



Oracle Cloud Infrastructure Scripting with OCI CLI

Robert Marz

2019
DOAG
Konferenz + Ausstellung

Robert Marz – Independent Consultant



Client

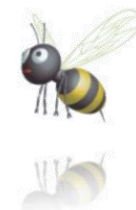
Senior Technical Architect
with database centric view of the world



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



blog.its-people.de



Robert.Marz
@its-people.de



Oracle Cloud Infrastructure - Scripting mit dem OCI CLI

- Robert Marz
- Dienstag, 19. Nov., 11:00 - 11:45 Raum Neu Delhi



Das Battle: On-Premises versus Cloud

- Robert Marz, Martin Klier
- Dienstag, 19. Nov., 14:00 - 14:45 Raum St. Petersburg



JSON, die Datenbank und Ich

- Robert Marz
- Dienstag, 19. Nov., 16:00 - 16:45 Raum Helsinki



PL/SQL Community Meeting

- Christian Schwitalla, Sabine Heimsath,
- Dienstag, 19. Nov., 18:45 - 20:15 Raum Kiew



Panel: DBADev – Bridging the Gap Between Dev and Operations

- Sabine Heimsath, Piet de Visser
- Mittwoch, 20. Nov., 12:00 - 12:45 Raum St. Petersburg



Geliebter Feind: Der DBA und DevOps

- Markus Flechtner, Johannes Ahrends
- Mittwoch, 20. Nov., 13:00 - 13:45 Raum St. Petersburg



Automate Database Deployments with SQLcl

- Sabine Heimsath, Robert Marz
- Mittwoch, 20. Nov., 15:00 - 15:45 Raum Neu Delhi



Polymorphic Table Functions und Qualified Expressions

- Robert Marz
- Mittwoch, 20. Nov., 17:00 - 17:45 Raum Kopenhagen



PL/SQL Security - die Rückkehr der Jedi-Hacker

- Sabine Heimsath, Samuel Nitsche
- Donnerstag, 21. Nov., 15:00 - 15:45 Raum St. Petersburg



19. - 22. November
in Nürnberg

2019.doag.org

500+ 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

Motivation

A low-angle shot of a red wooden ladder extending towards a bright blue sky filled with wispy white clouds. A person's hand is visible, gripping one of the rungs of the ladder. The ladder is made of thick, weathered wooden planks. The sky is a vibrant blue, and the clouds are scattered and light. The overall composition is clean and inspiring, symbolizing aspiration and reaching for goals.

CLIs are mighty Tools



CLIs aren't dead

even not in 2019

CLIs purposes

ad hoc Changes
Batch Scripts

Virtual Every Cloud Provider
provides a CLI

AWS Shell

aws

Azure CLI

az

Google Cloud SDK

gcloud, gsutil, kubectl, bq

Oracle Cloud Infrastructure CLI

oci

```
1 running, 12 sy, 0,0 ni, 97,2 id, 0,3 wa,  
total, 2814304 used, 954160 free,  
total, 0 used, 4192928 free. 117
```

| NI | VIRT | RES | SHR | S | %CPU | %MEM | |
|----|---------|--------|--------|---|------|------|---|
| 0 | 944140 | 77152 | 58752 | S | 3,3 | 2,0 | 0 |
| 0 | 2964784 | 177576 | 53704 | S | 0,7 | 2,1 | 0 |
| 0 | 3656688 | 197012 | 88396 | S | 0,7 | 5,2 | 0 |
| 0 | 342424 | 12612 | 139044 | S | 0,3 | 0,3 | 0 |
| 0 | 26240 | 3080 | 52492 | R | 0,3 | 0,1 | 0 |
| 0 | 1005180 | 50736 | 31004 | S | 0,3 | 1,3 | 0 |
| 0 | 33792 | 4276 | 2628 | S | 0,0 | 0,1 | 0 |
| 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0 |
| 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0 |
| 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0 |
| 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0 |
| 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0 |
| 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0 |
| 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0 |

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Scripting the Cloud

**AUTOMATE
IT!**

Scripting means Automation: Infrastructure as Code



Building up and tearing down of virtual environments happens frequently in the Cloud

Some changes can only be made by **recreating** the resource

Provisioning Cloud Resources by Clicking the UI is tedious and error prone

Use the Web-UI for Orientation only

Scripting is automation and documentation at the same time: **Software Defined Infrastructure**

Choosing the Right Tool for the Job



“A good tool improves
the way you **work**.”

A great tool improves
the way you **think**.”

— Jeff Duntemann



Building complex Infrastructures: Hashicorp Terraform



Used to

plan, define and provision a datacenter infrastructure

Scripting

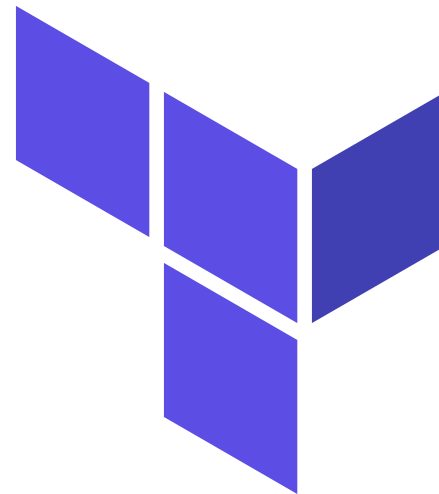
across all Major IaaS Providers

OCI Provider

developed by Oracle

De facto Standard

for Scripting Cloud Resources



HashiCorp

Terraform

Used to

change multiple Machines
to a desired state at once

e.g. Ansible

Agentless Orchestration and Automation

OCI Module provided by Oracle

provided by Oracle

Other CM Tools

- Chef
- Puppet
- SaltStack
- ...



Red Hat Ansible

REST API



“The Master”

All SDKs, CLI & The WebUI use it

Provides Access

to ALL Resources and Options

More Programming

than Scripting



Used to

Develop your own automation

Encapsulate

the complexity of REST API

Mutiple Languages

Java, Python, Ruby, Go

OCI Command line Interface



Use to

make small changes
utility batch scripts
set up small environments (demos, etc)

OCI CLI

Python Based CLI

Platforms

MacOS, Unix, Linux
Windows

OpenSource

Hosted on GitHub
Developed & Maintained by Oracle



OCI Basics

ORACLE[®]

CLOUD

Oracle Cloud Infrastructure Overview



GOVERNANCE
(IAM / APIs)



COMPUTE

STORAGE

DATABASE

NETWORK

EDGE

Services



Virtuelles Netzwerk

Physikalisches Netzwerk



ORACLE
REGION

RECHENZENTREN/
AVAILABILITY DOMAINS

AD
1

AD
2

AD
3

Verbindung - FastConnect/IPSec

ORACLE
REGION *n*

INTERNET

Kunden
RZ

Tenants



Oracle Cloud Identifier

ORACLE Cloud Infrastructure

SIGN IN



Cloud Account

Cloud Account with Identity Cloud Service

robbiedatabee

Next >

Administrators

- Perform administrative tasks
- Monitor key metrics and notifications
- Manage users and roles for your account
- Access the console for service

Users

- Launchpad to all of your applications
- Change your identity details



ACTIVE

robbiedatabee

Edit Audit Retention Policy Edit Object Storage Settings Apply Tag(s)

Tenancy Information Tags

Tenancy Information

OCID: ocid1.tenancy.oc1.aaaaaaaq746[REDACTED]eq
[Hide](#) [Copy](#)

Home Region: eu-frankfurt-1

Name: robbiedatabee

CSI Number: 22032370

Audit Retention Period: 90 Days

If you recently updated the audit retention period, please allow several minutes for the value to take effect.

Object Storage Settings

Amazon S3 Compatibility API Designated Compartment: robbiedatabee (root)

SWIFT API Designated Compartment: robbiedatabee (root)

Object Storage Namespace: robbiedatabee

Identity Domains,
Tenants
& Cloud Account



Mean the same thing:
Your Cloud Space



Enter your Identity Domain;
Login with user & password



Your User & Tenant have
both an OCID

Availability Domains



Oracle Region

Every Region has at least 3 ADs

Your Tenant gets exactly 3 ADs assigned

gets exactly 3 ADs assigned

The AD# to Datacenter assignment

is randomly generated

Your AD Names get a prefix

The prefix determines your assignment
eg: **yFpl**:EU-FRANKFURT-1-AD-3



Compartments

Logical
Dividers

Namespaces

Subdomains

Separation

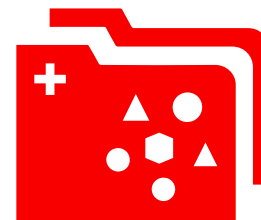
Departments

Applications

Cloud
Resources

Stay in their
Compartment

See each other



Compartments

A woman with red hair tied back, wearing glasses and a light-colored plaid shirt, is seated at a desk in a server room. She is looking at a computer monitor and typing on a keyboard. The room is dimly lit, with the primary light source being the screens. In the background, other server racks and monitors are visible. A red banner is overlaid on the image, containing the text 'Using the OCI CLI'.

Using the OCI CLI

Usage:

`oci <service> <type> <action> <options>`

Example:

compute

is the <service>

instance

is the resource <type>

launch

is the <action>

the rest of the command string consists of <options>.

Results

The Output is in JSON Format

Pagination

Attention:

Results often come paginated

Use `--all` or `--limit n (n > 0)`

Basics – Getting Help



Tab completion

Press <Tab> at any position for valid options

Getting Help:

```
oci --help
```

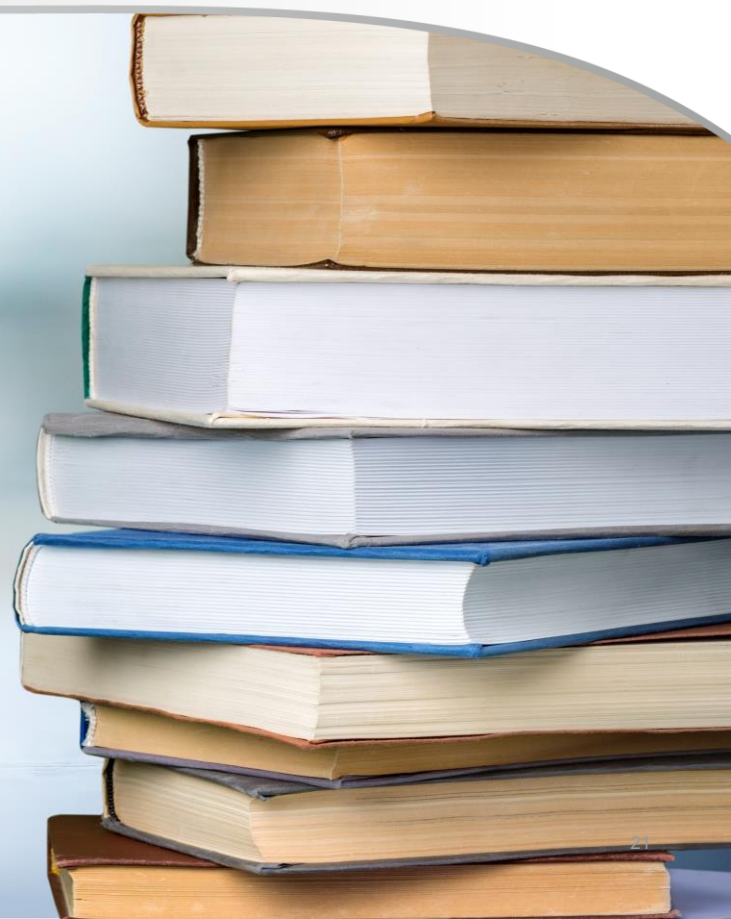
```
oci bv volume -h
```

```
oci os bucket create -?
```

Want to know more?

Check out the docs - they are awesome (no kidding!)

- [OCI CLI Concepts](#)
- [OCI CLI Reference](#)



Global Parameters



Global Parameters

work with virtual every command

--cli-rc-file

Defaults, aliases, predefined queries

--generate-full-command-json-input

prints a json document with all possible parameters

--generate-param-json-input

prints example json for complex input like arrays

--output json|table

prints output in json or text

--query

queries filter & format response before output
JMESPath query language

```
robble@NightSpark ~ ❯ oci db database create --generate-full-command-json-input
```

```
{
  "adminPassword": "string",
  "autoBackupEnabled": true,
  "characterSet": "string",
  "dbName": "string",
  "dbSystemId": "string",
  "dbVersion": "string",
  "dbWorkload": "OLTP|DSS",
  "maxWaitSeconds": 0,
  "ncharacterSet": "string",
  "pdbName": "string",
  "source": "NONE|DB_BACKUP",
  "waitForState": "PROVISIONING|AVAILABLE|UPDATING|TERMINATING|TERMINATED|FAILED",
  "waitIntervalSeconds": 0
}
```

```
robble@NightSpark ~ ❯ oci db autonomous-database create --generate-full-command-json-input
```

```
{
  "adminPassword": "string",
  "autonomousContainerDatabaseId": "string",
  "compartmentId": "string",
  "cpuCoreCount": 0,
  "dataStorageSizeInTbs": 0,
  "dbName": "string",
  "dbWorkload": "OLTP|DW",
  "definedTags": {
    "tagNamespace1": {
      "tagKey1": "tagValue1",
      "tagKey2": "tagValue2"
    },
    "tagNamespace2": {
      "tagKey1": "tagValue1",
      "tagKey2": "tagValue2"
    }
  },
  "displayName": "string",
  "dn": "string",
  "freeformTags": {
    "tagKey1": "tagValue1",

```

OCI CLI Service Commands Overview



Announcements Service (announce)

Audit (audit)

Autoscaling (autoscaling)

Block Volume Service (bv)

Budgets (budgets)

Compute Management Service (compute-management)

Compute Service (compute)

Container Engine for Kubernetes (ce)

Data Transfer Service (dts)

Database Service (db)

DNS (dns)

Email Delivery (email)

Events (events)

File Storage Service (fs)

Functions Service (fn)

Health Checks (health-checks)

Identity and Access Management Service (iam)

Key Management Service (kms)

Load Balancing (lb)

Monitoring (monitoring)

Networking Service (network)

Notifications (ons)

Object Storage Service (os)

Resource Manager (resource-manager)

Search Service (search)

Service limits s (limits)

Session commands for CLI (session)

Streaming Service (streaming)

Web Application Acceleration and Security Services (waas)

Work Requests (work-requests)



D

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M

O

A man and a woman are standing in a server room, looking at a laptop. The woman is pointing at the screen. The man is holding the laptop. They are both wearing blue lanyards. The server racks are visible in the background.

Administration

Installation Prerequisites



Supported Operating Systems

- MacOS
- Linux / Unix
- Windows

Python

- Version 2.7.5 and up
- Version 3.5 and later
- The Installer offers to install missing Python

Oracle Cloud Infrastructure Access

- OCI Account
- OCI User with desired permission
- A keypair – the public key uploaded to OCI
 - token-based Authentication is possible instead of keys



Automatic Installation MacOS, Linux, Unix



Execute

```
bash -c "$(curl -L  
https://raw.githubusercontent.com/oracle/oci-  
cli/master/scripts/install/install.sh)"
```

Installation

Follow Prompts

Autocompletion

Install adds autocompletion for oci commands at the end of your shell resource file

If using zsh instead of bash, add

```
autoload bashcompinit
```

```
bashcompinit
```

In your .zshrc before the call to autocomplete



Automatic Installation Windows

Open

Open Powershell as Administrator

Execute

```
Set-ExecutionPolicy RemoteSigned  
powershell -NoProfile -ExecutionPolicy Bypass  
-Command "iex ((New-Object  
System.Net.WebClient).DownloadString(  
'https://raw.githubusercontent.com/oracle/oci-  
cli/master/scripts/install/install.ps1'))"
```

Installation

Follow Prompts



Manual Installation



Follow Instruction

<https://docs.cloud.oracle.com/iaas/Content/API/SDKDocs/climanualinst.htm>



Upgrading Automatic Install

- Run the install script and specify the same install directory.
- When prompted, reply **Y** to overwrite the existing installation.

Upgrading Manual Install

```
pip install oci-cli --upgrade
```



Deinstalling Automatic install

- Delete Directories from installation location (showing defaults):
- MacOS / Linux / Unix:
 - ~/lib
 - ~/bin
- Windows:
 - %USERPROFILE%\lib
 - %USERPROFILE%\bin

Deinstalling Manual Install

```
pip uninstall oci-cli
```



Service Errors

Any operation resulting in a service error causes an error of type "ServiceError" to be returned by the CLI. For information about common service errors that Oracle Cloud Infrastructure returns, see API Errors.

oci Command Not Found

If the oci command isn't found, this can be caused by one of the following reasons:

- pip installed the package to a different virtual environment than your active one.
- You switched to a different active virtual environment after you installed the CLI.

To determine where the CLI is installed, run the which pip and which oci commands.

Wheel File Won't Install

If the wheel file won't install, verify that pip is up to date. To update pip, run the pip install -U pip command. Try to install the wheel again.

Oracle Linux Permissions Issues

On Oracle Linux 7.3, if you encounter permission issues when running pip install, you might need to use sudo.

Windows Issues

If the oci command isn't found, make sure that the oci.exe location is in your path (for example, the Scripts directory in your Python installation).

Contributions

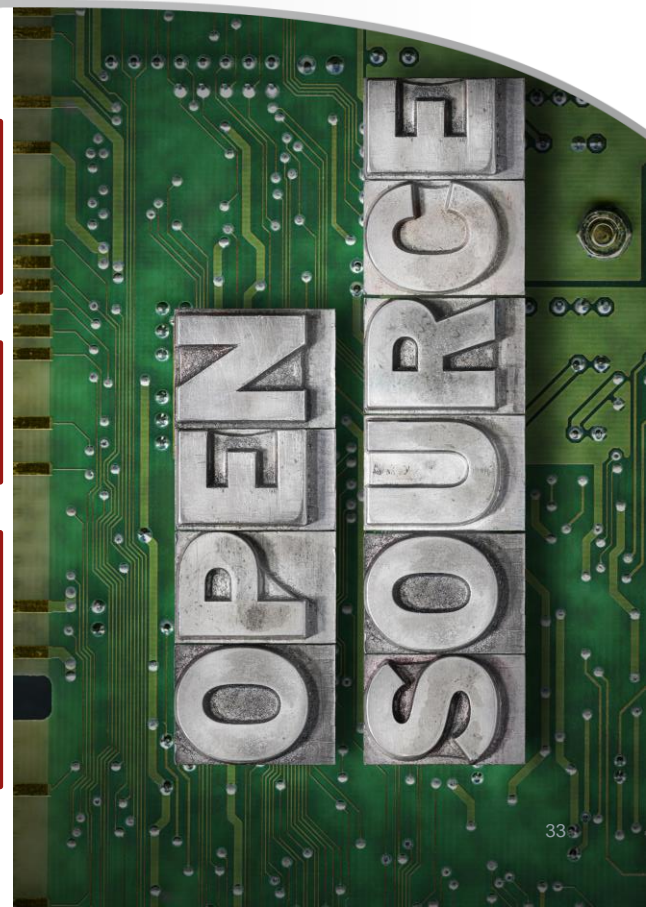
Got a fix for a bug, or a new feature you'd like to contribute? The CLI is open source and accepting pull requests on GitHub.
<https://github.com/oracle/oci-cli>

Notifications

To be notified when a new version of the CLI is released, subscribe to the [Atom feed](#).

Questions or Feedback

- GitHub: To file bugs and feature requests only.
- Stack Overflow: Use the oracle-cloud-infrastructure and oci-cli tags in your post.
- Developer Tools section of the Oracle Cloud forums
- My Oracle Support



Setting up OCI CLI



Setting up OCI CLI

Generate Keys

`oci setup keys`

Upload
Public Key

Gather
Information

- Tenancy OCID
- User OCID
- Regions & Availability Domains

Create config

`oci setup config`



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Demo Backup: Generate Keys



```
robbie@NightSpark:~$ oci setup keys
Enter a passphrase for your private key (empty for no passphrase):
Public key written to: /home/robbie/.oci/oci_api_key_public.pem
Private key written to: /home/robbie/.oci/oci_api_key.pem
Public key fingerprint: a0:ea:09:6e:4a:31:7b:f3:91:65:e8:31:fa:77:b9:34
```

If you haven't already uploaded your public key through the console, follow the instructions on the page linked below in the section 'How to upload the public key':

<https://docs.cloud.oracle.com/Content/API/Concepts/apisigningkey.htm#How2>

```
robbie@NightSpark:~$
```

Demo Backup: Upload Public Key



ORACLE Cloud

Core Infrastructure

- Compute
- Block Storage
- Object Storage
- File Storage
- Networking

Database

- Bare Metal, VM, and Exadata
- Autonomous Data Warehouse
- Autonomous Transaction Processing

Solutions and Platform

- Analytics
- Resource Manager
- Email Delivery
- Application Integration
- Monitoring
- Developer Services
- Marketplace
- My Services Dashboard

Governance and Administration

- Account Management
- Identity**
- Security
- Governance
- Administration

Identity > Users > User Details

robert.marz@databee.org

Description: Robert Marz

Create/Reset Password Enable Multi-Factor Authentication

User Information Tags

OCID: ...xejha Show Copy

Created: Sun, 11 Nov 2018 17:01:16 UTC

Multi-factor authentication: Disabled

Email :

Capabilities

Local password: Yes

API keys: Yes

Auth tokens: Yes

API Keys

Add Public Key

Fingerprint: 50:51:31:08:b9:3e:6a:77:d3:d4:

Group: s

Dynamic Groups

Policies

Compartments

Federation

Authentication Settings

ORACLE Cloud

Identity > Users > User Details

ACTIVE

Add Public Key [help](#) [cancel](#)

Note: Public Keys must be in the PEM format.

PUBLIC KEY

```
-----BEGIN PUBLIC KEY-----
MIIBIjANBgkqhkiG9w0BAQEFAAACQ8AMIIBCgKCAQEAyYBPM6bMT8MGz
PAQK91
7n8NnAgI0+fOUVafpUXW8FbQsjasWv1295jADt2Yn40w9/o4Ax2k+1/ZN
gkIcrS
UzbGqT8zVgyi3ABQsSxiC7m2dvzQZjr4BH2qoyosxJedI+m3tNPq5oTVM
tF0kwp
vcr2HaKgg+P9pRixLMZ9Pi4tzV/7cCwJvMgHqxCJ8YEFxZ9kX8m9c9yEbK
8mG1G/
q5En9V6XhHsjs9spu3ufwqiNaz6YeOwqkvrMrS11VfAAQ5Ze/EaOebIlnZ
```

Add

Multi-factor authentication: Disabled

Email :

Capabilities

Local password: Yes

API keys: Yes

Auth tokens: Yes

SMTP credentials: Yes

Customer secret keys: Yes

Resources

API Keys (2)

Auth Tokens (0)

API Key

Fingerprint: 50:51:31:08:b9:3e:6a:77:d3:d4:

Time Created: Tue, 20 Nov 2018 09:53:33 UTC

Demo Backup: Gather Information



ORACLE Cloud

- Cloud Storage
- File Storage
- Networking
- Database
- Bare Metal, VM, and Exadata
- Autonomous Data Warehouse
- Autonomous Transaction Processing
- Solutions and Platform
- Analytics
- Resource Manager
- Email Delivery
- Application Integration
- Monitoring
- Developer Services
- Marketplace
- My Services Dashboard
- Governance and Administration
 - Account Management
 - Identity
 - Security
 - Governance
 - Administration
 - Announcements

robbedatabase

Edit Audit Retention Policy Edit Object Storage Settings

Tenancy Information **Tags**

Tenancy Information

OCID: ...npzeeq [Show Copy](#)

Name: robbedatabase

Audit Retention Period: 90 Days
If you recently updated the audit retention period, please allow several minutes for the value to take effect.

Object Storage Settings

Amazon S3 Compatibility API Designated

Compartment: robbedatabase (root)

Object Storage Namespace: robbedatabase

Regions

Name: ap-mumbai-1

Tenancy Details

ORACLE Cloud

Identity » Users » User Details

robbedatabase

Edit Audit Retention Policy Edit Object Storage Settings

Tenancy Information **Tags**

Tenancy Information

OCID: ...npzeeq [Show Copy](#)

Name: robbedatabase

Audit Retention Period: 90 Days
If you recently updated the audit retention period, please allow several minutes for the value to take effect.

ACTIVE

ORACLE Cloud

Identity » Users » User Details

robert.marz@databee.org

Description: Robert Marz

Create/Reset Password Enable Multi-Factor Authentication

Delete Apply Tag(s)

User Information **Tags**

OCID: ...xejjha [Show Copy](#)

Created: Sun, 11 Nov 2023 17:01:16 UTC

Multi-factor authentication: Disabled

Email :

Capabilities

Local password: Yes

API keys: Yes

Auth tokens: Yes

Demo Backup: Setup Config



```
robbie@NightSpark:~$ oci setup config
This command provides a walkthrough of creating a valid CLI config file.

The following links explain where to find the information required by this
script:

User OCID and Tenancy OCID:

    https://docs.cloud.oracle.com/Content/API/Concepts/apisigningkey.htm#Other

Region:

    https://docs.cloud.oracle.com/Content/General/Concepts/regions.htm

General config documentation:

    https://docs.cloud.oracle.com/Content/API/Concepts/sdkconfig.htm

Enter a location for your config [/home/robbie/.oci/config]:
Enter a user OCID: ocid1.user.oc1..aaaaaaaabh2q[REDACTED]jha
Enter a tenancy OCID: ocid1.tenancy.oc1..aaaaaa[REDACTED]5cxnpzeeq
Enter a region (e.g. ap-mumbai-1, ap-seoul-1, ap-tokyo-1, ca-toronto-1, eu-frankfurt-1, eu-zurich-1, sa-saopaulo-1, uk-london-1, us-ashburn-1, us-gov-chicago-1, us-gov-phoenix-1, us-langley-1, us-luke-1, us-phoenix-1): eu-frankfurt-1
Do you want to generate a new RSA key pair? (If you decline you will be asked to supply the path to an existing key.) [Y/n]: n
Enter the location of your private key file: /home/robbie/.oci/oci_api_key.pem
Fingerprint: a0:ea:09:6e:4a:31:7b:f3:91:65:e8:31:fa:77:b9:34
Config written to /home/robbie/.oci/config

If you haven't already uploaded your public key through the console,
follow the instructions on the page linked below in the section 'How to
upload the public key':

    https://docs.cloud.oracle.com/Content/API/Concepts/apisigningkey.htm#How2

robbie@NightSpark:~$
```



The Keys to the Cloud

Key Pairs

Cloud Authentication

is done via x509 key pairs

The Private Key

never leaves your machine

Multiple file formats

- .pem – (Privacy-enhanced Electronic Mail)
- .cer, .crt, .der
- .p12
- .pfx

OCI CLI

needs pem

Generation and Conversion

with tools
puttygen
ssh-keygen
openssl

Best Practices



OCI CLI is the key to your datacenter

- do not put it on a laptop
- do not deploy it in the OCI Cloud
- Limit access

Script everything

- Scripts are automation and documentation
- Learn how to deal with json
 - JMESPath
 - Tools like jq
- Use Variables for common parameters and OCIDs

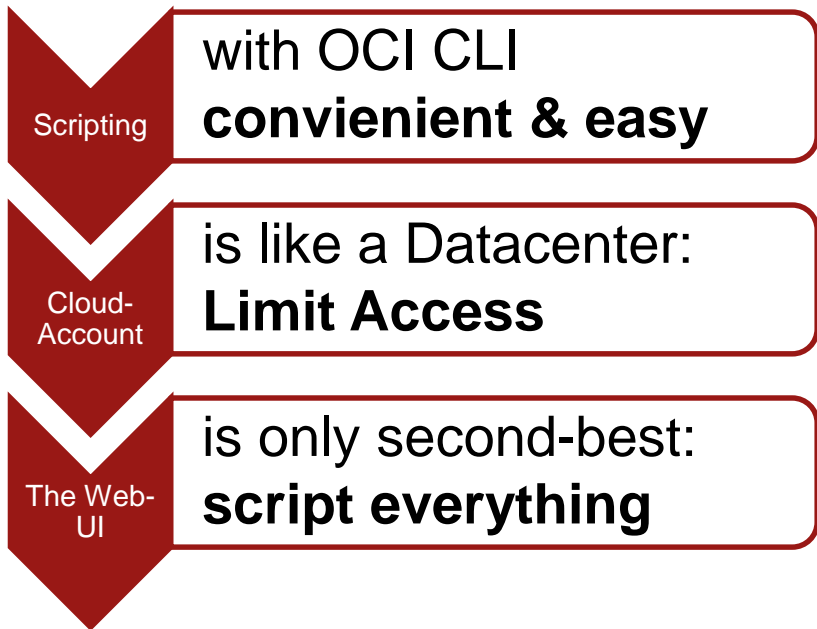
Store your scripts without credentials

- Especially, when you version control them
- Use a key vault



Conclusion





The ~~Sky~~ Cloud is the Limit





Vielen Dank für Ihre
Aufmerksamkeit.