DevOps 2TIN

Chapter 6

DTAP & Environments on demand

PXL DE HOGESCHOOL MET HET NETWERK

Elfde-Liniestraat 24, 3500 Hasselt, www.pxl.be

DTAP

Wat is het
Configuratie management
Mutable infrastructuur
Pets Vs. Cattle
Docker

Wat is een Pipeline?

Definitie “deployment pipeline”:

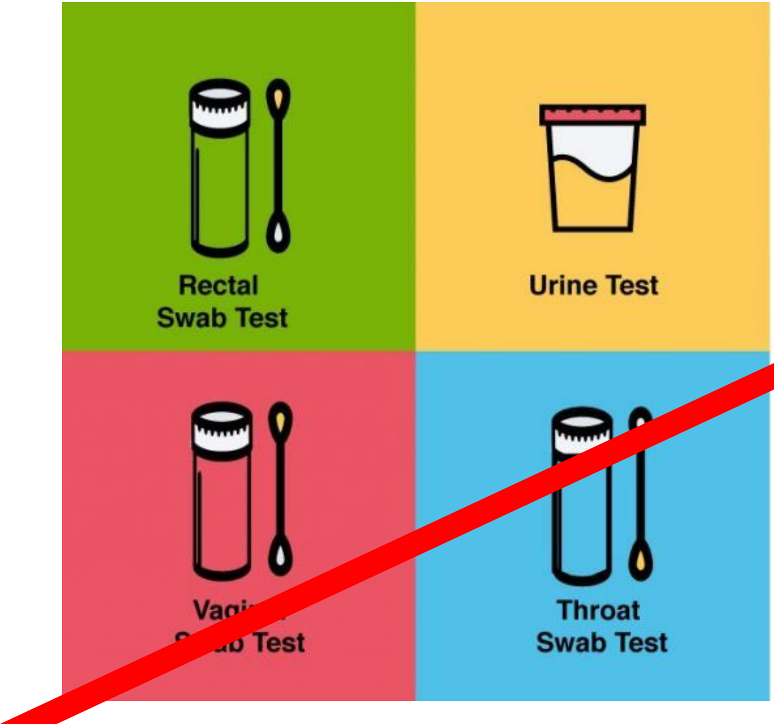
(first defined by Jez Humble and David Farley in their book *Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation*)

It ensures that all code checked in to version control is automatically built and tested in a production-like environment.

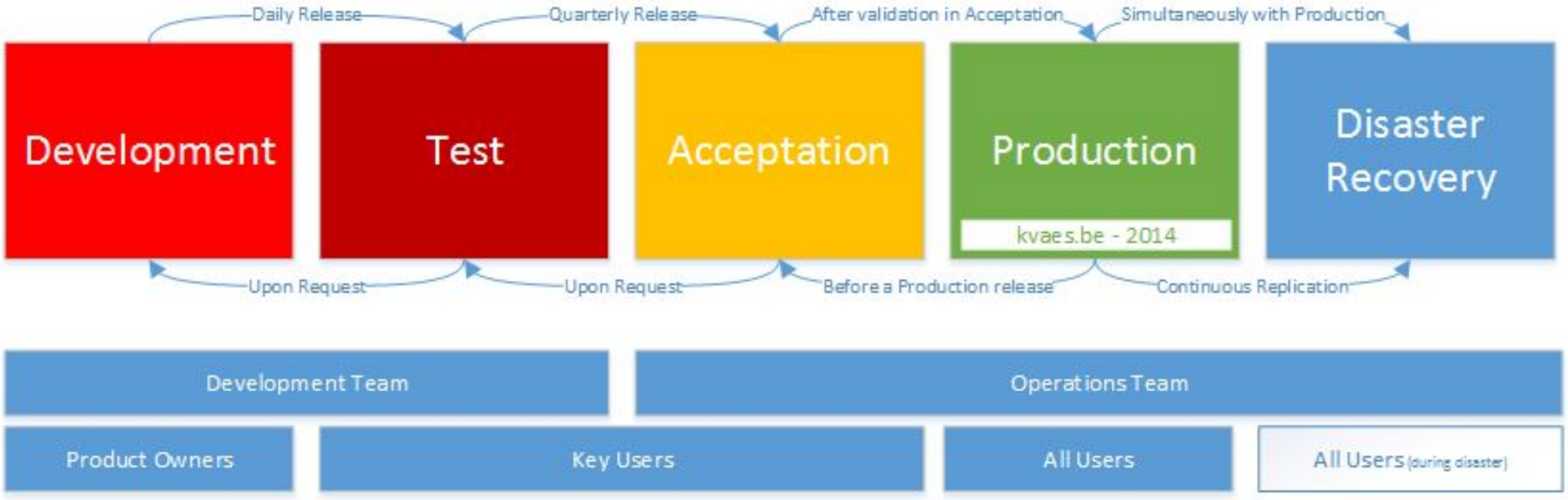
Sleutelwoorden:

- Alle Code
- Versiebeheer
- Automatisch gebouwd
- Automatisch getest
- **Productie-waardige omgeving**

Wat is een DTAP?



Wat is DTAP?

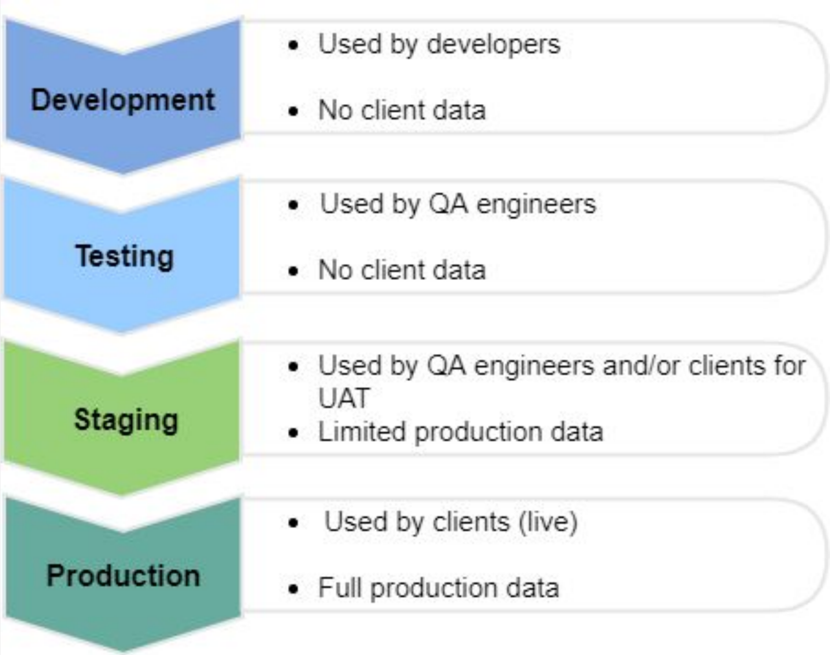


Source: https://kvaes.wordpress.com/2014/10/26/the-dtap-street-a-phased-approach-to-a-development-deployment-cycle/

Iedereen een omgeving - Recap

Automatiseren van de deploy

- Omgeving in orde maken
  - Dependencies
  - omgeving specifieke parameters, credentials, secrets, ...



Development
- Used by developers
- No client data

Testing
- Used by QA engineers
- No client data

Staging
- Used by QA engineers and/or clients for UAT
- Limited production data

Production
- Used by clients (live)
- Full production data

Code	Dependencies	build	(unit)test	archive artifact	Deploy to QA	Deploy to production
CI					CD	

Deployment Pipeline

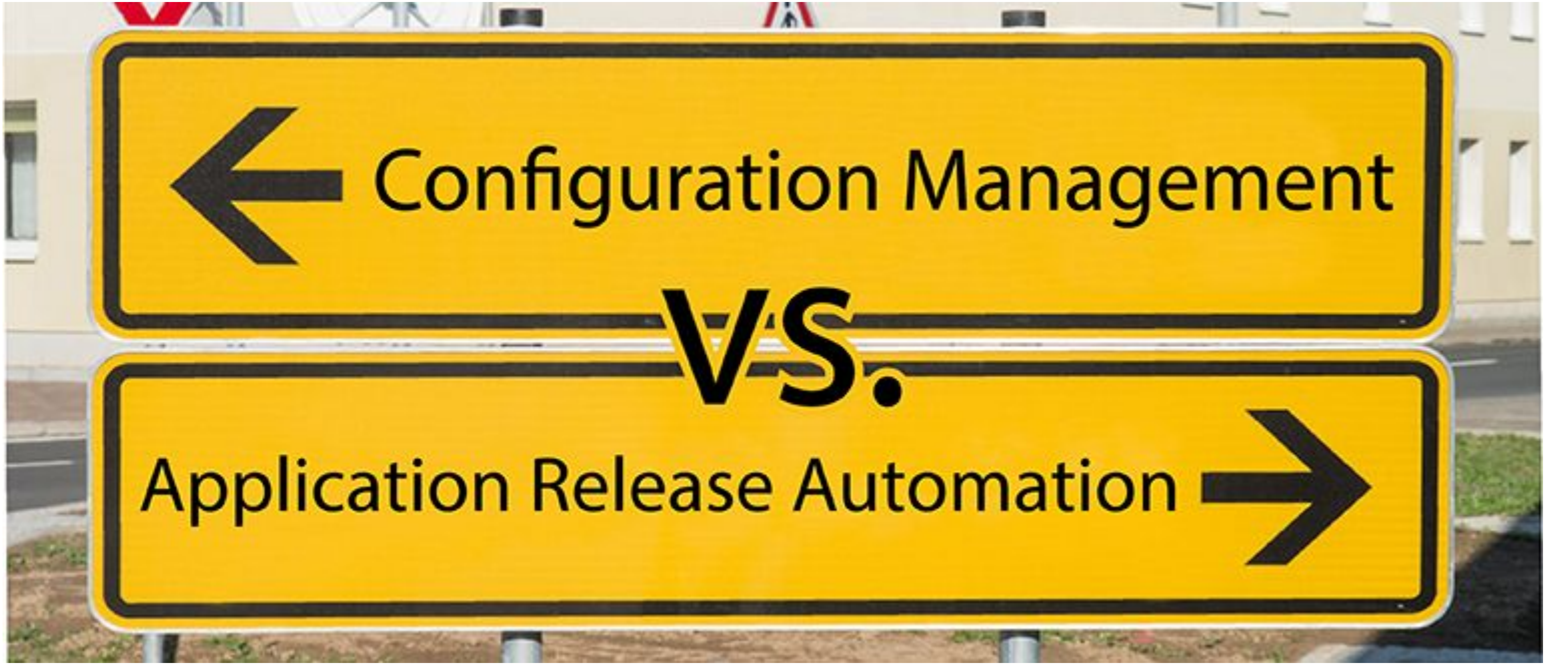
Omgevingen zijn onderdeel van de Continuous Deployment stappen van de Pipeline:

- Definitie:

  Continuous deployment (**CD**) is a software engineering approach in which software functionalities are delivered frequently through automated deployments (-Wikipedia)

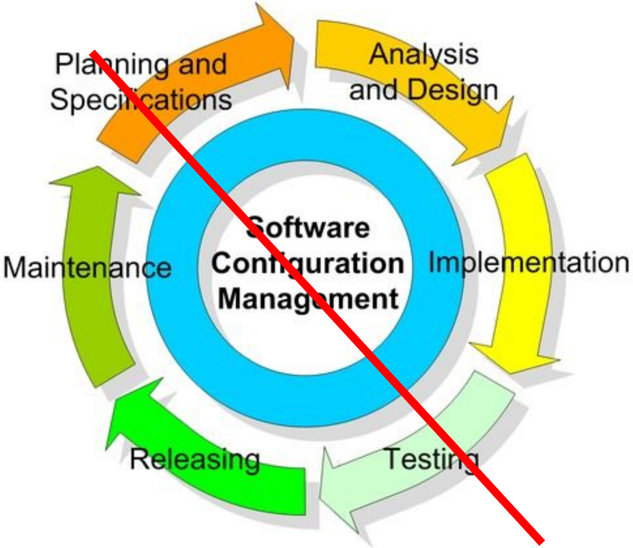
Elke omgeving wordt opgezet met specifieke doelen, vroeger manueel, nu als het kan automatisch, om de applicatie te testen en valideren alvorens deze naar de volgende omgeving gaat, met als doel Productie te bereiken.

Differentiëren per omgeving



Configuration management

Geen ITIL


Planning and Specifications
Analysis and Design
Implementation
Testing
Releasing
Maintenance
Software Configuration Management

Wel configuratie parameters zoals :

- IP adressen
- API endpoints
- Credentials
- (test)data

Configuration management

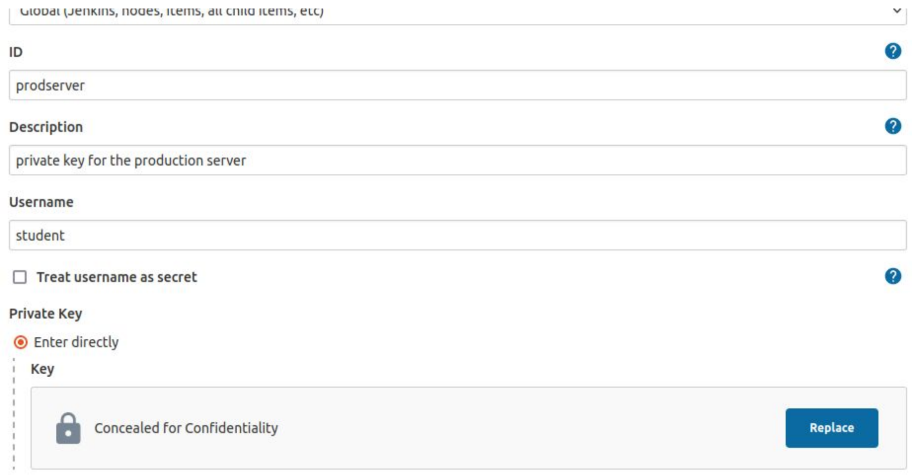
Voorlopig Manueel / semi-geautomatiseerd (best practices):

- Aparte repository voor configuration data
    - Single source of truth
- Georganiseerd per omgeving (Test, Acceptatie, Productie)
- In-line toevoegen aan deploy in Jenkins.

Later automatisch met Configuration Management Tools, nu semi automatisch via bv. ssh / scp / docker

SSH & sshagent plugin in jenkins

- SSH authenticatie naar verschillende servers
    - private & public keys (ssh-keygen)
    - Zie opdracht security essentials 1TIN
- sshagent
    - plugin voor jenkins
    - gebruik van keys bij ssh commando's als authenticatie
    - integratie met credential manager



Global (Jenkins, nodes, items, all child items, etc)

ID

prodserver

Description

private key for the production server

Username

student

□ Treat username as secret

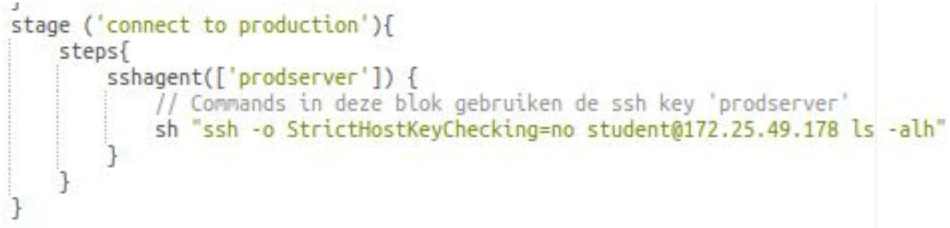
Private Key

● Enter directly

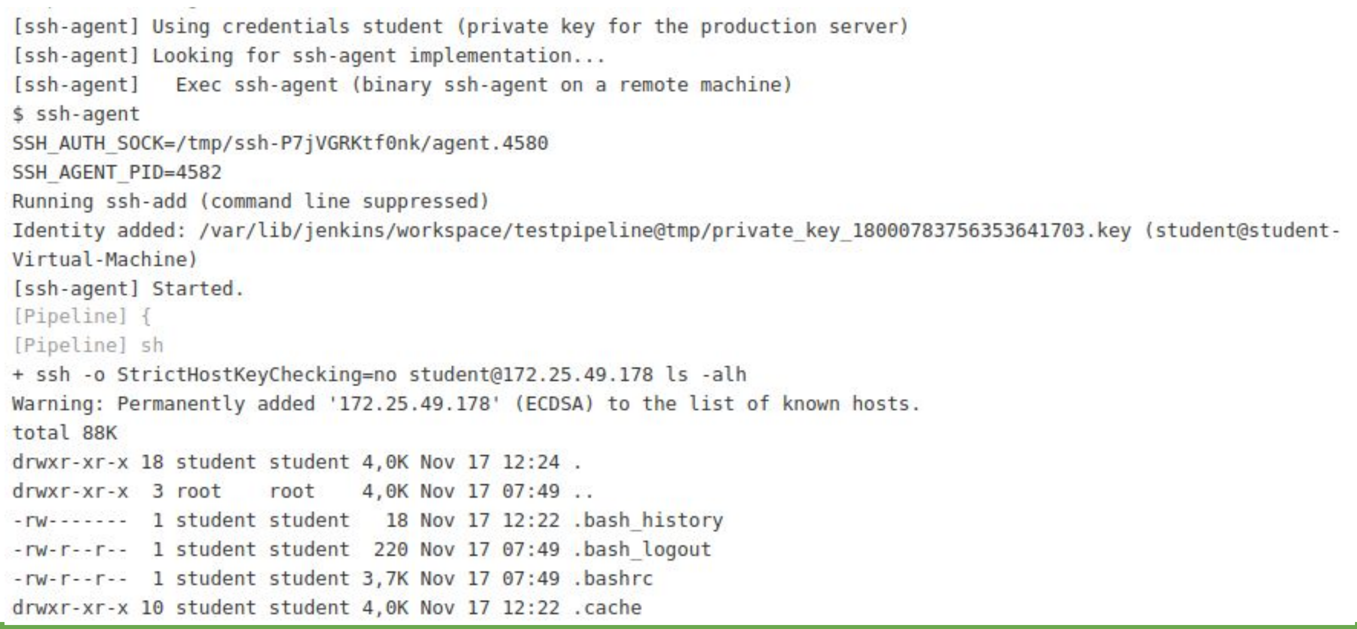
Key

Concealed for Confidentiality

SSH & SSH agent plugin in jenkins



```
stage ('connect to production'){
    steps{
        sshagent(['prodserver']) {
            // Commands in deze blok gebruiken de ssh key 'prodserver'
            sh "ssh -o StrictHostKeyChecking=no student@172.25.49.178 ls -alh"
        }
    }
}
```



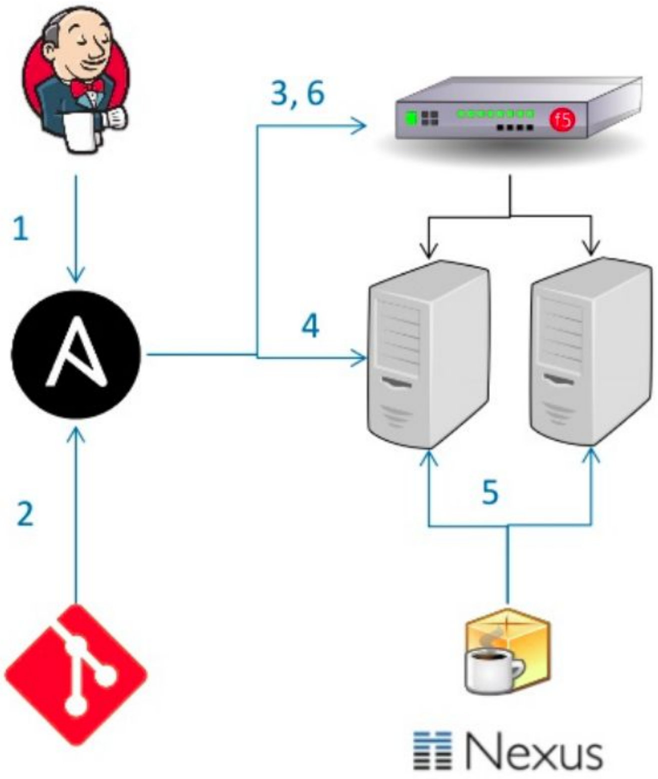
```
[ssh-agent] Using credentials student (private key for the production server)
[ssh-agent] Looking for ssh-agent implementation...
[ssh-agent]   Exec ssh-agent (binary ssh-agent on a remote machine)
$ ssh-agent
SSH_AUTH_SOCK=/tmp/ssh-P7jVGRKtf0nk/agent.4580
SSH_AGENT_PID=4582
Running ssh-add (command line suppressed)
Identity added: /var/lib/jenkins/workspace/testpipeline@tmp/private_key_18000783756353641703.key (student@student-
Virtual-Machine)
[ssh-agent] Started.
[Pipeline] {
[Pipeline] sh
+ ssh -o StrictHostKeyChecking=no student@172.25.49.178 ls -alh
Warning: Permanently added '172.25.49.178' (ECDSA) to the list of known hosts.
total 88K
drwxr-xr-x 18 student student 4,0K Nov 17 12:24 .
drwxr-xr-x  3 root    root    4,0K Nov 17 07:49 ..
-rw-------  1 student student   18 Nov 17 12:22 .bash_history
-rw-r--r--  1 student student  220 Nov 17 07:49 .bash_logout
-rw-r--r--  1 student student 3,7K Nov 17 07:49 .bashrc
drwxr-xr-x 10 student student 4,0K Nov 17 12:22 .cache
```

Configuration management

Later automated:

1. triggers deployment run
2. playbook checkout
3. remove from loadbalancer
4. deployment tasks
5. download software artefact
6. put back in loadbalancer

- same playbook in every $ENV



Application Release Automation

=

“we nemen het build artifact, kopiëren en unpacken het op de server, toch eh?”

ARA Tools = Hype Enterprise tooling terminologie

MAAR definitie kan ons helpen:

Application release automation provides a number of benefits, including:

- Streamlining processes
- Reducing timelines and decreasing manual tasks
- Increasing departmental agility and flexibility
- Improving productivity and collaboration while controlling risk

Application Release Automation made easier

Laat ons beginnen bij het begin:

Build once, deploy anywhere - maar niet elke omgeving is gelijk, toch?

Applicatie dependencies → Calculator-App: NodeJS, libraries, … ?

Oplossing voor elke deploy omgeving: Manueel dependencies in orde maken

OF:

Build once, pack correctly, deploy anywhere

Voordelen van applicatie in docker te bouwen:

- Runs anywhere*
- Dependencies included
- Promote immutable infrastructure

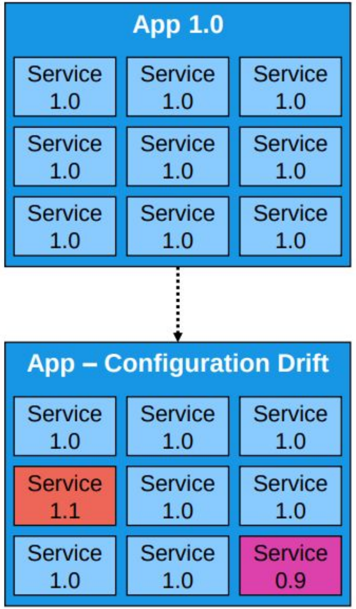
Immutable wat?

*waar docker op werkt

Mutable & immutable infrastructuur

Mutable Infrastructure

- Infrastructure will be **continually updated**, patched and tuned to meet the ongoing needs of the purpose it serves.
- Over time, as you apply more and more updates, each server builds up a **unique history of changes.**
- As a result, each service becomes slightly different than all the others, leading to **configuration drift** and can result to bugs which can be difficult to diagnose and reproduce.



App 1.0

Service 1.0	Service 1.0	Service 1.0
Service 1.0	Service 1.0	Service 1.0
Service 1.0	Service 1.0	Service 1.0

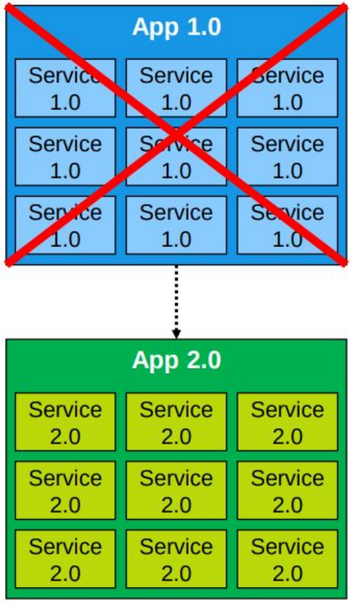
App – Configuration Drift

Service 1.0	Service 1.0	Service 1.0
Service 1.1	Service 1.0	Service 1.0
Service 1.0	Service 1.0	Service 0.9

Mutable & immutable infrastructuur

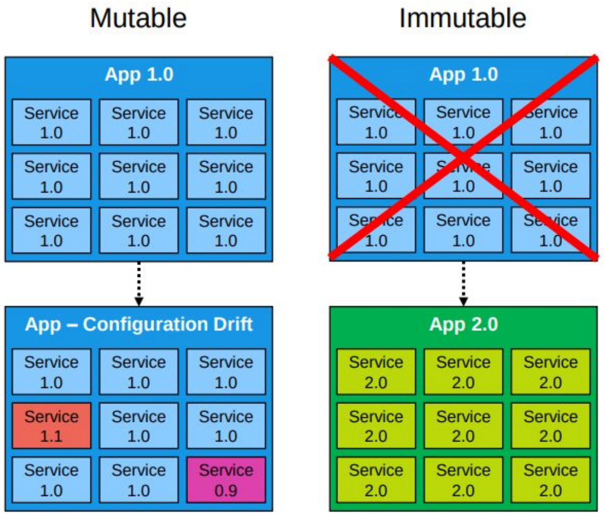
Immutable Infrastructure

- Using **Infrastructure-As-Code** to deploy machine images created by Docker, result "changes" to be deployments of a completely new app version.
- Reduces the likelihood of **configuration drift** bugs, makes it easier to know exactly what software is running on each server.
- **Automated testing** are more effective, as an immutable image that passes your tests in the test environment is likely to behave exactly the same way in the production.

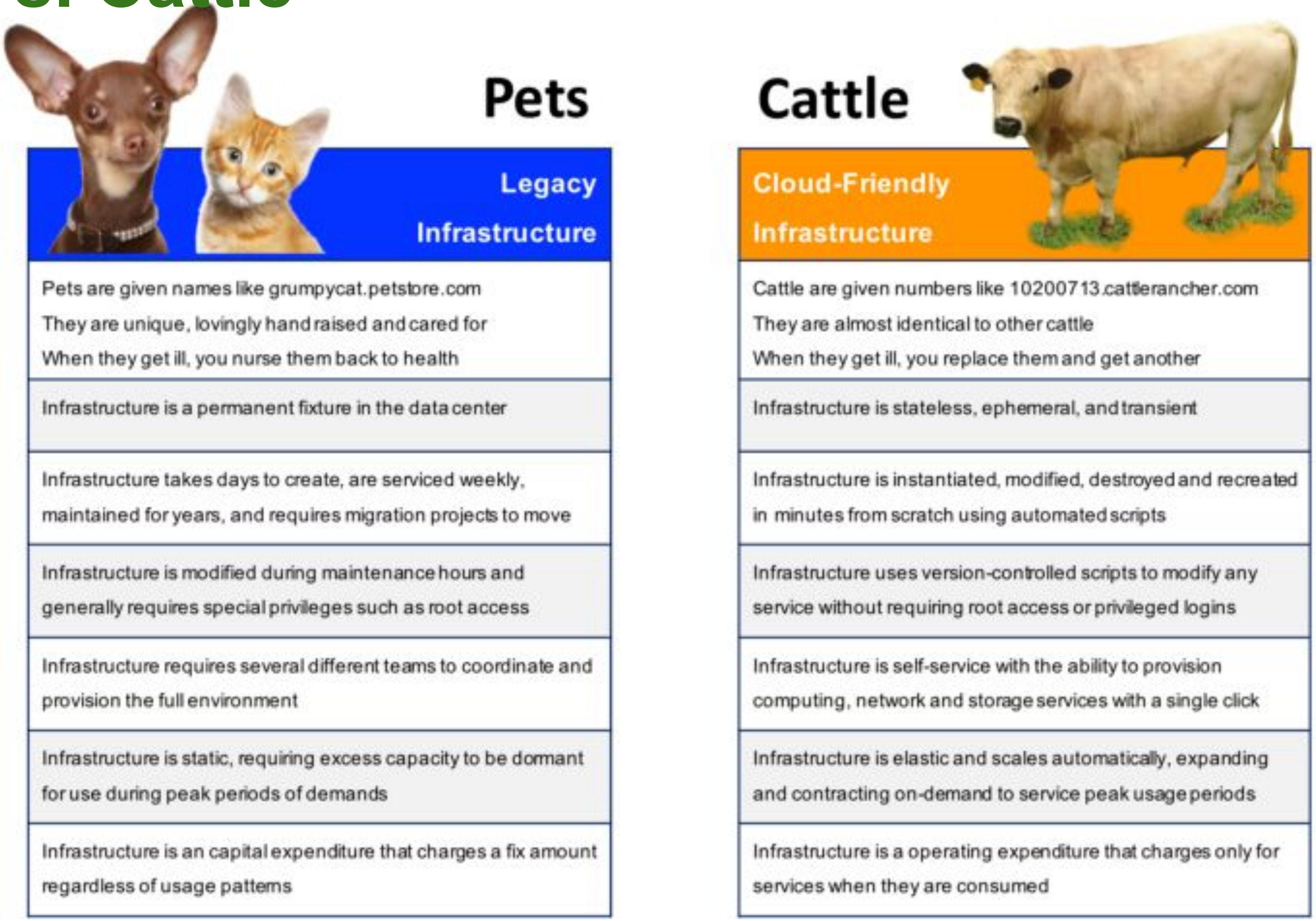


Mutable & immutable infrastructuur

- The **Pets and Cattle** debate.
- One approach is not necessary better then the other, it depends on your use-case.
- With the mutable approach, the team needs to be aware of the infrastructure "history".
- Generally speaking, the immutable approach is better for stateless applications.
- Immutable drives no deviation and no changes. It is what it is.

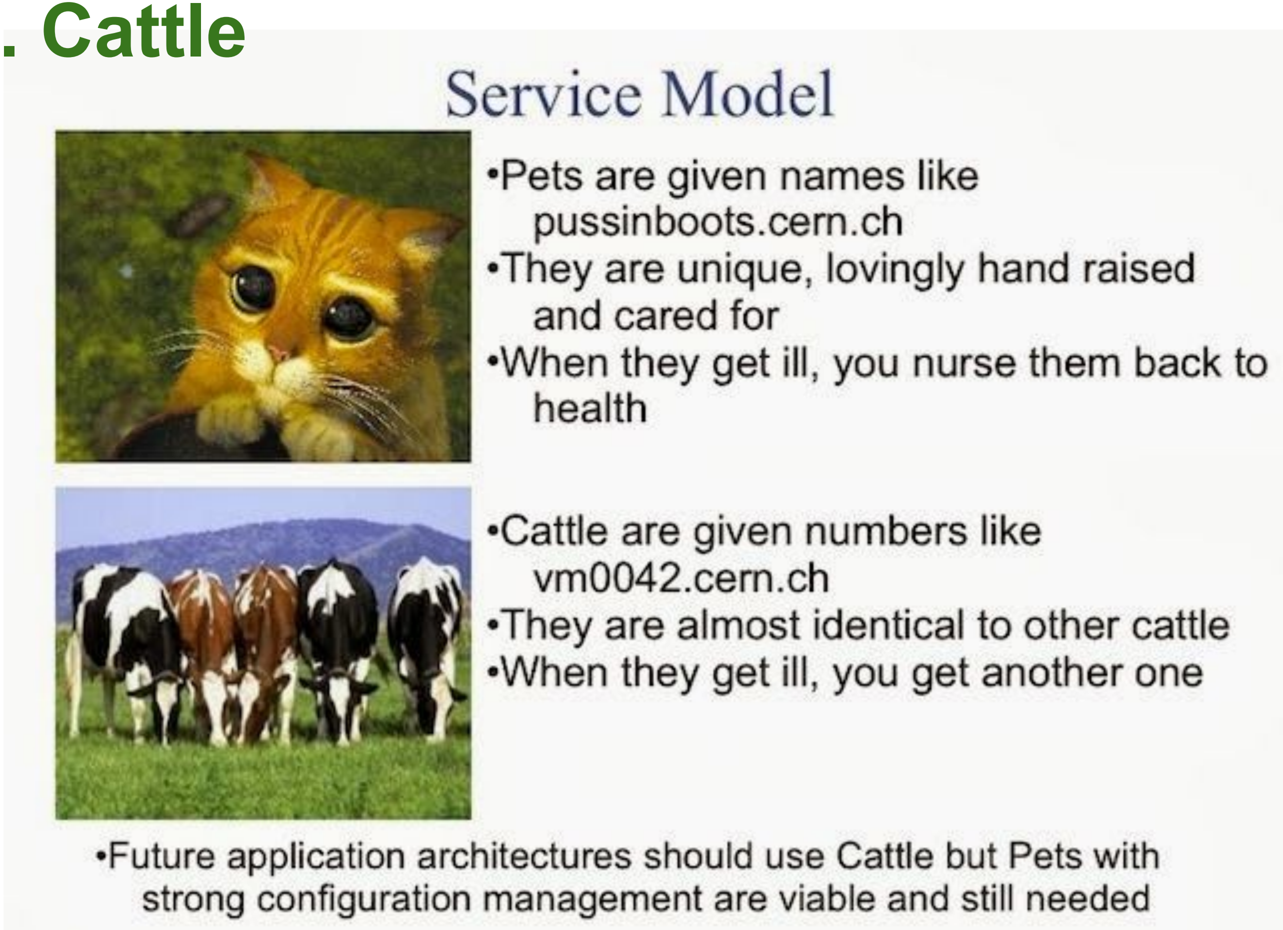


Pets Vs. Cattle



Pets	Cattle
Legacy Infrastructure	Cloud-Friendly Infrastructure
Pets are given names like grumpycat.petstore.com They are unique, lovingly hand raised and cared for When they get ill, you nurse them back to health	Cattle are given numbers like 10200713.cattlerancher.com They are almost identical to other cattle When they get ill, you replace them and get another
Infrastructure is a permanent fixture in the data center	Infrastructure is stateless, ephemeral, and transient
Infrastructure takes days to create, are serviced weekly, maintained for years, and requires migration projects to move	Infrastructure is instantiated, modified, destroyed and recreated in minutes from scratch using automated scripts
Infrastructure is modified during maintenance hours and generally requires special privileges such as root access	Infrastructure uses version-controlled scripts to modify any service without requiring root access or privileged logins
Infrastructure requires several different teams to coordinate and provision the full environment	Infrastructure is self-service with the ability to provision computing, network and storage services with a single click
Infrastructure is static, requiring excess capacity to be dormant for use during peak periods of demands	Infrastructure is elastic and scales automatically, expanding and contracting on-demand to service peak usage periods
Infrastructure is an capital expenditure that charges a fix amount regardless of usage patterns	Infrastructure is a operating expenditure that charges only for services when they are consumed

Pets Vs. Cattle



Service Model

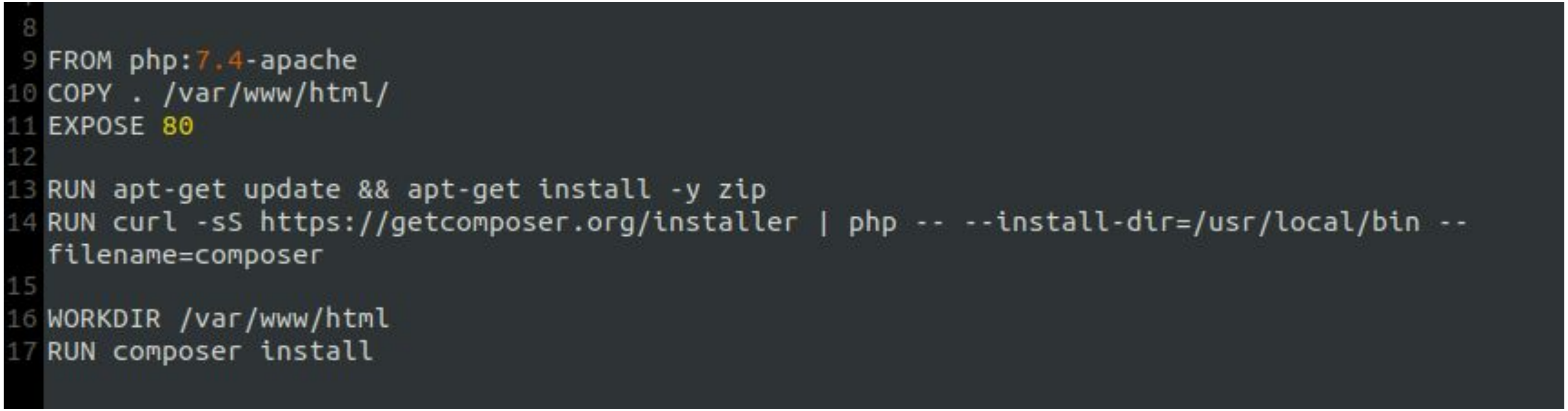
- Pets are given names like pussinboots.cern.ch
- They are unique, lovingly hand raised and cared for
- When they get ill, you nurse them back to health

- Cattle are given numbers like vm0042.cern.ch
- They are almost identical to other cattle
- When they get ill, you get another one

- Future application architectures should use Cattle but Pets with strong configuration management are viable and still needed

Maar dus...Docker:

Dockerfile:



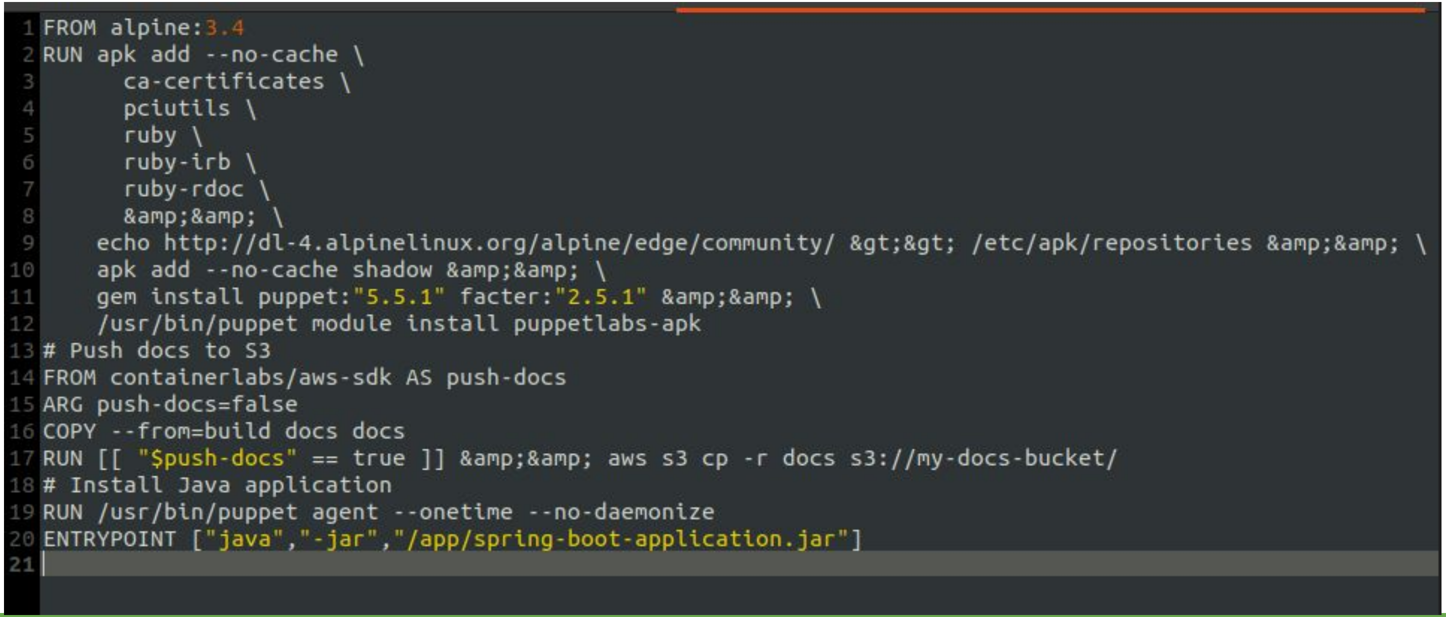
```
FROM php:7.4-apache
COPY . /var/www/html/
EXPOSE 80

RUN apt-get update && apt-get install -y zip
RUN curl -sS https://getcomposer.org/installer | php -- --install-dir=/usr/local/bin --filename=composer

WORKDIR /var/www/html
RUN composer install
```

Docker files moeten idempotent zijn.

a mixture of grass hay
alfalfa hay
grass silage
Any food
output

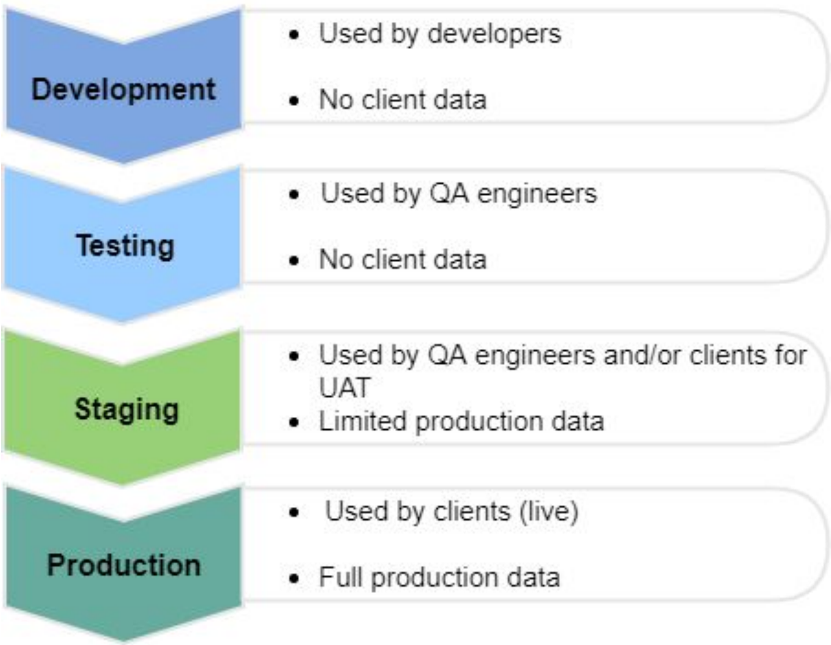
Dockerfiles moet dus NIET:

- Fixed versie nummers bevatten (in dit geval puppet)
- ervan uitgaan dat het toegang heeft tot bepaalde tools (puppet in dit geval)
- zomaar dingen naar het internet wegschrijven



```
FROM alpine:3.4
RUN apk add --no-cache \
      ca-certificates \
      pciutils \
      ruby \
      ruby-irb \
      ruby-rdoc \
      &amp;&amp; \
    echo http://dl-4.alpinelinux.org/alpine/edge/community/ &gt;&gt; /etc/apk/repositories &amp;&amp; \
    apk add --no-cache shadow &amp;&amp; \
    gem install puppet:"5.5.1" facter:"2.5.1" &amp;&amp; \
    /usr/bin/puppet module install puppetlabs-apk
# Push docs to S3
FROM containerlabs/aws-sdk AS push-docs
ARG push-docs=false
COPY --from=build docs docs
RUN [[ "$push-docs" == true ]] &amp;&amp; aws s3 cp -r docs s3://my-docs-bucket/
# Install Java application
RUN /usr/bin/puppet agent --onetime --no-daemonize
ENTRYPOINT ["java","-jar","/app/spring-boot-application.jar"]

```

Recap



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PLURALSIGHT

Title: **Building Reactive Microservices**
how to build good infrastructure, features importance of Idempotent operations . [1h26mins]

Title: **Getting Started with Ansible**
Introduction to this IaC tool that focuses heavily on idempotency [4h45mins]

Title: **Importance of DTAP environments - WordCampSG 2017**
Conference talk about the importance of the different environments. [17mins]

Assignments