

Oracle REST Data Services Architecture, Features, & Configuration

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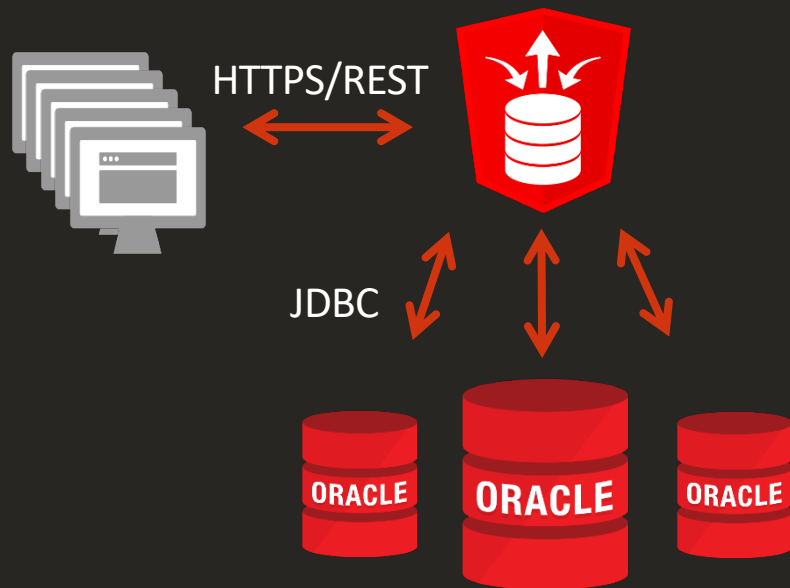
Agenda

- Introduction to ORDS
- Installation & Configuration
- Features
- Live demo

REST Access to your Oracle Database



- Auto REST enable your data tables, views, SQL, PL/SQL
- Auto paged results
- Auto JSON responses
- Complete read-write functionality
- Full dev support (GUI, CLI, API)
- Oracle Cloud and On-Premises



<https://www.oracle.com/REST>

Introduction

Use cases, supported
environments, and licensing



Do you need a...?

- Web listener for your Oracle PL/SQL programs or APEX
- RESTful Services harness for your Oracle Database
- Web client for working with your Oracle Database
- Database management REST API
- Mongo style API for Oracle Database (SODA)

Example: APIfy relational data

- HTTPS vs SQL
- in {json}
- Page the results
- I need links for each entry
- Handle the data types for me

The screenshot shows a web browser window with the address bar displaying the URL: `localhost:8181/ords/freepdb1/soe/customers/?q={"CUSTOMER_ID":{"$eq":73}}`. The browser's developer tools are open, showing the JSON response from the API. The response is a JSON object with a `items` array containing one customer record, and a `links` array containing a `self` link. The `items` array has a single element with the following properties:

- `customer_id`: 73
- `cust_first_name`: "virgil"
- `cust_last_name`: "brooks"
- `nls_language`: "XY"
- `nls_territory`: "India"
- `credit_limit`: 5500
- `cust_email`: "juan.brock@comcast.com"
- `account_mgr_id`: 548
- `customer_since`: "2008-08-26T00:00:00Z"
- `customer_class`: "Prime"
- `suggestions`: "Books"
- `dob`: "1981-01-23T00:00:00Z"
- `mailshot`: "y"
- `partner_mailshot`: "N"
- `preferred_address`: 1252551
- `preferred_card`: 644290

The `links` array has a single element with the following properties:

- `rel`: "self"
- `href`: "http://localhost:8181/ords/freepdb1/soe/customers/73"

The `hasMore` property is `false`, the `limit` is 25, the `offset` is 0, and the `count` is 1.

Example: PL/SQL web listener

The screenshot displays the 'Customer Tracker' application, a PL/SQL web listener interface. The browser address bar shows the URL: `https://apex.oracle.com/pls/apex/f?p=106788:59:8553756635865::NO:RP,RIR,CIR::`. The application features a dark blue sidebar with navigation links: Customers (19), Categories, Geographies, Referenceability, Products, Dashboard, Products (5), Partners, Competitors, Contacts (28), Activities (6), Reports, and Administration. The main content area is titled 'Customer Tracker' with the subtitle 'Track and Manage Customers'. It includes a search bar, filters for Product, Geography, and Publicity Referenceable, and a section for Reference Types (any) with checkboxes for Analyst Interview, Available for Calls, Logo, Quote, and Success Story. A 'Check All' button is also present. The status filter is set to '- All -'. The sort by option is 'Last Updated'. A 'Reset' button is located at the bottom left. The main content area displays a grid of customer cards, each with a circular icon, name, and description. The cards are: Illumina Biotech (IB), Cyphria (CY), Mogul Mashups (MM), Bankgraph (BA), Sakoro Speakers (SS), Synergy Sales Solutions (SS), Make Good (MG), Marvel Power Systems (MP), and A-Frame Aerospace (AA). Each card provides a brief description of the company's services and its location.

Customer Name	Icon	Description	Location
Illumina Biotech	IB	Specialize in validation, compliance, consulting and programming	Life Sciences, North America
Cyphria	CY	Manufacture drugs primarily for Multiple Sclerosis.	Life Sciences, North America
Mogul Mashups	MM	Produce new age marketing campaigns.	Communications, EMEA
Bankgraph	BA	Specialize in financial projections and modelling.	Financial Services, Asia Pacific
Sakoro Speakers	SS	Manufacture high-fidelity speaker systems for cinemas.	Media & Entertainment, Japan
Synergy Sales Solutions	SS	Sell financial software.	Financial Services, Asia Pacific
Make Good	MG	Provide free skills training and placements to returning veterans.	Education & Research, North America
Marvel Power Systems	MP	Manufacture automotive power plants, such as superchargers and	Automotive, South America
A-Frame Aerospace	AA	Specialize in building components for the aerospace industry.	Aerospace & Defense, North America

Example: Browser based DB client

Oracle Database Actions

localhost:8181/ords/freepdb1/soe/_sdw/

Oracle Linux HomeApplication ExpressSQL Developer WebJupyter ServerEnterprise Manager Exp...

ORACLE Database Actions | Launchpad

Search

Development

SQL

Execute queries and scripts, browse and manage your...

REST

An IDE for your REST APIs that enables you to manage...

JSON

Create collections, upload documents, query and filter...

SCHEDULING

An interface for DBMS_SCHEDULER that...

DATA MODELER

Reverse-engineer schemas to relational diagrams and dat...

LIQUIBASE

View ChangeLogs applied to your schema.

CHARTS

Use SQL queries to build rich charts and dashboards...

MLE JS

Execute JavaScript in Oracle Database

Administration

DATABASE USERS

REST enable schemas, change passwords, assign storage...

DATA PUMP

View Data Pump jobs and use our wizard to quickly create...

1

12:15:32 PM - REST call resolved successfully.



Example: Database Management REST API

```
curl -ks -X GET --user admin:welcome1 -H "Content-Type: application/json" \  
> -k http://localhost:8181/ords/_/db-api/stable/database/pdbs/ | jq -r '.items[] | (.con_uid|tostring) + " , " + .name + " => " +  
.open_mode'
```

```
871956951 , PDB$SEED => READ ONLY  
1511376183 , FREEPDB1 => READ WRITE
```

```
curl -ks -X POST --user admin:welcome1 --data '{  
"method": "CREATE",  
"adminName": "Admin",  
"adminPwd": "welcome1",  
"pdb_name": "PDB2",  
"asClone": true,  
"fileNameConversions": "NONE",  
"unlimitedStorage": true,  
"reuseTempFile": true,  
"totalSize": "10G",  
"tempSize": "100M",  
"getScript": false  
}' -H "Content-Type: application/json" -k http://localhost:8181/ords/_/db-api/stable/database/pdbs/ | jq
```

All of this is available at no additional cost

- Oracle 11gR2 and higher databases
- Support tied to your Database license (MOS)
- Classic architecture or Multitenant
- On Premise or Oracle Cloud Infrastructure
- Built by the Oracle Database Team FOR the Oracle Database

Oracle REST Data Services



2011

APEX Listener

- APEX based RESTful Services

2012

APEX Listener v2

- ORDS based REST Services
- Standalone Jetty

2015

ORDS v3.0

- APEX no longer required
- SODA
- AUTO REST

2017

ORDS v17

- REST enabled SQL
- Type 3 JDBC Driver
- Open API (Swagger)

2018

ORDS v18

- PL/SQL Gateway enhancements

2019

ORDS v19

- DB API
- SQL Developer Web

2020

SQ Developer Web

- REST IDE
- JSON Workshop

2021

- Database Actions for ALL databases in OCI
- FASTER RESTful Services
- DB API – Data Guard Broker
- Data Pump UI
- Chart content type REST APIs

Installation



How to get started?



“java -jar ords.war install” or “ords install”

- Follow the prompts
- Settings written out to %configdir%
- Start when finished (or, drop the WAR into Tomcat/WLS)

```
[root@a5ace0288185 ords]# ords install
2023-04-28T10:59:09Z INFO ORDS has not detected the option '--config' and this will be set up to the default directory.

ORDS: Release 23.1 Production on Fri Apr 28 10:59:12 2023

Copyright (c) 2010, 2023, Oracle.

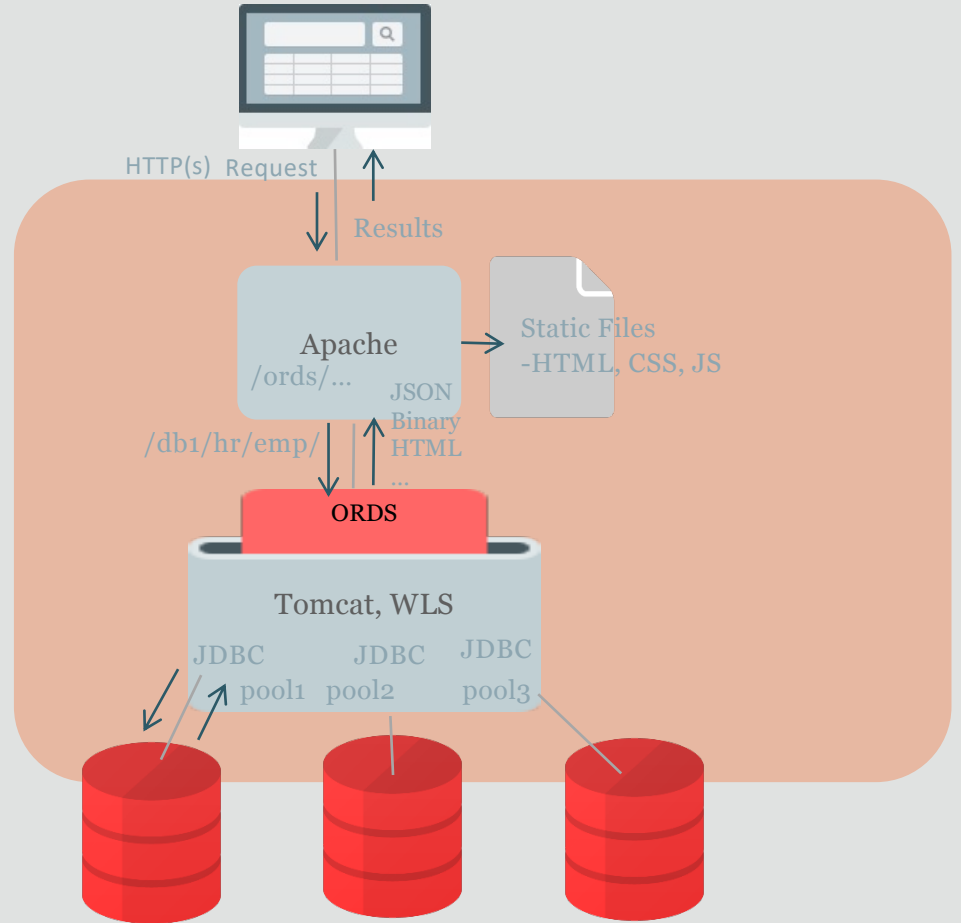
Configuration:
| /etc/ords/config/

Oracle REST Data Services - Interactive Install

Enter a number to select the type of installation
| [1] Install or upgrade ORDS in the database only
| [2] Create or update a database pool and install/upgrade ORDS in the database
| [3] Create or update a database pool only
Choose [1]:
[...]
```

Architecture

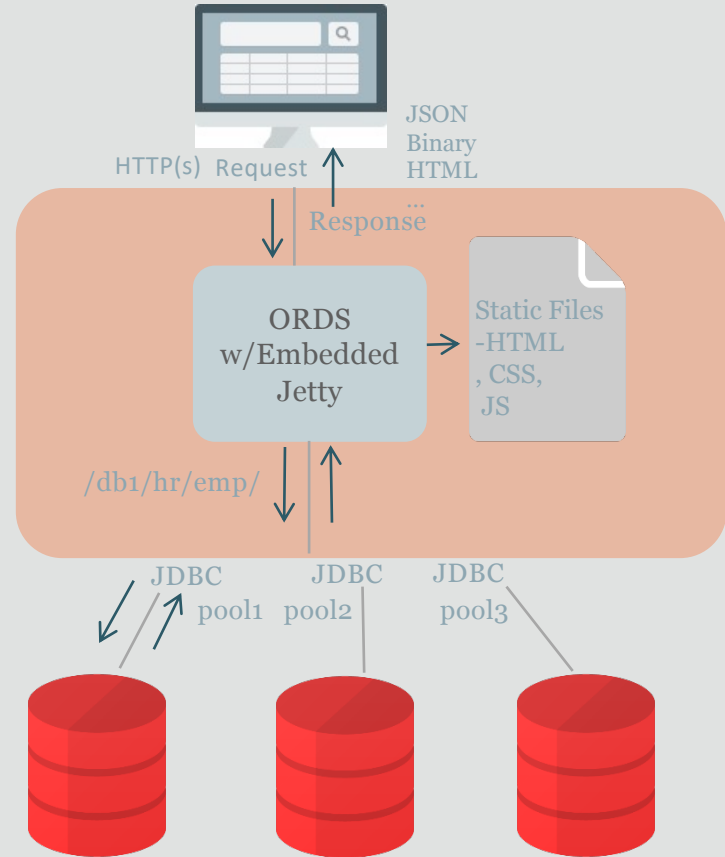
- Webservice layout
- Java Servlet
- Tomcat or WLS



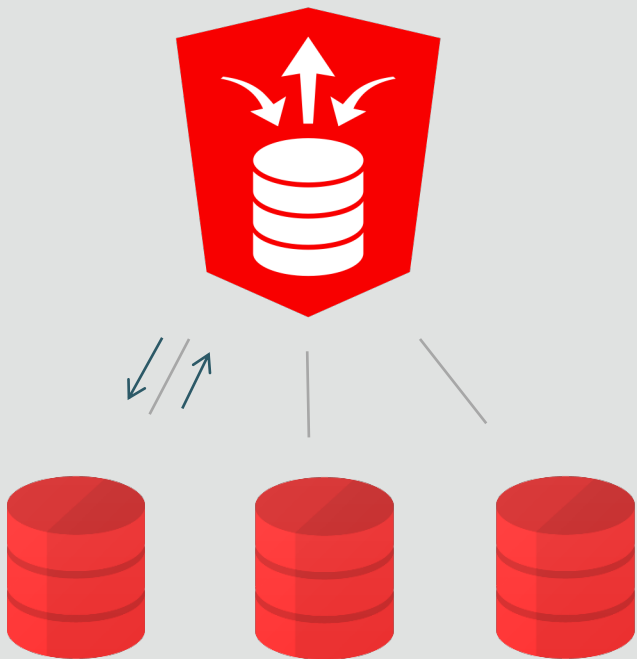
Standalone Architecture

java -jar ords.war standalone

- Production Supported!
- ORDS is both the web and REST server



1:n or 1:1 (ORDS:DB)



- Each database gets a connection pool
- CDB, PDB, or traditional instances
- Each database gets a mapping pattern, e.g. /ords/db1/...

TIP: 3 ORDS front-ended with a load balancer HA!

Features

You can have whatever you want, at the ORDS Restaurant.

ORACLE

DATABASE WEB SERVICES

STARTERS

SOUPS & SALADS

AUTO TABLE \$0

GET, PUT, POST, DELETE CRUD API
Plus Swagger Doc and CSV Batch Load

AUTO PL/SQL \$0

RPC via HTTP POST
Std Out/Refcursors to IJSON

AUTO VIEW \$0

GET All or Some rows plus
Metadata catalog describe

ENTREES

HEARTY MEALS

RESTful MODULES \$CODE

You provide the SQL and/or PL/SQL for your GET, POST, PUT, DELETE handlers. You determine the HTTP response codes. You define the inputs. You define the responses and rendering. We handle the JSON in and out.

DESSERTS

COFFEES & CAKES

REST ENABLED SQL

Ad Hoc PL/SQL or SQL executed via
POST

DB MANAGEMENT API

Manage your database via REST calls.

SQLDev
Web

Oracle REST Data Services (ORDS): more features

- REST enabled SQL for ad hoc workloads
- Database Management REST API (CI/CD)
- Database Actions (aka SQL Developer Web)
- No SQL Style API (SODA)
- Database API for MongoDB

The graphic is a menu for Oracle REST Data Services (ORDS), styled to look like a restaurant menu. At the top, it says 'ORACLE' in a large, serif font, followed by 'DATABASE WEB SERVICES' in a smaller, sans-serif font. The menu is divided into sections: 'STARTERS' (SOUPS & SALADS), 'ENTREES' (HEARTY MEALS), and 'DESSERTS' (COFFEES & CAKES). Under 'STARTERS', there are three items: 'AUTO TABLE \$0' (GET, PUT, POST, DELETE CRUD API, Plus Swagger Doc and CSV Batch Load), 'AUTO PL/SQL \$0' (RPC via HTTP POST, Std Out/Refcursors to JSON), and 'AUTO VIEW \$0' (GET All or Some rows plus Metadata, catalog describe). Under 'ENTREES', there is one item: 'RESTFUL MODULES \$CODE' (You provide the SQL and/or PL/SQL for your GET, POST, PUT, DELETE handlers. You determine the HTTP response codes. You define the inputs. You define the responses and rendering. We handle the JSON in and out). Under 'DESSERTS', there are two items: 'REST ENABLED SQL' (Ad Hoc PL/SQL or SQL executed via POST) and 'DB MANAGEMENT API' (Manage your database via REST calls). A large red star is positioned on the right side of the 'DESSERTS' section, containing the text 'SQLDev Web'.

ORACLE
DATABASE WEB SERVICES

STARTERS
SOUPS & SALADS

AUTO TABLE \$0
GET, PUT, POST, DELETE CRUD API
Plus Swagger Doc and CSV Batch Load

AUTO PL/SQL \$0
RPC via HTTP POST
Std Out/Refcursors to JSON

AUTO VIEW \$0
GET All or Some rows plus
Metadata, catalog describe

ENTREES
HEARTY MEALS

RESTFUL MODULES \$CODE

You provide the SQL and/or PL/SQL for your GET, POST, PUT, DELETE handlers. You determine the HTTP response codes. You define the inputs. You define the responses and rendering. We handle the JSON in and out.

DESSERTS
COFFEES & CAKES

REST ENABLED SQL
Ad Hoc PL/SQL or SQL executed via POST

DB MANAGEMENT API
Manage your database via REST calls.

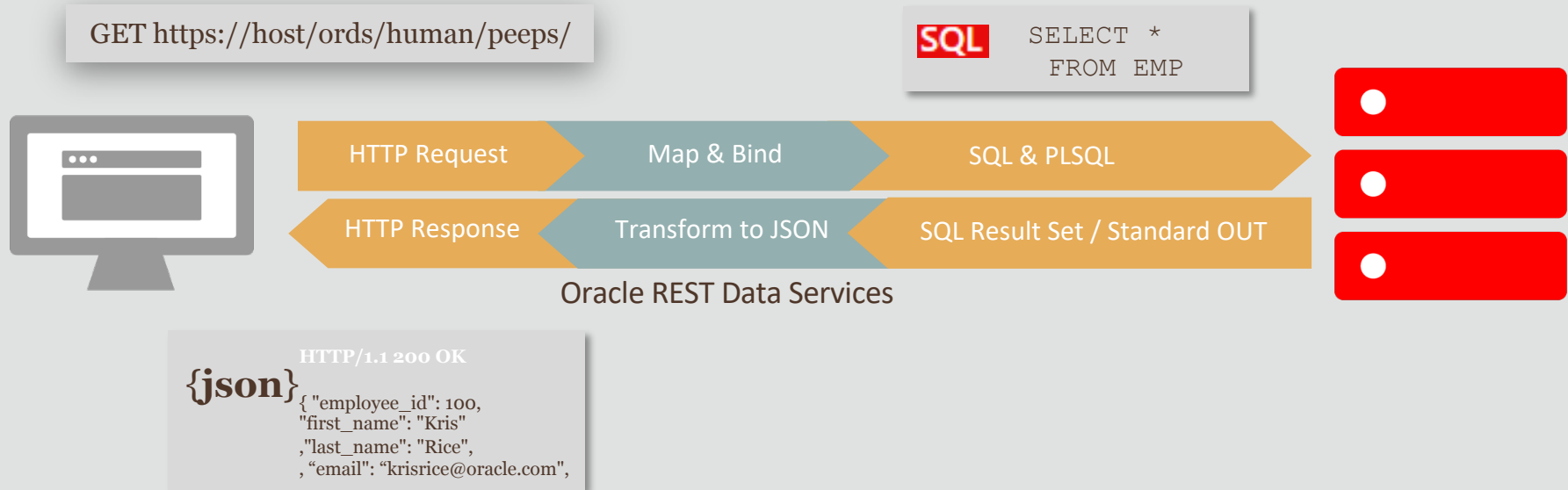
SQLDev Web



Things you can do with REST APIs

- Power applications – mobile, desktop, web...
 - HTTP(S) is ubiquitous, even avail in COBOL
 - Publish relational data and documents collection (SODA)
- Continuous Integration & Delivery (DBAPI)
 - Automation (BASH + cURL), ansible, ...

ORDS REST Request & Response Workflow



Unwinding an ORDS Request

PUT https://server:8080/ords/hr/examples/emps/:id

- **PUT** – HTTP Verb, GET, POST, & DELETE also supported
- **HTTPS** – secure, encrypted version of HTTP (recommended!)
- **Server:8080** – network location where ORDS is running
- **ords** – ords.war, Java servlet
- **hr** – schema alias, where service is defined
- **examples** – module, a collection of services
- **emps/:id** – template, defines the resource

Practice with Live labs

<https://apexapps.oracle.com/pls/apex/f?p=133:180:4299677427452::::wid:3518>

Develop Mobile Apps with Oracle REST Data Services



Share



Start

The screenshot shows the Oracle APEX application interface. At the top, there's a header with the application name 'dbNotify mobile application', navigation tabs for 'Team Development' and 'App Gallery', and a 'Copy link' button. Below the header, the breadcrumb trail is 'RESTful Services > ORDS RESTful Services > Modules > Module Definition'. The left sidebar shows a tree view of the application structure, with 'alert_web_service' selected under 'Modules'. The main content area displays the 'ORDS Module Definition' for 'alert_web_service'. It includes fields for 'Module Name', 'Base Path' (set to '/alerts/'), and 'Full URL' (set to 'https://hgr3xw4mcpzua1s-dbm2021.adb.uk-london-1.oraclecloudapps.com/fords/dbnotify21/alerts/'). There are also checkboxes for 'Is Published' (checked) and 'Pagination Size' (set to 10). A red YouTube play button icon is overlaid on the 'Full URL' field. At the bottom left, there's a red text overlay that says 'Simplify Development' and a 'Watch on YouTube' button.

2 hours

Outline

- Lab 1: Provision an Autonomous Database (ADW or ATP)
- Lab 2: Develop Mobile Apps using Oracle REST Data Services

Prerequisites

Access to Oracle Cloud Infrastructure (provided by the instructor for instructor-led workshops) or Free Tier
Access to a laptop or a desktop
No previous knowledge of Oracle REST Data Services (ORDS) is required
iOS and Android programming language knowledge is required

Practice with Live labs

<https://apexapps.oracle.com/pls/apex/f?p=133:180:4299677427452::::wid:3634>

AutoREST with JSON Relational Duality Views in 23c Free

Share

Start



30 minutes

Outline

- Create JSON Relational Duality Views
- Enable AutoREST on the JSON Relational Duality Views
- Populate, query, and update the views

Prerequisites

- An Oracle Database 23c Free Developer Release or one running in a LiveLabs environment
- Familiarity with Oracle Database is desirable, but not required
- Some understanding of database terms is helpful

Demo

ORACLE

DATABASE WEB SERVICES

STARTERS

SOUPS & SALADS

AUTO TABLE \$0

GET, PUT, POST, DELETE CRUD API
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GET All or Some rows plus
Metadata_catalog describe

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RPC via HTTP POST
Std Out/Refcursors to IJSON

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DESSERTS

COFFEES & CAKES

REST ENABLED SQL

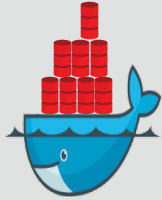
Ad Hoc PL/SQL or SQL executed via
POST

DB MANAGEMENT API

Manage your database via REST calls.

SQLDev
Web

Demo: ORDS and DB on Docker



Containers & Artifacts

Container Registry

Artifact Registry

Service Mesh

List scope

Compartment

Stephane

demo_ords

databaseenterprise

restdataservices

Create repository

restdataservices

Full path: [oraclelabsmaudub/demo_ordsrestdataservices](#)

Pushed by: [gracidenthy@cloudservice.kuorai@oracle.com](#)

OCIID: [_d8eyrwbkymys](#) Size: 604y

Digest: [_d8b7126a2e496](#) Show Copy

Repository: [demo_ords](#)

Namespace: [oraclelabsmaudub](#)

Date created: a day ago

Signatures

Layers

Associated tags

Scan results

Description

Verification response

No items found.

Host VM

```
[oracle@instance-20230116-1233 ~]$ sqlplus soe/oracle_4u@instance-20230116-1233:1577/MY19PDB1
```

SQLPlus: Release 21.0.0.0.0 - Production on Fri Jan 27 09:36:18 2023
Version 21.3.0.0.0

Copyright (c) 1982, 2021, Oracle. All rights reserved.

Last Successful login time: Wed Jan 25 2023 16:56:10 +08:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.3.0.0.0

```
[oracle@instance-20230116-1233 ~]$ sql soe/oracle_4u@instance-20230116-1233:1577/MY19PDB1
```

SQLcl: Release 21.2 Production on Fri Jan 27 09:38:54 2023

Copyright (c) 1982, 2023, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.3.0.0.0

SQL> soda create mymusiccollection

Successfully created collection: mymusiccollection

JSON	Raw Data	Headers
Save	Copy	Collapse All Expand All
customer_id	73	
cust_first_name	"Jingli"	
cust_last_name	"Norman"	
nta_language	"XX"	
nta_territory	"India"	
credit_limit	5500	
cust_email	"jtan.brock@owacast.com"	
account_mgr_id	548	
customer_since	"2008-09-26T08:00:00Z"	
customer_class	"Prime"	
suggestions	"Books"	
dob	"1985-01-23T08:00:00Z"	
mailshot	"N"	
partner_mailshot	"N"	
preferred_address	125551	
preferred_card	640398	
Links:		
0:	rel: "api"	
	href: "https://138.61.233.248/ords/ny19pdb1/soe/customers/73"	
1:	rel: "api"	
	href: "https://138.61.233.248/ords/ny19pdb1/soe/customers/73"	
2:	rel: "Description"	
	href: "https://138.61.233.248/ords/ny19pdb1/soe/metadata-catalog/customers/11em"	
3:	rel: "collection"	
	href: "https://138.61.233.248/ords/ny19pdb1/soe/customers/"	

