Stato di INFN Cloud

Uso e sviluppo di applicazioni e servizi su INFN Cloud - 13/09/2022

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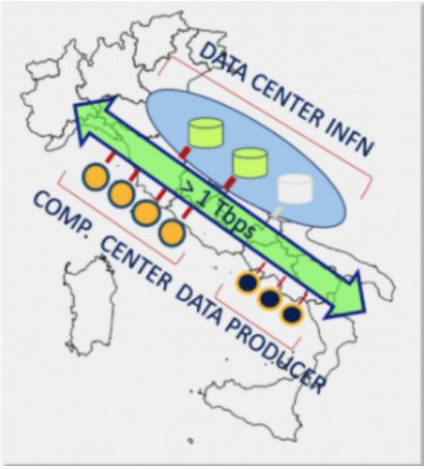
INFN Cloud Architecture

The INFN Cloud architecture

- An INFN Cloud backbone spanning the two main INFN computing sites (CNAF and Bari).
  - In each of these two sites there is an "INFN Cloud backbone infrastructure", connected at high speed with each other.
  - The backbone is used to host the INFN Cloud core services, such as the PaaS core, the internal DNS, the logging and monitoring services, as well as user services that leverage backbone features, such as automated replication of object storage data across the two sites.
- A set of distributed, federated cloud infrastructures connecting to the backbone. Currently, the cloud infrastructures at CNAF and Bari (which are not the corresponding backbone infrastructures) are already connected to the INFN Cloud backbone, with several other INFN sites in the pipeline.



The INFN Cloud backbone

The INFN Cloud Backbone is an OpenStack Cloud instance distributed over two data centers, in Bari and in Bologna.

Hardware resource are more or less evenly distributed among the two data centers:

- ~ 2000 vCPU
- ~ 15TB RAM
- ~ 1.6PB Storage (RAW)
- > 600 TB Storage net, ~10% SSD

All the Backbone resources are dedicated to INFN Cloud

The INFN Cloud backbone

- The INFN Cloud Backbone hosts INFN Cloud **core services** and **support services**

- It is also where the **development of new services and applications take place**. Development environments and testbeds are hosted by the INFN Cloud Backbone

The INFN Cloud backbone

It also hosts some use cases, particularly those that can take advantage from its distributed architecture:

- VM cold migration among data centers
- Volume migration among data centers
- on-line remote mirror of critical volumes for DR purposes

Users that need to implement HA and/or DR for their services should contact the INFN Cloud support team for support and assistance

Federated clouds

Presently the following infrastructures are federated to INFN Cloud:

- Cloud@ReCaS-Bari
- Cloud@CNAF
- CloudVeneto

Federated clouds

These infrastructures allocate a subset of their resources for INFN Cloud users and projects.

They can choose to support a subset of the INFN user groups and services

INFN Cloud established a set of rules that infrastructures must follow in order to join the federation

Although not a requirement, they all use OpenStack as a IaaS Cloud Middleware

INFN Cloud core services

INFN Cloud core services are those service that are needed in order to make INFN Cloud work

Core services are built with geographic redundancy in mind, the goal is to be able to quickly migrate each service from one of the backbone data centers to the other in case of issues

Although this goal is not completely fulfilled yet, recent events proved that we are on the right path

Automatic migration is being considered, but it increases complexity and more work is needed before we can adopt it

Core Services - The INFN Cloud PaaS

First of all the INFN Cloud Backbone hosts all the services needed by the PaaS infrastructure:

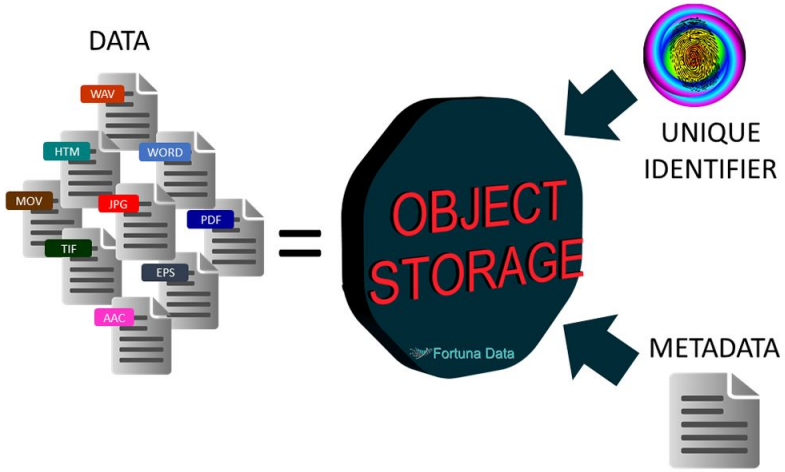
- Dashboard
- Orchestrator
- Infrastructure Manager
- CMDB
- SLAM
- Monitoring

The INFN Cloud PaaS is the means by which services requested by users are orchestrated and deployed on INFN Cloud

Core Services - Object Storage

INFN Cloud offers today a distributed object storage service based on **OpenStack Swift**

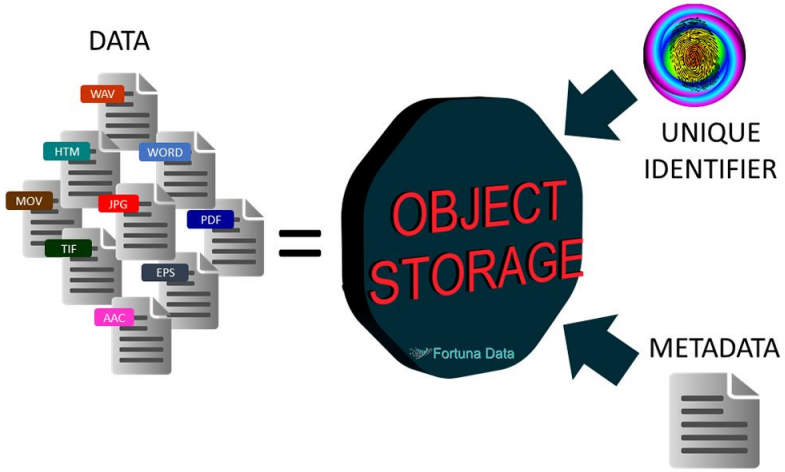
- data is replicated over two separate data centers (in Bologna and Bari)
- S3 and Swift API support (but only S3 APIs are presently available to end users)
- full integration with INFN Cloud use cases via high level tools



Core Services - Object Storage

Some high level tools that integrate with the INFN Cloud object storage service:

- **Duplicati**, **Duplicity** for data backup
- **MinIO Gateway** for interactive and programmatic access to scientific data
- **ownCloud**/**Nextcloud**
- **rclone** for programmatic access, fuse mount, backup

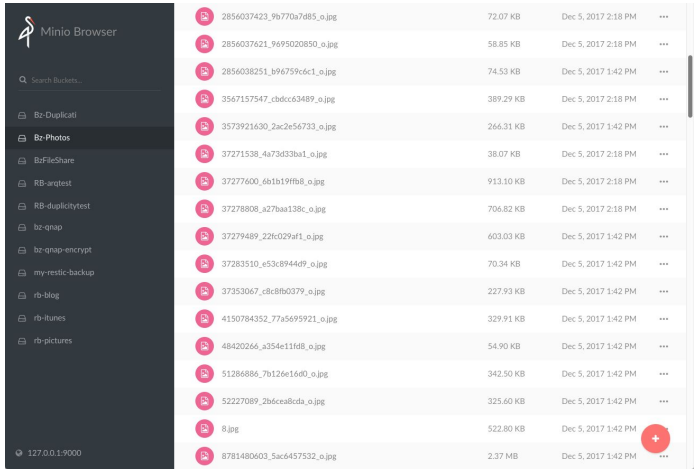


Core Services - Object Storage

A centrally managed **minio gateway** is presently the main entrypoint to data storage for INFN Cloud users

It is accessed via a web UI (https://minio.cloud.infn.it) or via S3 APIs

Jupyter notebook users find their data mounted under the *cloud-storage* folder



Core Services - DNS

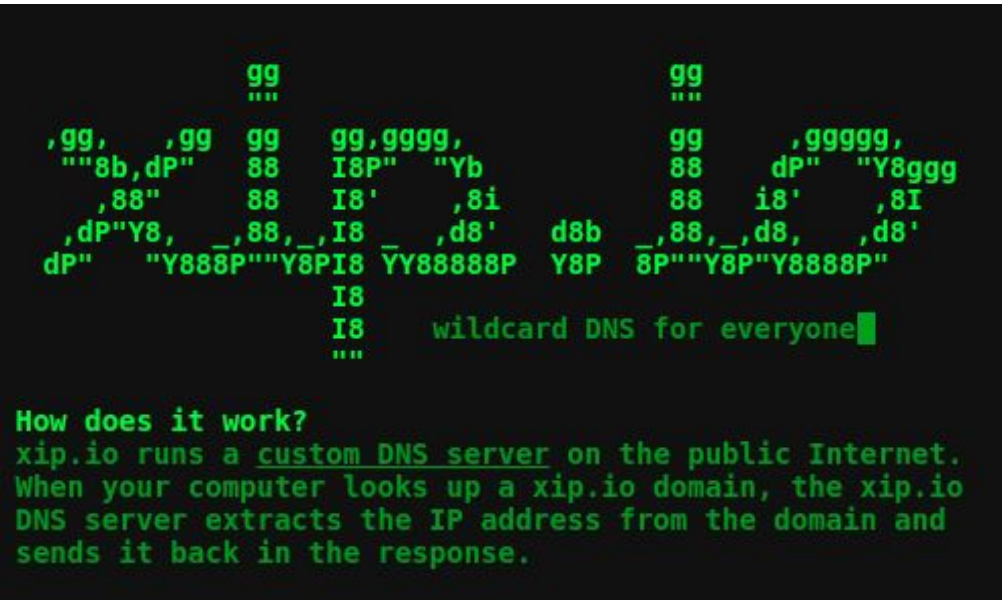
PowerDNS based DNS service:

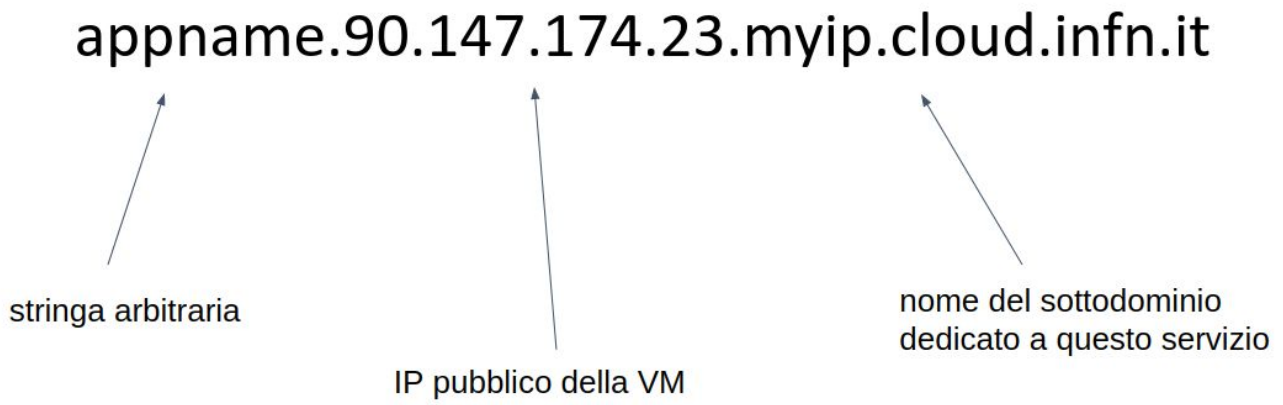
- rest API, command line client
- 3 servers: Bari, CNAF, LNL
- Used for implementing DNS-based HA/DR
- DNSaaS for end users as a future goal

Core Services - DNS

A mechanism similar to that of xip.io allows users to use one or more DNS names for each IP address exposing services on the network.

This makes the virtual host management and the use of x509 certificate (e.g. Let’s Encrypt) for connection security easier





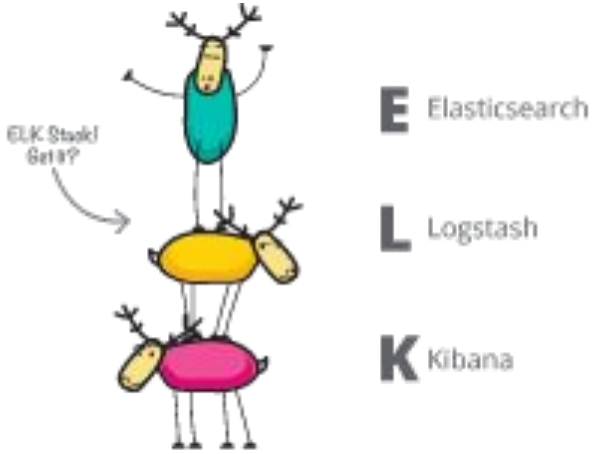
Core Services - Log collection & analysis

A **centralized log collection system** receives:

- logs from VMs running on INFN Cloud backbone
- core services logs
- support services logs

A **log analysis system** can give important information on:

- services operating status
- security issues and intrusion detection
- resource utilization imbalance



ELASTIC (ELK) STACK

Elasticsearch
Store, search, analyze

+

Kibana
Visualize, navigate, share

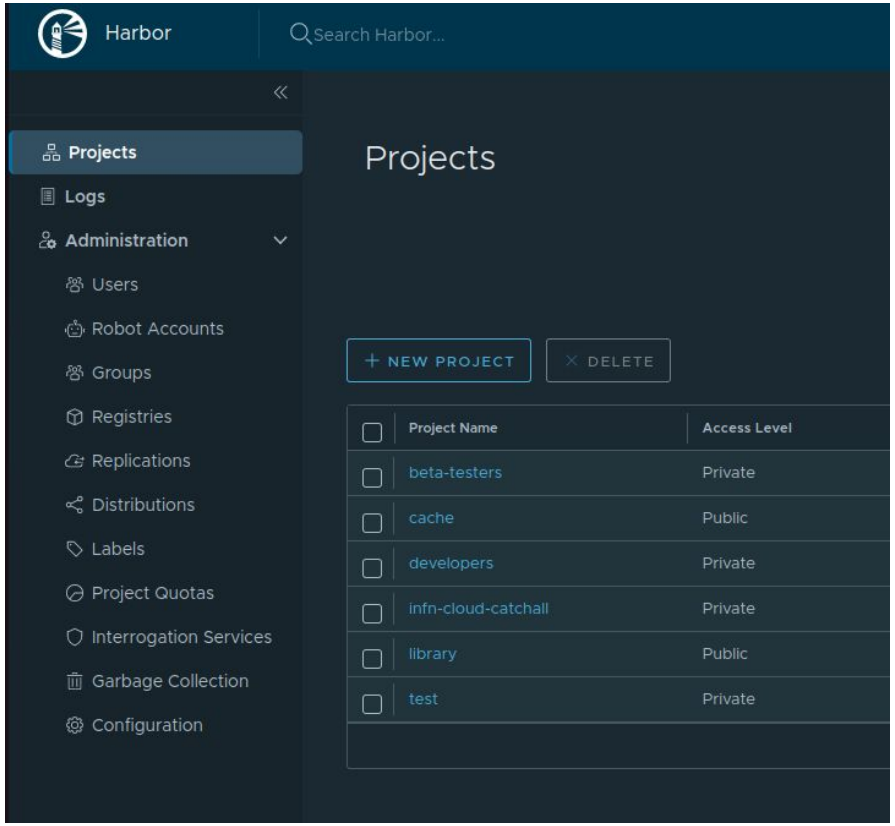
INFN Cloud support services

Support services are not strictly necessary for the normal operations of INFN Cloud

They provide useful tools for its users and its administrators

Docker/Helm chart repository

- A Docker/Helm chart repository based on harbor (https://goharbor.io/) is presently active for internal use
- Plans are to make it available to all INFN Cloud users



CI/CD facility

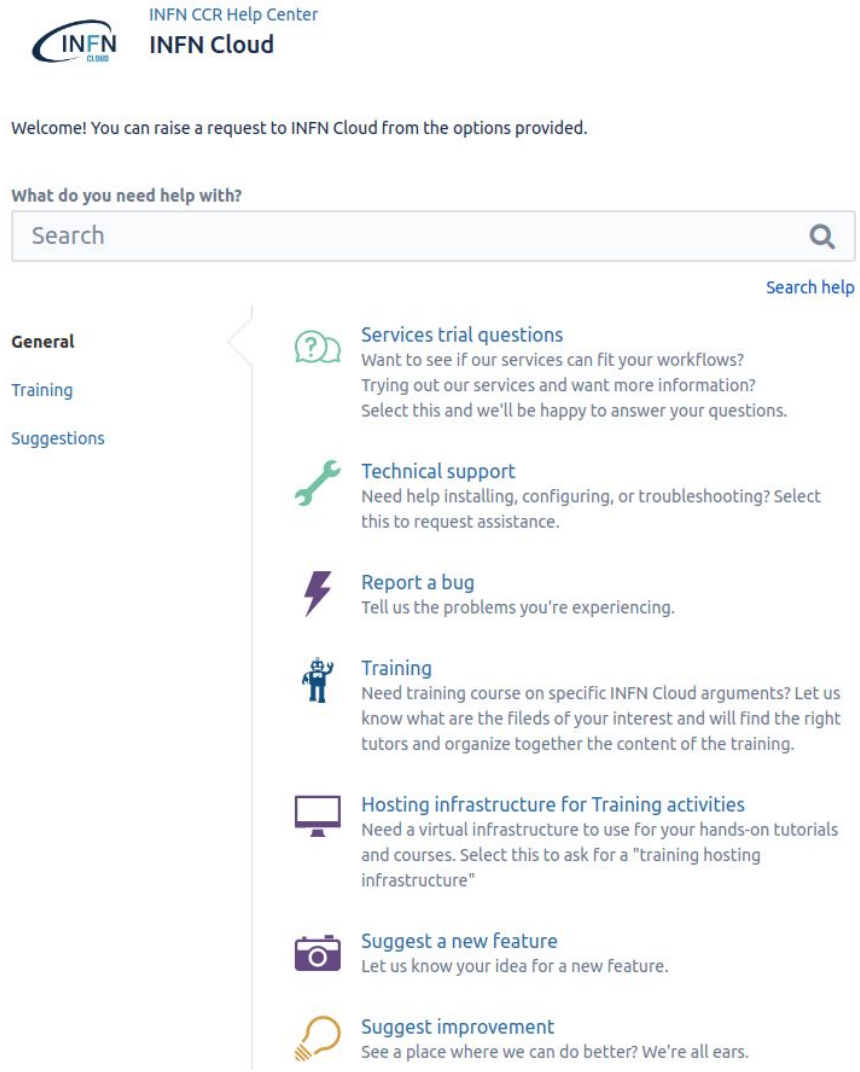
- A CI/CD facility based on jenkins (https://www.jenkins.io/) is presently active for internal use
- It might be made available to INFN Cloud users in the future

User support - Support team

- The first level support team it is the first contact point with the INFN Cloud infrastructure and its services. It is reachable via the INFN Cloud helpdesk at https://servicedesk.cloud.infn.it.
- The first level support team is responsible for receiving resource access requests, issue reports, support requests and other type of questions and requests from INFN Cloud users.
- It gives information on INFN Cloud and its services and gives help on using INFN Cloud.
- Issue reports and support requests are prioritized and classified and forwarded to experts or group of experts that provide the second level support.

User support - Ticketing system

https://servicedesk.cloud.infn.it

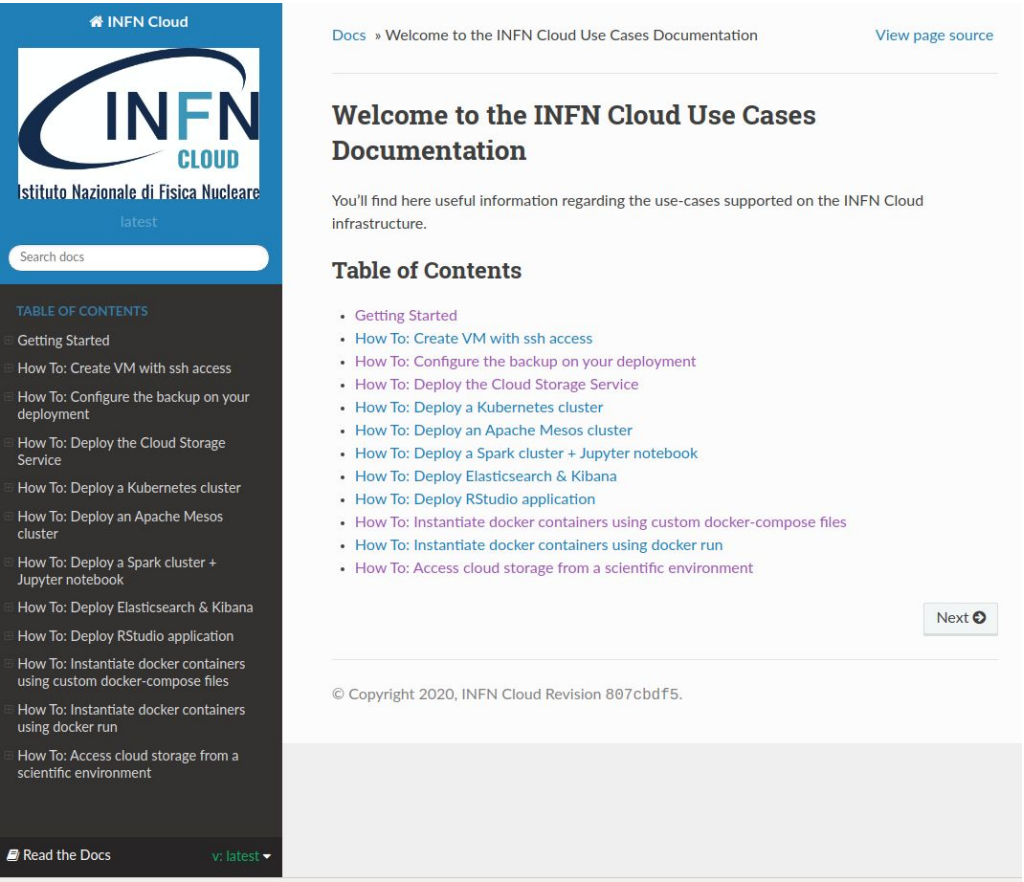


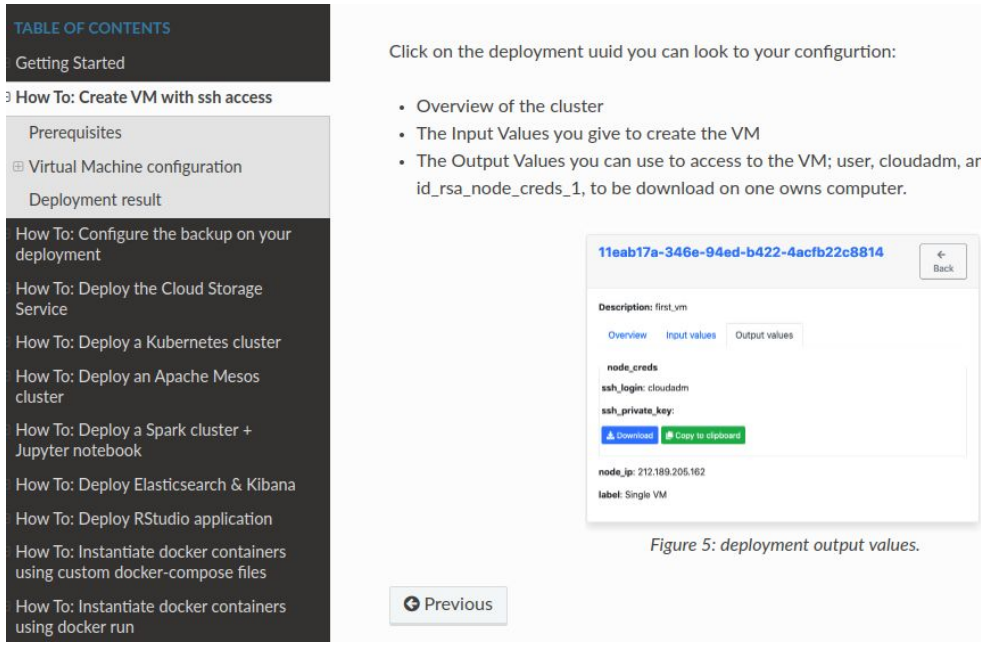
User support - Web site

www.cloud.infn.it

User support - Documentation for end users

https://guides.cloud.infn.it/docs/users-guides/en/latest/





Monitoring

INFN Cloud has a monitoring infrastructure designed to check the behavior of all its components:

- The compute/storage infrastructure
- The core services
- The support services
- The services deployed by INFN Cloud users
- Dedicated monitoring dashboards are available for the services that are deployed by INFN Cloud users or projects

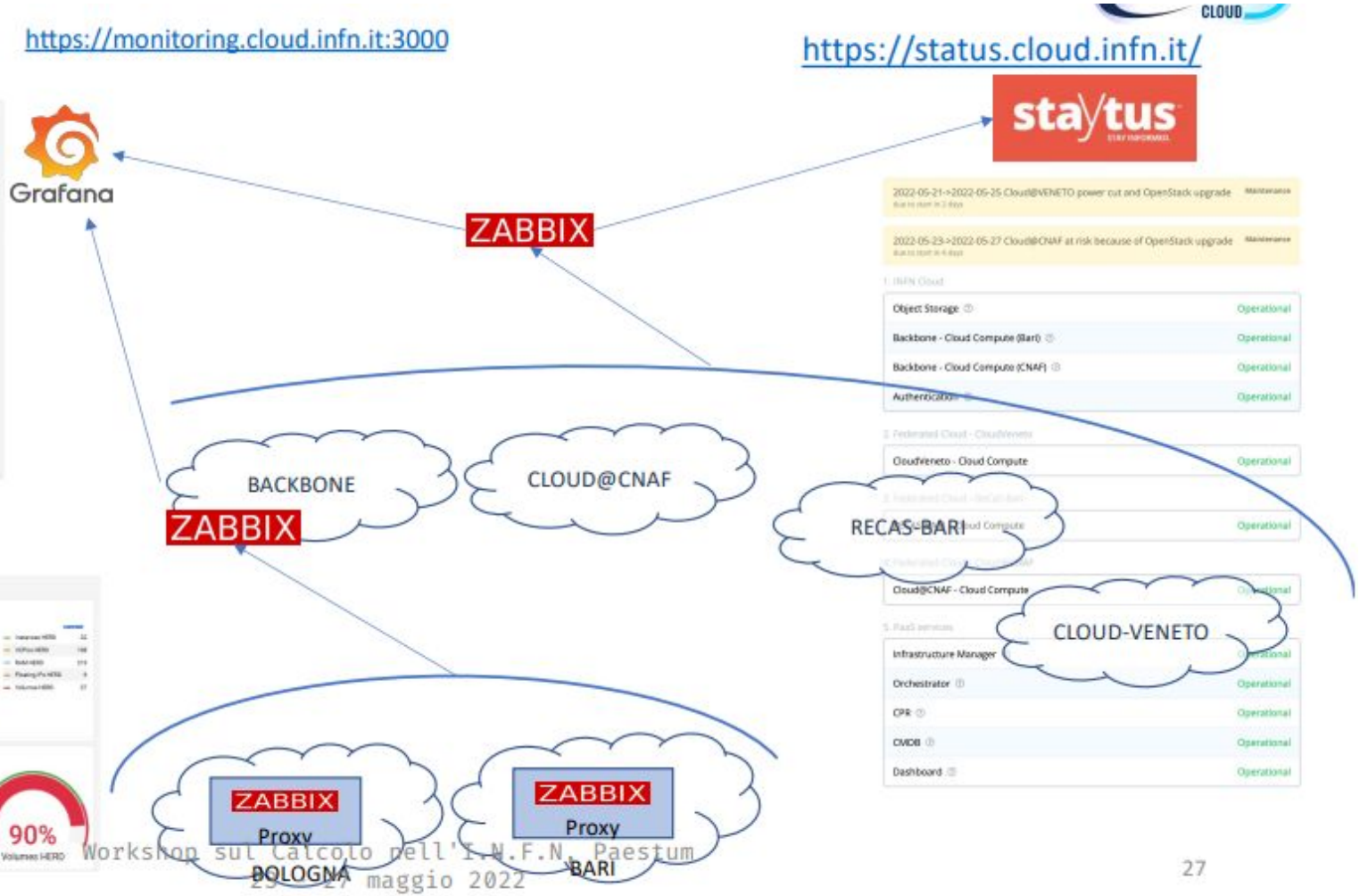
Monitoring

https://monitoring.cloud.infn.it:3000

https://status.cloud.infn.it/

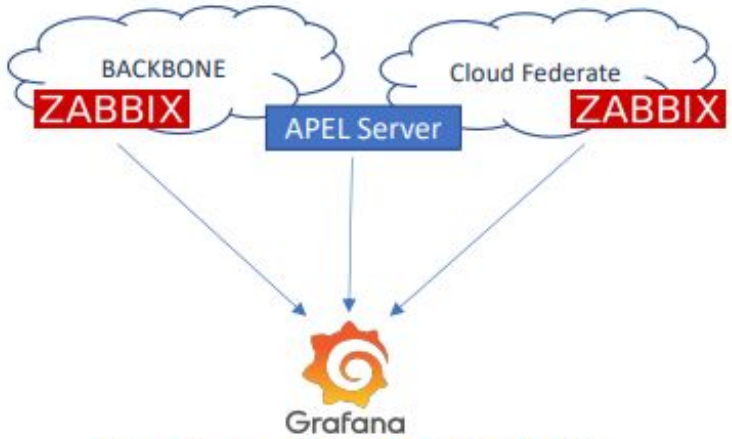
Stato servizi

Risorse cloud di progetto

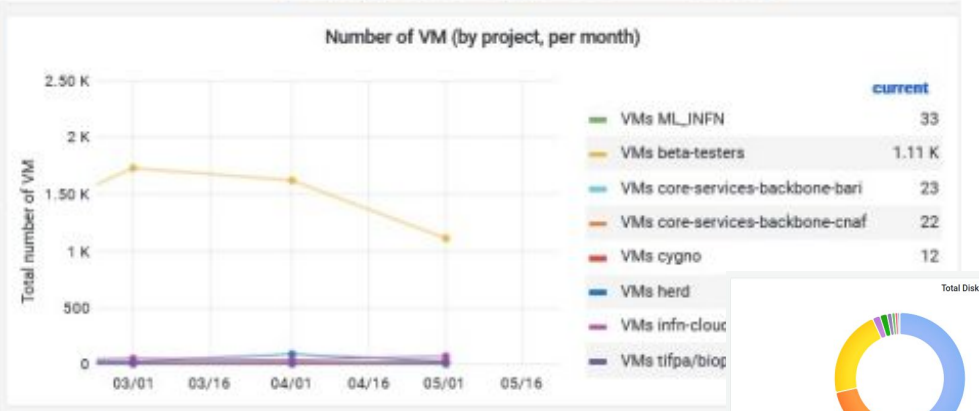


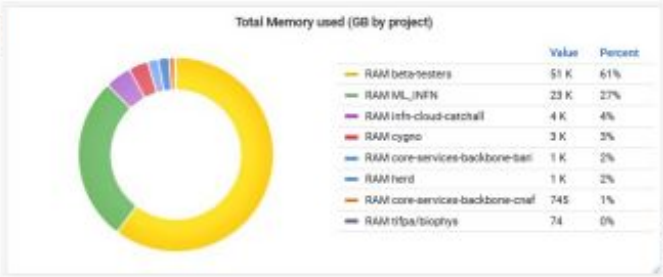
Accounting

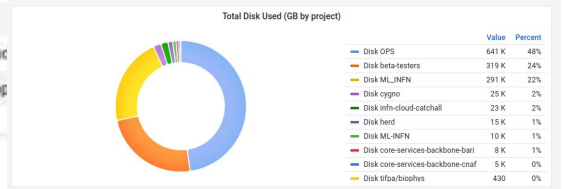
- Architettura
  - Ibrida basata su
    - servizi di accounting già in produzione in EGI
      - Server: APEL (database e aggregazione dei dati), RabbitMQ (message broker)
      - Client: Collectd/cASO per la collezione delle metriche
    - ZABBIX di infrastruttura
- Visualizzazione
  - Grafana
    - Data source: APEL (DB) + ZABBIX
    - Autenticazione via INDIGO-IAM
    - Accesso selettivo alle Dashboard
      - dati aggregati per provider (cloud federate), gruppi, utenti
- Metriche
  - CPUtime, RAM, disk, numero instanze
  - Volumi, IP (**new**)
  - GPU (**Coming soon**)

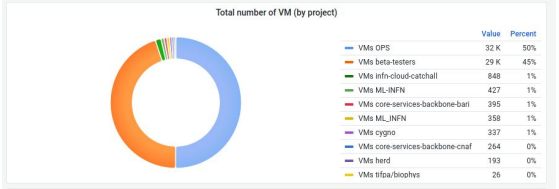


https://accounting.cloud.infn.it:3000









23/05/2022

N.F.N, Paestum

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