



Automate Database Deployments with SQLcl

Sabine Heimsath & Robert Marz



Sabine Heimsath – Independent Consultant



Client

Senior Consultant

with a soft spot for SQL Developer and APEX

its-people

Portfolio Manager Database Development

Blog Editor



ORACLE
ACE

DOAG (German Oracle User Group)

Active Member of Development Community

Responsible for PL/SQL



@oraesque



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Sabine.Heimsath
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Robert Marz – Independent Consultant



Client

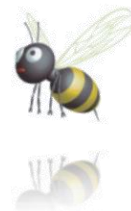
Senior Technical Architect
with database centric view of the world



ORACLE
ACE

its-people

Portfolio Manager Database Technologies
Blog Editor



DOAG (German Oracle User Group)

Active Member of Database Community
Responsible for Cloud Topics



@RobbieDatabee



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400+ Technical Experts Helping Peers Globally



ORACLE
ACE Director



ORACLE
ACE



ORACLE
ACE Associate

bit.ly/OracleACEProgram

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

A woman with dark hair in a braid, wearing a black and grey striped long-sleeved dress, 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 sun is shining brightly from the upper left, creating a lens flare effect. A red banner is overlaid on the left side of the image, containing the text 'SQLcl – An Overview'.

SQLcl – An Overview



Oracle SQL Developer Command Line

New

SQL*Plus

Java Based

Modern

Command Line

No Oracle Client
needed

Included

`$ORACLE_HOME/bin`
(12cR2)

`sqldeveloper/bin`



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Usability:

Tab-Completions
Change Directory
History
Command Editor



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New Commands

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



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DevOps Tools Integration: HashiCorp Vault





Secrets

- Usernames
- DB Credentials
- API Tokens
- TLS Certificates

Secret Sprawl

- Source code
- Configuration Files
- Version Control System

Applications leak Secrets

- Logs
- Diagnostics
- Monitor



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)



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



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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



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



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A woman with red hair tied back, wearing glasses and a light-colored plaid shirt, is seated in a black office chair at a desk. 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 some papers. The background is dark, suggesting a server room or a late-night office environment. A red banner is overlaid across the middle of 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 )
```



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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



A dark red horizontal bar with a white circle on its left side, connected by a thin red line.

SQLcl – a mighty Tool

A dark red horizontal bar with a white circle on its left side, connected by a thin red line.

Endless Possibilities

A dark red horizontal bar with a white circle on its left side, connected by a thin red line.

Uncharted Territory

PLEASE

**DO
TRY THIS
AT HOME**



Vielen Dank für Ihre
Aufmerksamkeit.