CERN openlab

Building Secure Rest Architectures With ORDS

Tech17

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04/12/2017

Agenda

About your speaker
About CERN
ORDS. What?
ORDS@CERN
Do It Yourself!
ORDS Security
Basic authentication
OAUTH2-based Authentication
Conclusions

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About your speaker

Asturias, Spain
Computing Engineer
  Java & Middleware
  CERN openlab staff (Oracle)
  Public-private partnership
CERN IT-DB-**IMS**
  Oracle Weblogic Applications
    Java, APEX, ORDS, Forms
  DB infrastructure support
  Third party applications
    Alfresco (CMS), Pentaho (BI)
    Infor (EAM),...

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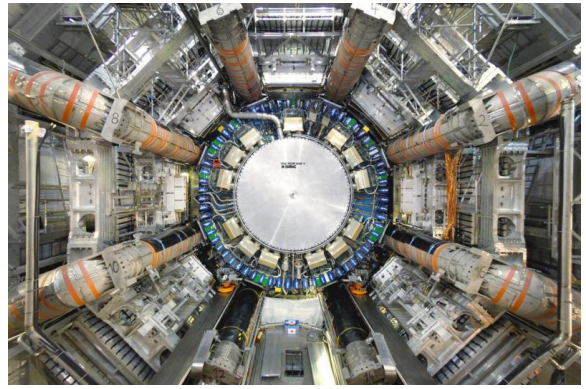
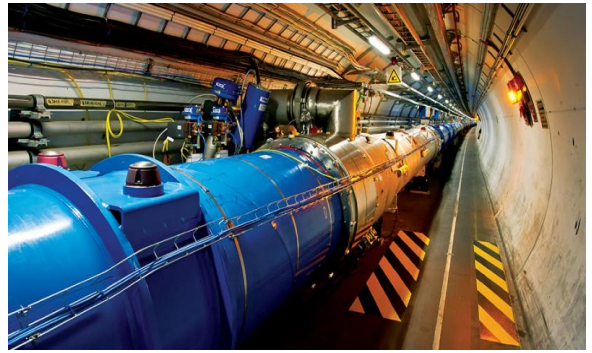
About CERN

- Fundamental Research
  - What is the universe made of?
  - How did it start?
  - What matter is made of?
- Tools
  - Accelerators
  - Detectors
- **Science for peace**
  - People from all over the world
  - Three pillars
    - Research
    - Innovation
    - Education





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ORDS. What ?

From **oracle.com**:

“Oracle REST Data Services (ORDS) makes it easy to develop modern REST interfaces for relational data in the Oracle Database, Oracle Database 12c JSON Document Store, and Oracle NoSQL Database. A mid-tier Java application, ORDS maps HTTP(S) verbs (GET, POST, PUT, DELETE, etc.) to database transactions and returns any results formatted using JSON.”

ORDS

GET /employee/64

POST /employee
```
{
  “name”:”Luis”
  “lastname”: “Rodríguez”
  …/…
}
```

DELETE /employee/32

HTTP

JSON

SELECT * FROM employee WHERE id=64

INSERT INTO employee (name, lastname...

DELETE FROM employee WHERE id=32

{ REST }

Pros

- Simple (autorest): automatically expose tables and views
- Standalone & Application Server
- Back-end APIs directly from PL/SQL
- Nice integration with tools like SQLDeveloper
- Different authentication methods: basic, OAUTH2

ORACLE SQL DEVELOPER

Java

OAUTH 2

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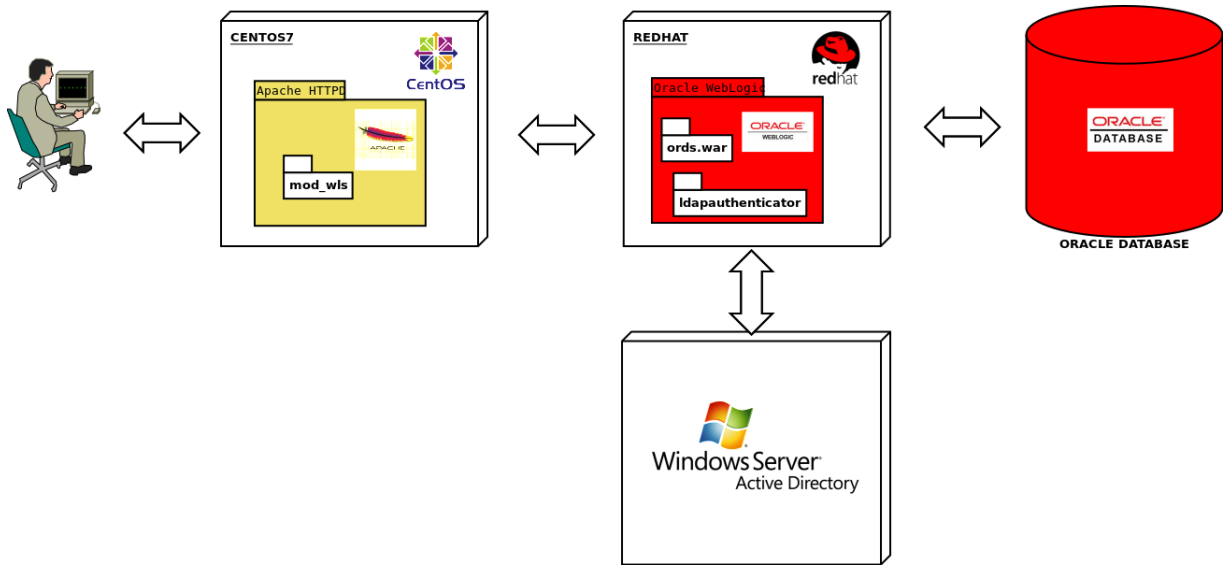
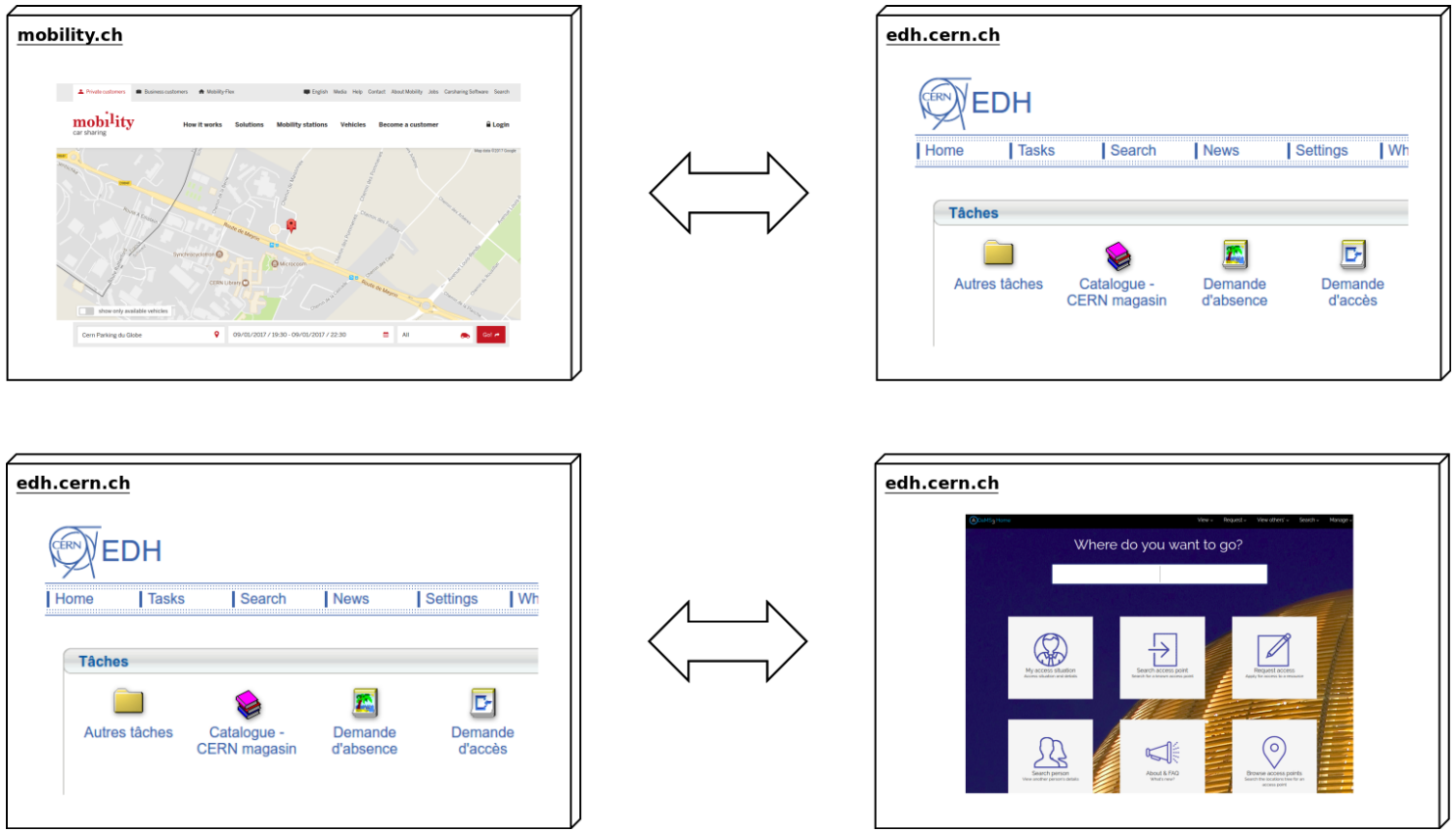
ORDS@CERN

15 deployments (dev + test + prod)
Automated configuration & deployment
Potential issue:
- APEX, ORDS, PL/SQL are mixed
- Open door to the database
  - APEX: auth & authz schemas
  - ORDS: basic auth & ORDS
  - PL/SQL: **custom developments**



ORDS@CERN

mobility.ch checks who can drive their vehicles at CERN (V permit)
edh.cern.ch uses adams.cern.ch services for approval/reject access



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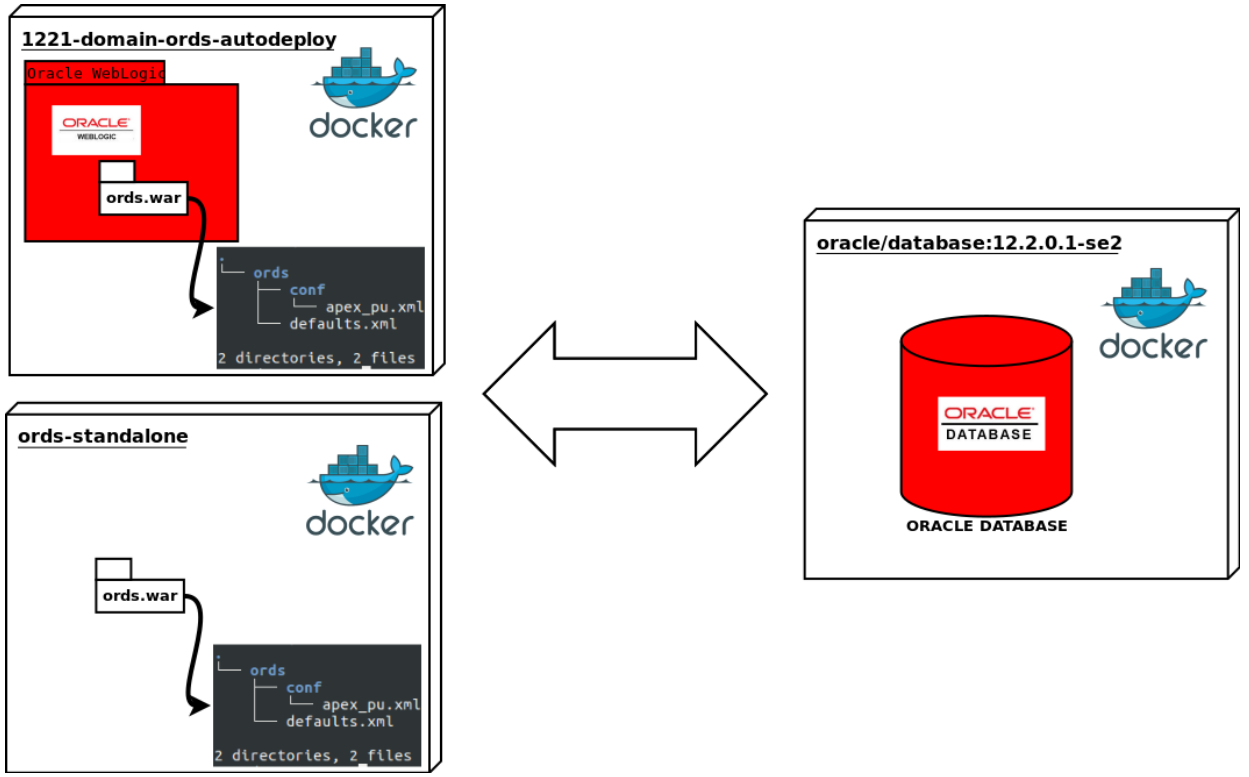
Do It Yourself !

Docker to the rescue!

Demo:

https://github.com/cerndb/oracle-weblogic-1221-domain-ords-autodeploy

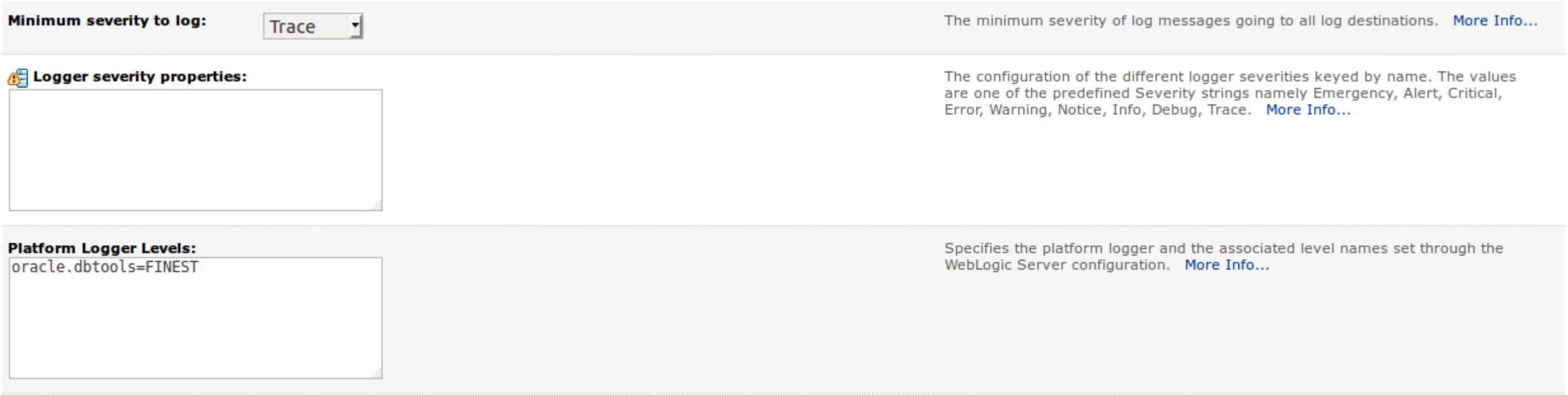


Do It Yourself !

<entry key="debug.debugger">true</entry>

Tip: increase ORDS logging level

oracle.dbtools=FINEST



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ORDS Security

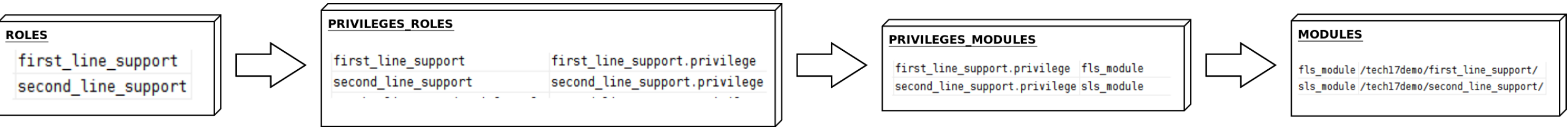
Key concepts:

Role: defines the user position/purpose in our application/system

Privilege: defines who (roles) can access what (urls)

Declared in the **DB** side

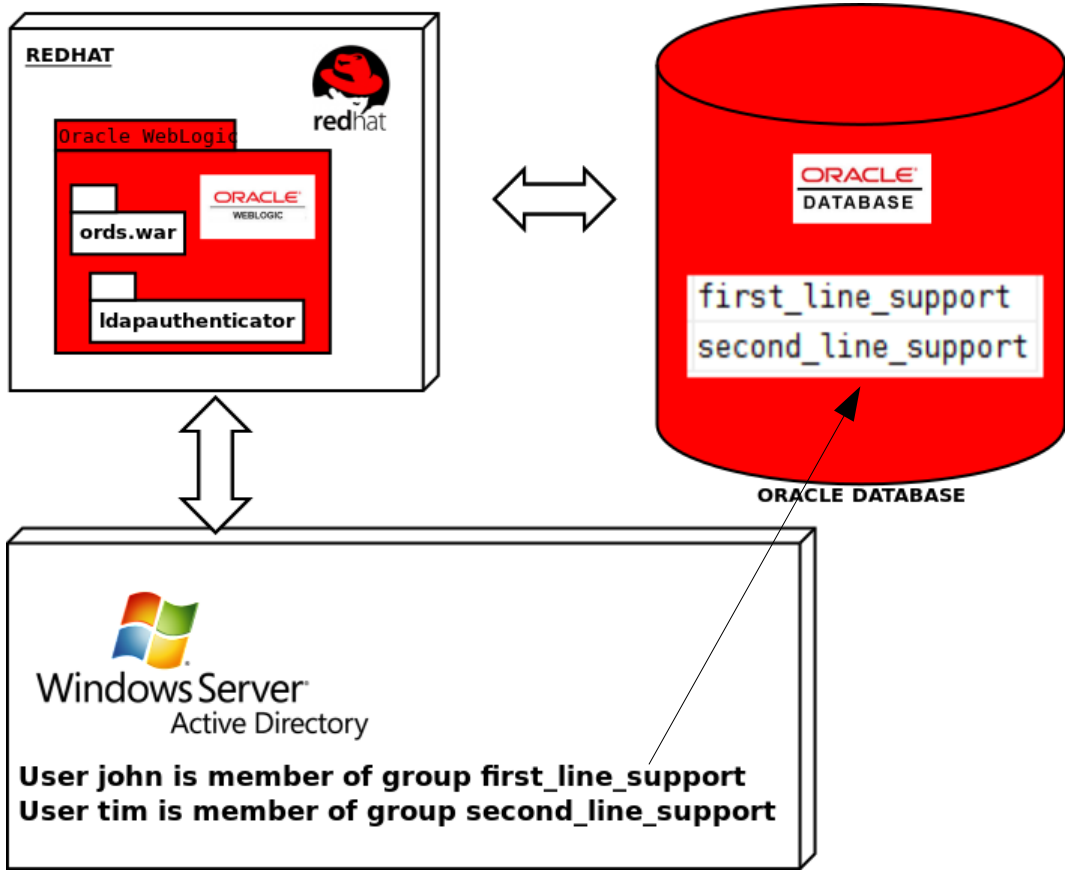
Module: way of grouping resources (urls)



ORDS Security

Users directory configured in the **JAVA mid-tier**

User's groups on mid-tier mapped to roles in the DB side



ORDS Security

Previous configuration says:

*Members of **first_line_support** can access resources mapped against **/tech17demo/first_line_support***
*Members of **second_line_support** can access resources mapped against **/tech17demo/second_line_support***

ORDS Security

TIP: show roles, privileges and mappings (url)

```
SELECT * FROM ORDS_METADATA.USER_ORDS_ROLES;

SELECT * FROM ORDS_METADATA.USER_ORDS_PRIVILEGES;

SELECT * FROM ORDS_METADATA.USER_ORDS_MODULES;

SELECT * FROM ORDS_METADATA.USER_ORDS_PRIVILEGE_ROLES;

SELECT * FROM ORDS_METADATA.USER_ORDS_PRIVILEGE_MODULES;
```

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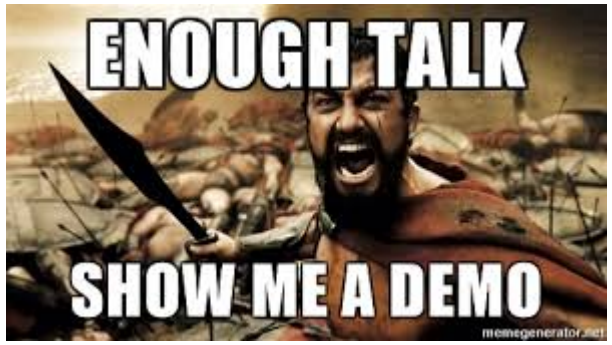
Basic Authentication

Non authenticated users are challenged for credentials
  Default ORDS sign in form
Users Directory configured on the Java Mid-tier
ORDS checks user **principals** against **roles** in DB

Basic Authentication



Scenario
  first_line_support users:
    Can read/update only the name and lastname of a customer
    Can not delete customers with financial_statement_status in RED
  second_line_support users:
    Full access rights

Basic Authentication

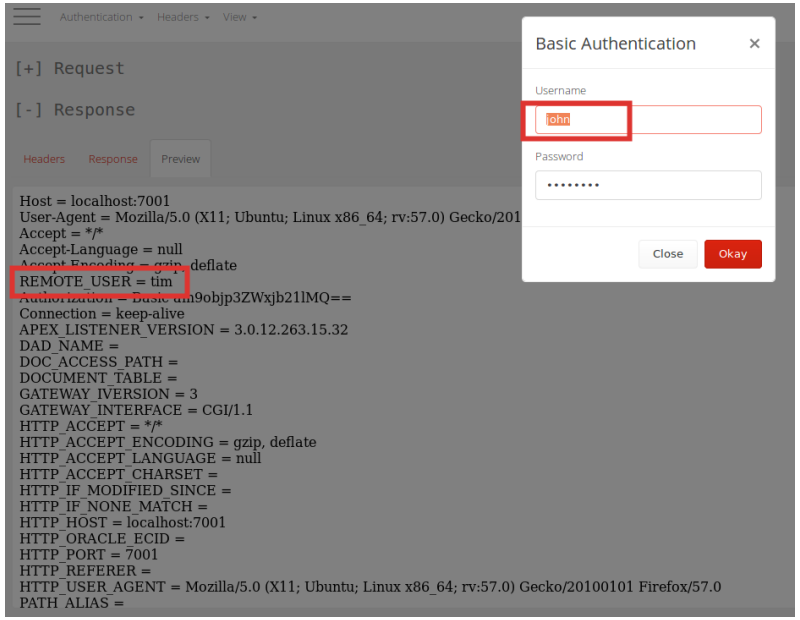
Question?

How to get user's principals on the DB side (PL/SQL)

SYS.OWA_UTIL.GET_CGI_ENV('REMOTE_USER');

Careful! It can be spoofed:

$curl -H "REMOTE_USER: tim"



Basic Authentication

Issue

User is member of ~300 groups

ORDS sign-in form throws an exception:

<Choosing: oracle.dbtools.http.dispatch.DispatchMetaData as current candidate with score: MetaDataScore [matchedMethod= GET: protected void oracle.dbtools.signin.SignInForm.doGet(javax.servlet.http.HttpServletRequest,javax.servlet.http.HttpServletResponse) throws javax.servlet.ServletException,java.io.IOException

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OAUTH2-based Authentication

OAUTH2 in a nutshell
- Security framework **Authorization**
- Access Tokens + HTTPS
- Actors:
  - Resource owner
  - Resource server (protected)
  - Client
  - Authorization Server

OAUTH2-based Authentication

OAUTH2. The Valet Parking Analogy

- Car owner → Resource owner
- Car owner → Authz server
- Car → Protected resource
- Parking Attendant → Client
- Valet Key → Access token

OAUTH2-based Authentication

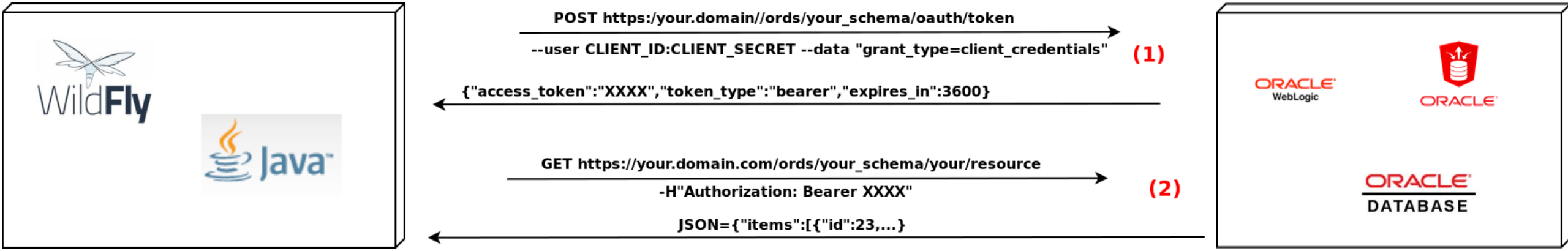
OAUTH2. The Valet Parking Analogy
- Resource owner → ORDS
- Authorization server → ORDS
- Protected resource → Service
- Client → User app
- Valet Key → Access token

ORDS supports 3 different authorization grants
- **Client Credentials**
- **Implicit**
- Authorization Code

OAUTH2-based Authentication

OAUTH2. **Client Credentials grant**

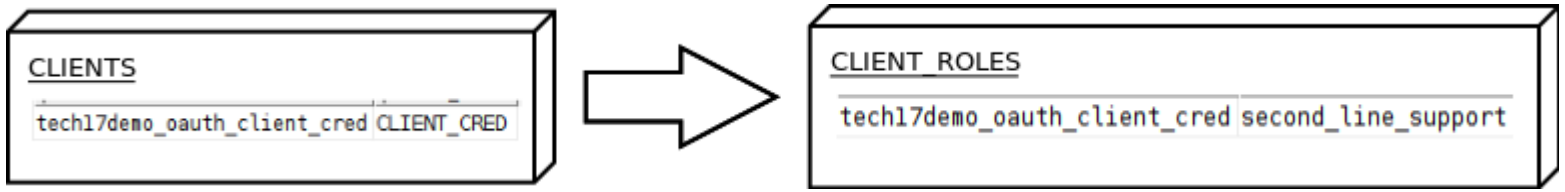
- Server side applications: e.g. servlet
- Client secret can be stored by the application
- No need for human interaction



OAUTH2-based Authentication

Client

Granted with the needed role



OAUTH2-based Authentication

Scenario

- Servlet application wants to access a list of resources
- Client credentials grant
- https://github.com/cerndb/oauth2-ords-client

OAUTH2-based Authentication

TIP: show client info, privileges and roles

*SELECT * FROM ORDS_METADATA.USER_ORDS_CLIENTS;*

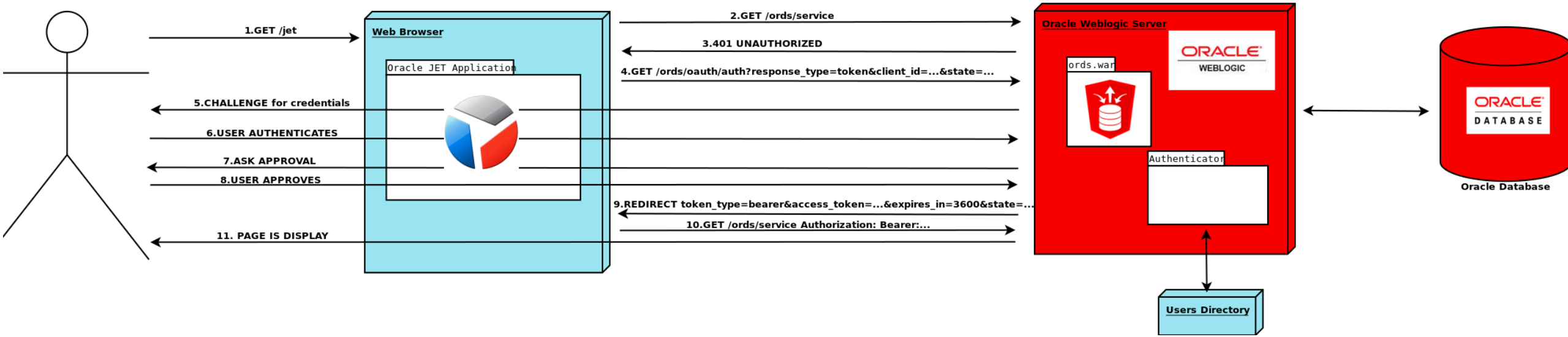
*SELECT * FROM ORDS_METADATA.USER_ORDS_CLIENT_PRIVILEGES;*

*SELECT * FROM ORDS_METADATA.USER_ORDS_CLIENT_ROLES;*

OAUTH2-based Authentication

OAUTH2. Implicit grant

- Client side applications: e.g. javascript, mobile
- Client secret can not be stored by the application
- User will be challenged for credentials



OAUTH2-based Authentication

Scenario

Oracle JET application wants to show a list of resources

https://github.com/cerndb/jet-oauth2-ords

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Conclusions

It works!

- Easy and simple REST APIs
- “Slim down” middle tier
- Flexible
  - Standalone && Application Server
  - Different choices for authentication
- Easy to “contenarized”

But...

- Sign in form issue
- Fine grained authorization?
  - Get principals on the PL/SQL? *SYS.OWA_UTIL.GET_CGI_ENV('REMOTE_USER');*
    - Warning! It can be override: *$curl -H “REMOTE_USER: BATMAN”...*

My TODO list:

- Investigate validation function

Acknowledgements

Damian Radoslaw Moskalik (CERN)
Use REST & ORDS. CERN IT-DB Database Tutorials
https://indico.cern.ch/event/672720/contributions/2756384/attachments/1561072/2457613/ORDS.pdf

Tim Hall (oracle-base.com)
Oracle REST Data Services (ORDS): Authentication
https://oracle-base.com/articles/misc/oracle-rest-data-services-ords-authentication

Gerald Venzl (Oracle)
Oracle Database on Docker
https://github.com/oracle/docker-images/tree/master/OracleDatabase

Monica Riccelli (Oracle)
Weblogic on Docker
https://github.com/oracle/docker-images/tree/master/OracleWebLogic

Martin Giffy D'Souza (talkapex.com)
Oracle REST Data Services on Docker
https://github.com/oracle/docker-images/tree/master/OracleRestDataServices

QUESTIONS?

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