

DATABASE MICROSERVICE ARCHITECTURES

Taller – SESTE España

Julio 2019

Oracle Ibérica

Oracle's Holistic Approach to AI

Provided Key elements for AI enablement



Oracle embeds AI and ML capabilities within its own business and IT services, using the same and optimized AI technology stack



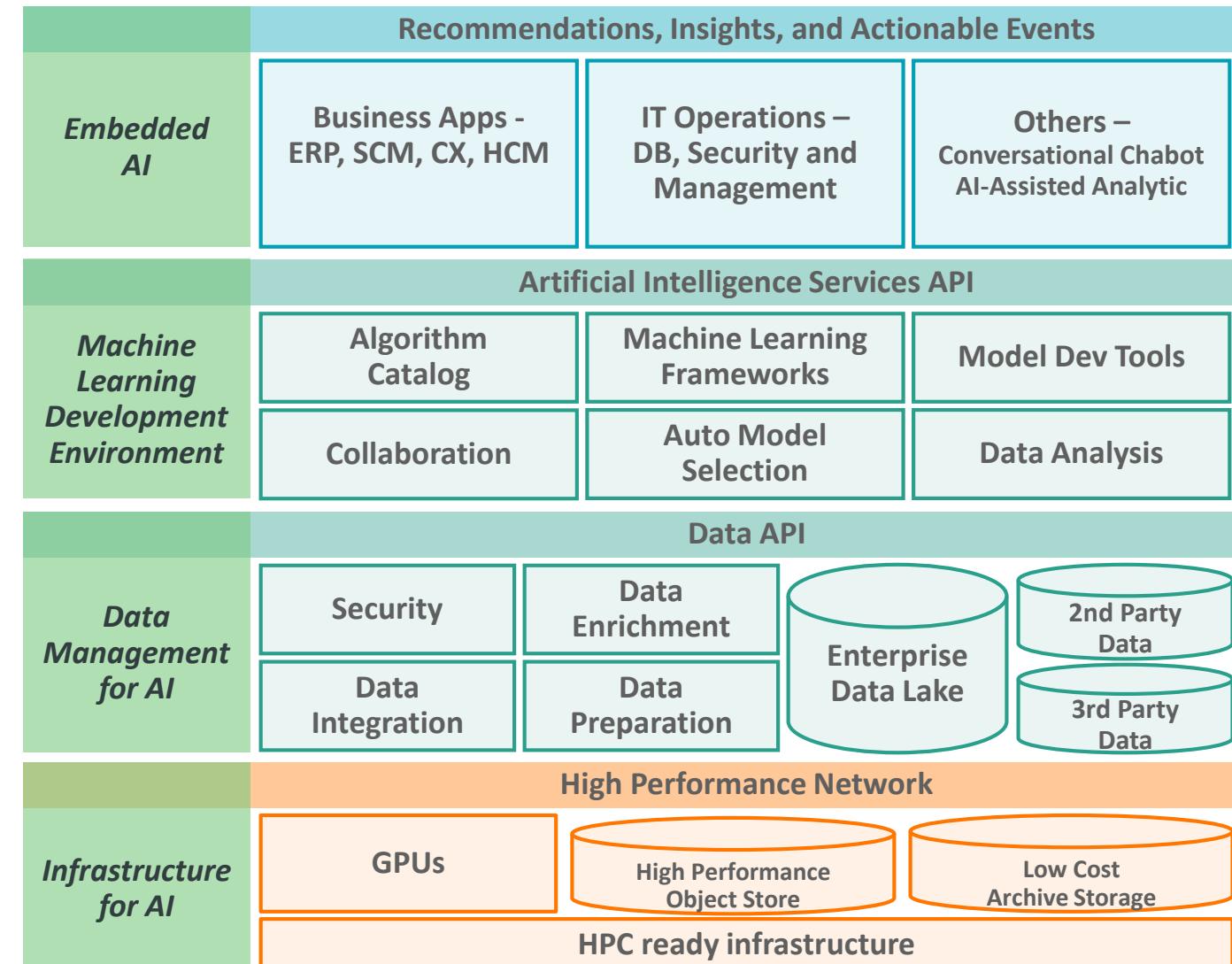
Comprehensive environment for rapid development of advanced ML models



Data-management infrastructure required for ingesting large volumes of data, data cleansing and normalization, and data enrichment.



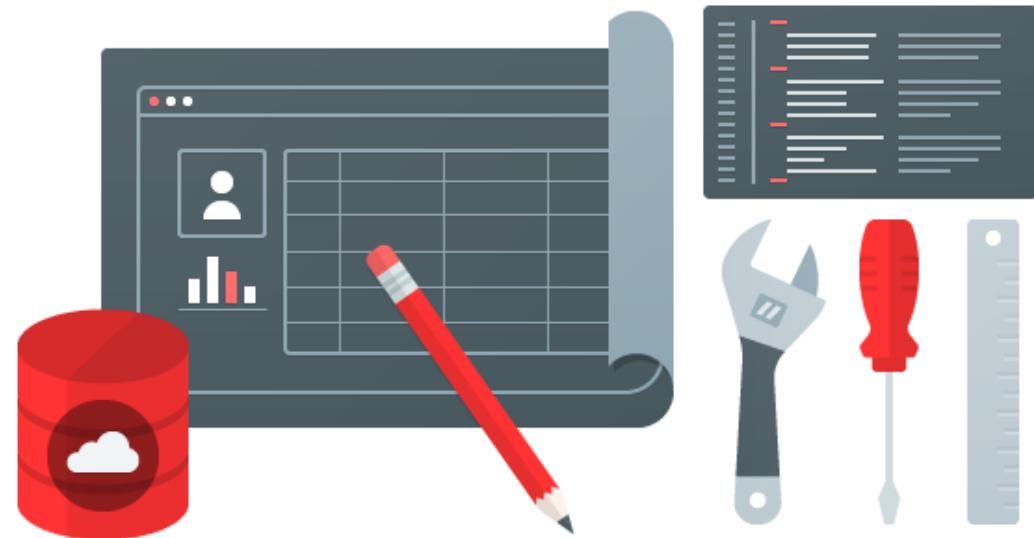
High-performance compute and storage infrastructure optimized for ML



Contenido del Taller

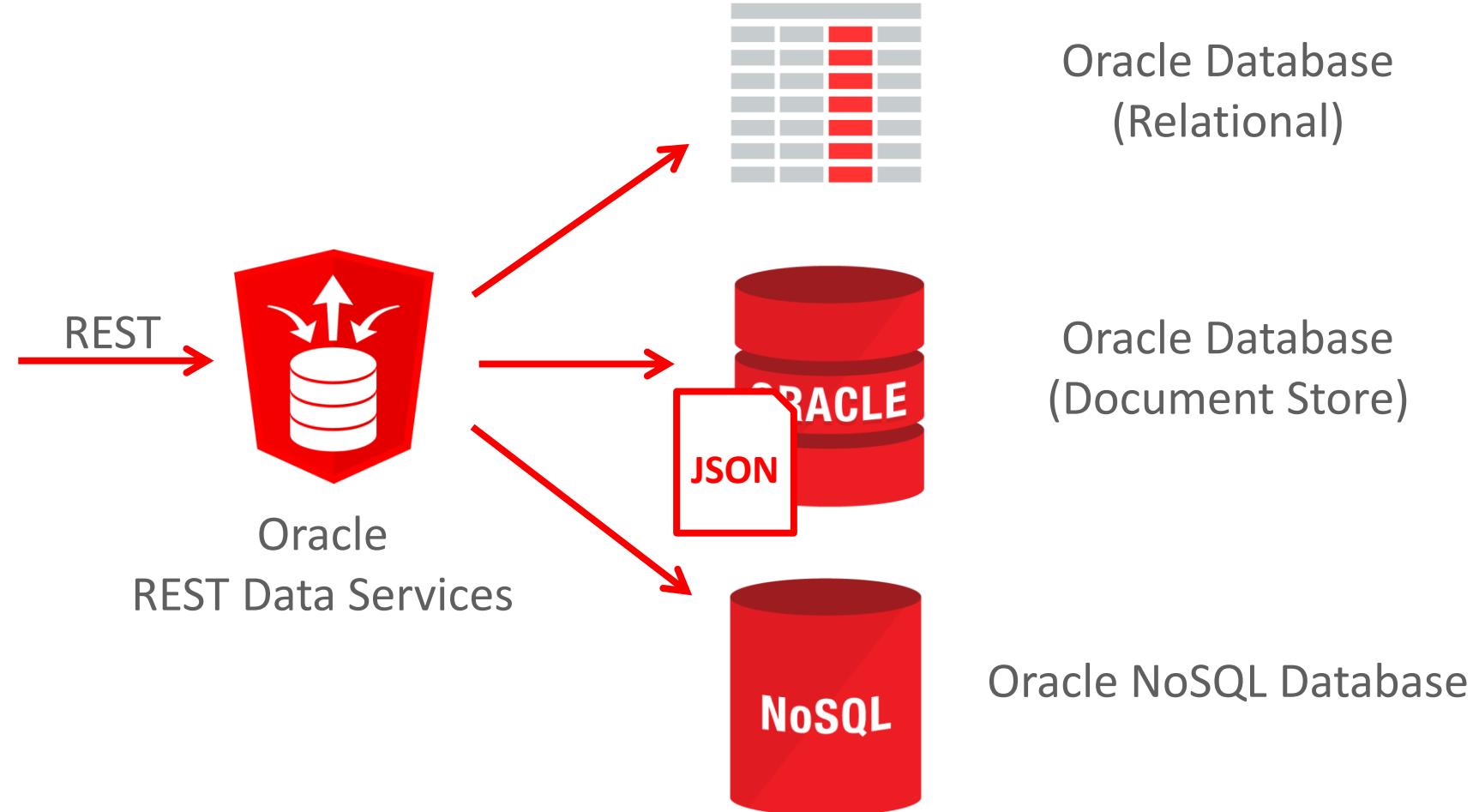
- 1** Ejecución operación interfaz REST sobre Base de Datos: ORDS
- 2** *Creación de una operación SQL-PL/SQL e interfaces REST en ORDS*
- 3** *Despliegue ORDS Standalone en un entorno de Docker o K8s*
- 4** *Creación de una BD Multitenant con varias PDBs*
- 5** *Copiado de PDBs mediante mecanismo de Clonado*
- 6** *Copia de datos entre PDBs mediante OGG*

ORACLE REST DATA SERVICES



Oracle REST Data Services

REST-enable your data



Oracle Database
(Relational)

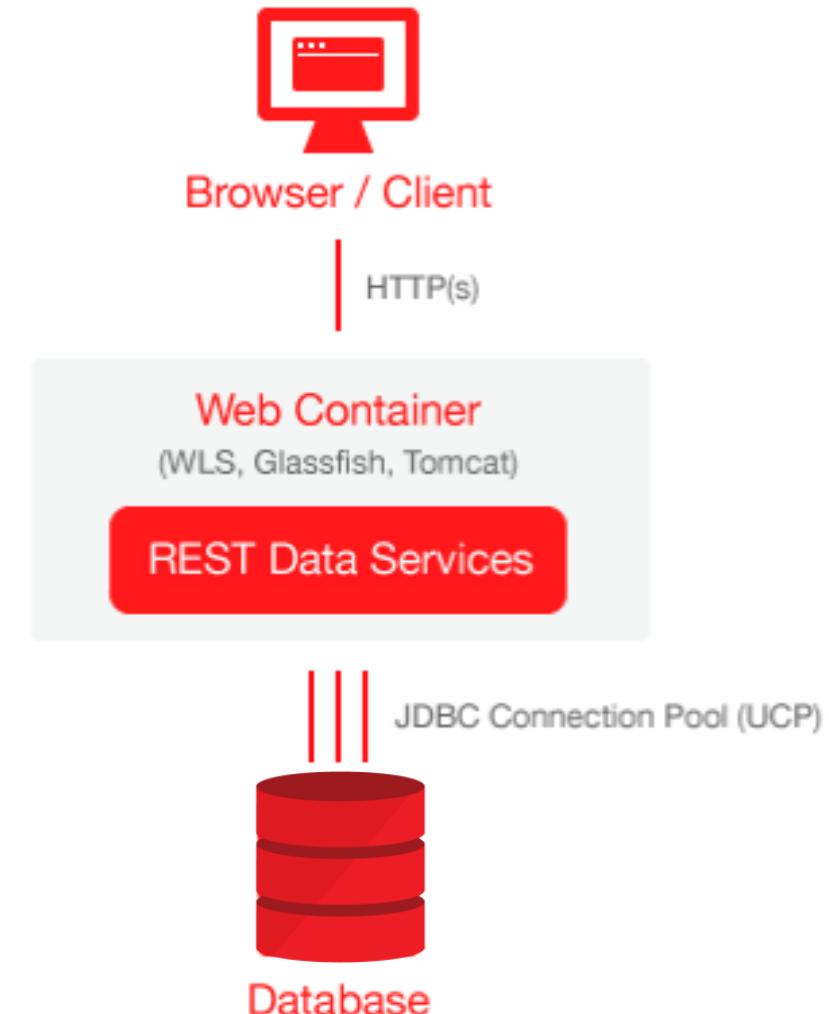
Oracle Database
(Document Store)

Oracle NoSQL Database

Oracle Database Cloud Service

Oracle REST Data Services

- Available **Standalone (Jetty)**, Weblogic, Tomcat & Glassfish
- Turns Database Service into an RESTful API service
- Fully provisioned and functional in all cloud editions
- Available in 11g, 12c and 18c, **no extra cost**
- Allows publishing of URI based access to Oracle database over REST
- Results in JSON or CSV
- Mapping of URI to SQL or PL/SQL
- All HTML methods GET, PUT, POST, DELETE, PATCH
- OAuth2 integration
- Highly scalable, can use all features of database



Oracle REST Data Services

ORDS powers the Schema Service, A Quick Detour

- Provides data access consistent with modern App Dev frameworks
 - Mid tier application
 - Can map standard http(s) RESTful gets and posts to SQL
 - Can declaratively returns results in JSON format
 - JavaScript friendly
 - Can support high numbers of end users
- Services
 - HTTP(s) relational data access
 - Oracle JSON collection based schema-less access
 - Oracle NoSQL access over HTTP
 - Oracle APEX mid-tier, web toolkit applications, mod_plsql replacement
- Formally known as Oracle APEX Listener
- Supported feature of the Oracle Database since 2010
- Ships with Oracle Database 12.1.0.2



Oracle REST Data Services

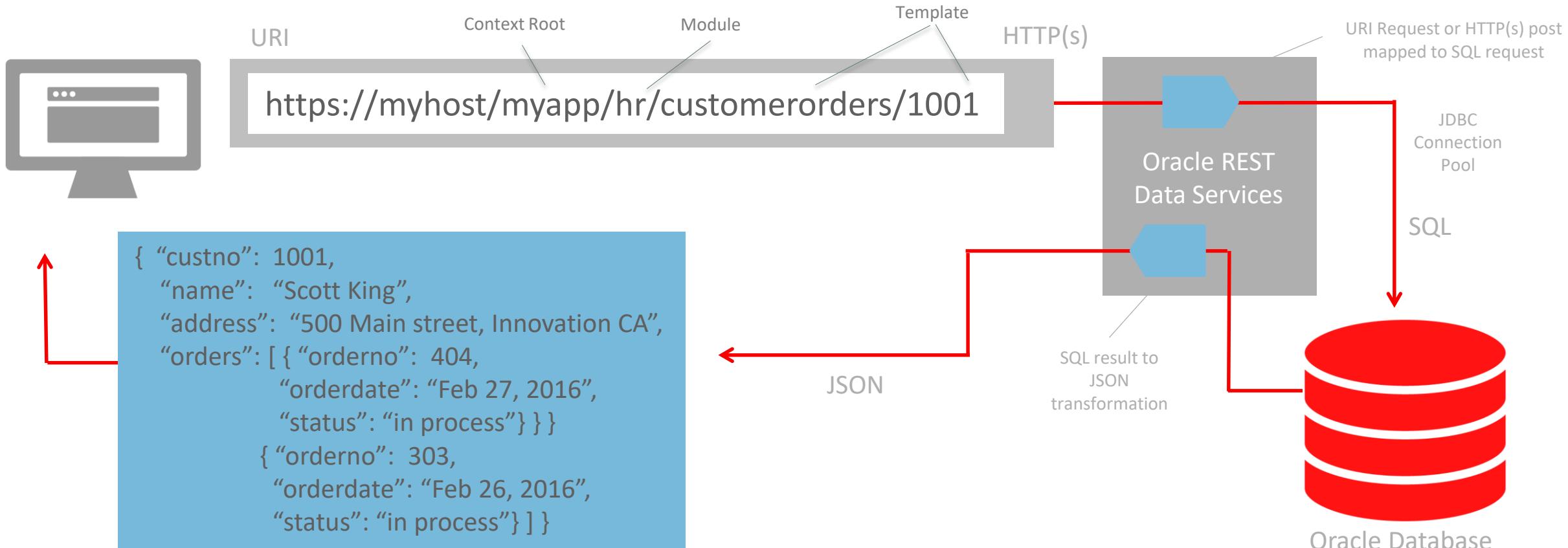
Serving JSON results from relational data



- Data stored in standard relational tables and columns
- Oracle REST Data Services (ORDS) Developer defines **URI<>SQL** mapping
- App Developer calls named **URI** over **HTTP(S)** gets and posts

Oracle REST Data Services

HTTP(s) API App-Dev with Relational Tables in Oracle Database



ORDS maps standard URI requests to corresponding relational SQL (not schemaless): e.g. SQL SELECT from customers and orders table.

ORDS also transforms the SQL results into JavaScript Object Notation (JSON), other formats include HTML, binary and CSV.

Fully committed to supporting any and all standards required by Fusion / SaaS / FMW; we are actively engaged in the ongoing dialog.

Oracle REST Data Services - Examples

```
BEGIN
ORDS.define_service(
  p_module_name    => 'module1',
  p_base_path      => 'mod1/',
  p_pattern        => 'channels/',
  p_method         => 'GET',
  p_source_type    => ORDS.source_type_collection_feed,
  p_source          => 'SELECT count(*) FROM sh.channels',
  p_items_per_page => 0);

  COMMIT;
END;
/

curl -i -k http://172.16.1.4:8080/ords/jsonpdb/sh/mod1/channels/
curl -i -k http://130.61.52.57:8080/ords/jsonpdb/sh/mod1/channels/
```

```
BEGIN
ORDS.define_service(
  p_module_name    => 'aggjson2',
  p_base_path      => 'aggjsoncomplex/',
  p_pattern        => 'crucejson/',
  p_method         => 'GET',
  p_source_type    => ORDS.source_type_collection_feed,
  p_source          => 'select ch.channel_desc, c.sales_json.TOTAL_SOLD+c1.sales_json.TOTAL_SOLD
from SALES_JSON_INDEX c,
      SALES_JSON_INDEX2 c1,
      CHANNELS ch
where c.sales_json.CHANNELID = ch.channel_id
and   c1.sales_json.CHANNELID = ch.channel_id
and   c.sales_json.CUSTID = c1.sales_json.CUSTID
and   c.sales_json.CUSTID = 397071',
  p_items_per_page => 0);

  COMMIT;
END;
/

curl -i -k http://172.16.1.4:8080/ords/jsonpdb/sh/aggjsoncomplex/crucejson
curl -i -k http://130.61.52.57:8080/ords/jsonpdb/sh/aggjsoncomplex/crucejson
```

Oracle REST Data Services - Examples

```
CREATE OR REPLACE PROCEDURE create_sales (
P_PROD_ID      sales.prod_id%TYPE,
P_CUST_ID      sales.cust_id%TYPE,
P_TIME_ID      VARCHAR2,
P_CHANNEL_ID   sales.CHANNEL_ID%TYPE,
P_PROMO_ID     sales.PROMO_ID%TYPE,
P_QUANTITY SOLD    sales.QUANTITY_SOLD%TYPE,
P_SELLER       sales.SELLER%TYPE,
P_FULFILLMENT_CENTER  sales.FULFILLMENT_CENTER%TYPE,
P_COURIER_ORG  sales.COURIER_ORG%TYPE,
P_TAX_COUNTRY   sales.TAX_COUNTRY%TYPE,
P_TAX_REGION    sales.TAX_REGION%TYPE,
P_AMOUNT SOLD   sales.AMOUNT_SOLD%TYPE
)
AS
BEGIN
  INSERT INTO sales (PROD_ID, CUST_ID, TIME_ID, CHANNEL_ID, PROMO_ID, QUANTITY_SOLD, SELLER, FULFILLMENT_CENTER, COURIER_ORG, TAX_COUNTRY, TAX_REGION,AMOUNT_SOLD )
  VALUES (
P_PROD_ID,
P_CUST_ID,
to_date(P_TIME_ID,'YYYY-MM-DD HH24:MI:SS'),
P_CHANNEL_ID,
P_PROMO_ID,
P_QUANTITY SOLD,
P_SELLER,
P_FULFILLMENT_CENTER,
P_COURIER_ORG,
P_TAX_COUNTRY,
P_TAX_REGION,
P_AMOUNT SOLD);
EXCEPTION
  --- Si hubiera PK, podríamos hacer un UPDATE en el caso de un POST de una clave ya existente !!!
  WHEN OTHERS THEN
    HTP.print(SQLERRM);
END create_sales;
/
```

Oracle REST Data Services - Examples

```
BEGIN
ORDS.define_module(
  p_module_name    => 'postsales',
  p_base_path      => 'cresale/',
  p_items_per_page => 0);

ORDS.define_template(
  p_module_name    => 'postsales',
  p_pattern        => 'sales/');

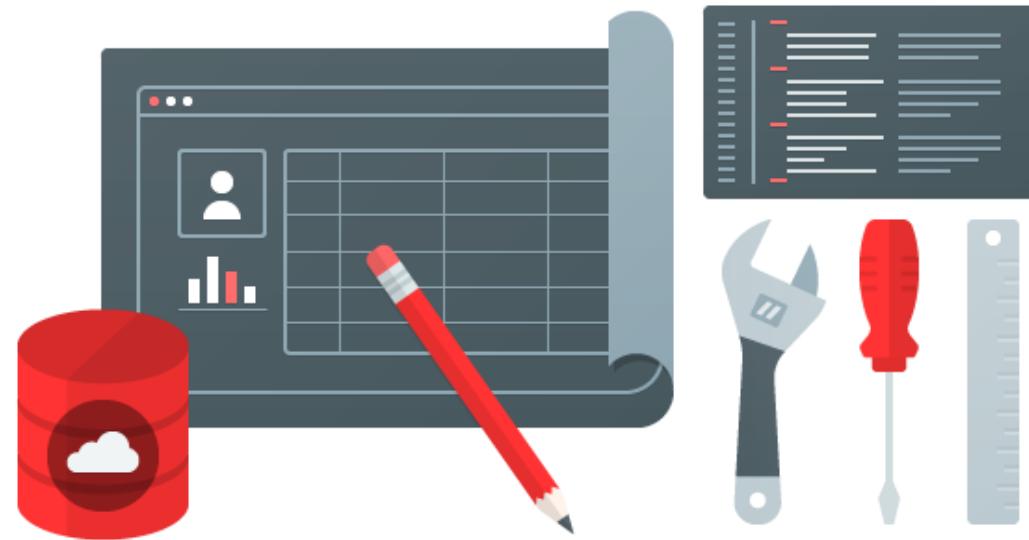
ORDS.define_handler(
  p_module_name    => 'postsales',
  p_pattern        => 'sales/',
  p_method         => 'POST',
  p_source_type   => ORDS.source_type_plsql,
  p_source         => '
BEGIN
create_sales (
  P_PROD_ID => :prodid,
  P_CUST_ID => :custid,
  P_TIME_ID => :timeid,
  P_CHANNEL_ID => :channelid,
  P_PROMO_ID => :promoid,
  P_QUANTITY SOLD => :qtysold,
  P_SELLER => :seller,
  P_FULFILLMENT_CENTER => :fullcenter,
  P_COURIER_ORG => :courierorg,
  P_TAX_COUNTRY => :taxcountry,
  P_TAX_REGION => :taxregion,
  P_AMOUNT_SOLD => :amountsold);
END;',
  p_items_per_page => 0);
commit;
END;
/
```

Hay que utilizar un JSON para el paso de parametros:

```
[opc@clicn01 ~]$ cat cre.sales.json
{
  "prodid": "132",
  "custid": "1684090",
  "timeid": "2018-03-28 00:00:00",
  "channelid": "9",
  "promoid": "419",
  "qtysold": "34",
  "seller": "10180",
  "fullcenter": "13681",
  "courierorg": "1105",
  "taxcountry": "NT",
  "taxregion": "KM",
  "amountsold": "1000"
}
```

```
curl -i -X POST --data-binary @/home/opc/cre.sales.json -H "Content-Type: application/json" http://172.16.1.4:8080/ords/jsonpdb/sh/cresale/sales/
```

ORDS



Create USER for ORDS

```
create user ords02 identified by oracle default tablespace users temporary tablespace temp;
```

```
grant create session to ords02;
```

```
grant create table to ords02;
```

```
grant unlimited tablespace to ords02;
```

ORDS Install & Execute

```
java -jar ords.war install advanced
```

```
java -jar ords.war -help
```

```
nohup java -jar ords.war standalone &
```

Oracle SQL Developer

The Oracle SQL Developer interface shows a "New / Select Database Connection" dialog box in the foreground. The dialog contains fields for Name (set to "tefdb_pdb1_sh"), Database Type (set to "Oracle"), User Info (Proxy User), Authentication Type (Default), Username (sh), Role (default), Password (****), and Connection Type (Basic). The Hostname is set to "10.0.0.4", Port to "1521", and Service name to "pdb01.sub07030810200.vcn01.oraclevcn.com". The "Save Password" checkbox is checked. Below the dialog, the status bar displays "Status :". At the bottom of the screen, a message bar says "Click on an identifier with the Control key down to perform 'Go to Declaration'".

Connections

- Oracle Connections
 - tefdb_pdb1_ords01
 - tefdb_pdb1_ords02
 - tefdb_pdb1_sh**
 - Tables (Filtered)
 - CAL_MONTH_SALES_MV
 - CHANNELS
 - COSTS
 - COUNTRIES
 - CUSTOMERS
 - DR\$UP_TEXT_IDX\$I
 - DR\$UP_TEXT_IDX\$K
 - DR\$UP_TEXT_IDX\$N
 - DR\$UP_TEXT_IDX\$R
 - DR\$UP_TEXT_IDX\$U
 - FWEEK_PSCAT_SALES_MV
 - PRODUCTS
 - PROMOTIONS
 - SALES
 - SALES_TRANSACTIONS_EXT
 - SUPPLEMENTARY_DEMOGRAPHICS
 - TIMES

REST Development

REST Data Services

- Modules
- Privileges

New / Select Database Connection

Connection Name: tefdb_pdb1_sh

Name: tefdb_pdb1_sh

Database Type: Oracle

User Info: Proxy User

Authentication Type: Default

Username: sh

Role: default

Password: ****

Save Password:

Connection Type: Basic

Hostname: 10.0.0.4

Port: 1521

SID

Service name: pdb01.sub07030810200.vcn01.oraclevcn.com

Status :

Help Save Clear Test Connect Cancel

Messages - Log

Messages Statements Logging Pages

Click on an identifier with the Control key down to perform "Go to Declaration"

Oracle SQL Develop

File Edit View Navigate Run Team Tools Window Help



- The screenshot shows the Oracle SQL Developer interface. The left sidebar has a tree view under 'Connections' with nodes for 'Oracle Connections' (selected), 'terdb_pdb1_ords01', 'terdb_pdb1_ords02', and 'terdb_pdb1_sh'. A context menu is open over the 'terdb_pdb1_sh' node, listing options: Connect, Disconnect, Reconnect, Reset Password..., Schema Browser, Find DB Object, Rename Connection..., Delete, Add to Folder, Remove from Folder, Apply Filter..., Clear Filter, Debug..., Manage Database, Migration Repository, and Manage Features. The 'REST Development' tab is selected at the bottom, showing 'REST Data Server' with 'Modules' and 'Privileges' listed.

- A screenshot of the Oracle SQL Developer interface. The top menu bar shows several tabs: 'Welcome Page', 'tefdb_pdb1_sys.sql', 'tefdb_pdb1_ords01', 'tefdb_pdb1_sys~1', 'tefdb_pdb1_ords01~1', 'tefdb_pdb1_ords02', and 'tefdb_pdb1_sh'. Below the menu is a toolbar with icons for various operations like copy, paste, search, and refresh. The main area is divided into two panes: 'Worksheet' on the left and 'Query Builder' on the right. The 'Worksheet' pane is currently active and contains a large, empty white space. A vertical scroll bar is visible on the left side of the worksheet area. At the bottom of the screen, there is a footer bar with the text 'Enable REST Services...'.

Click on an identifier with the Control key down to perform "Go to Declaration".

opc@tefol7:/app

Oracle SQL Develop

 Services - Kubernetes Dashboard..

 Postmark

opc@tefol7:~/k8s

E Documents

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections

- + Oracle Connections
- + tefdb_pdb1_ords01
- + tefdb_pdb1_ords02
- + tefdb_pdb1_sh
 - Tables (Filtered)
 - + CAL_MONTH_SALES_MV
 - + CHANNELS
 - + COSTS
 - + COUNTRIES
 - + CUSTOMERS
 - + DR\$UP_TEXT_IDX\$I
 - + DR\$UP_TEXT_IDX\$K
 - + DR\$UP_TEXT_IDX\$N
 - + DR\$UP_TEXT_IDX\$R
 - + DR\$UP_TEXT_IDX\$U
 - + FWEEK_PSCAT_SALES_MV
 - + PRODUCTS
 - + PROMOTIONS
 - + SALES
 - + SALES_TRANSACTIONS_EXT
 - + SUPPLEMENTARY_DEMOGRAPHICS
 - + TIMEC

REST Development

REST Data Services

- + Modules
- + Privileges

RESTful Services Wizard - Step 1 of 2

Specify Details

Specify Details RESTful Summary

Enable schema

Schema alias sh

Authorization required

Help < Back Next > Finish Cancel

Messages - Log

Click on an identifier with the Control key down to perform "Go to Declaration"

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections

- + Oracle Connections
- tefdb_pdb1_ords01
- tefdb_pdb1_ords02
- tefdb_pdb1_sh
- Tables (Filtered)
 - CAL_MONTH_SALES_MV
 - CHANNELS
 - COSTS
 - COUNTRIES
 - CUSTOMERS
 - DR\$UP_TEXT_IDX\$I
 - DR\$UP_TEXT_IDX\$K
 - DR\$UP_TEXT_IDX\$N
 - DR\$UP_TEXT_IDX\$R
 - DR\$UP_TEXT_IDX\$U
 - FWEEK_PSCAT_SALES_MV
 - PRODUCTS
 - PROMOTIONS
 - SALES
 - SALES_TRANSACTIONS_EXT
 - SUPPLEMENTARY_DEMOGRAPHICS
 - TIMES

REST Development

REST Data Services

- Modules
- Privileges

RESTful Services Wizard - Step 2 of 2

RESTful Summary

Specify Details RESTful Summary

Summary SQL

RESTful Services Summary

- Schema RESTful Summary
 - Enabled
 - Alias: sh
 - Authorization required
 - Commit

Help < Back Next > Finish Cancel

Messages - Log

Click on an identifier with the Control key down to perform "Go to Declaration"

opc@tefol7:app Oracle SQL Developer Services - Kubernetes Dashboard... Postman opc@tefol7:~/k8s Documents 1 / 4

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections

- + Oracle Connections
- tefdb_pdb1_ords01
- tefdb_pdb1_ords02
- tefdb_pdb1_sh
- Tables (Filtered)
 - CAL_MONTH_SALES_MV
 - CHANNELS
 - COSTS
 - COUNTRIES
 - CUSTOMERS
 - DR\$UP_TEXT_IDX\$I
 - DR\$UP_TEXT_IDX\$K
 - DR\$UP_TEXT_IDX\$N
 - DR\$UP_TEXT_IDX\$R
 - DR\$UP_TEXT_IDX\$U
 - FWEEK_PSCAT_SALES_MV
 - PRODUCTS
 - PROMOTIONS
 - SALES
 - SALES_TRANSACTIONS_EXT
 - SUPPLEMENTARY_DEMOGRAPHICS
 - TIMES

RESTful Services Wizard - Step 2 of 2

RESTful Summary

Specify Details RESTful Summary

Summary SQL

```
DECLARE
  PRAGMA AUTONOMOUS_TRANSACTION;
BEGIN

  ORDS.ENABLE_SCHEMA(p_enabled => TRUE,
                      p_schema => 'SH',
                      p_url_mapping_type => 'BASE_PATH',
                      p_url_mapping_pattern => 'sh',
                      p_auto_rest_auth => FALSE);

  commit;

END;
```

Help < Back Next > Finish Cancel

Messages - Log

Statements Logging Page

Click on an identifier with the Control key down to perform "Go to Declaration"

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections

- + Oracle Connections
 - tefdb_pdb1_ords01
 - tefdb_pdb1_ords02
 - tefdb_pdb1_sh
 - Tables (Filtered)
 - CAL_MONTH_SALES_MV
 - CHANNELS
 - COSTS
 - COUNTRIES
 - CUSTOMERS
 - DR\$SUP_TEXT_IDX\$I
 - DR\$SUP_TEXT_IDX\$K
 - DR\$SUP_TEXT_IDX\$N
 - DR\$SUP_TEXT_IDX\$R
 - DR\$SUP_TEXT_IDX\$U
 - FWEEK_PSCAT_SALES_MV
 - PRODUCTS
 - PROMOTIONS
 - SALES
 - SALES_TRANSACTIONS_EXT
 - SUPPLEMENTARY_DEMOGRAPHICS
 - TIMES

REST Development

REST Data Services

- Modules
- Privileges

Worksheet Query Builder

Successful

Successfully processed SQL command

OK

Messages - Log

Statements Logging Page

Click on an identifier with the Control key down to perform "Go to Declaration"

Oracle SQL Developer

The screenshot shows the Oracle SQL Developer interface. The left sidebar displays a tree view of database connections and objects. The main pane shows the structure of a table named 'CHANNELS'.

Connections:

- tefdb_pdb1_sh
- Tables (Filtered)
- CAL_MONTH_SALES_MV
- CHANNELS
- COSTS
- COUNTI
- CUSTOI
- DR\$SUP
- DR\$SUP
- DR\$SUP
- DR\$SUP
- DR\$SUP
- FWEEK
- PRODUCTS
- PROMO
- SALES
- SALES
- SUPPLIERS
- TIMES
- Views
- Indexes

Actions...

- Table
- Column
- Constraint
- Index
- Privileges
- Statistics
- Storage
- Trigger
- Spatial
- Redaction

REST Development:

- Enable REST Service...
- Quick DDL

REST Data Services:

- Modules
- Privileges

Table Structure: CHANNELS

COLUMN_NAME	DATA_TYPE	NULLABLE	DATA_DEFAULT	COLUMN_ID	COMMENTS
1 CHANNEL_ID	NUMBER	No	(null)	1	primary key column
2 CHANNEL_DESC	VARCHAR2(20 BYTE)	No	(null)	2	e.g. telesales, internet, catalog
3 CHANNEL_CLASS	VARCHAR2(20 BYTE)	No	(null)	3	e.g. direct, indirect
4 CHANNEL_CLASS_ID	NUMBER	No	(null)	4	(null)
5 CHANNEL_TOTAL	VARCHAR2(13 BYTE)	No	(null)	5	(null)
6 CHANNEL_TOTAL_ID	NUMBER	No	(null)	6	(null)

Messages - Log:

Messages Statements Logging Page

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections tefdb_pdb1_sh ...ql tefdb_pdb1_ords01 tefdb_pdb1_sys~1 tefdb_pdb1_ords01~1 tefdb_pdb1_ords02 tefdb_pdb1_sh CHANNELS Indexes SQL

RESTful Services Wizard - Step 1 of 2

Specify Details

RESTful Summary

Enable object Object alias channels Authorization required

Help < Back Next > Finish Cancel

Messages - Log

opc@tefol7:app Oracle SQL Developer Services - Kubernetes Dashboard... Postman opc@tefol7:~/k8s Documents 1 / 4

This screenshot shows the Oracle SQL Developer interface with the RESTful Services Wizard open. The 'Connections' sidebar on the left lists several databases, with 'tefdb_pdb1_sh' selected. The main workspace displays the 'Specify Details' step of the wizard, which allows defining an object alias ('channels') for the selected database connection. Other tabs like 'RESTful Summary' and 'Help' are also visible. The bottom navigation bar includes links to the Oracle SQL Developer home, Kubernetes dashboard, Postman, and local terminal sessions.

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections tefdb_pdb1_sh ...ql tefdb_pdb1_ords01 tefdb_pdb1_sys~1 tefdb_pdb1_ords01~1 tefdb_pdb1_ords02 tefdb_pdb1_sh CHANNELS Indexes SQL

RESTful Services Wizard - Step 2 of 2

RESTful Summary

Specify Details RESTful Summary

Summary SQL

RESTful Services Summary Object RESTful Summary

- Enabled (Green checkmark)
- Alias: channels (Red X)
- Authorization required (Red X)
- Commit (Green checkmark)

Help < Back Next > Finish Cancel

Messages - Log

opc@tefol7:app Oracle SQL Developer Services - Kubernetes Dashboard... Postman opc@tefol7:~/k8s Documents 1 / 4

This screenshot shows the Oracle SQL Developer interface with the RESTful Services Wizard open. The main window displays the 'RESTful Summary' step, which includes sections for 'Specify Details' and 'RESTful Summary'. Under 'RESTful Summary', there are tabs for 'Summary' and 'SQL'. The 'Summary' tab shows a tree view of 'RESTful Services Summary' and 'Object RESTful Summary', with several configuration items listed: 'Enabled' (green checkmark), 'Alias: channels' (red X), 'Authorization required' (red X), and 'Commit' (green checkmark). Below the wizard are standard navigation buttons: Help, Back, Next, Finish, and Cancel. At the bottom of the screen, a taskbar lists various applications: 'opc@tefol7:app', 'Oracle SQL Developer', 'Services - Kubernetes Dashboard...', 'Postman', 'opc@tefol7:~/k8s', and 'Documents'. The status bar at the bottom right shows the date and time: '08/07/2019 5:54 ESP ES'.

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections tefdb_pdb1_sh ...ql tefdb_pdb1_ords01 tefdb_pdb1_sys~1 tefdb_pdb1_ords01~1 tefdb_pdb1_ords02 tefdb_pdb1_sh CHANNELS

RESTful Services Wizard - Step 2 of 2

RESTful Summary

Specify Details RESTful Summary

Summary SQL

```
DECLARE
  PRAGMA AUTONOMOUS_TRANSACTION;
BEGIN

  ORDS.ENABLE_OBJECT(p_enabled => TRUE,
                      p_schema => 'SH',
                      p_object => 'CHANNELS',
                      p_object_type => 'TABLE',
                      p_object_alias => 'channels',
                      p_auto_rest_auth => FALSE);

  commit;

END;
```

Help < Back Next > Finish Cancel

Messages - Log

opc@tefol7:app Oracle SQL Developer Services - Kubernetes Dashboard... Postman opc@tefol7:~/k8s Documents 1 / 4

Mozilla Firefox

Developing Oracle REST API | 10.0.0.3:8080/ords/sh/chapter | 10.0.0.3:8080/ords/ords | Services - Kubernetes Dashboard | 130.61.13.76:8080/ords/clickhouse | +

① 10.0.0.3:8080/ords/sh/channel

 Filter JSON

Save Copy

▼ items:

8

```
channel_id:      3
channel_desc:   "Direct Sales"
channel_class:  "Direct"
channel_class_id: 12
channel_total:  "Channel tota
channel_total_id: 1
```

▼ Links:

```
▼ 0:  
  rel: "self"  
  href: "http://10.0.0.3:8080/ords/sh/channels"
```

13

```
channel_id:      9
channel_desc:   "Tele Sales"
channel_class:  "Direct"
channel_class_id: 12
channel_total:   "Channel total"
channel_total_id: 1
```

▼ links:

```
▼ 0:  
  rel: "self"  
  href: "http://10.0.0.3:8080/ords/sh/channels"
```

2:

```
channel_id:      5
channel_desc:   "Catalog"
channel_class:  "Indirect"
channel_class_id: 13
channel_total:  "Channel total"
channel_total_id: 1
```

<http://10.0.0.3:8080/ords/sh/channels/>

opc@tefol7:/app

Oracle SQL Develop

Mozilla Firef

 Postma

opc@tefol7:~/k8s

Documents

Postman

File Edit View Help

New Import Runner + My Workspace Invite No Environment Sign In

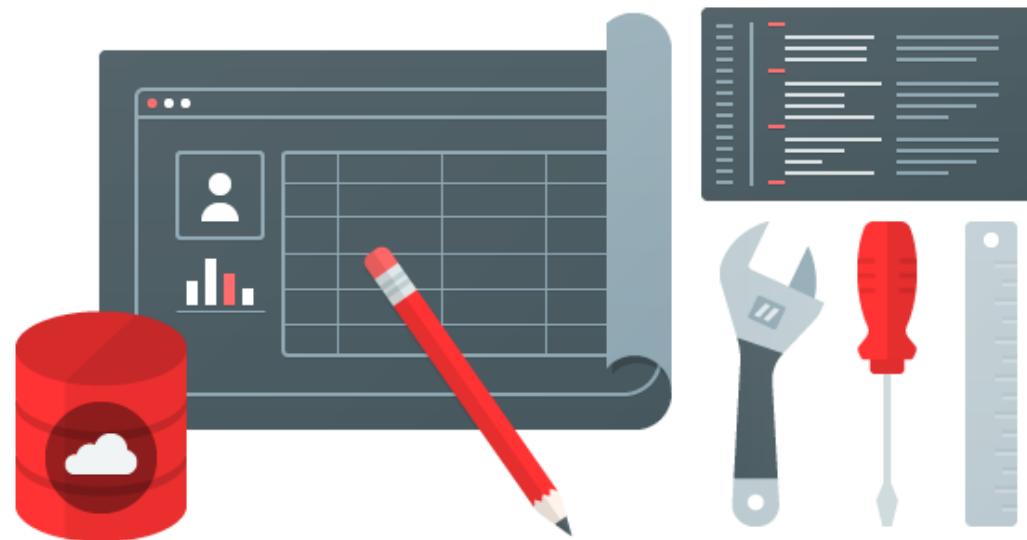
Filter History Collections APIs BETA + New Collection Trash

GET http://10.0.0.3:8080/ords/sh/channels/ Send Save

Pretty Raw Preview JSON

```
57      ],
58  },
59  {
60    "channel_id": 2,
61    "channel_desc": "Partners",
62    "channel_class": "Others",
63    "channel_class_id": 14,
64    "channel_total": "Channel total",
65    "channel_total_id": 1,
66    "links": [
67      {
68        "rel": "self",
69        "href": "http://10.0.0.3:8080/ords/sh/channels/2"
70      }
71    ],
72  },
73  {
74    "channel_id": 11,
75    "channel_desc": "Test Oli 2",
76    "channel_class": "Direct",
77    "channel_class_id": 12,
78    "channel_total": "Channel total",
79    "channel_total_id": 1,
80    "links": [
81      {
82        "rel": "self",
83        "href": "http://10.0.0.3:8080/ords/sh/channels/11"
84      }
85    ]
}
```

ORDS with Security Access



File Edit View Navigate Run Source Team Tools Window Help



Connections

- + Procedures
- + Functions
- + Operators
- + Queues
- + Queues Tables
- + Triggers
- + Types
- + Sequences
- REST Data Services
 - Modules
 - module1
 - + mytablecount/
 - Privileges
 - oracle.dbtools.autorest.privilege.ORDS01
 - oracle.dbtools.autorest.privilege.ORDS01.MYTABLE
 - oracle.soda.privilege.developer
 - Roles
 - oracle.dbtools.role.autorest.ORDS01
 - oracle.dbtools.role.autorest.ORDS01.MYTABLE
- + Materialized Views
- + Materialized View Logs

REST Development

- REST Data Services
 - Modules
 - Privileges

Oracle SQL Developer : /home/opc/Documents/tefdb_pdb1_sys.sql

```
select limit from dba_profiles where profile = 'DEFAULT' and resource_name = 'PASSWORD_VERIFY_FUNCTION';
-- ORA12C_STRONG_VERIFY_FUNCTION
alter profile default limit password_verify_function null;

create user ords01 identified by oracle default tablespace users temporary tablespace temp;

grant create session to ords01;
grant create table to ords01;
grant unlimited tablespace to ords01;
```

Script Output x Query Result x
Task completed in 0.024 seconds

User ORDS01 created.

Grant succeeded.

Grant succeeded.

Grant succeeded.

Messages - Log

Messages Statements Logging Pages

Line 9 Column 38 | Insert | Unix/Mac LF

File Edit View Navigate Run Source Team Tools Window Help



Connections

- + Oracle Connections
 - tefdb_pdb1_ords01
 - + Tables (Filtered)
 - + Views
 - + Indexes
 - + Packages
 - + Procedures
 - + Functions
 - + Operators
 - + Queues
 - + Queues Tables
 - + Triggers
 - + Types
 - + Sequences
 - + REST Data Services
 - + Modules
 - REST module1
 - + mytablecount/
 - + Privileges
 - oracle.dbtools.autorest.privilege.ORDS01
 - oracle.dbtools.autorest.privilege.ORDS01.MYTABLE

REST Development

- + REST Data Services
 - + Modules
 - + Privileges

Oracle SQL Developer : tefdb_pdb1_ords01

```
begin
    oauth.create_client(
        p_name => 'Client Credentials Ords01',
        p_grant_type => 'client_credentials',
        p_privilege_names => 'oracle.dbtools.autorest.privilege.ORDS01.MYTABLE',
        p_support_email => 'support@example.com');
    commit;
end;

select client_id,client_secret from user_ords_clients where name = 'Client Credentials Ords01';

begin
    oauth.grant_client_role(
        'Client Credentials Ords01',
        'oracle.dbtools.role.autorest.ORDS01.MYTABLE');
    commit;
end;
```

Script Output x | Query Result x

Task completed in 0.053 seconds

PL/SQL procedure successfully completed.

Messages - Log

Messages | Statements | Logging Page

| Line 23 Column 1 | Insert | Modified | Unix/Mac: LF

File Edit View Navigate Run Source Team Tools Window Help



Connections

Oracle Connections

- tefdb_pdb1_ords01
 - Tables (Filtered)
 - Views
 - Indexes
 - Packages
 - Procedures
 - Functions
 - Operators
 - Queues
 - Queues Tables
 - Triggers
 - Types
 - Sequences
- REST Data Services
 - Modules
 - module1
 - mytablecount/
 - Privileges
 - oracle.dbtools.autorest.privilege.ORDS01
 - oracle.dbtools.autorest.privilege.ORDS01.MYTABLE

REST Development

- REST Data Services
- Modules
 - Privileges

Oracle SQL Developer : tefdb_pdb1_ords01

```
oAuth.grant_client_role(
    'Client Credentials Ords01',
    'oracle.dbtools.role.autorest.ORDS01.MYTABLE');
commit;
end;
```

```
BEGIN
    ORDS.define_service(
        p_module_name      => 'module1',
        p_base_path        => 'mod1/',
        p_pattern          => 'mytablecount/',
        p_method           => 'GET',
        p_source_type      => ORDS.source_type_collection_feed,
        p_source            => 'SELECT count(*) FROM mytable',
        p_items_per_page   => 0);

    COMMIT;
END;
/
```

Script Output x Query Result x
Task completed in 0.053 seconds

PL/SQL procedure successfully completed.

Messages - Log
Messages Statements Logging Page

| Line 23 Column 1 | Insert | Modified | Unix/Mac LF

Mozilla Firefox

Developing Oracle REST | 10.0.0.3:8080/ords/ords0 | Services - Kubernetes Da | 130.61.13.76:8080/ords/c | +

10.0.0.3:8080/ords/ords01/mod1/mytablecount/

JSON Raw Data Headers

Save Copy Filter JSON

```
items:
  0:
    count(*): 3
    hasMore: false
    limit: 0
    offset: 0
    count: 1
  links:
    0:
      rel: "self"
      href: "http://10.0.0.3:8080/ords/ords01/mod1/mytablecount/"
    1:
      rel: "describedby"
      href: "http://10.0.0.3:8080/ords/ords01/metadata-catalog/mod1/mytablecount/"
```

tefol7:1 (opc) - TigerVNC

Applications Places Postman

en Mon 00:42

Postman

File Edit View Help

New Import Runner + My Workspace Invite No Environment

Filter History Collections APIs BETA + New Collection Trash

ORDS 6 requests

POST Get OAuth token
GET Get data from table using token
GET Get data from table using token 2
POST Insert data to table using token
PUT Update data to table using token
DEL Delete data to table using token

ORDS k8s 7 requests

POST Get OAuth token
GET Get data from table using token
GET Get data from table using token 2
POST Insert data to table using token
PUT Update data to table using token
DEL Delete data to table using token

GET http://10.0.0.3:8080/ords/ords01/mytable/

Send Save

TYPE Bearer Token

Heads up! These parameters hold sensitive data. To keep this data secure while working in a collaborative environment, we recommend using variables. [Learn more about variables](#)

Token j55rw9p_xkyNLpznwRyYvA

Preview Request

Status: 200 OK Time: 63 ms Size: 897 B

Body Cookies Headers (4) Test Results

Pretty Raw Preview JSON

```
1 {  
2   "items": [  
3     {  
4       "id": 1,  
5       "text": "texto uno",  
6       "links": [  
7         {  
8           "rel": "self",  
9           "href": "http://10.0.0.3:8080/ords/ords01/mytable/1"  
10      ]  
11    ]  
12  ]  
13}
```

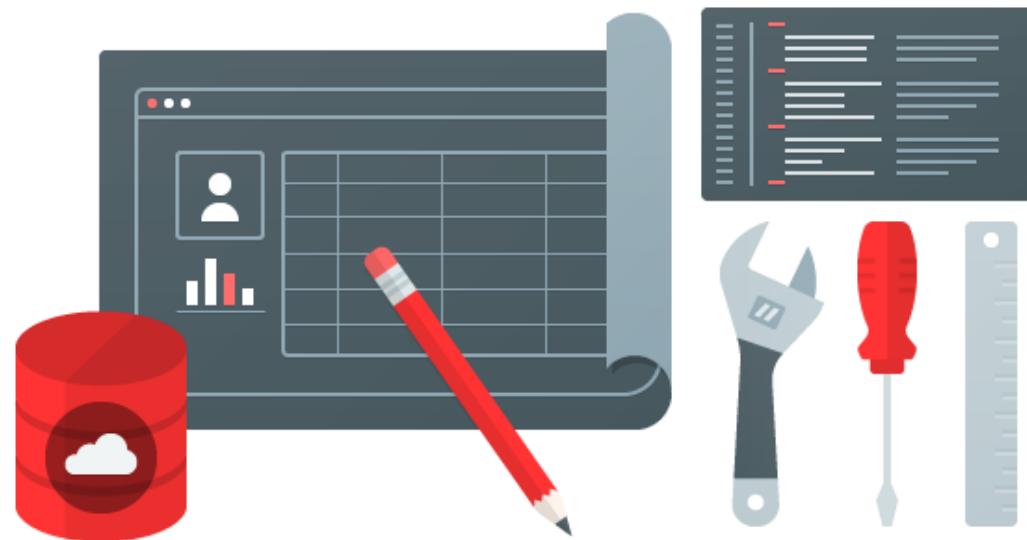
Bootcamp

opc@tefol7:app Oracle SQL Developer Services - Kubernetes Dashboard... Postman [opc@tefol7:~/k8s] Documents 1 / 4

Windows Search File Explorer Mail Edge Microsoft Store Camera Paint 3D Modeler Powerpoint Firefox

ESP ES 2:42 08/07/2019 13

ORDS for SES Use Case



File Edit View Navigate Run Source Team Tools Window Help



Connections tefdb_pdb1_ords01

Worksheet Query Builder

```
CREATE TABLE REPS_PRFSNAL (
    COD_PROFESIONAL NUMBER(20) NOT NULL,
    NOMBRE_PROFESIONAL VARCHAR2(50) NOT NULL,
    APELLIDO1_PROFESIONAL VARCHAR2(50) NOT NULL,
    APELLIDO2_PROFESIONAL VARCHAR2(50),
    DNI_TIE_PROFESIONAL VARCHAR2(10) NOT NULL,
    COD_SEXO VARCHAR2(1) NOT NULL,
    COD_TIPO_DOCUMENTO VARCHAR2(1) NOT NULL,
    COD_CONTROL_DOCUMENTO VARCHAR2(20),
    FECHA_NACIMIENTO_PROFESIONAL DATE NOT NULL,
    NACIONALIDAD_PROFESIONAL VARCHAR2(50) NOT NULL,
    FECHA_INCORPORACION_REGISTRO DATE,
    FECHA_BAJA_REGISTRO DATE
);

COMMENT ON TABLE REPS_PRFSNAL IS
'Listado de profesionales sanitarios';
```

Script Output x Query Result x
Task completed in 0.071 seconds
PL/SQL procedure successfully completed.
PL/SQL procedure successfully completed.

Messages - Log
Commit Successful

Messages Statements Logging Page

File Edit View Navigate Run Source Team Tools Window Help



Connections

- + Queues Tables
- + Triggers
- + Types
- + Sequences
- REST Data Services
 - Modules
 - module_seste
 - checkdni/:dni
 - GET
 - module1
 - mytablecount/
 - GET
 - Privileges
 - oracle.dbtools.autorest.privilege.ORDS01
 - oracle.dbtools.autorest.privilege.ORDS01.MYTABLE
 - oracle.soda.privilege.developer
 - Roles

REST Development

- REST Data Services
 - Modules
 - Privileges

...ql tefdb_pdb1_ords01 tefdb_pdb1_sys~1 tefdb_pdb1_ords01~1 tefdb_pdb1_ords02 tefdb_pdb1_sh module_seste tefdb_pdb1_ords01

Worksheet Query Builder

```
select DECODE(count(*), 0, 'FALSE', 'TRUE') from REPS_PRFSNAL where DNI_TIE_PROFESIONAL = 'X2192253P' and rownum < 2 ;
```

BEGIN

```
    ORDS.define_service(
        p_module_name      => 'module_seste',
        p_base_path        => 'ses/',
        p_pattern          => 'checkdni/:dni',
        p_method           => 'GET',
        p_source_type      => ORDS.source_type_collection_feed,
        p_source           => 'select DECODE(count(*), 0, ''FALSE'', ''TRUE'') AS ENCONTRADO from REPS_PRFSNAL where DNI_TIE_PROFESIONAL = :dni and rownum < 2';
        p_items_per_page   => 0);

    COMMIT;
END;
/
```

Script Output x Query Result x
Task completed in 0.071 seconds

PL/SQL procedure successfully completed.

PL/SQL procedure successfully completed.

Messages - Log

Commit Successful

Messages Statements Logging Page

| Line 35 Column 1 | Insert | Modified | Unix/Mac LF

Oracle REST Data Services for SES

```
BEGIN  
  
ORDS.define_service(  
  
    p_module_name => 'module_seste',  
  
    p_base_path => 'ses/',  
  
    p_pattern => 'checkdni/:dni',  
  
    p_method => 'GET',  
  
    p_source_type => ORDS.source_type_collection_feed,  
  
    p_source => 'select DECODE(count(*), 0, "FALSE", "TRUE") AS ENCONTRADO from REPS_PRFSNAL where DNI_TIE_PROFESIONAL = :dni and rownum < 2',  
    p_items_per_page => 0);  
  
COMMIT;  
  
END;  
/  
/
```

File Edit View Navigate Run Team Tools Window Help



Connections

- + Queues Tables
- + Triggers
- + Types
- + Sequences
- REST Data Services
 - Modules
 - module_seste
 - checkdni/dni
 - GET
 - module1
 - mytablecount/
 - GET
 - Privileges
 - oracle.dbtools.autorest.privilege.ORDS01
 - oracle.dbtools.autorest.privilege.ORDS01.MYTABLE
 - oracle.soda.privilege.developer
 - Roles

REST Development

- REST Data Services
 - Modules
 - Privileges

...ql tefdb_pdb1_ords01 tefdb_pdb1_sys~1 tefdb_pdb1_ords01~1 tefdb_pdb1_ords02 tefdb_pdb1_sh module_seste

General Templates Privilege Protected Module

Actions...

Module Name	URI Prefix	Items Per Page	Published Status	Created	Updated
1 module_seste	/ses/	0	PUBLISHED	10-JUL-19	10-JUL-19

Messages - Log

Commit Successful

Messages Statements Logging Page

| tefdb_pdb1_ords01| ORDS01| module_seste

Mozilla Firefox

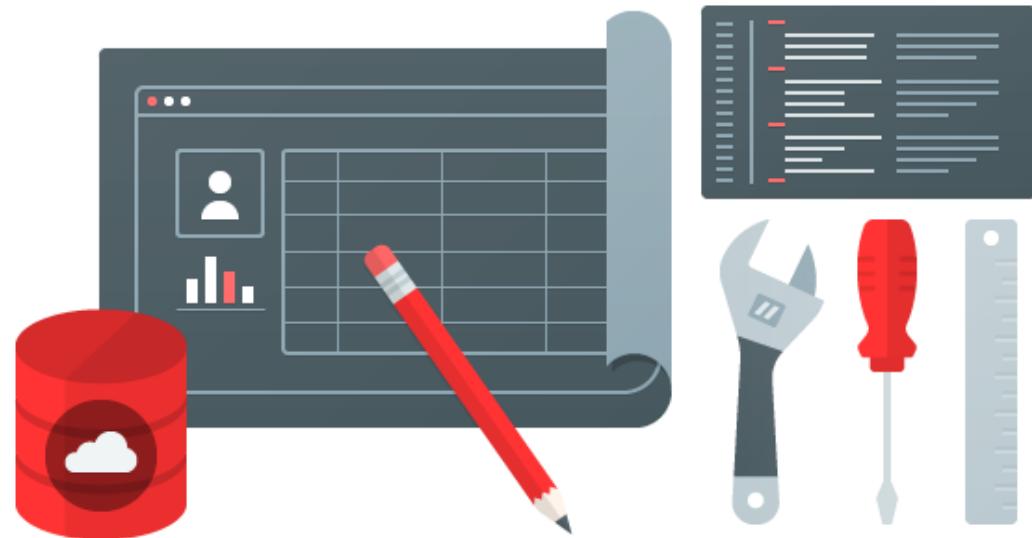
Developing Oracle REST | 10.0.0.3:8080/ords/sh/ch | 10.0.0.3:8080/ords/ords0 | ords-k8s-service - Kubernetes | 130.61.13.76:8080/ords/c | 10.0.0.3:8080/ords/ords0 | +

10.0.0.3:8080/ords/ords01/ses/checkdni/X2192253P

JSON Raw Data Headers Save Copy Filter JSON

```
items:
  0:
    encontrado: "TRUE"
    hasMore: false
    limit: 0
    offset: 0
    count: 1
  links:
    0:
      rel: "self"
      href: "http://10.0.0.3:8080/ords/ords01/ses/checkdni/X2192253P"
    1:
      rel: "describedby"
      href: "http://10.0.0.3:8080/ords/ords01/metadata-catalog/ses/checkdni/item"
```

Kubernetes K8S



Kubernetes

Kubernetes provides abstractions for deploying software in containers at scale

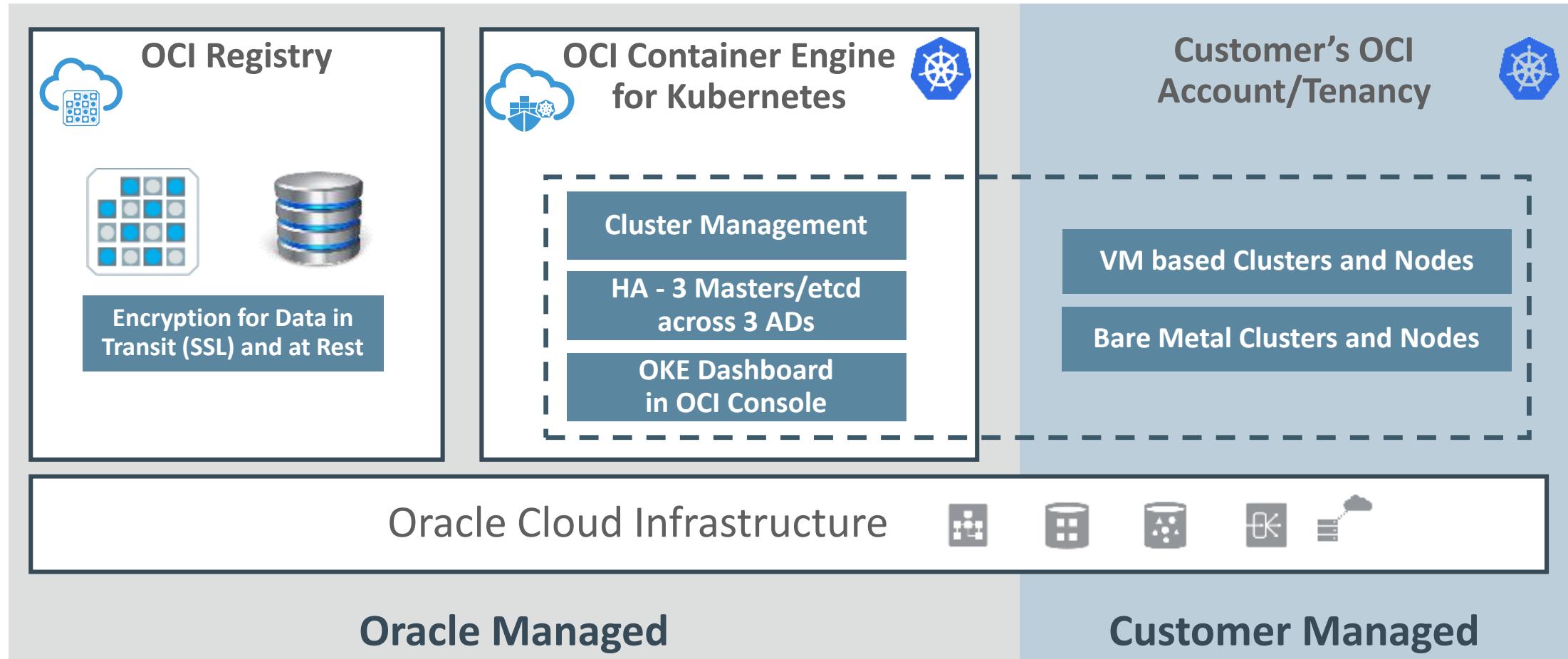
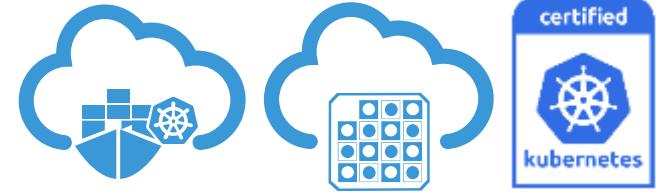


Kubernetes as a Platform

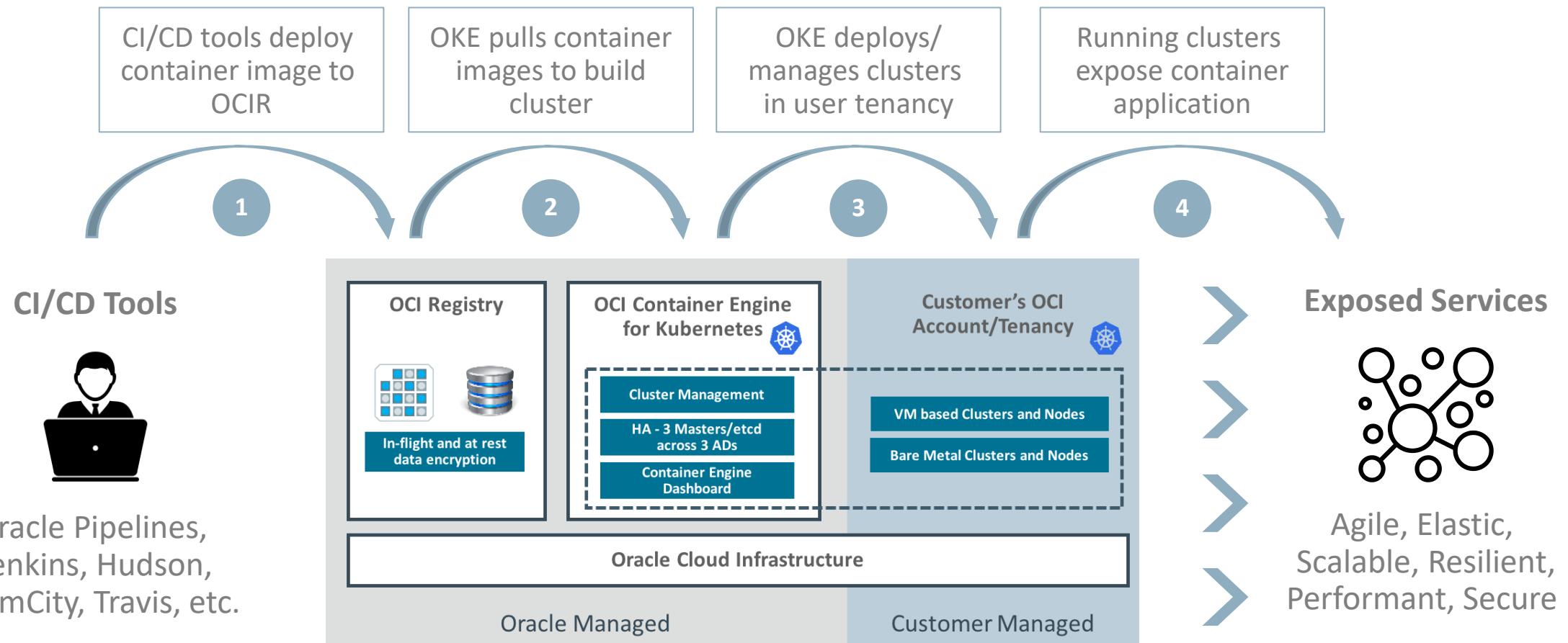
- Infrastructure resource abstraction
- Cluster software where one or more masters control worker nodes
- Scheduler deploys work to the nodes
- Work is deployed in groups of containers



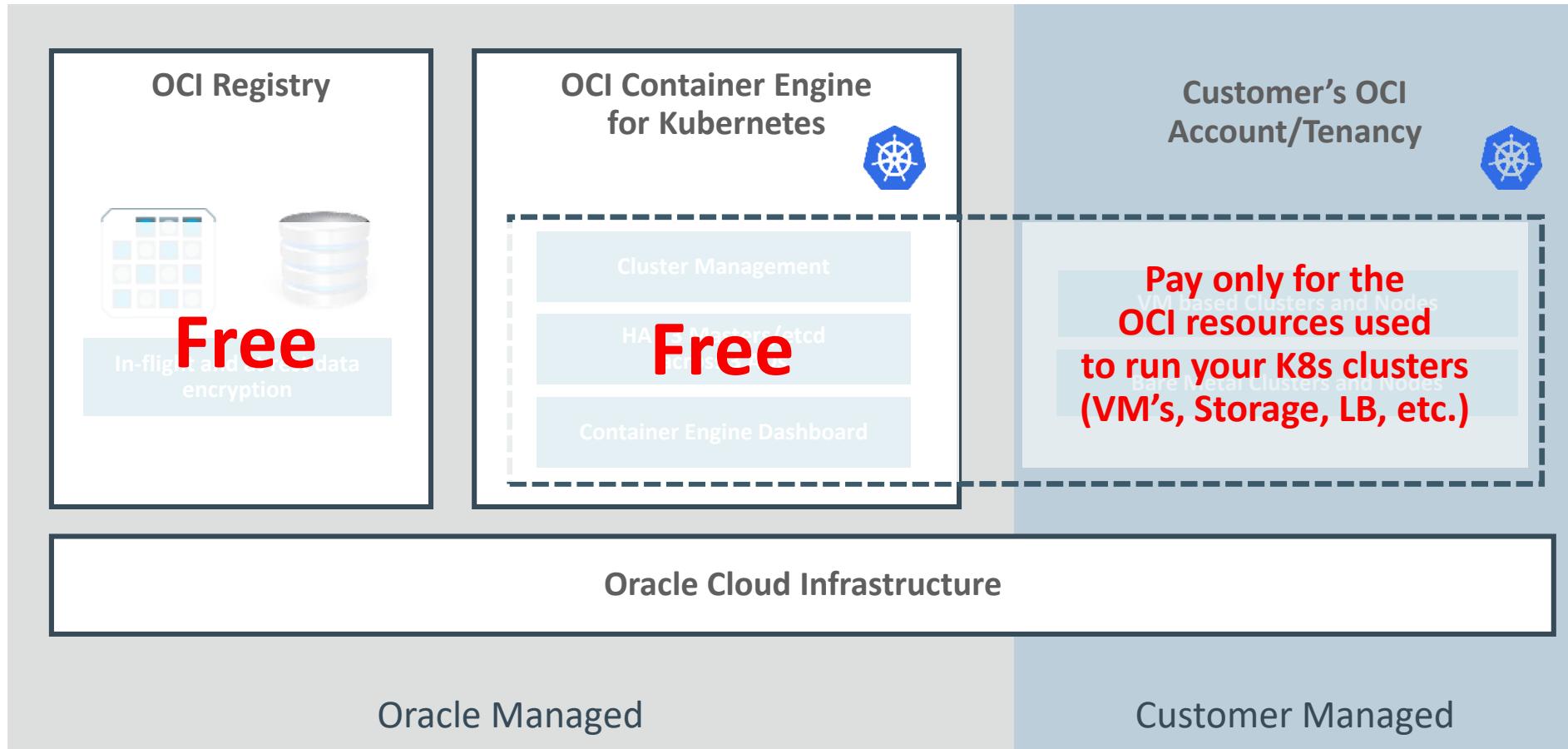
Working with OKE and OCIR on OCI



Container Application Life Cycle



OKE/OCIR Pricing and Packaging



ORDS in Docker



DockerFile

```
# Dockerfile for Oracle ORDS

# Updated to use openjdk:8-slim and reduce overall size

FROM openjdk:8-slim

# Dockerfile for Oracle ORDS

RUN apt-get update \
&& apt-get install -y curl \
&& apt-get install -y unzip \
&& mkdir app

COPY ords-telefonica.zip app/ords-telefonica.zip

COPY entrypoint.sh app/entrypoint.sh

RUN chmod +x /app/entrypoint.sh

WORKDIR /app

RUN unzip ords-telefonica.zip

ENV PATH "$PATH:/app/"

WORKDIR /app/

ENTRYPOINT ["/app/entrypoint.sh"]
```

```
#!/bin/bash

java -jar ords.war set-property db.hostname $DB_HOSTNAME
java -jar ords.war set-property db.servicename $DB_SERVICE
# New variables
java -jar ords.war set-property user.public.password "$DB_PASSWORD"

java -jar ords.war standalone
```

DockerFile

```
# Dockerfile for Oracle ORDS

# Updated to use openjdk:8-slim and reduce overall size

FROM openjdk:8-slim

# Dockerfile for Oracle ORDS

RUN apt-get update \
&& apt-get install -y curl \
&& apt-get install -y unzip \
&& mkdir app

COPY ords-telefonica.zip app/ords-telefonica.zip

COPY entrypoint.sh app/entrypoint.sh

RUN chmod +x /app/entrypoint.sh

WORKDIR /app

RUN unzip ords-telefonica.zip

ENV PATH "$PATH:/app/"

WORKDIR /app/

ENTRYPOINT ["/app/entrypoint.sh"]
```

```
#!/bin/bash

java -jar ords.war set-property db.hostname $DB_HOSTNAME
java -jar ords.war set-property db.servicename $DB_SERVICE
# New variables
java -jar ords.war set-property user.public.password "$DB_PASSWORD"

java -jar ords.war standalone
```



Explore Repositories Organizations Get Help tallerords operard

Repositories > tallerords / ords > Using 0 of 0 private repositories. [Get more](#)

General Tags Builds Timeline Permissions Webhooks Settings

 tallerords / ords

This repository does not have a description 

 Last pushed: never

Docker commands

To push a new tag to this repository,

```
docker push tallerords/ords:tagname
```

Public View

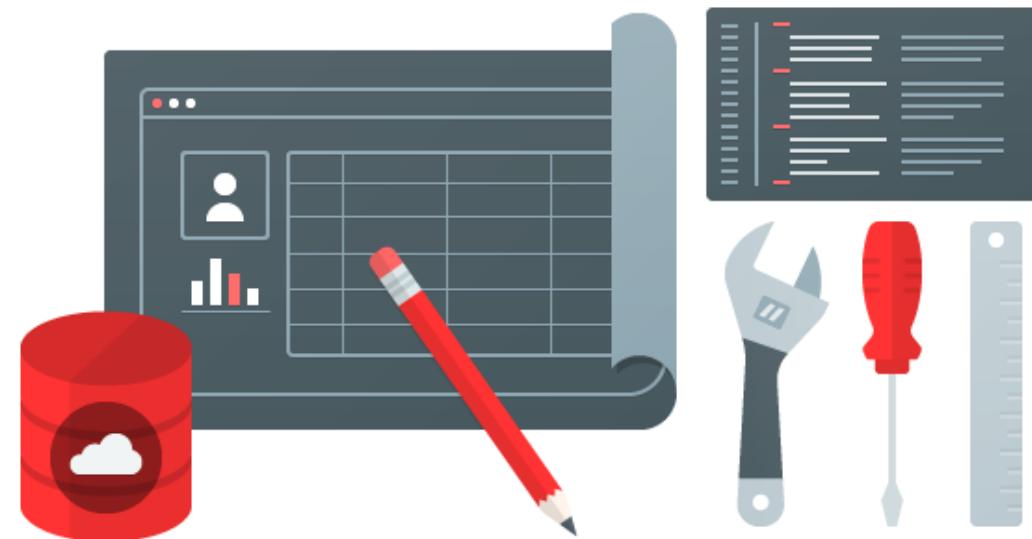
Tags

This repository is empty. When it's not empty, you'll see a list of the most recent tags here.

Full Description 

Repository description is empty. Click [here](#) to edit.

ORDS in K8S



tefol7:1 (opc) - TigerVNC

Applications Places Firefox

Services - Kubernetes Dashboard - Mozilla Firefox

Developing Oracle REST | 10.0.0.3:8080/ords/ords0 | Services - Kubernetes Da | 130.61.13.76:8080/ords/c | +

localhost:8001/api/v1/namespaces/kube-system/services/https:kubernetes-dashboard:/proxy/#/service?namespace=default

kubernetes

Search

+ CREATE |

Discovery and load balancing > Services

default

Overview

Workloads

Cron Jobs

Daemon Sets

Deployments

Jobs

Pods

Replica Sets

Replication Controllers

Stateful Sets

Discovery and Load Balancing

Ingresses

Services

Config and Storage

Services

Name	Labels	Cluster IP	Internal endpoints	External endpoints	Age
ords-k8s-service	-	10.96.66.192	ords-k8s-service:8080 TCP ords-k8s-service:30486 TCP	130.61.13.76:8080	-
kubernetes	component: apiserver provider: kubernetes	10.96.0.1	kubernetes:443 TCP	-	4 minutes

opc@tefol7:app Oracle SQL Developer : tef... Services - Kubernetes Das... kubernetes_dashboard.txt ... Postman [opc@tefol7:~/k8s] Documents

1 / 4

Windows Taskbar icons: Search, File Explorer, Edge, Mail, Chrome, Camera, Paint, File Manager, Microsoft Word, Microsoft Excel, Microsoft Powerpoint.

System tray icons: Volume, Battery, Network, Signal strength, Date and Time (ESP ES 07/07/2019 17:56).

Mozilla Firefox

Developing Oracle REST

10.0.0.3:8080/ords/ords0

Services - Kubernetes Da

130.61.13.76:8080/ords/c

+



130.61.13.76:8080/ords/ords01/mod1/mytablecount/



JSON Raw Data Headers

Save Copy

Filter JSON

```
items:
  0:
    count(*): 3
    hasMore: false
    limit: 0
    offset: 0
    count: 1
  links:
    0:
      rel: "self"
      href: "http://130.61.13.76:8080/ords/ords01/mod1/mytablecount/"
    1:
      rel: "describedby"
      href: "http://130.61.13.76:8080/ords/ords01/metadata-catalog/mod1/mytablecount/"
```

```
{"items": [{"id": 1, "text": "texto uno", "links": [{"rel": "self", "href": "http://130.61.215.158:8080/ords/ords01/mytable/1"}]}, {"id": 2, "text": "mas texto", "links": [{"rel": "self", "href": "http://130.61.215.158:8080/ords/ords01/mytable/2"}]}, {"id": 4, "text": "texto desde Postman", "links": [{"rel": "self", "href": "http://130.61.215.158:8080/ords/ords01/mytable/4"}]}, {"hasMore": false, "limit": 25, "offset": 0, "count": 3, "links": [{"rel": "self", "href": "http://130.61.215.158:8080/ords/ords01/mytable/"}], {"rel": "edit", "href": "http://130.61.215.158:8080/ords/ords01/mytable/"}, {"rel": "describedby", "href": "http://130.61.215.158:8080/ords/ords01/metadata-catalog/mytable/"}, {"rel": "first", "href": "http://130.61.215.158:8080/ords/ords01/mytable/"}]}
```

Postman

File Edit View Help

[+ New](#) [Import](#) [Runner](#) [+](#)My Workspace [Invite](#)

Filter

History Collections APIs **BETA**

+ New Collection

ORDS 6 requests

- POST Get OAuth token
- GET Get data from table using token
- GET Get data from table using token 2
- POST Insert data to table using token
- PUT Update data to table using token
- DEL Delete data to table using token

ORDS k8s 7 requests

- POST Get OAuth token
- GET Get data from table using token
- GET Get data from table using token 2
- POST Insert data to table using token
- PUT Update data to table using token
- DEL Delete data to table using token

DNFLICT GET ... PUT ... POST ... DEL ... GET ... POST C GET ... GET ... POST li PUT ... DEL ... GET ... + ... No Environment Examples (0)

Get data from table using token

Method: GET URL: http://130.61.13.76:8080/ords/ords01/mytable/

Send Save

Params Authorization Headers (9) Body Pre-request Script Tests Cookies Code Comments (0)

Authorization Type: Bearer Token

The authorization header will be automatically generated when you send the request. [Learn more about authorization](#)

Token: 8dVuXI5xMUZhTXJFcIxkAg

Preview Request

Body Cookies Headers (4) Test Results Status: 200 OK Time: 180 ms Size: 925 B Save Download

Pretty Raw Preview JSON

```
1 { "items": [ 2 { 3 { 4 { 5 { 6 { "id": 1, "text": "texto uno", "links": [ ] } } } } } ] }
```

Bootcamp

Documents

1 / 4

opc@tefol7:app

Oracle SQL Developer

Services - Kubernetes Dashboard...

Postman

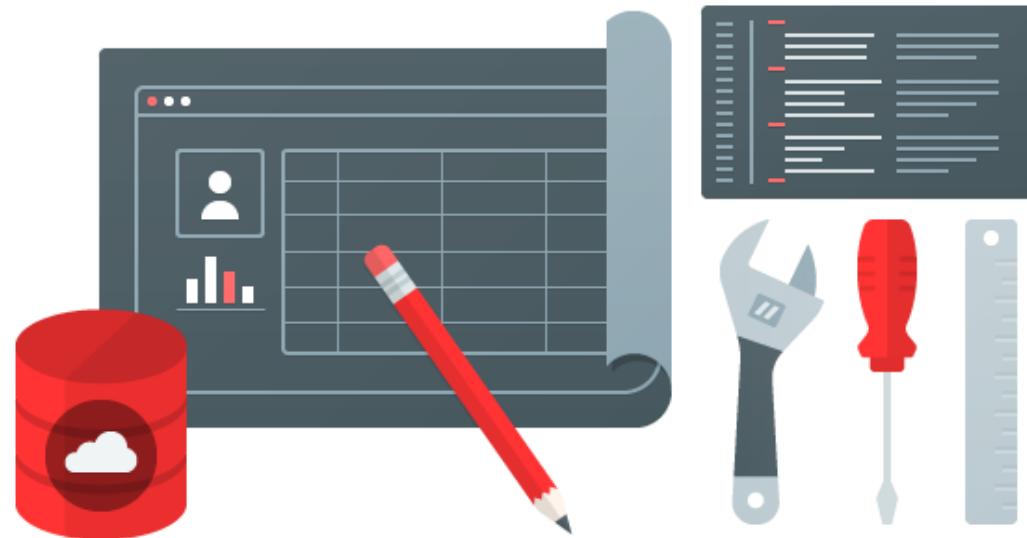
[opc@tefol7:~/k8s]

Documents



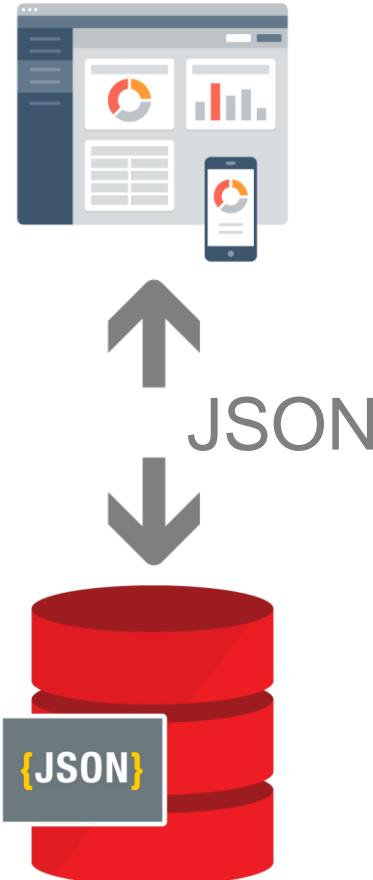
ESP ES 2:45 08/07/2019 13

ORACLE SODA SERVICES



Oracle SODA

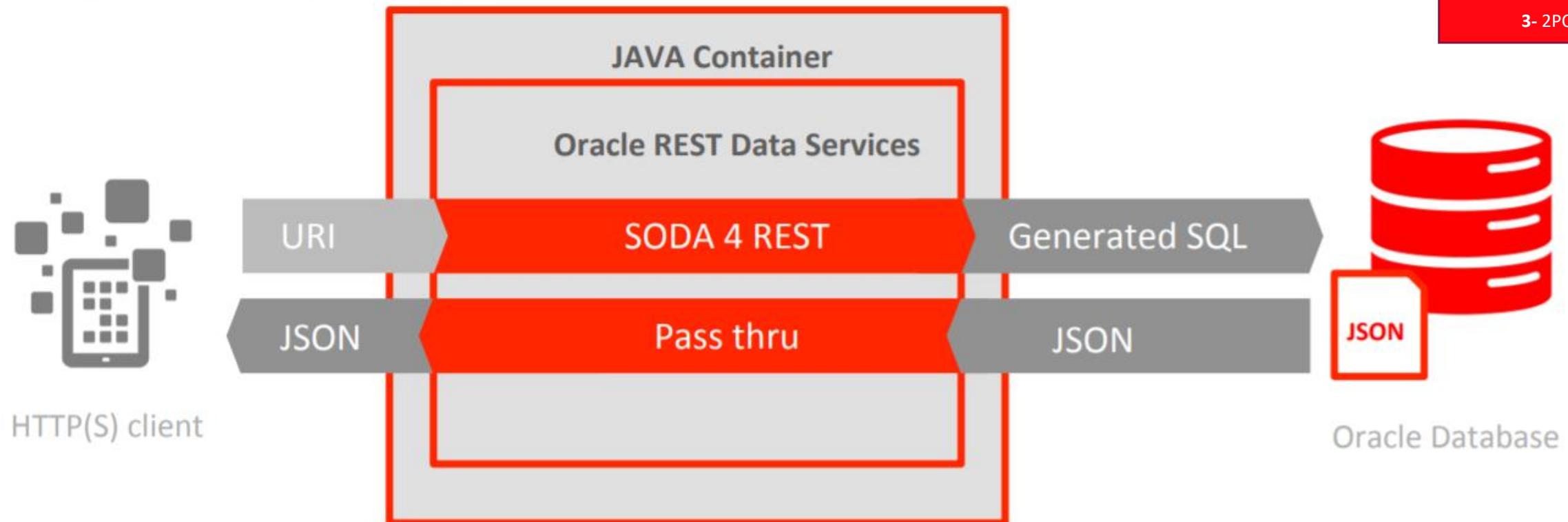
Simple Oracle Document Access



- JSON Document APIs for REST and Java
- Leverages native 12.2 database JSON features
- Allows developers to combine the ease of use of document development and relational
- SQL analytics can be used on JSON documents
- Full PL/SQL API

Oracle REST Data Services

SODA for REST and ORDS 3.0



- Data stored in Oracle Database as JSON documents
- App Developer make standard HTTP(S) calls to SODA for REST API

Oracle Database 12c as a Document Store

12.2 JSON DataGuide – Automatic Schema Inference

Table containing
JSON documents

```
SQL> desc MOVIE_TICKETS
NAME                      TYPE
-----
BOOKING_ID                RAW(16)
BOOKING_TIME               TIMESTAMP(6)
BOOKING_DETAILS             VARCHAR2(4000)

{ "Theater": "AMC 15",
  "Movie": "Jurassic World 3D",
  "Time": "2015-11-26T18:45:00",
  "Tickets": {
    "Adults": 2
  }
}
```

JSON DataGuide

```
DBMS_JSON.AddVC(
  "MOVIE_TICKETS",
  "BOOKING_DETAILS");
```



Table enhanced with
virtual columns

```
SQL> desc MOVIE_TICKETS
NAME                      TYPE
-----
BOOKING_ID                RAW(16)
BOOKING_TIME               TIMESTAMP(6)
BOOKING_DETAILS             VARCHAR2(4000)
BOOKING_DETAILS$Movie      VARCHAR2(16)
BOOKING_DETAILS$Theater    VARCHAR2(16)
BOOKING_DETAILS$Adults     NUMBER
BOOKING_DETAILS$Time       VARCHAR2(32)
```

Oracle Database 12c as a Document Store

12.2 JSON DataGuide – Automatic Schema Inference

NEW IN
12.2

The 12.2+ SQL functions available for JSON generation are:

JSON_OBJECT – single-row function, creates an object for each row.

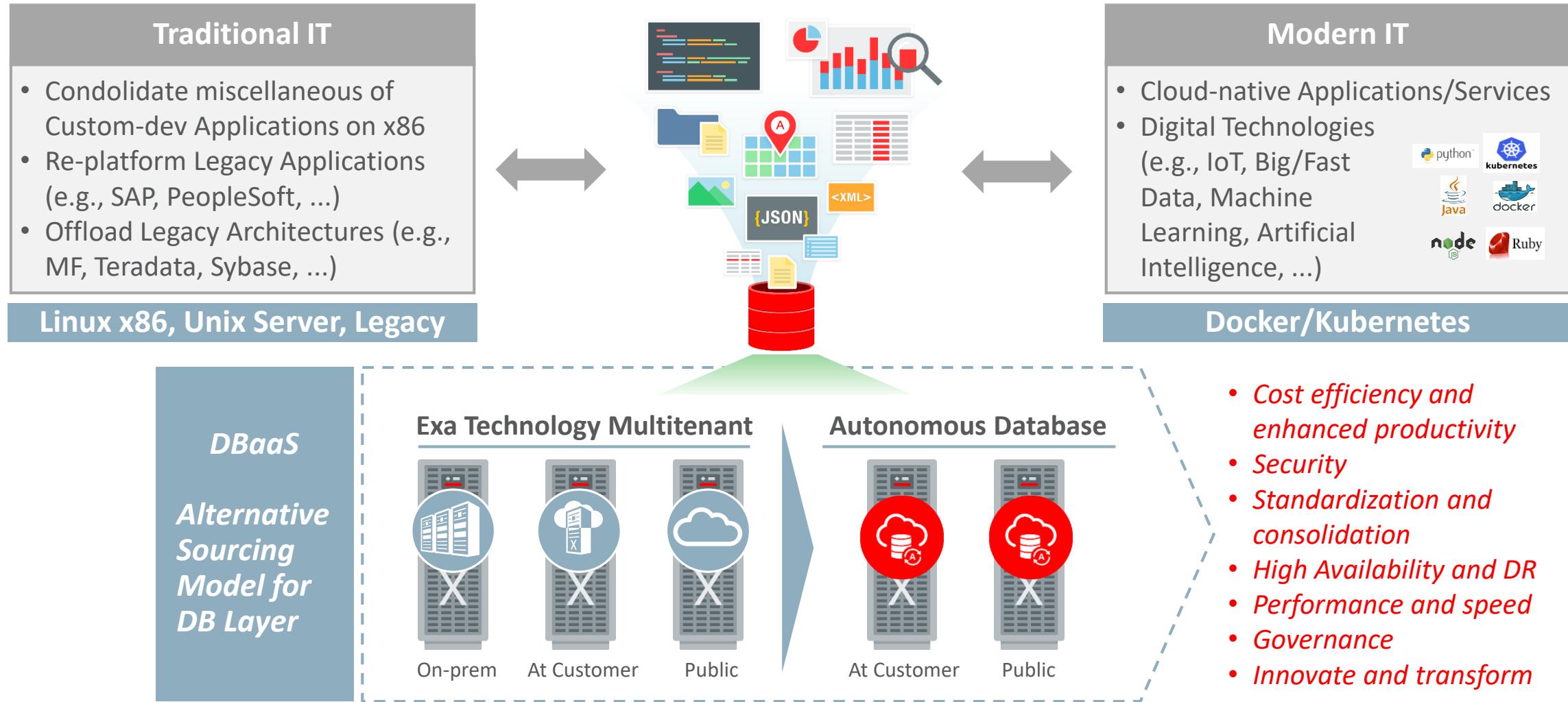
JSON_ARRAY – single-row function, creates an array for each row.

JSON_OBJECTAGG – aggregate function, creates an object based on groups of rows.

JSON_ARRAYAGG – aggregate function, creates an array based on groups of rows.

Innovative and secured DBaaS Platform to support any kind of Application landscape

Benefits unlocked



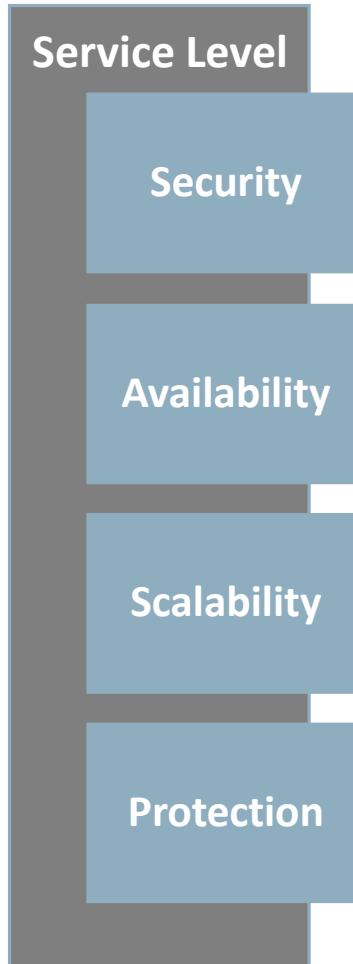
Source: Oracle Insight

Simplify by standardizing to a well defined Service Catalog of Service Classes and Service Levels

Service Classes		Service Level		
OLTP	<ul style="list-style-type: none">Row Level LockingDistributed Transactional Consistency <ul style="list-style-type: none">Fine Grade AuditingSegregation of Duties	Bronze	Silver	Gold
Analytics	<ul style="list-style-type: none">Columnar in MemoryQuery ConsistencyColumnar CompressionVirtual Private DB <ul style="list-style-type: none">Columnar in FlashQuery OffloadingShared Nothing Scalability	Performances	Performances	Performances
Cloud Native	<ul style="list-style-type: none">Multi Semantic ModelMulti Access InterfaceOpen Service Broker Integration <ul style="list-style-type: none">SODA and ORDSOn Demand Provisioning	Availability	Availability	Availability
Legacy	<ul style="list-style-type: none">Old VersionsAccess Control <ul style="list-style-type: none">Transparent Data Encryption	Cold Backup No RAC Continuity No DR No RTO RPO 1 day	Hot Backup RAC Continuity No DR RTO weeks RPO hours	Hot Backup Hot RAC Continuity DR RTO day RPO minutes

Source: Oracle Presales

Key Capabilities for Service Level definition

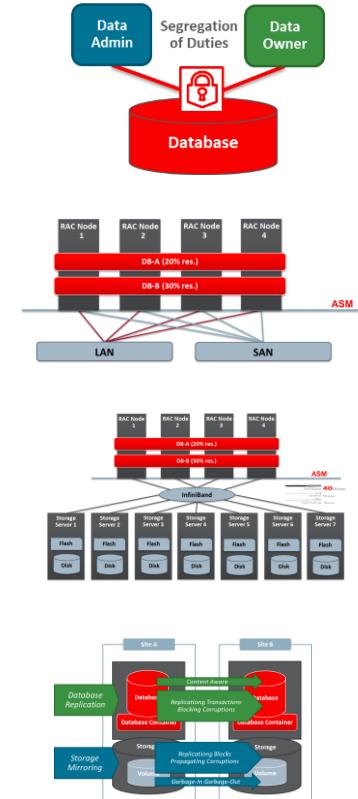


Key requirements

- Segregation of duties between Data Admin and Data Owner
- Maximum availability with transparent failures to Applications ...
 - ... keeping distributed consistency
- Avoiding the Storage bottleneck allowing unlimited scalability ...
 - ... keeping distributed consistency
- Avoid propagation of data corruptions with storage-based replication ...
 - ... also unlocking other benefits (bandwidth and IOPS costs, SLA)

Oracle enablers

- DB Vault for Segregation of Duties
- Real Application Cluster
- Exadata Technology
- DB-level data replication (Active Data Guard and Data Guard)



Source: Oracle Insight

Key Functionalities for Service Class definition

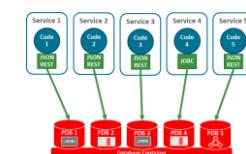
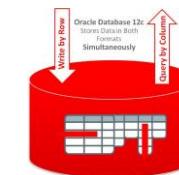
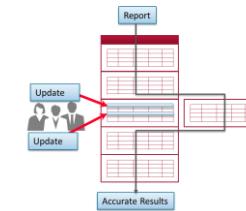


Key requirements

- Consistency required not only for transactional workloads, but also for real-time changing analytics
- In-memory capability transparent to Applications
- Multi-model semantics ...
 - ... segregated services ...
 - ... in Enterprise Environment

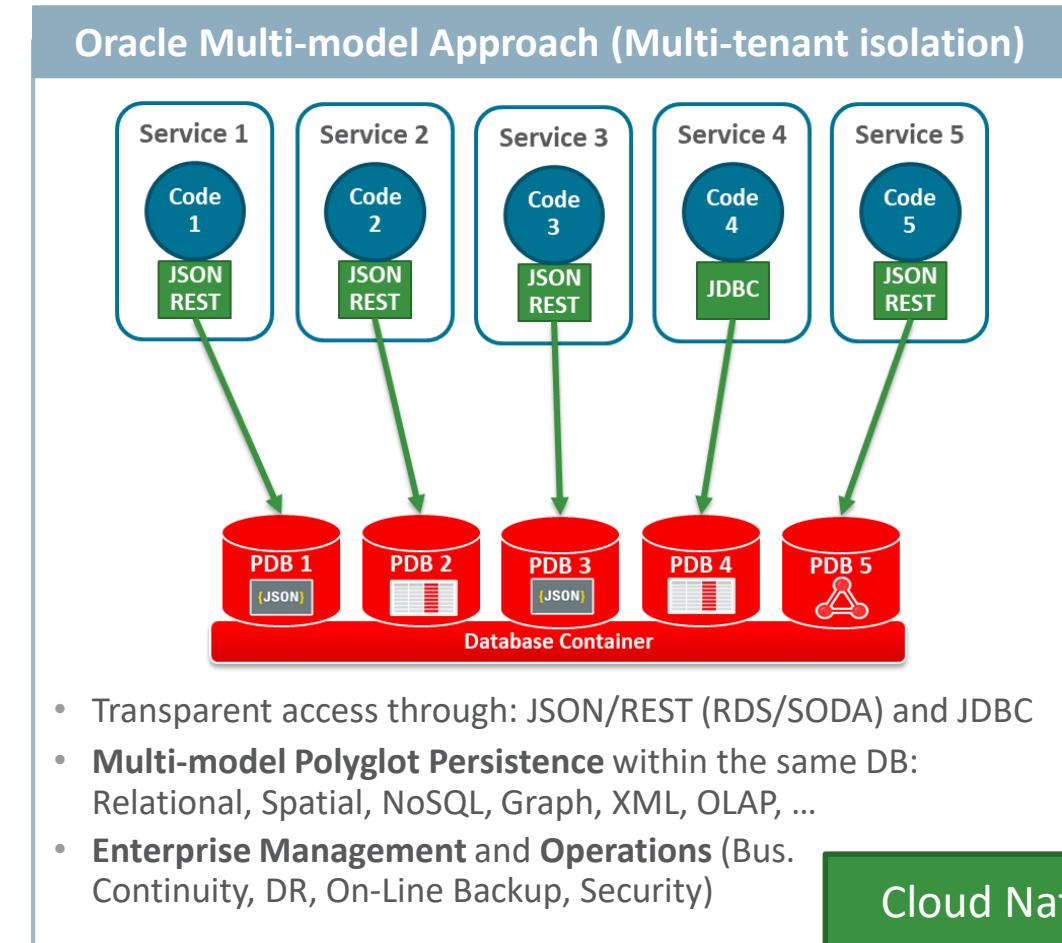
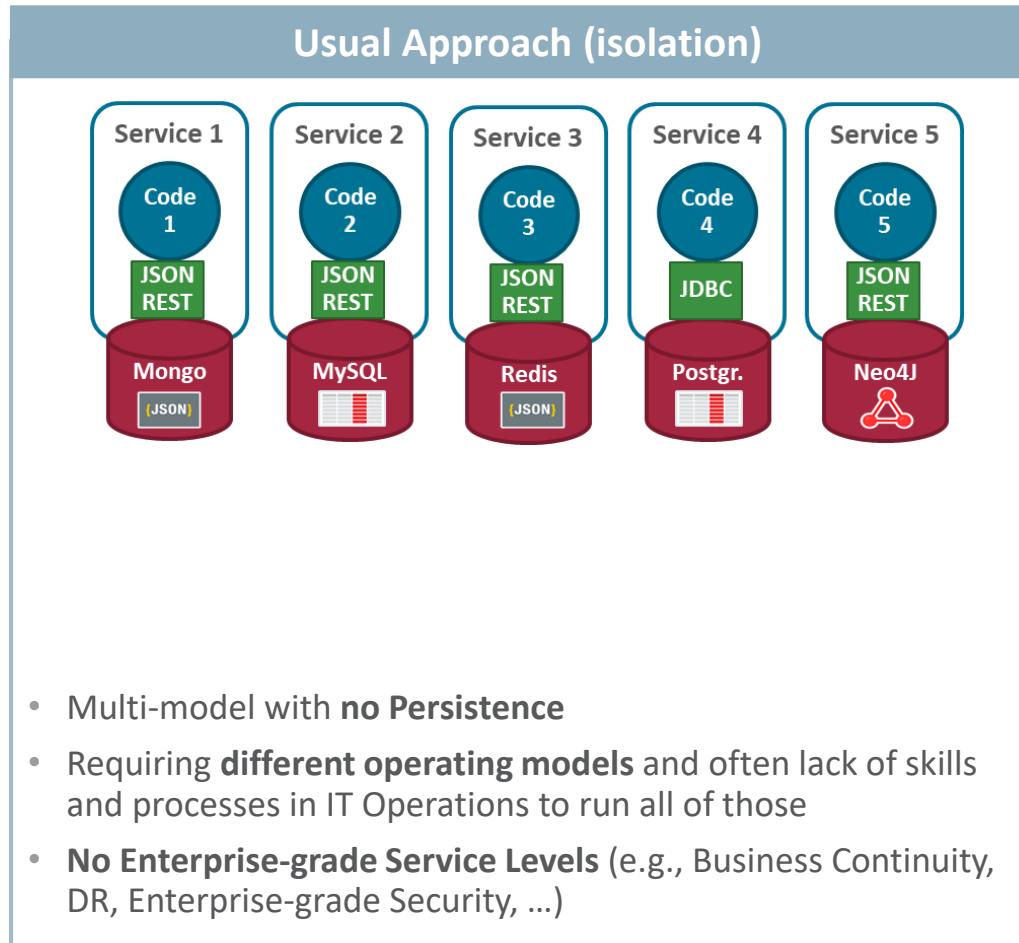
Oracle enablers

- Oracle Relational DB: provide best consistency
- Oracle In-memory: ability to write by row and read by column simultaneously
- Oracle Relational DB: enterprise-grade multi-model and multi-tenant segregation



Source: Oracle Insight

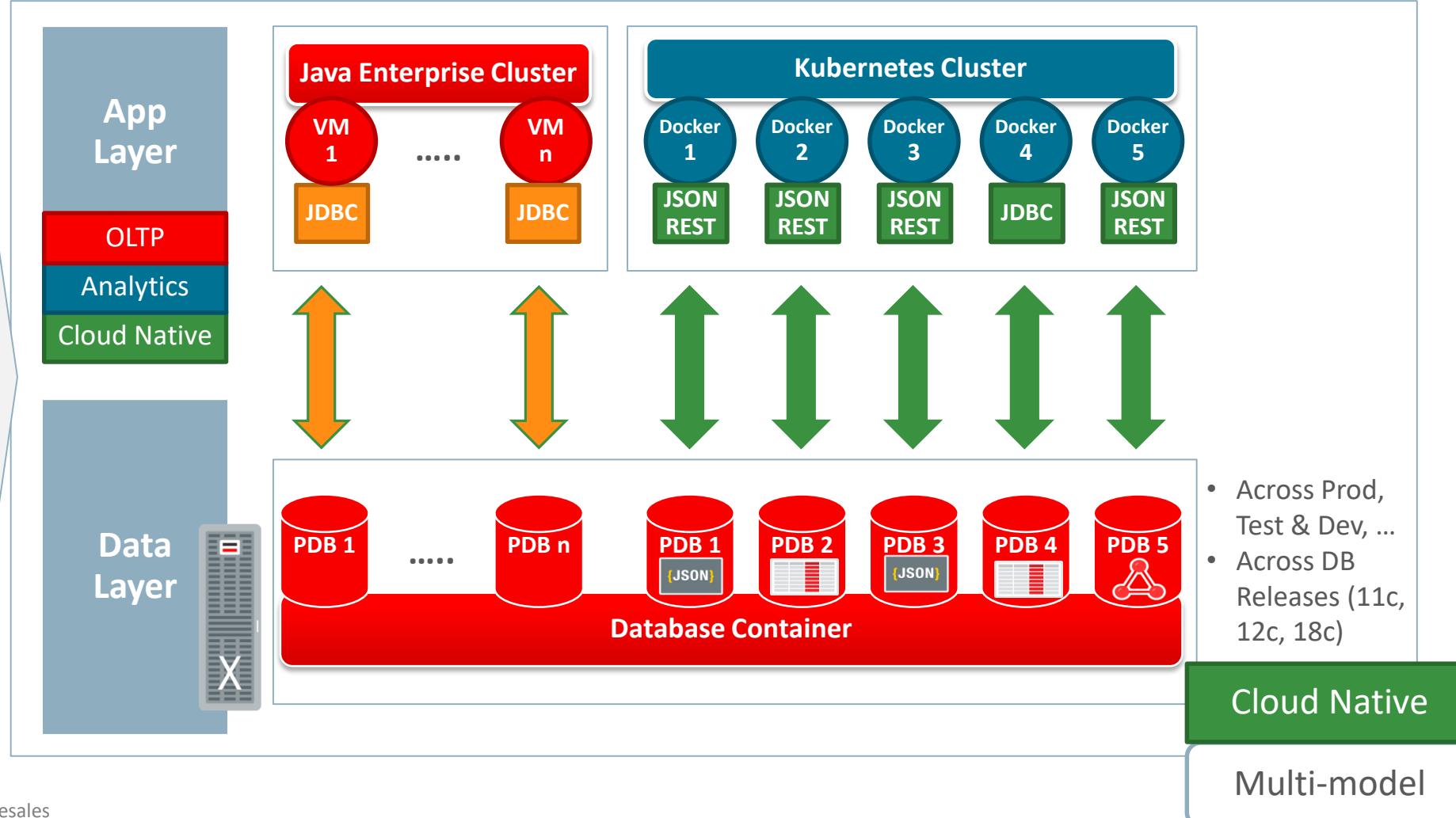
Microservices with Poliglot persistence delivered and operated in an Enterprise Environment ...



Source: Oracle Presales

... by leveraging Exadata to implement a Modern Horizontal Grid Scalability

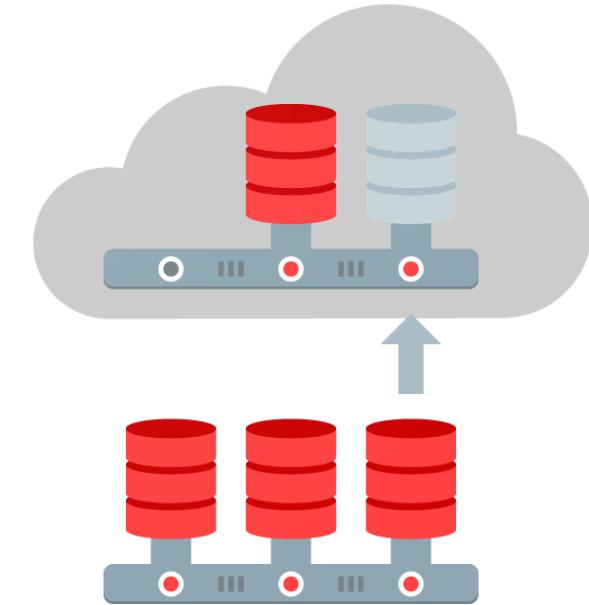
- Coexistence of Java Enterprise and Kubernetes
- Cross Model Data Access
- Gradual migrations avoiding big bang risky projects
- Unified Management and Operations
- Integrated comprehensive security



Source: Oracle Presales

Multitenant

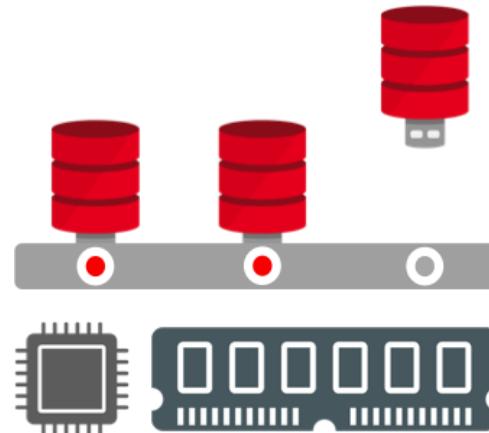
4k PDBs, Hot Clone/Relocate/Refresh, Application Root



12.1 Multitenant

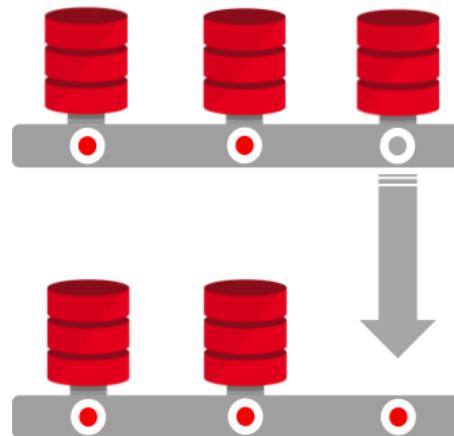
Reduce CapEx and Opex by Half

Cloud Scale Operations



Manage many as one
CPU and I/O management

Agility



Rapid provisioning and cloning
Unplug/plug databases

Software as a Service

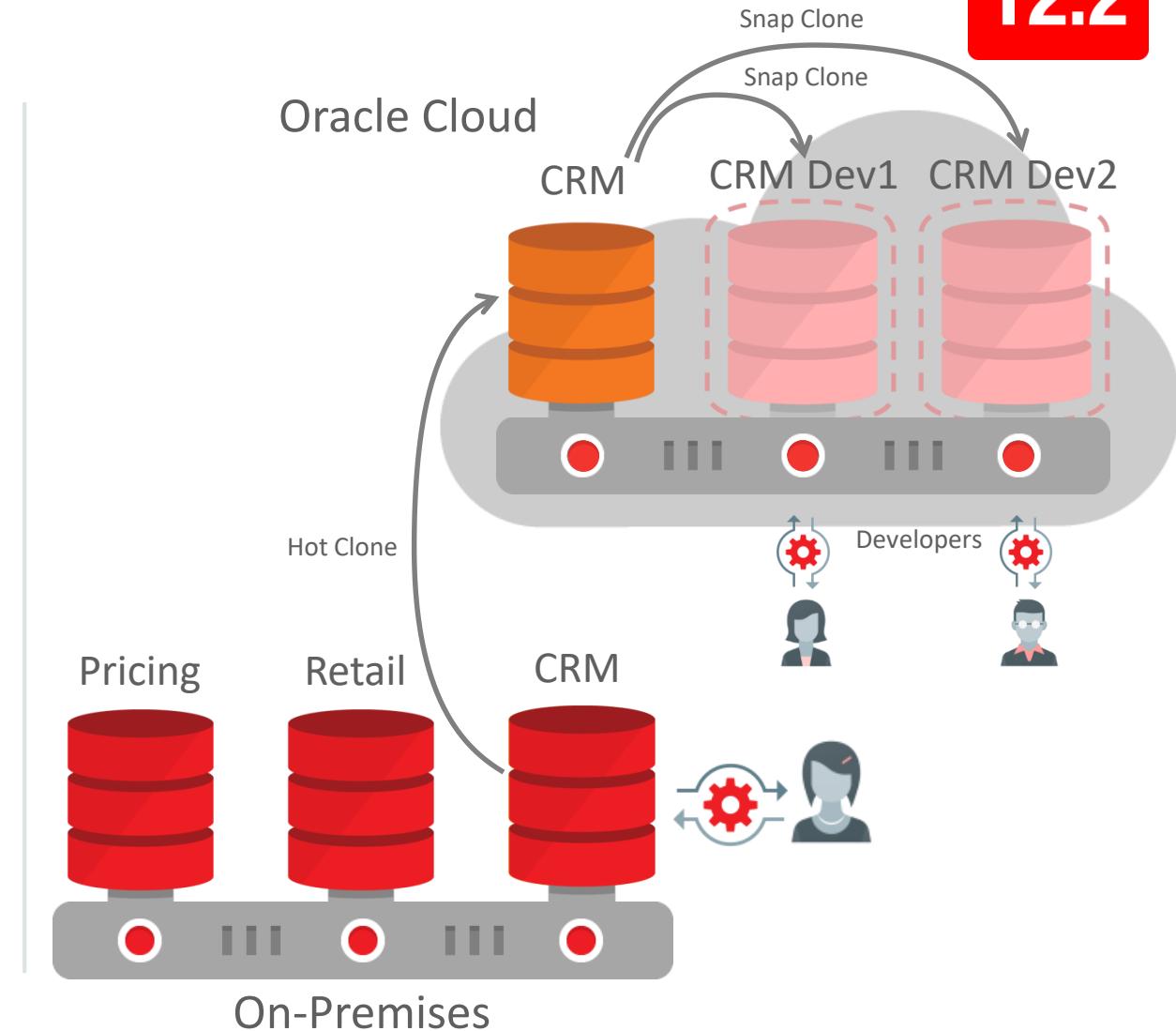


Instant SaaS architecture
No application changes required

NEW IN
12.2

PDB Hot Clone

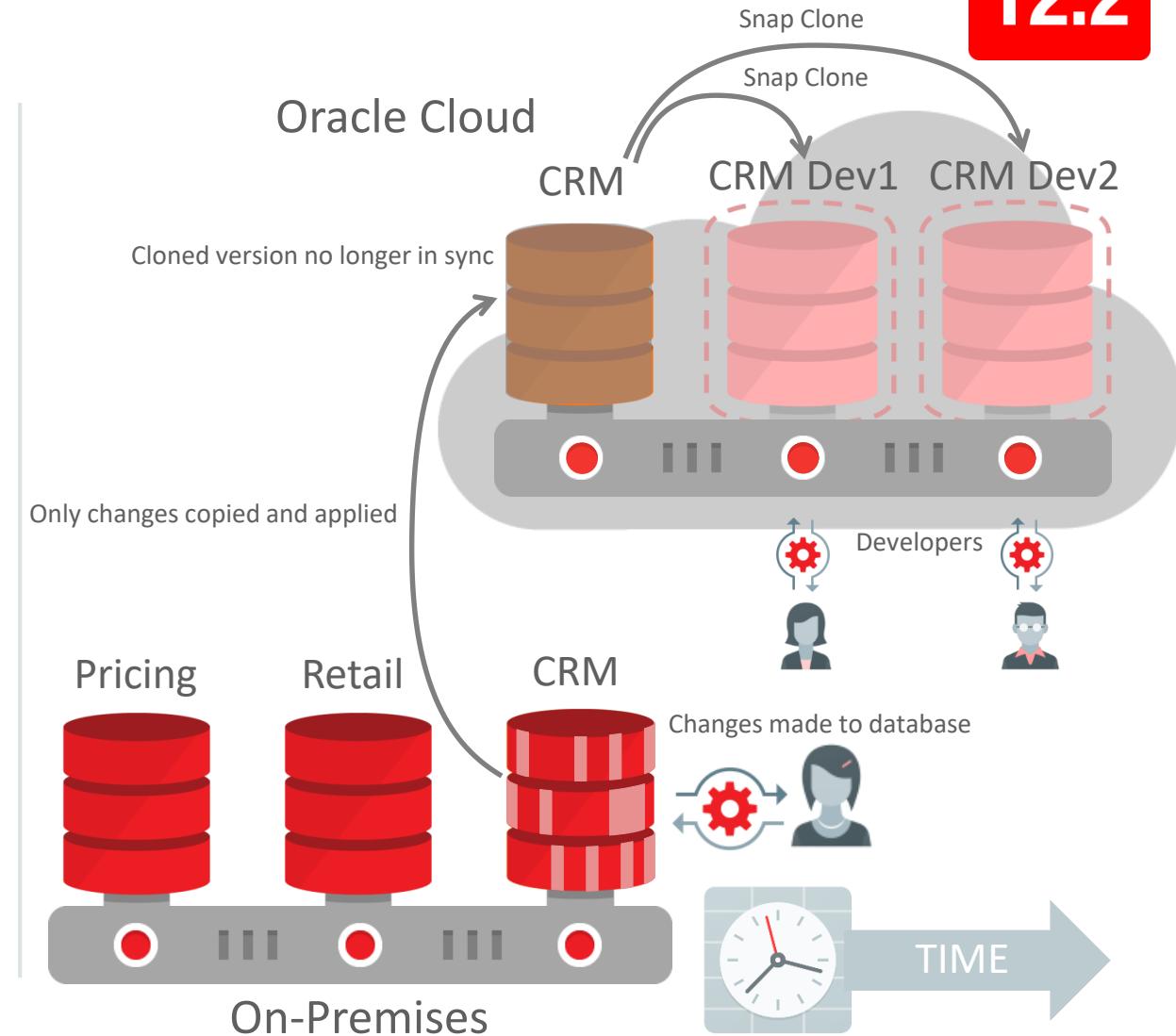
- PDB Hot Clone
 - Online test master instantiation



NEW IN
12.2

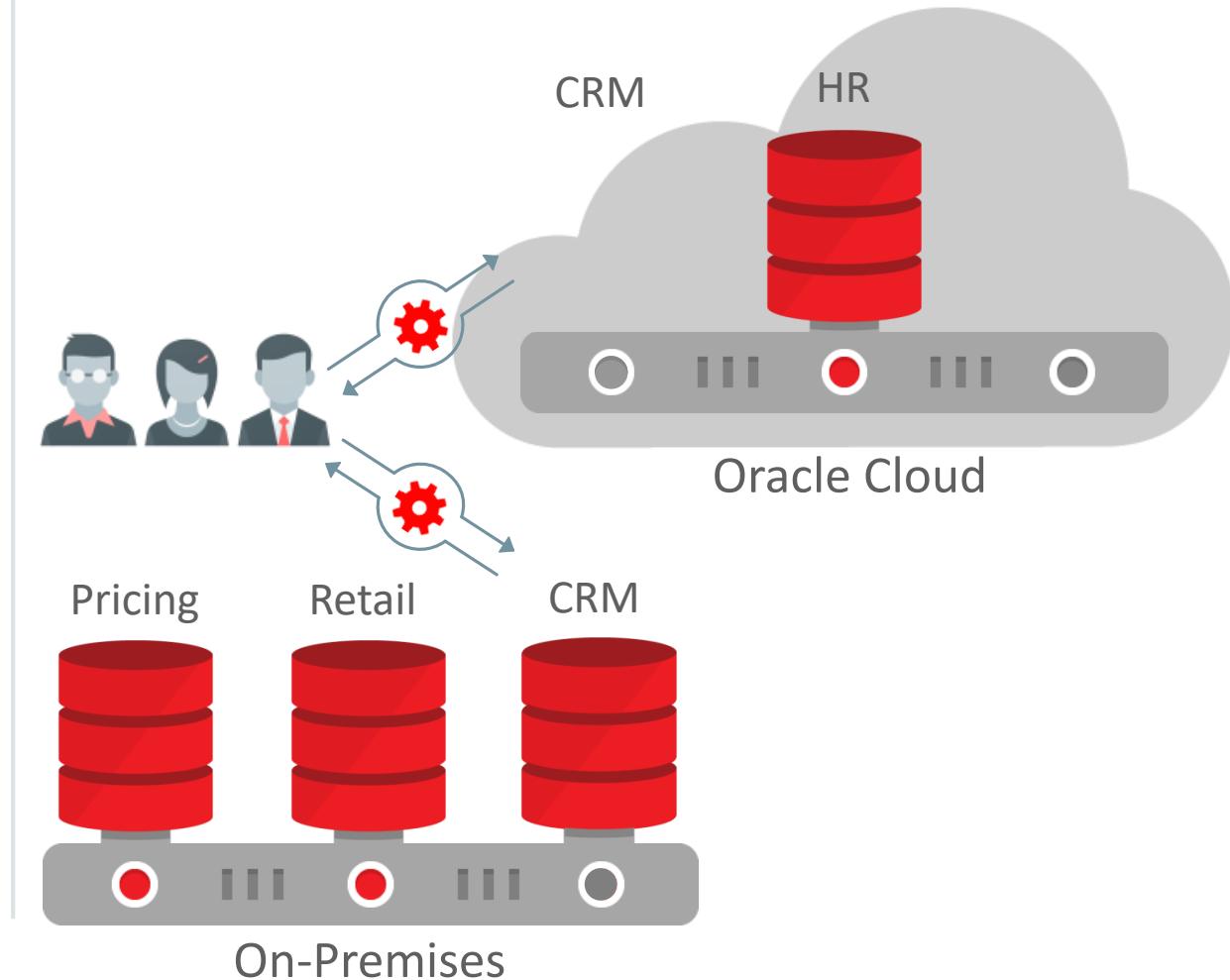
PDB Refresh

- PDB Hot Clone
 - Online test master instantiation
- PDB Refresh
 - Incremental refresh of clone with latest data



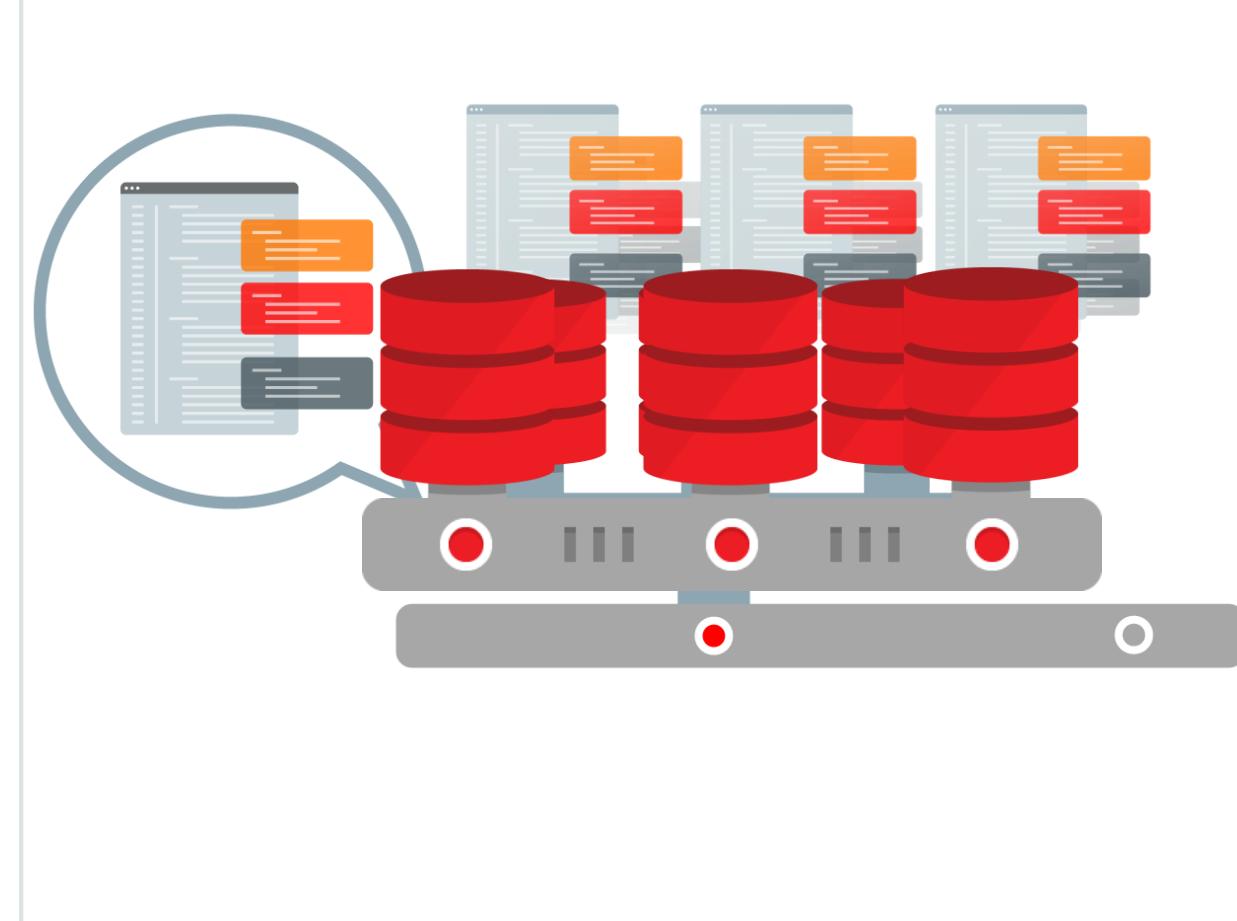
PDB Relocate

- PDB Hot Clone
 - Online test master instantiation
- PDB Refresh
 - Incremental refresh of clone with latest data
- PDB Relocate
 - Relocate with no downtime



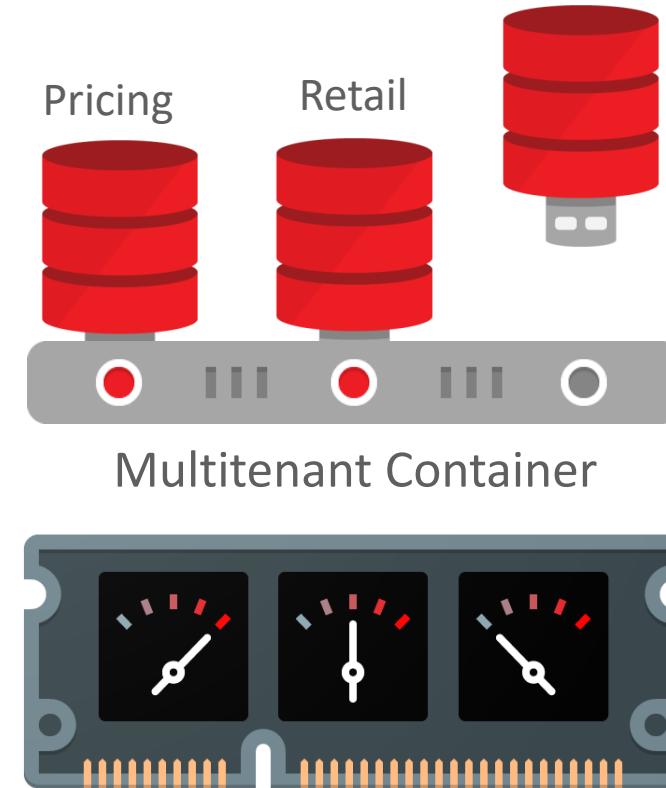
Application Container

- PDBs share application objects
 - Code, metadata and data
- Further simplifies management
 - Apply updates to application container
- Suitable for SaaS-like applications



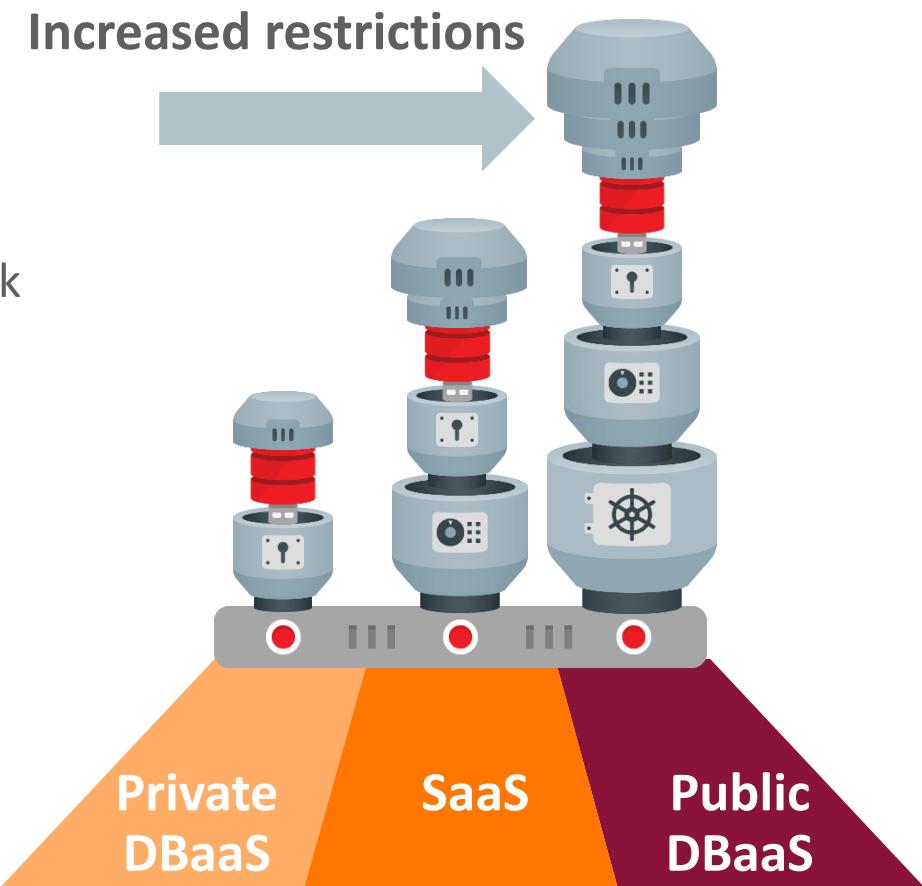
Consolidation & Isolation at Scale

- PDBs per container increased from 252 to 4,096
- Memory resource prioritization in addition to CPU and I/O
- PDBs optimized for RAC
 - PDB lock domain



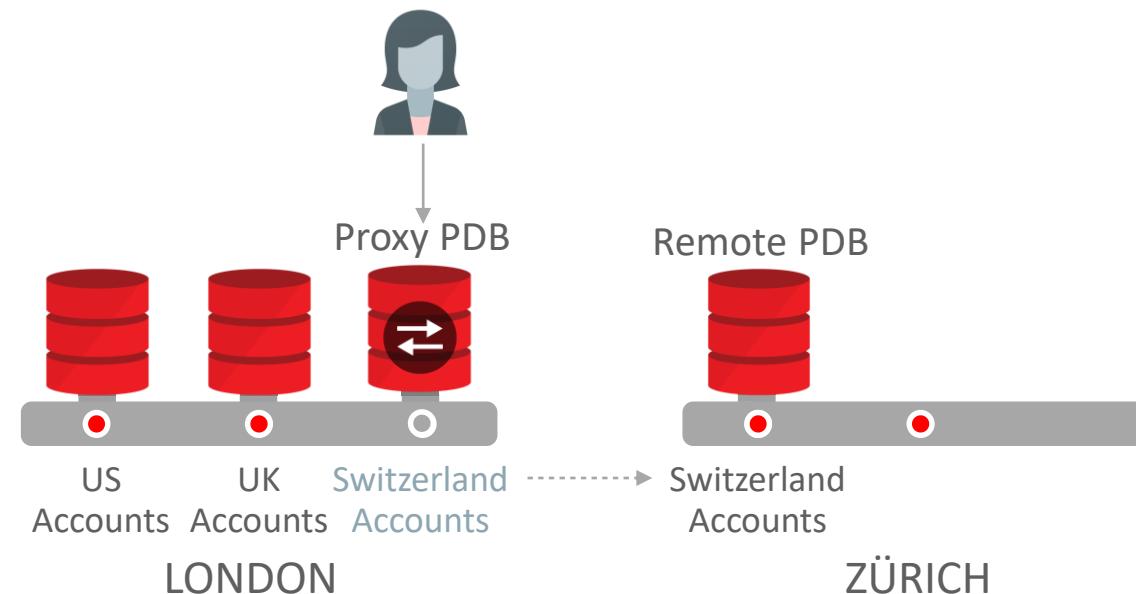
Configurable Isolation

- Challenge
 - Economies of scale are achieved by sharing key infrastructure and memory components
 - Tenants (PDBs) not only share the host but also the OS, the network and common objects.
- Solution “PDB Lockdown Profiles” block access to
 - Network
 - Administrative features
 - Common users and objects
- Out of box profiles
 - Public DBaaS, SaaS, Private DBaaS



More 12.2 Multitenant Innovations

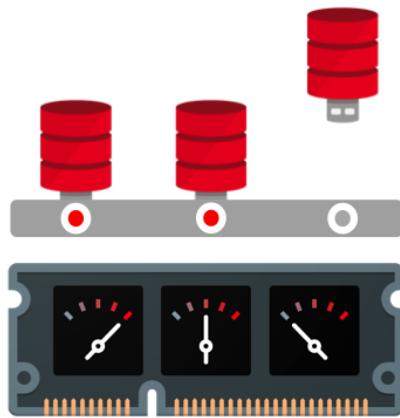
- Central CDB cloud provisioning framework
 - contains a catalog and PDB templates
- Proxy PDBs
 - provides local context for remote PDB for location transparency



Multitenant with Oracle Database 12c Release 2

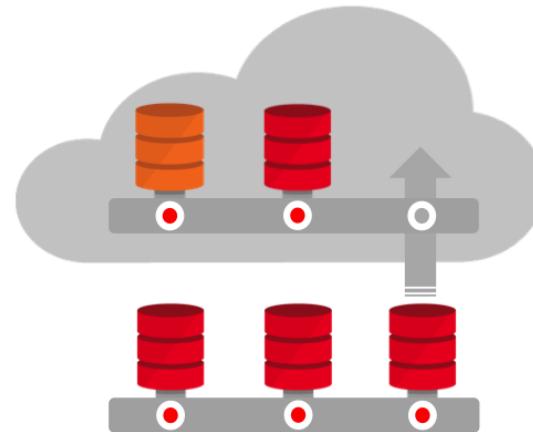
Summary

Cloud Scale Operations



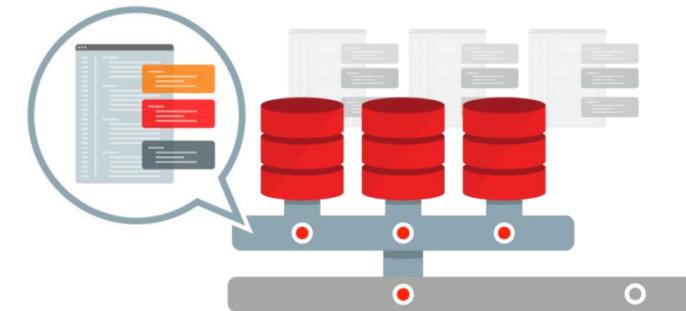
- 12.1 Manage many as one
CPU and I/O management
- 12.2 4,096 PDBs per CDB
Memory management

Agility



- Rapid provisioning and cloning
- Unplug/plug databases
- Hot cloning & PDB clone refresh
- Online tenant relocation

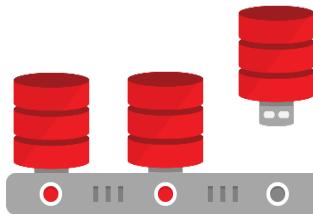
Software as a Service



- Instant SaaS architecture
- No application changes required
- Shared application objects
- Online tenant relocation

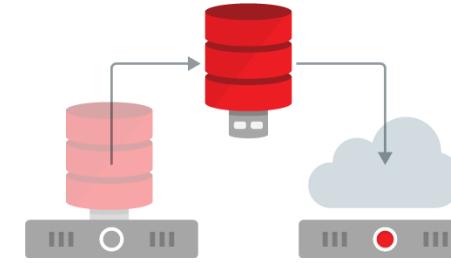
Multitenant

12.1



- Container managed database virtualization
- Manage Many as one
 - Patching, Backup, Security, Online Cloning, Online Relocation
- Software as Service
 - Shared metadata, Data location transparency

12.2, 18c, 19c



- 12.2
 - Online cloning & relocation
 - Incremental refresh of test/dev master
 - Application containers
- 18c
 - Transportable backups
 - Snapshot carousel
 - Refreshable PDB switchover
- 19c
 - RAT and ADDM at PDB level

Taller:

- Create PDB: `create_pdb.txt`
- Clone PDB: `clone_pdb.txt`

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