SYSTEM TESTING CLOUD SERVICES USING EOS + CTA DEVELOPMENT USE-CASE

Julien Leduc from IT Storage 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 = ♥
  - Meet CTA: CERN Tape Archive
  - Streamline data paths, software and infrastructure
CTA is glued to the back of EOS
EOS manages CTA tape files as replicas
CTA contains a catalogue of all tape files
CTA provides optimised, preemptive scheduling
CTA DEVELOPMENT TIMELINE

- End 2016: First functional prototype release
- April 2017: First release for additional copy use cases
- 2018: Production-ready version

Easy migration path from CASTOR to EOS+CTA: only metadata need to be migrated CASTOR tape format will be reused.
CTA + EOS DEVELOPMENTS

This involves tightly coupled development in the initial phase for both software, and extensive testing to quickly catch regressions.
CASTOR INTEGRATION TESTS

- 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:
  - deploying a developer instance from scratch takes loooonnnng 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...
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 $\rightarrow$ CI
    - make it fast
  - Must allow similarly easy beta testing deployments for administrators/users (simple and bulletproof)
  - How to test 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 RPMs for instantiation (CTA artifacts, specific EOS version, specific XROOTD version)
- Run system tests in custom kubernetes cluster
KUBERNETES RESOURCES

System tests on dedicated kubernetes clusters

- One **Puppet deployed** kubernetes cluster per developer on one 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 Configuration 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

NAMESPACE

CONFIGURATIONs

- Object Store
- Data Base
- Tape Library

PODs

- CTA frontend
- CTA EOS
- CTA CLI
- tape srv
- KDC

SERVICEs

- ctafrontend
- ctaeos
- kdc

SYSTEM TEST

- setup EOS WFE
  \( \text{xrdcp file } -> \text{ctaeos} \)

- is it on tape?
- remove EOS disk copy
- retrieve from CTA

- is it back in EOS?

GITLAB

- INSTANTIATING A TEST

\[ \checkmark \]
REAL TAPE DRIVE TESTS

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

VOILÀ!

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

- Very powerful approach addresses all our use cases
- Fast, flexible, isolated and self contained in software repository

TO DO

- Write more system tests (using jtest? scripts?...)
- Bulletproofing reproducibility for regression tests
- Evaluate possible production use 😊
QUESTIONS?