COLLABORATE 18

TECHNOLOGY AND APPLICATIONS FORUM FOR THE ORACLE COMMUNITY

Automatically deploy Schema Changes

with Ansible and Liquibase

Session ID:
1502

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23rd April 2018

Remember to complete your evaluation for this session within the app!

#C18LV

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Client	Senior Technical Architect with database centric view of the world
its-people	Portfolio Manager Database Technologies Blog Editor
DOAG	Active Member Database Community in charge of Cloud topics

ORACLE ACE

@RobbieDatabee

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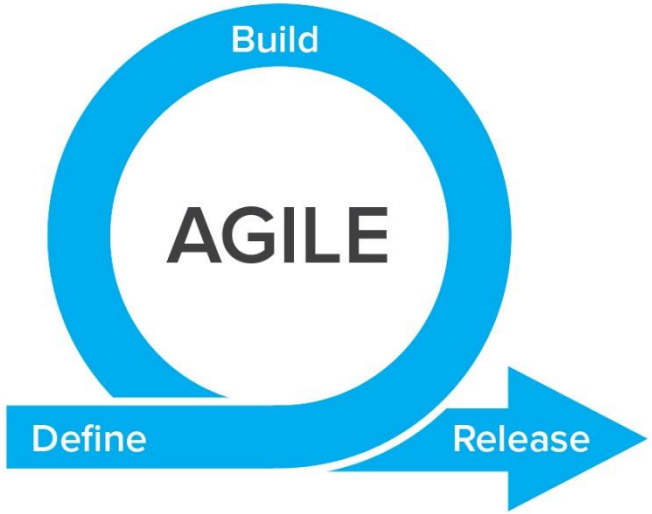
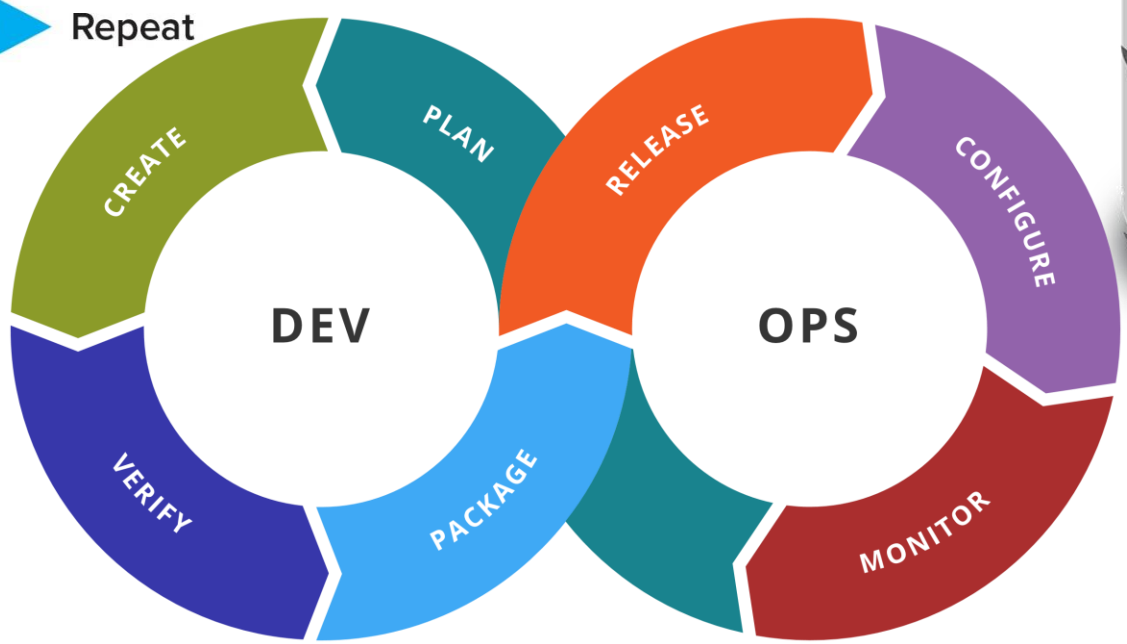
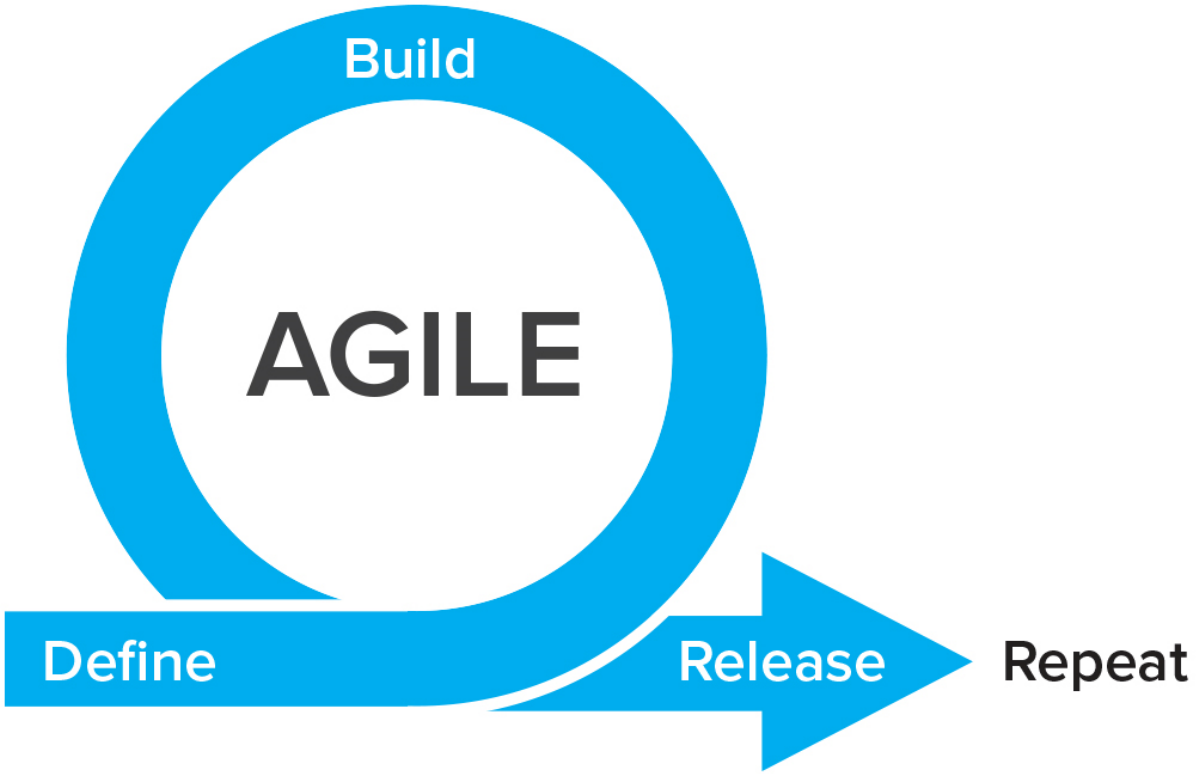
Agile and DevOps – Database Challenges



Repeat



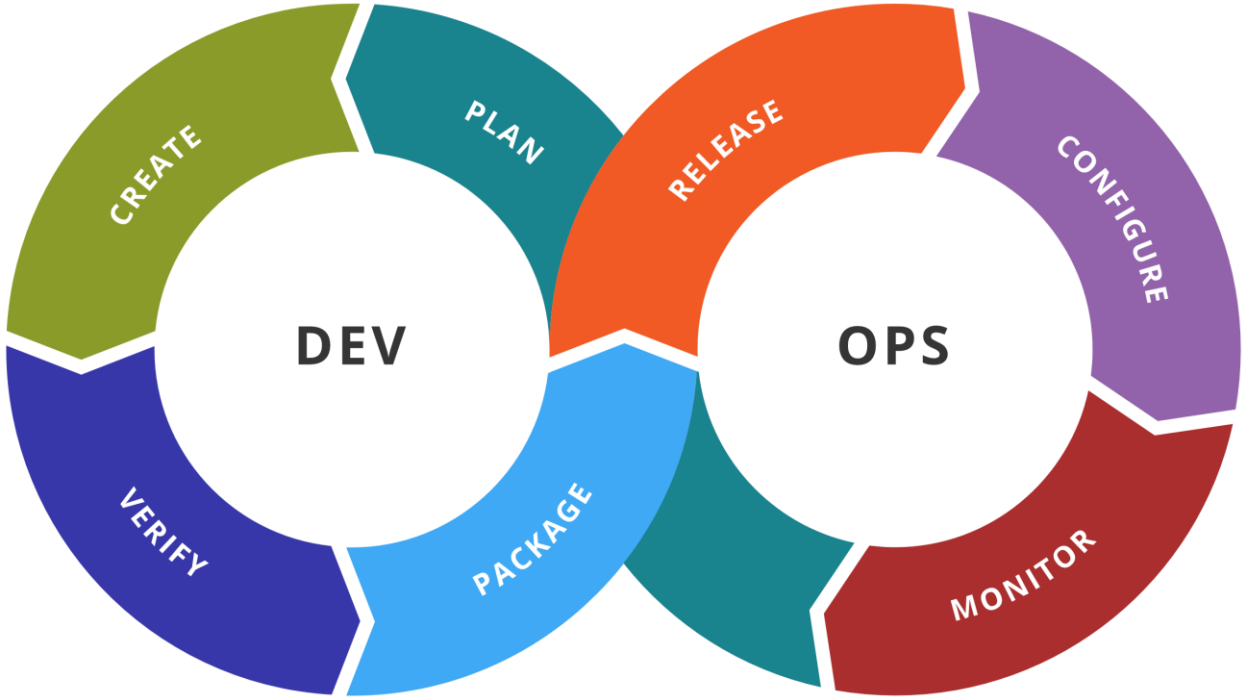
Agile meets Databases



Agile

- Short Development cycles
- Many Iterations
- Frequent Schema Changes

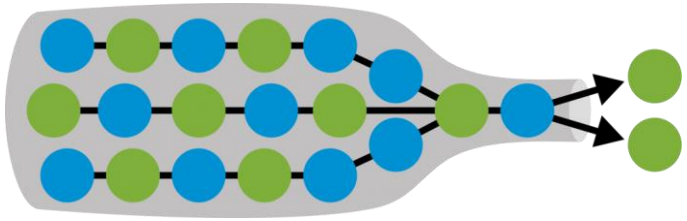
DevOps Requirements for Databases



DevOps

- Continous Integration
- Rolling Releases Back and Forward
- Mutliple (DB-) Servers

Database Challenges



Database Challenges

DB Schemas	DevOps Bottleneck
Scripts	create
	modify
	revert
Existing Data	

Liquibase – Overview

DB Changes

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

Supported Databases

Oracle
MySQL, PostgreSQL, SQL Server, DB2 & more

Incremental Changes

Change sets / Change logs
File formats
  YAML, JSON, XML, SQL
Changelog Tables inside DBs

Java based Open Source

Commercial Product: Datical

Ansible in a Nutshell

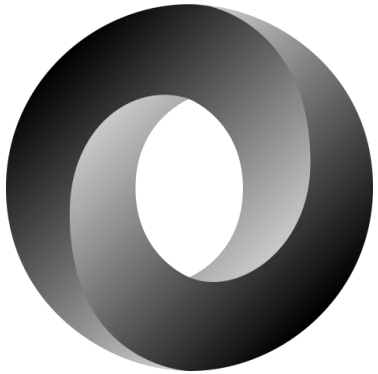
ANSIBLE

Agentless IT Automation

Open Source	Based on python
	by RedHat
Parallel execution	Linux / OS X via ssh
	Windows PowerShell Remoting
Ansible Playbooks	describe the desired state
	YAML – Human and Machine readable

YAML & JSON: two related file formats


```yaml
databaseChangeLog:
  - changeSet:
      id: 2
      author: nvoxland
      changes:
        - addColumn:
            tableName: person
            columns:
              - column:
                  name: username
                  type: varchar(8)
```



```json
{ "databaseChangeLog": [
    { "changeSet": {
        "id": "2",
        "author": "nvoxland",
        "changes": [
          { "addColumn": {
              "tableName": "person",
              "columns": [
                { "column": {
                    "name": "username",
                    "type": "varchar(8)"
                  }
                }]
            }
          }]
      }
    }]
}
```

JSON

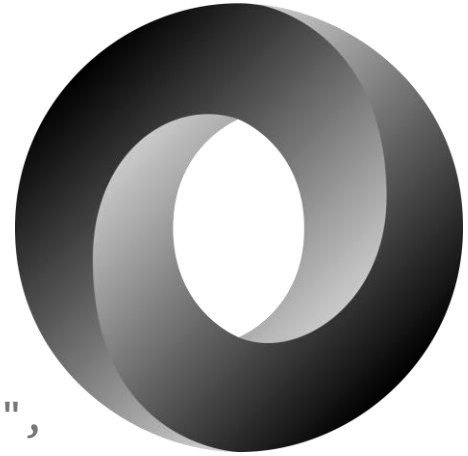
JSON:
Java Script Object Notation

Data: “Key“: “Value“

Brackets: {} - Groupings

[] - Arrays

Schemaless



```
{ "databaseChangeLog": [
    { "changeSet": {
        "id": "2",
        "author": "nvoxland",
        "changes": [
          { "addColumn": {
              "tableName": "person",
              "columns": [
                { "column": {
                    "name": "username",
                    "type": "varchar(8)"
                }
              }]
          }]
      }
    }]
}
```

YAML

YAML: YAML Ain't Markup Language

Human readable	structured data format
Data Types	Scalar (Key: Value)
	Sequences (Arrays)
	Mappings
Grouping	Whitespace is important
	Brackets as in JSON
JSON	can be valid YAML

```yaml
databaseChangeLog:
  - changeSet:
      id: 2
      author: nvoxland
      changes:
        - addColumn:
            tableName: person
            columns:
              - column:
                  name: username
                  type: varchar(8)
```

Ansible – The Basics

Installation

Only on Control Machine
- Python 2 or 3
- Windows not supported

Packages are available
- yum install ansible
- apt-get install ansible
- …

Command Line Interface

ansible

ansible-playbook

ansible-console
- REPL for debugging

ansible-vault
- Encrypts sensitive Files

…

Ansible Inventory

Inventory lists the Hosts Ansible can Change

Default location	/etc/ansible/hosts
File formats	ini
	YAML
Grouping	
Static or dynamic	
Variables	per Host
	Per Group
connection types	ssh (default)
	local, docker

```
mail.example.com
jumper ansible_port=5555 ansible_host=192.0.2.50

[webservers]
foo.example.com http_port=80 maxRequestsPerChild=808
bar.example.com http_port=303 maxRequestsPerChild=909
www[01:50].example.com

[dbservers]
one.example.com
two.example.com
three.example.com
db-[a:f].example.com

[dbservers:vars]
ntp_server=ntp.atlanta.example.com
proxy=proxy.atlanta.example.com
halon_system_timeout=30
self_destruct_countdown=60
escape_pods=2

[CoolApp:children]
dbservers
webservers
```

Ansible Playbooks (1/3)

Playbook

Task Sequence	single steps
	describe **desired state**
	YAML (default)
Modules	Abstract System tasks
	Over 1300 predefined
	Write your own
Variable values	Defined in Playbook
	Facts gathered from Hosts
	Passed from Inventory

```
---
- hosts: stredax.dev
  remote_user: root
  tasks:
  - name: Determine old APEX dirs
    shell: ls -1d /app/apex/{5*,4*,o*} 2>/dev/null
    ignore_errors: True
    register: apex_dirs
  - name: Remove old APEX dirs
    file:
      path: "{{ item }}"
      state: absent
      with_items: "{{ apex_dirs.stdout_lines }}"
  - name: unzip apex and ords
    unarchive:
      src: ./apex_ords.tar.gz
      dest: /app/apex
  - name: Link ords
    file:
      path: /app/apex/ords
      src: /app/apex/ords.{{ ords_version }}
      state: link
  - name: Change Oracle PWDs
    script: change_ords_pwds.sh
      remote_user: orastred
```

Ansible Playbooks (2/3)

Playbook

Variables	Jinja2 templating
	Filters available
Loops	Iterate: {{ item }}
	Define: with_items
	Task Results (register)

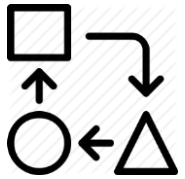
```
---
- hosts: stredax.e
  remote_user: root
  tasks:
  - name: Determine old APEX dirs
    shell: ls -1d /app/apex/{5*,4*,o*} 2>/dev/null
    ignore_errors: True
    register: apex_dirs
  - name: Remove old APEX dirs
    file:
      path: "{{ item }}"
      state: absent
    with_items: "{{ apex_dirs.stdout_lines }}"
  - name: unzip apex and ords
    unarchive:
      src: ./apex_ords.tar.gz
      dest: /app/apex
  - name: Link ords
    file:
      path: /app/apex/ords
      src: /app/apex/ords.3.0.10
      state: link
  - name: Change Oracle PWDs
      script: change_ords_pwds.sh
      remote_user: orastred
```

Ansible Playbooks (3/3)

```
---
- hosts: webservers
vars:
- docroot: /var/www/stredax/public
tasks:
- name: Install Nginx
  apt:
    pkg: nginx
    state: installed
    update_cache: true
  register: nginxinstalled
  notify:
    - Start Nginx
- name: Create Web Root
  when: nginxinstalled|success
  file:
    dest: {{ docroot }}
    mode: 775
    state: directory
    owner: www-data
    group: www-data
  notify:
    - Reload Nginx
```

```
handlers:
  - name: Start Nginx
    service: name=nginx state=started

  - name: Reload Nginx
    service: name=nginx state=reloaded
```



Playbook

Conditions	When result| success/failed/skipped "foo" == "bar"
Notify	
Handlers	Tasks Executed when notified

Ansible Roles

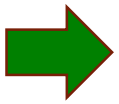
Roles

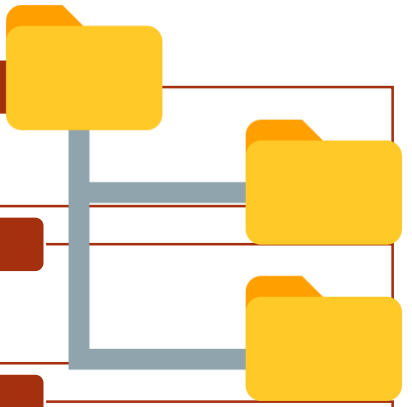
organize multiple related tasks and data

predefined folder structure:
`roles/rolename/…`

ansible executes file
main.yml
automatically, if present

ansible galaxy :
community roles repository





defaults
Vars with default Values

files
Files to be copied unchanged

handlers
Playbook Handlers

meta
Dependencies

tasks
Playbook Tasks

templates
Content with Variables, e.g. config files.
Will be proccessed by Jinja2 template enginge

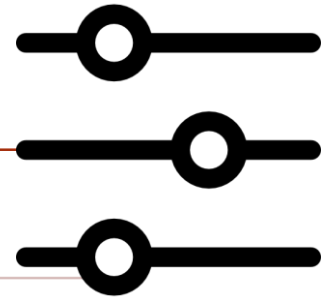
vars
Variables

Liquibase – a closer Look

Liquibase

Installation	Download Liquibase	
	unpack	
Requirements:	JDK 1.7 or higher	
	JDBC driver	
Command Line Interface	liquibase	update[SQL] rollback[SQL] Diff dbDoc

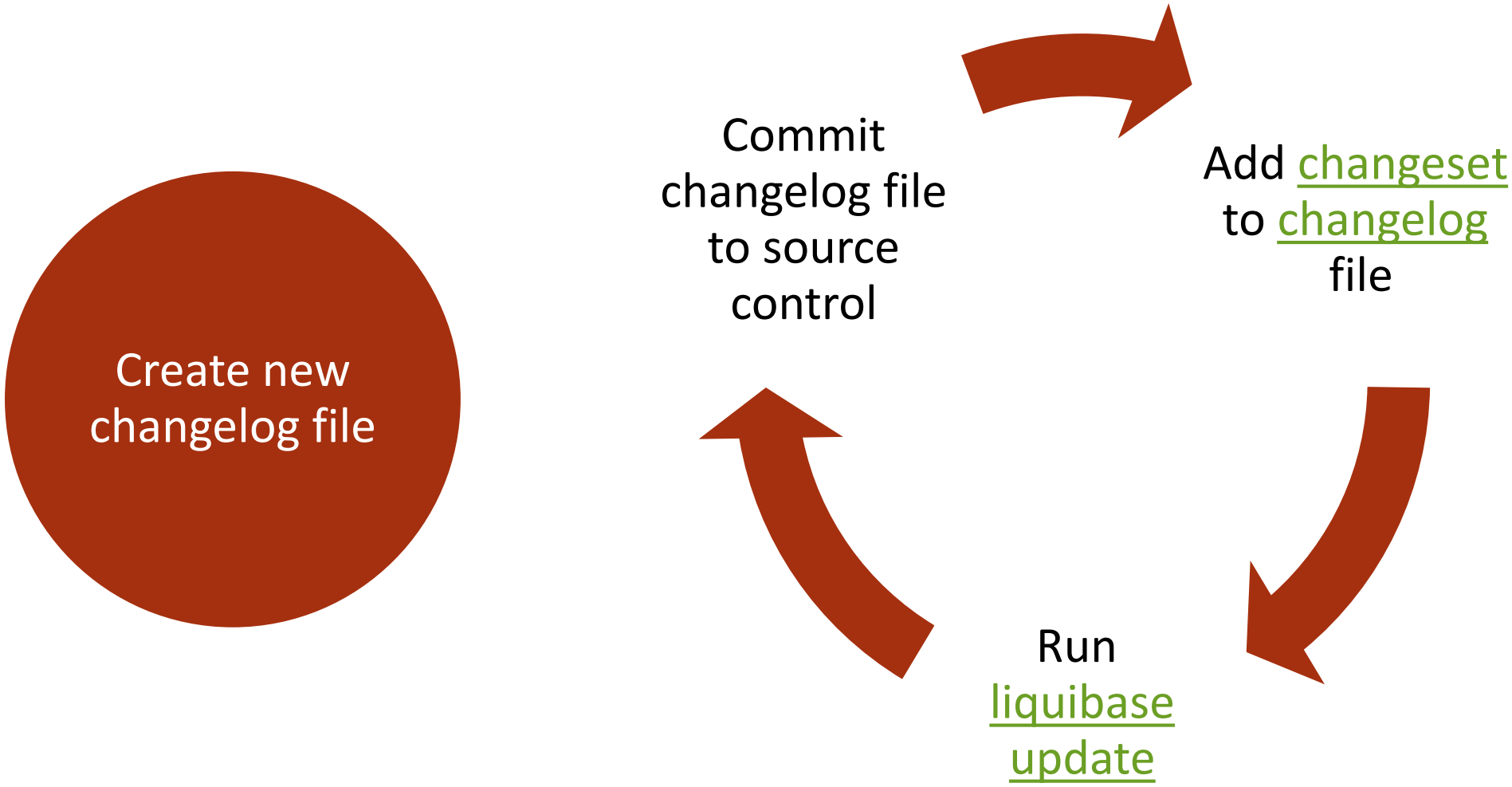
Liquibase CLI Parameters



Parameters

Required	--changeLogFile=<path
	--username=<value>
	--password=<value>
	--url=<value>
	--driver=<jdbc.driver.ClassName>
liquibase .properties	working dir
	Parameter Default Values

Liquibase Workflow



Liquibase Procedure for the developer

Edit	create new local changeSet
Test	Test the changeSet SQL: Run liquibase update
Change	Change your Application: Edit the AppCode
Test	Test application code & database change together
Commit	Commit changeSet and application code.

Defining Changes in Liquibase: Changelog

Changelogs

contain	attributes
	preConditions
	changesets
nestable	include
keeping Track	Table databasechangelog

```yaml
databaseChangeLog:
  - preConditions:
    dbms type: oracle
    runningAs:
      username: ROBBIE

  - include:
      file: robbie-changeset-1.0.yaml
      relativeToChangelogFile: true
  - include:
      file: robbie-changeset-1.1.yaml
      relativeToChangelogFile: true
  - include:
      file: robbie-changeset-2.0.yaml
      relativeToChangelogFile: true
```

Defining Changes in Liquibase: Changeset

Changesets

contain	Attributes
	Actual changes
	Rollback
identified	ID
	Author
	Changelog Filename
runOnChange	Excutes on change
	Checksum in Table
	PL/SQL code

```yaml
databaseChangeLog:
  - changeSet:
    id: TabStockTicker-1
    author: robbie
    changes:
      - createTable:
          tableName: StockTicker
          columns:
          - column:
            name: id
            type: number
            autoIncrement: true
            constraints:
              primaryKey: true
              nullable: false
          - column:
            name: symbol
            type: varchar2(50)
```

Liquibase Changes

Changes

Basic Operations	Bundled
	With rollback
Example	createTable
	SQL / SQLFile
Extensions	Oracle
	Build your own

```yaml
databaseChangeLog:
  - changeSet:
    id: TabTab1-1
    author: robbie
    changes:
      - createTable:
        tableName: Tab1
        columns:
          - column:
            name: id
            type: number
    rollback:
     - dropTable:
         tableName: Tab1
  - changeSet:
    id: TabTab1-2
    author: robbie
    changes:
      - dropTable:
        tableName: Tab1
    rollback:
      changeSetId: TabTab1-1
      changeSetAuthor: robbie
```

Using Liquibase with Ansible

Deploy Liquibase to Targets

see example on the right

Execute liquibase update on target

File Module: Transport changelogs
Shell Module: run liquibase

Run Liquibase from Control Host

Local_action with jdbc URLS
See Blog Post

ssh Tunnels

let ansible create ssh tunnels
Run Liquibase as local action
  connecting to localhost
See Blog Post

```
---
- name: Create Liquibase directory
  file:
    name: /opt/liquibase
    state: directory
    mode: 0755

- name: Install Liquibase
  unarchive:
    src:
https://github.com/liquibase/liquibase/releases
/download/liquibase-parent-{{ liquibase_version
}}/liquibase-{{ liquibase_version }}-bin.tar.gz
    dest: /opt/liquibase
    copy: no
    mode: 0755
    creates: /opt/liquibase/liquibase
```

Demo

Liquibase Best Practices

Use a master changelog

One change per changeset

PL/SQL Code with runOnChange=”true“

IDs are literals – use them

Document changesets with comments

Always think about rollback

Leverage Liquibase to manage your Reference Data

Want to know more?

Liquibase

- Homepage
- Official Documentation
- Tutorial: Change Happens by Blaine Carter

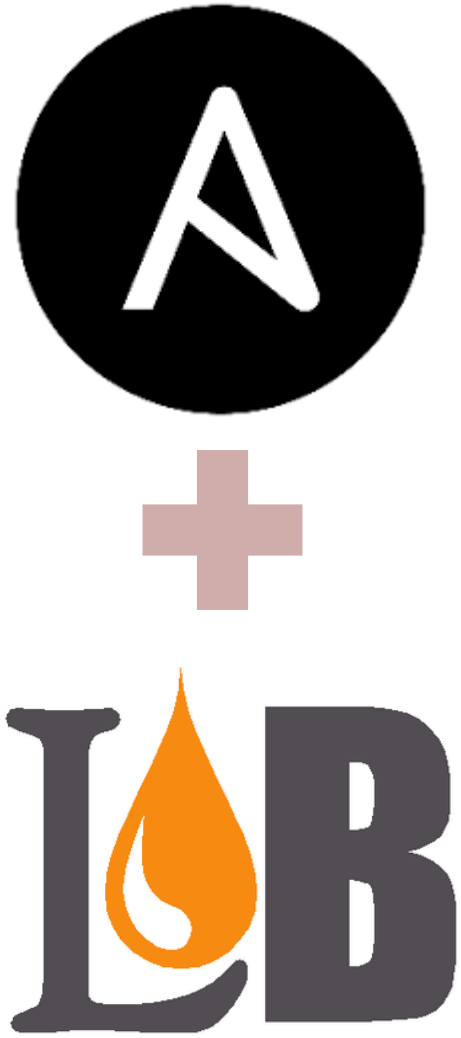
Ansible

- Homepage
- Official Documentation
- Free Webinar

YAML

- Tutorial
- Tutorial Learn X in Y Minutes
- Reference Card
- YAML 1.2 Spec

Conclusion



Overcome
Database
DevOps
Bottleneck

Herzlichen Dank für Ihre Aufmerksamkeit

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Questions ?

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