

› CLOUDS, CONTAINERIZATION, CI/CD

Current & future research

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TNO innovation
for life

CLOUD-NATIVE APPLICATIONS

“Cloud-native is a term describing software designed to run and scale reliably and predictably on top of potentially unreliable cloud-based infrastructure.”

“Cloud-native applications are purposefully designed to be infrastructure unaware, meaning they are decoupled from infrastructure and free to move as required.”

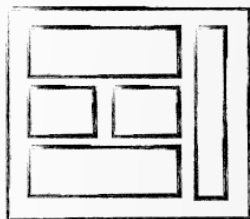
Source: Cloud Foundry: The Cloud-Native Platform, Duncan C. E. Winn

DESIGN

DEPLOY

MANAGE

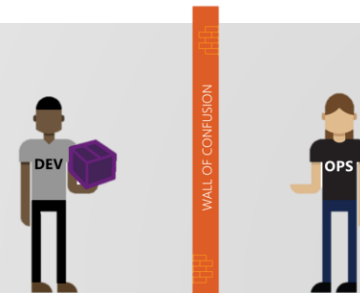
Traditional



Tightly coupled
components



Release once
every six months



“Not my
problem”

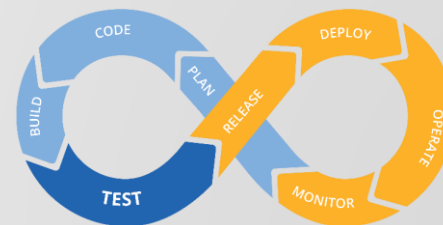
Modern



Loosely coupled
components



Release early
and often



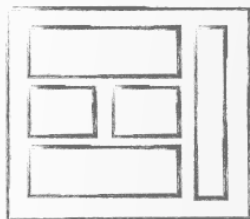
Shared
responsibilities

DESIGN

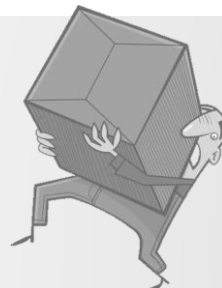
DEPLOY

MANAGE

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WALL OF CONFUSION



“Not my
problem”

Modern



Loosely coupled
components



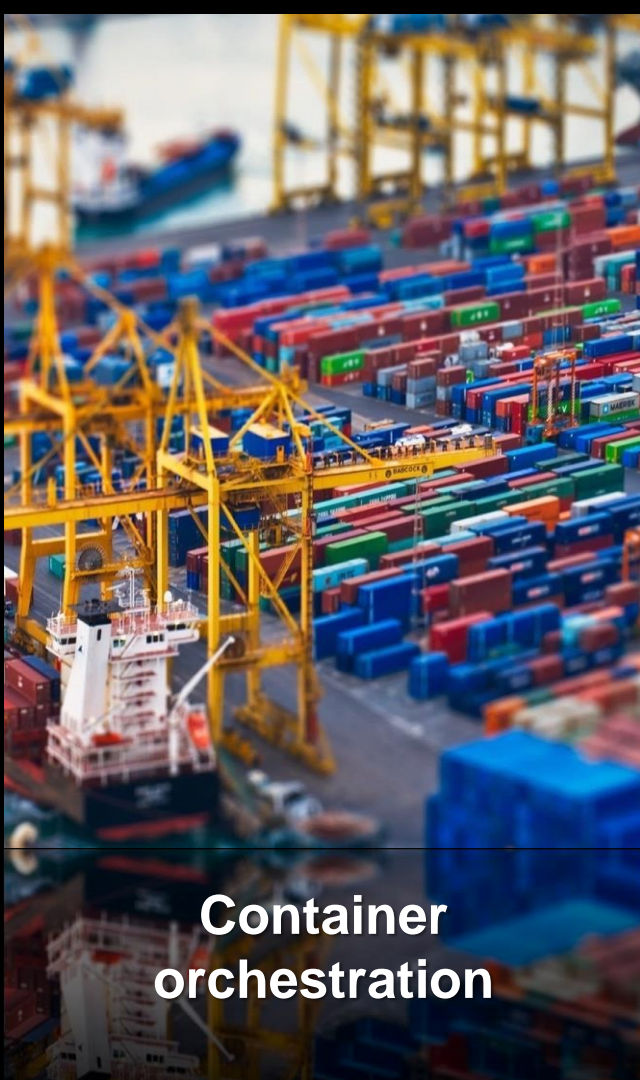
Release early
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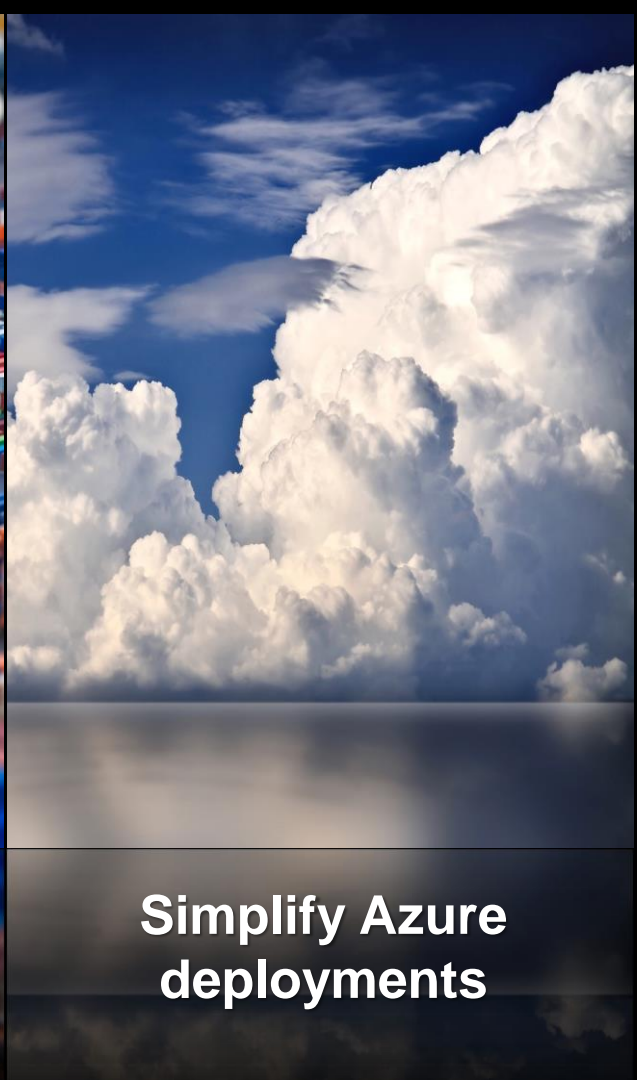
Shared
responsibilities



**Continuous Integration
with containers**



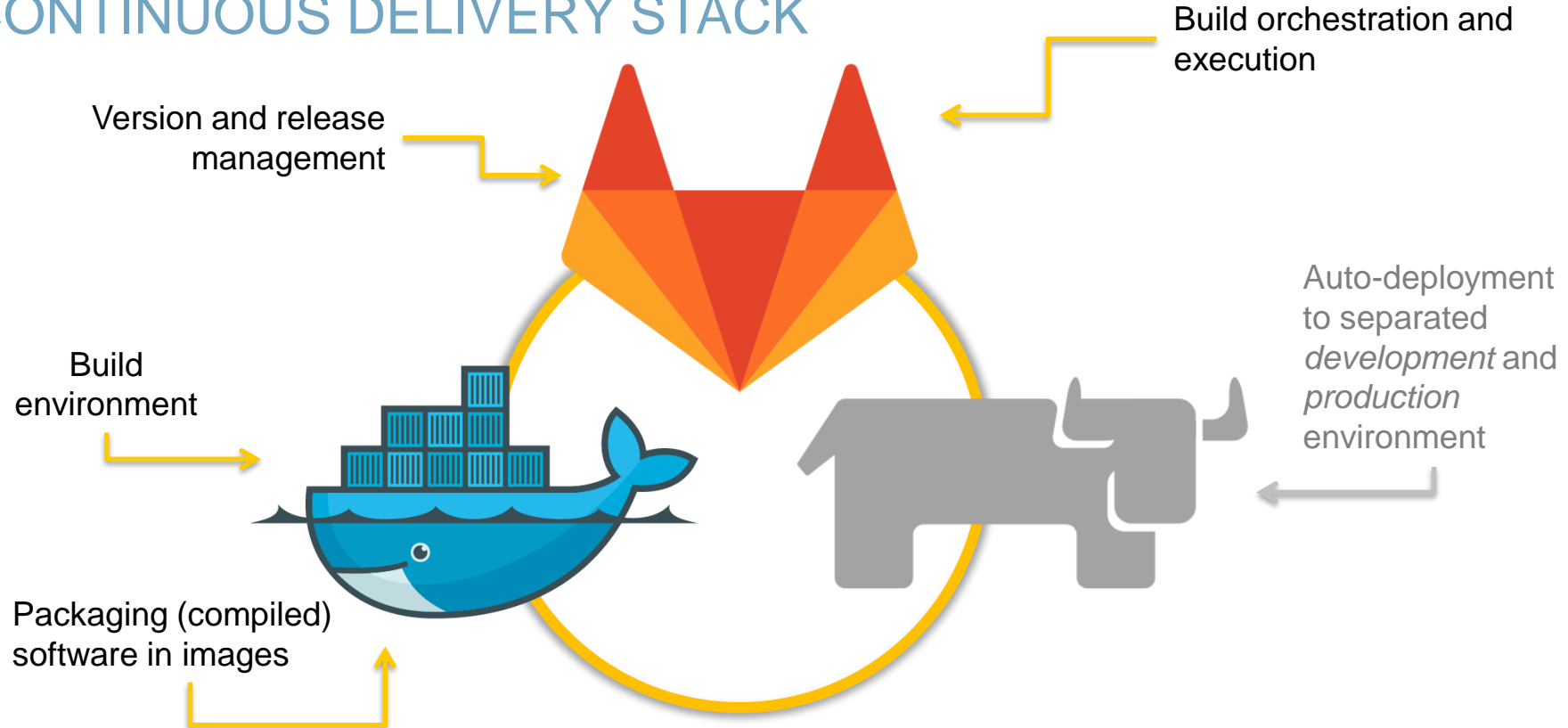
**Container
orchestration**



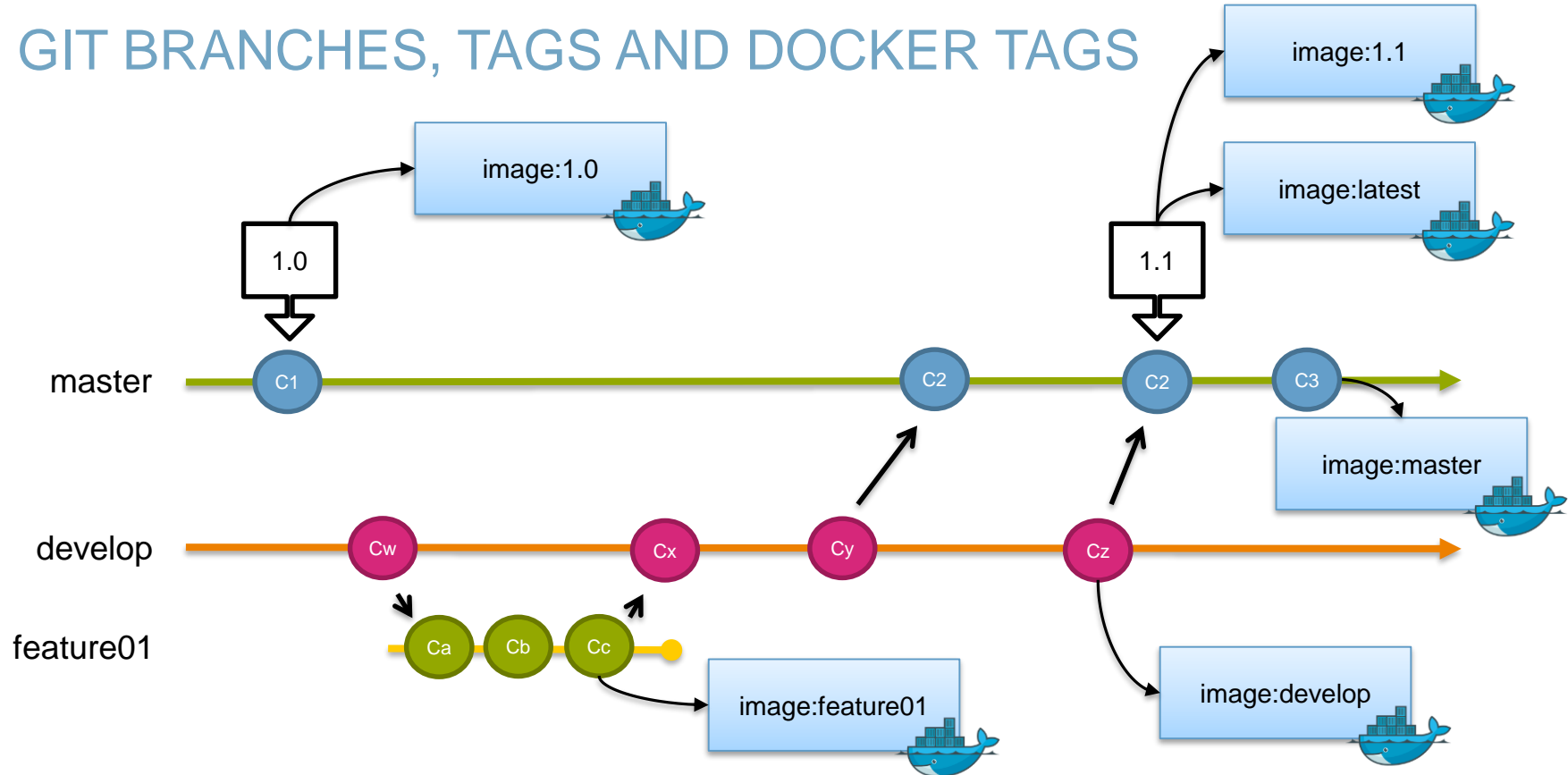
**Simplify Azure
deployments**

CONTINUOUS INTEGRATION WITH CONTAINERS

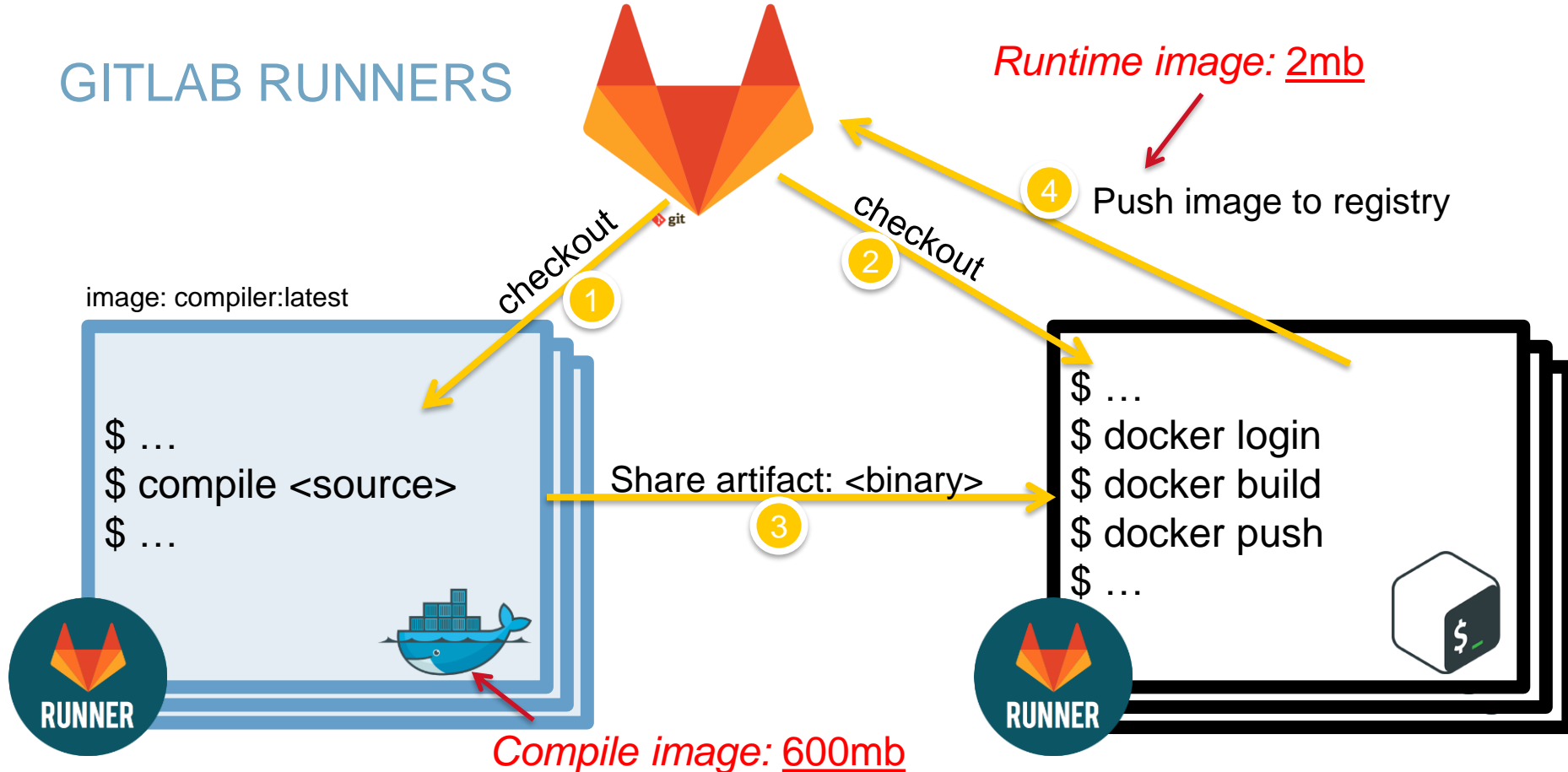
CONTINUOUS DELIVERY STACK



GIT BRANCHES, TAGS AND DOCKER TAGS



GITLAB RUNNERS



CONTAINER ORCHESTRATION

WHAT IS AN ORCHESTRATOR?



Architecture

Composition and stitching.



Workflow & Policies

Scaling, load balancing, fault tolerancy, resource optimization, adapting to faults.

PETS



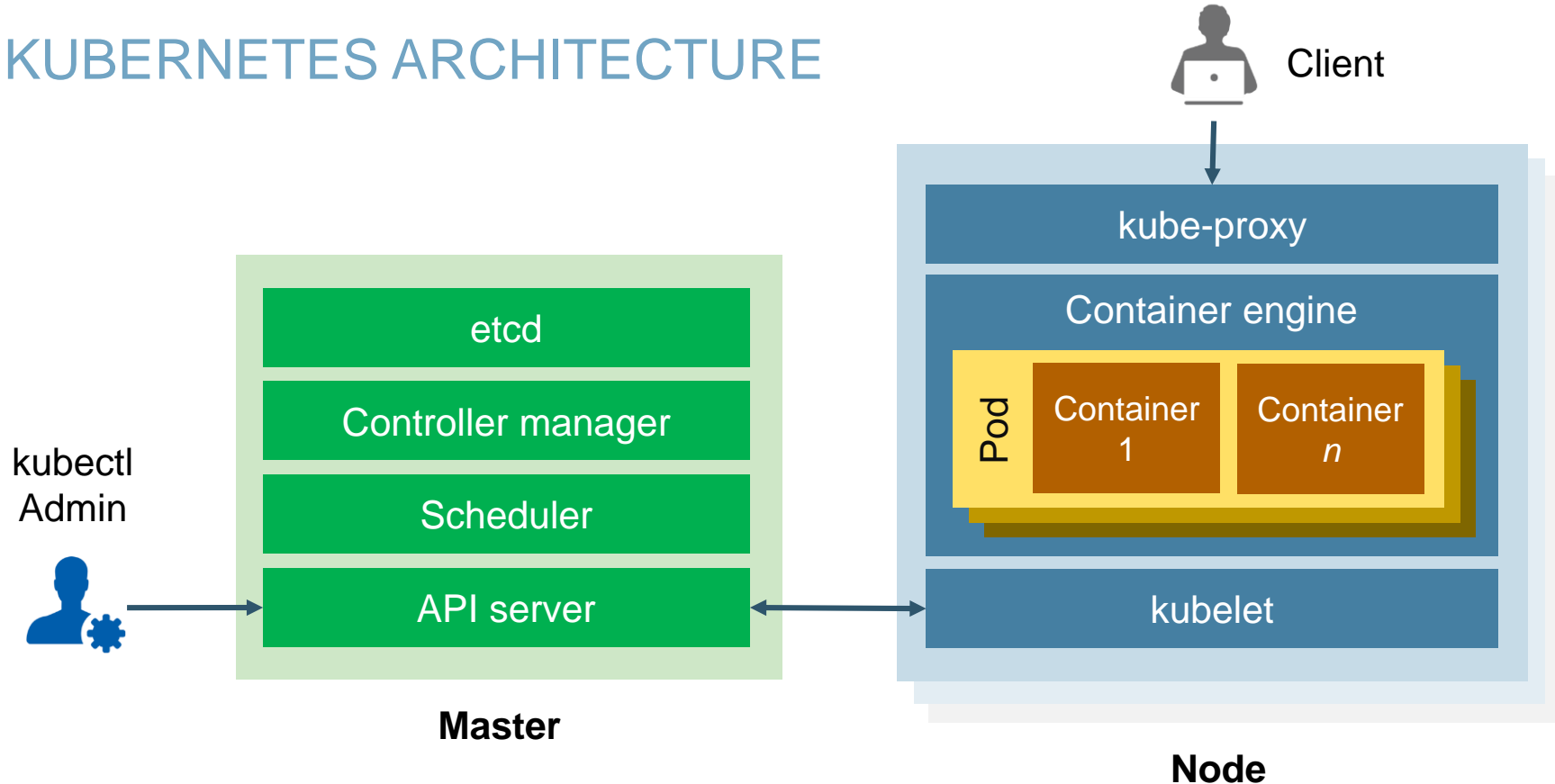
- Given names like frontend.xyz.org
- Unique, lovingly raised and cared for
- When they get ill, you nurse them back to health

CATTLE



- Given numbers like sparkworker-32
- Almost identical to other cattle
- When they get ill, you get another one

KUBERNETES ARCHITECTURE

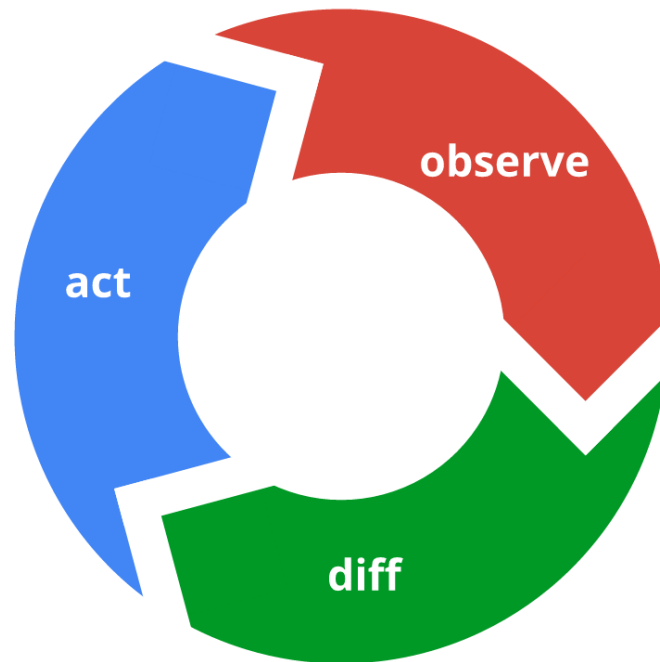


REPLICA SETS & DEPLOYMENTS

Drive the cluster to a desired state by ensuring N copies of a pod is always running:

- Too few? Start new ones.
- Too many? Kill some.

Also used for upgrading and rollbacks of versions of containers.

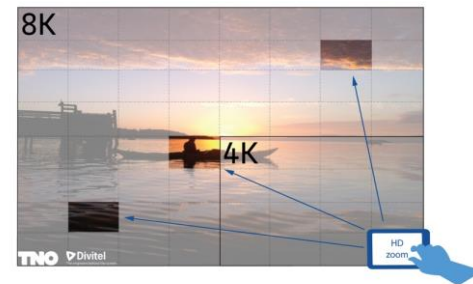


› SIMPLIFY AZURE DEPLOYMENTS

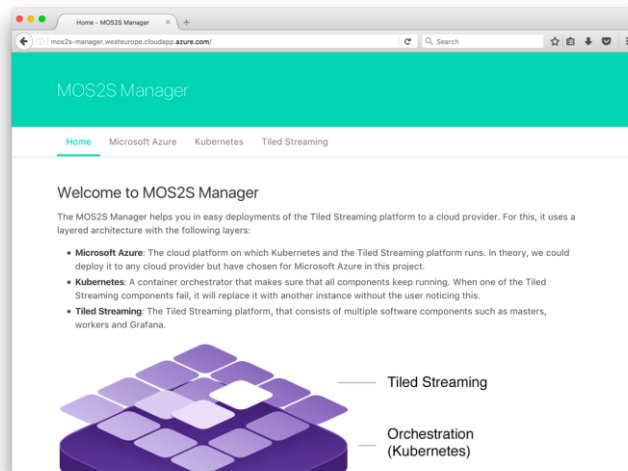
CURRENT WAY



Tiled Streaming
ARM files



NEW WAY



1. Python flask web-app that runs 24/7 on a cheap Azure VM (in a container).



2. Using *azure pip* package to deploy Kubernetes with Azure Container Service.



kubernetes



3. Using *kubectl* to deploy Tiled Streaming.



› OTHER RESEARCH TOPICS

- Hybrid clusters (Windows + Linux) with Kubernetes and Mesos
- Enhancing CI/CD pipeline with:
 - CVE/vulnerability scanning on images
 - Stress/performance testing
 - Test environments for (feature) merge requests
- Traceability and unified logging
- Enhanced isolation (Intel Clear Containers, unikernels)
- Rollback/recovery in production

**THANKS FOR
YOUR ATTENTION!**

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