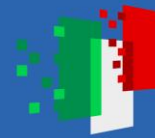




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# Federation Manager: a New Component for the Federated Resource Management in INFN Cloud

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## The INFN Cloud ecosystem

INFN decided to implement a **national Cloud computing infrastructure** for research

- as a **federation** of existing distributed Cloud infrastructures
- as an "user-centric" infrastructure which makes available to the final users a dynamic **set of services** tailored on specific use cases
- leveraging the outcomes of several national and European Cloud projects where INFN actively participated, e.g. INDIGO DataCloud

INFN Cloud was officially made available to users in **March 2021**



e.g. Notebook as a Service

e.g. Virtual Machine, Docker compose

e.g. Start & Stop, Hostname choice

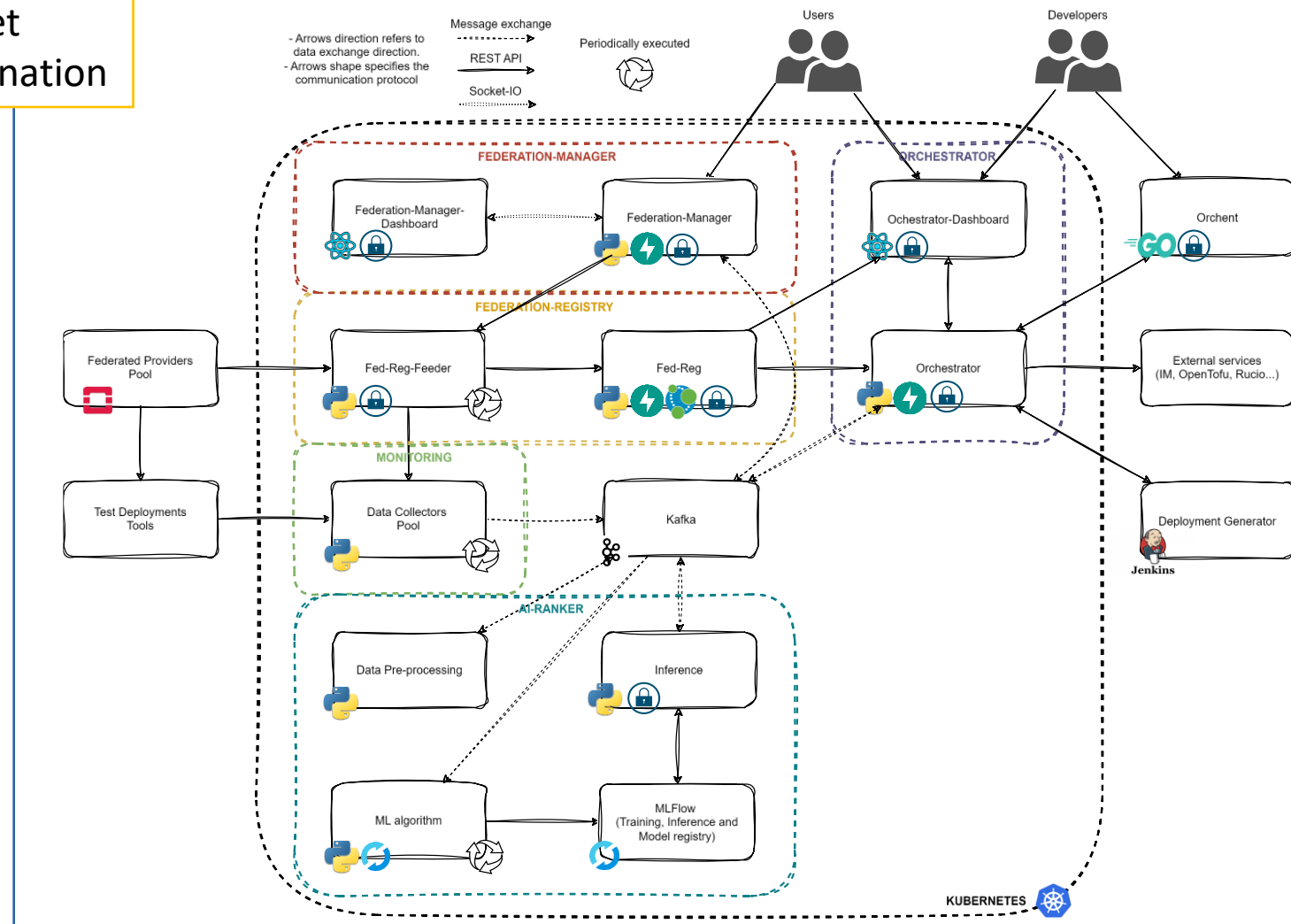
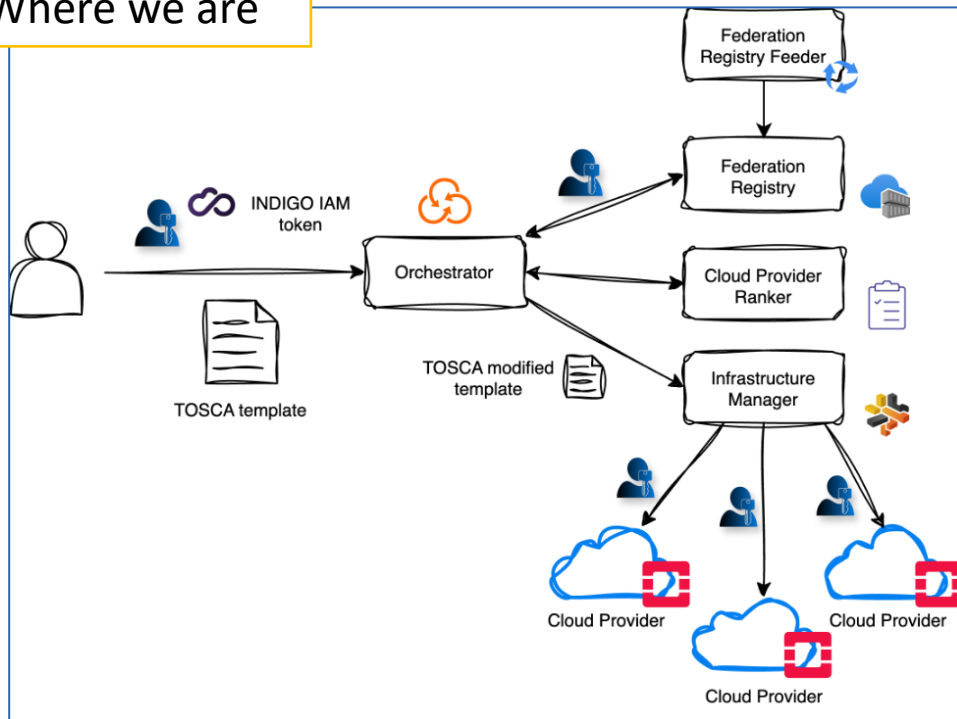




# The new PaaS

Target destination

Where we are

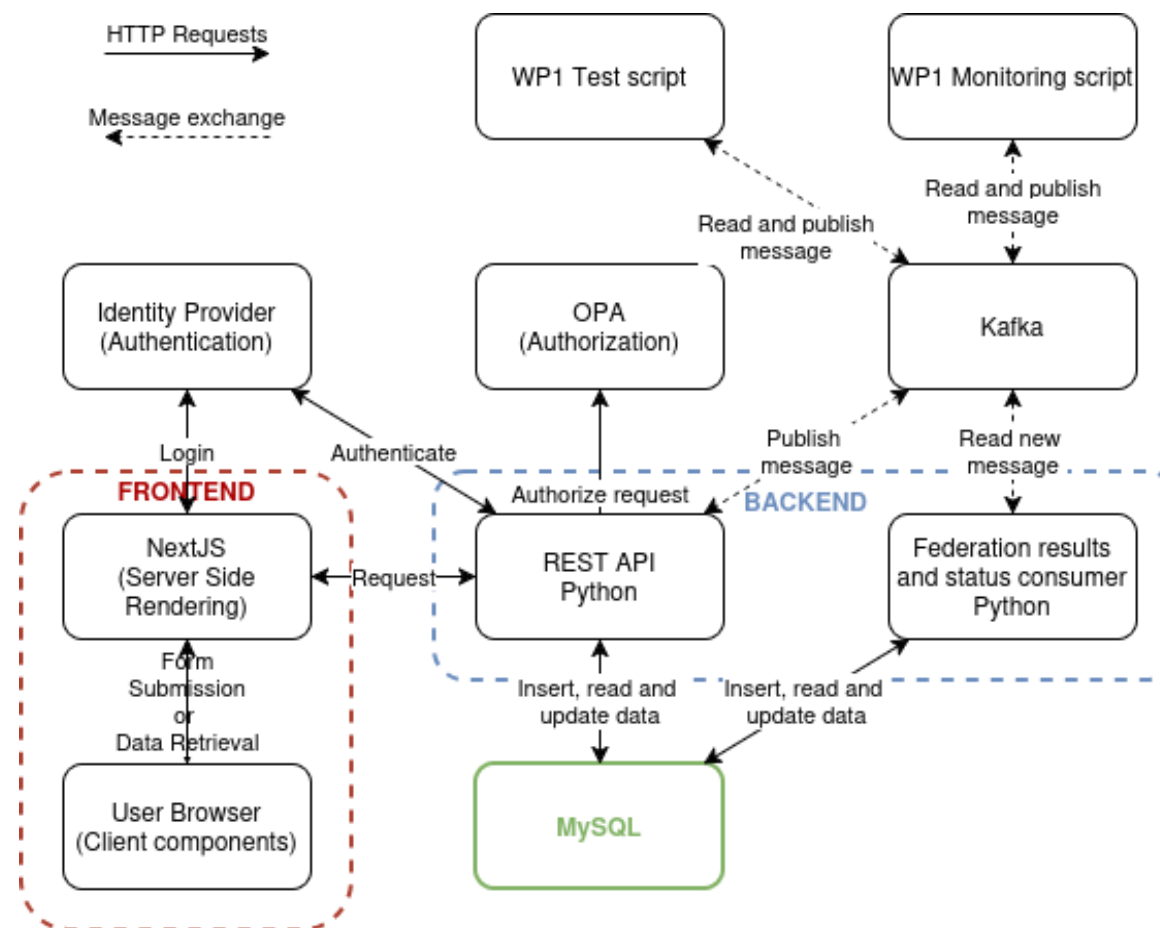


## Federation Manager: Targets and motivations

- **The Federation Manager is the core component of the DataCloud PaaS**, responsible for the end-to-end management of provider federation processes and the onboarding of scientific communities.
- **It automates and governs policies, identities, and SLAs**, ensuring consistency, security, and scalability across heterogeneous and geo-distributed cloud environments.
- **It enables a user-centric and dynamic model**, where resources and services are transparently integrated and exposed across multiple federated infrastructures.
- **Through native integration with the new PaaS architecture**, the Federation Manager acts as a key enabler for evolution, interoperability, and long-term sustainability of the DataCloud.

## Architecture

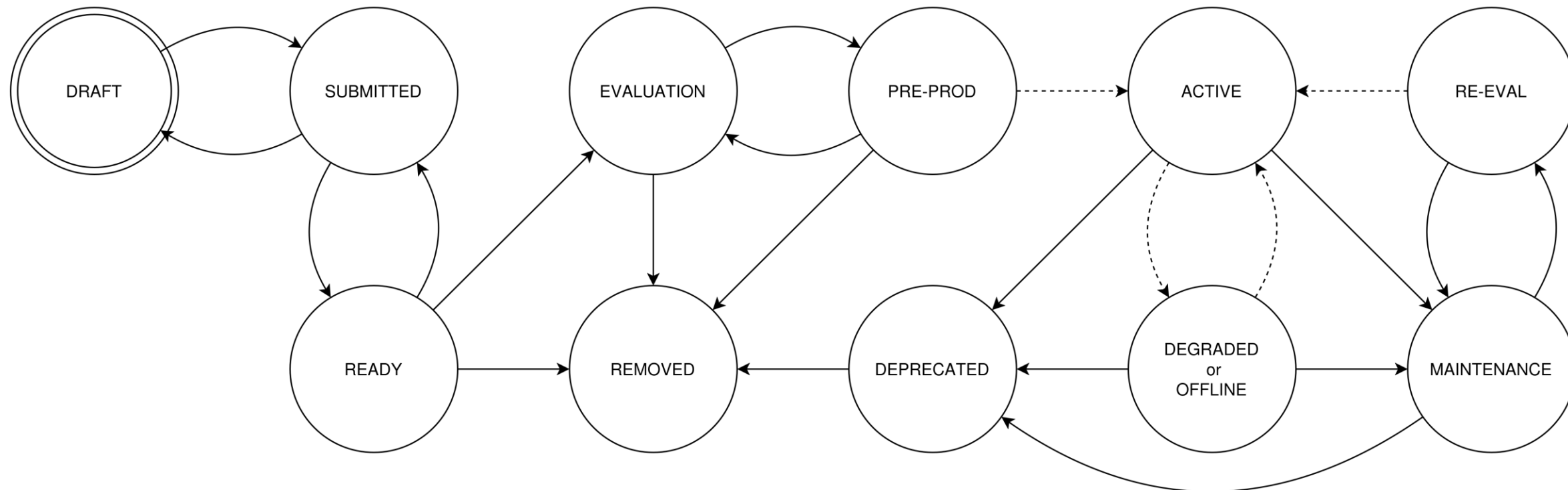
- **Frontend:** React (typescript) provided by Next.js
- **Backend:** FastAPI (python)
- **Database:** MySQL
- **Workflow management:** Kafka
- **Authentication:** Flaas library (backend) + BetterAuth (frontend)
- **Authorization:** Open Policy Agent



## New provider federation request workflow

Automatic or pseudo-automatic

Manual (GUI operation)





# Dashboard

**Federation Manager**

INFN  
Federation Manager  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt.

**PROVIDERS**

STATUS: All  Owned by me

PE	Provider Example	Ettore Serra	ERROR
PT	Provider Test	Giovanni Savarese	COMPLETED

**+ CREATE PROVIDER**

**+ CREATE NEW PROVIDER**

NAME (0/50)  
Description

AUTH URL  
https://keystone.cloud.infn.it/v3

IS PUBLIC

PROVIDER TYPE  
Openstack

IMAGE TAGS  
infn-cloud

NETWORK TAGS  
infn-cloud

SUPPORT EMAILS  
example@gmail.com

CANCEL SAVE

**Federation Manager**

PE **Provider Example** Openstack - https://keystone.cloud.infn.it/v3 DRAFT

Step 4  
Check everything and submit the request

**IDENTITY PROVIDERS** + Connect IDP

NAME	PROTOCOL	IDP	CREATED AT
IAM CLOUD	openid	Test IDP	10/10/2025

**REGIONS** + Add Region

NAME	COUNTRY	SITE	LAT	LON	CREATED AT
CNAF-1	IT	Tecnopolo	44.1	11.3	10/10/2025

**PROJECTS** + Add Project

NAME	IS ROOT	REGION OVERRIDES	CREATED AT
InterTwin	True	True (3)	10/10/2025

**Submit the request**  
Be sure to check that everything is correct and submit the request

SUBMIT

## Backend REST API and Kafka consumer

Unique access point to the MySQL DB

### REST API

- All endpoints requires user authentication
- Based on the user's groups OPA can authorize or reject requests on specific operations

### Kafka Consumer

- Secured communication
- Listen for kafka messages sent by the *Rally tests* component and update the DB

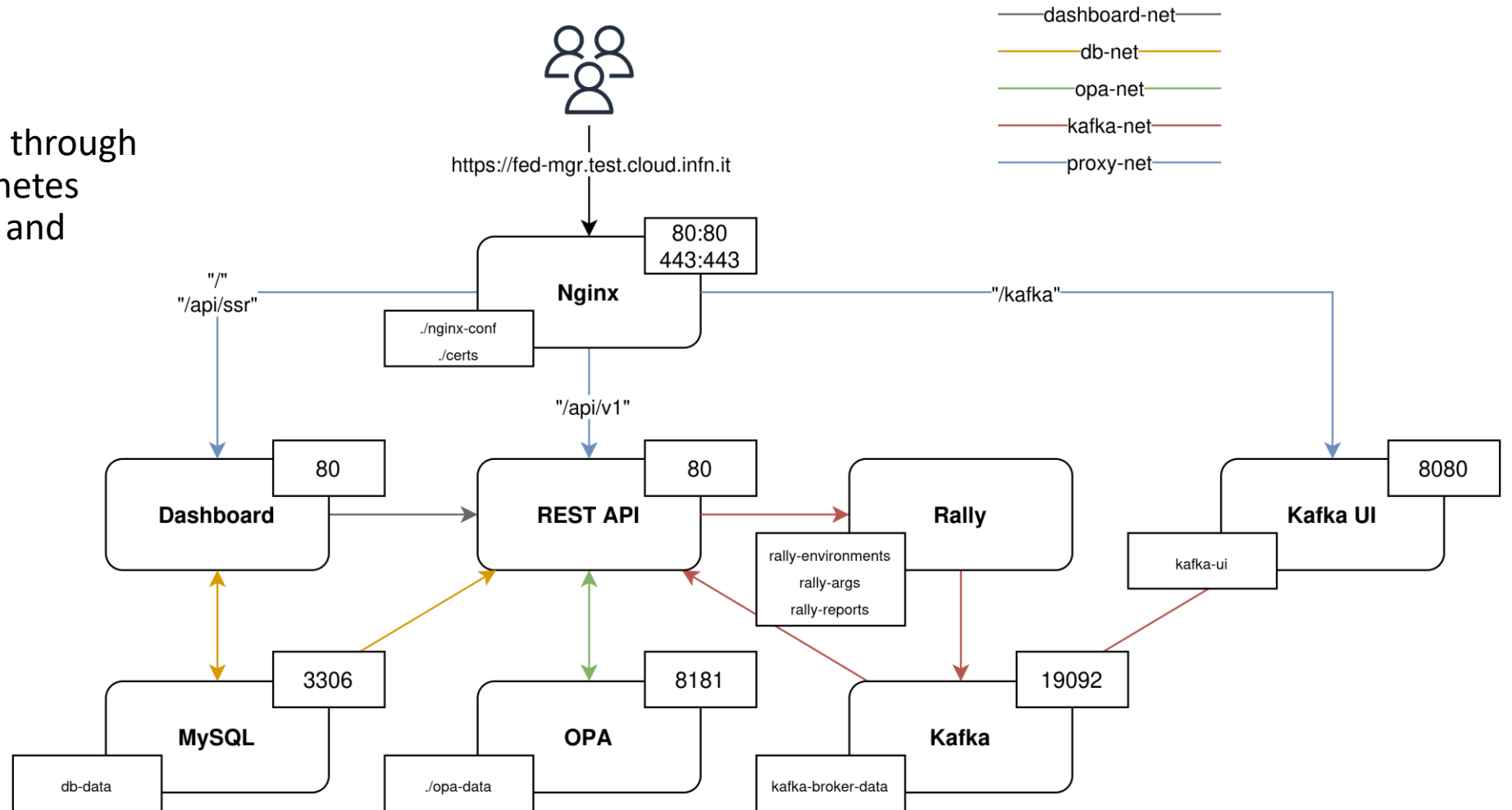
## Rally tests

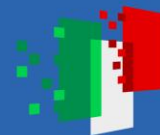
- Periodic python script
- On all federated clouds (only Openstack) execute rally tests to validate the configuration
  - **Nova**: list of OpenStack flavors, creation-elimination of a keypair.
  - **Neutron**: association-dissociation of floating IPs, creation-elimination of security groups and security group rule.
  - **Glance**: list of images, creation-elimination of an image.
  - **Cinder**: creation-elimination and creation-attachment of a volume.
  - **Keystone**: The user authentication and token validation.
- Send a Kafka message to report the result
- Continuous monitoring of the provider's resources
- Can be used to perform more in-depth debug of the status of the provider



## Deployment

Containerized deployment through docker Compose or Kubernetes (both configuration tested and available)





## The story so far

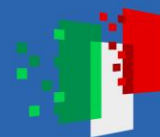
- We discussed a lot about the **best federation workflow**, the **role based access**, and the **integration with the PaaS architecture**
- We in depth analyzed the **UI navigation**, the **components shape** and **behavior** and the **REST API** definition
- We hardened **security details** about secrets sharing between the federation manager components.
- In the direction of deploying the whole PaaS on kubernetes, we deployed a beta version of the application using both a **docker-compose** file and **kubernetes manifests**.



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# Thank you

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