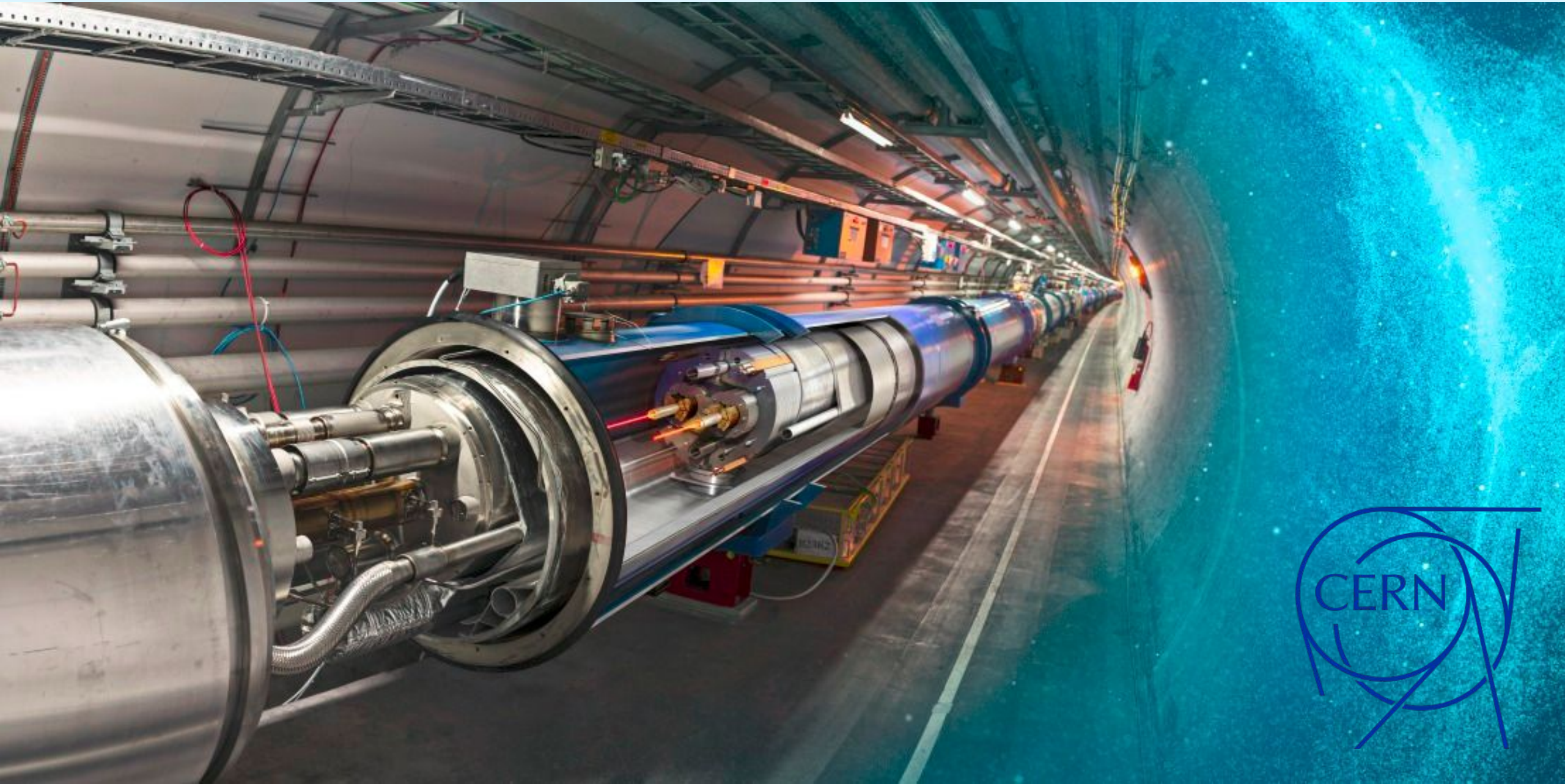
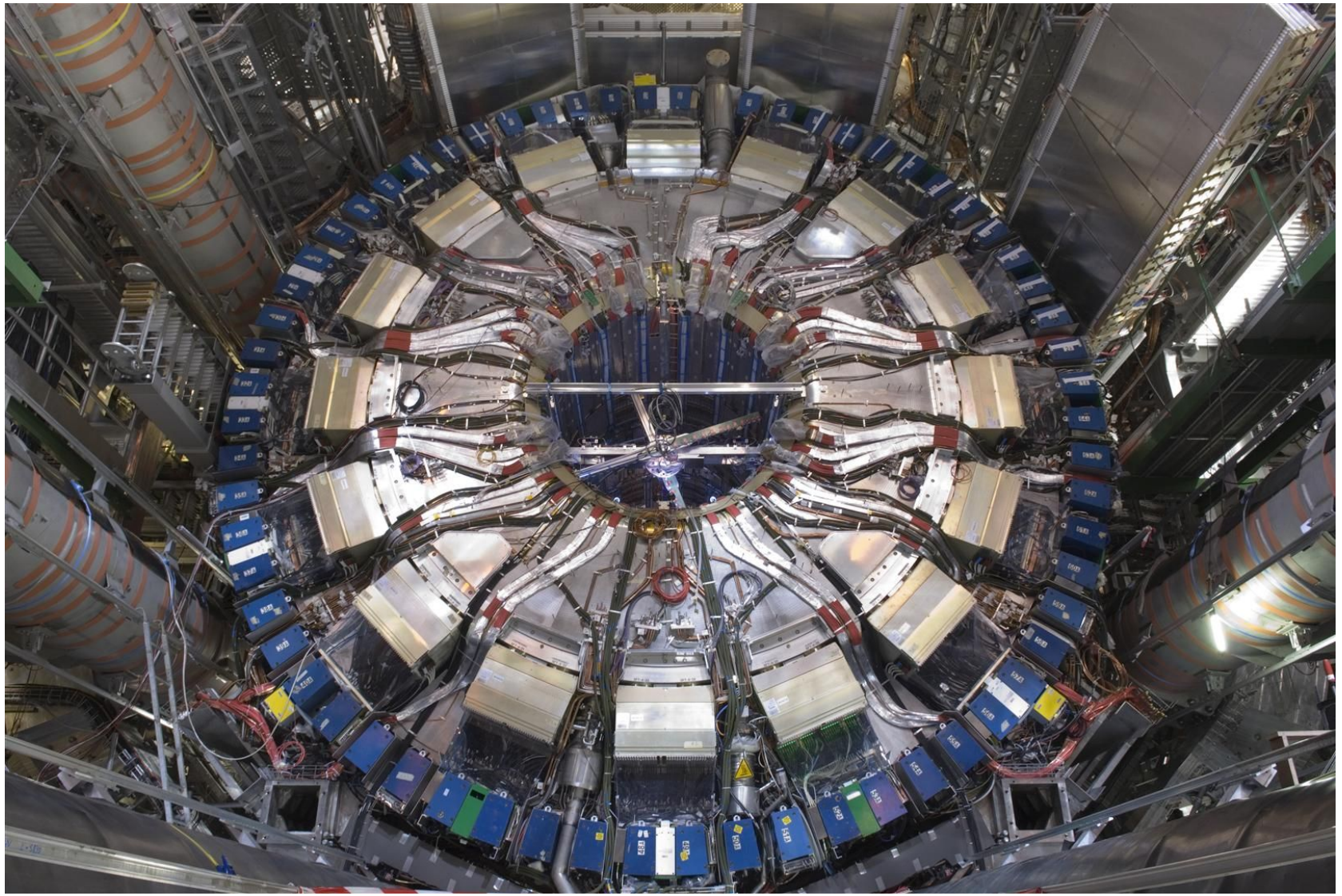

KubeCon
CloudNativeCon
Europe 2023
TiKV

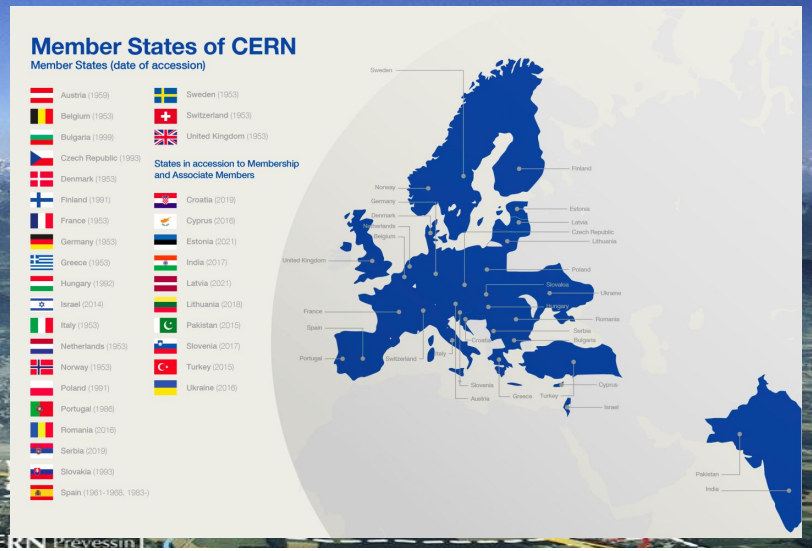
Operating CERN SaaS at Scale with Operators

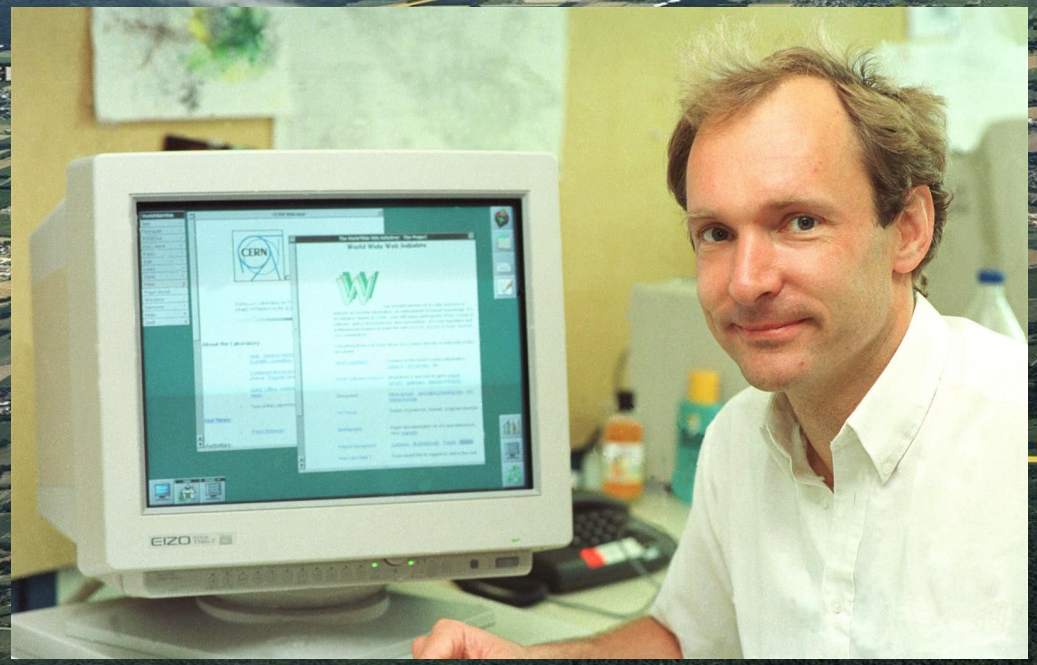
Michael Hrivnak, Red Hat
Varsha Prasad Narsing, Red Hat
Francisco Barros, CERN
Rajula Vineet Reddy, CERN


CERN

7000 Tonnes







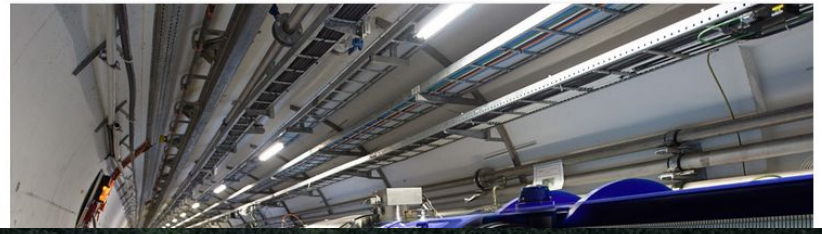
News › News › Topic: Physics

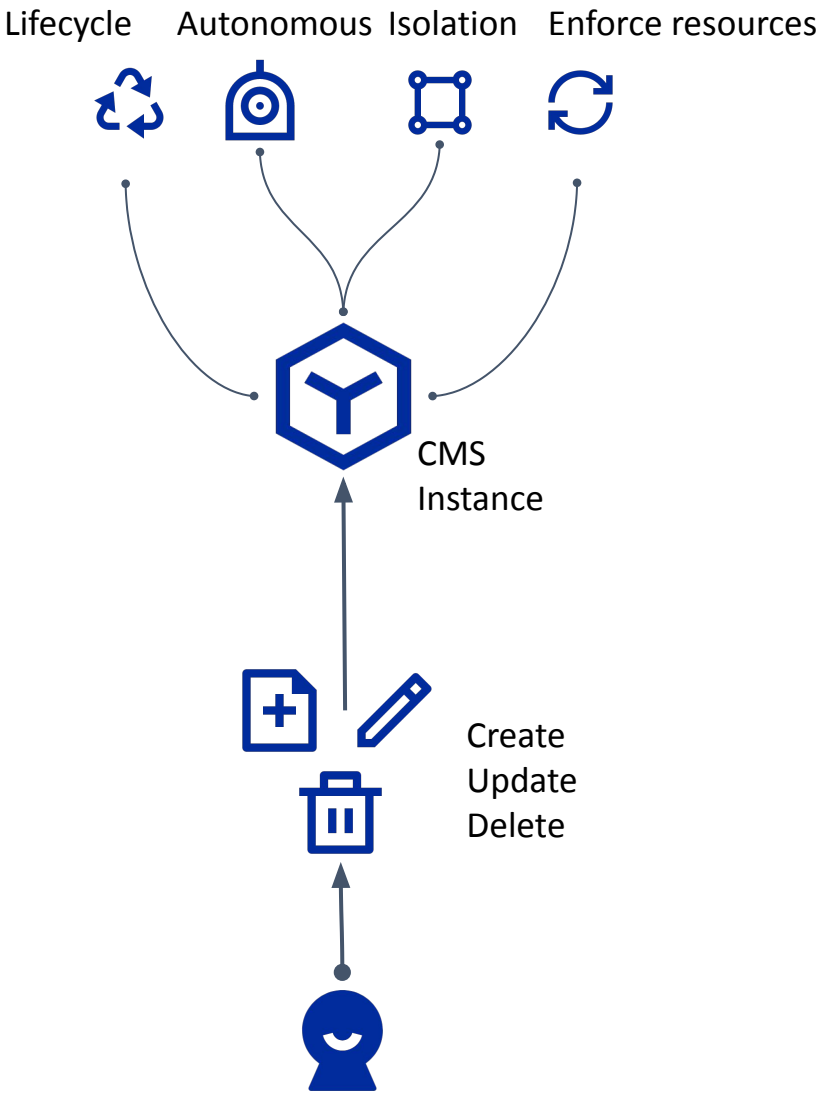
Voir en français

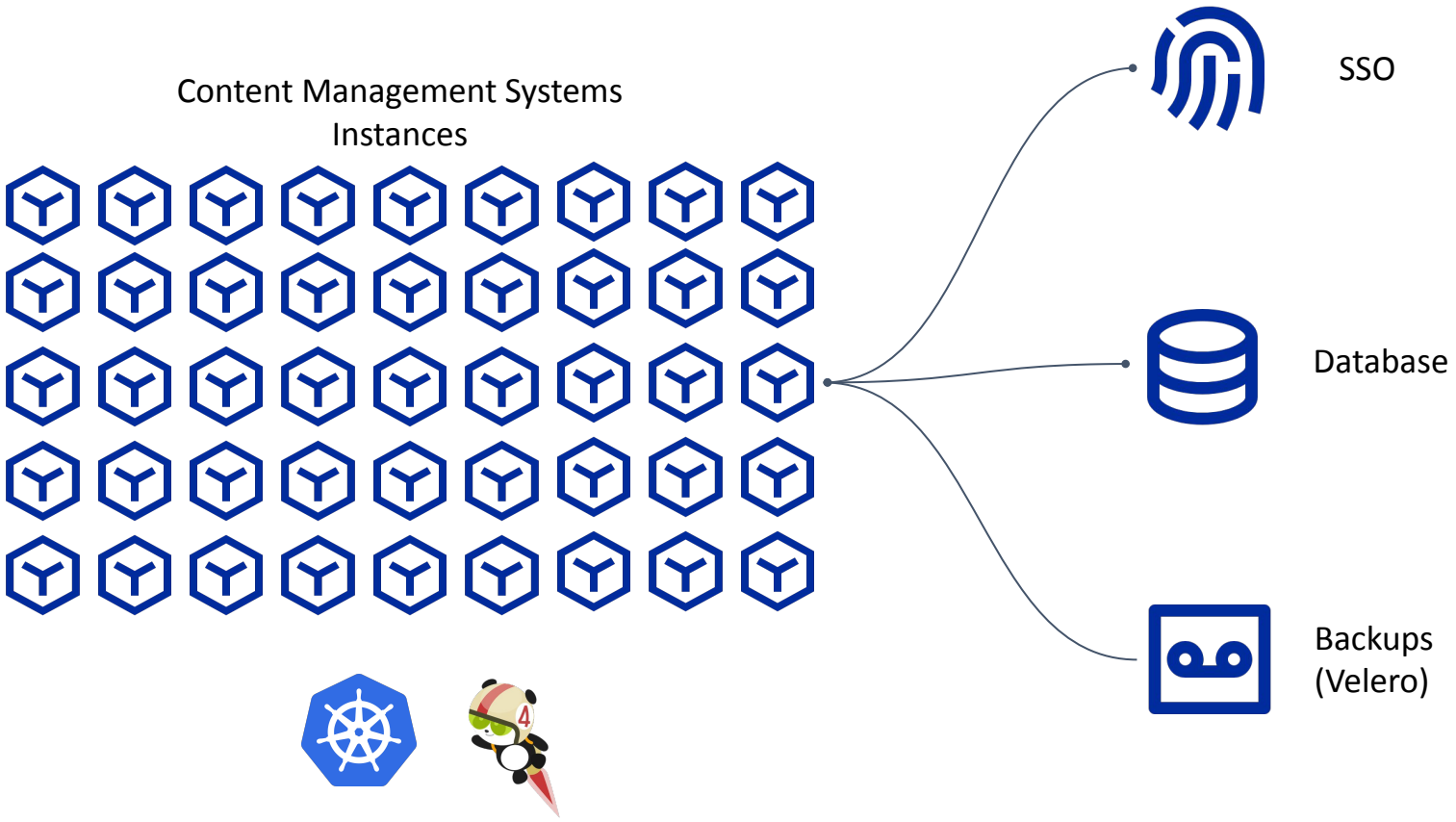
LHC Run 3: physics at record energy starts tomorrow

The Large Hadron Collider is ready to once again start delivering proton collisions to experiments, this time at an unprecedented energy of 13.6 TeV, marking the start of the accelerator's third run of data taking for physics

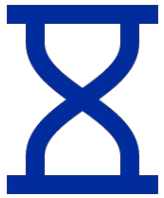
4 JULY, 2022




Lifecycle
Autonomous
Isolation
Enforce resources
CMS
Instance
Create
Update
Delete


Content Management Systems
Instances
SSO
Database
Backups
(Velero)

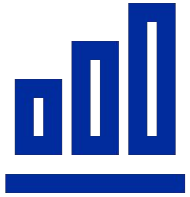
Why Operator?



Time-saving

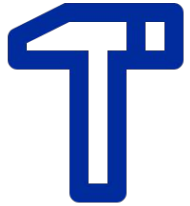
Standardization

Scalability



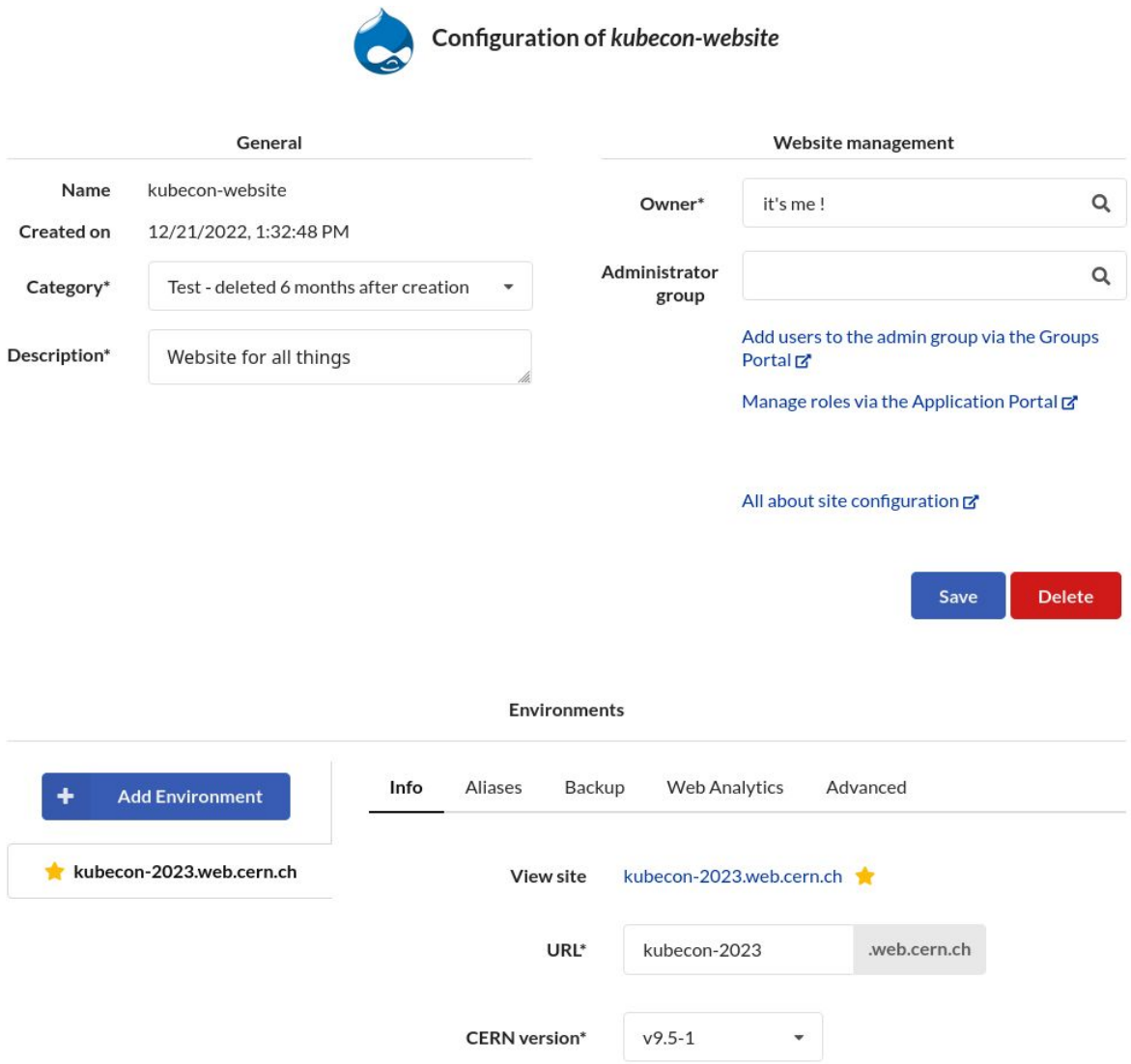
Large
Number
of Instances

Access control



Self healing

User portal to interface the Operator




```yaml
apiVersion: drupal.webservices.cern.ch/v1alpha1
kind: DrupalSite
metadata:
  name: demo-website
spec:
  configuration:
    databaseClass: standard
    diskSize: 2Gi
    qosClass: standard
    scheduledBackups: disabled
  siteUrl:
  - kubecon2023.webtest.cern.ch
  version:
    name: v9.5-1
```

Publicly available?

What is CERN specific?

- Usage of internal DB service
- Integration with CERN SSO
- Our CRD takes assumptions on where to retrieve images from
- Operator automatically assumes our Git instance

Open Source?

- A product of its design
- CERN specific integrations are coupled with the operator

Operator code is publicly available at
https://gitlab.cern.ch/drupal/paas/drupalsite-operator/

Observations

What is Multitenancy?

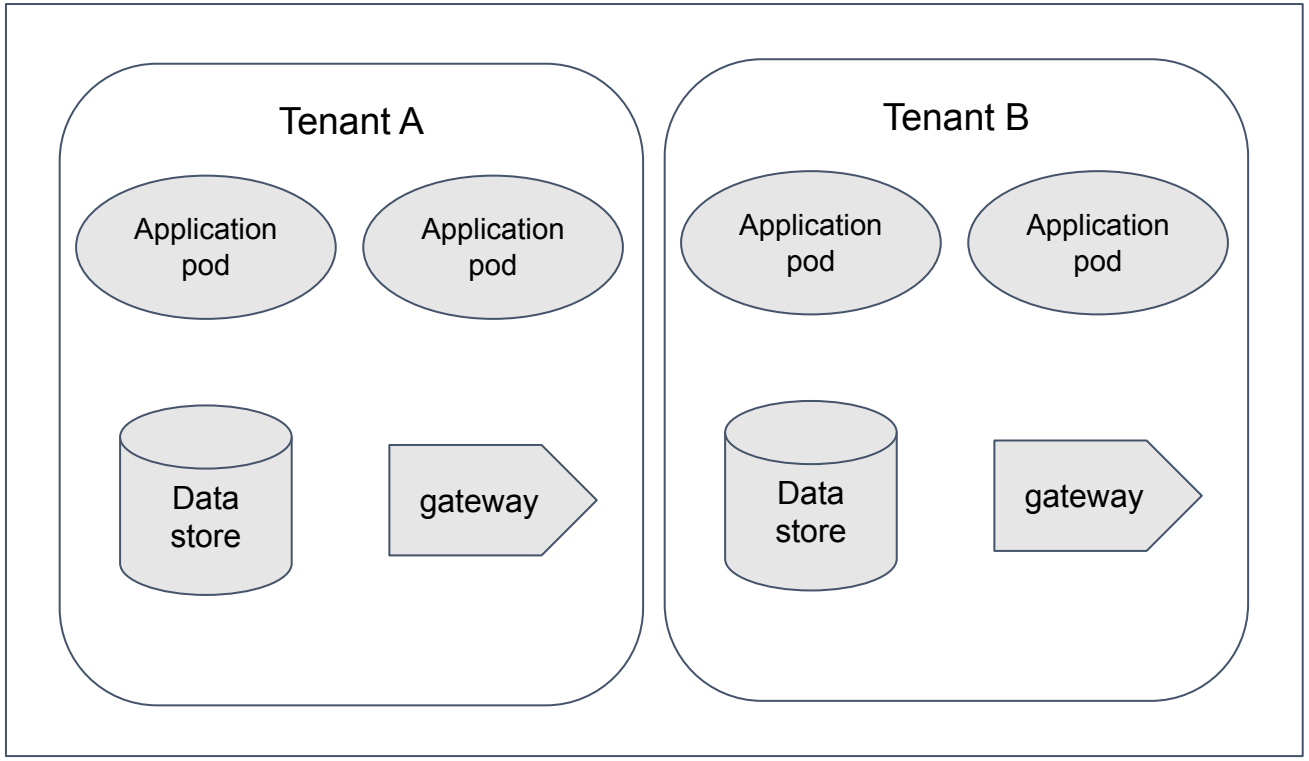
- Multiple users and groups (tenants) with a shared pool of resources.
- Tenants have discrete data that is secure from each other.
- A common characteristic of SaaS.
- **Namespace**-level and **Application**-level

Namespace-level Tenancy

Each tenant has a unique deployment of the application.

- Tenant isolation enforced by separation of namespaces.
- Each tenant's deployment can be lifecycled and customized independently.

Namespaces are a quick path from single-tenant application to SaaS.



Metrics, Alerts and Visualization

Key reason why Operator Observability is important:

1. Deployment success rate: Successful deployments of Operator workloads.
2. Health Checks: To ensure proper functioning of the Operator and its workloads.
3. Resource Utilization: Efficiency of Operator in utilizing the resources allocated to it by Kubernetes.
4. Scaling: Measures how well the operator is able to scale.
5. Availability: Percentage of time that the operator and its workloads are available.

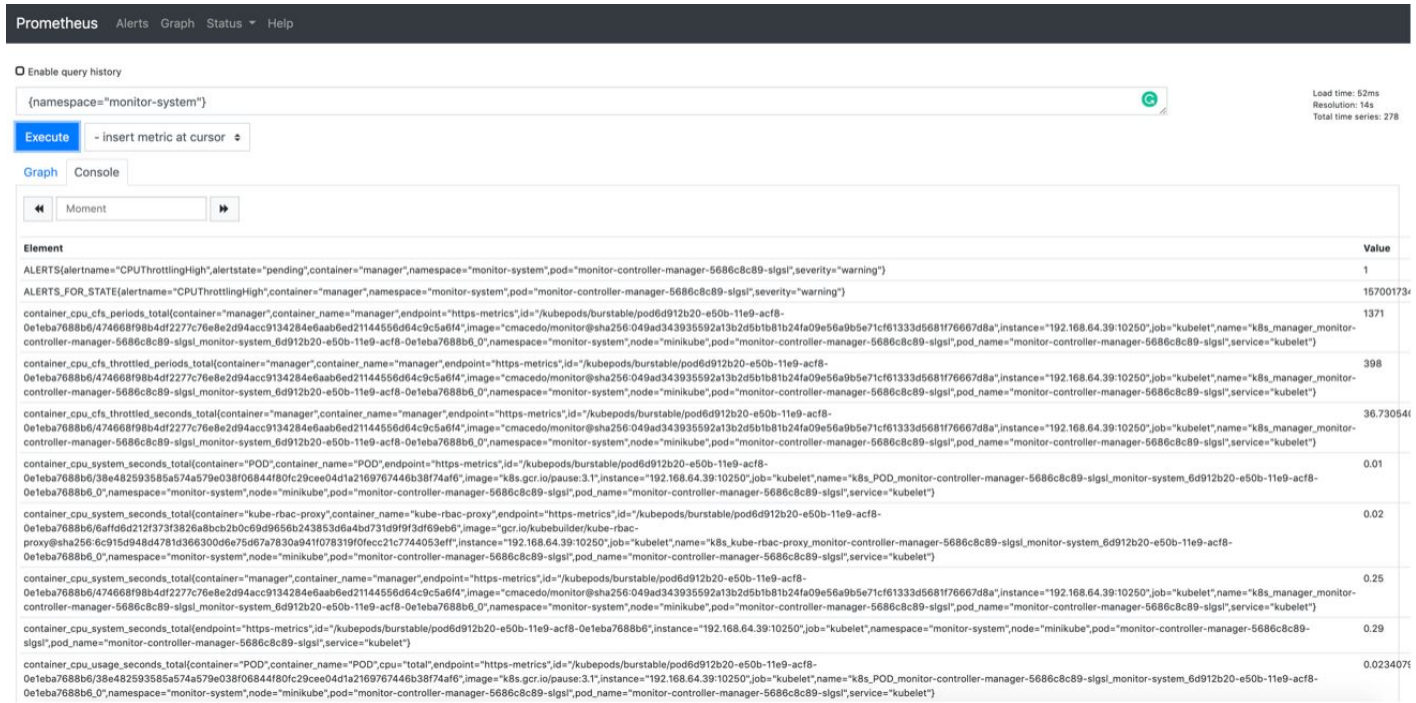
Best practices on metrics related tasks for an Operator:

https://sdk.operatorframework.io/docs/best-practices/observability-best-practices/

Resources to help gather metrics

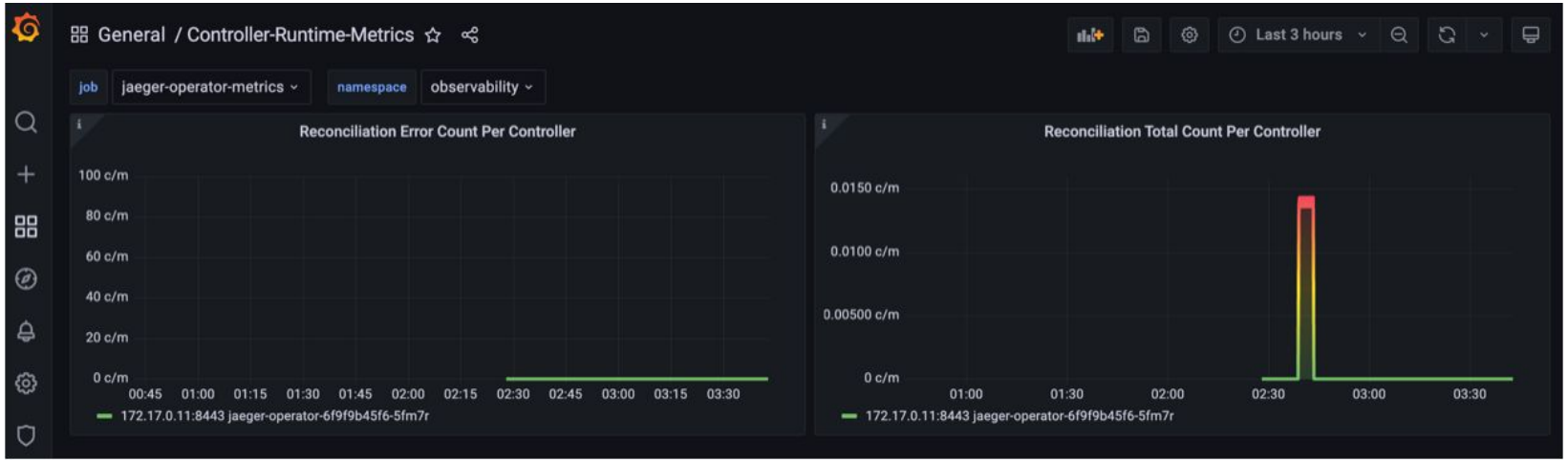
1. Controller-runtime collects a set of default reconciler metrics.

2. Integrate Prometheus Operator Service Monitor with Operator built with SDK.



Resources to help gather metrics

3. Grafana plugin to visualize metrics:



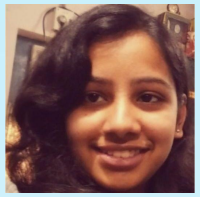
Useful Metrics

Some of the useful controller-runtime metrics for controllers:

Name	Metric Label	Usefulness
Total number of reconciles	controller_runtime_reconcile_total	Can be used to monitor the health of the controller and to identify any issues that may be causing the controller to reconcile more frequently than expected.
Total number of errors during reconciliation	controller_runtime_reconcile_errors_total	Can be used to identify any issues that may be causing the controller to fail to reconcile the resources it manages.
Duration of a reconcile for a controller	controller_runtime_reconcile_time_seconds	Monitor the performance of the controller and to identify any bottlenecks that may be causing the reconciliation process to take longer than expected.
Available Backups	← Custom Metric →	Monitor the number of backup instances available for the application.
Scheduled Backups	← Custom Metric →	Monitor the number of instances targeted for backup.

Discussion

Michael Hrivnak, Red Hat



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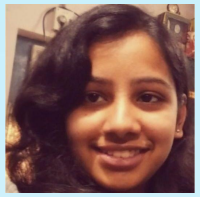
Questions

Michael Hrivnak, Red Hat



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… and maybe some answers

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<Internal Discussion>

Q: What went well with your operator in the last two years?
A: <To be discussed>

Q: What maintenance do you do to the operator?
A: Currently we only update the operator on two occasions, one is for improvements on it's code, such as fixing a corner case, second is for Kubernetes API, when a deprecation occurs and we need to update the operator accordingly

Q: What went wrong with your operator in the last two years?
A: Started becoming sluggish, reconciliation time started taking too long to process each element whitin acceptable time

Q: Can you explain further on how the Operator impacted Access Control?

Backup Slides