



EPIKS

Epics on K8s for a Control as a Service

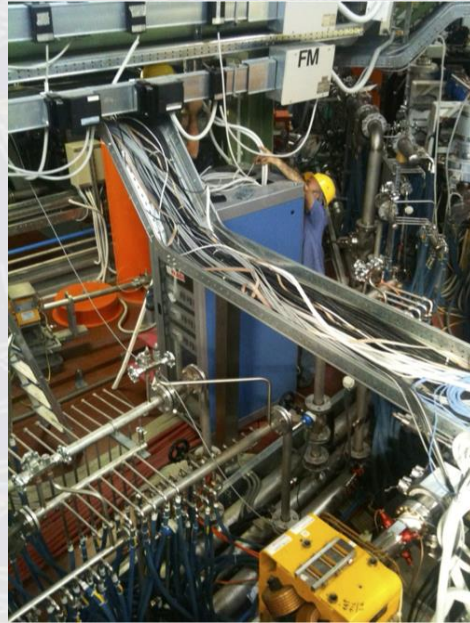
Riccardo Gargana

Workshop CCR 2024 - 20-24/05/2024

Control systems for scientific installations



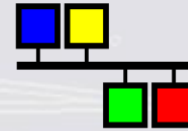
Software
many applications
in a coherent
framework



Plant = many devices

Accelerators
Detectors (slow control)
Telescope arrays
Experimental setups
...

EPICS



TANGO



!CHAOS

**Many other custom
solutions...**



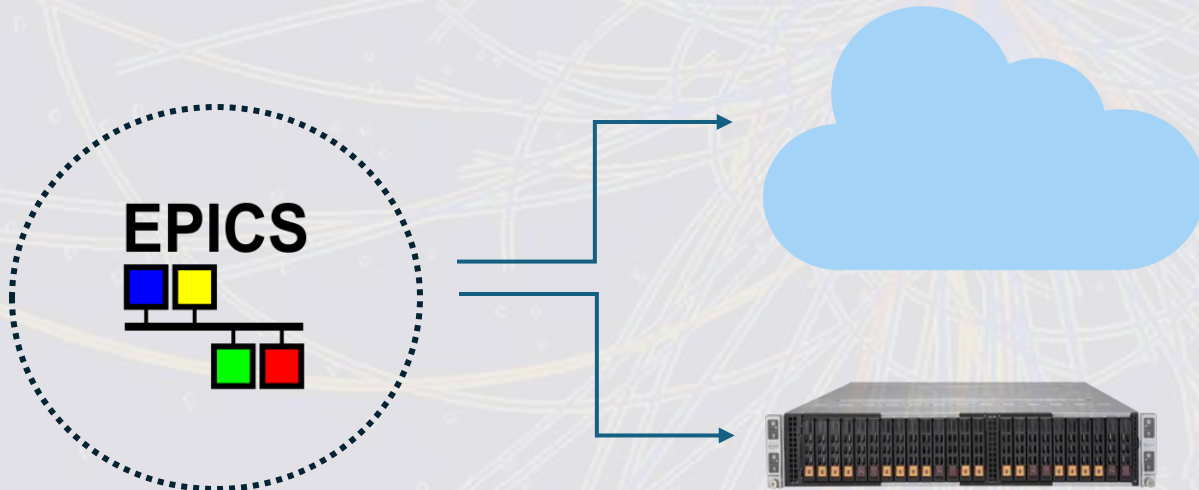
Features

- Actuation
- Monitoring
- User friendly interface
- Data logging & retrieval
- Openness to external apps



Why not to provide a CaaS (Control as a Service)?

- It fully meets the INFN mission;
- There is a large catchment area completely disregarded;
- We have already done a pilot project of it (!CHAOS INFN flagship project, funded by MIUR);
- !CHAOS is running on K8s (Really! Right now!) on some LNF facilities;
- We are using this approach for the SSRIP project in Romania (formerly ELI-NP).



Provisioning K8s on Bare Metal



FOREMAN is a complete lifecycle management tool for physical and virtual servers.

PXE, DHCP and KICKSTAR file



4 X Server con Rocky Linux 9



K8s Cluster configuration



puppet is a software configuration management tool which includes its own declarative language to describe system configuration.

Module using from puppet-forge:

puppetlabs-kubernetes version 8.0.0

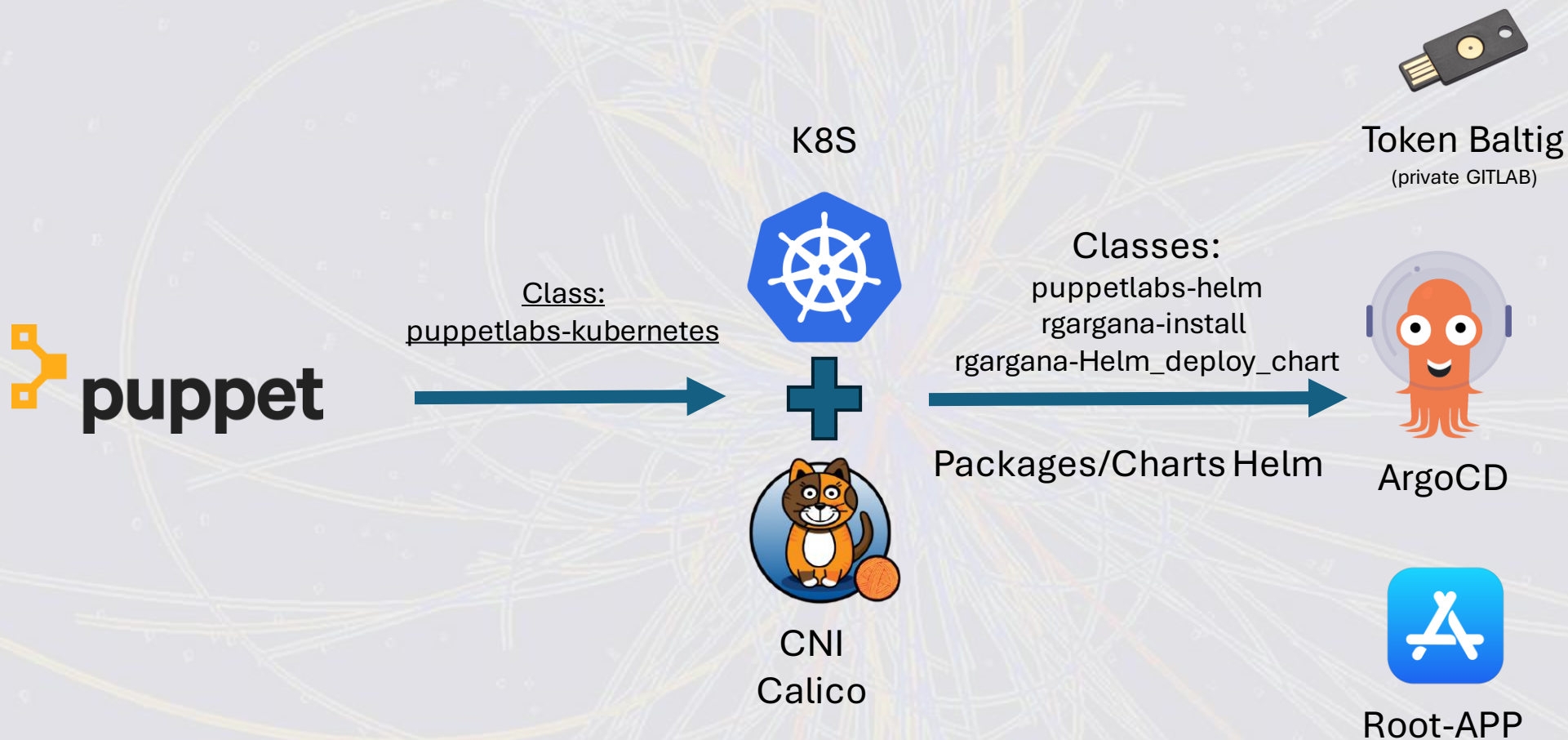
puppetlabs-helm version 4.0.0 (Patched in baltig)

Module create purpose:

rgargana-helm_deploy_chart (in baltig)

rgargana-installer (in baltig)

Workflow deploy Infrastructure



ArgoCD



Baltig Token access

Token Baltig
(private GITLAB)



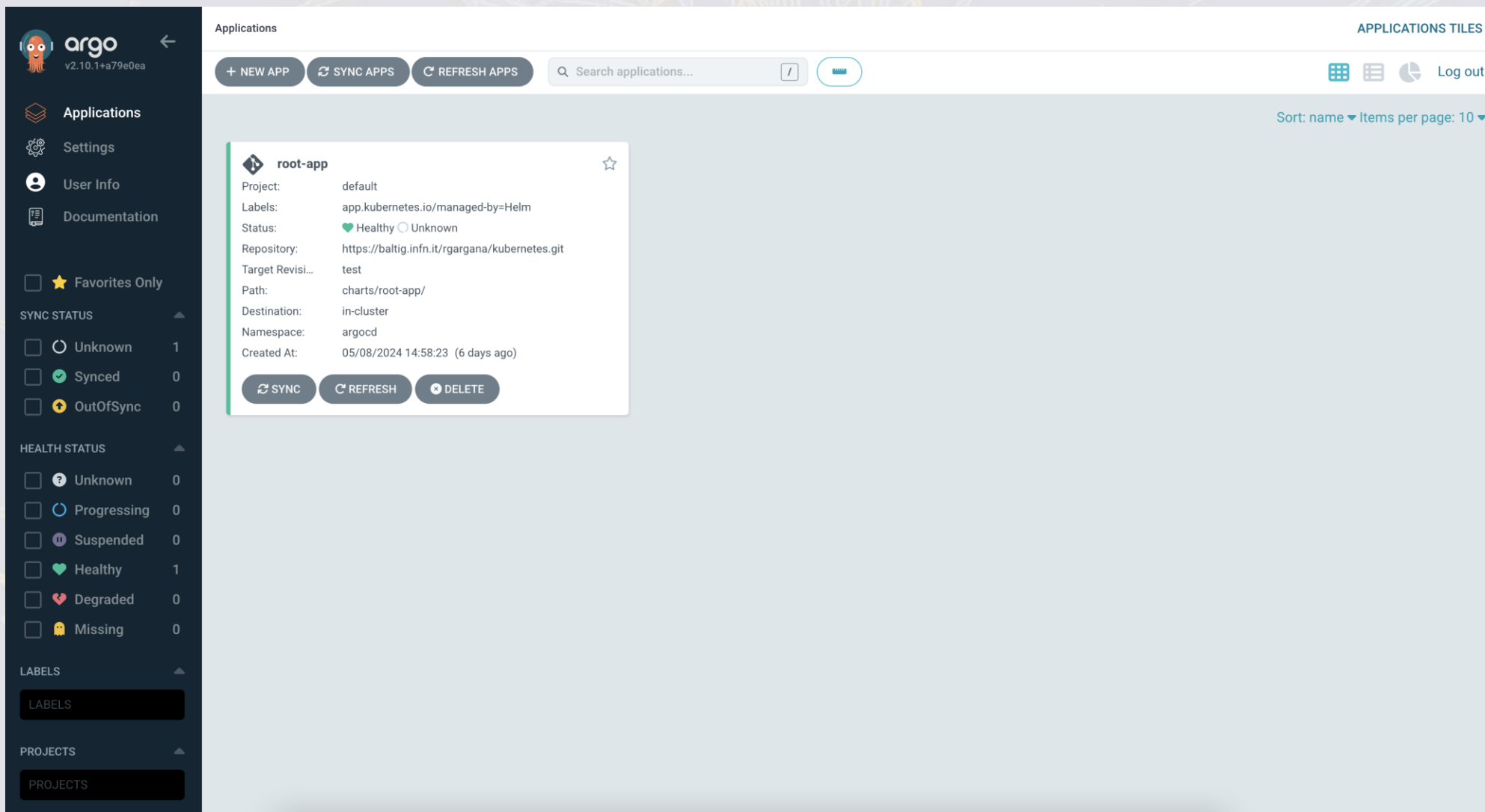
Argo CD is a declarative, GitOps continuous delivery tool for Kubernetes.



Root-APP

Root-APP is ArgoCD application, is used to automatically deploy other services included in the owner's Git/Baltig repository.

ArgoCD Dashboard after deploy

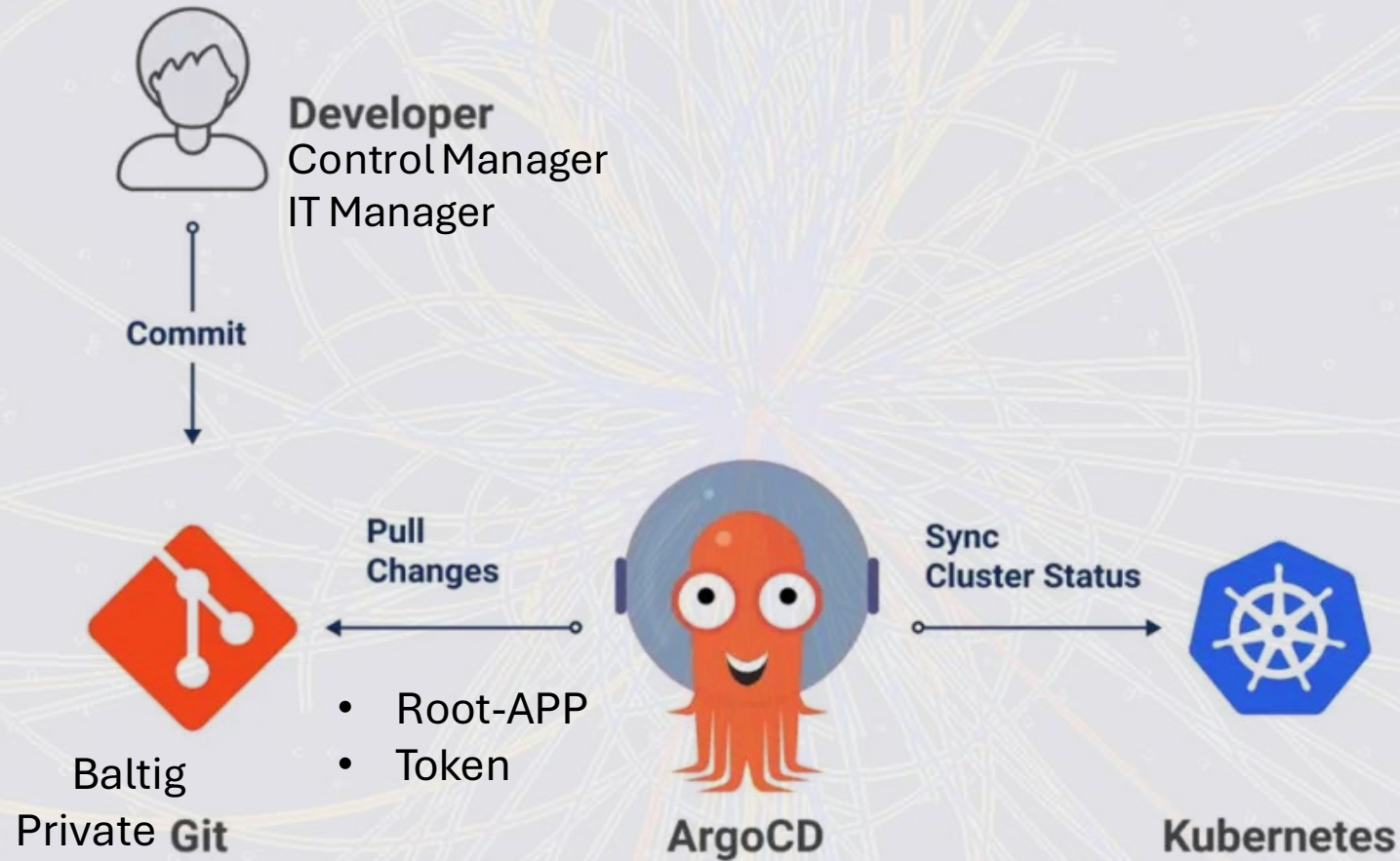


The screenshot displays the ArgoCD dashboard interface. On the left is a dark sidebar with navigation options: Applications, Settings, User Info, and Documentation. Below these are sections for 'Favorites Only', 'SYNC STATUS' (Unknown: 1, Synced: 0, OutOfSync: 0), 'HEALTH STATUS' (Unknown: 0, Progressing: 0, Suspended: 0, Healthy: 1, Degraded: 0, Missing: 0), 'LABELS', and 'PROJECTS'. The main area is titled 'Applications' and features a top bar with '+ NEW APP', 'SYNC APPS', 'REFRESH APPS', a search bar, and a 'Log out' button. A card for 'root-app' is highlighted, showing the following details:

- Project: default
- Labels: app.kubernetes.io/managed-by=Helm
- Status: Healthy Unknown
- Repository: https://baltig.infn.it/rgargana/kubernetes.git
- Target Revisi...: test
- Path: charts/root-app/
- Destination: in-cluster
- Namespace: argocd
- Created At: 05/08/2024 14:58:23 (6 days ago)

Below the details are three buttons: SYNC, REFRESH, and DELETE. The top right of the dashboard shows 'APPLICATIONS TILES' and 'Sort: name Items per page: 10'.

ArgoCD App-of-App - GitOps Approach



Root-APP deploy

Riccardo Gargana / kubernetes / Repository

main ▾ kubernetes / charts / root-app / templates / + ▾

History Find file Edit ▾ Code ▾












Fix new Typo

root authored 46 minutes ago

a28c9d6a



Name	Last commit	Last update
..		
 NFS-subdir-external-provisioner.yaml	Remove default storage class to nfs	2 months ago
 argo-cd.yaml	Fix dex on argocd files	1 month ago
 epik8-backend.yaml	fix Typo	2 hours ago
 haproxy-ingress.yaml	Add longhorn ingress. fix creation ns for other services	2 months ago
 longhorn.yaml	Change longhorn app	2 months ago
 metallb.yaml	Add longhorn ingress. fix creation ns for other services	2 months ago
 root-app-kustomize.yaml	Fix new Typo	46 minutes ago
 root-app.yaml	Fix namespace application	2 months ago
 sparc-console.yaml	Change privileg to null	2 months ago


Kustomize into ArgoCD








Kubernetes native configuration management

Kustomize introduces a template-free way to customize application configuration that simplifies the use of off-the-shelf applications.

Riccardo Gargana / kubernetes / Repository

main ▾ kubernetes / charts / kustomize / base / + ▾

 **Fix typo longhorn ingress**
root authored 2 months ago

Name	Last commit
..	
 haproxy-ns.yaml	Fix name of file
 ingress-argocd.yaml	Change FQDN service
 ingress-k8s-dashboard.yaml	Change FQDN service
 ingress-longhorn.yaml	Fix typo longhorn ingress
 kustomization.yaml	Add longhorn ingress. fix creation ns for other services
 metallb-config.yaml	Fix code
 nfs-provisioner-ns.yaml	Fix namespace application

argo v2.3.0-rc1

- Applications
- Settings
- User info
- Documentation

NAME

KINDS

SYNC STATUS

- Synced 11
- OutOfSync 0

HEALTH STATUS

- Healthy 3
- Progressing 0
- Degraded 0
- Suspended 0
- Missing 0
- Unknown 0

NAMESPACES

Applications | root-app-kustomize

DETAILS | DIFF | SYNC | SYNC STATUS | HISTORY AND ROLLBACK | DELETE | REFRESH

APP HEALTH: Healthy

SYNC STATUS: Synced to HEAD (a28c9d6)

LAST SYNC: Sync OK to a28c9d6

Authorized by root <root@kubernetes:chaos.inf.infn.it> an hour ago (Tue May 14 2024 15:06:53 GMT+0200)

Fix new Typo

root-app-kustomize

- haproxy
- metallb
- nfs-provisioner
- admin-user
- admin-user
- first-pool
- zadvertising
- argocd-ingress
- dashboard-ingress
- longhorn-ingress
- admin-user

Overview Dashboard ArgoCD

APPLICATIONS TILES

+ NEW APP
↻ SYNC APPS
🔄 REFRESH APPS

🏠
👤 Log out

Sort: name ▾ Items per page: 10 ▾

argo-cd ★

Project: default

Labels: argocd.argoproj.io/instance=root-app

Status: ♥ Healthy ✔ Synced

Repository: https://baltig.infn.it/rgargana/kubernetes.git

Target Revis... HEAD

Path: charts/argo-cd

Destination: in-cluster

Namespace: argocd

Created At: 03/03/2024 12:21:22 (3 months ago)

Last Sync: 04/12/2024 00:24:06 (a month ago)

↻ SYNC
🔄 REFRESH
🗑️ DELETE

haproxy-ingress ★

Project: default

Labels: argocd.argoproj.io/instance=root-app

Status: ♥ Healthy ✔ Synced

Repository: https://haproxy-ingress.github.io/charts

Target Revis... 0.14.6

Chart: haproxy-ingress

Destination: in-cluster

Namespace: haproxy

Created At: 03/03/2024 12:21:22 (3 months ago)

Last Sync: 05/14/2024 15:12:05 (7 days ago)

↻ SYNC
🔄 REFRESH
🗑️ DELETE

longhorn ★

Project: default

Labels: argocd.argoproj.io/instance=root-app

Status: ♥ Healthy ✔ Synced

Repository: https://charts.longhorn.io/

Target Revis... v1.6.0

Chart: longhorn

Destination: in-cluster

Namespace: longhorn-system

Created At: 03/12/2024 22:20:10 (2 months ago)

Last Sync: 03/12/2024 22:20:28 (2 months ago)

↻ SYNC
🔄 REFRESH
🗑️ DELETE

metallb ★

Project: default

Labels: argocd.argoproj.io/instance=root-app

Status: ♥ Healthy ✔ Synced

Repository: https://metallb.github.io/metallb

Target Revis... 0.13.12

Chart: metallb

Destination: in-cluster

Namespace: metallb

Created At: 03/11/2024 23:46:36 (2 months ago)

Last Sync: 05/21/2024 09:46:48 (2 minutes ago)

↻ SYNC
🔄 REFRESH
🗑️ DELETE

nfs-subdir-external-provisioner ★

Project: default

Labels: argocd.argoproj.io/instance=root-app

Status: ♥ Healthy ✔ Synced

Repository: https://kubernetes-sigs.github.io/nfs-subdir-ext...

Target Revis... 4.0.18

Chart: nfs-subdir-external-provisioner

Destination: in-cluster

Namespace: nfs-provisioner

Created At: 03/12/2024 00:01:22 (2 months ago)

Last Sync: 05/14/2024 15:12:05 (7 days ago)

↻ SYNC
🔄 REFRESH
🗑️ DELETE

root-app ★

Project: default

Labels: app.kubernetes.io/managed-by=Helm, argocd.arg...

Status: ♥ Healthy ✔ Synced

Repository: https://baltig.infn.it/rgargana/kubernetes.git

Target Revis... HEAD

Path: charts/root-app/

Destination: in-cluster

Namespace: argocd

Created At: 03/03/2024 12:09:13 (3 months ago)

Last Sync: 05/21/2024 09:19:52 (29 minutes ago)

↻ SYNC
🔄 REFRESH
🗑️ DELETE

root-app-kustomize ★

Project: default

Labels: argocd.argoproj.io/instance=root-app

Status: ♥ Healthy ✔ Synced

Repository: https://baltig.infn.it/rgargana/kubernetes.git

Target Revis... HEAD

Path: charts/kustomize/base/

Destination: in-cluster

Namespace: argocd

Created At: 05/14/2024 15:11:45 (7 days ago)

Last Sync: 05/14/2024 15:12:36 (7 days ago)

↻ SYNC
🔄 REFRESH
🗑️ DELETE

📁 Applications

⚙️ Settings

👤 User Info

📖 Documentation

🌟 Favorites Only

🔄 SYNC STATUS

- 🤔 Unknown 0
- 🟢 Synced 7
- 🟡 OutOfSync 0

🟢 HEALTH STATUS

- 🤔 Unknown 0
- 🔄 Progressing 0
- ⏸️ Suspended 0
- 🟢 Healthy 7
- 🟡 Degraded 0
- 🟠 Missing 0

🏷️ LABELS

📁 PROJECTS

📁 CLUSTERS

🏠 Home

📄 Applications

📄 Settings

📄 User Info

📄 Documentation

📄 Labels

📄 Projects

📄 Clusters

Provisioning OKD on vSphere

by Ramon Orrù



Terraform (Infrastructure as code) creates bastion host & service account privileges

Ansible sets up bastion host and compiles install config



OKD installer brings up whole cluster

Installation takes approx. 45 mins

OKD Cluster configuration



Kustomize allows maintaining a cluster configuration efficiently

vSphere storage drivers support PVs dynamic allocation out of the box, even with CSI compliance



ArgoCD enables gitops features and keeps apps in sync

Why OKD?

- IPI/UPI automated installer
- OTA updates
- CNI drivers
- CSI drivers
- Complete dashboard
- Ingress
- Monitoring platform
- Log ingestion
- Alerting
- Registry
- Auth connectors
- Operators marketplace
- KubeVirt (VMs)

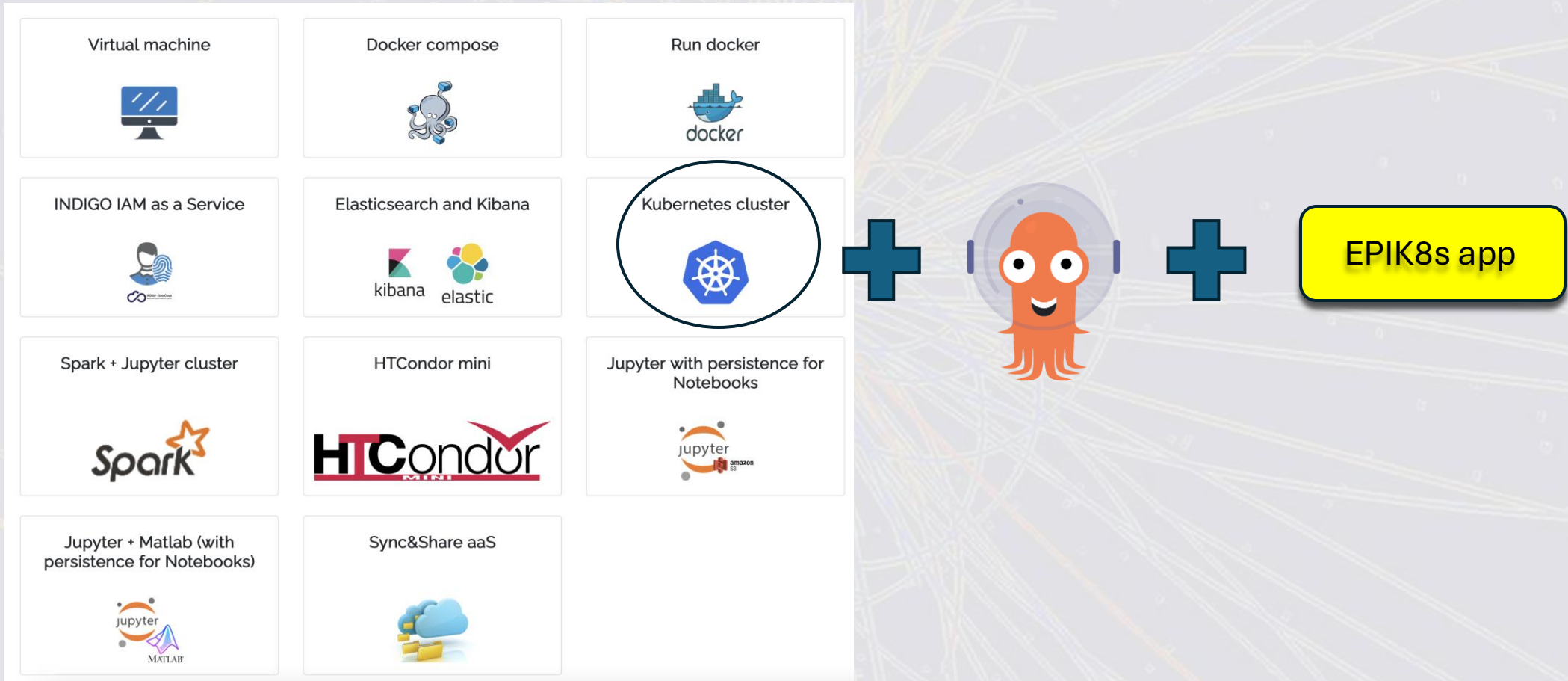


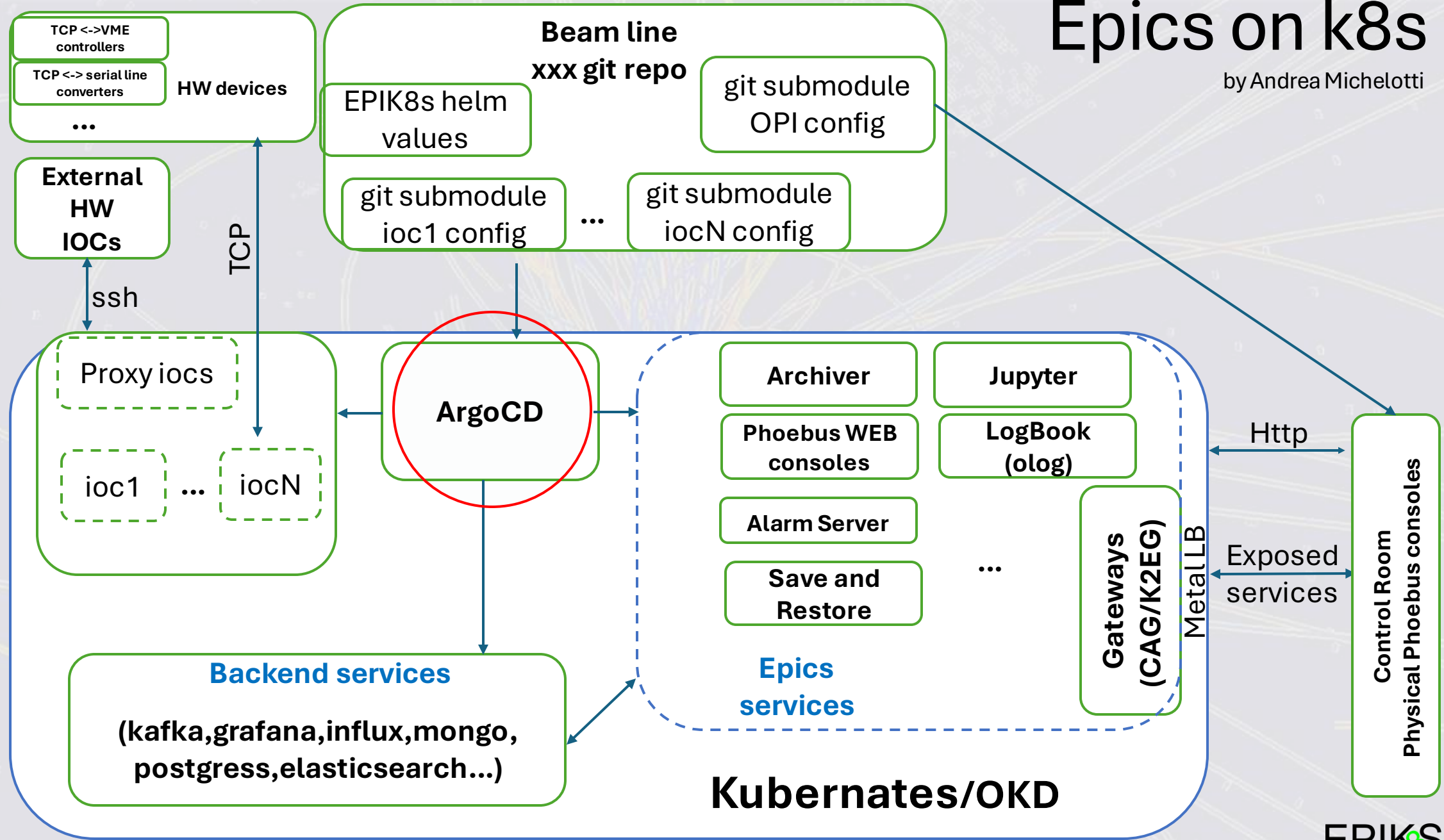
+

= **okd**

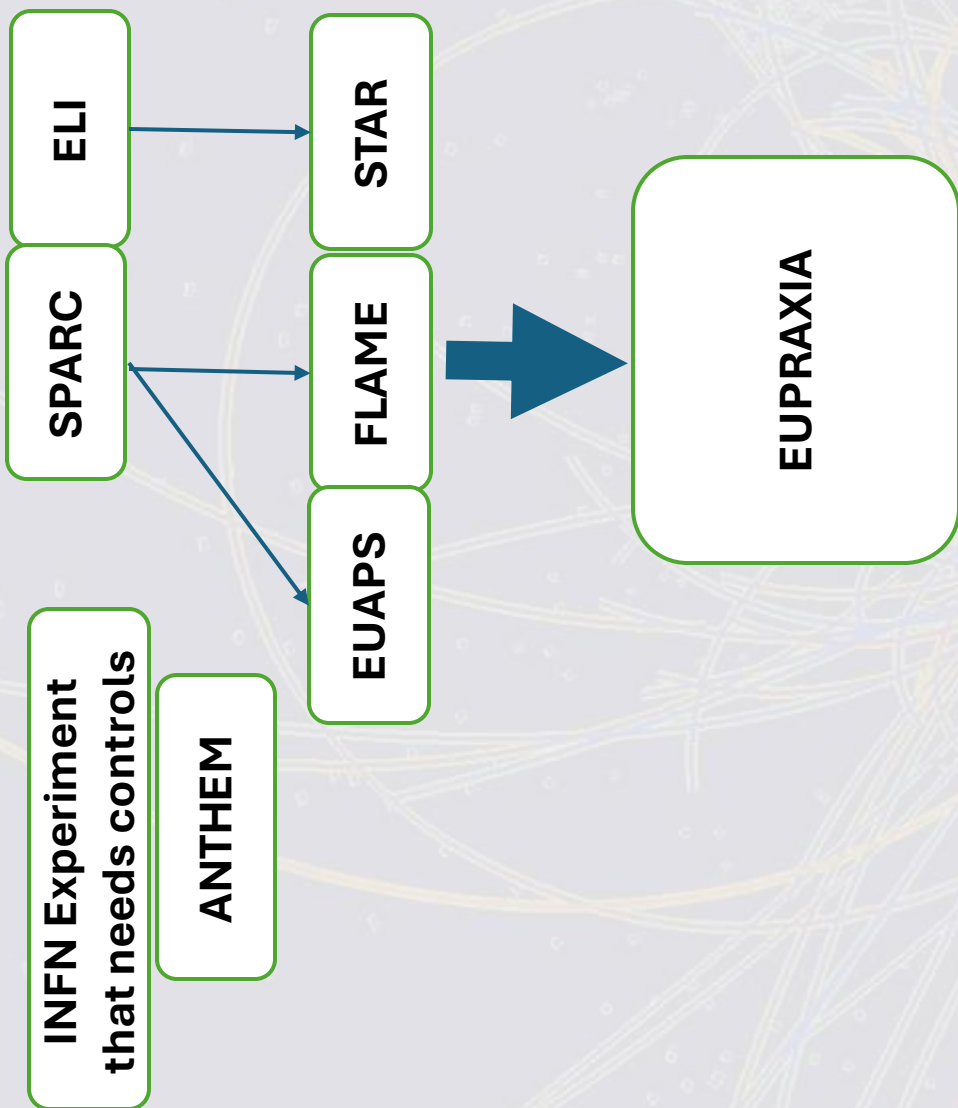
Out of the box

K8s in INFN Cloud + ArgoCD





EPIK8s a common platform for INFN experiments that needs EPICS controls



With standardized workflows and tools provided by a predefined platform, a database of controls, interfaces, and common procedures will be established. This platform will gradually become more comprehensive and refined, simplifying the installation of full-featured EPICS controls in our experiments.

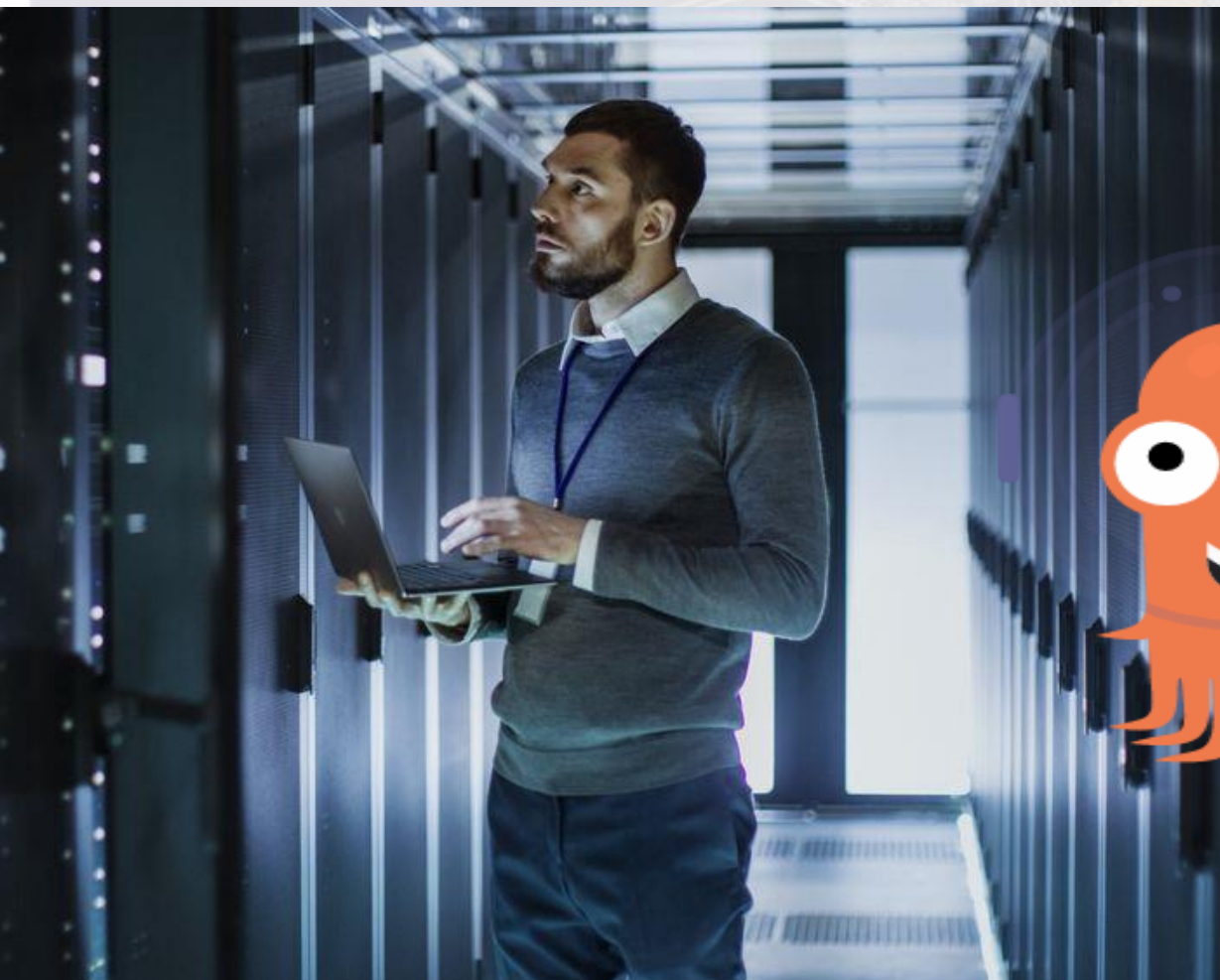
THIS IS THE MISSION OF “RETE EPICS INFN”
epics@lists.infn.it

ArgoCD control application lifecycle dashboard (LNF SPARC facility)

Applications

Project	Status	Repository	Target Revision	Path	Destination	Namespace	Created At	Last Sync	Actions
sparc-archiver-service	Healthy Synced	https://baltig.infn.it/epics-containers/epics-archiver-chart.git	dev	-	in-cluster	sparc	04/10/2024 11:08:57 (a month ago)	05/04/2024 23:14:30 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcac1bpm001-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:17:49 (14 days ago)	05/04/2024 23:31:28 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcac2bpm001-loc	OutOfSync	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/16/2024 12:43:21 (15 minutes ago)	-	SYNC REFRESH DELETE
sparc-bdparcac3bpm001-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:20:09 (14 days ago)	05/04/2024 23:34:37 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcdg1bpm001-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:20:20 (14 days ago)	05/04/2024 23:34:35 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcdg1bpm002-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:21:29 (14 days ago)	05/04/2024 23:34:35 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcdg1bpm003-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:21:29 (14 days ago)	05/04/2024 23:34:37 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcdg1bpm004-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:21:29 (14 days ago)	05/04/2024 23:34:35 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcdg1bpm005-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:21:39 (14 days ago)	05/04/2024 23:34:35 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcplbpm002-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/03/2024 00:21:51 (14 days ago)	05/04/2024 23:34:35 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcplbpm003-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	04/30/2024 11:14:16 (16 days ago)	05/04/2024 23:34:19 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcplbpm004-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	04/30/2024 11:14:16 (16 days ago)	05/04/2024 23:34:35 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcplbpm005-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	04/30/2024 11:14:16 (16 days ago)	05/04/2024 23:34:38 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcplbpm006-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	04/30/2024 11:14:16 (16 days ago)	05/04/2024 23:34:37 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcplbpm007-loc	Progressing Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	05/07/2024 21:46:28 (9 days ago)	05/07/2024 21:46:29 (9 days ago)	SYNC REFRESH DELETE
sparc-bdparcptbpm001-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	04/30/2024 10:52:43 (16 days ago)	05/04/2024 23:34:38 (12 days ago)	SYNC REFRESH DELETE
sparc-bdparcutbpm001-loc	Healthy Synced	https://baltig.infn.it/epics-containers/loc-launcher-chart.git	dev	-	in-cluster	sparc	04/30/2024 11:46:17 (16 days ago)	05/04/2024 23:34:35 (12 days ago)	SYNC REFRESH DELETE
sparc-cagateway-service	Healthy Synced	https://baltig.infn.it/epics-containers/ca-gateway-chart.git	dev	-	-	-	-	-	SYNC REFRESH DELETE
sparc-channelfinder-service	Healthy Synced	https://baltig.infn.it/epics-containers/channelfinder-chart.git	dev	-	-	-	-	-	SYNC REFRESH DELETE
sparc-console-service	Healthy Synced	https://baltig.infn.it/epics-containers/epics-console-chart.git	dev	-	-	-	-	-	SYNC REFRESH DELETE
sparc-deploy-all	Healthy Synced	https://baltig.infn.it/epics-containers/epik8-chart.git	HEAD	-	-	-	-	-	SYNC REFRESH DELETE

Collaborative environment



IT Architect



Control System Manager

Acknowledgement

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Mauro Giacchini

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.... apologies for my memory