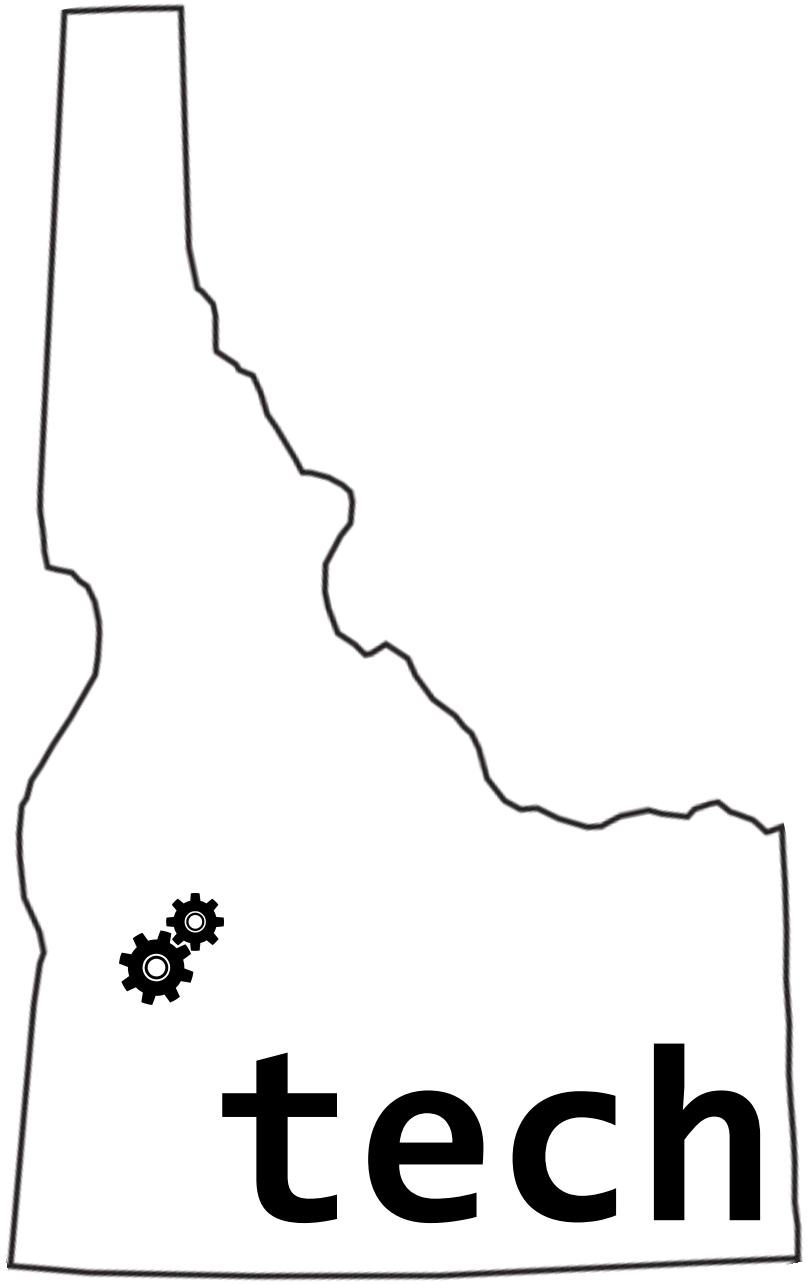
Cradlepoint's Journey to Kubernetes

Matt Messinger
Distinguished Engineer

@BoiseMatt

cradlepoint



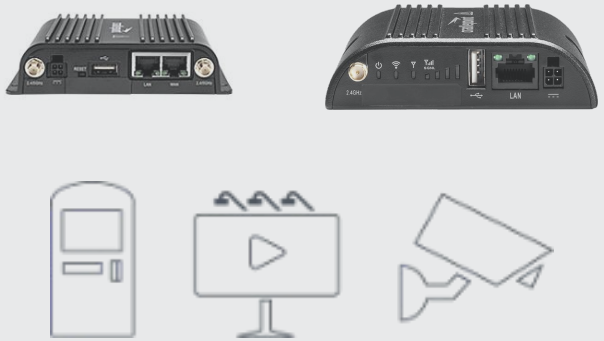
Kubernetes!

NetCloud Manager

Network Management | Analytics | Security

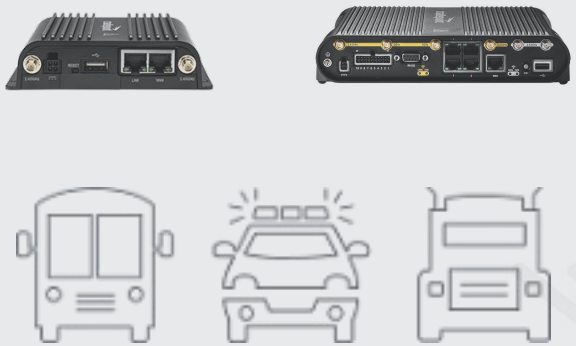
Branch Networks

SD-WAN | Edge Security | WLAN



IoT Networks

Internet of Things | Edge



Mobile Networks

SD-WAN | WiFi | Telematics

Industry leader in 4G/LTE network solutions and moving to 5G

NetCloud Manager - the early days.

2013 - 2015

The problem with success.

2016 - 2017

The problem of flexibility.

Too many ways to deploy code

Service(s)	CI	Artifact	Deployment Scripts (master → AWS)	OS Config on EC2 (app depend.)	Service Install on EC2	App Config on EC2 (environment & secrets)
A1, A2	Docker	debian	"stack-builder" tool	Chef	Native	Chef
B1	Docker	Docker & jar	custom bash + CloudFormation	Chef	Native	Chef
C1, C2, C3, C4, C5, C6	Docker	Docker	custom bash + CloudFormation	Salt	Docker	Consul/Vault
D1, D2	Docker	Docker & jar	custom bash + CloudFormation	Chef	Native	Chef
E1, E2, E3, E4, E5	Docker	Docker & deb	"marshal" tool	Salt	Kubernetes	Consul/Vault
F1, F2, F3	Docker	Docker & jar	"marshal" tool	Chef	Native	Chef
G1, G2	Docker	tar	"stackctl" tool	Salt	Native	Salt
H1, H2, H3, H4	Docker	debian	"stackctl" tool	Salt	Native	Salt
I1	None	tar	custom bash + CloudFormation	CloudFormation	Native	S3/KMS

Productivity Inhibitors

- Difficult to change teams
- Microservice maintenance challenges
- Local development was hard
- Creating new microservices was hard
- Too many deployment Jenkins jobs

R&D Productivity

Number of Developers × Developer Efficiency

The campaign for change.

Kube Squad

What are we going to build?

Design Objectives

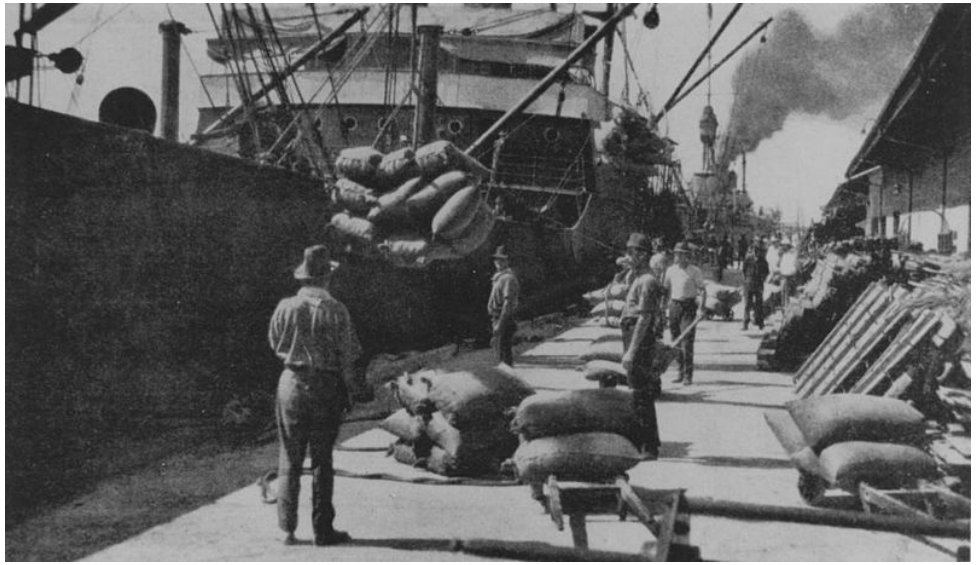
- Build a fully automated system test pipeline
- Simplify local development
- Simplify deploying services
- Simplify microservice bringup

How did we build it?

Container Standardization Metaphor

Old Way

Ad hoc and Manual



vs.

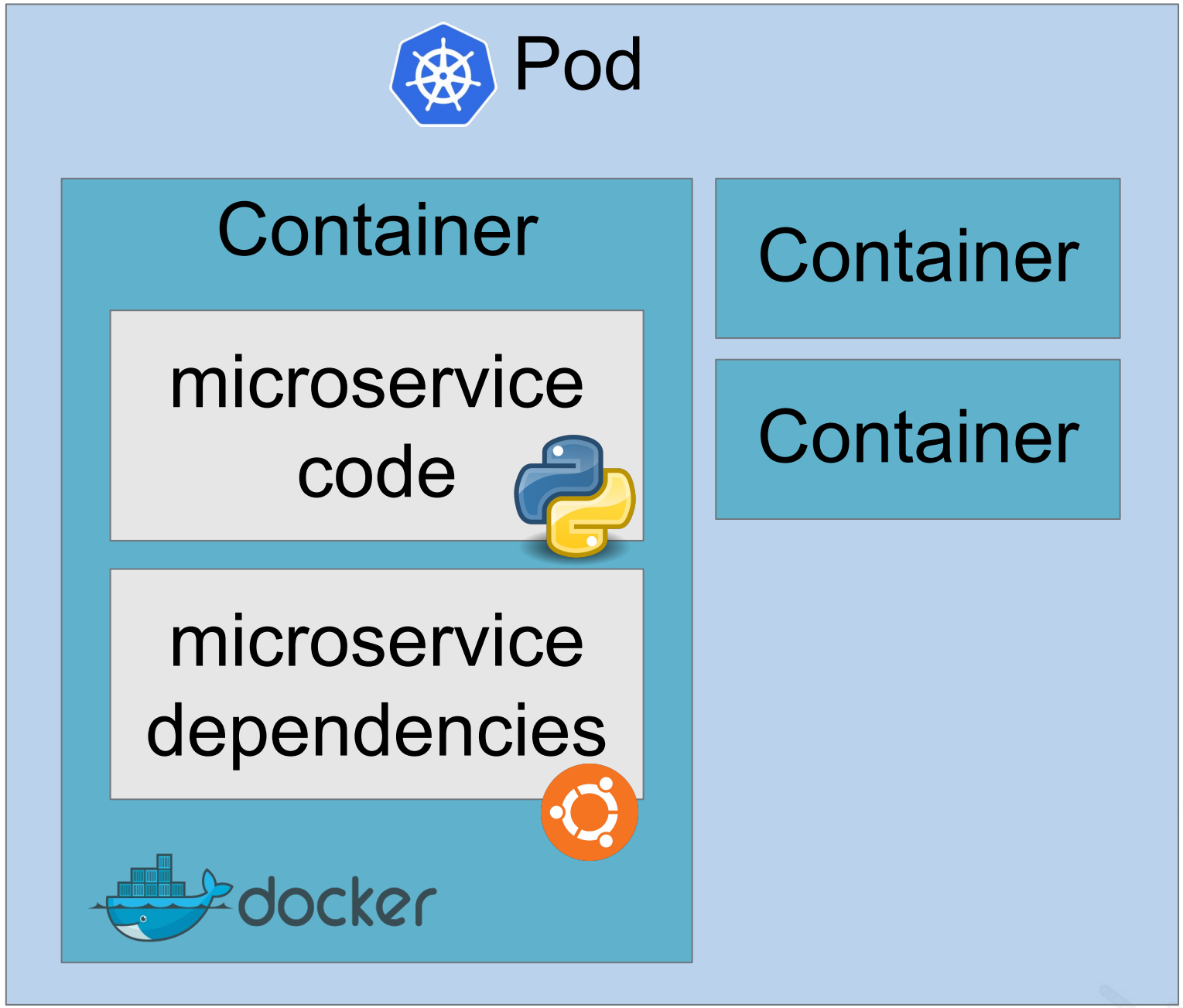
New Way

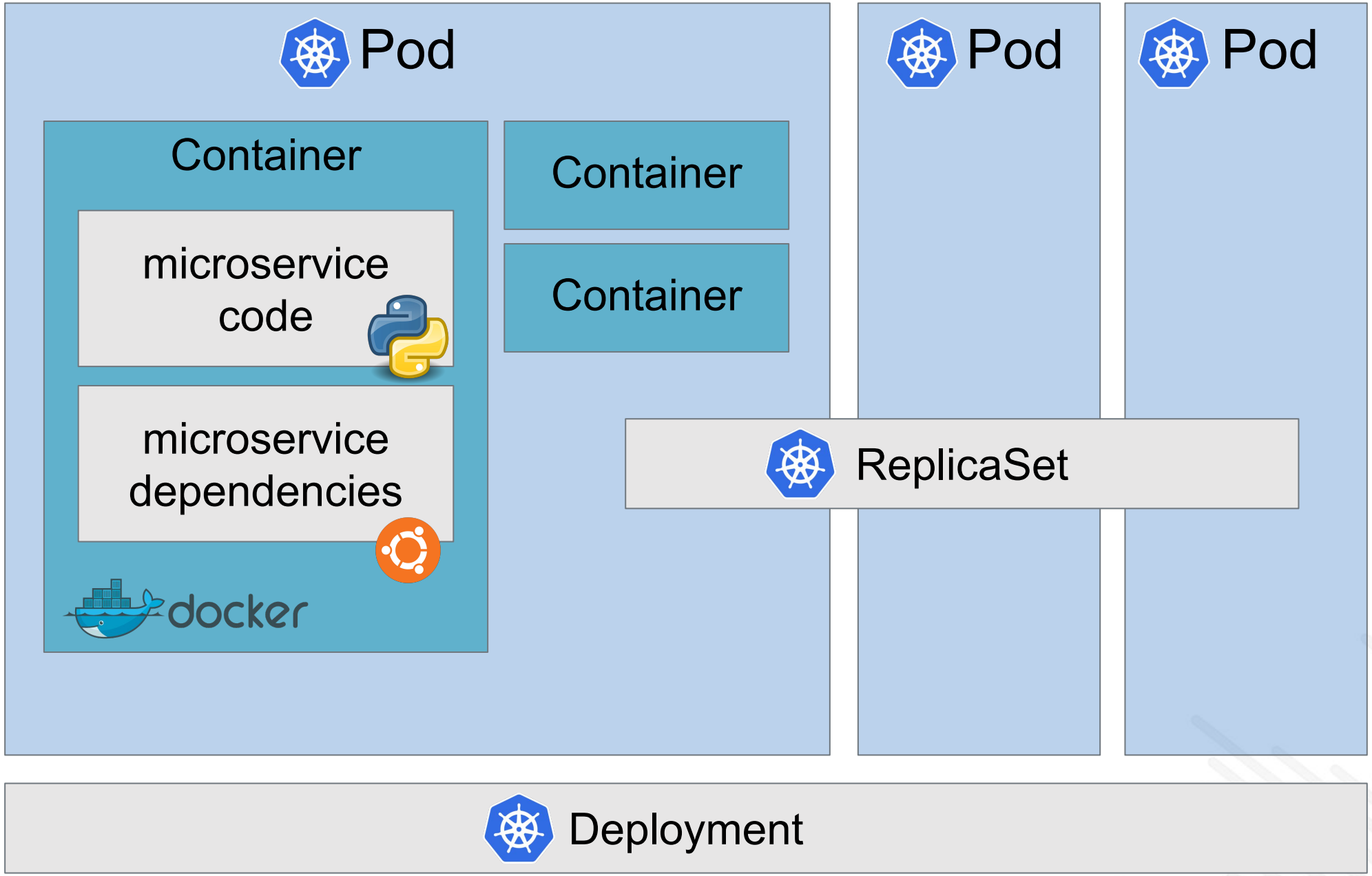
Standardized and Automated

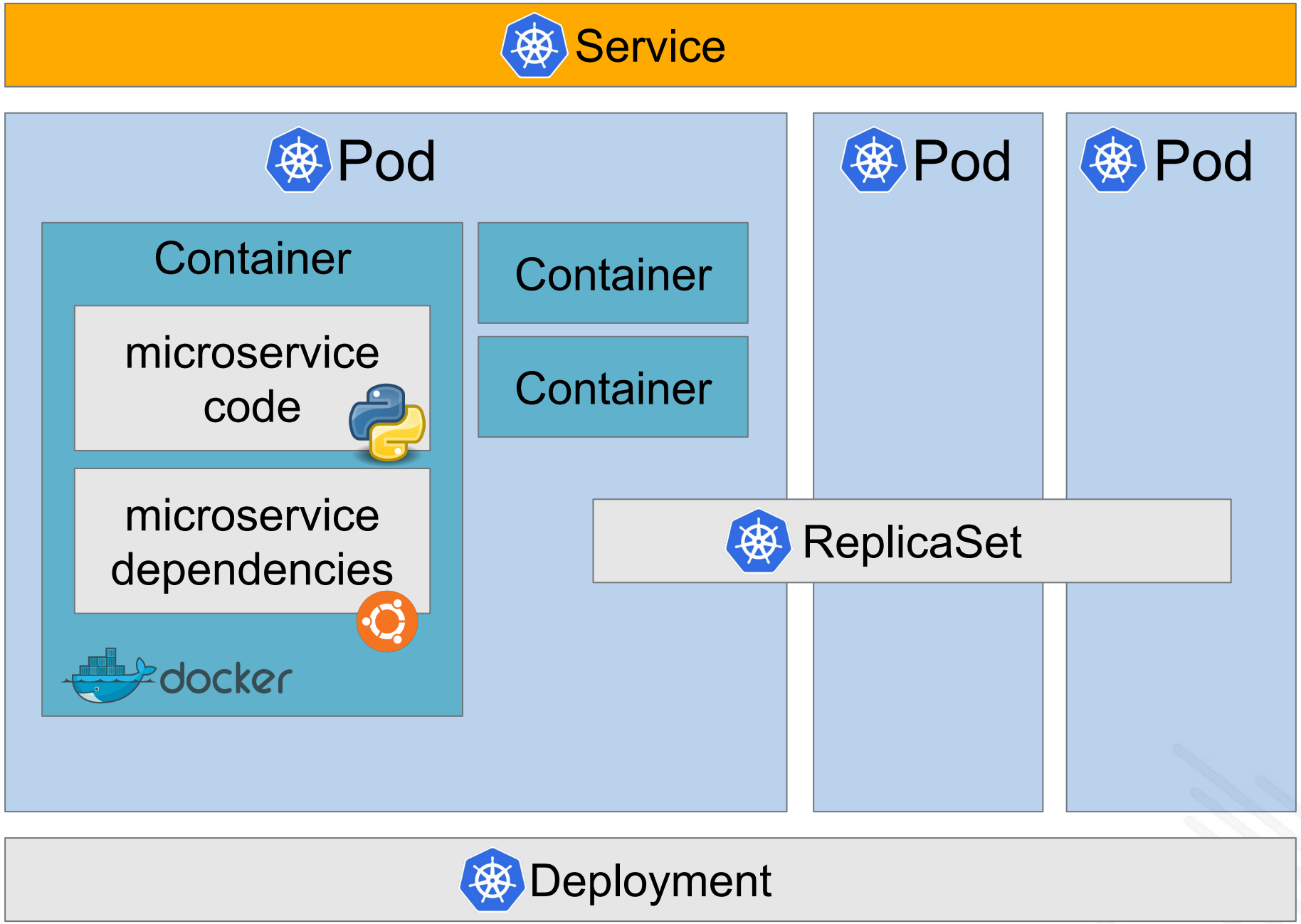
Image

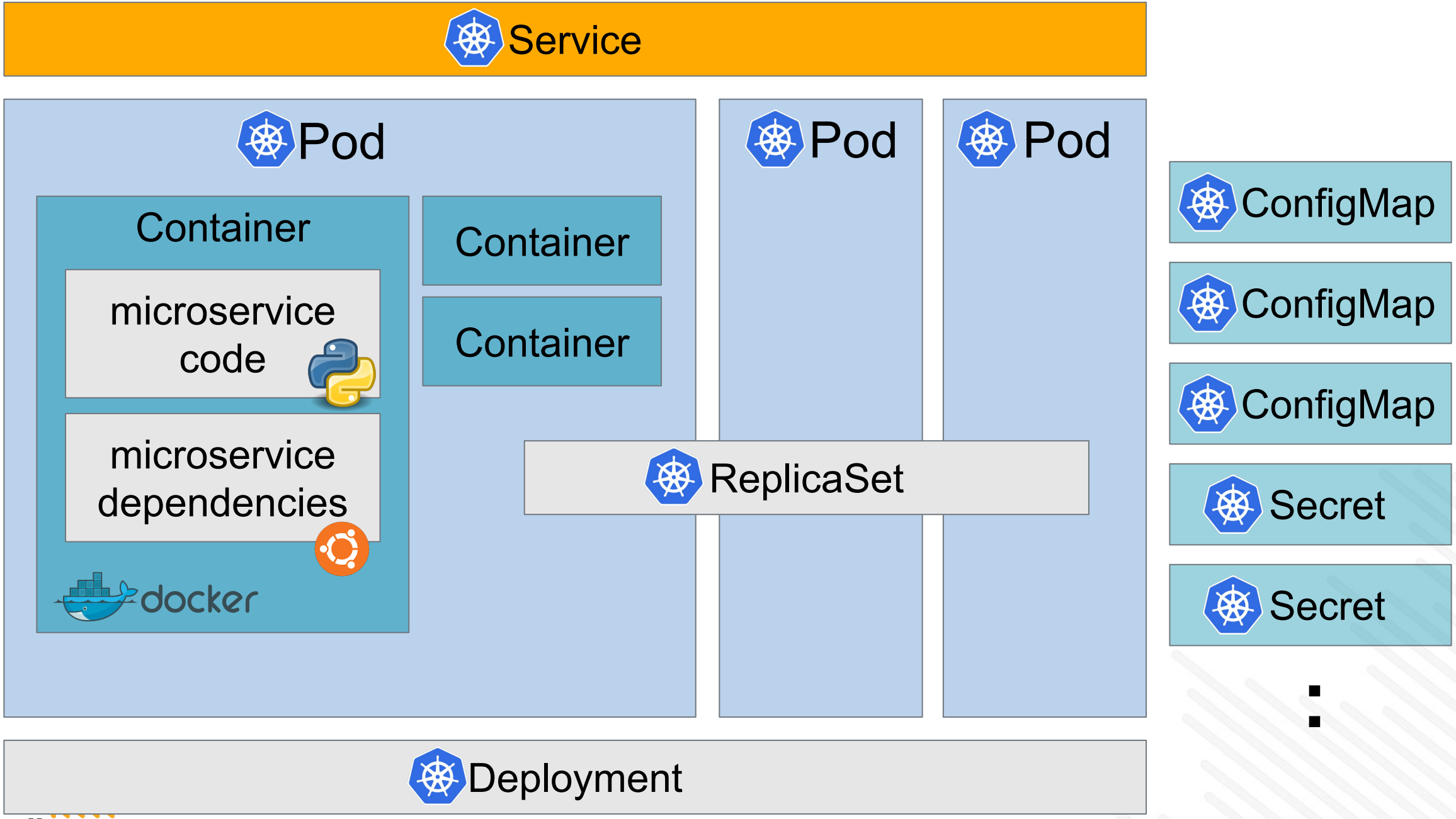
microservice code

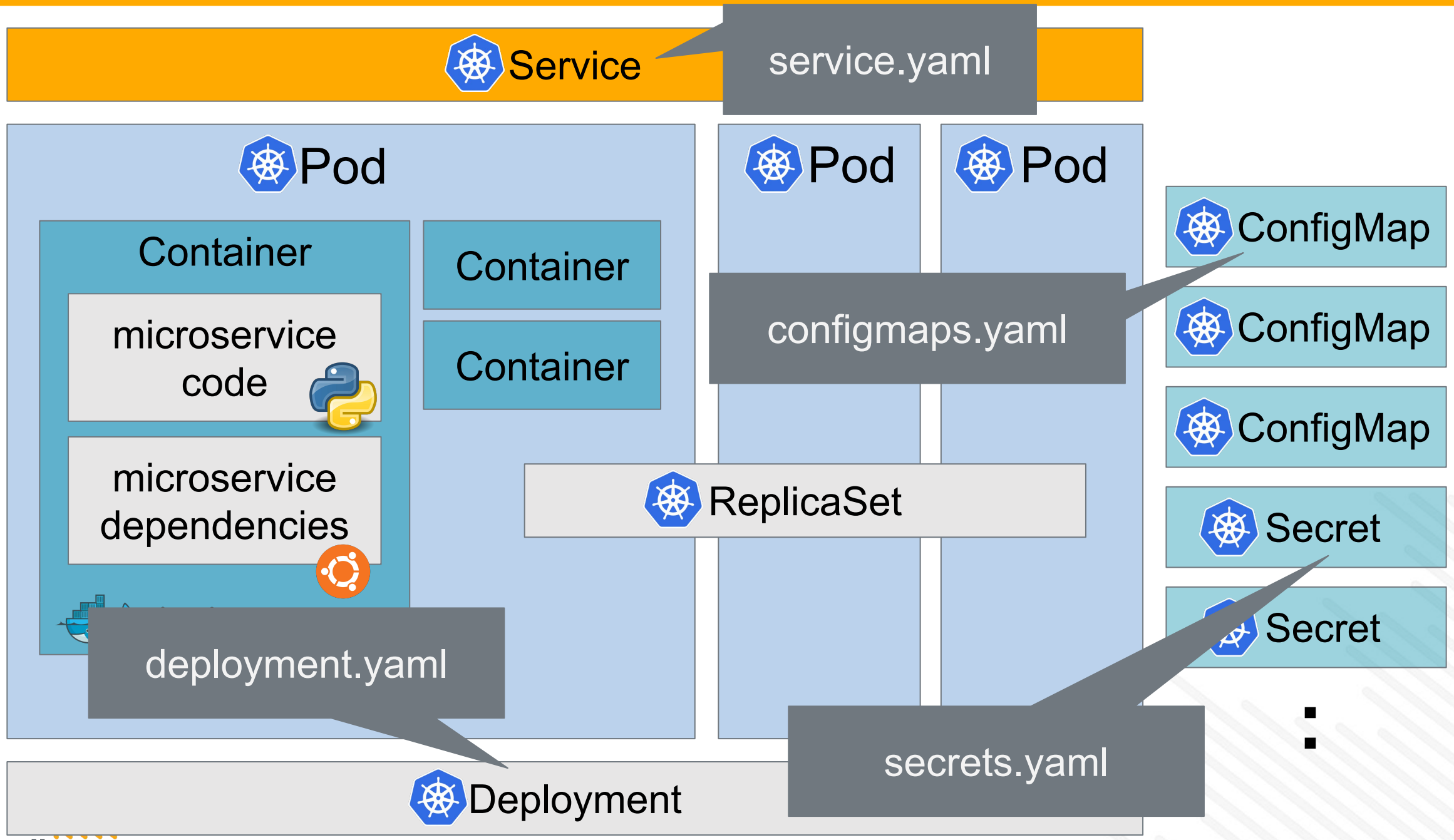
microservice dependencies

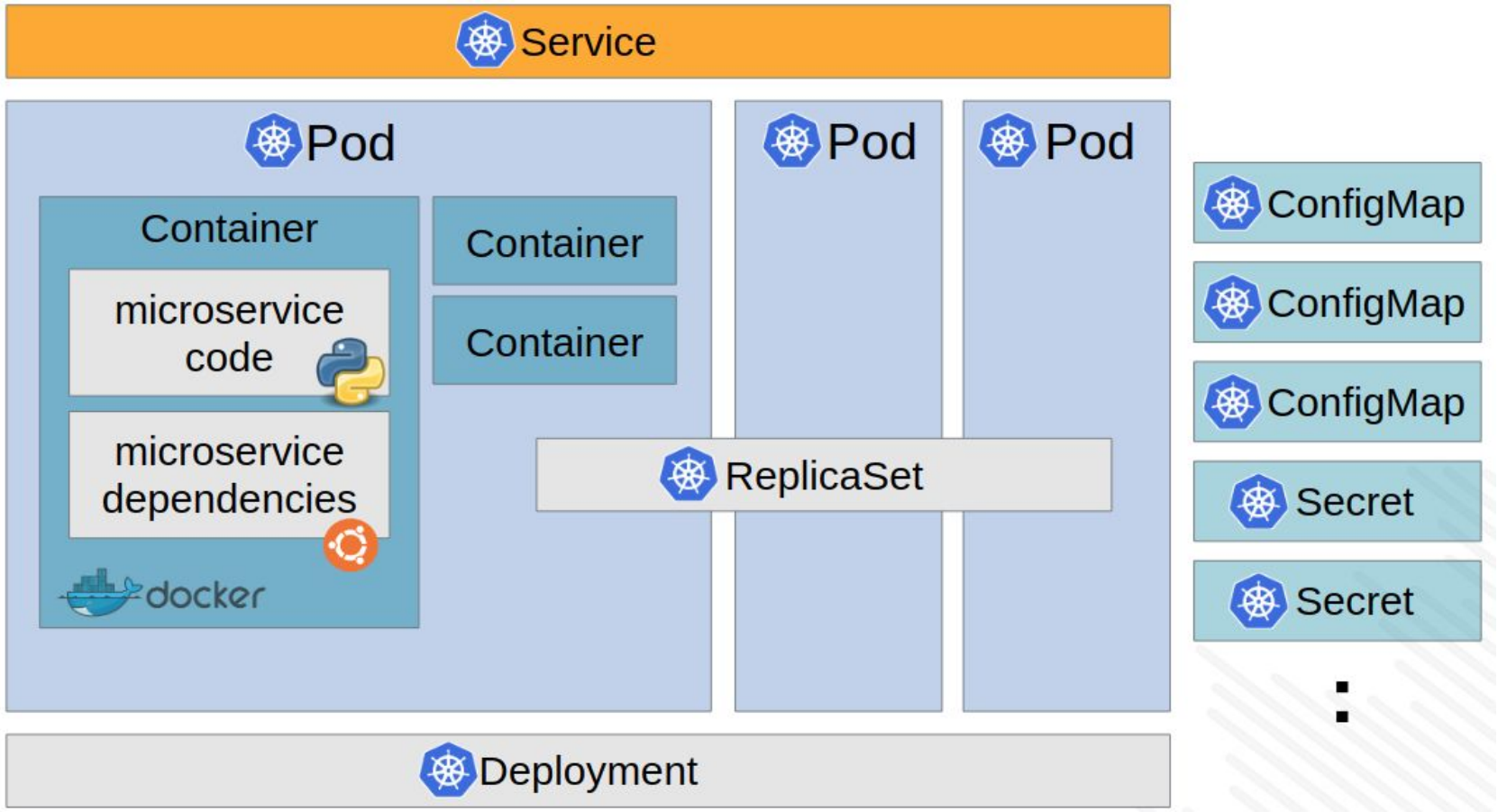




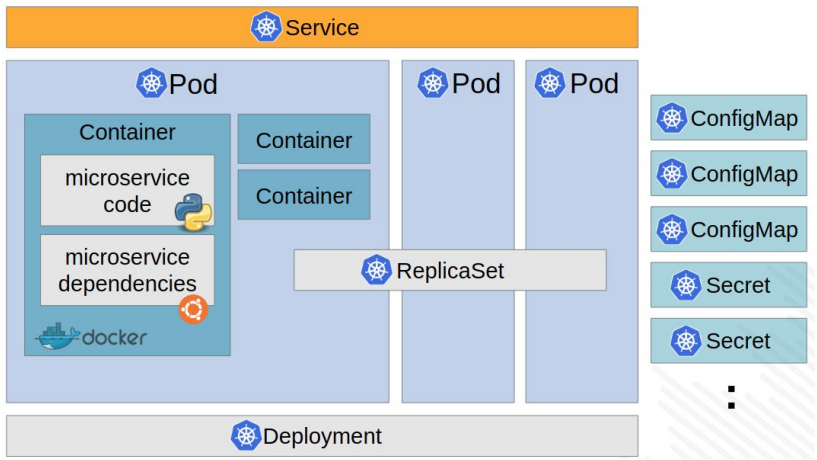








Helm Chart



Helm Chart

package

upload

Chart Repository

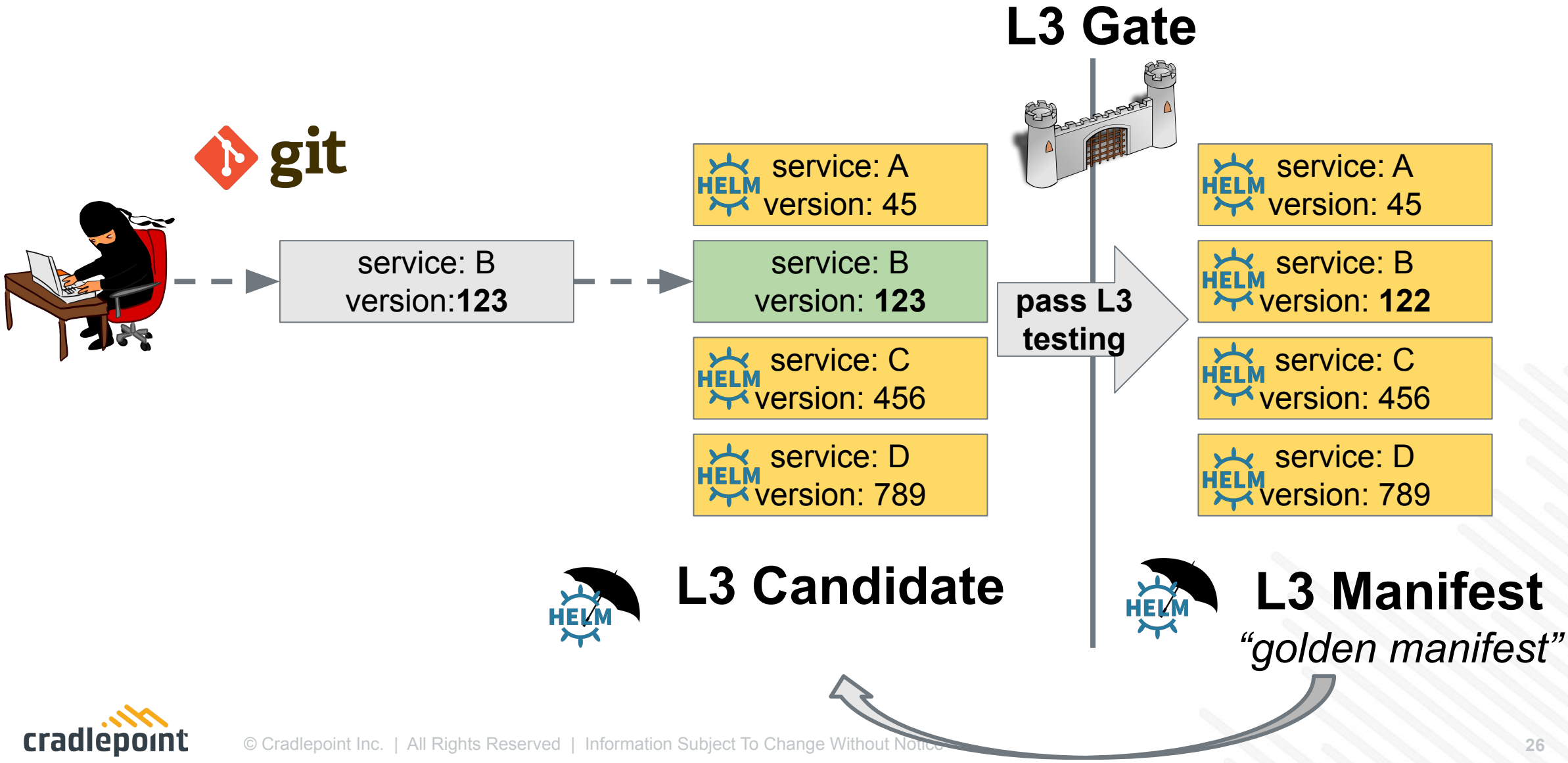
accounts-1.1164.434.tgz

Helm Umbrella Chart “Manifest”

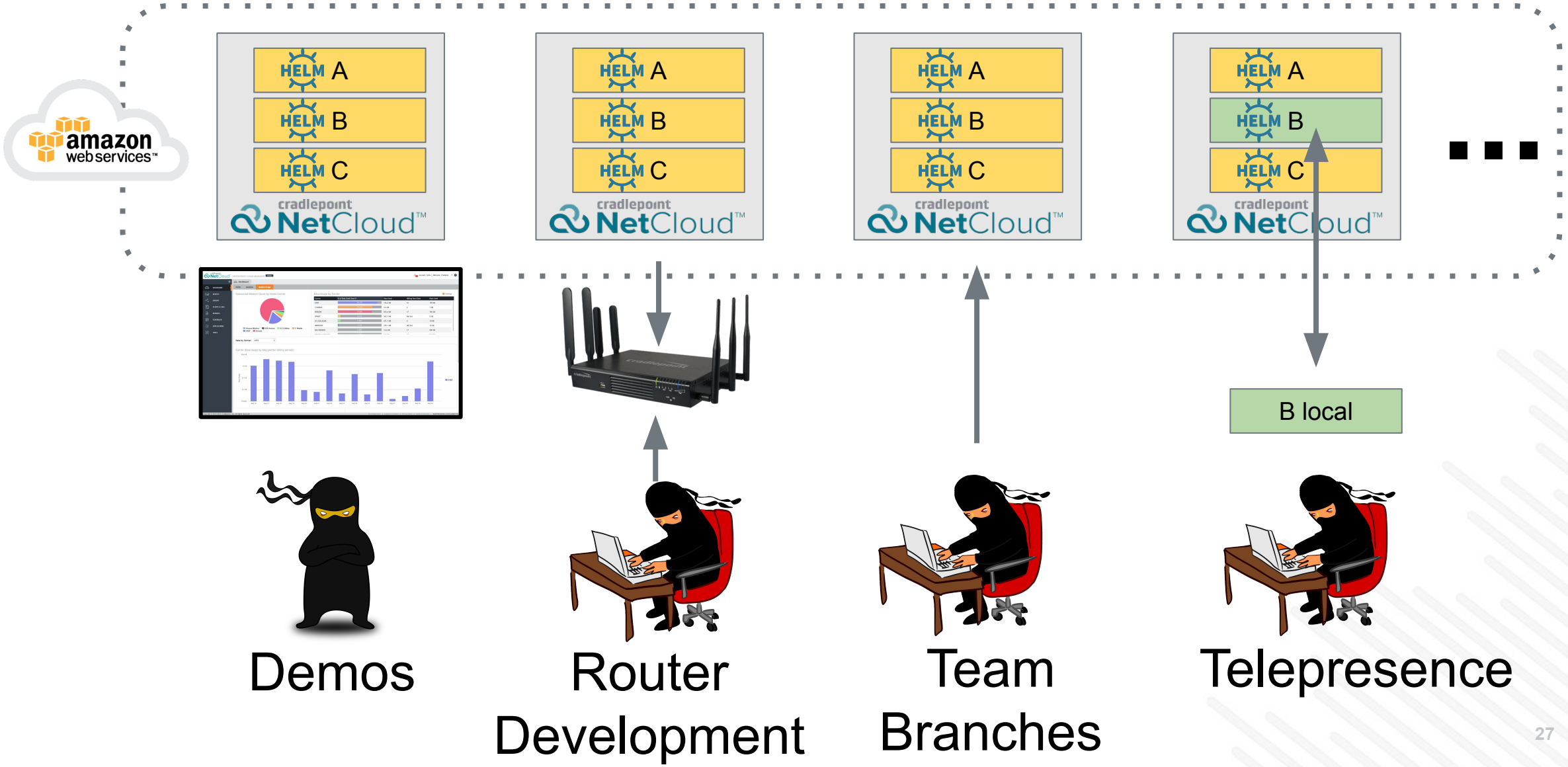
requirements.yaml 798 Bytes

```yaml
dependencies:
- name: ncm-core
  version: 1.12345.3807
  repository: https://example.com/cp-helm-all
- name: ncm-data
  version: 1.12345.3807
  repository: https://example.com/cp-helm-all
- name: accounts-data
  version: 1.5432.434
  repository: https://example.com/cp-helm-all
- name: accounts-webserver
  version: 1.5432.434
  repository: https://example.com/cp-helm-all
- name: ncm-streamserver
  version: 1.456.1185
  repository: https://example.com/cp-helm-all
- name: ncm-cms
  version: 1.654.80
  repository: https://example.com/cp-helm-all
- name: mailhog-aws
  version: 0.2.0
  repository: https://example.com/cp-helm-all
  condition: global.mailhog.enabled
- name: activity-webserver
  version: 1.987.196
  repository: https://example.com/cp-helm-all
```

L3 Quality Gate



MyStack: Single-click Developer Stack in AWS



More about MyStacks

- Creation takes about 10 minutes
- Auto-deletes if not used for 7 days
- Default is small but can opt-in for more services
- Developer dashboard for control and custom urls

Simple deployment to any stack

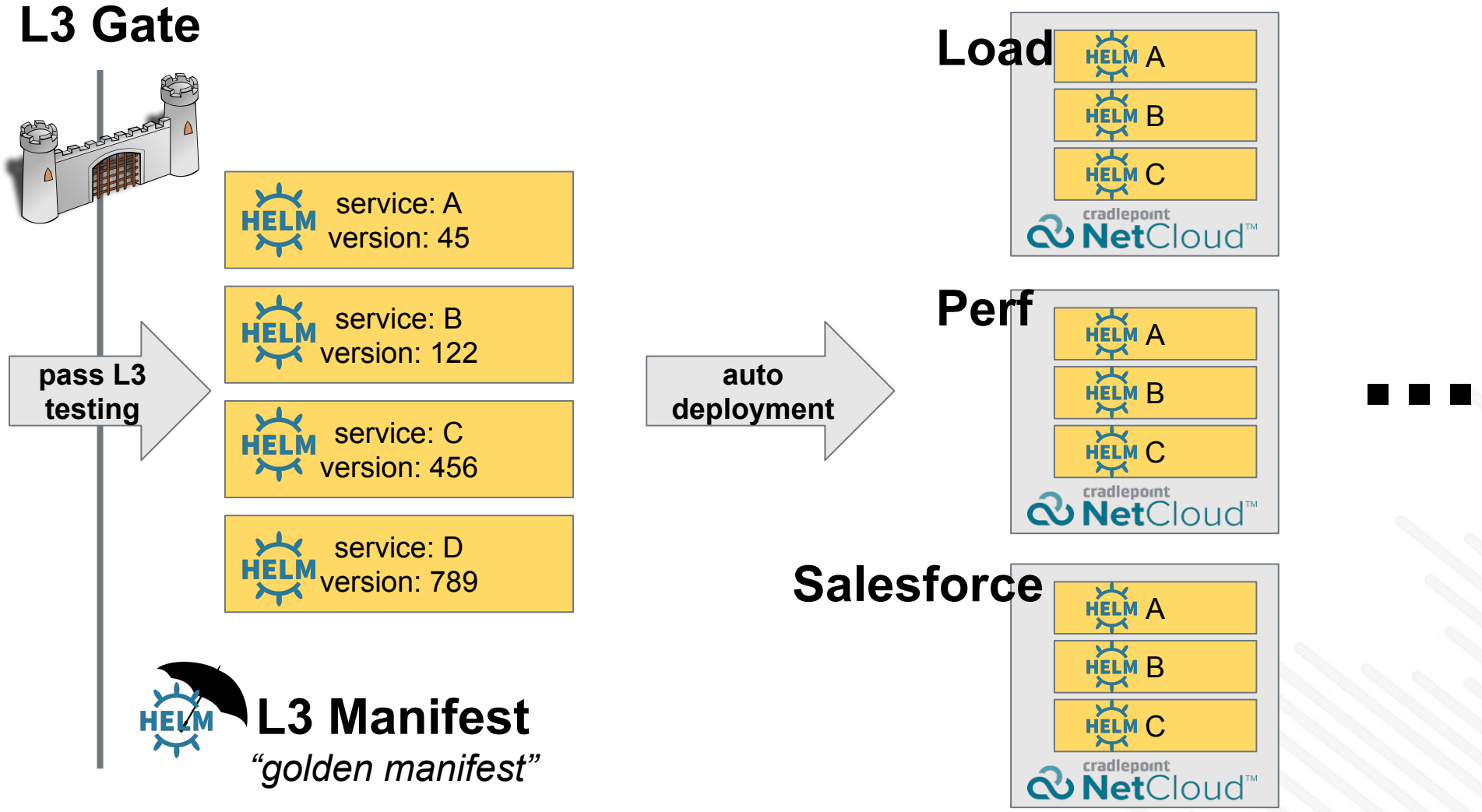
Pipeline upgrade-release

This build requires parameters:

CLUSTER	stage stack to deploy
CHART	accounts-webserver chart to deploy
CHART_VERSION	1.12345.987 chart version ex: 0.1.147+37 or latest
DRY_RUN	☐ (optional) do a helm dry run

Build

Continuous Deployment to Test Stacks



Full chart visibility in every deployment

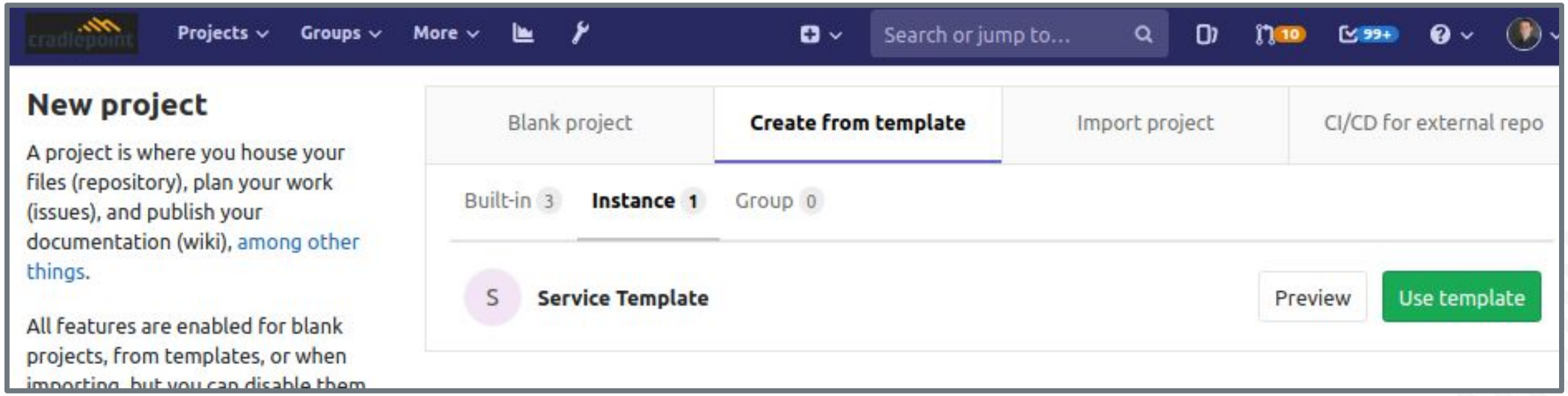
Cradlepoint Kubernetes Dashboard

Chart Pipeline | MyStacks | Clusters | Nightly | QA1 | QA2 | QA4 | Stage | Prod

Updated 4 minutes ago

CHART NAME	LATEST	L3	NIGHTLY A V5	NIGHTLY B V5	QA1 A V
accounts-data	1.1166.535	1.1166.535	1.1166.535	1.1166.535	1.1145.2
accounts-webserver	1.1166.535	1.1166.535	1.1166.535	1.1166.535	1.1145.22
alerts-ui	1.130.190	1.128.182			
als-webserver	1.249.196	1.249.196	1.249.196	1.249.196	1.249.196

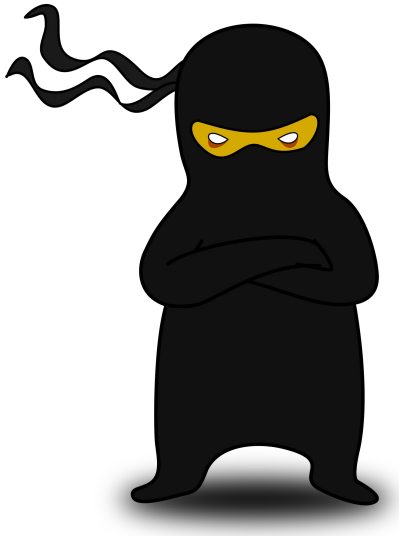
GitLab Project Template



Achieved Design Objectives

- ☑ Build a fully automated system test pipeline - **L3**
- ☑ Simplify local development - **MyStacks**
- ☑ Simplify deploying services - **Auto Promotion**
- ☑ Simplify microservice bringup - **~ 1 hour**

Productive Engineers are Happy Engineers



Lessons Learned

- Build a Kubernetes cluster pipeline
- Helm 2 has some warts
- L3 is complex and takes investment
- Microservices are still hard

Future

- Complete last few charts on production
- Service Mesh
- Helm 3
- kops to EKS
- Canary Deployments

Thank You!

- Come visit the Cradlepoint table in the lobby!
- Twitter @BoiseMatt
- R&D Blog @ https://cradlepoint.com/blog