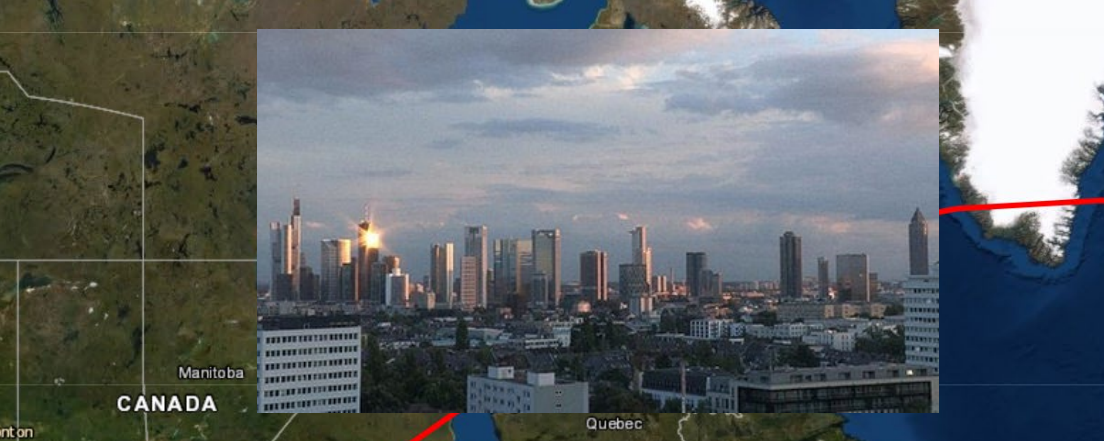




Automate Database Deployments with SQLcl

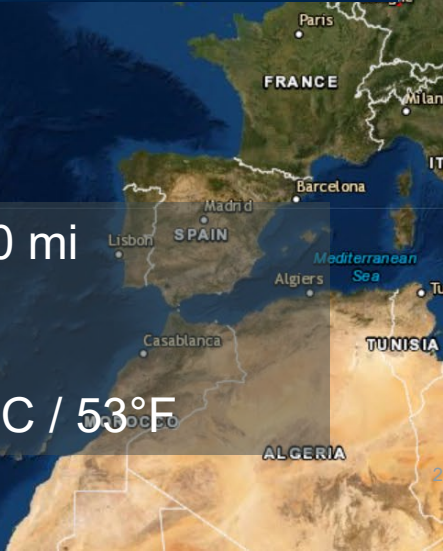
Robert Marz



Frankfurt, DE – Denver, CO



Distance as the Crow flies: 8115 km / 5140 mi
Flight Time of Crane (Lufthansa): 10:25 h
Time Shift: -8 Hours
Weather: Frankfurt: partly cloudy, max 12°C / 53°F



Robert Marz – Independent Consultant

Primary Role

- Senior Technical Architect
- with database centric view of the world

DOAG (German Oracle User Group)

- Active Member of Database Community
- Responsible for Cloud Topics



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@databee.de



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bit.ly/OracleACEProgram

Nominate yourself or someone you know: acenomination.oracle.com

Session Presentation & Evaluations

Complete evaluations online in less than a minute.

- Open the Bizzabo app.
- Select Agenda.
- Select current session.
- Scroll to Polls & Surveys; tap Session Evaluation.

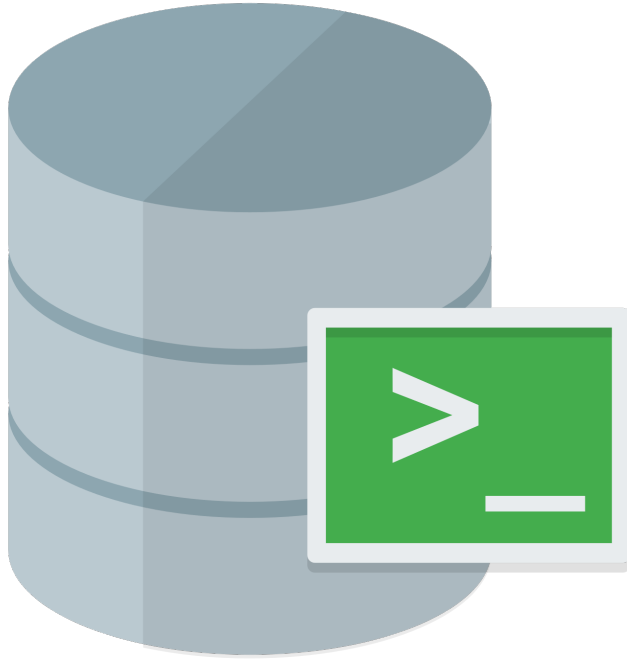
Select Attachments to view presentation (if applicable).

Thanks for your valuable feedback!

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

SQLcl – An Overview

What is SQLcl?



Oracle SQL Developer Command Line

New

SQL*Plus

Java Based

Modern

Command Line

No Oracle Client
needed

Included

`$ORACLE_HOME/bin`
(12cR2)

`sqldeveloper/bin`

SQLcl Features



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Usability:

- Tab-Completions
- Change Directory
- History
- Command Editor

SQLcl Features



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New Commands

cd
script
alias
apex
ddl
history
lb (liquibase)
rest
soda
vault
which
[...]



DevOps Tools Integration: HashiCorp Vault



Keeping Secrets in Applications



Secrets

- Usernames
- DB Credentials
- API Tokens
- TLS Certificates

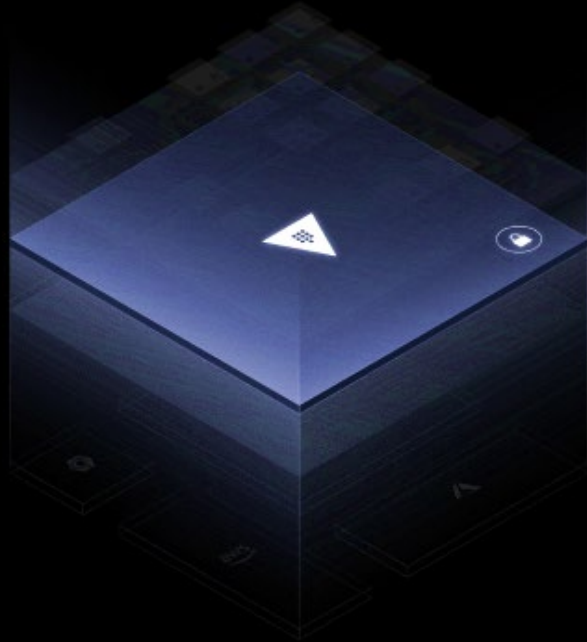
Secret Sprawl

- Source code
- Configuration Files
- Version Control System

Applications leak Secrets

- Logs
- Diagnostics
- Monitor

HashiCorp Vault: Concepts & Features



HashiCorp

Vault

Vault Centralizes Secrets

Encrypts

at rest

in transit

Access Control
Lists

Audit Usage

Dynamic Secrets

ephemeral (eg. 5 days)

Unique, Revokable

Encrypt as a
Service

Named Keys; Key Lifecycle

High Level API
(Encrypt, Decrypt - Sign, Verify)

HashiCorp Vault: Architecture



Client / Server

- Cluster / HA capable by default
- REST API (JSON Documents) / CLI

Open Source hosted on GitHub

- Released as single binary
- **vault / vault.exe**

Highly Pluggable / Extendable

- Authenticate
- Audit
- Store
- Secret Backends

HashiCorp Vault - SQLcl Integration

```
$ sql orcl/robbie
```

```
SQLcl: Release 19.2.1 Production on Sun Nov 03 20:37:10 2019
```

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

```
Attempting vault based connection.
```

```
Connecting to : robbie/xxxx@jdbc:oracle:thin:@127.0.0.1:1521/orcl
```

```
Connected using : http://127.0.0.1:8200/v1/cubbyhole/orcl/robbie
```

```
Connected.
```

```
SQL> help vault
```

```
The vault command provides integration with HashiCorp Vault for saving and sourcing connection information.
```

```
Vault configuration settings are read from the environment:
```

```
VAULT_TOKEN, VAULT_ADDR
```

```
SSL Settings are used from Java configuration.
```

```
vault config           : Print current configuration
vault base             : Sets base path                               Default : /cubbyhole/
vault list [filter]   : Lists stored connections
vault store [name]    : Store current connection to vault.         Default : 'global_name/username'
vault delete [name]   : Delete store name configuration.
vault autostore [true/false] : Sets auto storing of connections.   Default : false
SQL>
```

Enable: Environment Variables

- VAULT_ADDR
- VAULT_TOKEN

Connect Strings

- interpreted as vault KV Paths
- SQLcl attempts to read credentials
- if unsuccessful, use as normal connect string

Established Connections

- Can be stored in vault
- Autostore available



The background features a complex, abstract pattern of yellow and black wavy lines that create a sense of depth and movement. Several reflective, metallic spheres are scattered throughout the scene, each reflecting the intricate patterns of the background. The lighting is dramatic, with bright highlights and deep shadows, giving the spheres a three-dimensional appearance.

DevOps Tools Integration: Liquibase

Liquibase – Source Control for your Database



DB Changes

- Deploy, Rollback
- Track, Manage, Document
- DDL, Sources, Data

Java-based Open Source

- Commercial Product: Datical

No extra installation needed

- Liquibase Libraries come with SQLcl



Supported Databases

- Oracle
- MySQL
- PostgreSQL
- SQL Server
- DB2
- more

Oracle features in SQLcl Liquibase

- Virtual Columns – ok
- Materialized Views – ?
- Hidden Columns – ?
- Partitions – ?
- Global Temporary Tables – ?

```
<databaseChangeLog>
  <preConditions>
    ...
  </preConditions>

  <changeSet id="A" author="Shaun">
    <createTable tableName="persons">
      ...
    </createTable>
  </changeSet>

  <changeSet id="B" author="Shirley">
    <insert tableName="persons">
      ...
    </insert>
  </changeSet>
</databaseChangeLog>
```

Incremental Changes

- Change sets/Change logs
- File formats:
 - YAML
 - JSON
 - XML ← SQLcl
 - SQL
- Changelog Tables inside DB



A woman with red hair tied back, wearing glasses and a light-colored plaid shirt, is seated at a desk in a dimly lit office. She is focused on her work, with her hands on a keyboard. The desk is cluttered with a computer monitor displaying code, a mouse, and other office supplies. The background shows other computer workstations, suggesting a server room or data center environment. A red banner is overlaid on the image, containing the title text.

The Scripting API of SQLcl

Scripting in SQLcl

Keyword script

executes

```
File  
script scriptname.js  
-- (single line)
```

```
Inline Script  
script -- (linebreak)  
# type your script on the fly
```

Supported Languages

All JSR-223 Implementations

JavaScript (nashorn)

Python (Jython)

... lots more ...

Endless Possibilities

controlling SQLcl Buffer

background DB Connections

... lots more ...

[Oracle DB Tools GitHub Examples](#)

Globals

There are a few globals pushed into the scripting engine for use.

args - This is a simple array of the arguments passed along

Example:

```
for(var arg in args) {  
  ctx.write(arg + ":" + args[arg]);  
  ctx.write("\n");  
}
```

sqlcl - This is SQLCL itself

```
setStmt(<String of stuff to run>  
  This can be a single statement, an entire script of stuff, or any sqlcl command such as "@numbers.sql"
```

```
run()  
  Runs whatever is set via the setStmt function
```

Example:

```
/* Run any amount of command in the sqlcl prompt */  
sqlcl.setStmt("select something from somewhere; @myscript \n begin null;end;");  
  
sqlcl.run();
```

ctx (this has tons of methods but this is the single most important)

```
write(<String>)
```

Example:

```
ctx.write('Hello World');
```

util (again tons of methods)

```
execute(<string>,binds)  
  executes whatever is passed in with a boolean return for success/failure
```

```
executeReturnOneCol(<string>,binds)  
  executes and returns the first row , first column
```

```
executeReturnListOfList(<string>,binds)  
  executes and returns an array(rows) of arrays(row).
```

```
executeReturnList(<string>,binds)  
  execute and returns and array ( rows ) of objects ( row )
```





Speeding Things up with GraalVM

GraalVM™

Universal VM

JS, Python, Ruby, R
Java, Scala, Groovy, Kotlin, Clojure

Polyglot

Embed different Language

Execute SQLcl in GraalVM

Unpack Graal
set PATH & JAVA_HOME Variables
Lightning fast

Scripting

uncharted territory
very promising



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Conclusion





SQLcl – a mighty Tool

Endless Possibilities

Uncharted Territory

PLEASE

**DO
TRY THIS
AT HOME**