

HOL5 - ATP tooling

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Ejercicio 1: Crear usuario de Machine Learning

En este ejercicio se explica crear un usuario de Oracle Machine Learning. Este usuario lo utilizaremos en ejercicios posteriores para crear un Notebook y consultar datos del esquema HR.
En la pantalla principal del ATP, elegir la pestaña “Tools”, y luego cliquear el botón “Open Oracle ML User Administration”

The screenshot shows the 'Autonomous Database Details' page for an Autonomous Database named 'atplabpub'. At the top, there are tabs for 'DB Connection', 'Performance Hub', 'Service Console', 'Scale Up/Down', and 'More Actions'. Below these, the 'Tools' tab is selected. Under the 'Tools' tab, there are several sections: 'SQL Developer Web', 'Oracle Application Express', 'Oracle ML User Administration' (which is highlighted with a red box), and 'SODA Drivers'. Each section contains a brief description and a 'View Details' button.

En la pantalla de login, entrar las **credenciales** de **ADMIN**:

Usuario: ADMIN

Contraseña: Autonomous#2020

The screenshot shows the 'SIGN IN' page for the Oracle Machine Learning Database Administrator. It features a large blue header with a cloud icon on the left. Below the header, it says 'Database name: ATPLABPUB'. The main form asks 'Sign in with your Oracle Machine Learning Database Administrator credentials'. It has fields for 'USERNAME *' (containing 'ADMIN') and 'PASSWORD *' (containing a series of dots). A 'Sign In' button is at the bottom, which is highlighted with a red box.

En la pantalla siguiente, vemos un listado de **usuarios de OML**, solo ADMIN de momento.



Users

User Name	Role	Email	Created On	Status
ADMIN	System Administrator	pp@gmail.com	1/27/20 11:34 PM	Open

Cliquar el botón “Create”.

Create User

Username: ML_HR

First Name:

Last Name:

Email Address: pp@gmail.com

Generate password and email account details to user. User will be required to reset the password on first sign in.

Password:

Confirm Password:

En la pantalla de creación de usuario, llenar la información y pulsar el botón “Create”.

Usuario: ML_HR

Contraseña: Autonomous#2020

Email: cualquier valor con formato email.

Importante: de-chequear “Generate password and email account details to user”, para poder teclear la contraseña.

Una vez creado, el nuevo usuario aparece en la lista de usuarios de OML:

Users

User Name	Role	Email	Created On	Status
ADMIN	System Administrator	pp@gmail.com	1/27/20 11:34 PM	Open
ML_HR	Developer	pp@gmail.com	5/7/20 11:34 AM	Open



Ejercicio 2: Utilizar Sql*Developer Web

En este ejercicio, vamos a utilizar Sql*Developer Web para:

- Habilitar ORDS para el esquema HR
- Como HR, ejecutar algunas consultas SQL
- Habilitar una política de Data Redaction sobre un campo de la tabla “employees”
- Dar privilegios de consulta al usuario ML_HR sobre la tabla “employees”
- Habilitar ORDS sobre la tabla “employees”

Desde la pantalla principal del ATP, en la pestaña “Tools”, cliquar el botón “Open Sql Developer Web”.

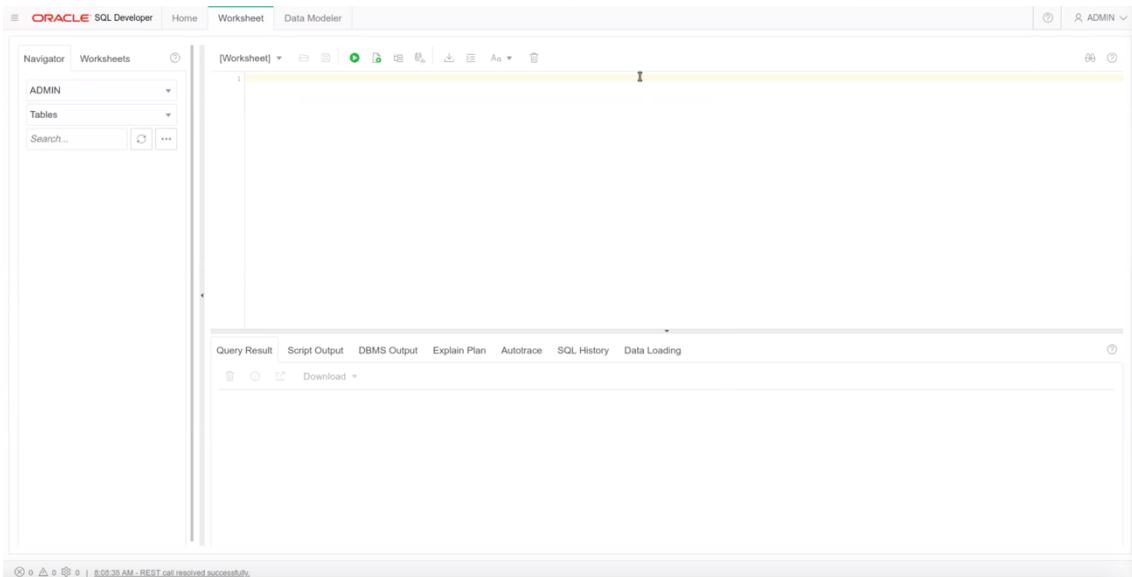
The screenshot shows the Oracle Cloud Infrastructure (OCI) Autonomous Database Details page for a database named 'atplabpub'. The 'Tools' tab is selected. Under the 'SQL Developer Web' section, there is a button labeled 'Open SQL Developer Web' which is also highlighted with a red box.

Esto nos lleva a la pantalla de login: conectarse como usuario ADMIN, password “Autonomous#2020”.

The screenshot shows the Oracle SQL Developer Web login screen. It features a logo and the text 'ORACLE SQL Developer Web'. Below this is a form with two fields: 'Username' containing 'ADMIN' and 'Password' which is currently empty. At the bottom is a large blue 'Sign in' button.

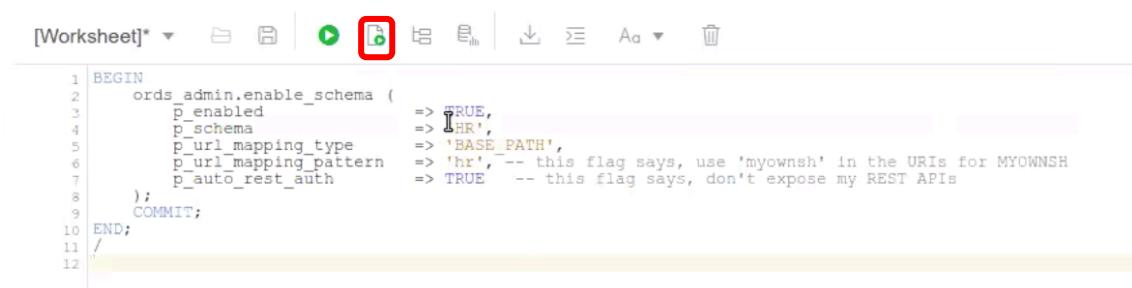
Una vez hecho esto, accedemos a la pantalla de **SQL Developer Web**, Que nos dará acceso para interactuar con la base de datos mediante SQL.





A continuación, ejecutamos el siguiente código, que habilita el usuario HR en ORDS y lo habilita para poder acceder con SQL Developer Web:

```
BEGIN
    ord.admin.enable_schema (
        p_enabled          => TRUE,
        p_schema            => 'HR',
        p_url_mapping_type => 'BASE_PATH',
        p_url_mapping_pattern => 'hr',
        p_auto_rest_auth   => TRUE );
    COMMIT;
END;
/
```



Luego, para preparar un ejercicio posterior, vamos a habilitar **Data Redaction** sobre la tabla “HR.employees”, para impedir que el usuario ML_HR pueda ver el contenido de la columna “salary”. Ejecutamos el código siguiente:

```
BEGIN
    SYS.DBMS_REDACT.ADD_POLICY(
        object_schema=> 'HR',
        object_name => 'EMPLOYEES',
        column_name => 'SALARY',
        column_description => 'Employee salary',
        policy_name => 'POL_HIDE_SALARY',
        policy_description => 'Hide salary',
        function_type => DBMS_REDACT.PARTIAL,
        function_parameters => '9,1,9',
        expression => 'SYS_CONTEXT(''USERENV'', ''SESSION_USER'') = ''ML_HR''');
    end;
/
```



[Worksheet]*

```
1 BEGIN
2 SYS.DBMS_REDACT.ADD_POLICY(
3 object_schema=> 'HR',
4 object_name => 'EMPLOYEES',
5 column_name => 'SALARY',
6 column_description => 'Employee salary',
7 policy_name => 'POL_HIDE_SALARY',
8 policy_description => 'Hide salary',
9 function_type => DBMS_REDACT.PARTIAL,
10 function_parameters => '9,1,9',
11 expression => 'SYS_CONTEXT(''USERENV'', ''SESSION_USER'') = ''ML_HR''');
12 end;
13 /
```

Query Result Script Output DBMS Output Explain Plan Autotrace SQL History

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.311

Esta política impedirá que el usuario ML_HR pueda ver el contenido del campo “salary” en la tabla “HR.employees”.

Una vez hecho esto, podemos acceder a [SQL Developer Web](#) mediante la URL anterior, pero cambiando el usuario admin por HR.

Primero nos desconectamos del Sql*Developer Web, y cerramos la pestaña del navegador.



The screenshot shows the Oracle SQL Developer interface. In the top navigation bar, 'Worksheet' is selected. On the right, a user menu shows 'ADMIN' and a 'Sign Out' button. The main area displays a PL/SQL script:

```

1 BEGIN
2   ORDS_ADMIN.enable_schema (
3     p_schema           => TRUE,
4     p_schemas          => 'HR',
5     p_url_mapping_type => 'BASE_PATH',
6     p_base_path        => '/ORDS/hr',
7     p_auto_index_auth  => TRUE
8   );
9 END;
10/

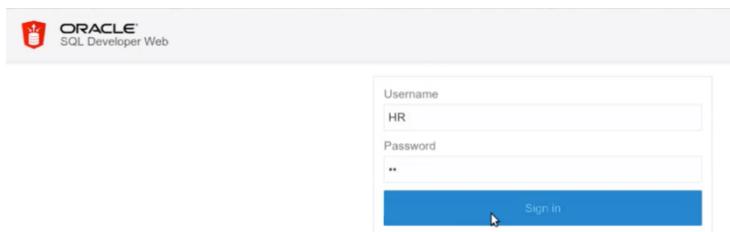
```

Below the script, the message 'PL/SQL procedure successfully completed.' is displayed. The status bar at the bottom shows 'Elapsed: 00:00:00.409'.

Luego desde la pagina principal del ATP, pestaña “Tools”, volvemos a cliquar “**Open Sql Developer Web**”, para volver a la pantalla de login. En la URL, **cambiamos “admin” por “hr”**:

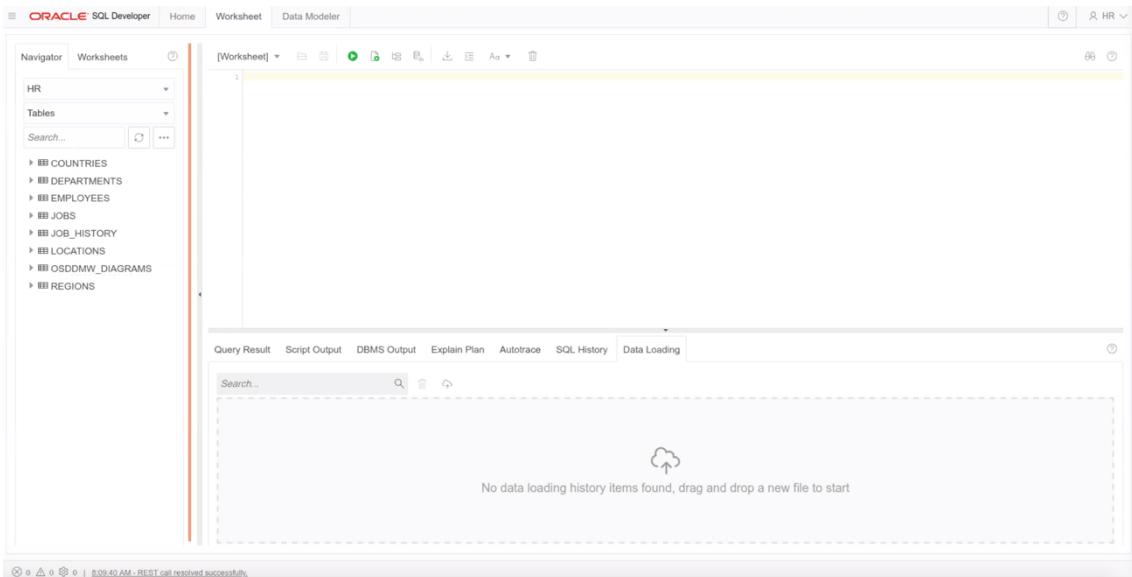


Volverá a aparecer la consola de login, volvemos a introducir el nombre de usuario y contraseña. En este caso el usuario HR/hr o hr/hr (**contraseña siempre en minúsculas**).



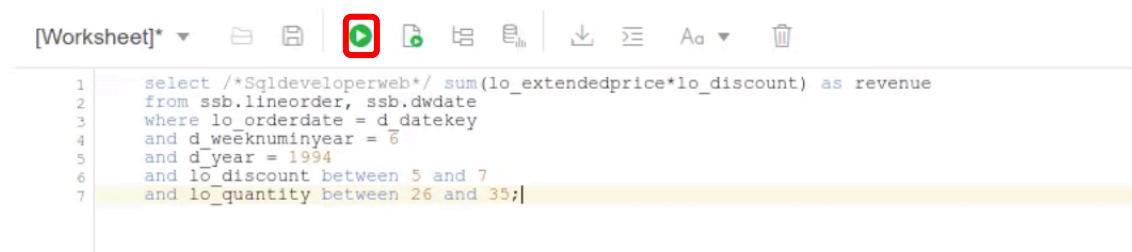
En la siguiente pantalla podemos ver la misma consola de SQL Developer Web, pero en este caso a la izquierda podemos ver las tablas del esquema HR:





Ejecutamos el siguiente código, como se muestra en la imagen. Es una query sobre el **esquema SSB**, accesible a cualquier usuario:

```
select /*Sqldeveloperweb*/ sum(lo_extendedprice*lo_discount) as revenue
from ssb.lineorder, ssb.dwdate
where lo_orderdate = d_datekey
and d_weeknuminyear = 6
and d_year = 1994
and lo_discount between 5 and 7
and lo_quantity between 26 and 35;
```



Se puede consultar la ejecución de la query desde la sección Performance HUB, en la pantalla principal del ATP:

This screenshot shows the Oracle ATP Performance Hub. It features a large green button labeled 'ATP' with 'AVAILABLE' underneath. To its right is a navigation bar with buttons for 'DB Connection', 'Performance Hub' (which is highlighted with a red box), 'Service Console', 'Scale Up/Down', and 'More Actions'. Below the navigation bar is a tab bar with 'Autonomous Database Information' selected, followed by 'Tools' and 'Tags'. Under 'Autonomous Database Information', there are sections for 'General Information' (Database Name: atplabpub, Workload Type: Transaction Processing) and 'Infrastructure' (Dedicated Infrastructure: No). A 'Backup' section is also visible.



Una vez aquí, se puede ver la query ejecutándose:

The screenshot shows the Oracle ASH Analytics interface under the 'SQL Monitoring' tab. It displays a table titled 'Top 100 by Last Active Time'. A single row is highlighted in red, representing a session with the following details:

Status	Duration	Inst ID	SQL ID	SQL Plan Hash	User Name	Parallel	Database Time	I/O Requests	SQL Text
Executing	20.00s	1	228q0dh6lrmz	817007416	HR@Z36W1ZYAC6L8LPZ_ATPLABPUB	1	20.40s	71K	select /*+ parallel(1) */ ...

Se puede seleccionar el SQL ID de la query, y acceder a sus detalles

The screenshot shows the Oracle Real-time SQL Monitoring page for SQL ID 228q0dh6lrmz. The top navigation bar includes 'Back', 'Save Report', and 'Refresh' buttons. The main area is divided into several sections:

- Overview:** Shows general information like SQL Text, Execution Start Date, and Activity.
- Time & Wait:** A chart showing Duration (28.0s), Database Time (28.6s), and PL/SQL & Java: 0s.
- I/O:** A chart showing Buffer Gets (13M), I/O Requests (99K), I/O Bytes (96.3GB), and Cell Offload Efficiency (100%).

Más abajo, se puede ver el código de la query, en la pestaña SQL Text:

The screenshot shows the 'SQL Text' tab of the Oracle SQL Text details page. The tab also includes 'Plan Statistics', 'Activity', and 'Metrics' tabs. The SQL Text section displays the following query:

```
select * from
(select q.* , row_number() over (order by 1) RN
from (
select sum_extendedprice / sum_qty_extendedprice*lo_discount as revenue
from v$lineitem, sales, parts, suppliers, nations, regions, countries
where lo_orderdate = d.datekey
and s.supplierid = p.partkey
and p.partkey = ps.supplierid
and d.year = 1994
and lo_discount between 5 and 7
and lo_quantity between 26 and 35
) q
where RN between :1 and :2)
```



Volviendo a SQL Developer Web, cuando la query haya terminado, podemos ver el resultado de la consulta:

The screenshot shows the Oracle SQL Developer Web interface. In the top navigation bar, the 'Worksheet' tab is selected. On the left, the Navigator pane shows the HR schema with tables like COUNTRIES, DEPARTMENTS, EMPLOYEES, JOBS, JOB_HISTORY, LOCATIONS, OSDDMW_DIAGRAMS, and REGIONS. The main workspace contains a query editor window with the following SQL code:

```
1 select O.developerdept, O.extendedprice*O.discount) as revenue
2 from orders O
3 where O.orderdate = '1997-02-01'
4 and O.weeknuminyear = 2
5 and O.discount <= 10
6 and O.discount between 3 and 7
7 and O.quantity between 10 and 20
```

Below the query editor is a 'Query Result' panel showing the output:

revenue
1 26113.0600347

The execution time is listed as 48.562 seconds.

A continuación, ejecutamos una segunda consulta, en este caso la consulta devuelve un **objeto JSON** a partir de los datos de la consulta SQL:

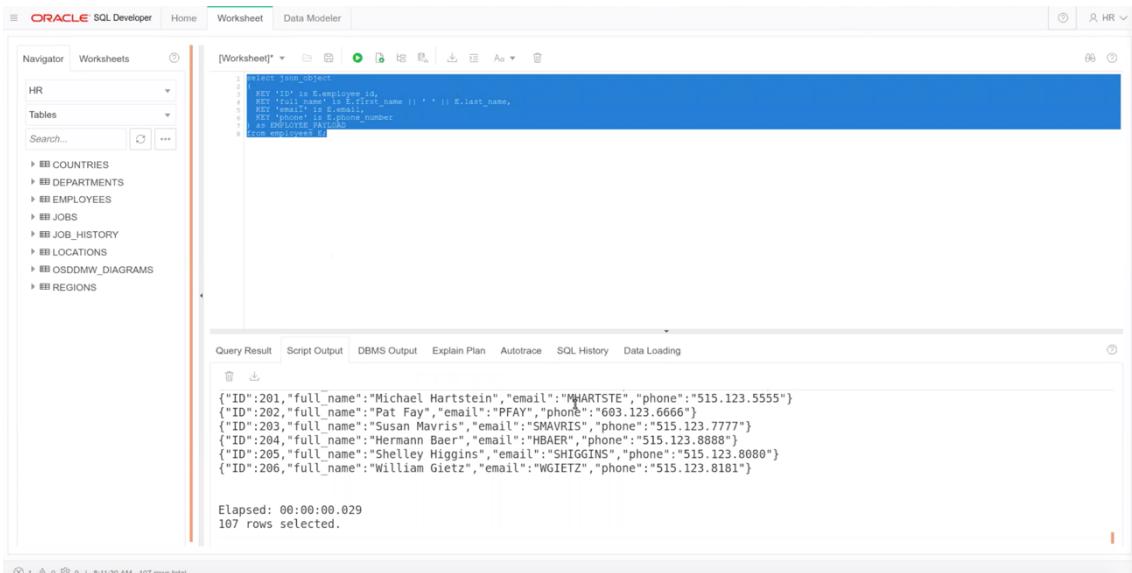
```
select json_object
(
  KEY 'ID' is E.employee_id,
  KEY 'full_name' is E.first_name || ' ' || E.last_name,
  KEY 'email' is E.email,
  KEY 'phone' is E.phone_number
) as EMPLOYEE_PAYLOAD
from employees E;
```

The screenshot shows the Oracle SQL Developer Web interface with the 'Worksheet' tab selected. The query editor contains the same SQL code as the previous screenshot:

```
1 select json_object
2 (
  KEY 'ID' is E.employee_id,
  KEY 'full_name' is E.first_name || ' ' || E.last_name,
  KEY 'email' is E.email,
  KEY 'phone' is E.phone_number
) as EMPLOYEE_PAYLOAD
from employees E;
```



Podemos ver el resultado en formato JSON:



The screenshot shows the Oracle SQL Developer interface. In the top navigation bar, 'Worksheet' is selected. On the left, the Navigator pane shows the HR schema with tables like COUNTRIES, DEPARTMENTS, EMPLOYEES, JOBS, JOB_HISTORY, LOCATIONS, OSDDMW_DIAGRAMS, and REGIONS. The main workspace displays a query in the [Worksheet]* tab:

```
SELECT * FROM employees
  WHERE first_name = 'Michael'
    AND last_name = 'Hartstein';
```

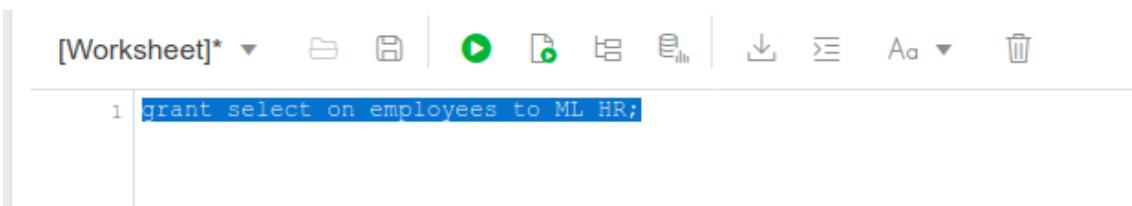
The results are shown in the 'Query Result' tab, displaying 107 rows of employee data in JSON format:

```
[{"ID":201,"full_name":"Michael Hartstein","email":"MHAERTSTE","phone":"515.123.5555"}, {"ID":202,"full_name":"Pat Fay","email":"PFAY","phone":"603.123.6666"}, {"ID":203,"full_name":"Susan Mavris","email":"SMAVRIS","phone":"515.123.7777"}, {"ID":204,"full_name":"Hermann Baer","email":"HBAER","phone":"515.123.8888"}, {"ID":205,"full_name":"Shelley Higgins","email":"SHIGGINS","phone":"515.123.8680"}, {"ID":206,"full_name":"William Gietz","email":"WGIETZ","phone":"515.123.8181"}]
```

Below the results, it says 'Elapsed: 00:00:00.029' and '107 rows selected.'

Para preparar los ejercicios siguientes, otorgamos privilegios al **usuario ML_HR** sobre la tabla “employees”:

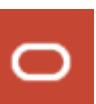
```
grant select on employees to ML_HR;
```



The screenshot shows the Oracle SQL Developer interface with the 'Worksheet' tab selected. The code 'grant select on employees to ML_HR;' is entered in the workspace.

Y habilitamos ORDS sobre la tabla “employees”, para permitir el acceso por REST a sus datos:

```
DECLARE
  PRAGMA AUTONOMOUS_TRANSACTION;
BEGIN
  ORDS.ENABLE_OBJECT(p_enabled => TRUE,
                      p_schema => 'HR',
                      p_object => 'EMPLOYEES',
                      p_object_type => 'TABLE',
                      p_object_alias => 'emp',
                      p_auto_rest_auth => FALSE);
  commit;
END;
/
```



```

1 DECLARE
2   PRAGMA AUTONOMOUS_TRANSACTION;
3 BEGIN
4   ORDS.ENABLE_OBJECT(p_enabled => TRUE,
5                      p_schema => 'HR',
6                      p_object => 'EMPLOYEES',
7                      p_object_type => 'TABLE',
8                      p_object_alias => 'emp',
9                      p_auto_rest_auth => FALSE);
10
11   commit;
12 END;
13 /

```

Ahora podremos consultar la tabla “employees” mediante REST API. Para ello recuperamos el REST Endpoint desde la pagina principal del ATP. Hacer click en el botón “Service Console”:

Autonomous Database » Autonomous Database Details

atplabpub

DB Connection Performance Hub **Service Console** Scale Up/Down More Actions ▾

Autonomous Database Information Tools Tags

Database administration and developer tools for Autonomous Database

SQL Developer Web
Oracle SQL Developer Web provides an integrated development environment and a database administration interface for Oracle Database. [Learn more.](#)

[Open SQL Developer Web](#)

Oracle ML User Administration
Oracle Machine Learning is a development environment that uses a web-based interface to enable you to perform data analytics, data discovery and data visualizations. [Learn more.](#)

En la pantalla siguiente, hacer click en “Development”. En el apartado “**RESTful Services and SODA**”, vemos nuestro **REST Endpoint**:

Autonomous Transaction Processing

Download Oracle Instant Client
This is a free, light-weight set of tools, libraries and SDKs for building and connecting applications. These libraries underly the Oracle APIs of languages including Node.js, Python and PHP and provide access for OCI, OCCI, JDBC, ODBC and Pro*C applications. Tools such as SQLPlus and Oracle Data Pump are also included - Oracle recommends using this version of Data Pump for moving existing Oracle Database schemas to Autonomous Transaction Processing.

Download SODA Drivers
Simple Oracle Document Access (SODA) is a set of APIs for using collections of JSON documents stored in Oracle Database. SODA drivers are available for Java, Node.js, Python, C, PL/SQL, and REST.

Oracle APEX
Oracle APEX is a low code application development framework for building and deploying world-class data centric applications. APEX provides an easy-to-use browser-based environment to load data, manage database objects, develop REST interfaces, and build applications which look and run great on both desktop and mobile devices.

SQL Developer Web
Oracle SQL Developer Web provides a browser-based integrated development environment and administration interface for Oracle Autonomous Database. It provides a subset of the features available in the desktop product.

Oracle Machine Learning Notebooks
Oracle Machine Learning (ML) Notebooks are a collaborative, Apache Zeppelin-based user interface for data scientists and business SQL users of Autonomous Database. ML Notebooks provide an easy-to-use, in-database parallel, distributed machine learning algorithms, in addition to statistical and analytical SQL and PL/SQL functions. ML Notebooks enable sharing of notebooks and templates across the enterprise through permissions-based access, versioning, and execution scheduling.

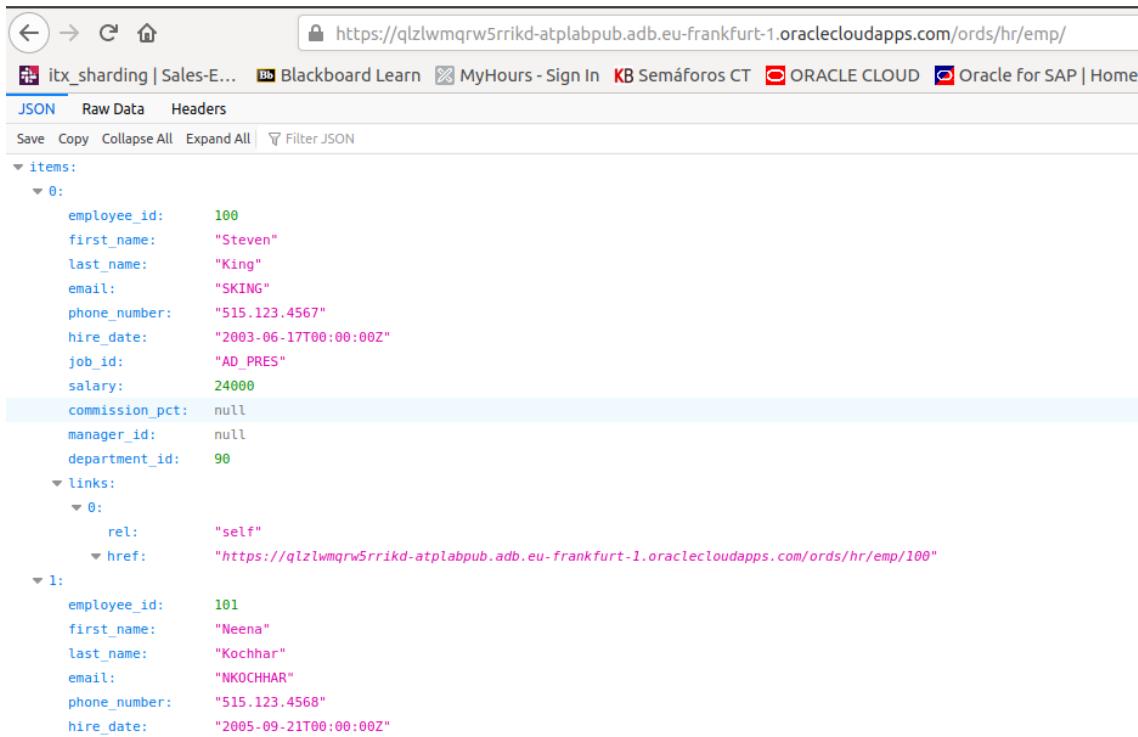
RESTful Services and SODA
Oracle REST Data Services (ORDS) provides HTTPS interfaces for working with the contents of your Oracle Database in one or more REST enabled schemas.

<https://QLZLWMQRW5RRIKD-ATPLABPUB.adb.eu-frankfurt-1.oraclecloudapps.com/ords/> [Copy URL](#)

Para consultar nuestra tabla, a la URL de REST Endpoint le añadimos “[/hr/emp/](#)”, por ejemplo:
<https://QLZLWMQRW5RRIKD-ATPLABPUB.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/>



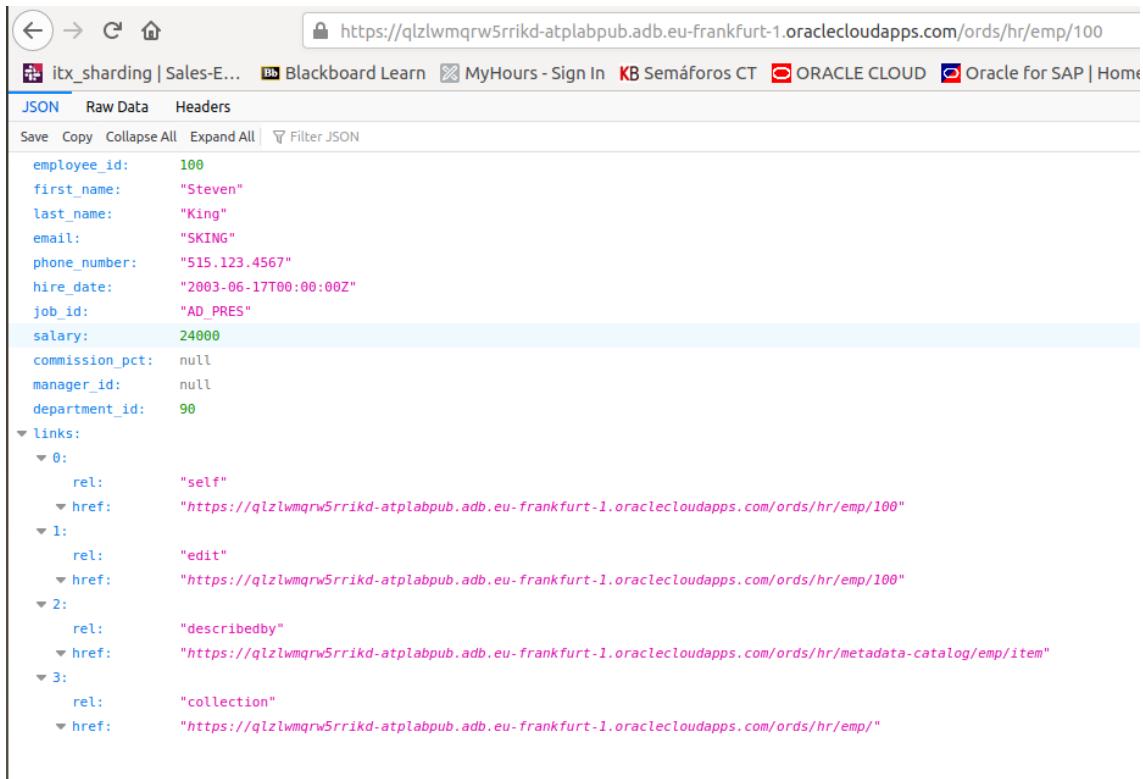
Si pegamos esta URL en un navegador Web, vemos los datos de la tabla “employees”:



The screenshot shows a browser window with the URL <https://qlzlwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/>. The page displays a JSON response with two items (employees). Item 0 has employee_id 100, first_name "Steven", last_name "King", email "SKING", phone_number "515.123.4567", hire_date "2003-06-17T00:00:00Z", job_id "AD_PRES", salary 24000, commission_pct null, manager_id null, and department_id 90. It also contains a link with rel "self" pointing back to the same URL. Item 1 has employee_id 101, first_name "Neena", last_name "Kochhar", email "NKOCHHAR", phone_number "515.123.4568", hire_date "2005-09-21T00:00:00Z", job_id "AD_PRES", salary 24000, commission_pct null, manager_id null, and department_id 90. It also contains a link with rel "self" pointing back to the same URL.

```
items:
  0:
    employee_id: 100
    first_name: "Steven"
    last_name: "King"
    email: "SKING"
    phone_number: "515.123.4567"
    hire_date: "2003-06-17T00:00:00Z"
    job_id: "AD_PRES"
    salary: 24000
    commission_pct: null
    manager_id: null
    department_id: 90
  links:
    0:
      rel: "self"
      href: "https://qlzlwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100"
  1:
    employee_id: 101
    first_name: "Neena"
    last_name: "Kochhar"
    email: "NKOCHHAR"
    phone_number: "515.123.4568"
    hire_date: "2005-09-21T00:00:00Z"
```

Si queremos ver únicamente el employee ID=100, completamos la URL con “100”:

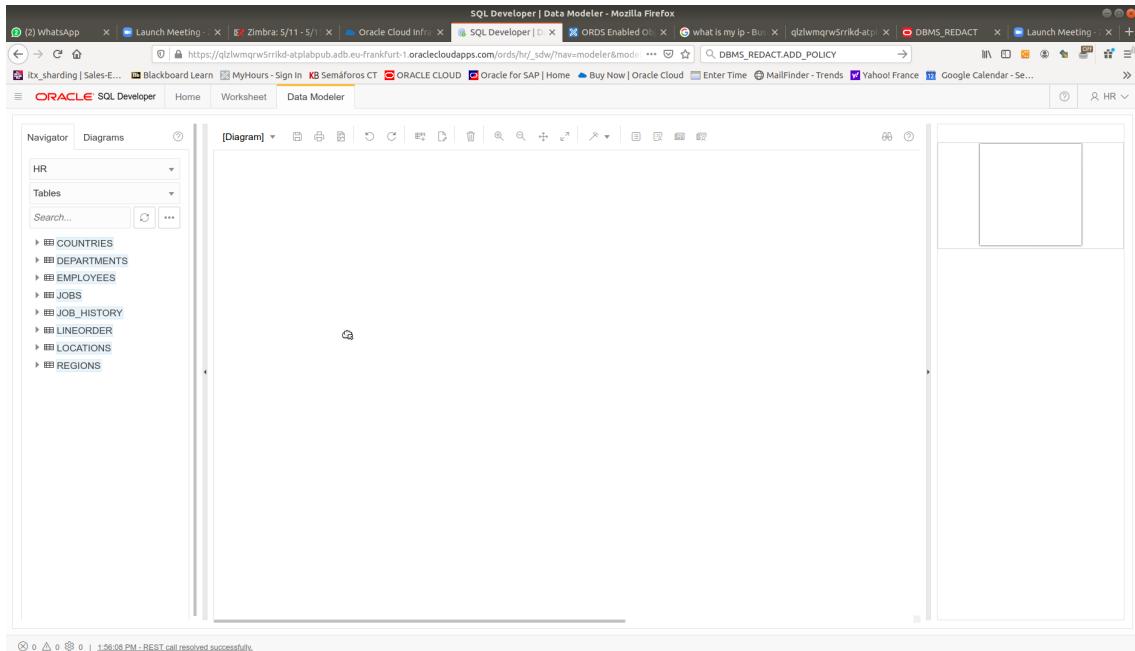


The screenshot shows a browser window with the URL <https://qlzlwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100>. The page displays a JSON response for employee ID 100. It includes the same details as item 0 in the previous screenshot. It also contains a link with rel "self" pointing back to the same URL, and additional links for edit, describedby, and collection.

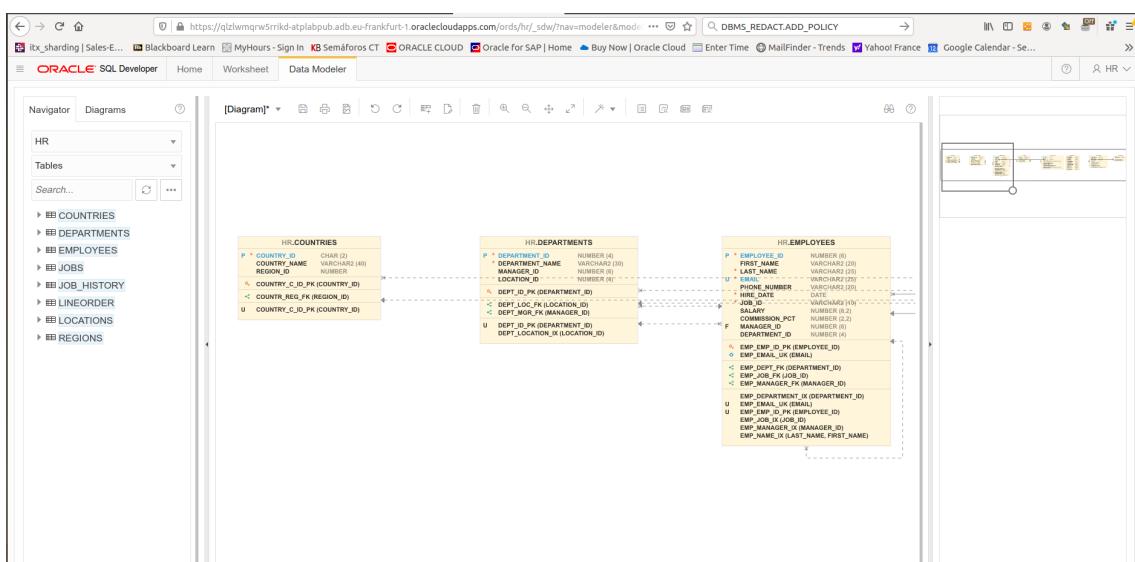
```
employee_id: 100
first_name: "Steven"
last_name: "King"
email: "SKING"
phone_number: "515.123.4567"
hire_date: "2003-06-17T00:00:00Z"
job_id: "AD_PRES"
salary: 24000
commission_pct: null
manager_id: null
department_id: 90
links:
  0:
    rel: "self"
    href: "https://qlzlwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100"
  1:
    rel: "edit"
    href: "https://qlzlwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100"
  2:
    rel: "describedby"
    href: "https://qlzlwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/metadata-catalog/emp/item"
  3:
    rel: "collection"
    href: "https://qlzlwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/"
```

Finalmente, desde el Sql*Developer Web, hacemos click en la pestaña Data Modeler para visualizar el modelo de datos del esquema HR. Arrastramos todas las tablas a la parte central de la pantalla:





Y visualizamos nuestro modelo relacional:



Ejercicio 3: Crear un notebook en Oracle Machine Learning

En este ejercicio vamos a conectarnos a OML con el usuario ML_HR que hemos creado anteriormente. Desde la pantalla principal del ATP. Pulse en el botón “**Service Console**”.

Vamos a la parte de desarrollo (Development) dentro de la consola de servicio, y pulsamos en “**Oracle Machine Learning Notebooks**”:

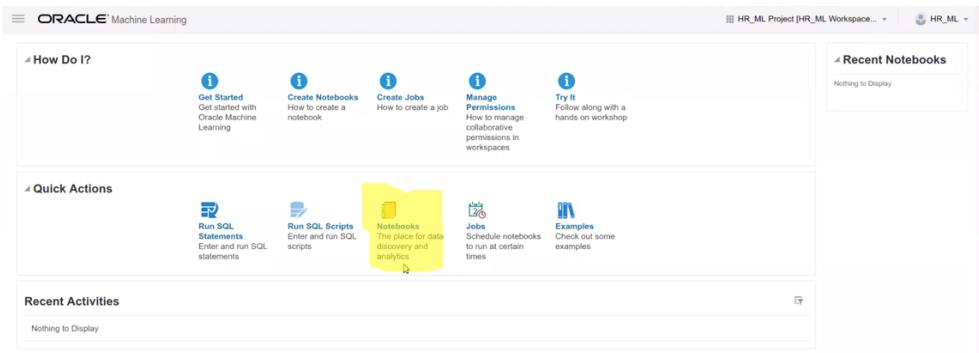
The screenshot shows the Oracle Cloud Infrastructure Service Console. On the left, there's a sidebar with 'Autonomous Transaction Processing' selected. Under 'DATABASE', 'ATPLABPUB' is listed. In the main area, under 'Development', there are several options: 'Download Oracle Instant Client', 'Oracle APEX', 'SQL Developer Web', 'Oracle Machine Learning Notebooks', and 'RESTful Services and SODA'. The 'Oracle Machine Learning Notebooks' option is highlighted in red.

En la pantalla de login, nos conectamos con el usuario **ML_HR/Autonomous#2020**:

The screenshot shows a sign-in page for Oracle Machine Learning. It asks for 'Database name:' and 'ATPLABPUB' is entered. Below it, it says 'Sign in with your Oracle Machine Learning Database User credentials'. There are fields for 'USERNAME *' (containing 'ML_HR') and 'PASSWORD *' (containing a series of dots). A blue 'Sign In' button is at the bottom.

A continuación, aparece la pantalla principal de la sección de Machine Learning, elegimos la opción “**Notebooks**”:





Esto dará paso a la creación de nuestro primer Notebook de Machine Learning. Pulsamos en el botón de crear:

Damos un nombre al nuevo Notebook, en este caso **TESTNB**:

A continuación, ejecutamos una query en el nuevo notebook:

```
select /*MLnotebook*/ sum(lo_extendedprice*lo_discount) as revenue
from ssb.lineorder, ssb.dwdate
where lo_orderdate = d_datekey
and d_weeknuminyear = 6
and d_year = 1994
and lo_discount between 5 and 7
and lo_quantity between 26 and 35;
```

Podemos monitorizar la ejecución de la query en el “Performance Hub” desde la pestaña de ATP, dos pestanas a la izquierda de aquí:



Top 100 by Last Active Time

Status	Duration	Inst ID	SQL ID	SQL Plan Hash	User Name	Parallel	Database Time	I/O Requests	SC
Running	19.00s	1	9tdd94jw9tqg	1992170205	HR_ML@Z36W1ZYAC6L8LPZ_ATPLABPUB	2	37.09s	92K	selected
Running	48.00s	1	9tdd94jw9tqg	3002741515	HR_ML@Z36W1ZYAC6L8LPZ_ATPLABPUB	1	48.38s	165K	selected

Dentro de la pestaña SQL Monitoring, podemos ver la query ejecutada. Si entramos dentro de esta query se pueden ver los detalles:

Top 100 by Last Active Time

Status	Duration	Inst ID	SQL ID	SQL Plan Hash	User Name	Parallel	Database Time	I/O Requests	SC
Running	19.00s	1	9tdd94jw9tqg	1992170205	HR_ML@Z36W1ZYAC6L8LPZ_ATPLABPUB	2	37.09s	92K	selected
Running	48.00s	1	9tdd94jw9tqg	3002741515	HR_ML@Z36W1ZYAC6L8LPZ_ATPLABPUB	1	48.38s	165K	selected

Podemos ver en la pestaña SQL Text que, en este caso, el motor de Machine Learning no ha reescrito la query. Tambien podemos ver los detalles asociados a esta query, como el plan de ejecución, estadísticas, actividad, métricas, etc

General

```
SQL Text: select /*ML.notebook*/
           sum(l_extendedprice*l_discount) as revenue
         from svb_lineorder, svb_datekey
        where l_orderdate = d_datekey
          and l_shipdate between d_year - 1 and d_year
          and l_shipmode between 5 and 7
          and l_quantity between 26 and 35
```

Execution Plan: 2

Execution Started: Apr 7, 2020 10:32:19 AM

Last Refresh Time: Apr 7, 2020 10:32:46 AM

Execution Id: 16777220

User Name: HR_ML@Z36W1ZYAC6L8LPZ_ATP...

Fetch Calls: 0

Time & Wait

Duration	Time
28.0s	57.6s

I/O

Buffer Gets	IO Requests	Bytes
19M	147K	142.9GB

Activity

Details

Plan Statistics Parallel SQL Text Activity Metrics

```
select /*ML.notebook*/
       sum(l_extendedprice*l_discount) as revenue
     from svb_lineorder, svb_datekey
    where l_orderdate = d_datekey
      and l_shipdate between d_year - 1 and d_year
      and l_shipmode between 5 and 7
      and l_quantity between 26 and 35
```



Finalmente volvemos al Notebook y comprobamos el resultado de la query:

The screenshot shows the Oracle Machine Learning Notebook interface. The top bar indicates "Connected" to "HR_ML Project [HR_ML Workspace...]" and "default". The main area displays a query result titled "REVENUE" with one row of data: "26113126600347". Below the result is a SQL editor window containing the following query:

```
select /*+ no_parallel */ /*+ use_extended_dml(xe_document) */ revenue
  From xtb_licenses, xtb_dialect
 where xtb_licenses.license_id = xtb_dialect.license_id
   and xtb_licenses.year = 4
   and xtb_licenses.month = 1
   and xtb_dialect.between 5 and 7
   and xtb_dialect.between 26 and 30;
```

At the bottom, it says "Took 32 sec. Last updated by HR_ML at April 07 2020, 1:32:33 PM (continued)".

Vamos a ejecutar ahora una query contra la tabla HR.employees desde el mismo Notebook:

```
Select * from hr.employees;
```

The screenshot shows the Oracle Machine Learning Notebook interface with the previous query result still visible. A new query result for "SELECT * from hr.employees;" is displayed, showing 107 rows of employee data. The salary column values are all masked with "9999".

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT	MANAGER_ID	DEPARTMENT_ID
100	Steven	King	SKING	515.123.4567	2003-06-17 00:00:00	AD_PRES	99999		90	
101	Neena	Kochhar	NKOCHHAR	515.123.4568	2005-09-21 00:00:00	AD_VP	99999		100	90
102	Lex	De Haan	LDEHAAN	515.123.4569	2001-01-13 00:00:00	AD_VP	99999		100	90
103	Alexander	Hunold	AHUNOLD	590.423.4567	2006-01-03 00:00:00	IT_PROG	9999		102	60
104	Bruce	Ernst	BERNST	590.423.4568	2007-05-21 00:00:00	IT_PROG	9999		103	60
105	David	Austin	DAUSTIN	590.423.4569	2005-06-25 00:00:00	IT_PROG	9999		103	60
106	Valli	Pataballa	VPATABAL	590.423.4560	2006-02-05 00:00:00	IT_PROG	9999		103	60
107	Diana	Lorentz	DLORENTZ	590.423.5567	2007-02-07 00:00:00	IT_PROG	9999		103	60

Observamos que el campo “salary” esta **enmascarado** con “9”, ocultando el valor real del campo en todas las filas. Esto es el efecto de la **política de Data Redaction** que hemos implementado anteriormente.

Podemos compararlo con la consulta que se hace con el usuario HR desde SQL Developer web.

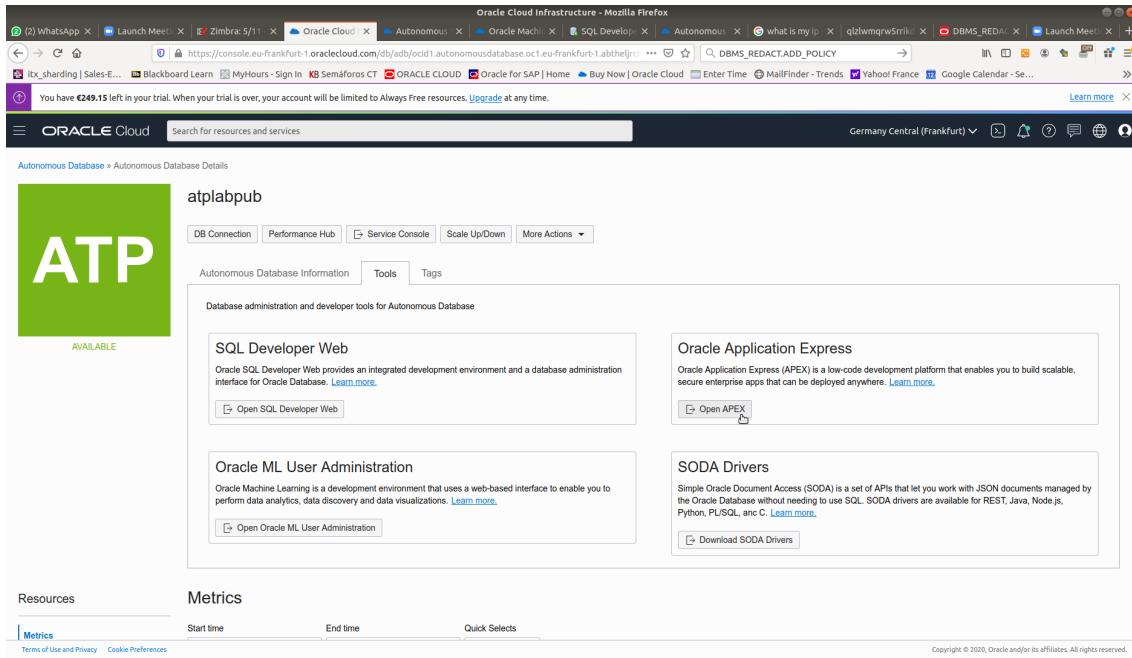
The screenshot shows the Oracle SQL Developer web interface. The query "SELECT * from hr.employees;" is run in a worksheet, and the results are displayed in a table. The salary column values are shown as they are, without being masked.

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT	MANAGER_ID	DEPARTMENT_ID
100	Steven	King	SKING	515.123.4567	2003-06-17T00:00:00Z	AD_PRES	24000		90	
101	Neena	Kochhar	NKOCHHAR	515.123.4568	2005-09-21T00:00:00Z	AD_VP	17000		90	
102	Lex	De Haan	LDEHAAN	515.123.4569	2001-01-13T00:00:00Z	AD_VP	17000		90	
103	Alexander	Hunold	AHUNOLD	590.423.4567	2006-01-03T00:00:00Z	IT_PROG	9000		102	60
104	Bruce	Ernst	BERNST	590.423.4568	2007-05-21T00:00:00Z	IT_PROG	6000		103	60
105	David	Austin	DAUSTIN	590.423.4569	2005-06-25T00:00:00Z	IT_PROG	4800		103	60
106	Valli	Pataballa	VPATABAL	590.423.4560	2006-02-05T00:00:00Z	IT_PROG	4800		103	60
107	Diana	Lorentz	DLORENTZ	590.423.5567	2007-02-07T00:00:00Z	IT_PROG	4200		103	60



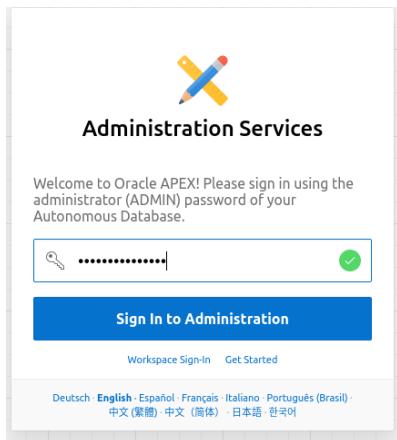
Ejercicio 4: Utilización de APEX

En el ejercicio siguiente, vamos a utilizar APEX. Desde la pantalla principal del ATP, en la pestaña “Tools”, elegimos “Oracle Application Express”:

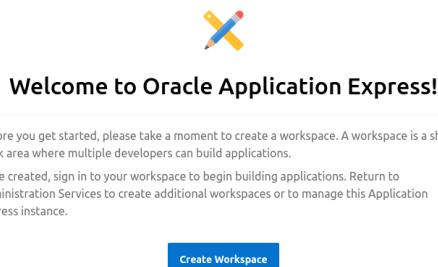


The screenshot shows the Oracle Cloud Infrastructure interface. In the top navigation bar, there is a message: "You have €249.15 left in your trial. When your trial is over, your account will be limited to Always Free resources. [Upgrade at any time.](#)". Below the navigation bar, the main content area is titled "Autonomous Database Details" for the database "atplabpub". There are tabs for "DB Connection", "Performance Hub", "Service Console", "Scale Up/Down", and "More Actions". The "Tools" tab is selected. Under the "Tools" tab, there are four sections: "SQL Developer Web", "Oracle Application Express", "Oracle ML User Administration", and "SODA Drivers". Each section has a brief description and a "Open [Tool]" button. The "Oracle Application Express" section is specifically highlighted with a red box around its title and description. At the bottom of the page, there are "Metrics" and "Resources" sections, and a footer with copyright information.

Primero nos conectamos con el usuario ADMIN a la consola de administración de APEX:



A continuación, creamos un “Workspace” con nombre WSHR para el usuario “HR”



Create Workspace

Identify a new or existing database user to use with your new workspace.

* Database User: HR

* Password:

* Workspace Name: WSHR

Advanced

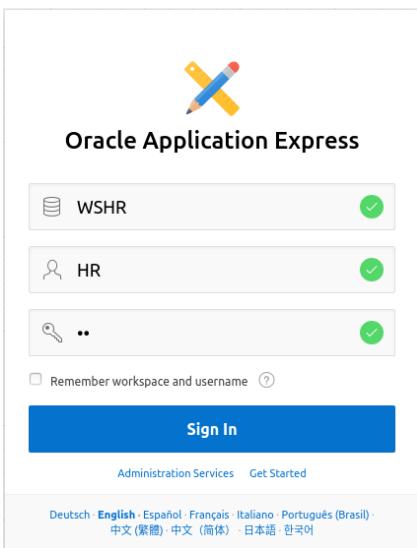
[Cancel](#) [Create Workspace](#)

Una vez creado el Workspace, nos conectamos a APEX con el usuario HR, siguiendo el enlace arriba a la izquierda en la pantalla principal de APEX.

The screenshot shows the Oracle Application Express Administration Services interface. At the top, there's a navigation bar with various links like 'WhatsApp', 'Launch Mail', 'Zimbra', 'Oracle Cloud', etc. Below it, a sub-navigation bar includes 'ORACLE APEX', 'Manage Instance', 'Manage Workspaces' (which is selected), and 'Monitor Activity'. A success message says 'Workspace created. Sign out of Administration Services and sign in to WSHR to begin building applications.' On the right, a sidebar titled 'About' provides information about administration tasks for an entire Oracle Application Express instance. The main content area has three tabs: 'Manage Instance', 'Manage Workspaces' (selected), and 'Monitor Activity'. Under 'System Message', there's a table with rows for 'Workspaces', 'Schemas', 'Applications', 'Users', 'Mail Queue Entries', and 'Websheets'. Under 'Jobs', there's a table with rows for 'ORACLE_APEX_AUTO_APPROVAL', 'ORACLE_APEX_DAILY_MAINTENANCE', 'ORACLE_APEX_MAIL_QUEUE', 'ORACLE_APEX_PURGE_SESSIONS', and 'ORACLE_APEX_WS_NOTIFICATIONS'. The bottom of the page shows the URL <https://qlzwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/f?p=4050:3:11213692322077> and the footer 'Application Express 19.2.0.0.18'.

Y nos conectamos como HR/hr o hr/hr (**contraseña siempre en minúsculas**):





Seguimos los pasos siguientes:



Welcome to Oracle Application Express!

Before you get started, please take a moment to set your Application Express (APEX) account password.
Your access to this service is controlled by Single Sign-On (SSO). When your workspace was created, an APEX account was also created with your SSO username and a randomly generated password. Resetting this password is required to run apps you create.

Note: This will not reset your SSO password.

[Set APEX Account Password](#)

Completamos el perfil del usuario HR:

Edit Profile

Profile Details

Workspace	WSHR
Username	HR
* Email Address	pp@gmail.com
First Name	
Last Name	

Profile Photo
Your profile photo personalizes your activity by showing up in the Top Users list. Add, change, or remove your photo.

Photo No file selected.

Esto nos lleva a la pantalla principal del workspace, desde donde podremos crear aplicaciones nuevas, gestionar el acceso por REST, etc ...

En esta pantalla, Pulsamos sobre el **menu “SQL Workshop”**, opción **“Restful Services”**:



The screenshot shows the Oracle Application Express (APEX) interface in Mozilla Firefox. The URL is https://qlzwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/f?p=4500:100:10560686599::DBMS_REDACT_ADD_POLICY. The main menu bar includes links like Oracle Cloud, Autonomous, Oracle Machine Learning, Oracle Development, Autonomous Database, what is my IP, DBMS REDACT, and Launch Me. The left sidebar has sections for ORACLE APEX, App Builder, SQL Workshop, Team Development, and App Gallery. The SQL Workshop section is currently selected. A tooltip for 'RESTful Services' is shown above a button in the sidebar. The main content area displays 'Top Apps', 'Top Users', 'News and Messages', and a dashboard with counts for Applications (0), Tables (8), Productivity Apps (0), and Features (0). The right sidebar contains sections for About, Dashboard, Resources, and Social media links.

Vemos que **ORDS** está habilitada sobre el esquema HR, que su alias es “hr”, y que tiene un objeto habilitado para REST. Pulsamos sobre “**Total Enabled Objects**”:

The screenshot shows the ORDS RESTful Services interface in Mozilla Firefox. The URL is https://qlzwmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/f?p=4850:100:10560686599::DBMS_REDACT_ADD_POLICY. The main menu bar includes links like Oracle Cloud, Autonomous, Oracle Machine Learning, Oracle Development, Autonomous Database, what is my IP, DBMS REDACT, and Launch Me. The left sidebar has sections for RESTful Services, Enabled Objects, Modules, Privileges, and Roles. The RESTful Services section is currently selected. It shows the ORDS Version (19.4.3.r1061746), Schema Access (Access Status: ENABLED), Metadata Access (Authorization Required: ENABLED), and Schema Aliased (Schema Alias: hr). Below this, it shows summary statistics for Modules (0), Privileges (4), Roles (8), and Enabled Objects (1). The bottom section shows Module Status (No Modules Defined), Module Security (No Modules Defined), and Object Aliases (No Aliases Defined). A tooltip for 'Total Enabled Objects' is shown over a button in the bottom right corner.



RESTful Enabled Objects

Parsing Schema	Parsing Object	Object Alias	Type	Status	Auto REST Auth	Ops Allowed	Type Path	Aliased
HR	EMPLOYEES	emp	TABLE	ENABLED	DISABLED	-	ENABLED	(green circle)

Legend: (green circle) Object name and alias are different (red circle) Object name and alias are the same

Ahora volvemos al menú SQL Workshop, y elegimos la opción “Object Browser”:

Object Browser

Parsing Schema	Parsing Object	Object Alias	Type	Status	Auto REST Auth	Ops Allowed	Type Path	Aliased
HR	EMPLOYEES	emp	TABLE	ENABLED	DISABLED	-	ENABLED	(green circle)

Legend: (green circle) Object name and alias are different (red circle) Object name and alias are the same



Esto nos lleva a una pantalla donde vemos los objetos del esquema HR. Pulsamos en el objeto “EMPLOYEES”, y accedemos a la **pestaña REST**.

EMPLOYEES		
Column Name	Data Type	Nullable
EMPLOYEE_ID	NUMBER(6,0)	No
FIRST_NAME	VARCHAR2(20)	Yes
LAST_NAME	VARCHAR2(25)	No
EMAIL	VARCHAR2(25)	No
PHONE_NUMBER	VARCHAR2(20)	Yes
HIRE_DATE	DATE	No
JOB_ID	VARCHAR2(10)	No
SALARY	NUMBER(8,2)	Yes
COMMISSION_PCT	NUMBER(2,2)	Yes
MANAGER_ID	NUMBER(6,0)	Yes
DEPARTMENT_ID	NUMBER(4,0)	Yes

Aquí vemos la **URL** a utilizar para acceder a la tabla mediante **API REST**:

REST Enable Object	<input checked="" type="radio"/> Yes	<input type="radio"/> No	(?)
Object Alias	emp (?)		
Authorization Required	<input type="radio"/> Yes	<input checked="" type="radio"/> No	(?)
RESTful URI	https://qlzlwqmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/ (Copy) (?)		

Si copiamos esta URL y la pegamos en un navegador, vemos los datos de la tabla, al igual que en un ejercicio anterior. Alternativamente, desde cualquiera de las máquinas “bastion”, podemos acceder a esta URL mediante cURL:

```
curl https://qlzlwqmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100
```

```
{"employee_id":100,"first_name":"Steven","last_name":"King","email":"SKING","phone_number":"515.123.4567","hire_date":"2003-06-17T00:00:00Z","job_id":"AD_PRES","salary":24000,"commission_pct":null,"manager_id":null,"department_id":90,"links":[{"rel":"self","href":"https://qlzlwqmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100"}, {"rel":"edit","href":"https://qlzlwqmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100"}, {"rel":"describedby","href":"https://qlzlwqmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/metadata-catalog/emp/item"}, {"rel":"collection","href":"https://qlzlwqmqrw5rrikd-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/"}]}
```



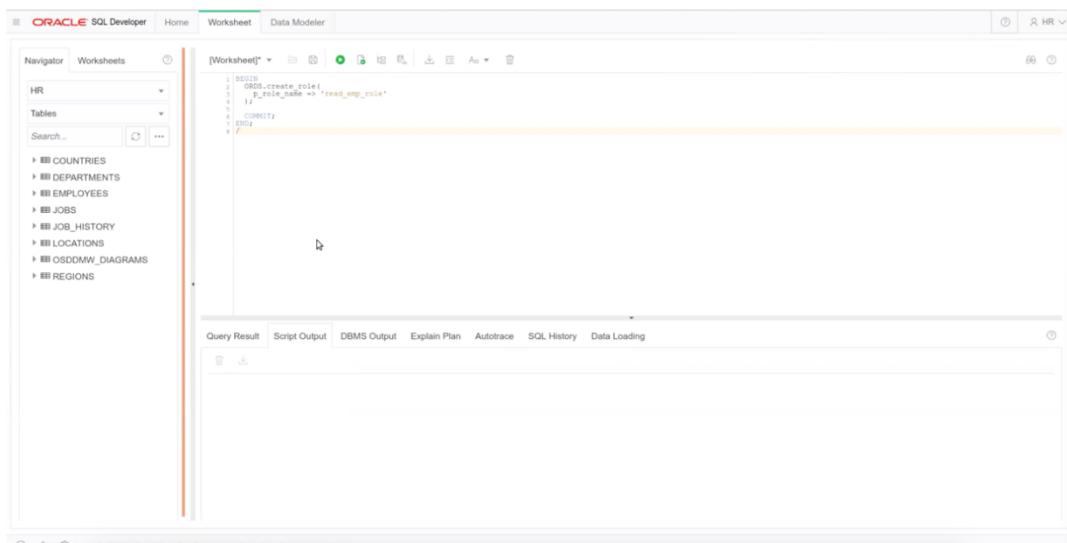
Ejercicio 5 (opcional): Configuración de seguridad de acceso OAuth2

En este ejercicio se explica como configurar seguridad de autenticación para acceder a los datos a través de REST API con un token de autenticación. Vamos a dotar el acceso a la tabla “employees” de seguridad mediante autenticación por token.

Nos conectamos al Sql*Developer Web como usuario HR, igual que en el ejercicio 2.

En primer lugar, hay que crear un rol, que se asociará al usuario HR y nos permitirá acceder al endpoint “/emp”:

```
BEGIN
  ORDS.create_role(
    p_role_name => 'read_emp_role'
  );
  COMMIT;
END;
/
```



A continuación, se crea un privilegio en ORDS. Este privilegio lo asociamos al role creado en el paso anterior:

```
DECLARE
  l_arr OWA.VC_ARR;
BEGIN
  l_arr(1) := 'read_emp_role';

  ORDS.DEFINE_PRIVILEGE (
    p_privilege_name => 'read_emp_priv',
    p_roles          => l_arr,
    p_label           => 'Employee reader privilege',
    p_description     => 'Allow to query employees'
  );
  COMMIT;
END;
/
```



```

1 BEGIN
2   ORDS.create_role(
3     p_role_name => 'read_emp_role'
4   );
5   COMMIT;
6 END;
7 /
8
9 DECLARE
10   l_arr OWA.VC_ARR;
11   l_arr(1) := 'read_emp_role';
12
13   ORDS.define_privilege (
14     p_privilege_name => 'read_emp_priv',
15     p_privilege_desc => l_arr,
16     p_label      => 'Employees reader privilege',
17     p_description => 'Allow to query employees'
18   );
19   COMMIT;
20
21 END;
22
23 COMMIT;
24
25 /

```

Con las siguientes queries, comprobamos que el rol ha sido correctamente asociado al privilegio de ORDS:

```

SELECT id, name
FROM user_ords_privileges
WHERE name = 'read_emp_priv';

SELECT privilege_id, privilege_name, role_id, role_name
FROM user_ords_privilege_roles
WHERE role_name = 'read_emp_role';

```

```

1 SELECT id, name
2 FROM user_ords_privileges
3 WHERE name = 'read_emp_priv';
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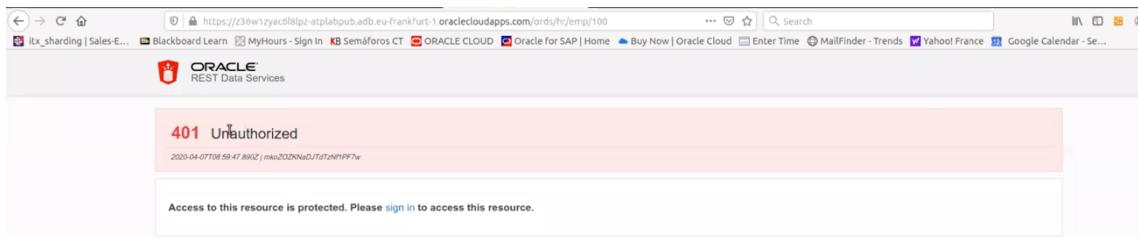
A continuación, mapeamos el privilegio a todas las terminaciones del endpoint “/emp/*”.

```
BEGIN
  ORDS.create_privilege_mapping(
    p_privilege_name => 'read_emp_priv',
    p_pattern => '/emp/*'
  );
  COMMIT;
END;
/
SELECT privilege_id, name, pattern
FROM user_ords_privilege_mappings
WHERE name = 'read_emp_priv';
```

The screenshot shows the Oracle SQL Developer interface. At the top, there is a code editor window containing the PL/SQL block and the SELECT statement. Below it is a 'Query Result' tab where the output of the query is displayed in a table format.

privilege_id	name	pattern
1	10061	/emp/*

Comprobamos si podemos acceder a los datos de la tabla employees a través de un navegador, con la URL utilizada en ejercicios anteriores:



La URL falla, por fallo de autorización.



El siguiente paso es crear un token de autorización, valido durante una hora desde su ultima utilización.

Ejecutamos lo siguiente:

```
BEGIN
  OAUTH.create_client(
    p_name          => 'Employee Client',
    p_grant_type    => 'client_credentials',
    p_owner         => 'Employees reader',
    p_description   => 'Client app for employees consultation',
    p_support_email => 'tim@example.com',
    p_privilege_names => 'read_emp_priv'
  );
  COMMIT;
END;
/
```

```
SELECT id, name, client_id, client_secret
FROM user_ords_clients;
```

La última sentencia SELECT devuelve un client ID y client secret. Los copiamos en un fichero de texto para introducirlos en la próxima llamada REST para conseguir un token de autenticación.

The screenshot shows a SQL worksheet with the following code:

```
1 BEGIN
2   OAUTH.create_client(
3     p_name          => 'Employee Client',
4     p_grant_type    => 'client_credentials',
5     p_owner         => 'Employees reader',
6     p_description   => 'Client app for employees consultation',
7     p_support_email => 'tim@example.com',
8     p_privilege_names => 'read_emp_priv'
9   );
10  COMMIT;
11 END;
12 /
13
14 SELECT id, name, client_id, client_secret
15 FROM user_ords_clients;
```

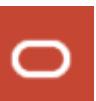
Below the code, the "Query Result" tab is selected, showing the execution time: 0.034 seconds. The result table contains one row:

	id	name	client_id	client_secret
1	10064	Employee Client	mVzhIKydBlVdL...	h0R4l0hJE6XV4...

A continuación, mapeamos el token de autenticación con el rol que se ha creado anteriormente para la tabla de empleados:

```
BEGIN
  OAUTH.grant_client_role(
    p_client_name => 'Employee Client',
    p_role_name    => 'read_emp_role'
  );
  COMMIT;
END;
/
```

```
SELECT client_name, role_name
FROM user_ords_client_roles;
```



```

1 BEGIN
2   OAUTH.create_client(
3     p_name      => 'Employee Client',
4     p_grant_type => 'client_credentials',
5     p_owner      => 'Employees reader',
6     p_description => 'Client app for employees consultation',
7     p_support_email => 'tim@example.com',
8     p_privilege_names => 'read_emp_priv'
9   );
10  COMMIT;
11 END;
12 /
14
15 SELECT id, name, client_id, client_secret
16 FROM user_ords_clients;
17
18 SELECT name, client_name
19 FROM user_ords_client_privileges;
20
21 BEGIN
22   OAUTH.grant_client_role(
23     p_client_name =>'Employee Client',
24     p_role_name  =>'read_emp_role'
25   );
26
27  COMMIT;
28 END;
29 /
30
31 SELECT client_name, role_name
32 FROM user_ords_client_roles;

```

Query Result

	client_name	role_name
1	Employee Client	read_emp_role

El siguiente paso es comprobar mediante el comando “curl”, desde una terminal Linux, si se puede acceder introduciendo el token de autenticación. Esto lo podemos hacer desde cualquiera de las máquinas de bastion.

Si no hemos apuntado el client_id y el secret en uno de los pasos anteriores, lo podemos consultar de nuevo con la siguiente query:

```
SELECT id, name, client_id, client_secret
FROM user_ords_clients;
```

A continuación, ejecutamos el siguiente comando, desde cualquiera de las máquinas bastion, para conseguir un token. Observamos en el comando de cURL el uso del parametro “**--user**”, con el valor <client_id>:<secret>:

La URL de oAUTH es nuestro REST Endpoint ya utilizado en varios ejercicios anteriores, completado por “/hr/oauth/token”:

```
#CLIENT_ID : x3n1g7heGXI0zxN_DJrIXw..
#CLIENT_SECRET : Az4WOTviFaDjgHgSMq-KLg..
#OAUTH_URL : https://z36w1zyac618lpz-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/oauth/token

curl -i -k --user x3n1g7heGXI0zxN_DJrIXw..:Az4WOTviFaDjgHgSMq-KLg.. --data "grant_type=client_credentials"
https://<use su ATP ORDS URL>/ords/hr/oauth/token
```

El comando anterior nos devuelve un token, que utilizamos ahora para consultar la tabla “employees” (sustituir <TOKEN> por el token devuelto por el paso anterior):

```
curl -i -k -H"Authorization: Bearer <TOKEN>" https://z36w1zyac618lpz-atplabpub.adb.eu-frankfurt-1.oraclecloudapps.com/ords/hr/emp/100
```

