move the data in OSS into the database
    - Noting the "password" here is your OCI Auth Token, not an admin password
    - Monitor the operations using <user or dba>_load_operations tables
- Dedicated – use DBMS_CREDENTIALS for auth, then use Data Pump with impdp/expdp
    - There is no DBMS_CLOUD wrapper yet, but it is coming soon
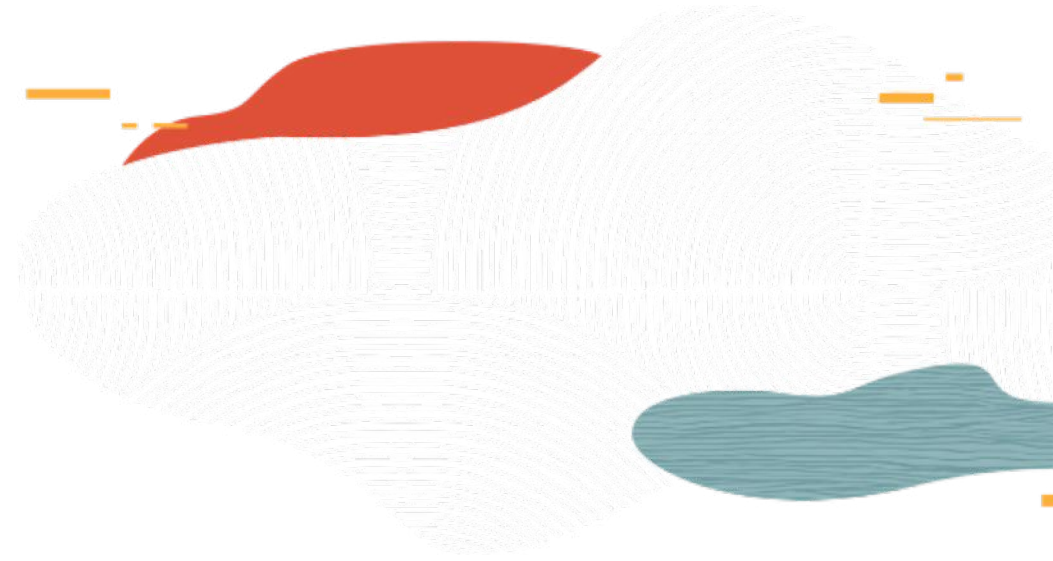
Autonomous Data Migration & Test Master

Online and Continuous Data Migration

- This can be done using Data Integration Platform Cloud Service or Golden Gate image available in OCI Marketplace.
- Service allows to configure Autonomous as a target for replication

Test Master Creation

- Serverless – use the service Clone feature
- Dedicated – use the same technique as Data Migration

Part 5. Autonomous Database

Deployment Considerations- Management & Monitoring Options for Autonomous Database

Maximum Choice of Tools for Various Personas

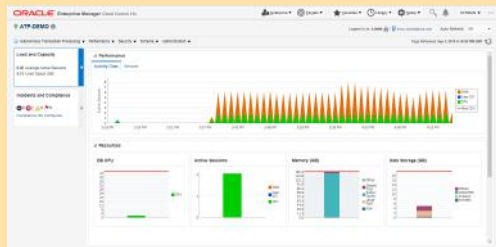## All these tools are bundled with ADB .

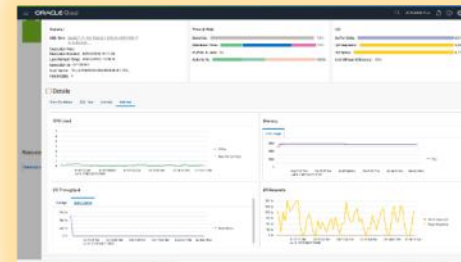**Enterprise Manager** > **Oracle Management Cloud** > **OCI Console / DB Mgmt Service** > **SQL Developer Web**

Hybrid Cloud Administrators

Managing multiple DB instances across On-premises and Oracle Cloud – needs a consolidated view

Hybrid Cloud Administrators

Managing multiple DB instances across On-premises and heterogeneous Cloud – needs a consolidated view

Cloud Administrators

Managing multiple departmental ADB instances – needs a quick access to performance data across their instances

Technical Developers

Working across multiple ADB instances (dev, text, QA etc.) – needs access to SQL performance data

Autonomous DB Service – Management Interfaces

- Database actions are exposed through Cloud UI and REST APIs
  - Database create/terminate/backup/restore/stop/start
  - Changes to provisioned CPUs or storage
- Monitoring is available through the cloud service dashboard
  - Autonomous Database monitoring is also possible with customer's existing Enterprise Manager Cloud Control & Performance HUB
  - Developers can use SQL Developer, or any other developer tool that supports standard Oracle database connections
- Using Oracle Rest Data Services (ORDS) developers can easily build Rest APIs for data and procedures in the database

Autonomous DB Service – Interfaces
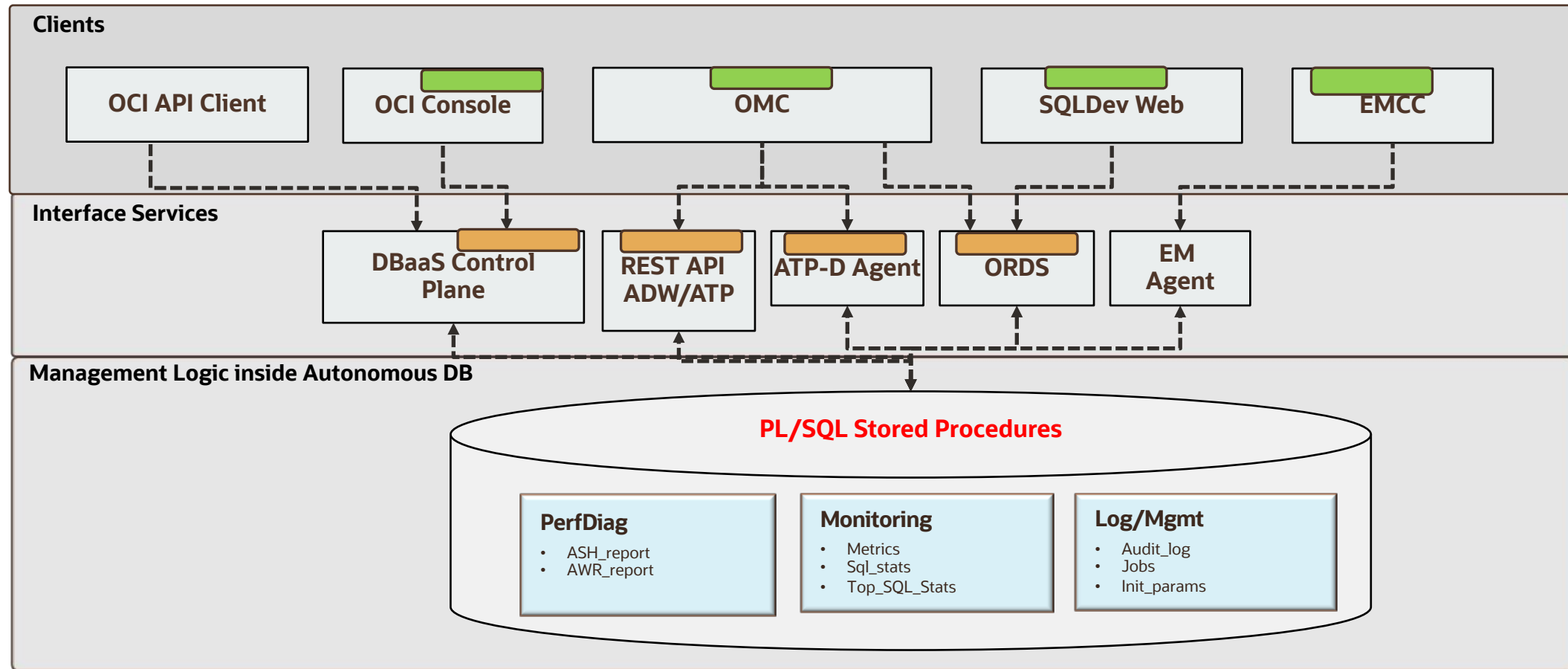
- Single set of APIs for collecting metrics that are exposed by various consoles (OMC, ADW, ATP, etc.)
- EM/OMC provides both DB server back-end and front-end (UI) support with unified data collection

Autonomous Database Management Capabilities

- Autonomous DB automates most tasks for the infrastructure DBA

- App DBA still needs to monitor, diagnose and perform basic app-level administrative operations

- EM/OMC/OCI Console provides management capabilities for these operations
  - Database movement and cloning
  - Monitoring and alerting
  - Deep performance diagnostics and troubleshooting
  - Performance and capacity insights based on historical data

Discover and Monitor

Move

Manage

Diagnose

Analyze

ORACLE
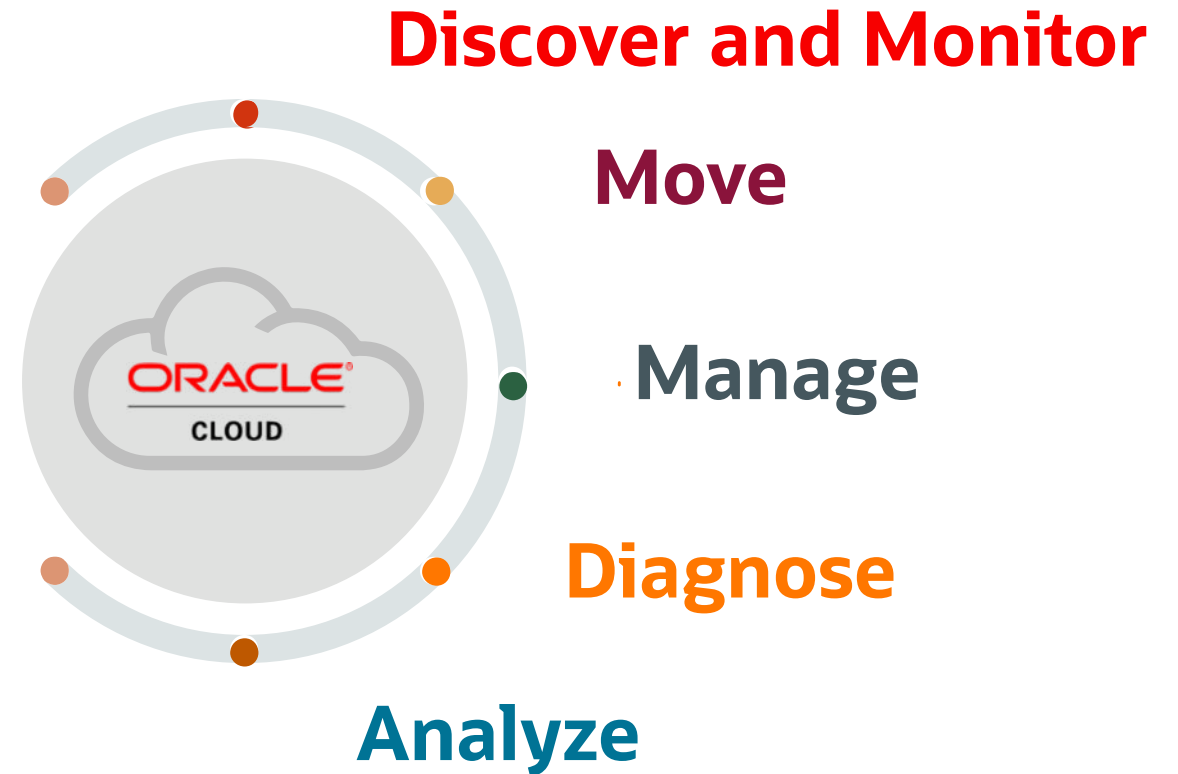
Autonomous Database

Summary

Autonomous Database – Summary

After Completing this training You should be able to

Describe the features of Autonomous Database Cloud Service and Use cases

Understand Connectivity options.

Understand Autonomous Database Service Deployment best practices.

Understand the aspects of service management in Autonomous Database

Understand Migration option for Autonomous Database

Understand manageability option for Autonomous Databases

Oracle Cloud always free tier:
oracle.com/cloud/free/

OCI training and certification:
oracle.com/cloud/iaas/training
oracle.com/cloud/iaas/training/certification
education.oracle.com/oracle-certification-path

OCI hands-on labs:
ocitraining.qloudable.com/provider/oracle

Oracle learning library videos on YouTube:
youtube.com/user/OracleLearning