

# GARR Cloud

## OpenStack report

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# GARR consortium

- Italian NREN (National Research and Education Network)

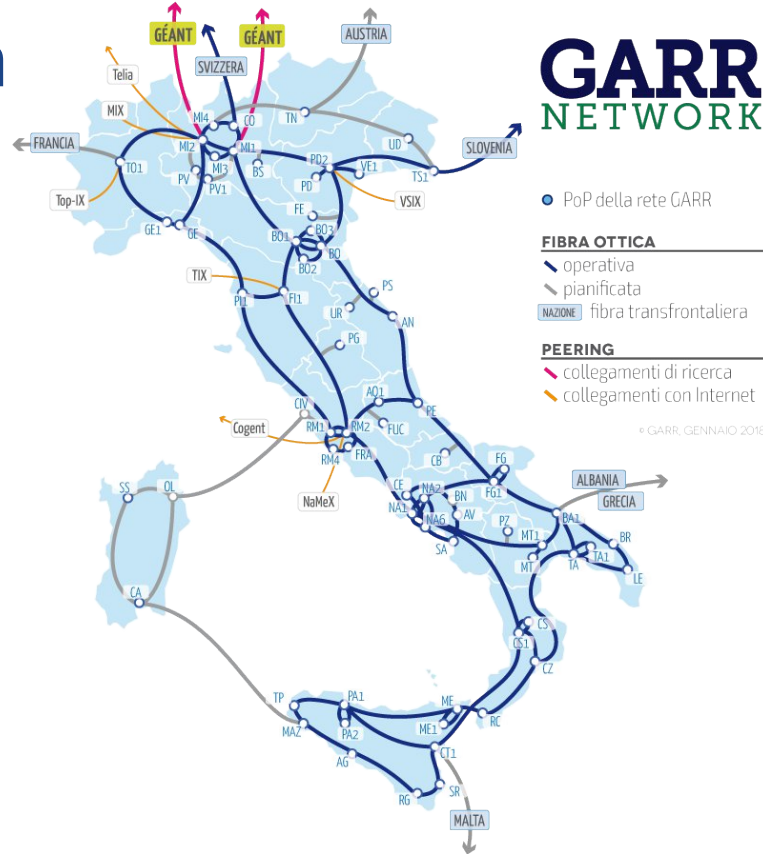
- nonprofit organization
- connected to GÉANT

- High speed network

- 1000+ locations
- 4.5 million users
  - researchers, students...
- 15,000 km of optical fiber
- 500 Petabyte Yearly Traffic

- Private Cloud

- 11500 core
- 16.3 PB



# Questions

1. How do you deploy OpenStack
2. How do upgrade it to the next version
3. What do you use to monitor your OpenStack-based Cloud infrastructure
4. What kind of accounting system do you use
5. How do you register and authenticate users to the cloud
6. How do you perform authorization, based on which parameters/attributes
7. How do you keep your OpenStack infrastructure secure
8. How do you debug OpenStack

# 1. How do you deploy OpenStack



# GARR Distributed Computing and Storage Infrastructure

**CPUs: 11500 cores**

**RAM: 90 PB**

**Storage: 16.3 PB**



**SSD**

**GPUs: 333 TFLOPS**

**Datacentres: 5**

# 4 Layers *recipe*

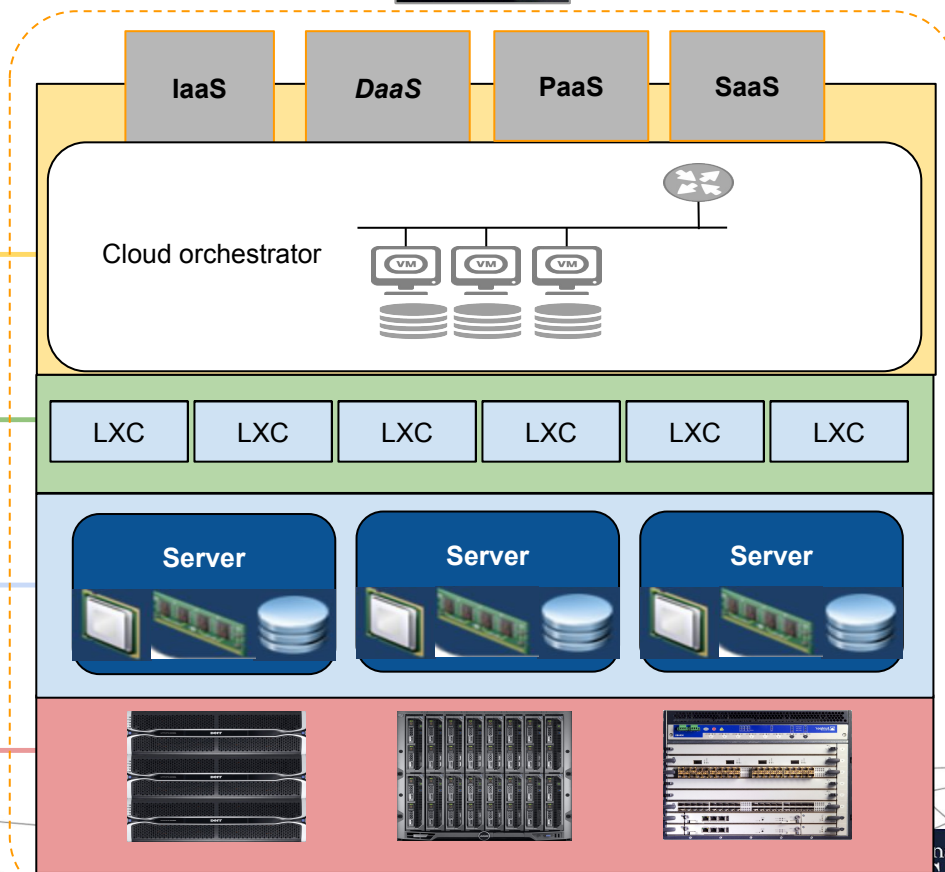


1. Application Services

2. Infrastructure *Virtualization*

3. Operating System

4. Physical resources



# The engines

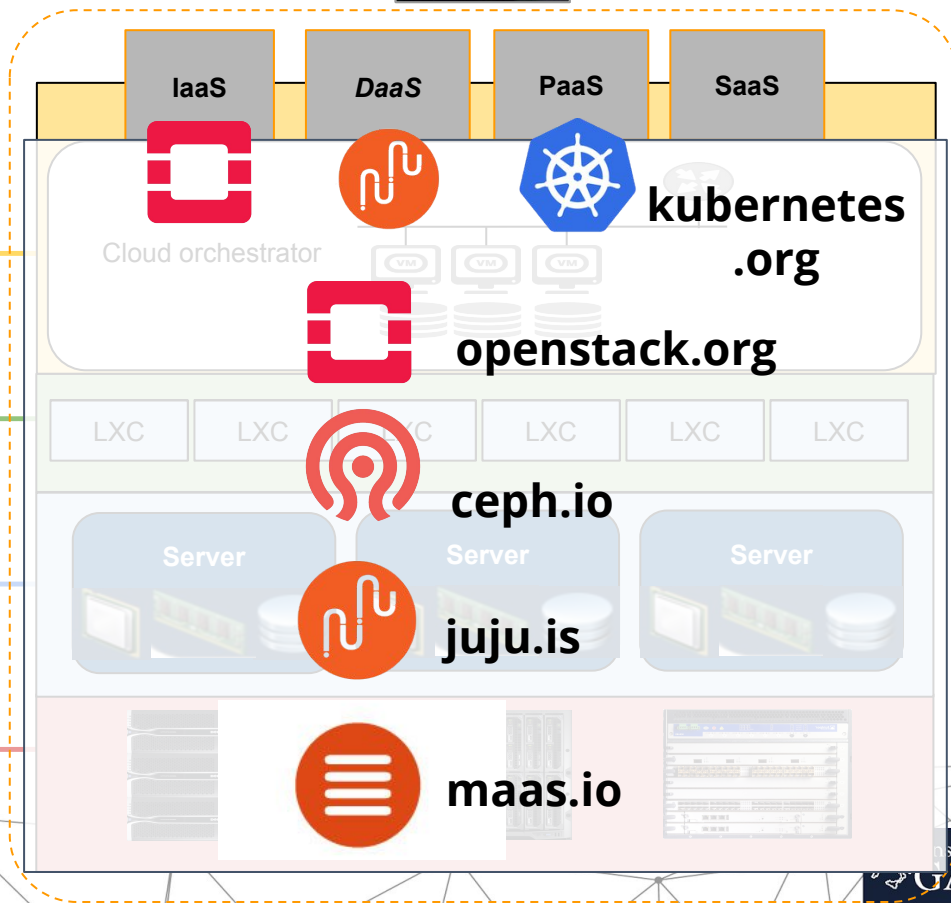


1. Application Services

2. Infrastructure *Virtualization*

3. Operating System

4. Physical resources



# GARR Cloud Services

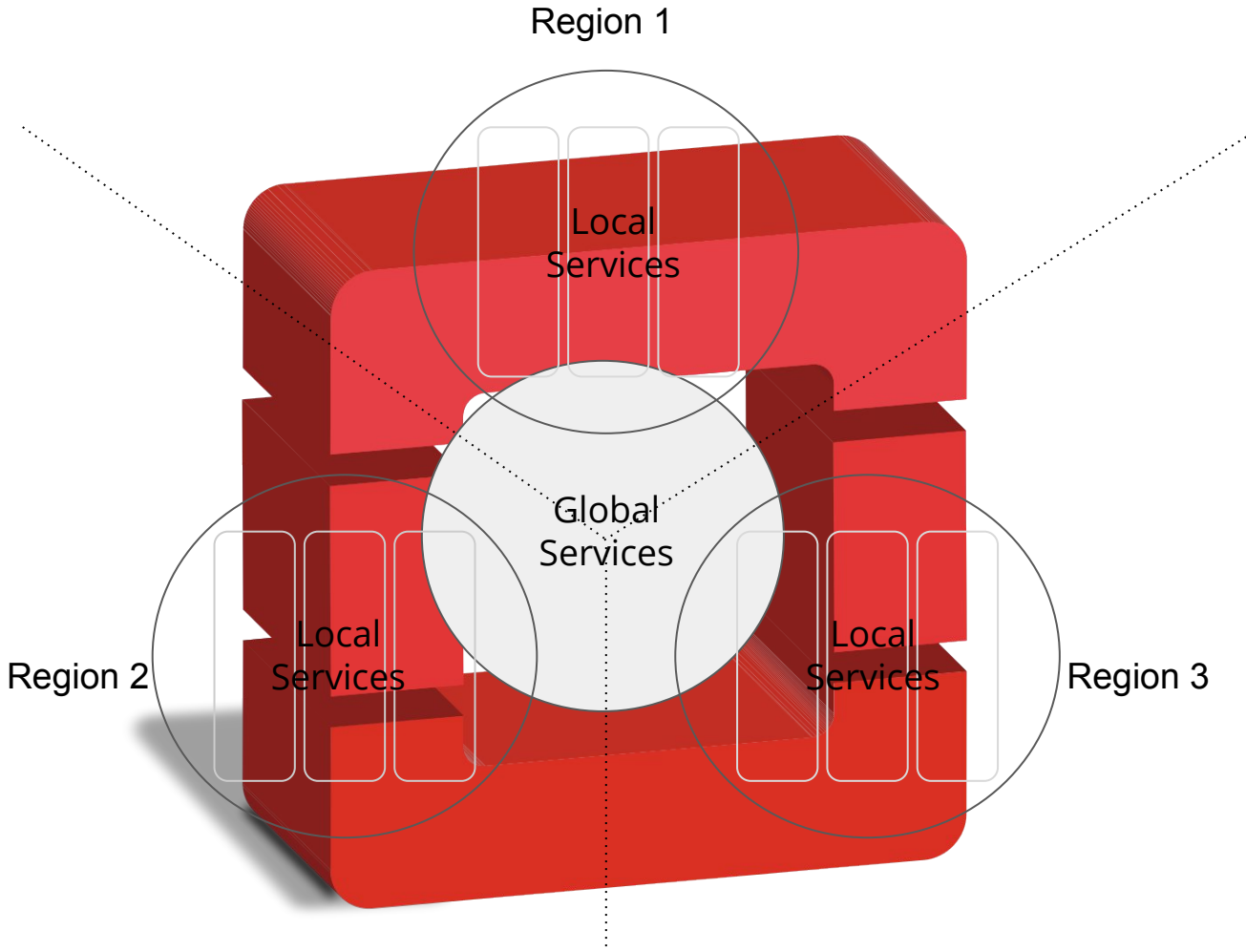
IaaS - Cloud Platform

DaaS - Deployment as a Service

PaaS - Container Platform

SaaS - GARR Workplace  
(based on OnlyOffice)





## Global Services

Identity

Image repo

Object storage

## Local Services

## Global Services

Controller nodes

Network nodes

Block storage

Compute nodes

CEPH: obj & block

backend:

- HDD, replica 3
- SSD, replica 3
- HDD+SSD journal EC

## 2. How do you upgrade OpenStack

Juju OpenStack charms do the magic

E.g. a. release upgrade OpenStack component:

```
juju config keystone openstack-origin="cloud:focal/wallaby"  
juju run-action keystone/leader pause  
juju run-action keystone/leader openstack-upgrade  
juju run-action keystone/leader resume
```

E.g. b. series upgrade machine/container:

```
juju upgrade-series <machine/lxd> prepare focal  
juju ssh <machine/lxd> sudo apt update; sudo apt full-upgrade  
(log-in to console) do-release-upgrade  
juju upgrade-series <machine/lxd> complete
```



# cloud evolution timeline

**Tender** GARR X progress

Study/tests

**1st prod setup**

MAAS+Juju

**Production ready**

**Fed GARRCloud** model:  
INGV sale sismiche

geo-HA Global services

1st Federated DC:  
**PolITO**

**Federation spreads:**

EMSO INGV

Uninuvola PG

HPC4AI

...



# regions

1

2

3

4

5

2014

2016

2018

2020

2022

HW upgrade: storage Ct/Pa

HW upgrade + GPU  
32 A30 + 12 A100

O~S juno

O~S mitaka

O~S queens

O~S Stein

O~S Wallaby

**8500 core & 11 PB**  
8x blade 16 poweredge m620  
8x MD3860/3060e

16



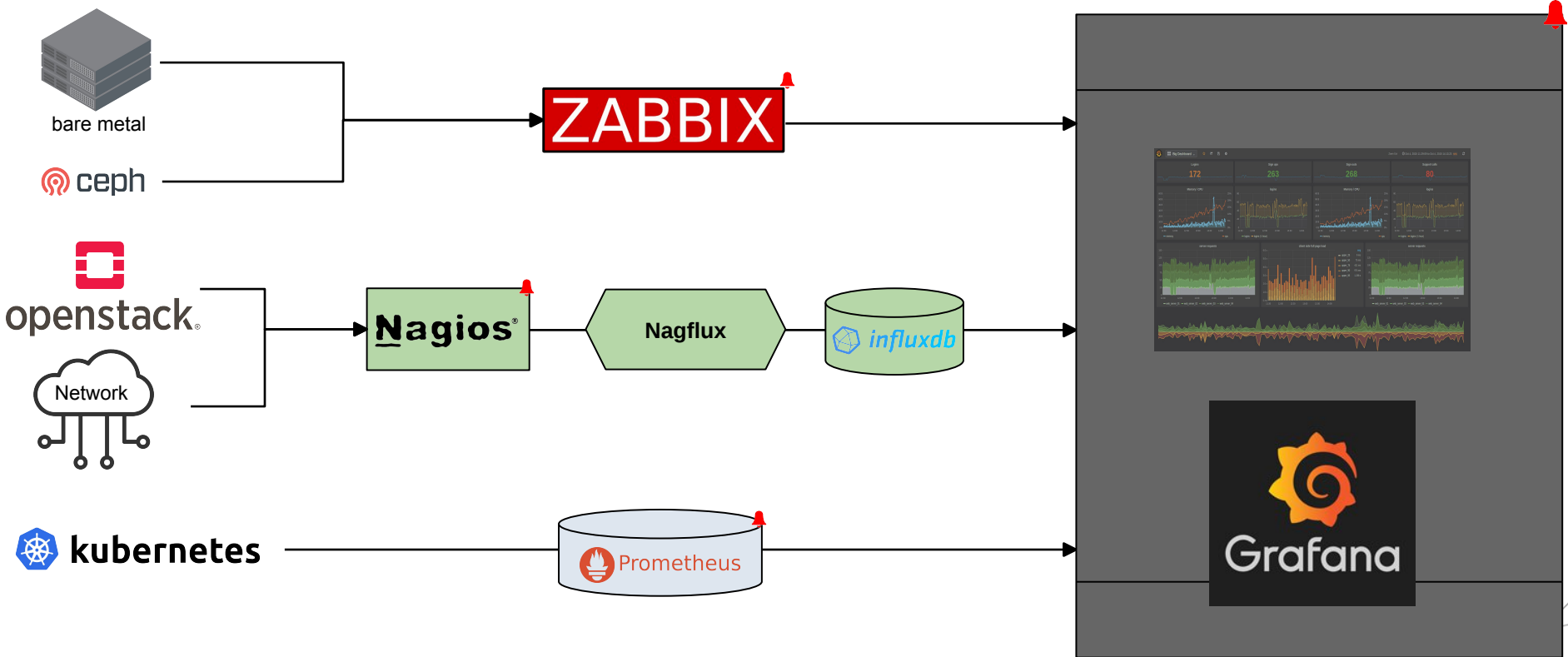
**+2.5 PB + ssd**  
+12 power edge R740 XD2

20

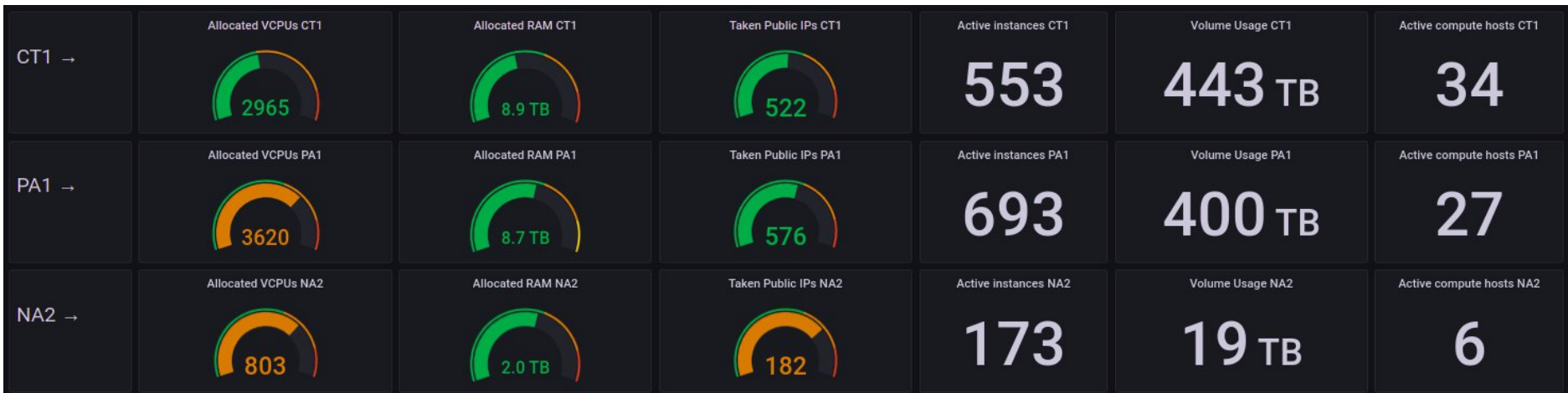


**11500 core & 16PB**  
11x 8 poweredge R650/R750

### 3. How do you monitor your Cloud infrastructure

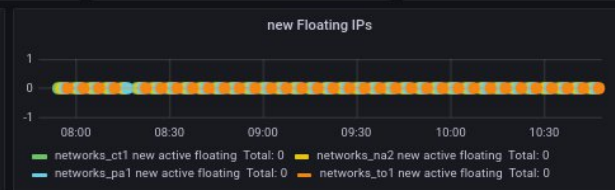


# Cloud Status



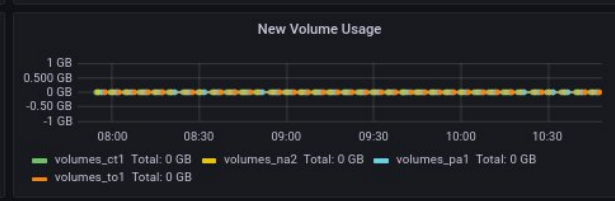
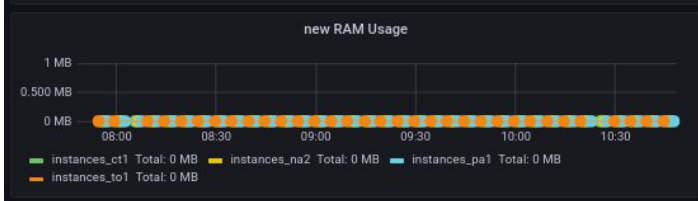
~1500 active VMs  
~3 PB storage used

Legend: instances\_ct1 Total: 0, instances\_na2 Total: 0, instances\_pa1 Total: 0, instances\_to1 Total: 0



problems

host	service	status
onlyoffice-icdi	disk	1
garr-na-na2-r1-s05	iops	1
maas-cs-01	hostcheck	2
csr1s15	hostcheck	1
garr-ct1-ct1-r1-s04	iops	1
garr-na-na2-r1-s11	iops	1
garr-ct1-ct1-r3-s09	iops	2
garr-na-na2-r1-s12	iops	1
garr-na-na2-r1-s13	iops	2



# 4. What kind of accounting system do you use

Work and design in progress

Objectives:

- Increase the observability of the infrastructure for GARR Cloud users (functionality, performance and resource usage)
- generation of automatic reports for internal and external accounting

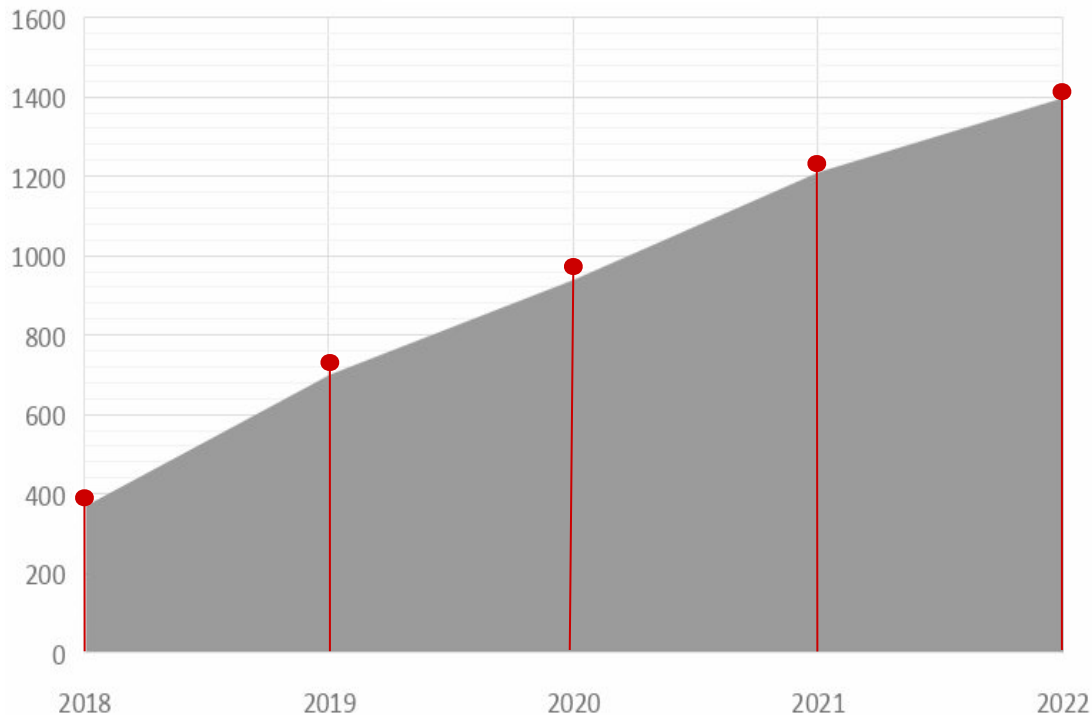
Design criteria:

- use the infrastructure itself as a single source of truth
- modularity: many simple(r) tools each one doing one specific thing
- eduGAIN/IDEM friendly

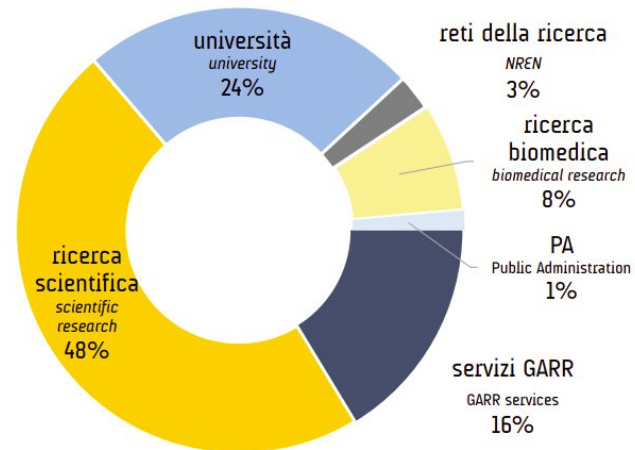
# Community - use



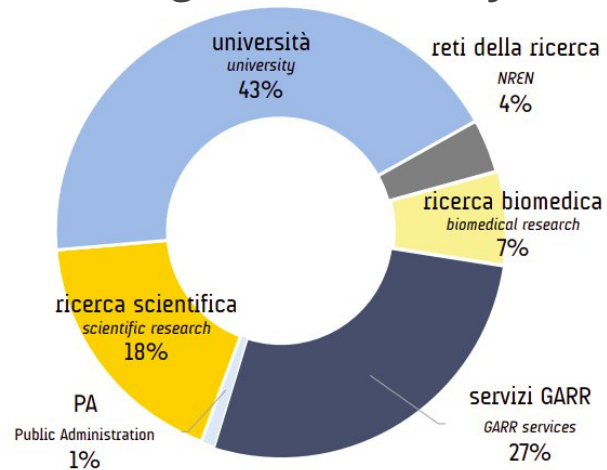
## Registered users



## user vs community



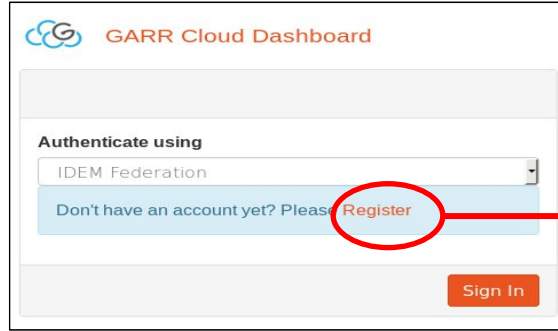
## Usage vs community



# 5. User registration and authentication

# GARR Cloud user account creation workflow

- User asks for account
- Authentication options:
  - IDEM/EduGAIN (preferred)
  - Google (OIDC)
  - Local password



GARR Cloud Dashboard

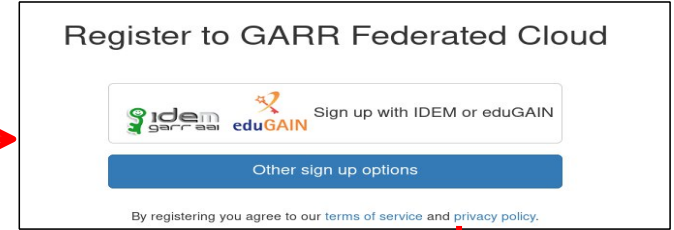
Authenticate using

IDEM Federation

Don't have an account yet? Please **Register**

Sign In

[cloud.garr.it/forms/register](https://cloud.garr.it/forms/register)



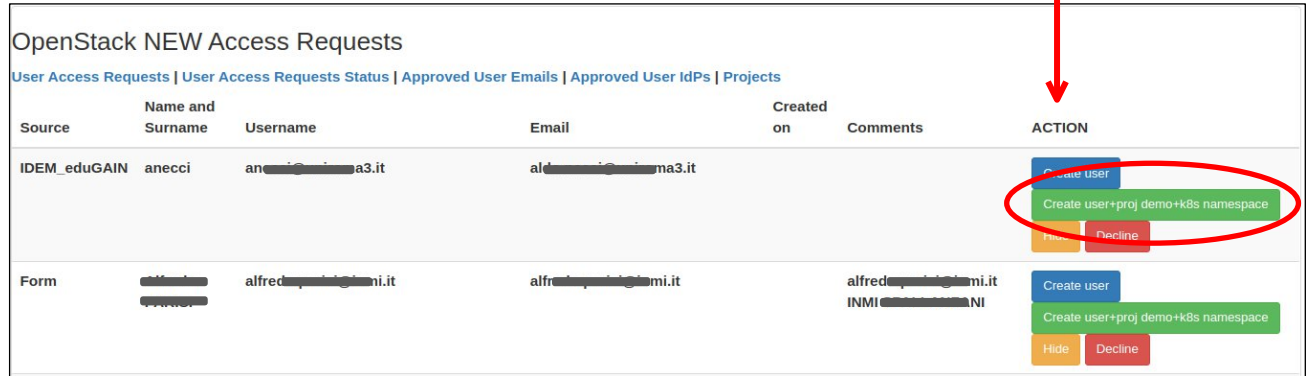
Register to GARR Federated Cloud

idem garr.it eduGAIN Sign up with IDEM or eduGAIN

Other sign up options

By registering you agree to our [terms of service](#) and [privacy policy](#).

- Request goes to DB
- Admins approve/decline
- Approval triggers:



OpenStack NEW Access Requests

[User Access Requests](#) | [User Access Requests Status](#) | [Approved User Emails](#) | [Approved User IdPs](#) | [Projects](#)

Source	Name and Surname	Username	Email	Created on	Comments	ACTION
IDEM_eduGAIN	anecci	anecci@ma3.it	alfred@ma3.it			<a href="#">Create user</a> <a href="#">Create user+proj demo+k8s namespace</a> <a href="#">Hide</a> <a href="#">Decline</a>
Form		alfred@mi.it	alfred@mi.it		alfred@mi.it INMI	<a href="#">Create user</a> <a href="#">Create user+proj demo+k8s namespace</a> <a href="#">Hide</a> <a href="#">Decline</a>

OpenStack username creation, (demo) project assignment

k8s namespace creation with quotas, bound to username

e-mail notification to user



## 6. User authorization

- Work in progress
- Currently all users are “Members”
- Goal: Extend RBAC model to manage projects, domains, federated regions
- Leverage on “policy.json”

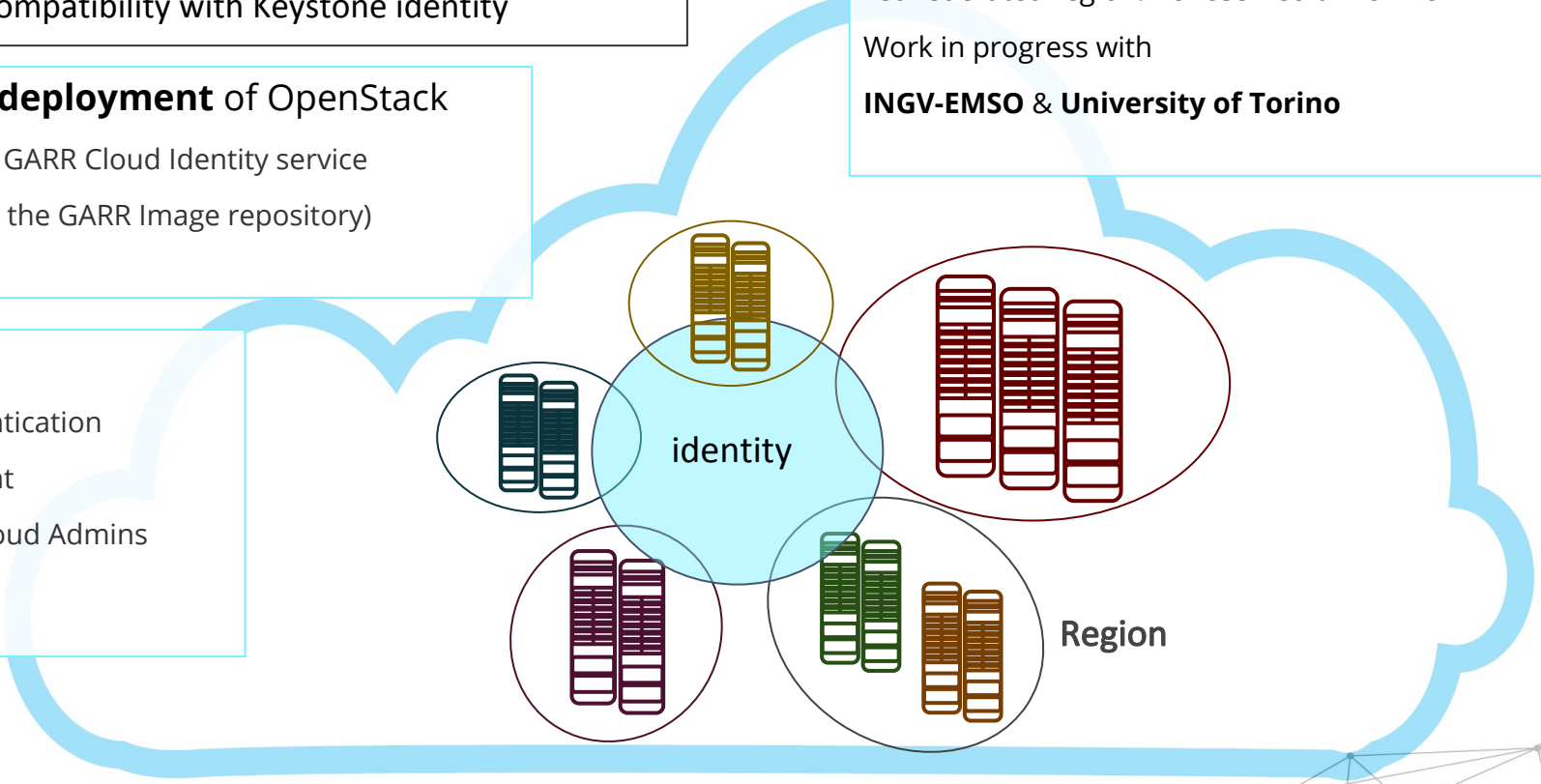
# Federation model

**Requirement:** compatibility with Keystone identity

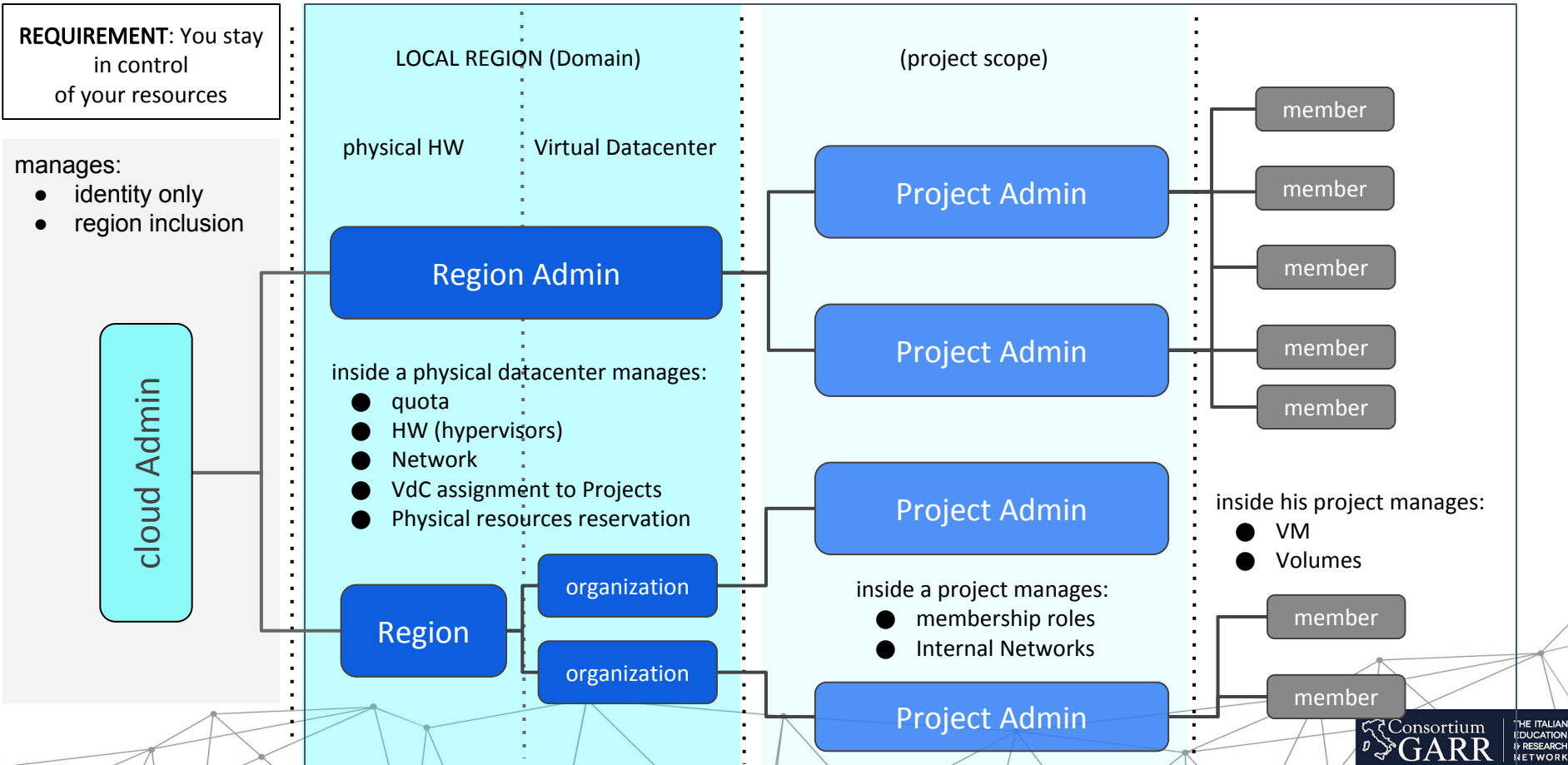
**Region: own deployment** of OpenStack  
Connected to the GARR Cloud Identity service  
(and optionally to the GARR Image repository)

1st Federated region: **Politecnico di Torino**  
Work in progress with  
**INGV-EMSO & University of Torino**

**Benefits**  
Federated authentication  
User management  
Community of Cloud Admins  
...



# Delegation of authority (via domains, policy and metadata filters)



## 7. How do you keep your infrastructure secure

- Infrastructure, DCs, practices, procedures are ISO-27001/27017/27018 certified
- VMs and infrastructure vulnerabilities handled by GARR CERT (via ShadowServer)
- ... And by ourselves  
SCARR (based on Greenbone GVM/OpenVAS)

# 8. How do you debug OpenStack

- Log files

Work in progress: redesign centralized log management tool

- Usual debug tools

tcdump, iperf, google ...

- Keep documentation/knowledge base up-to-date

- Help from the community (Federation)

- Help from Canonical (support contract)

# team CSD aka *fantastic 9*

