Infrastructure-as-Code:
Which one best suits you?

Meetup @ Qstars IT | 29-02-2024
Ernest Neijenhuis | ernest@qstars.nl

So...

QSTARS IT

What is Infrastructure-as-Code ???
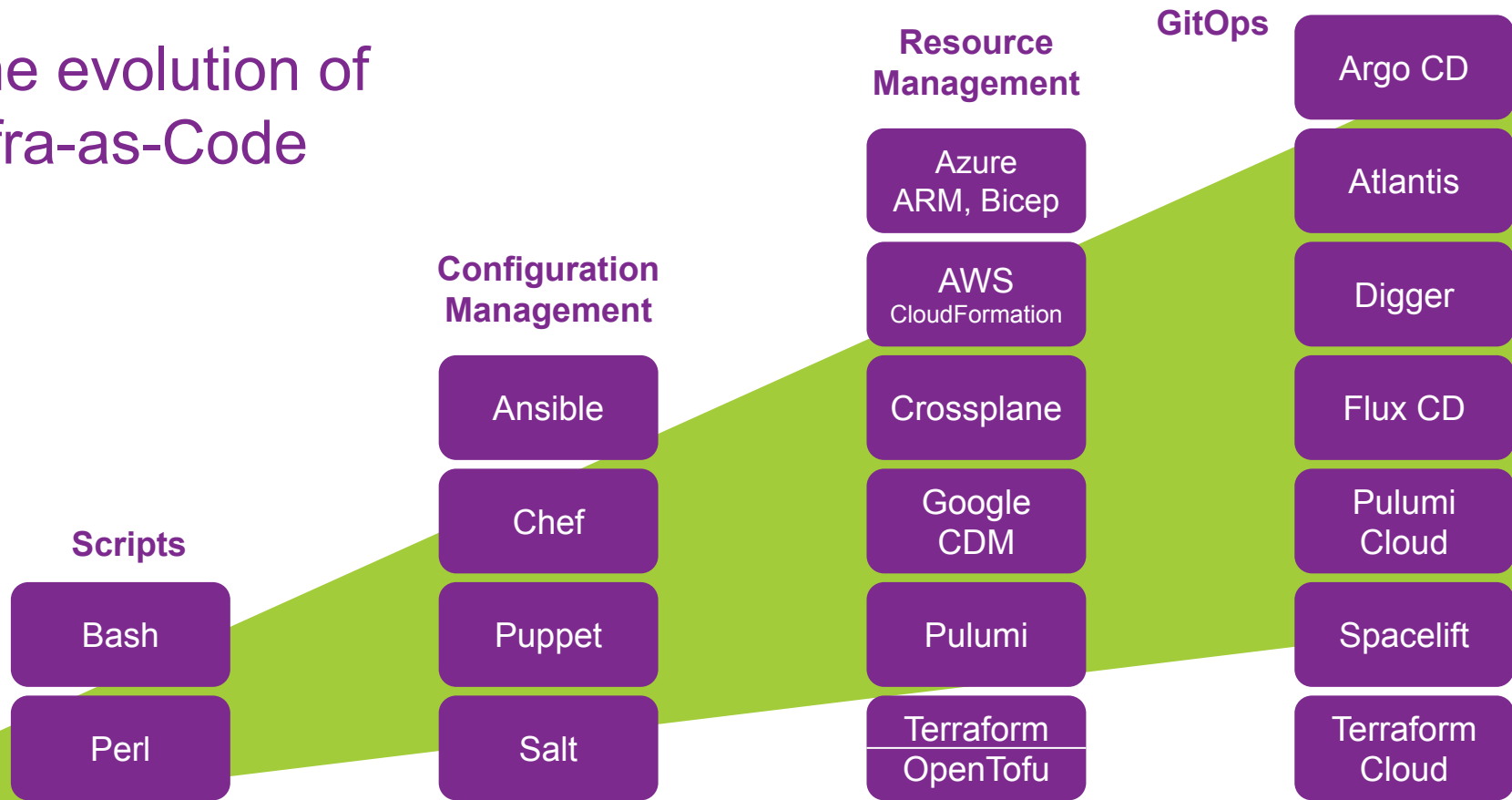
QSTARS IT

The evolution of Infra-as-Code

Scripts

- Bash
- Perl

Configuration Management

- Ansible
- Chef
- Puppet
- Salt

Resource Management

- Azure ARM, Bicep
- AWS CloudFormation
- Crossplane
- Google CDM
- Pulumi
- Terraform / OpenTofu

GitOps

- Argo CD
- Atlantis
- Digger
- Flux CD
- Pulumi Cloud
- Spacelift
- Terraform Cloud

From pets to cattle... from servers to compute... from on-premise to cloudnative...

Infrastructure-as-Code: Which one best suits you?

QSTARS IT

Reconciliation

Desired state → Current state

QSTARS IT

Drift

Desired state

Current state
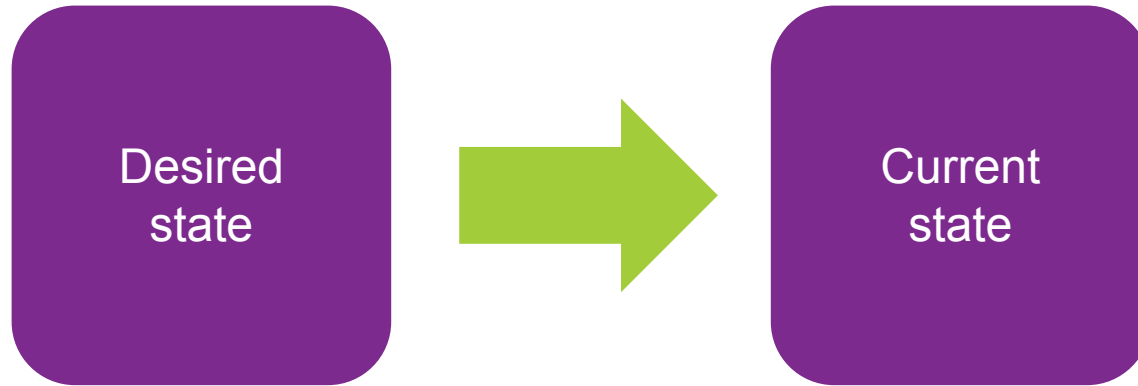
QSTARS IT
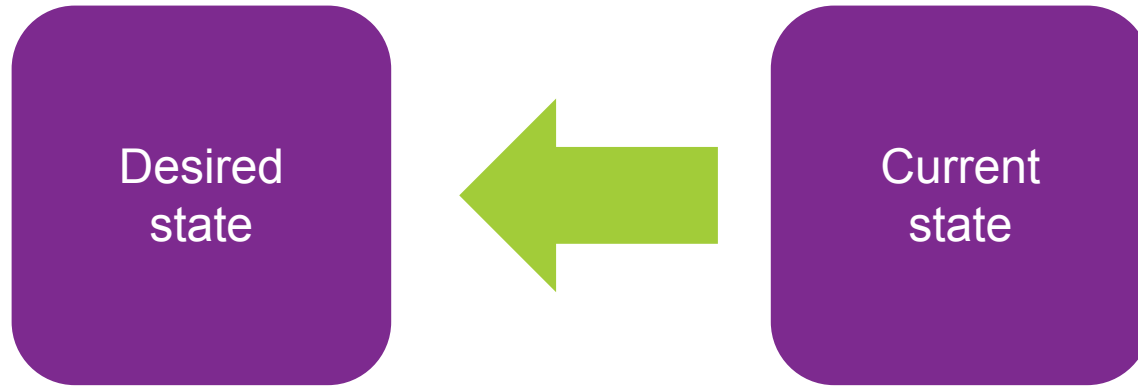
About the demo's

The evolution of Infra-as-Code

Scripts

Bash

Perl

Configuration Management

Ansible

Chef

Puppet

Salt

Resource Management

Azure
ARM, Bicep

AWS
CloudFormation

Crossplane

Google
CDM

Pulumi

Terraform
OpenTofu

GitOps

Argo CD

Atlantis

Digger

Flux CD

Pulumi
Cloud

Spacelift

Terraform
Cloud

time... from pets to cattle... from servers to compute... from on-premise to cloudnative...

Infrastructure-as-Code: Which one best suits you?

QSTARS IT
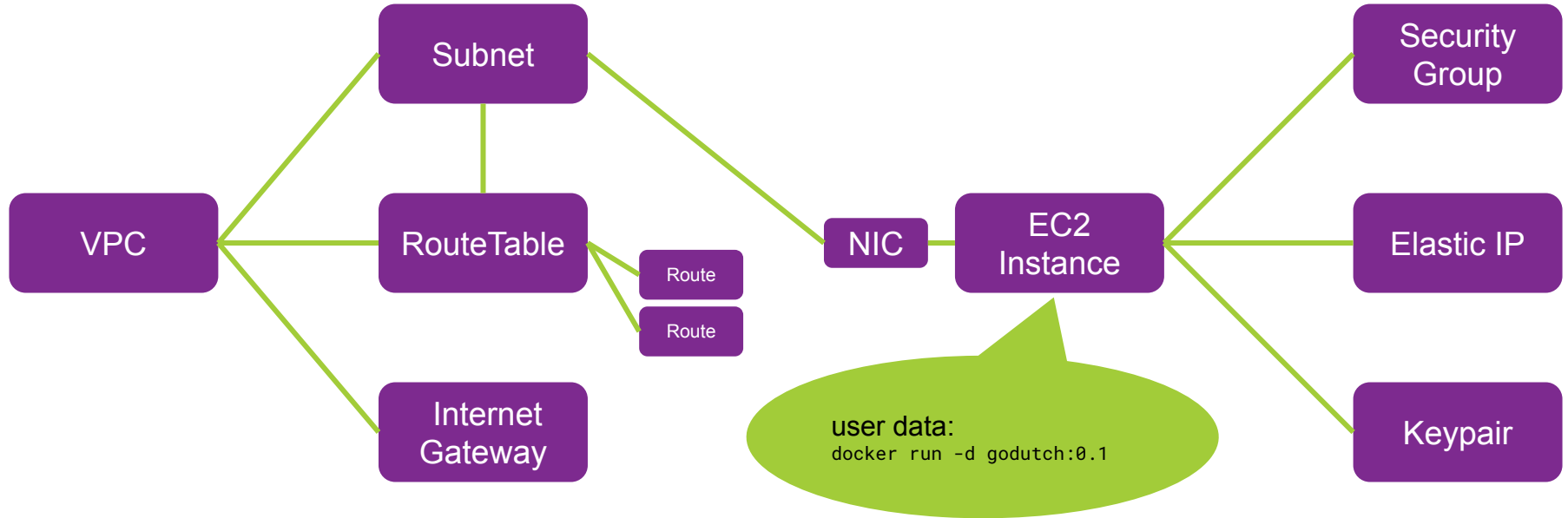
Today's goal: run a Docker container in AWS

Resources in AWS

QSTARS IT
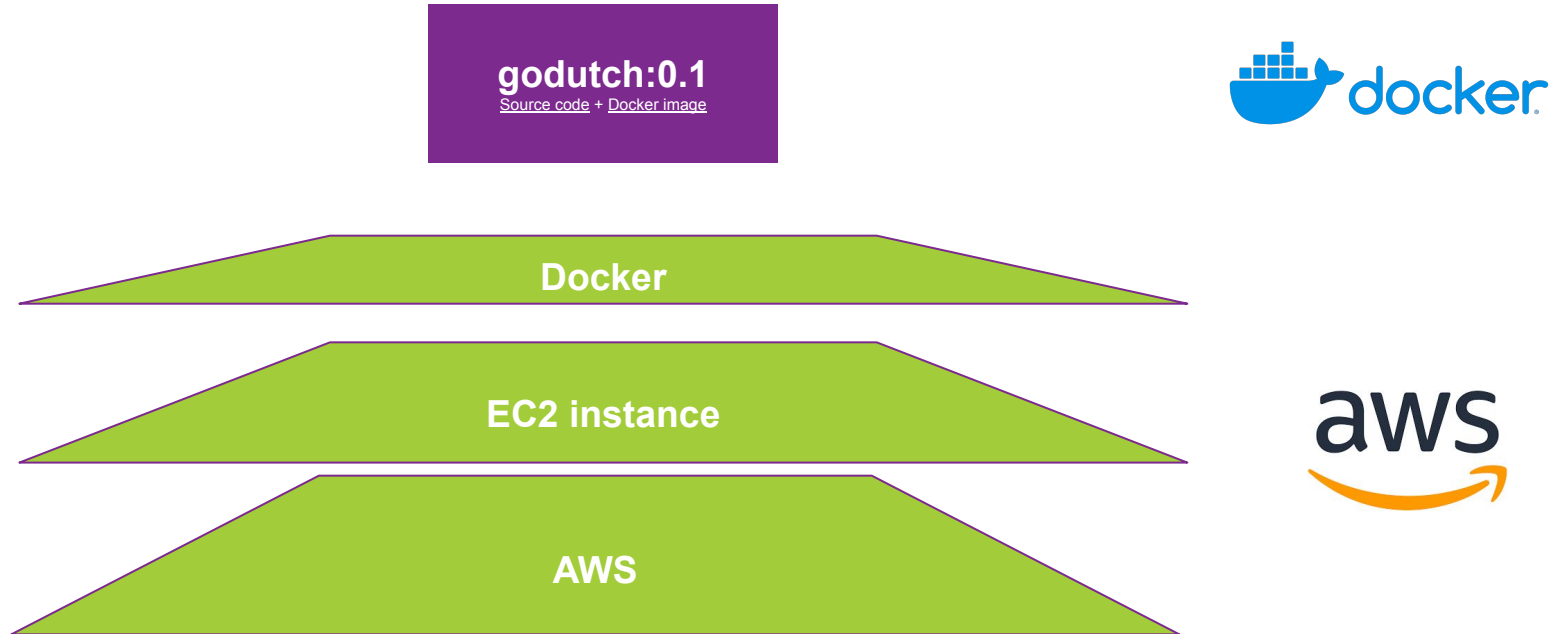
Solution 1: Terraform

AWS CloudFormation is so cool,
however it should be cloud-agnostic
and open source! (2011)

QSTARS IT

About Terraform

- Owned by HashiCorp (Vault, Vagrant, Packer, ...)

- 2011: Inspired by AWS CloudFormation

- 2014: Terraform 0.1 (MPL v2)

- 2019: Terraform Cloud

- 2023: License changed to BSL 1.1, OpenTofu fork

QSTARS IT

How it works

- Create a directory

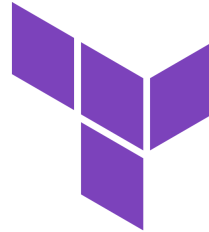- Put your (HCL) code in directory

- Run Terraform:

  ```
  terraform init   # installs providers, plugins...
  terraform plan   # compares desired vs running state
  terraform apply  # applies changes to running state
  ```
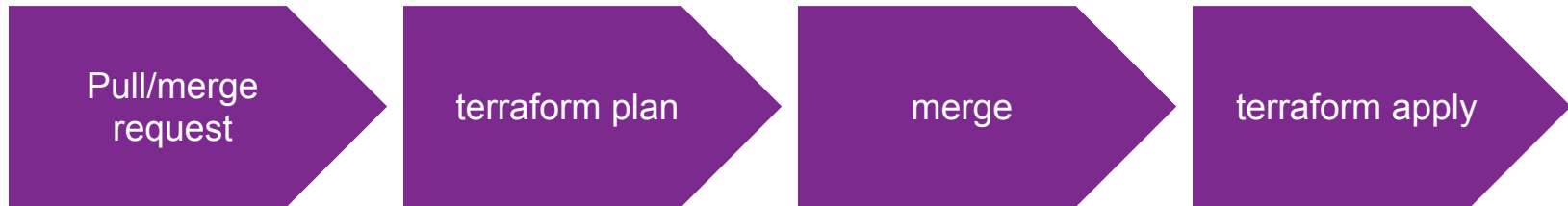
- Providers, modules, etc..: https://registry.terraform.io/

Terraform demo

GitOps with Terraform

- Terraform Cloud - https://www.hashicorp.com/products/terraform
- Spacelift - https://spacelift.io/
- Atlantis - https://runatlantis.io/
- Digger - https://digger.dev/

Pull/merge request → terraform plan → merge → terraform apply

Solution 2: Crossplane

If Kubernetes is such a great orchestrator, why not use it for all infrastructure?

About Crossplane

- Created by Upbound, CNCF project

- Dec 2018: release 0.1.0 (Apache license)

- Dec 2020: release 1.0.0, CNCF accepted

- Sep 2021: CNCF *Incubating* project

QSTARS IT

How it works

- Install Crossplane on Kubernetes cluster

- Install and configure provider(s)

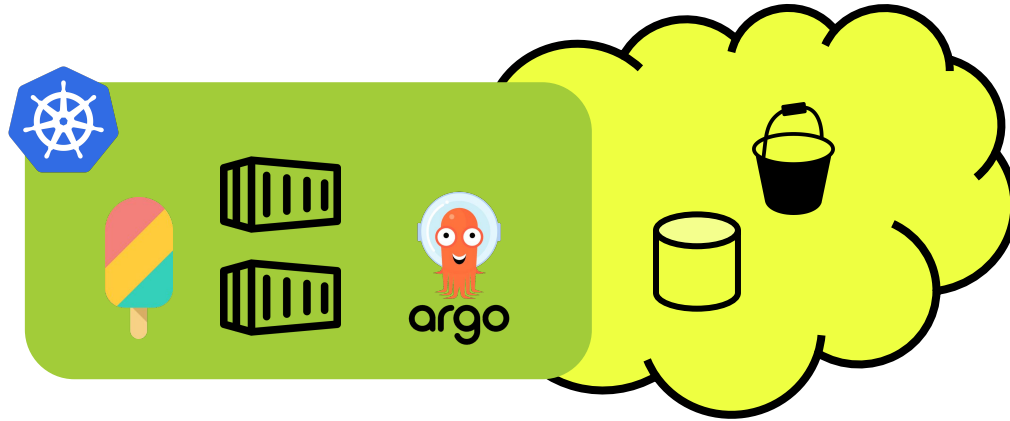- Create yaml files to deploy infrastructure

- Providers: https://marketplace.upbound.io/

QSTARS IT

Crossplane demo

GitOps with Crossplane

- Just add a GitOps agent to your Kubernetes cluster!

Small scale scenario

- Single cluster
- Developer self-service

QSTARS IT

Large scale scenario

Workload clusters

Management cluster

QSTARS IT
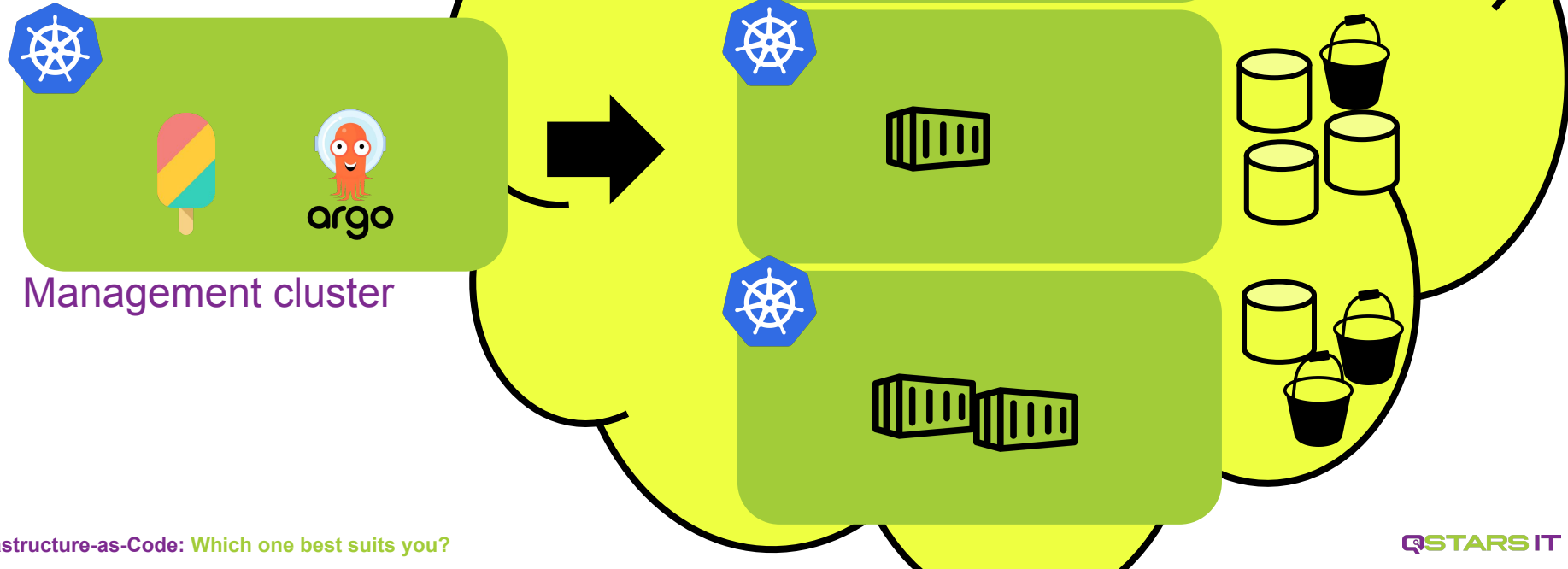
Solution 3: Pulumi

Why learn a new language for IaC,
if you already master
a programming language?

QSTARS IT

Pulumi demo

GitOps with Pulumi

- Pulumi includes GitOps solutions
    - Integrations with GitHub Actions, Azure DevOps, GitLab CI, Bitbucket, etc...
- Spacelift - https://spacelift.io/

QSTARS IT

So...

QSTARS IT

What do you think now?

QSTARS IT

Thank you for attending my talk!

Ernest Neijenhuis | Platform Engineer | ernest@qstars.nl

https://linkedin.com/in/ernestneijenhuis/

QSTARS IT