



Oracle Apex & ORDS From a DBA's Perspective

Robert Marz



Robert Marz – Independent Consultant



Client

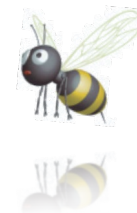
Senior Technical Architect
with database centric view of the world



ORACLE
ACE

its-people

Portfolio Manager Database Technologies
Blog Editor



DOAG (German Oracle User Group)

Active Member of Database Community
Responsible for Cloud Topics



@RobbieDatabee



blog.its-people.de



Robert.Marz
@its-people.de

This Presentation is all about DBA stuff
You won't learn how to build an Apex App here

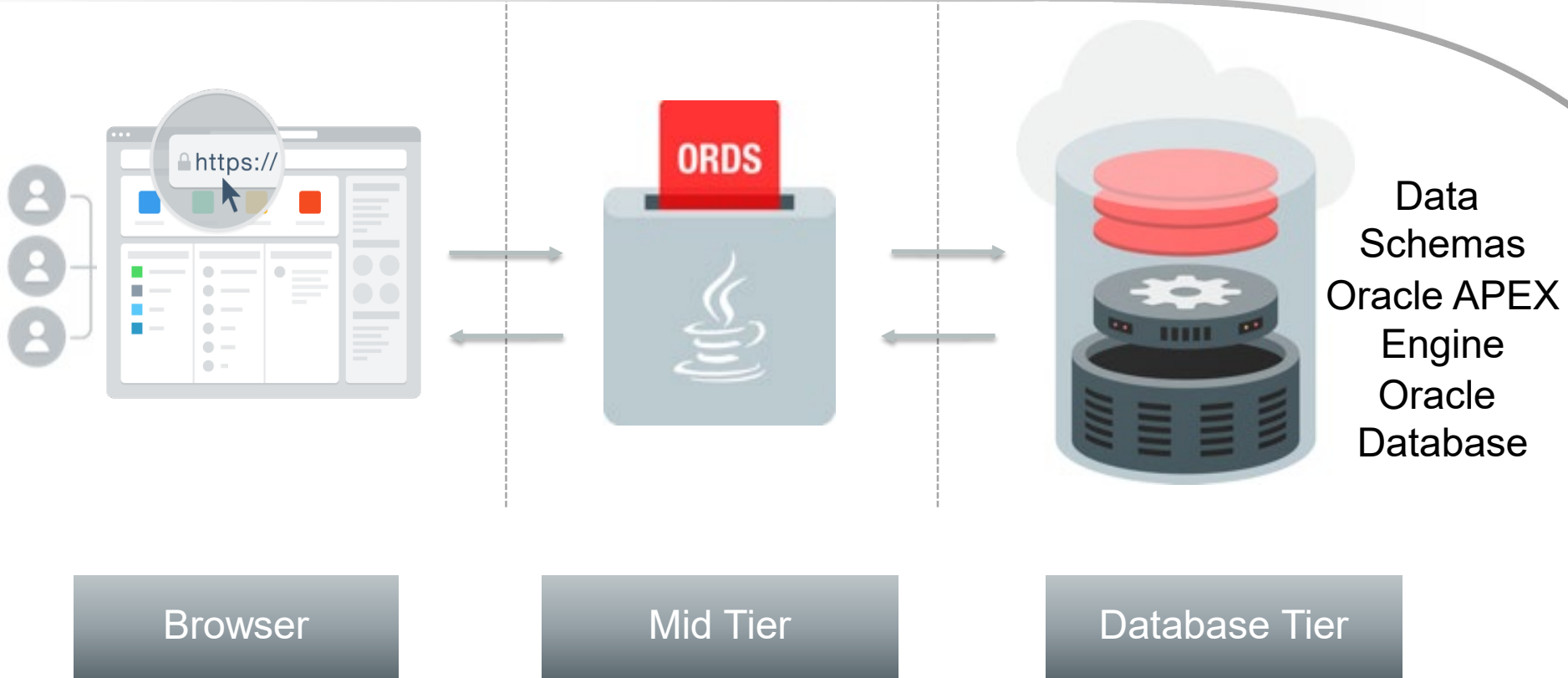
Why should a DBA care about
Oracle APEX & ORDS?

Oracle APEX turns DBAs
into Web Application Administrators

A woman with dark hair in a braid, wearing a black and grey striped long-sleeved shirt, is climbing a grey metal ladder. She is holding binoculars to her eyes and looking upwards. The background is a high-angle view of a dense city with many skyscrapers, partially obscured by a layer of white clouds. The sky is bright and hazy. A red banner is overlaid on the left side of the image, containing white text.

Oracle APEX & ORDS: An Overview for DBAs

Oracle Application Express 3-Tier Architecture



ORDS = Oracle REST Data Services

APEX Schemas

APEX_<VERSION>
eg. APEX_180200

Apex Objects and Metadata

FLows_FILES

Apex uploaded files

APEX_PUBLIC_USER

Used to connect by
ORDS and mod_plsql

APEX_REST_PUBLIC_USER

Used for **invoking** RESTful
Services defined in Apex

APEX LISTENER

Used for **querying** RESTful
Services defined in Apex



ORDS Schemas

ORDS_PUBLIC_USER

Used by ORDS

connect to DB when

executing RESTful
Services

ORDS_METADATA

Contains All ORDS
Objects

RESTful Services

Definitions

Parameters

Authentication



Apex builds on OWA

- the Oracle Web Agent (OWA)
- aka The PL/SQL Web Toolkit

Available

- since Oracle7

Packages

- owa
- owa_util
- owa_% ...
- htp / htf

htp.p

- Wrapper for htp.prn
- prints a line to the htp-Buffer



The htp Buffer

is a PL/SQL table used for output buffering

Definition (in package sys.htp)

```
type htbuf_arr is table of varchar2(256)  
index by binary_integer;
```

Usage

Webpages are printed Line by Line to the Buffer
And returned completely via the Middle Tier
to the Browser

Similar to

dbms_output.put_line
in PL/SQL and SQL*Plus

Oracle REST Data Services (ORDS)



Evolved

from APEX Listener

Deploy in Application Server

- Tomcat
- Glassfish (deprecated)
- WebLogic

ords.war

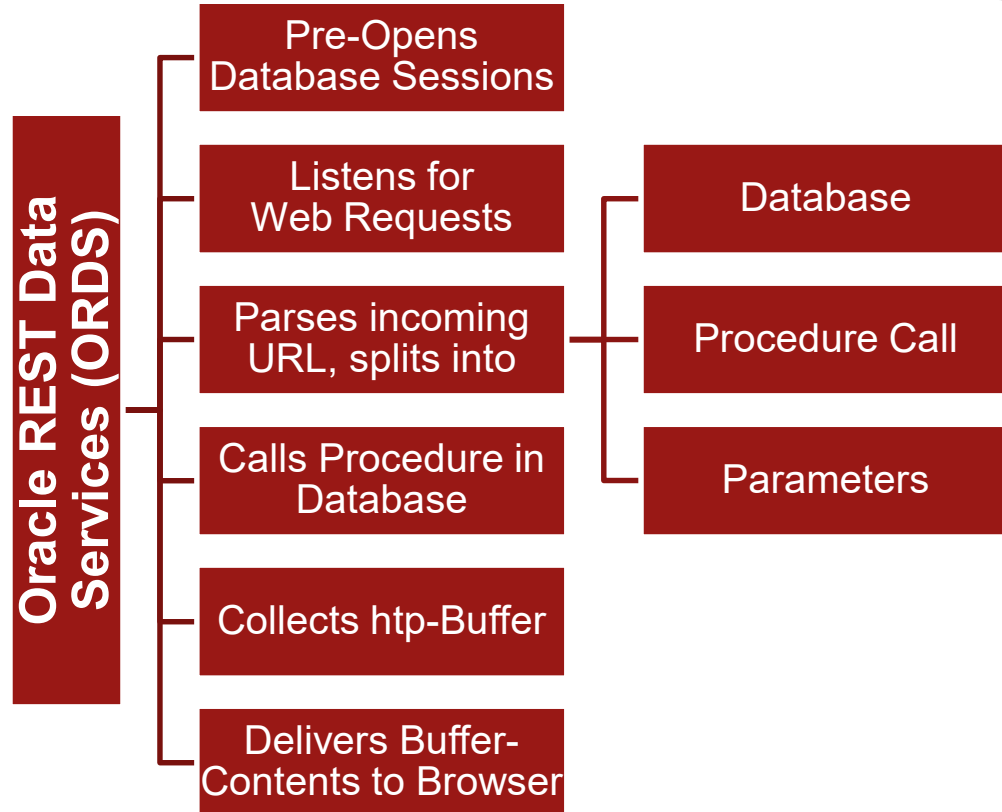
Java Web Archive

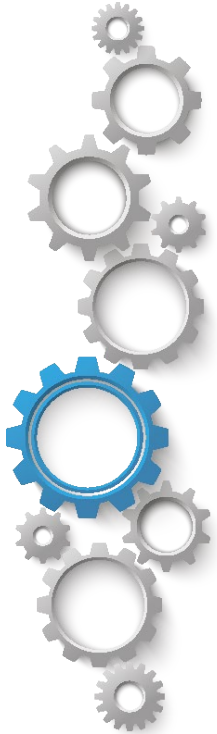
Standalone mode

Brings own http-server
Supported for Production
`java -jar ords.war`



What is ORDS' job?





Parsing Schema

Every Apex Application has one

SQL Statements

will be parsed and executed in Context of the Parsing Schema

Implementation

Apex Core uses internal Version of `dbms_sql`
Additional Parameter:
Username for Execution

The background of the image is a complex digital interface. It features a hand in the lower right quadrant, with a bright blue light emanating from the index finger, suggesting a touch or click. The interface is composed of various data visualization elements: a central glowing blue stream of particles, several circular gauges and progress indicators, line graphs, and world maps. A network of white lines crisscrosses the entire scene, creating a sense of connectivity and data flow. The overall color palette is dominated by deep blues and bright whites, with a prominent red horizontal bar in the middle-left area.

Installation & Upgrade

Installation Procedure

1. apex_x.x.x.zip

download

unzip

2. execute

```
sqlplus "sys/syspass@10g as sysdba" @apexins SYSAUX SYSAUX TEMP /i/
```

Arguments:

Position 1: Name of tablespace for Application Express application user

Position 2: Name of tablespace for Application Express files user

Position 3: Name of temporary tablespace **or** tablespace group

Position 4: Virtual directory for APEX images

3. Images Directory

Make sure it is up to date and available /i/



Images Directory

Static Files

ca. 200MB

Graphics, Stylesheets, JavaScript

Source

Directory <<images>>

in apex.zip

Delivery via

App Server

ORDS

httpd (Apache, nginx, ...)

Contents

MUST match Apex-Version

Dependency

URI /i/

is changeable

utilities/reset_image_prefix.sql

Apex Schema APEX_PUBLIC_USER Post Installation Tasks



APEX_PUBLIC_USER

This Account is used by Middle Tier to connect to the Database

Middle Tier

Connector between

- Browser
- Database

Middle Tier Software

ORDS
Previously

- mod_plsql
- dbms_epg
- ...

The first Apex Installation will

- create it
- lock it
- assign a random password

Unlock the User

```
alter user apex_public_user  
account unlock;
```

Set new Password and Profile

Change password

- remember it!

Assign Profile with Password lifetime unlimited

- to prevent that your Apex Apps
stop working after 180 days



Major Upgrade

Same procedure as for installation

Phased execution to reduce downtime

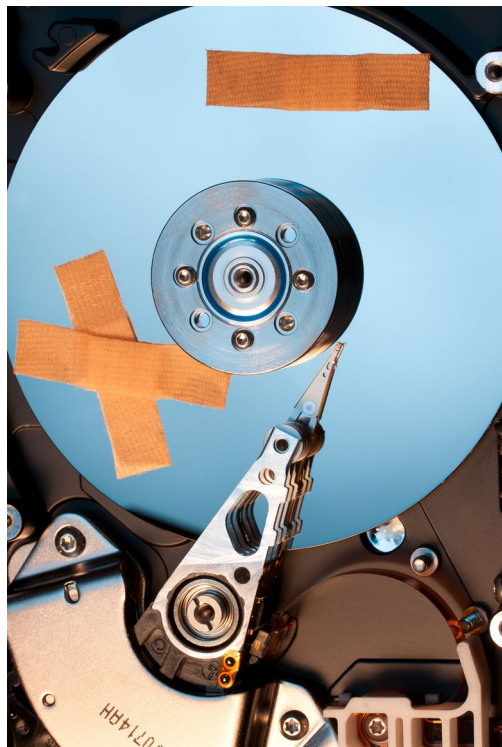
Drop old schema
APEX_<Version>

install
new apex schema

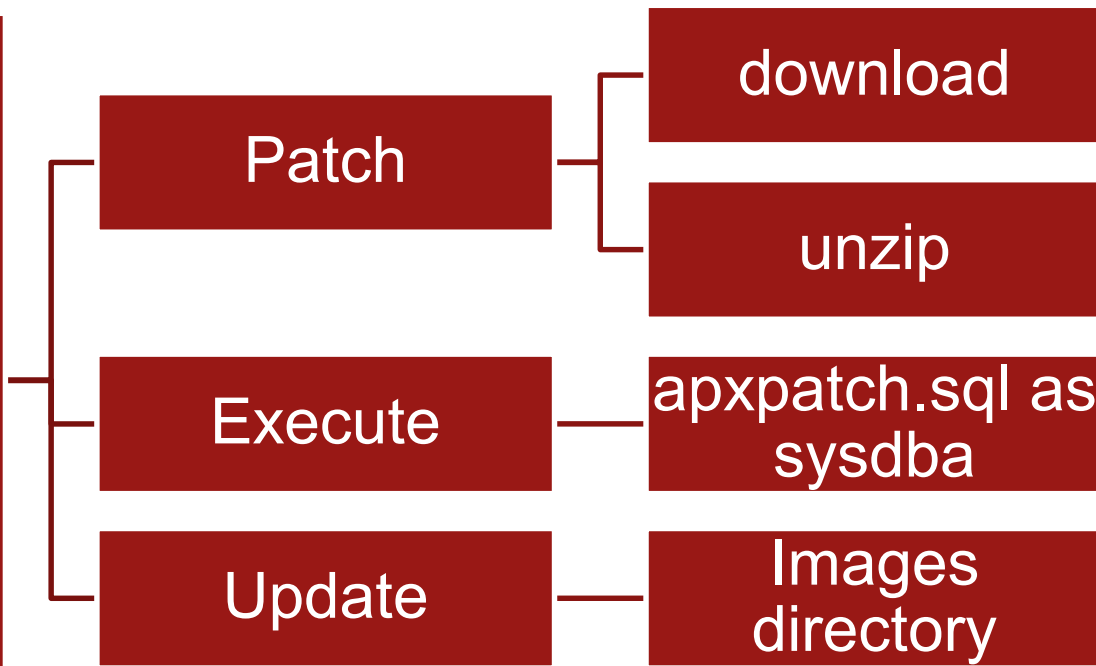
copy applications

copy user defined
Settings

cleaning up &
switching over



Minor Upgrade





Oracle REST Data Services

Installation

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

```
java -jar ords.war setup
```

```
java -jar ords.war --parameterFile
```

changes

ords.war itself

config files

Startup standalone

```
java -jar ords.war [standalone]
```

Configuration

```
java -jar ords.war set-property
```

```
java -jar ords.war get-property
```

```
java -jar ords.war configdir [DIR]
```



Upgrade Procedure

ords.zip	download
	unzip
Stop [old Version]	running ords
Execute [new Version]	java -jar ords.war configdir [DIR]
Do upgrade [new Version]	java -jar ords.war
Already Up Running	After previous Step (when standalone)



Metadata



Apex Apps & ORDS RESTful Services

Metadata only

Rows in Tables

Dictionary Views

Maintained

PL/SQL APIs

App Builder

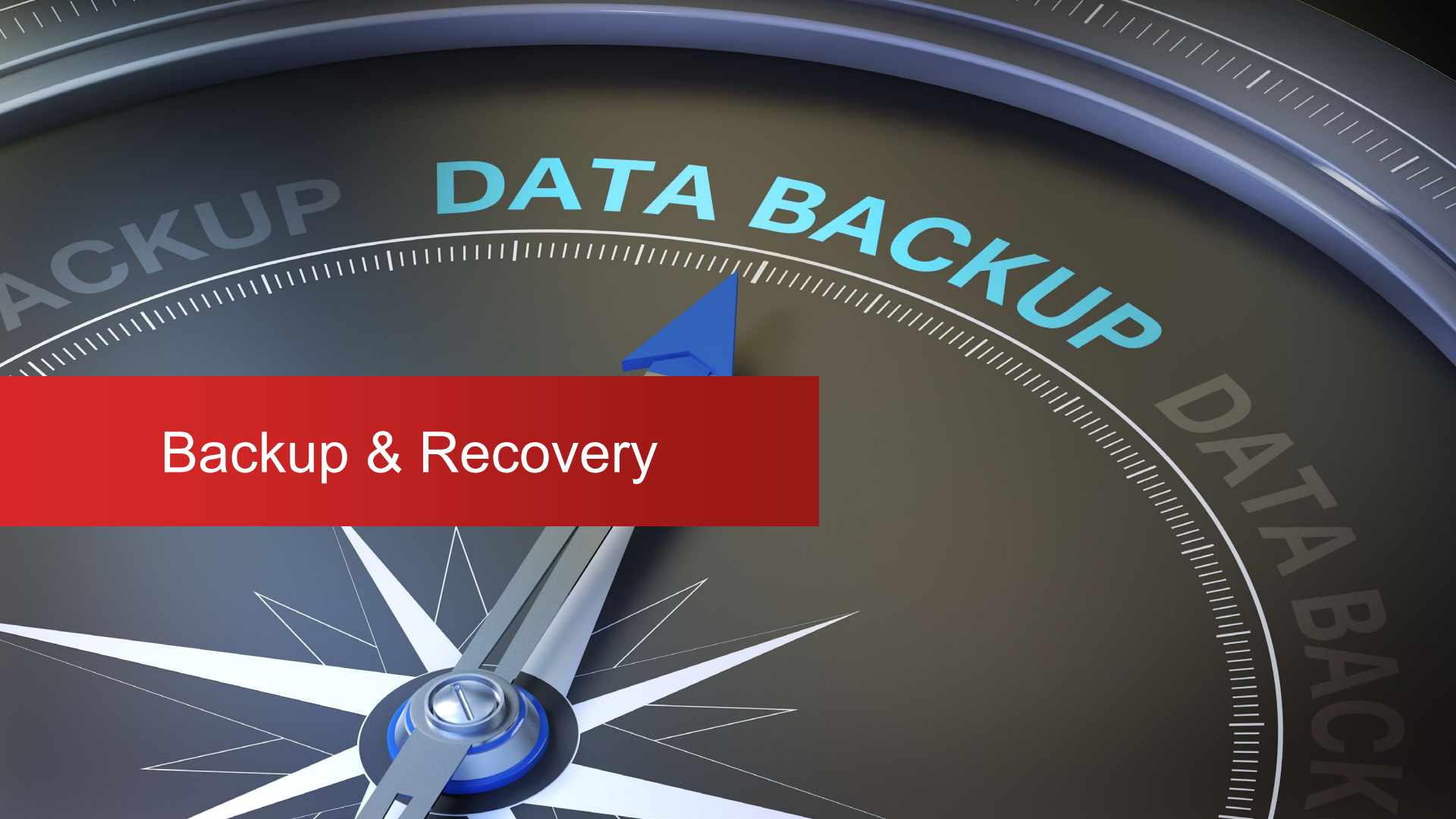
Reporting

Metadata Views

SQL Developer

Apex & ORDS Metadata





Backup & Recovery

OS Level (Application Server)

- ORDS Configuration Dir
- parameter.properties

Database (Metadata)

- rman Backup
- datapump exports



Backup RESTful Service Definition

Service Definitions

Pure Metadata

Export

SQL Developer
Wizard
SQLcl
REST export

SQLcl: Release 18.3 Production on Sun Mar 17 21:38:17 2019

Copyright (c) 1982, 2019, Oracle. All rights reserved.

Connected to:

Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

```
SQL> help rest
```

```
REST
```

```
-----
```

REST allows to export ORDS 3.X services.

REST export	-	All modules
REST export <module_name>	-	Export a specific module
REST export <module_prefix>	-	Export a specific module related to the given prefix
REST modules	-	List the available modules
REST privileges	-	List the existing privileges
REST schemas	-	List the available schemas

```
SQL> rest schemas
```

```
PARSING_SCHEMA PATTERN STATUS
```

```
-----
```

```
APEX_USER      util      ENABLED
```

```
SQL> rest modules
```

```
NAME          PREFIX  STATUS  ITEMS_PER_PAGE
```

```
-----
```

```
StaticFiles  /static/  PUBLISHED 25
```

```
SQL> rest export
```

```
-- Generated by SQLcl REST Data Services 18.3.0.0  
-- Exported REST Definitions from ORDS Schema Version 18.4.0.r3541002  
-- Schema: APEX_USER   Date: Sun Mar 17 21:39:00 CET 2019  
--
```

```
BEGIN
```

```
ORDS.ENABLE_SCHEMA(  
  p_enabled      => TRUE,  
  p_schema       => 'APEX_USER',  
  p_url_mapping_type => 'BASE_PATH',  
  p_url_mapping_pattern => 'util',  
  p_auto_rest_auth => FALSE);
```

```
ORDS.DEFINE_MODULE(  
  p module name => 'StaticFiles',
```

OS Level (Application Server)

- Static Files
- No need for apex Images

Database (Metadata)

- rman Backup
- datapump exports



App Definitions

Pure Metadata

Export

Apex App Builder

APEXExport

Java Class

Single file or directory
per App

APEXExport

part of

apex.zip

utilities

./oracle / apex /
APEXExport.class

CLASSPATH

utilities
Directory

or „.“ &
cd there

ojdbc<X>.jar

<X>: Java Version

JDK 1.8: X=8

ApexExport Options



```
[oracle@localhost ~]$ cd apex/utilities/
[oracle@localhost utilities]$ export CLASSPATH=.:~/sqlcl/lib/ojdbc8.jar
[oracle@localhost utilities]$ java oracle/apex/APEXExport
Usage java oracle.apex.APEXExport [option]...
Available options:
  -db:                Database connect url in JDBC format
  -user:              Database username
  -password:          Database password
  -applicationid:     ID for application to be exported
  -workspaceid:       Workspace ID for which all applications to be exported or the workspace to be exported
  -instance:          Export all applications
  -expWorkspace:      Export workspace identified by -workspaceid or all workspaces if -workspaceid not specified
  -expMinimal:        Only export workspace definition, users, and groups
  -expFiles:          Export all workspace files identified by -workspaceid
  -skipExportDate:    Exclude export date from application export files
  -expPubReports:     Export all user saved public interactive reports
  -expSavedReports:   Export all user saved interactive reports
  -expIRNotif:        Export all interactive report notifications
  -expTranslations:  Export the translation mappings and all text from the translation repository
  -expFeedback:       Export team development feedback for all workspaces or identified by -workspaceid to development or deployment
  -expTeamdevdata:    Export team development data for all workspaces or identified by -workspaceid
  -deploymentSystem: Deployment system for exported feedback
  -expFeedbackSince:  Export team development feedback since date in the format YYYYMMDD
  -expOriginalIds:    If specified, the application export will emit ids as they were when the application was imported
  -expNoSubscriptions: Do not export references to subscribed components
  -expComments:       Export developer comments
  -expSupportingObjects: Pass (Y)es, (N)o or (I)nstall to override the default
  -expACLAssignments: Export ACL User Role Assignments.
  -debug:             Print debug output
  -nochecksum:        Overwrite existing files even if the contents have not changed
  -split:             Split applications into multiple files
```

APEXEXPORT Options (the good ones)



Connecting

- db
- user
- password

```
APEXEXPORT -db localhost:1521:ORCL -user scott -password scotts_password
```

Exporting

- applicationid <AppID>
- workspaceid <WorkspaceID>
- instance

Versioning / Source Code Control

- split
(creates a dir and splits into multiple file)
- skipExportDate
Won't put an Export Date in Files
Unchanged Apps / Components result in same File

Start

- exported *.sql Files
- SQL*Plus
- SQLcl / SQL Developer

Apex Connect as

- APEX_180200, SYS, SYSTEM,
- or any schema with granted role APEX_ADMINISTRATOR_ROLE

ORDS Connect as

- Owner Schema of RESTful Services



A woman is sleeping peacefully in a bed, wearing a white t-shirt and a grey eye mask. She is covered with a light blue blanket. The bed is positioned against a plain white wall. To the left of the bed, there is a black metal plant stand with three tiers. The top tier holds a potted plant with colorful, variegated leaves. The middle tier holds a white ceramic cup. The bottom tier holds another potted plant with long, green, spiky leaves. To the far left, dark grey curtains are visible, partially covering a window. The overall scene is calm and serene, suggesting a restful environment.

RESTful Services with ORDS

What is REST



REST	Representational state transfer	doctoral dissertation by Roy Fielding, 2000
	programming paradigm	distributed systems Web services.
RESTful Applications	implements 6 constraints	Uniform Interface (API via URIs) Stateless , Client-Server, Layered System Cacheable , Code on Demand
Implementation	Transport protocol	http(s)
	content	JSON Documents

AutoREST

REST enable Table or Procedure very easy

Read / Write

Stateless / no transaction

SQLDeveloper Wizards

PL/SQL API

Anatomy of a ORDS AutoREST URL



ORDS Base

Table

Parameter

http://192.168.56.101:8080/ords/rdbl/Tab-StockTicker/?offset=55&limit=100

/ORCL,2016-01-08

PKCol1,PKCol2
or Primary Key

Protocol

Host:Port

Schema


HTTP Method	ORDS AutoREST Action
GET	Retrieve Data – Single Row or Rowset
PUT	Insert or Modify Row
POST	Bulk Insert csv-data
DELETE	Delete Row

```
begin
  ords.enable_schema;
  commit; -- This commit is important!
end;
/
```

```
BEGIN
  ORDS.ENABLE_SCHEMA
    (   p_schema => 'RESTDBLINKSPROV',
        p_url_mapping_type => 'BASE_PATH',
        p_url_mapping_pattern => 'rdbl',
        p_auto_rest_auth => false );
  commit; -- This commit is important!
END;
/
```

```
begin
  ords.enable_object (
    P_ENABLED      => true,
    P_SCHEMA       => 'RESTDBLINKSPROV',
    P_OBJECT       => 'STOCKTICKER',
    P_OBJECT_TYPE  => 'TABLE',
    P_OBJECT_ALIAS => 'tab-StockTicker',
    P_AUTO_REST_AUTH => false
  );
  commit; -- This commit is important, too!
end;
/
```

Case Sensitive



ORDS & REST





Apex in the Cloud

Deploying Apex in the Cloud



Same

as on Premises

Deploy ORDS

on dedicated App-Server

Security

use https

Monitor

- Usage
- Access Logs

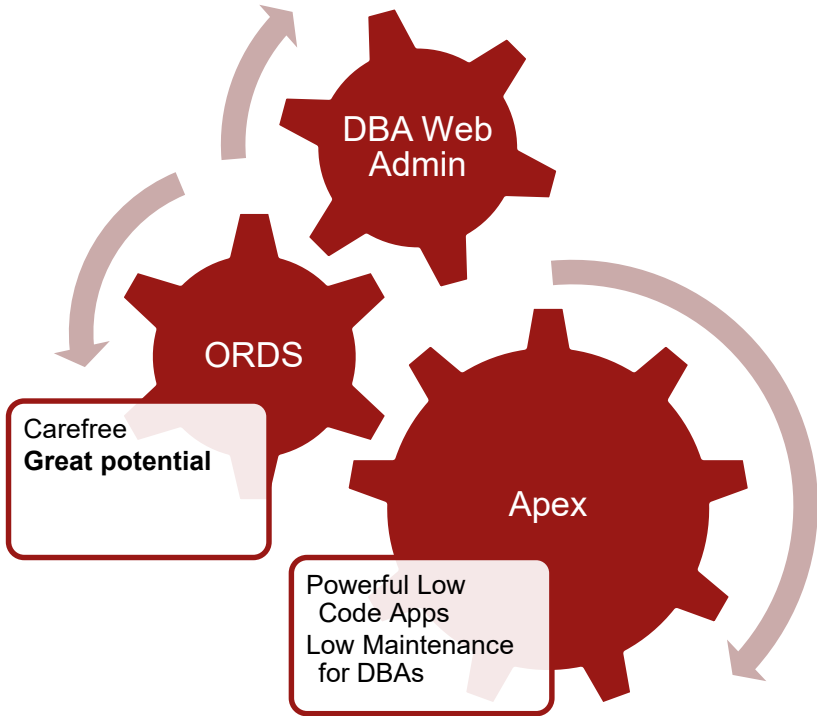
Free Apex Workspaces

<https://apex.oracle.com>



Conclusion







Vielen Dank für Ihre
Aufmerksamkeit.