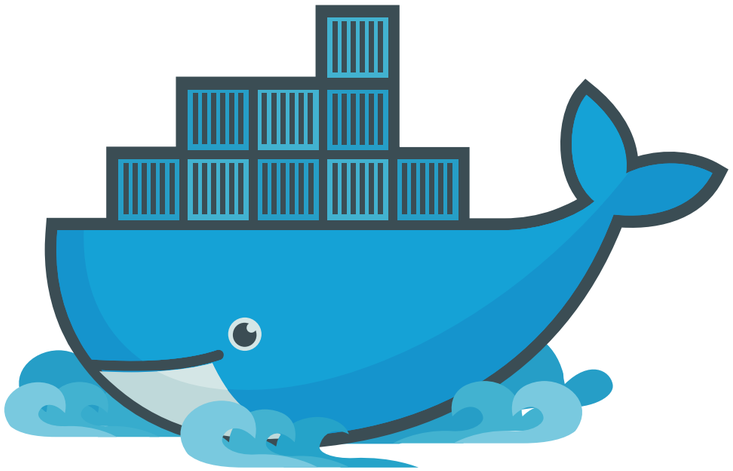
SYSTEM TESTING SERVICE DEVELOPMENTS USING

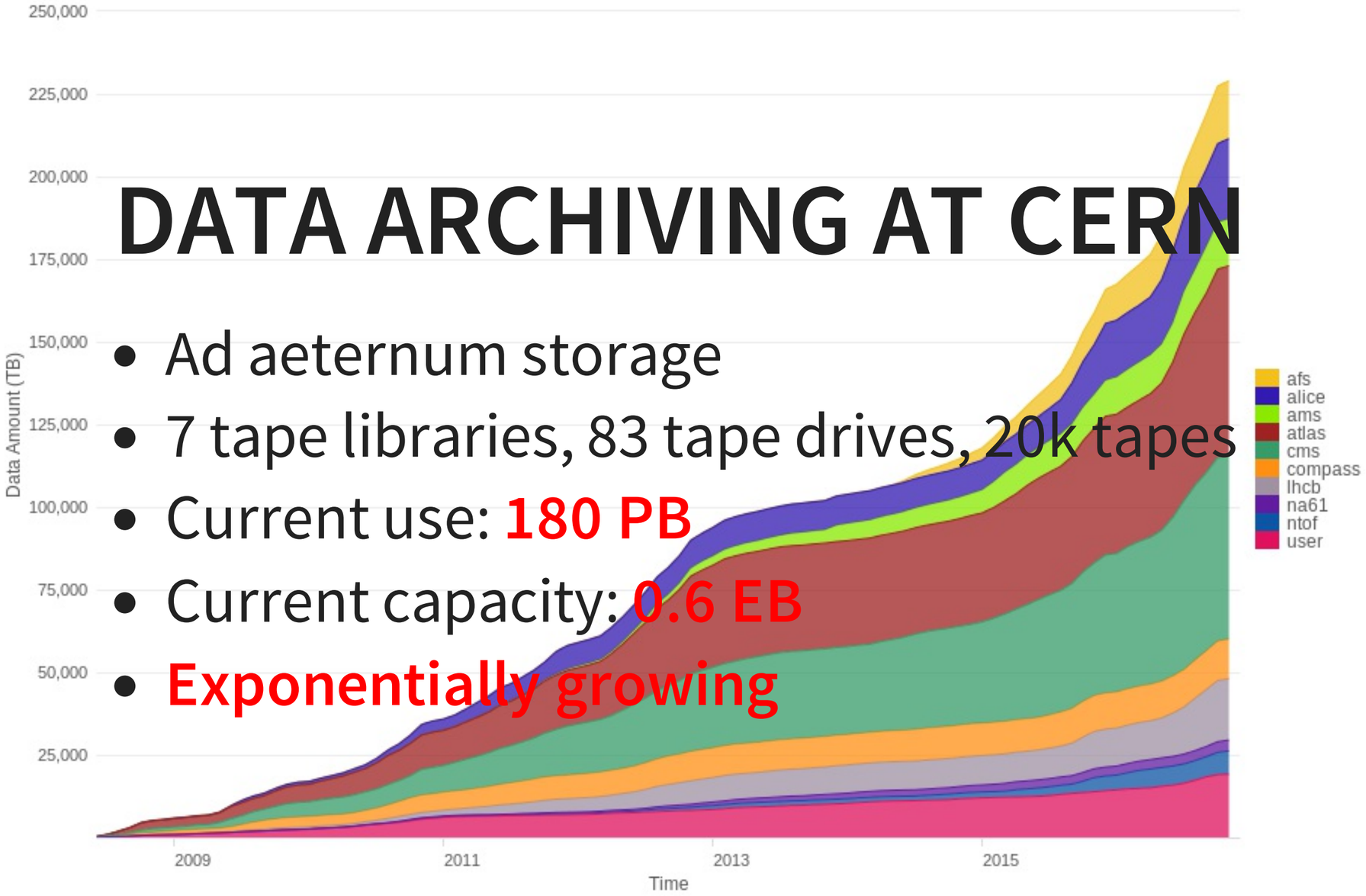


EOS + CTA USE CASE

Julien Leduc from **IT ST**orage group CERN

DATA ARCHIVING AT CERN

- Ad aeternum storage
- 7 tape libraries, 83 tape drives, 20k tapes
- Current use: **180 PB**
- Current capacity: **0.6 EB**
- **Exponentially growing**



DATA ARCHIVING AT CERN

EVOLUTION

- EOS + tapes...
  - EOS is CERN strategic storage platform
  - tape is the strategic long term archive medium
- EOS + tapes = ♥
  - You just met CTA: CERN Tape Archive

CTA + EOS DEVELOPMENTS

Tightly coupled software ⇒ tightly coupled developments

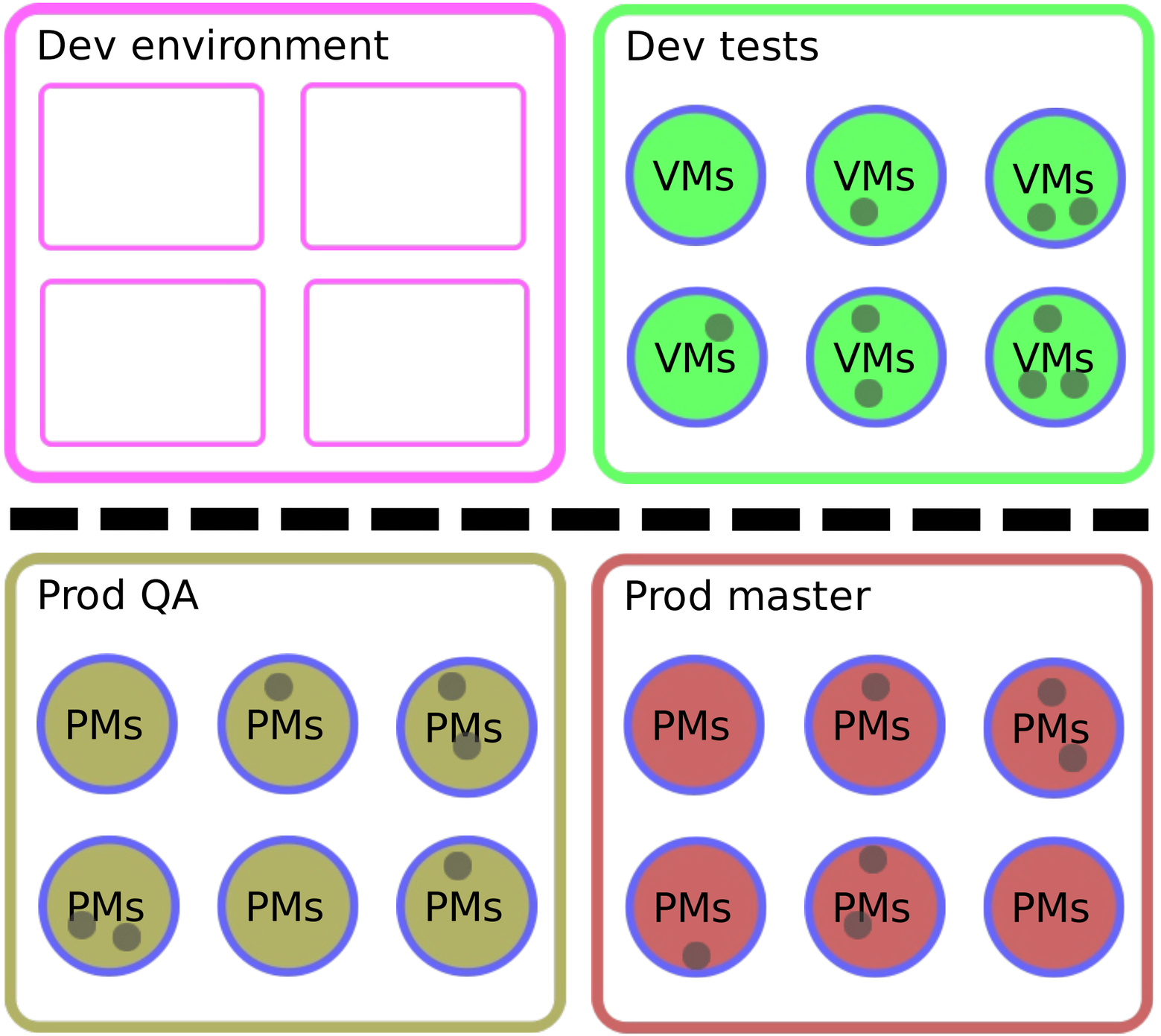
Extensive and systematic testing is paramount to limit regressions

CASTOR INTEGRATION TEST

- Easy situation:
  - all components are within **one git repository**
  - Puppet deploys development instances on VMs
  - **Limited external dependencies** per instance: 1 database, 1 virtual tape library

CASTOR INTEGRATION TESTS

- But several issues with VM/Puppet approach:
  - deploying a developer instance from scratch takes **looooonnng time...**
  - code changes in CASTOR often require Puppet **manifest change**
  - **real tape hardware** tests are way further down the road in separate hostgroups, environments...
    - which implies **ad hoc** developer tests...


Dev environment
Dev tests
VMs
VMs
VMs
VMs
VMs
VMs
Prod QA
PMs
PMs
PMs
PMs
PMs
PMs
Prod master
PMs
PMs
PMs
PMs
PMs
PMs

CTA+EOS INTEGRATION TESTS

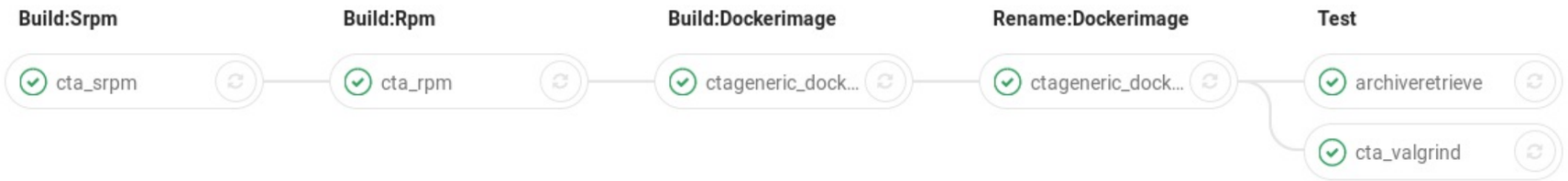
- Complex situation:
  - **2 distinct software projects**
  - **More external dependencies** per instance: 1 database, 1 virtual tape library, 1 objectstore

CTA+EOS INTEGRATION TESTS

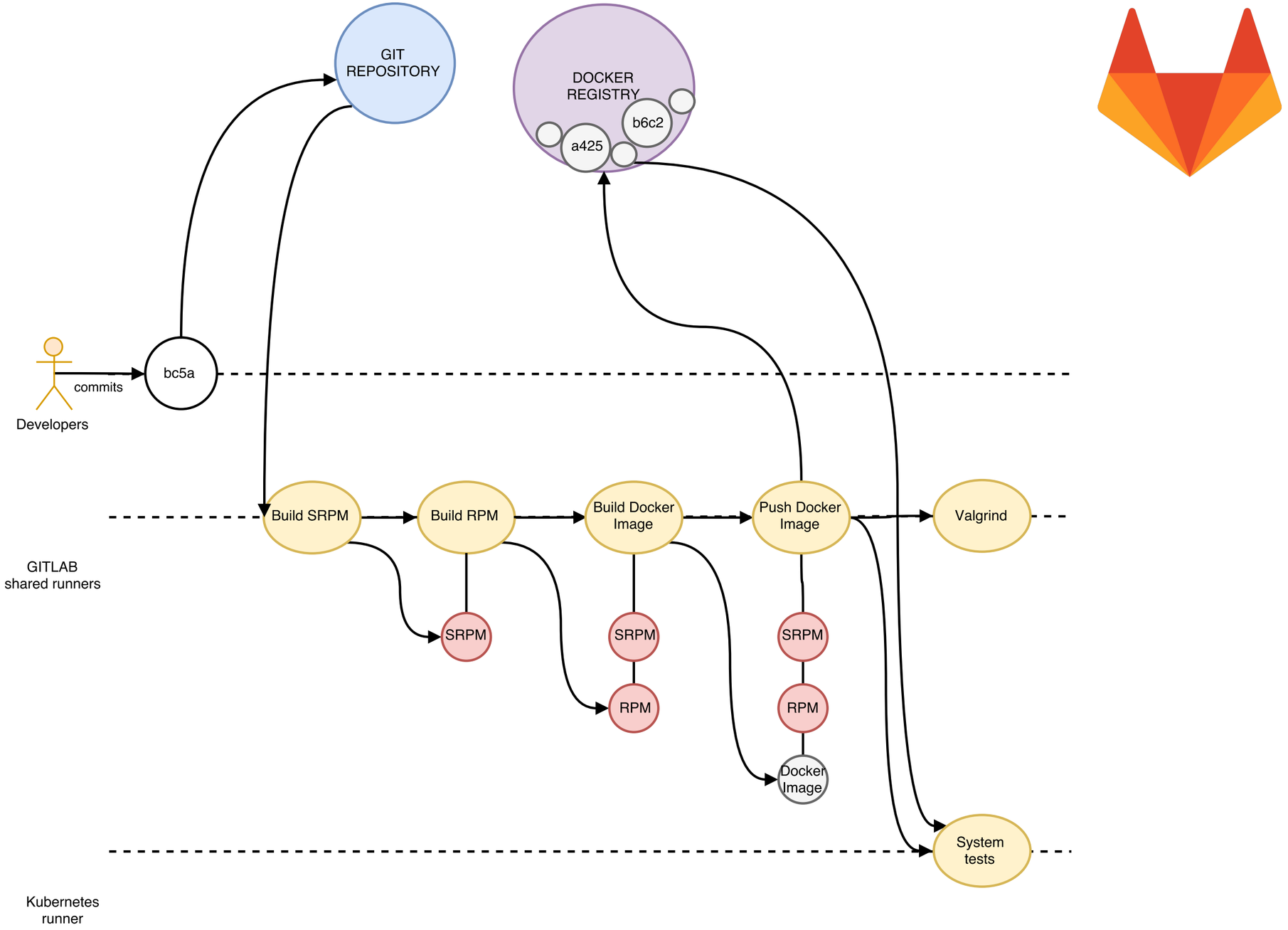
- How to fix everything?
  - I am **lazy** and **impatient**
    - no manual operation → CI
    - make it fast
  - Must allow similarly easy beta testing deployments for administrators/users (simple and bulletproof)
  - Must allow tests on real tape hardware.

CTA CI

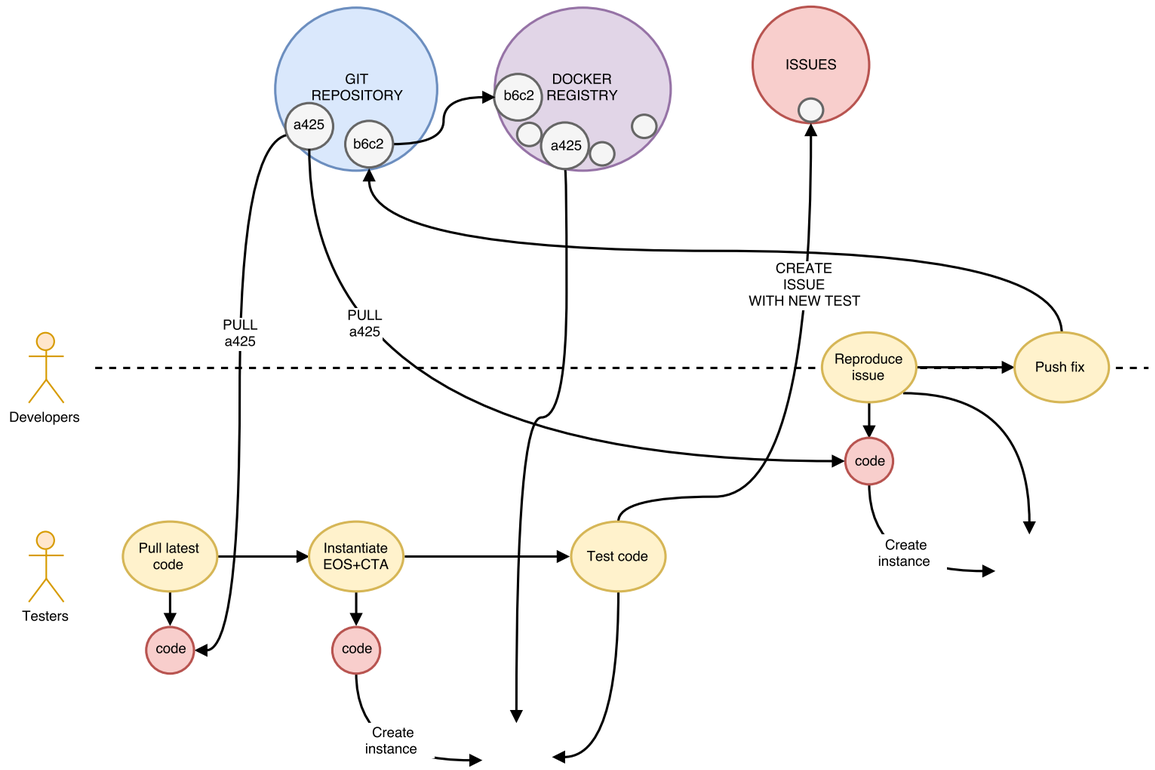
Implemented in CERN Gitlab instance



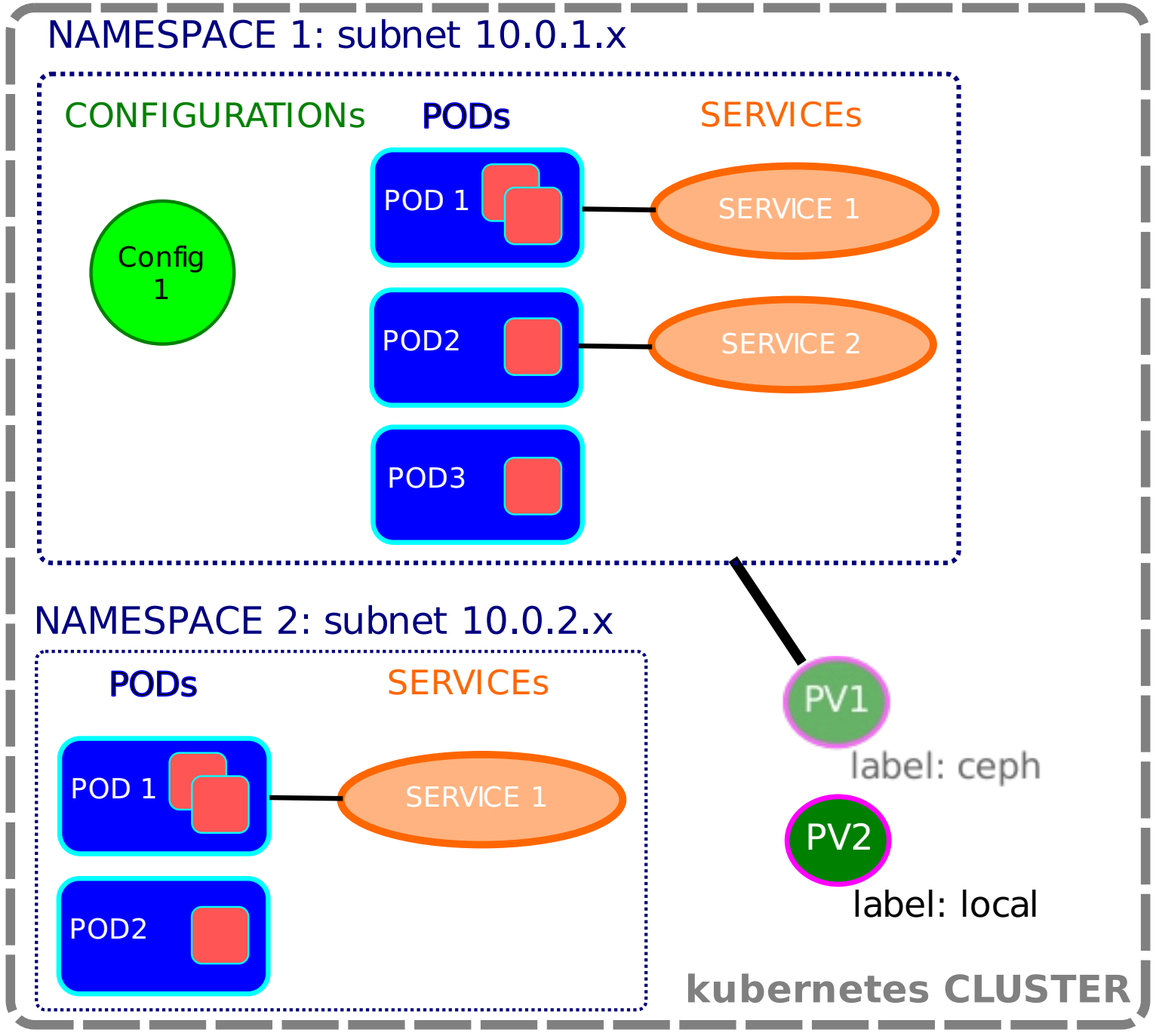
- Build software: CTA RPMs available as **artifacts**
- Build and publish a **generic Docker image** in gitlab registry
  - Contains **all required versioned RPMs for instantiation** (built artifacts, EOS, XROOTD)
- Run **system tests** in custom kubernetes cluster


GIT
REPOSITORY
DOCKER
REGISTRY
b6c2
a425
commits
bc5a
Developers
Build SRPM
Build RPM
Build Docker
Image
Push Docker
Image
Valgrind
GITLAB
shared runners
SRPM
SRPM
SRPM
RPM
RPM
Docker
Image
System
tests
Kubernetes
runner

A COMMON REFERENCE INFRASTRUCTURE



BASIC KUBERNETES CONCEPTS



KUBERNETES RESOURCES

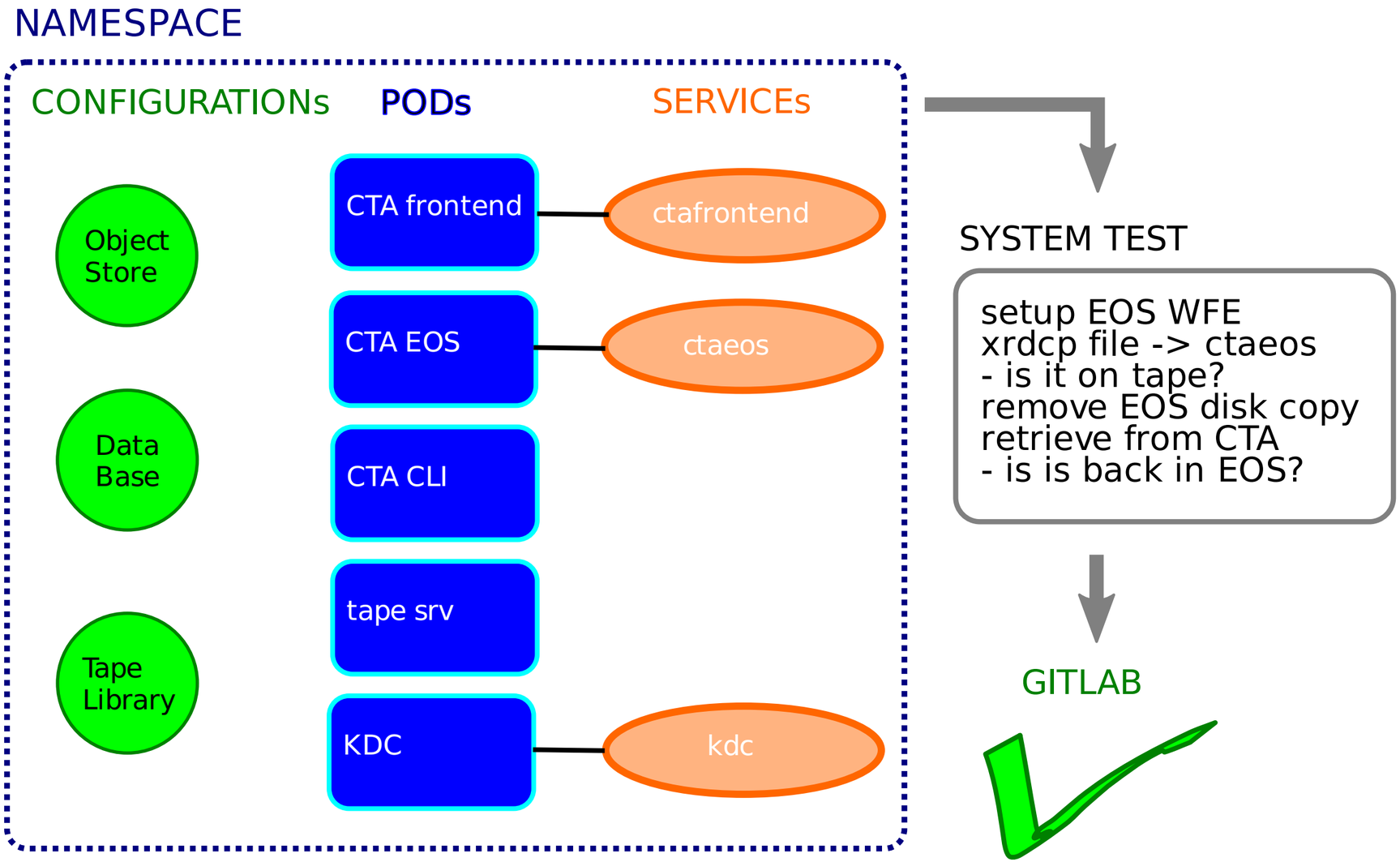
System tests on dedicated kubernetes clusters

- One Puppet deployed kubernetes cluster per developer on a single VM
- Kubernetes resources per cluster:
  - 1 Oracle database (+ unlimited sqlite accounts)
  - 1 Ceph objectstore (+ unlimited local objectstores)
  - 10 Virtual tape libraries: 2 tape drives, 10 tapes

INSTANTIATING A TEST

- Create k8 Namespace
- Instantiate all Services in the namespace
- Consumable resources are implemented as Persistent Volumes
  - Issue a Persistent Volume Claim with selector
  - Instantiate associated ConfigMaps in the Namespace
- Instantiate all the Pods with their associated containers to implement all the services
- Wait for all the pods to be ready

INSTANTIATING A TEST



REAL TAPE DRIVE TESTS

- Deploy Puppet manifest on real hardware
- Add physical tape library resources in hiera
- Increase timeouts for system tests

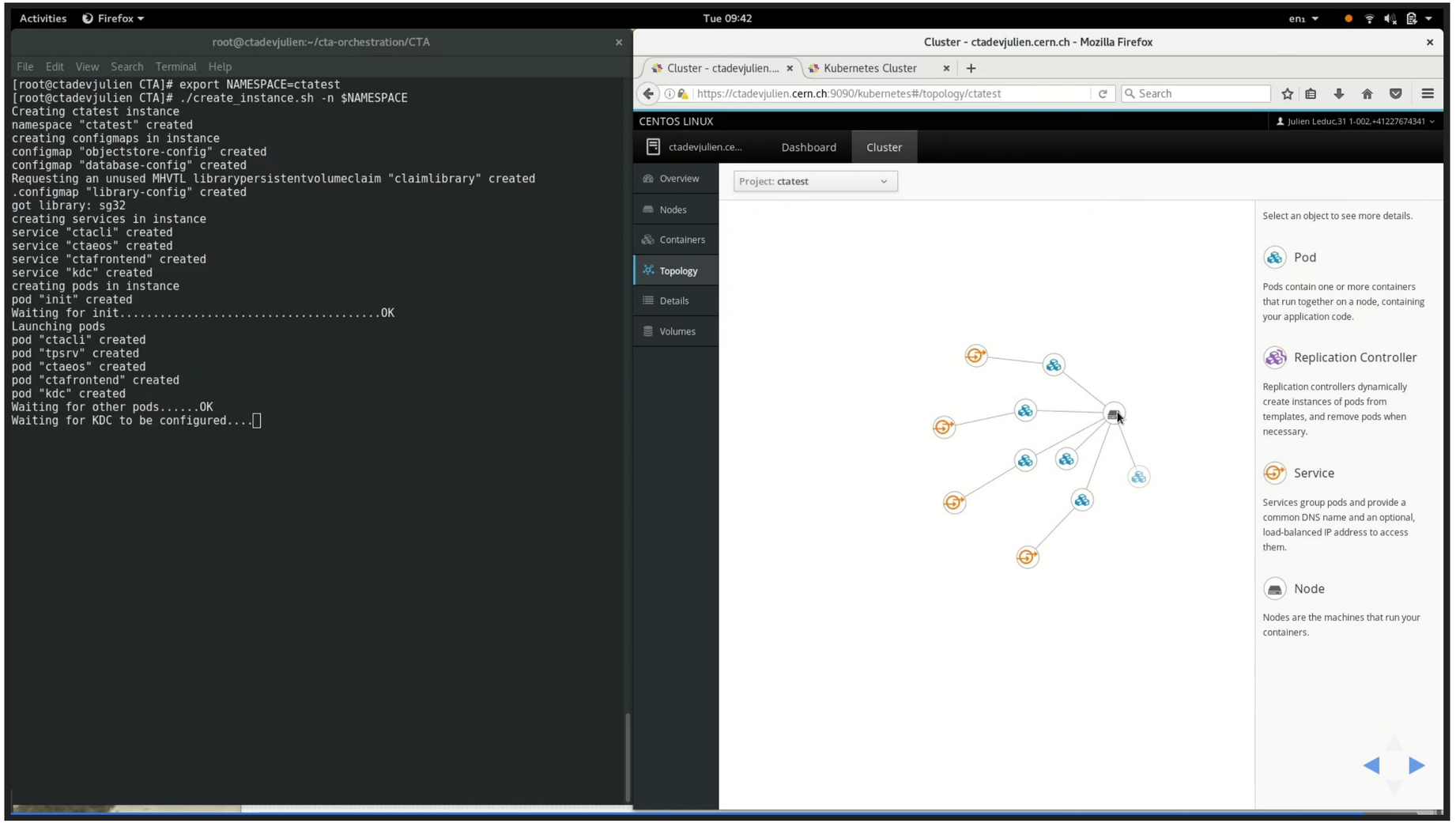
We can deploy the same kubernetes instance on real tape hardware and run exactly the same system tests.

THE END

- Very powerful approach addresses and federates all our use cases
- Fast, flexible, isolated and self contained in software repository
- Reproducible development environment that allows regression tests

TO DO

- Write more system tests
- Evaluate possible production use ☺


Activities
Firefox
Tue 09:42
en1
root@ctadevjulien:~/cta-orchestration/CTA
File Edit View Search Terminal Help
[root@ctadevjulien CTA]# export NAMESPACE=ctatest
[root@ctadevjulien CTA]# ./create_instance.sh -n $NAMESPACE
Creating ctatest instance
namespace "ctatest" created
creating configmaps in instance
configmap "objectstore-config" created
configmap "database-config" created
Requesting an unused MHVTL librarypersistentvolumeclaim "claimlibrary" created
.configmap "library-config" created
got library: sg32
creating services in instance
service "ctacli" created
service "ctaeos" created
service "ctafrontend" created
service "kdc" created
creating pods in instance
pod "init" created
Waiting for init.....OK
Launching pods
pod "ctacli" created
pod "tpsrv" created
pod "ctaeos" created
pod "ctafrontend" created
pod "kdc" created
Waiting for other pods......OK
Waiting for KDC to be configured...
Cluster - ctadevjulien.cern.ch - Mozilla Firefox
Cluster - ctadevjulien....
Kubernetes Cluster
https://ctadevjulien.cern.ch:9090/kubernetes#/topology/ctatest
Search
CENTOS LINUX
Julien Leduc,31 1-002,+41227674341
ctadevjulien.ce...
Dashboard
Cluster
Overview
Nodes
Containers
Topology
Details
Volumes
Project: ctatest
Select an object to see more details.
Pod
Pods contain one or more containers that run together on a node, containing your application code.
Replication Controller
Replication controllers dynamically create instances of pods from templates, and remove pods when necessary.
Service
Services group pods and provide a common DNS name and an optional, load-balanced IP address to access them.
Node
Nodes are the machines that run your containers.