Oracle Norge/OUGN webinarer

–

From Edge to ML

Hands On lab on IOT/Edge computing with Arduino based sensors

11 mars, 2021

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Master Principal Cloud
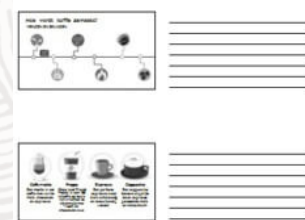Specialist, Oracle Norge

inge.os@oracle.com

Still gjerne med Q&A knappen når som helst

Mikrofonen din er dempet

Bruk Q&A

Slides vil bli delt

From Edge to ML

11/5-2021 Hands On lab on IOT/Edge computing with Arduino based sensors

27/5-2021 Applied Machine Learning based on sensor data, with Auto ML

10/6-2021 An intelligent app with APEX low-code, extended with Machine Learning

https://go.oracle.com/LP=109857?elqCampaignId=294067

Agenda

Introduction

Prepare Database, create REST API

Prepare Arduino IDE

Create Code and run

11.05.2021

Introduction

What we will build
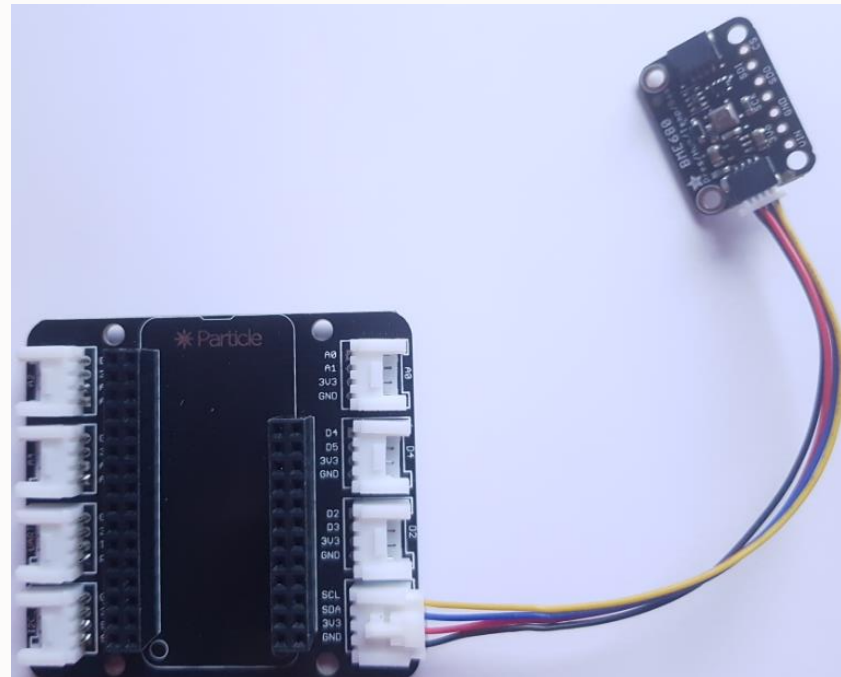
—

Building blocks

       Always Free Cloud Account
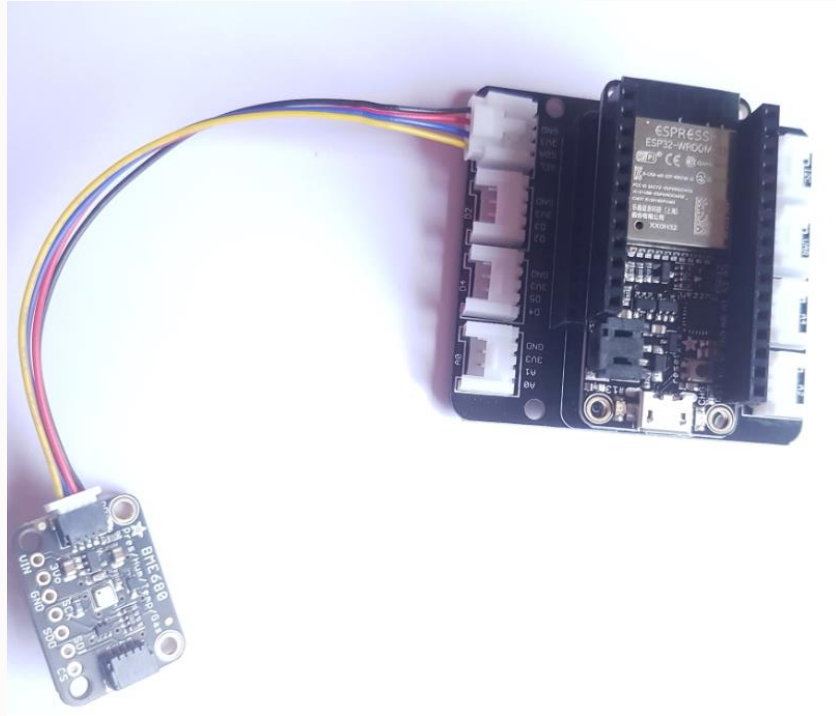
       Autonomous Database, ATP, with ORDS and SODA

       Arduino Microcontroller

       Arduino IDE

11.05.2021

Arduino and Sensors

 11.05.2021

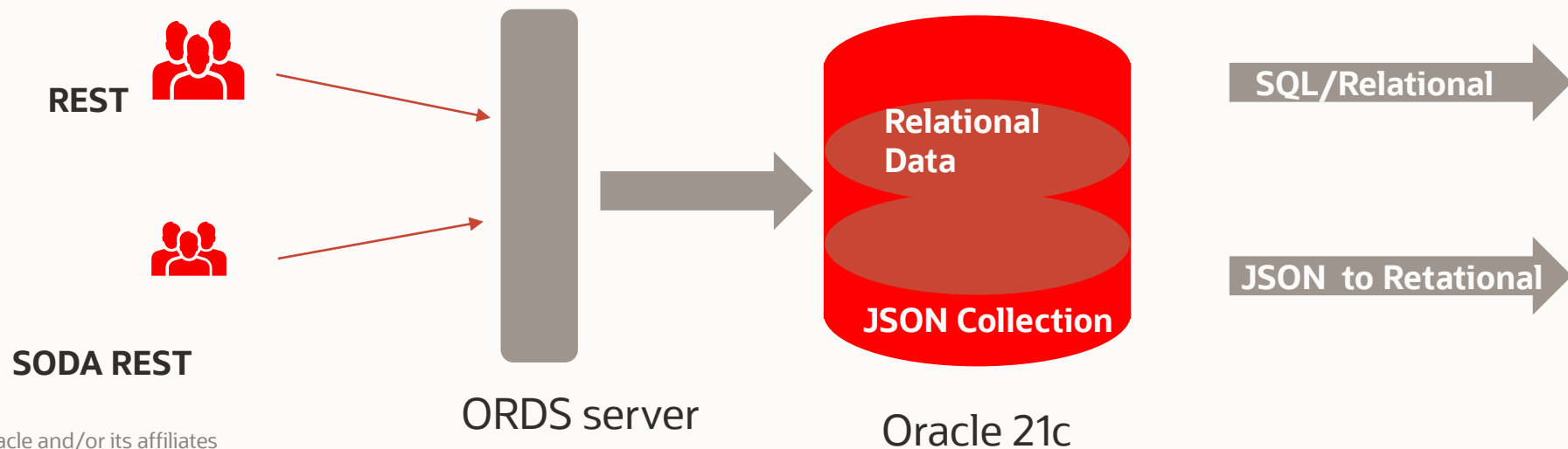# Arduino and Sensors

Arduino Adafruit HUZZAH32 ESP32 Feather
          240 MHz dual core Tensilica LX6 microcontroller
          520 KB SRAM , 4MB Flash
          WiFi
BME680 sensor
          temperature, humidity, barometric pressure, VOC gas

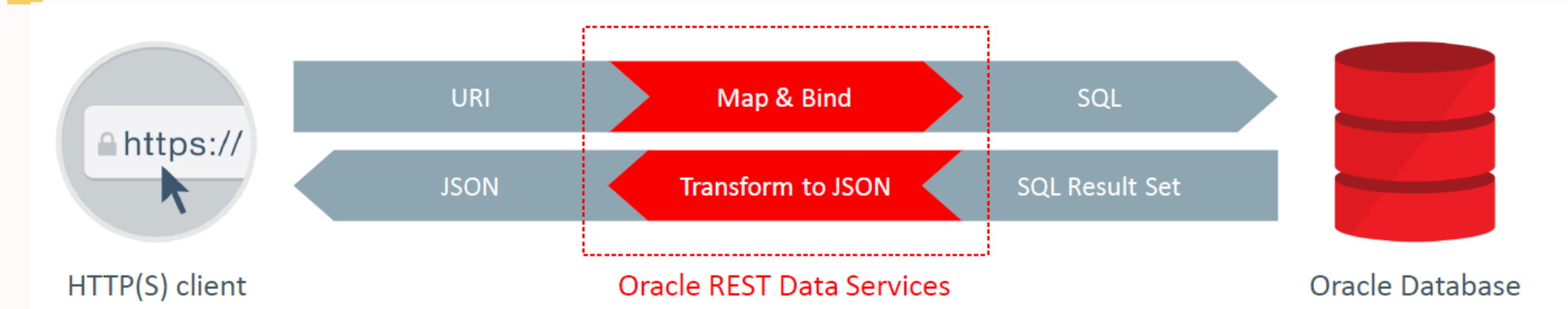   11.05.2021

JSON/REST Data access overview

REST enable relational CRUD DML, with Oracle Rest Data Services, ORDS

NoSQL type data access with Oracle SODA

Native JSON storage in the database for fast processing CRUD

REST

SODA REST

ORDS server

Relational Data

JSON Collection

Oracle 21c

SQL/Relational

JSON to Retational

Oracle ORDS

| HTTP(S) client | Oracle REST Data Services | Oracle Database |

URI → Map & Bind → SQL
JSON ← Transform to JSON ← SQL Result Set

Java J2EE mid tier application, e.g., WebLogic, Tomcat, Glassfish
   • Also supports "Standalone" mode for development

For input, maps/binds URI to SQL and PL/SQL

For output, transforms results to JSON and other formats

ORDS uses declarative approach, gives the DBA full control over what is exposed and how

Oracle SODA

SODA is Oracle API for creating a OOTB JSON Document Database
SODA REST API does not yet create JSON type document store OOTB

It provides a set of APIs
REST
JAVA
PL/SQL
Node.js
Python

Uses HTTP Verbs
GET, Select
PUT create collection
DELETE, drop collection
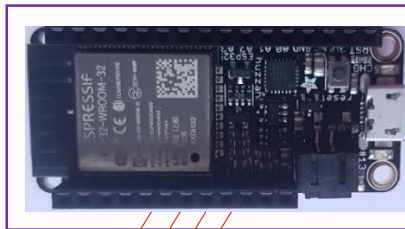POST insert/update

Introduction
What we will build

—

Arduino

I2C Bus

BME 680

REST POST of sensor data
WiFi/HTTPS
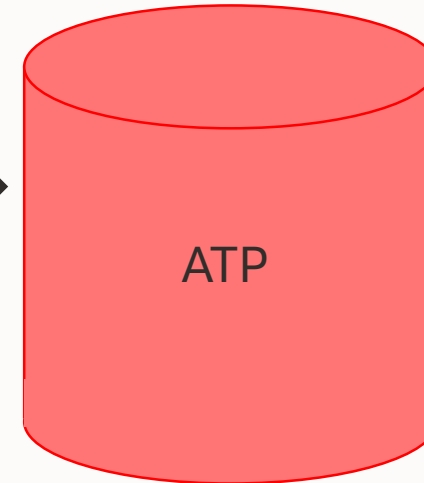
ATP

Always Free

11.05.2021

Server side

There are two options
- Use ORDS to create a REST API based on a standard SQL Table
- Use SODA to create a JSON document store collection

In the Lab we will share the code for both solutions

                       11.05.2021

Server side preparation, Always Free Database

- Create Autonomous Database, Always free
  - Not required step, we will offer tables for you to use
- Create Account for the Lab

Table Preparation
- Using ORDS
- Using SODA

 11.05.2021

Create Autonomous ATP database

11.05.2021

console.eu-frankfurt-1.oraclecloud.com/compute/instances

Learn more

ORACLE Cloud

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Germany Central (Frankfurt)

Home

Featured

Autonomous Database

Functions

Cloud Guard

Logging

GoldenGate

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Home

Compute

Storage

Networking

Oracle Database

Databases

Analytics & AI

Developer Services

Identity & Security

Observability & Management

Hybrid

Migration

Governance & Administration

Marketplace

Any state

Capacity type

console.eu-frankfurt-1.oraclecloud.com/db/adb/atp

Gmail   YouTube   Maps   Oracle Cloud Ops P...   📋 Reading list

⬆ You are using a Free Tier account. To access all services and resources, upgrade to a paid account.   Learn more ✕

ORACLE Cloud   Search for resources, services, and documentation   Germany Central (Frankfurt) ⌄   >_   🔔   ❓   🌐   👤

Overview » Autonomous Database » Autonomous Databases

Autonomous Database

Autonomous Database

Dedicated Infrastructure ⓘ

Autonomous Container Database

Autonomous Exadata Infrastructure

List Scope

Compartment

ios62 (root) ⇅

Filters

Workload Type

Transaction Processing ⇅

State

Any state ⇅

Tag Filters   add | clear

Autonomous Databases *in ios62 (root) Compartment*

Autonomous Database delivers fast performance and requires no database administration. It performs all routine database maintenance tasks while the system is running, without human intervention. Autonomous Databases located in the Oracle cloud can run on dedicated or shared infrastructure. Learn more.

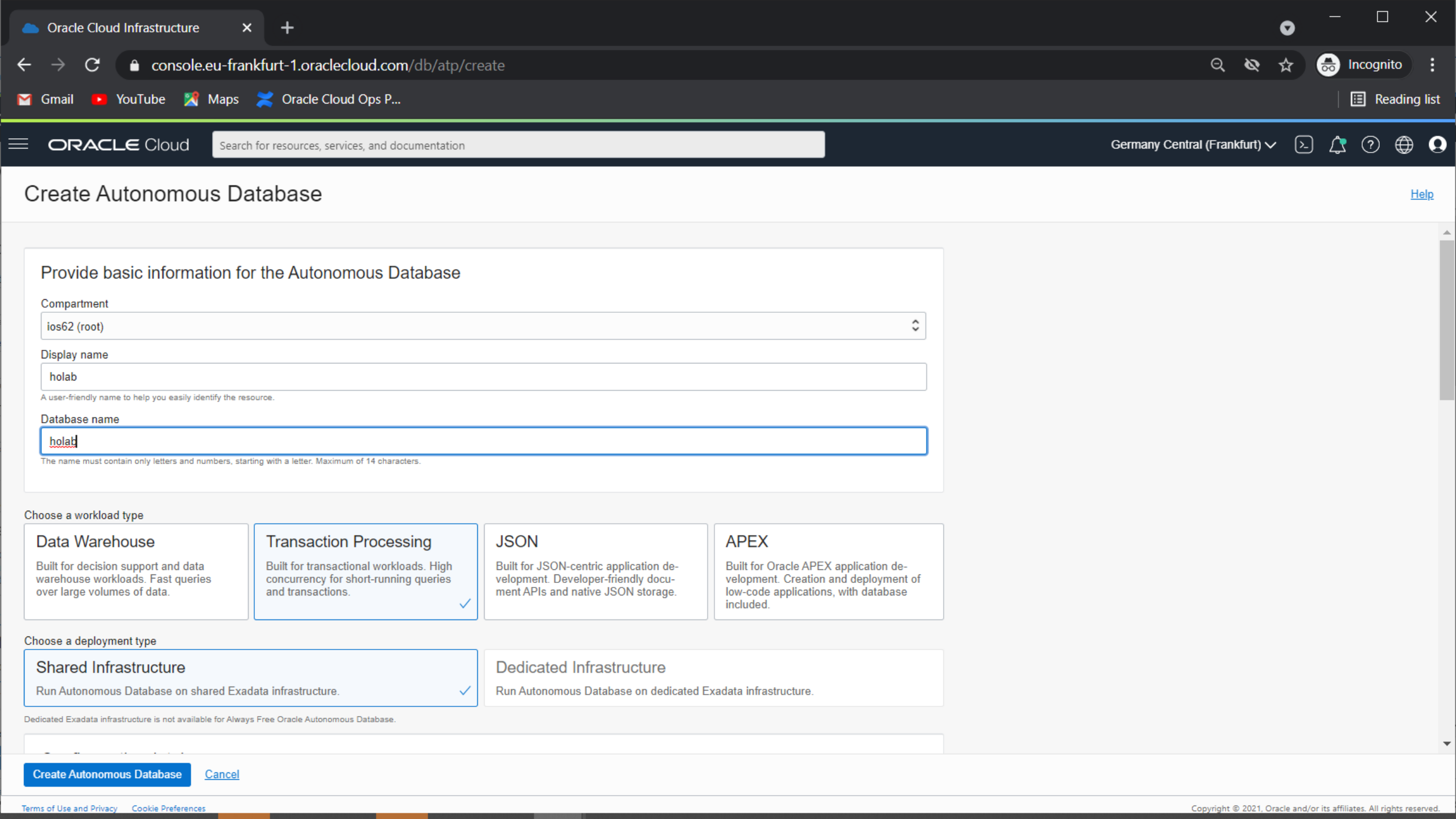| Create Autonomous Database |
|---|

Display Name	State	Dedicated	OCPUs	Storage (TB)	Workload Type	Autonomous Data Guard	Created
No items							

Displaying 0 Autonomous Databases   ‹ 1 of 1 ›

console.eu-frankfurt-1.oraclecloud.com/db/atp/create

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Create Autonomous Database

Help

Provide basic information for the Autonomous Database

Compartment

ios62 (root)

Display name

holab

A user-friendly name to help you easily identify the resource.

Database name

holab

The name must contain only letters and numbers, starting with a letter. Maximum of 14 characters.

Choose a workload type

Data Warehouse	Transaction Processing	JSON	APEX
Built for decision support and data warehouse workloads. Fast queries over large volumes of data.	Built for transactional workloads. High concurrency for short-running queries and transactions. ✓	Built for JSON-centric application development. Developer-friendly document APIs and native JSON storage.	Built for Oracle APEX application development. Creation and deployment of low-code applications, with database included.

Choose a deployment type

Shared Infrastructure	Dedicated Infrastructure
Run Autonomous Database on shared Exadata infrastructure. ✓	Run Autonomous Database on dedicated Exadata infrastructure.

Dedicated Exadata infrastructure is not available for Always Free Oracle Autonomous Database.

Create Autonomous Database   Cancel

console.eu-frankfurt-1.oraclecloud.com/db/atp/create

ORACLE Cloud   Search for resources, services, and documentation   Germany Central (Frankfurt) ⌄

Create Autonomous Database

Help

Shared Infrastructure	Dedicated Infrastructure
Run Autonomous Database on shared Exadata infrastructure. ✓	Run Autonomous Database on dedicated Exadata infrastructure.

Dedicated Exadata infrastructure is not available for Always Free Oracle Autonomous Database.

Configure the database

Always Free ⓘ

🔵 Show only Always Free configuration options

⚠️ If your Always Free Autonomous Database has no activity for 7 consecutive days, the database will be automatically stopped. Your data will be preserved, and you can restart the database to continue using it. If the database remains stopped for 3 months, it will be reclaimed. Learn more

Choose database version

19c

OCPU count *Read-Only*

1

Always Free Autonomous databases can utilize up to 1 core. The CPU core count cannot be adjusted.

Storage (TB) *Read-Only*

0.02

Always Free Autonomous databases can utilize up to 0.02 TB (20 GB) of storage. The storage size cannot be adjusted.

☐ Auto scaling

Allows system to use up to three times the provisioned number of cores as the workload increases. Learn more.

Create administrator credentials ⓘ

Username *Read-Only*

ADMIN

Create Autonomous Database   Cancel

console.eu-frankfurt-1.oraclecloud.com/db/atp/create

ORACLE Cloud   Search for resources, services, and documentation

Germany Central (Frankfurt) ∨

Create Autonomous Database

Help

Create administrator credentials ⓘ

Username *Read-Only*

ADMIN

ADMIN username cannot be edited.

Password

••••••••••••

Confirm password

••••••••••••

Choose network access

Access Type

Secure access from everywhere	Private endpoint access only
Restrict access to specified IP addresses and VCNs. ✓	Restrict access to a private endpoint within an OCI VCN.

The virtual cloud network option is not available for Always Free Autonomous Database instances.

☐ Configure access control rules ⓘ

Choose a license type

Bring Your Own License (BYOL)	License Included
Bring my organization's Oracle Database software licenses to the Database service. Learn	Subscribe to new Oracle Database software licenses and the Database service.

Create Autonomous Database   Cancel

console.eu-frankfurt-1.oraclecloud.com/db/atp/create

Gmail | YouTube | Maps | Oracle Cloud Ops P...

ORACLE Cloud

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Create Autonomous Database

Help

•••••••••••

Choose network access

Access Type

Secure access from everywhere
Restrict access to specified IP addresses and VCNs. ✓

Private endpoint access only
Restrict access to a private endpoint within an OCI VCN.

The virtual cloud network option is not available for Always Free Autonomous Database instances.

☐ Configure access control rules ⓘ

Choose a license type

Bring Your Own License (BYOL)
Bring my organization's Oracle Database software licenses to the Database service. Learn more.

License Included
Subscribe to new Oracle Database software licenses and the Database service. ✓

Provide up to 10 maintenance contacts

Add Contact

⚙ Show Advanced Options

Create Autonomous Database | Cancel

ORACLE Cloud   Search for resources, services, and documentation   Germany Central (Frankfurt)

Overview » Autonomous Database » Autonomous Database Details

holab Always Free

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

ATP

PROVISIONING

Autonomous Database Information   Tools   Tags

General Information

Database Name: holab

Workload Type: Transaction Processing

Compartment: nose (root)/PreSales/ios_no

OCID: ...fwhjjq Show Copy

Created: Sat, May 8, 2021, 04:33:28 UTC

OCPU Count: 1

Storage: 20 GB

License Type: License included

Database Version: 19c

Auto Scaling: Disabled ⓘ

Lifecycle State: Provisioning

Instance Type: Free Upgrade to Paid

Mode: Read/Write Edit

APEX Instance

Instance Name: holab

Infrastructure

Dedicated Infrastructure: No

Autonomous Data Guard ⓘ

Status: Disabled ⓘ

Backup

Last Automatic Backup: No active backups exist for this database.

Manual Backup Store: Not Configured

Network

Access Type: Allow secure access from everywhere

Access Control List: Disabled Edit

Data Safe ⓘ

Status: Not Registered Register

console.eu-frankfurt-1.oraclecloud.com/db/adb

ORACLE Cloud

Search for resources, services, and documentation

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Autonomous Databases *in* ios62 (root) *Compartment*

Autonomous Database delivers fast performance and requires no database administration. It performs all routine database maintenance tasks while the system is running, without human intervention. Autonomous Databases located in the Oracle cloud can run on dedicated or shared infrastructure. Learn more.

Autonomous Database

Autonomous Database

Dedicated Infrastructure ⓘ

Autonomous Container Database

Autonomous Exadata Infrastructure

List Scope

Compartment

ios62 (root)

Filters

Workload Type

All

State

Any state

Tag Filters   add | clear

no tag filters applied

Create Autonomous Database

Display Name	State	Dedicated	OCPUs	Storage (TB)	Workload Type	Autonomous Data Guard	Created	
holab *Always Free*	● Available	No	1	0.02	Transaction Processing	—	Sat, May 8, 2021, 04:33:28 UTC	⋮
iosprojects *Always Free*	● Available	No	1	0.02	Transaction Processing	—	Mon, Dec 16, 2019, 18:51:16 UTC	⋮

Displaying 2 Autonomous Databases   ‹ 1 of 1 ›

console.eu-frankfurt-1.oraclecloud.com/db/adb/ocid1.autonomousdatabase.oc1.eu-frankfurt-1.abtheljt25o7fj5hhkxtqiht4i2srlla66sj5euerds2dkehmog3tzrv7lwa

Gmail   YouTube   Maps   Oracle Cloud Ops P...

Reading list

ORACLE Cloud   Search for resources, services, and documentation

Germany Central (Frankfurt) ⌄

Overview » Autonomous Database » Autonomous Database Details

holab   Always Free

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

ATP

AVAILABLE

Autonomous Database Information   Tools   Tags

General Information

Database Name: holab

Workload Type: Transaction Processing

Compartment: nose (root)/PreSales/ios_no

OCID: ...fwhjjq   Show   Copy

Created: Sat, May 8, 2021, 04:33:28 UTC

OCPU Count: 1

Storage: 20 GB

License Type: License included

Database Version: 19c

Auto Scaling: Disabled ⓘ

Lifecycle State: Available

Instance Type: Free Upgrade to Paid

Mode: Read/Write Edit

APEX Instance

Instance Name: holab

Infrastructure

Dedicated Infrastructure: No

Autonomous Data Guard ⓘ

Status: Disabled ⓘ

Backup

Last Automatic Backup: No active backups exist for this database.

Manual Backup Store: Not Configured

Network

Access Type: Allow secure access from everywhere

Access Control List: Disabled Edit

Maintenance ⓘ

Next Maintenance: Sat, May 8, 2021, 09:00:00 UTC - 11:00:00 UTC View History

Customer Contacts: None ⓘ Manage

ORACLE Cloud   ❓   🌐   👤

Autonomous Transaction Processing

Overview

Activity

Administration

Development

DATABASE
HOLAB

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 SQL*Plus 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.

Database Actions   ⓘ

Load, explore, transform, model, and catalog your data. Use a SQL worksheet, build REST interfaces and low-code apps, manage users and connections, build and apply machine learning models.
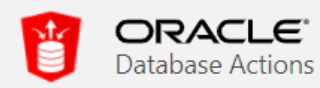
Oracle Machine Learning Notebooks   ⓘ

Oracle Machine Learning (OML) Notebooks are a collaborative, Apache

RESTful Services and SODA   ⓘ

Oracle REST Data Services (ORDS) provides HTTPS interfaces for working with

Create datasensor Schema

 11.05.2021

Development

SQL	DATA MODELER	REST	JSON
Execute queries and scripts, and create database objects	Create relational diagrams for database objects	Deploy REST APIs for your database	Manage your JSON Document Database

APEX			
Build web applications rapidly			

Data Tools

DATA LOAD	CATALOG	DATA INSIGHTS	BUSINESS MODELS
Load or access data from local files or remote databases	Understand data dependencies and the impact of changes	Discover anomalies, outliers and hidden patterns in your data	Create business models for performance and analysis

Administration

DATABASE USERS			
Create, edit privileges and other parameters, and REST-enable database users			

Getting Started

RESTful Web Services
Deploy REST APIs for your Oracle database - GET, PUT, POST and DELETE securely using HTTPS with your Oracle data and stored procedures.
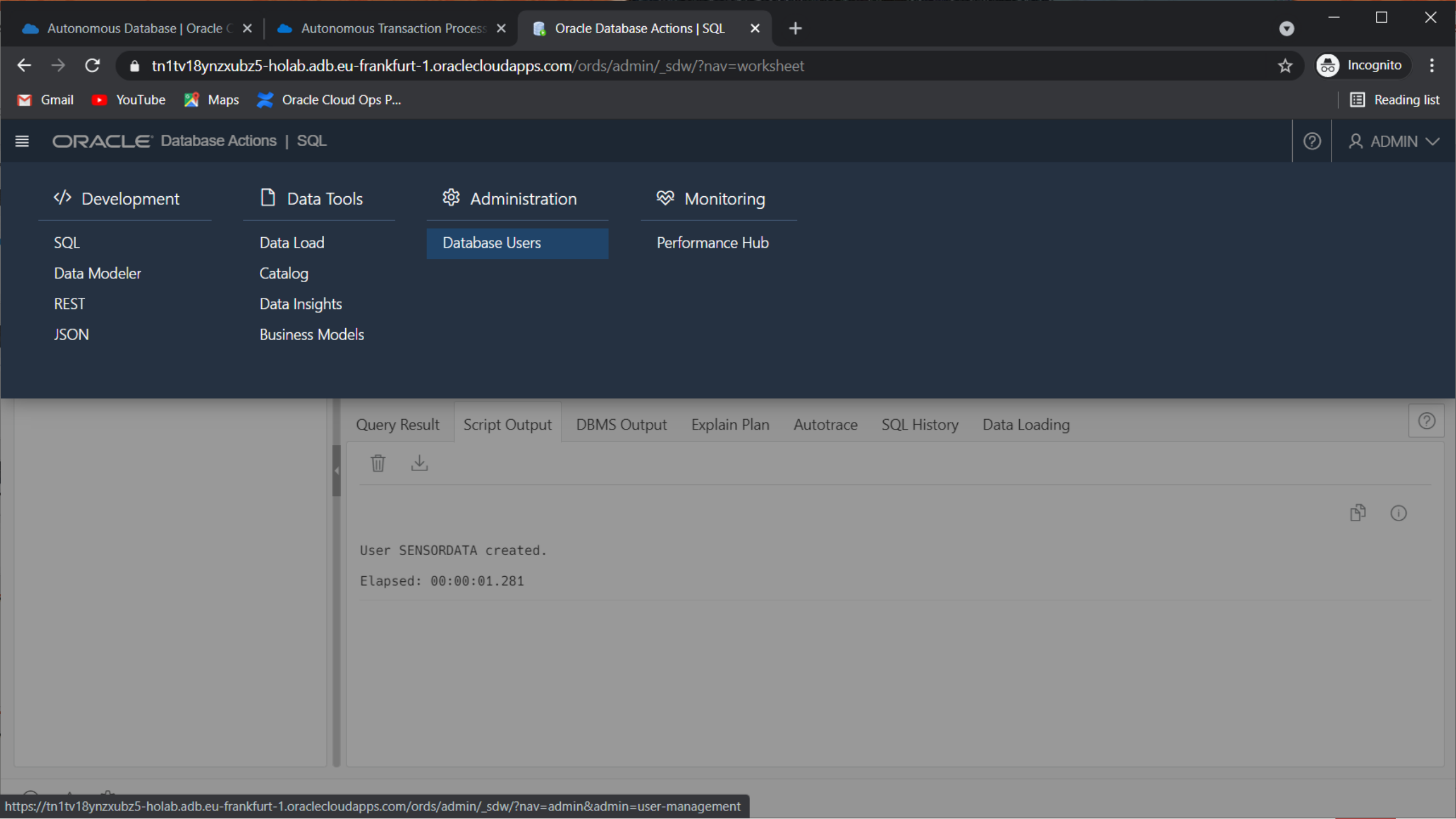
Load Data
Populate existing tables or build new ones from local files (Avro, JSON, XML, CSV, or Excel) using our data loading wizard.

JSON
Create collections, documents, add, edit, delete, and browse your documents, and visualize your JSON Data Guides.

Available On-Premises
SQL Developer Web is now available for your On-Premises Oracle Databases too!

Need Help?

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SQL Developer on Twitter

0   0   0 | 4:45:29 AM - REST call resolved successfully.

tn1tv18ynzxubz5-holab.adb.eu-frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/?nav=worksheet

Incognito

Gmail   YouTube   Maps   Oracle Cloud Ops P...   Reading list

ORACLE Database Actions | SQL   ADMIN

</> Development   Data Tools   Administration   Monitoring

SQL   Data Load   Database Users   Performance Hub

Data Modeler   Catalog

REST   Data Insights

JSON   Business Models

Query Result   Script Output   DBMS Output   Explain Plan   Autotrace   SQL History   Data Loading

User SENSORDATA created.

Elapsed: 00:00:01.281

https://tn1tv18ynzxubz5-holab.adb.eu-frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/?nav=admin&admin=user-management

tn1tv18ynzxubz5-holab.adb.eu-frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/?nav=admin&admin=user-management

Gmail YouTube Maps Oracle Cloud Ops P... Reading list

ORACLE Database Actions | Database Users ADMIN

Current User

Create User

User	0 Granted Roles

ADMIN REST Enabled

ORDS Alias: admin

🔑 Last Login: 5/8/2021, 4:45:17 AM   🕐 Password Expires in 122 days

https://tn1tv18ynzxubz5-holab.adb.eu-frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/

All Users

Search by User Name 🔍   ▼ Filter by ▾   ⇅ Sort by ▾

ADBSNMP   ⋮

GGADMIN   ⋮

User Name *

SENSORDATA

Password *

•••••••••••

Confirm Password *

•••••••••••

Graph ❓

Web Access ❓

Quota on tablespace DATA

UNLIMITED

Password Expired (user must change)

Account is Locked

OML ❓

▶ Web access advanced features

❓   Create User   Cancel

⊗ 0   ⚠ 0   ⚙ 0 | 5:20:56 AM - REST call resolved successfully.

Current User

ADMIN [REST Enabled]

ORDS Alias: admin

🔑 Last Login: 5/8/2021, 4:45:17 AM   🕐 Password Expires in 122 days

https://tn1tv18ynzxubz5-holab.adb.eu-frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/

All Users

SENSORDATA   ⊗ 🔍   ▽ Filter by ▼   ⇅ Sort by ▼

SENSORDATA   ⋮

🕐 Password Expires in 359 days

Edit User

User	① Granted Roles

Filter by role   ✕

Role	Granted	Admin	Default
CDB_DBA	☐	☐	☐
CLOUD_INGEST$IMPL	☐	☐	☐
CLOUD_INGEST_ADMIN	☐	☐	☐
CLOUD_INGEST_USER	☐	☐	☐
CONNECT	☑	☐	☐
CONSOLE_ADMIN	☐	☐	☐
CONSOLE_DEVELOPER	☐	☐	☐
CONSOLE_MONITOR	☐	☐	☐
CONSOLE_OPERATOR	☐	☐	☐
CTXAPP	☐	☐	☐

?   Apply Changes   Cancel

⊗ 0   ⚠ 0   ⚙ 0 | 5:22:38 AM - REST call resolved successfully.

← → C | 🔒 tn1tv18ynzxubz5-holab.adb.eu-frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/?nav=admin&admin=user-management | ☆ | 👤 Incognito | ⋮

📧 Gmail ▶️ YouTube 🗺️ Maps ✳️ Oracle Cloud Ops P... | 📑 Reading list

ORACLE Database Actions | Database Users | ❓ 👤 ADMIN ⌄

Current User

Edit User

User | ④ Granted Roles

Filter by role ✕

Password Expires in 122 days

Role	Granted	Admin	Default
RECOVERY_CATALOG_USER	☐	☐	☐
RESOURCE	☑	☐	☐
SCHEDULER_ADMIN	☐	☐	☐
SELECT_CATALOG_ROLE	☐	☐	☐
SODA_APP	☑	☐	☐
SYSUMF_ROLE	☐	☐	☐
XS_CACHE_ADMIN	☐	☐	☐
XS_CONNECT	☐	☐	☐
XS_NAMESPACE_ADMIN	☐	☐	☐
XS_SESSION_ADMIN	☐	☐	☐

frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/

All Users

> connect
> dwrole
> resource
> SODA_APP

SENSORDATA ⊗ 🔍 | ▽ Filter by ⌄ | ↓↑ Sort by ⌄

SENSORDATA ⋮

🕐 Password Expires in 359 days

❓ | Apply Changes | Cancel

⊗ 0 ⚠ 0 ⚙ 0 | 5:22:38 AM - REST call resolved successfully.

tn1tv18ynzxubz5-holab.adb.eu-frankfurt-1.oraclecloudapps.com/ords/admin/_sdw/?nav=admin&admin=user-management

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ORACLE Database Actions | Database Users   ADMIN

HOLAB20
Last Login: 1/7/2020, 12:34:49 PM

IOS
Last Login: 5/8/2021, 5:15:02 AM   Password Expires in 217 days

IOS62
Password Expires in 222 days

REST Enable User   ✕

Enable Schema: URL Mapping Type:

SENSORDATA   BASE_PATH

Schema Alias: *   Authorization required:

sensordata

REST Enable User   Cancel

RMAN$VPC
Password Expires in 359 days

Page Size: 20

⊗ 0 | ⚠ 0 | ⚙ 0 | 5:27:08 AM - REST call resolved successfully.

Build ORDS REST API

                    11.05.2021

Create table and enable ORDS REST

ORDS/REST Enable schema (Already done, required for Database Actions)
Create table
ORDS/REST enable table
Define Module
Define Template
Define Handlers
      GET handler for search
      PUT handler for insert

     11.05.2021

Create ORDS REST Interface Screenshot

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SENSORDATA

Development

SQL
Execute queries and scripts, and create database objects

DATA MODELER
Create relational diagrams for database objects

REST
Deploy REST APIs for your database

JSON
Manage your JSON Document Database

Administration

DATABASE USERS
Create, edit privileges and other parameters, and REST-enable database users

Monitoring

REAL TIME SQL MONITOR
Monitor executed SQL queries in real time

Getting Started

RESTful Web Services
Deploy REST APIs for your Oracle database - GET, PUT, POST and DELETE securely using HTTPS with your Oracle data and stored procedures.

Load Data
Populate existing tables or build new ones from local files (Avro, JSON, XML, CSV, or Excel) using our data loading wizard.

JSON
Create collections, documents, add, edit, delete, and browse your documents, and visualize your JSON Data Guides.

Available On-Premises
SQL Developer Web is now available for your On-Premises Oracle Databases too!

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SQL Developer on Twitter

0   0   0 | 2:00:14 PM - REST call resolved successfully.

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

ORACLE Database Actions | SQL   SENSORDATA

Navigator   Worksheets

SENSORDATA

Tables

Search...

[Worksheet]*

```
1   create table sensors (id NUMBER GENERATED ALWAYS as IDENTITY(START with 1 INCREMENT by 1) primary key,
2                         create_time timestamp default systimestamp,
3                         objectname varchar2(20),
4                         sensorname varchar2(20),
5                         sensorvalue varchar2(20));
```

Query Result   Script Output   DBMS Output   Explain Plan   Autotrace   SQL History   Data Loading

Table SENSORS created.

Elapsed: 00:00:00.061

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

Apps   Gmail   YouTube   Maps   Oracle Cloud Ops P...   Reading list

ORACLE Database Actions | SQL   SENSORDATA

Navigator   Worksheets

SENSORDATA

Tables

Search...

[Worksheet]*

```
1   begin
2     insert into sensors (objectname,sensorname,sensorvalue) values('test','temp','22.0');
3     insert into sensors (objectname,sensorname,sensorvalue) values('test','temp','23.0');
4     insert into sensors (objectname,sensorname,sensorvalue) values('test','temp','24.0');
5     commit;
6   end;
7   /
```

Query Result   Script Output   DBMS Output   Explain Plan   Autotrace   SQL History   Data Loading

Table SENSORS created.

Elapsed: 00:00:00.061

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.111

Apps · Gmail · YouTube · Maps · Oracle Cloud Ops P... · Reading list

ORACLE Database Actions | SQL · SENSORDATA

Navigator · Worksheets

SENSORDATA

Tables

Search...

[Worksheet]*

```sql
1   DECLARE
2     PRAGMA AUTONOMOUS_TRANSACTION;
3   BEGIN
4       ORDS.ENABLE_OBJECT(p_enabled => TRUE,
5                          p_schema => 'SENSORDATA',
6                          p_object => 'SENSORS',
7                          p_object_type => 'TABLE',
8                          p_object_alias => 'sensorapi',
9                          p_auto_rest_auth => FALSE);
10
11      commit;
12
13  END;
14  /
```

Query Result · Script Output · DBMS Output · Explain Plan · Autotrace · SQL History · Data Loading

Elapsed: 00:00:00.131

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.093

1 · 0 · 0 · 2:06:42 PM - SQL executed by SENSORDATA

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

Apps   Gmail   YouTube   Maps   Oracle Cloud Ops P...   Reading list

ORACLE Database Actions | SQL   ?   SENSORDATA

Navigator   Worksheets

[Worksheet]*

SENSORDATA

Tables

Search...

```
 1  begin
 2  ORDS.DEFINE_MODULE(
 3      p_module_name     => 'sensors',
 4      p_base_path       => 'sensors',
 5      p_items_per_page  => 0,
 6      p_status          => 'PUBLISHED',
 7      p_comments        => NULL);
 8  ORDS.DEFINE_TEMPLATE(
 9      p_module_name     => 'sensors',
10      p_pattern         => 'iotapi/',
11      p_priority        => 0,
12      p_etag_type       => 'HASH',
13      p_etag_query      => NULL,
14      p_comments        => NULL);
15  ORDS.DEFINE_TEMPLATE(
16      p_module_name     => 'sensors',
17      p_pattern         => 'iotapi/:objectname',
18      p_priority        => 0
```

Query Result   Script Output   DBMS Output   Explain Plan   Autotrace   SQL History   Data Loading

Elapsed: 00:00:00.380

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.131

⊗ 1   ⚠ 0   ⚙ 0 | 2:05:35 PM - SQL executed by SENSORDATA

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

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ORACLE Database Actions | SQL · SENSORDATA

Navigator · Worksheets

SENSORDATA

Tables

Search...

[Worksheet]*

```
1   begin
2   ORDS.DEFINE_MODULE(
3       p_module_name    => 'sensors',
4       p_base_path      => 'sensors',
5       p_items_per_page => 0,
6       p_status         => 'PUBLISHED',
7       p_comments       => NULL);
8   ORDS.DEFINE_TEMPLATE(
9       p_module_name    => 'sensors',
10      p_pattern        => 'iotapi/',
11      p_priority       => 0,
12      p_etag_type      => 'HASH',
13      p_etag_query     => NULL,
14      p_comments       => NULL);
15  ORDS.DEFINE_TEMPLATE(
16      p_module_name    => 'sensors',
17      p_pattern        => 'iotapi/:objectname',
18      p_priority       => 0
```

Query Result | Script Output | DBMS Output | Explain Plan | Autotrace | SQL History | Data Loading

Elapsed: 00:00:00.093

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.017

⊗ 1 ⚠ 0 ⚙ 0 | 2:07:16 PM - SQL executed by SENSORDATA

ORACLE Database Actions | SQL

? SENSORDATA ⌄

Navigator Worksheets

[Worksheet]*

SENSORDATA

Tables

Search...

```
 1  begin
 2  ORDS.DEFINE_HANDLER(
 3      p_module_name     => 'sensors',
 4      p_pattern         => 'iotapi/',
 5      p_method          => 'GET',
 6      p_source_type     => 'json/collection',
 7      p_items_per_page  => 0,
 8      p_mimes_allowed   => '',
 9      p_comments        => NULL,
10      p_source          =>
11  'select create_time,sensorname, sensorvalue from sensors'
12      );
13  commit;
14  end;
15  /
```

Query Result   Script Output   DBMS Output   Explain Plan   Autotrace   SQL History   Data Loading

Elapsed: 00:00:00.017

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.034

⊗ 1   ⚠ 0   ⚙ 0 | 2:08:49 PM - SQL executed by SENSORDATA

ORACLE Database Actions | SQL | ⑦ | 👤 SENSORDATA ⌄

Navigator | Worksheets | ⑦

[Worksheet]* ⌄

SENSORDATA ⌄

Tables ⌄

Search... 🔄 •••

```
1  begin
2  ORDS.DEFINE_HANDLER(
3      p_module_name    => 'sensors',
4      p_pattern        => 'iotapi/:objectname',
5      p_method         => 'GET',
6      p_source_type    => 'json/collection',
7      p_items_per_page => 0,
8      p_mimes_allowed  => '',
9      p_comments       => NULL,
10     p_source         =>
11  'select create_time,sensorname, sensorvalue from sensors where objectname=:objectname'
12     );
13  commit;
14  end;
15  /
```

Query Result | Script Output | DBMS Output | Explain Plan | Autotrace | SQL History | Data Loading | ⑦

🗑 ⤓

Elapsed: 00:00:00.034

📋 ⓘ

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.019

⊗ 1 ⚠ 0 ⚙ 0 | 2:09:34 PM - SQL executed by SENSORDATA

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

Apps | Gmail | YouTube | Maps | Oracle Cloud Ops P... Reading list

ORACLE Database Actions | SQL SENSORDATA

Navigator | Worksheets

[Worksheet]*

SENSORDATA

Tables

Search...

```
1  begin
2    ORDS.DEFINE_HANDLER(
3      p_module_name      => 'sensors',
4      p_pattern          => 'iotapi/',
5      p_method           => 'POST',
6      p_source_type      => 'plsql/block',
7      p_items_per_page   => 0,
8      p_mimes_allowed    => 'application/json',
9      p_comments         => NULL,
10     p_source           =>
11  'declare
12    id sensors.id%type;
13  BEGIN
14    INSERT INTO sensors(objectname, sensorname, sensorvalue)
15      VALUES (:objectname,:sensorname,:sensorvalue)
16    RETURNING ID INTO id;
17    :status := 201;
18  END;'
19    );
20    COMMIT;
```

Query Result | Script Output | DBMS Output | Explain Plan | Autotrace | SQL History | Data Loading

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.015

⊗ 1 ⚠ 0 ⚙ 0 | 2:10:19 PM - SQL executed by SENSORDATA

Create ORDS REST Interface Source code
Create table and add dummy data

```
create table sensors (id NUMBER GENERATED ALWAYS as IDENTITY(START with 1 INCREMENT by 1) primary key,
                      create_time timestamp default systimestamp,
                      objectname varchar2(20),
                      sensorname varchar2(20),
                      sensorvalue varchar2(20));



begin
insert into sensors (objectname,sensorname,sensorvalue) values('test','temp','22.0');
insert into sensors (objectname,sensorname,sensorvalue) values('test','temp','23.0');
insert into sensors (objectname,sensorname,sensorvalue) values('test','temp','24.0');
commit;
end;
/
```

Create ORDS REST Interface Source code
REST enable table

—

```
DECLARE
  PRAGMA AUTONOMOUS_TRANSACTION;
BEGIN
    ORDS.ENABLE_OBJECT(p_enabled => TRUE,
                       p_schema => 'SENSORDATA',
                       p_object => 'SENSORS',
                       p_object_type => 'TABLE',
                       p_object_alias => 'sensorapi',
                       p_auto_rest_auth => FALSE);

    commit;

END;
/
```

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Create ORDS REST Interface Source code
Define ORDS Module

```
begin
ORDS.DEFINE_MODULE(
        p_module_name     => 'sensors',
        p_base_path       => 'sensors',
        p_items_per_page =>  0,
        p_status          => 'PUBLISHED',
        p_comments        => NULL);
ORDS.DEFINE_TEMPLATE(
        p_module_name     => 'sensors',
        p_pattern         => 'iotapi/',
        p_priority        => 0,
        p_etag_type       => 'HASH',
        p_etag_query      => NULL,
        p_comments        => NULL);
ORDS.DEFINE_TEMPLATE(
        p_module_name     => 'sensors',
        p_pattern         => 'iotapi/:objectname',
        p_priority        => 0,
        p_etag_type       => 'HASH',
        p_etag_query      => NULL,
        p_comments        => NULL);
commit;
end;
```

                                11.05.2021

Create ORDS REST Interface Source code
Define ORDS GET all handler

```
begin
ORDS.DEFINE_HANDLER(
        p_module_name    => 'sensors',
        p_pattern        => 'iotapi/',
        p_method         => 'GET',
        p_source_type    => 'json/collection',
        p_items_per_page =>  0,
        p_mimes_allowed  => '',
        p_comments       => NULL,
        p_source         =>
'select object_name,create_time,sensorname, sensorvalue from sensors'
        );
commit;
end;
/
```

Create ORDS REST Interface Source code
Define ORDS GET handler with where clause

```
begin
ORDS.DEFINE_HANDLER(
        p_module_name     => 'sensors',
        p_pattern         => 'iotapi/:objectname',
        p_method          => 'GET',
        p_source_type     => 'json/collection',
        p_items_per_page  =>  0,
        p_mimes_allowed   => '',
        p_comments        => NULL,
        p_source          =>
'select create_time,sensorname, sensorvalue from sensors where objectname=:objectname'
        );
commit;
```

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Create ORDS REST Interface Source code
Define ORDS post handler for INSERT

```
begin
  ORDS.DEFINE_HANDLER(
      p_module_name    => 'sensors',
      p_pattern        => 'iotapi/',
      p_method         => 'POST',
      p_source_type    => 'plsql/block',
      p_items_per_page =>  0,
      p_mimes_allowed  => 'application/json',
      p_comments       => NULL,
      p_source         =>
'declare
  id sensors.id%type;
BEGIN
  INSERT INTO sensors(objectname, sensorname, sensorvalue)
     VALUES (:objectname,:sensorname,:sensorvalue)
  RETURNING ID INTO id;
  :status := 201;
END;'
     );
  COMMIT;
END;
/
```

REST Insert with Post

Request ↗ ⚙ +

| POST ▾ | iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/sensors/iotapi/ | Send request |

Headers ⌄

| Content-Type | application/json | 🗑 |

➕ Add header

Basic auth ›

Request body ⌄

Type | Custom ▾

```
{"objectname":"test3","sensorname":"rpm","sensorvalue":"850"}
```

Response (0.235s) - https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/sensors/iotapi/

200 OK

Headers ›

                                  11.05.2021

REST GET
Fetch all

Request

GET   ⌄ | zxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/sensors/iotapi/ | **Send request**

Headers⌄

Content-Type | application/json | 🗑

+Add header

Basic auth⌄

Username | Password | ☑ Show password?

Response (1.16s) - https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/sensors/iotapi/
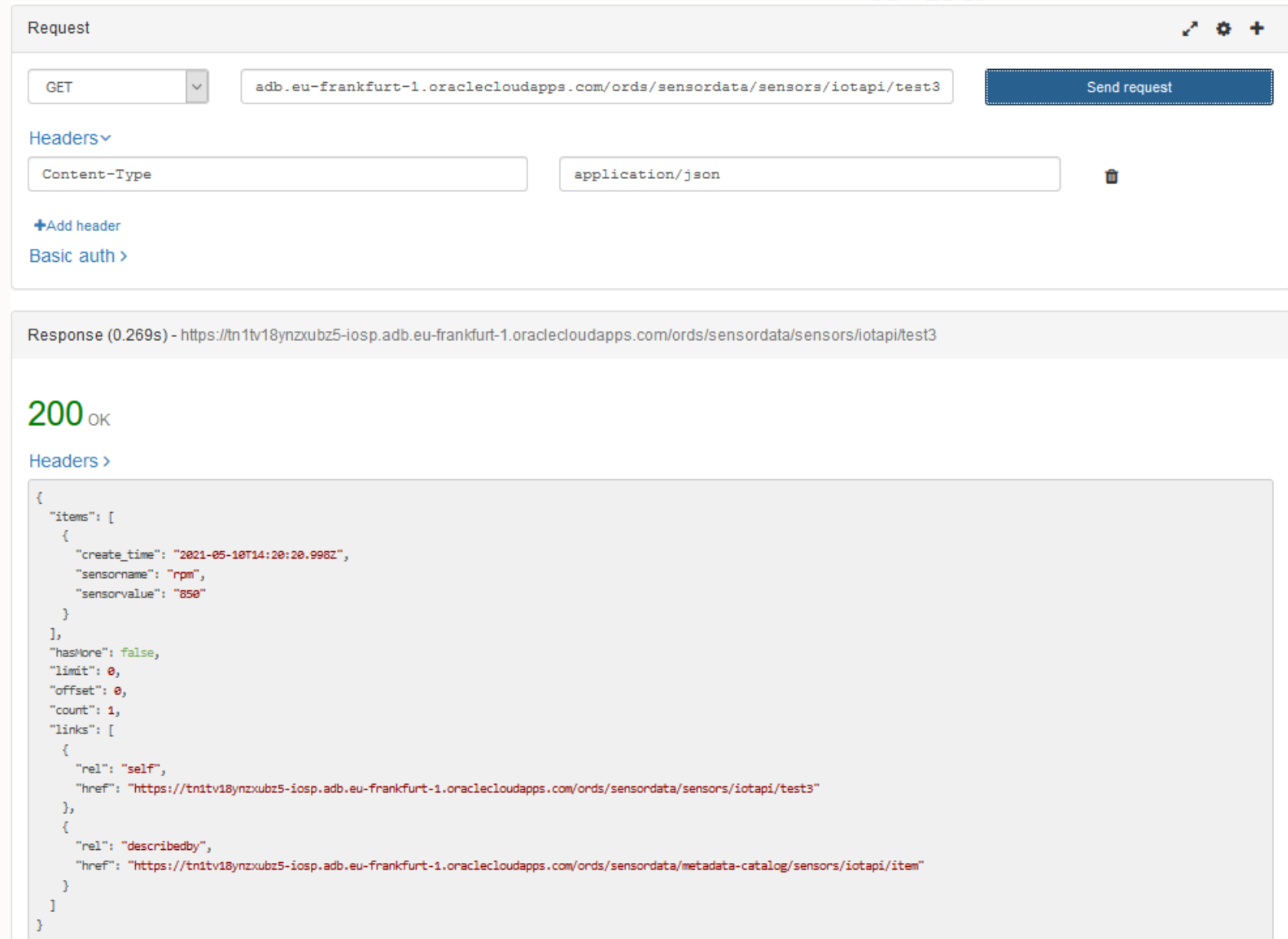
200 OK

Headers >

The size of the response is greater than 20KB, syntax highlighting has been disabled for performance reasons.

```
{
  "items": [
    {
      "objectname": "FrodeTest",
      "create_time": "2021-05-10T18:11:54.098Z",
      "sensorname": "TempMC",
      "sensorvalue": "22570"
```

REST GET
fetch with where

Request

GET ▾   adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/sensors/iotapi/test3   Send request

Headers ▾

Content-Type   application/json   🗑

➕ Add header

Basic auth ›

Response (0.269s) - https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/sensors/iotapi/test3

200 OK

Headers ›

```json
{
  "items": [
    {
      "create_time": "2021-05-10T14:20:20.998Z",
      "sensorname": "rpm",
      "sensorvalue": "850"
    }
  ],
  "hasMore": false,
  "limit": 0,
  "offset": 0,
  "count": 1,
  "links": [
    {
      "rel": "self",
      "href": "https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/sensors/iotapi/test3"
    },
    {
      "rel": "describedby",
      "href": "https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/metadata-catalog/sensors/iotapi/item"
    }
  ]
}
```

                    11.05.2021

Build SODA JSON Collection

 11.05.2021

Create SODA Collection

Require to enable user for SODA
PUT Request creates collection
POST Request inserts into collection
GET Request fetches from collection
DELETE Request drops collection

All operations require basic authentication with DB User/password
Prior to work with SODA the following needs to be in place:

- Grant SODA_APP, and resource to the user
- ORDS/REST enable the schema

                                                11.05.2021

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

ORACLE Database Actions | SQL   ⦿   ⦿ SENSORDATA ⌄

</> **Development**   ⚙ **Administration**   💓 **Monitoring**

SQL   Database Users   Real Time SQL Monitor

Data Modeler

REST

JSON

```
11    'declare
12      id sensors.id%type;
13    BEGIN
14      INSERT INTO sensors(objectname, sensorname, sensorvalue)
15        VALUES (:objectname,:sensorname,:sensorvalue)
16      RETURNING ID INTO id;
17      :status := 201;
18    END;'
19      );
20    COMMIT;
```

Query Result   Script Output   DBMS Output   Explain Plan   Autotrace   SQL History   Data Loading   ?

🗑   ⤓

📋   ⓘ

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.015

https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=application&application=soda

Request

PUT | -iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensorapi/soda/latest/iot | **Send request**

Headers⌄

| Content-Type | application/json | 🗑 |

+Add header

Basic auth⌄

| sensordata | •••••••••••• | ☐ Show password? |

Request body⌄

Type | Custom ⌄

Response (0.316s) - https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensorapi/soda/latest/iot

201 Created

Headers ›

          11.05.2021

Request

POST ▼ | -iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensorapi/soda/latest/iot | **Send request**

Headers ⌄

| Content-Type | application/json | 🗑 |

+Add header

Basic auth ⌄

| sensordata | •••••••••••• | ☐ Show password? |

Request body ⌄

| Type | Custom ▼ |

```
{"objectname":"test4","sensorname":"rpm","sensorvalue":"950"}
```

Response (0.296s) - https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensorapi/soda/latest/iot

201 Created

Headers >

   11.05.2021

Request

POST `-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensorapi/soda/latest/iot` [Send request]

Headers⌄

| Content-Type | application/json | 🗑 |

+Add header

Basic auth⌄

| sensordata | •••••••••••• | ☐ Show password? |

Request body⌄

Type   Custom

```
{"objectname":"test4","data":[{"sensorname":"rpm","sensorvalue":"950"},{"sensorname":"enginetemp","sensorvalue":"123,5"}]}
```

Response (0.269s) - https://tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensorapi/soda/latest/iot

201 Created

Headers ›

{

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=application&application=soda&page=JsonCollection%23iot

ORACLE Database Actions | JSON

SENSORDATA

JSON Collections

Search...

iot

JSON - iot

Add Clause ▼

1   {}

```json
{
    "objectname": "test4",
    "sensorname": "rpm",
    "sensorvalue": "950"
}
```

⊗ 1   ⚠ 0   ⚙ 0 | 2:27:45 PM - REST call resolved successfully.

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

ORACLE Database Actions | SQL

SENSORDATA

Navigator | Worksheets

SENSORDATA

Tables

Search...

▶ ⊞ IOT
▶ ⊞ SENSORS

[Worksheet]* ▼

```sql
1   select id, created_on, json_serialize(json_document) as json_data from iot;
```

Query Result | Script Output | DBMS Output | Explain Plan | Autotrace | SQL History | Data Loading

Download ▼   Execution time: 0.004 seconds

	id	created_on	json_data
1	585852C0FF0B4585	2021-05-10T14:27:1	{"objectname":"test4","sensorname":"rpm","sensorvalue":"950"}
2	584907CD3C6B48B	2021-05-10T14:32:5	{"objectname":"test4","data":[{"sensorname":"rpm","sensorvalue":"950"},{"sensorname":"enginetemp","s

⊗ 1 ⚠ 0 ⚙ 0 | 2:33:28 PM - 2 rows total

tn1tv18ynzxubz5-iosp.adb.eu-frankfurt-1.oraclecloudapps.com/ords/sensordata/_sdw/?nav=worksheet

ORACLE Database Actions | SQL

SENSORDATA

Navigator   Worksheets

[Worksheet]*

```
1    select id, created_on, json_serialize(json_document) as json_data from iot;
```

SENSORDATA

Tables

Search...

▸ ⊞ IOT

▸ ⊞ SENSORS

Query Result   Script Output   DBMS Output   Explain Plan   Autotrace   SQL History   Data Loading

Download   Execution time: 0.007 seconds

	id	created_on	json_data
1	585852C0FF0B4585	2021-05-10T14:27:1	{"objectname":"test4","sensorname":"rpm","sensorvalue":"950"}

⊗ 1   ⚠ 0   ⚙ 0 | 2:31:07 PM - 1 rows total