



Automatically deploy Schema Changes with Ansible and Liquibase

Robert Marz

DOAG

Robert Marz

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



@RobbieDatabee



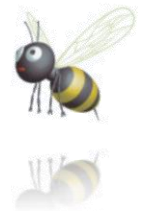
blog.its-people.de



Robert.Marz
@its-people.de



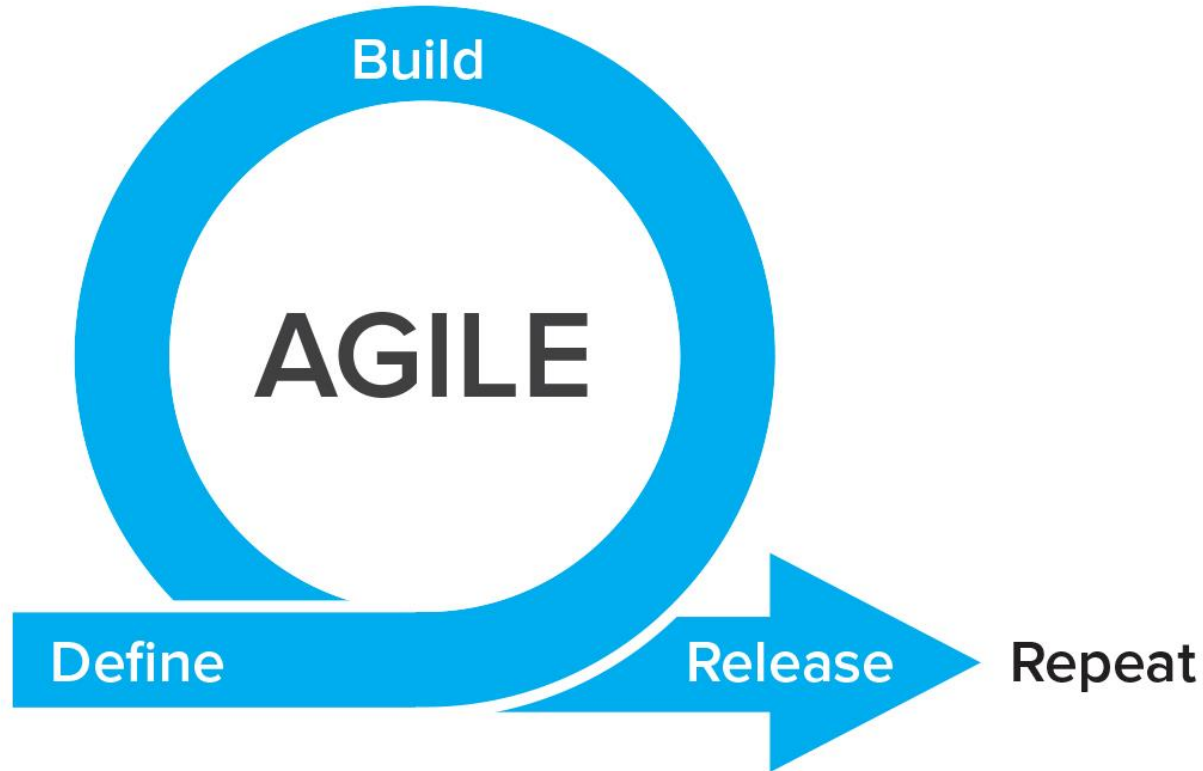
ORACLE
ACE



Agile and DevOps – Database Challenges



Agile meets Databases



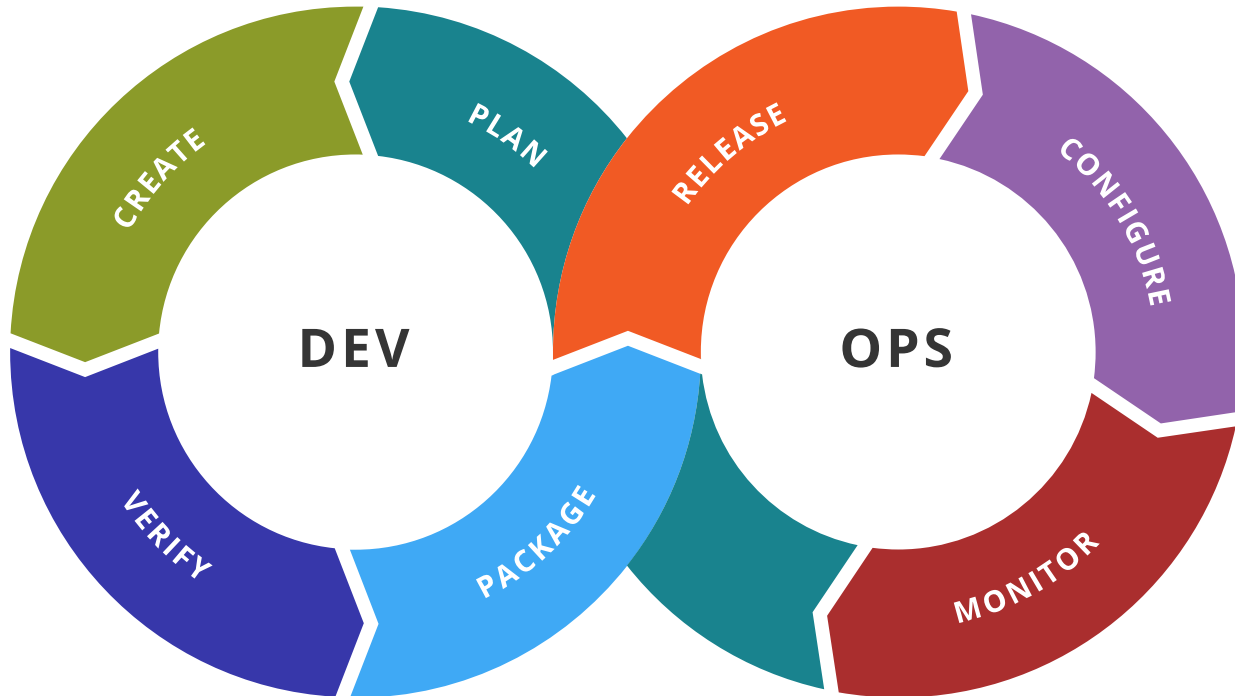
Short Development cycles

Many Iterations

Frequent Schema Changes

Agile

DevOps Requirements for Databases



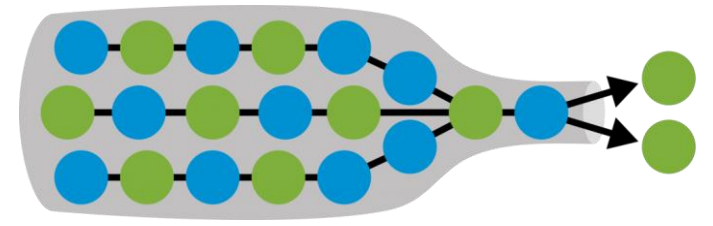
Continuous
Integration

Rolling Releases
Back and Forward

Multiple (DB-)
Servers

DevOps

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

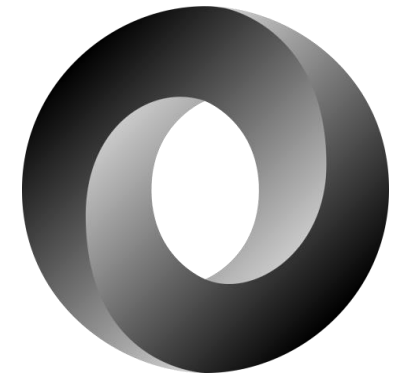
YAML – Human and
Machine readable

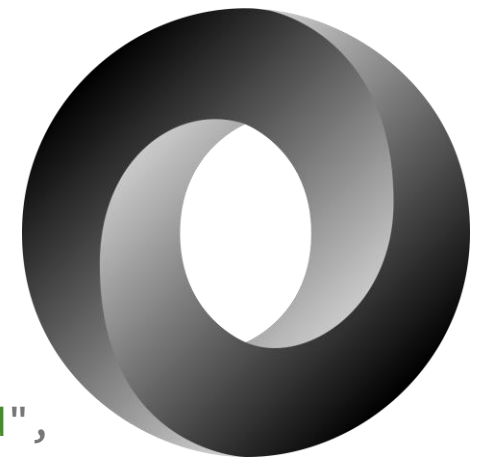
YAML & JSON: two related file formats

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

YAML

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





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 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

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

Ansible – The Basics

Only on Control Machine

Python 2 or 3

Windows not supported

Packages are available

yum install ansible

apt-get install ansible

...

Installation



ansible

ansible-playbook

ansible-console

REPL for debugging

ansible-vault

Encrypts sensitive Files

...

Command Line Interface



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
```





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
  
```



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 -ld /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)

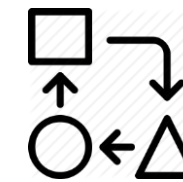
```

---
- 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

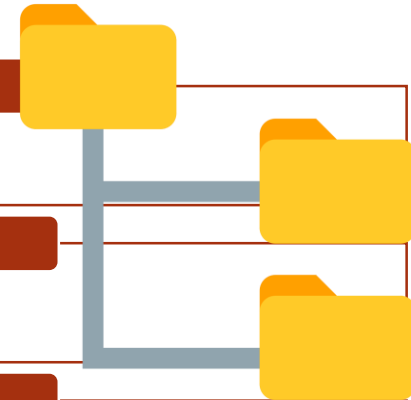
Playbook Tasks

templates

Content with Variables, e.g. config files.
Will be processed by Jinja2 template engine

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]

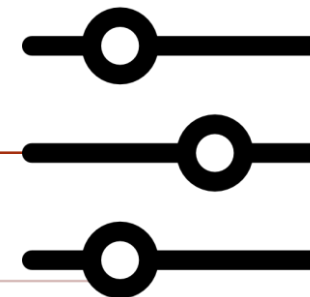
Diff

dbDoc



Java





Parameters

Required

`--changeLogFile=<path>`

`--username=<value>`

`--password=<value>`

`--url=<value>`

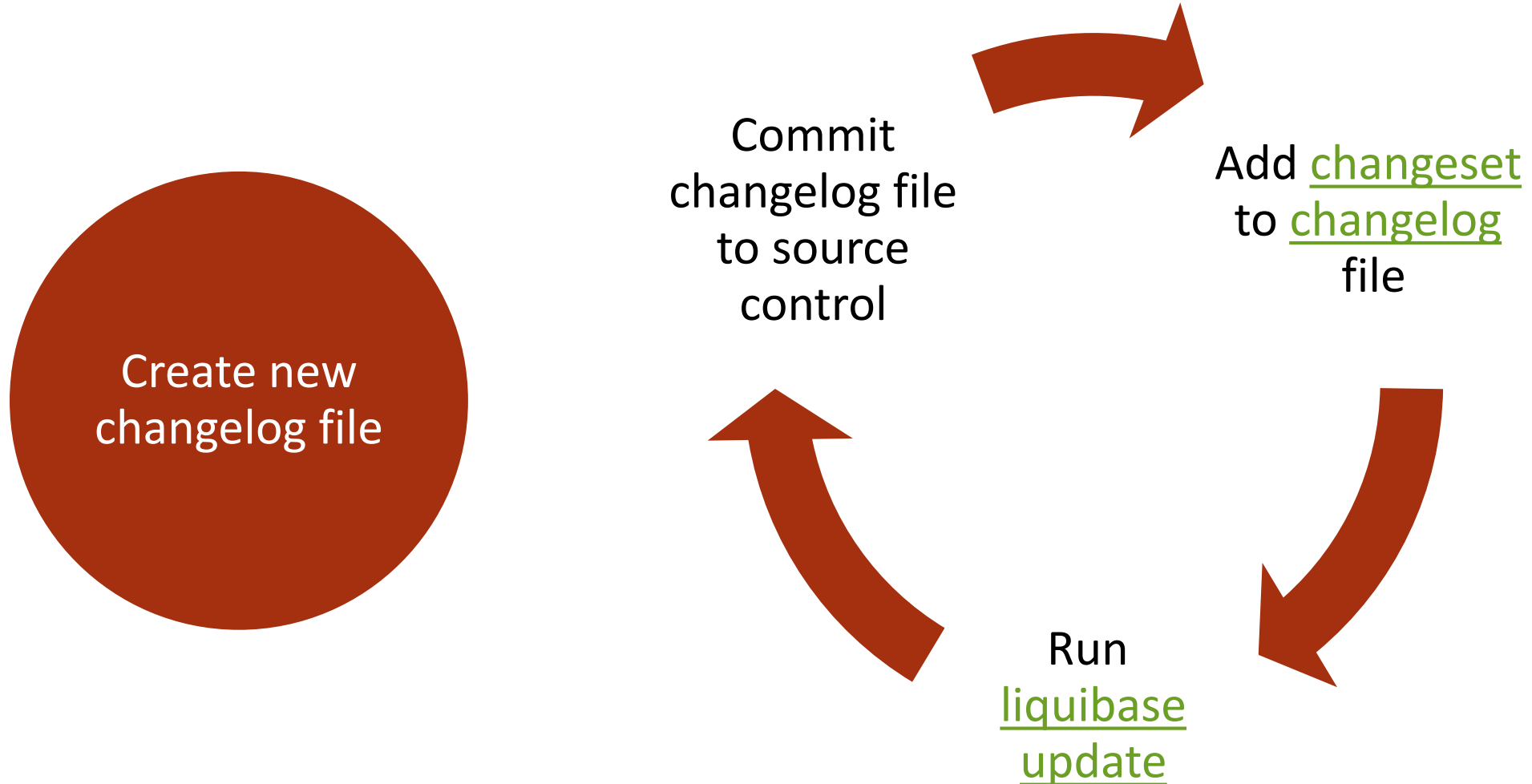
`--driver=<jdbc.driver.ClassName>`

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

```
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

```
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
<u>Extensions</u>	<u>Oracle</u> Build your own

```
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

PLEASE

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TRY THIS
AT HOME**



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Questions ?



its-people GmbH

Frankfurt

Hamburg

Köln

München

Tel. 069 2475 2100

Tel. 040 2360 8808

Tel. 0221 1602 5204

Tel. 089 5484 2401

its-people ERP Beratungsgesellschaft mbH

Frankfurt

Tel. 069 2475 1980

www.its-people.de info@its-people.de