INFN-Box

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INFN and its organization

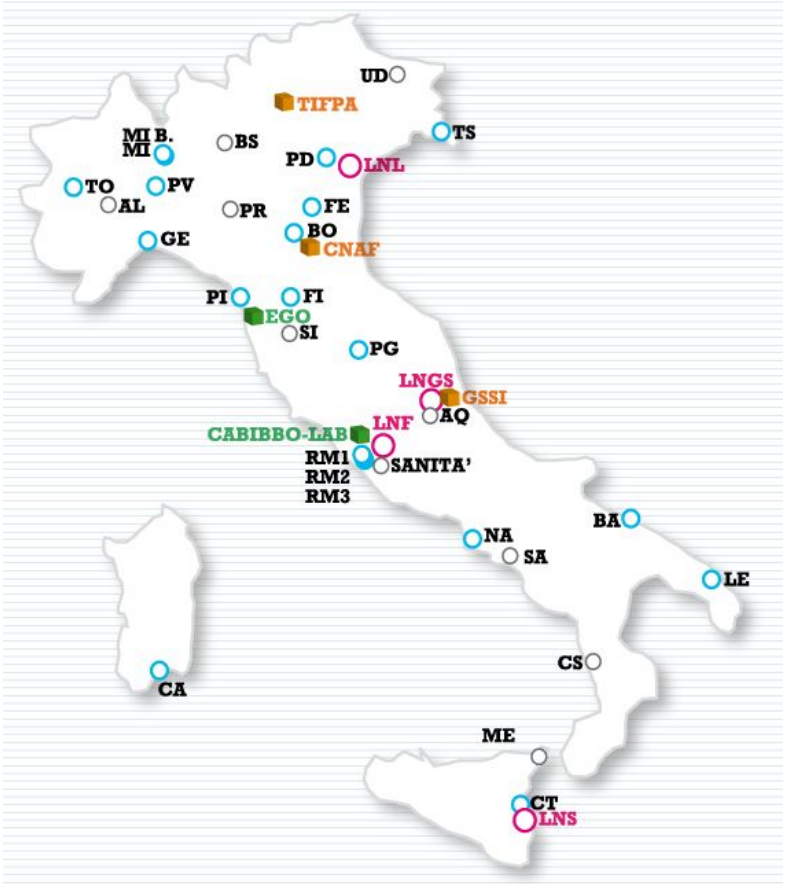
- INFN means **Istituto Nazionale di Fisica Nucleare** (National Institute for Nuclear Physics)
- Italian research agency dedicated to the study of the fundamental constituents of matter and the laws that govern them, under the supervision of the Ministry of Education, Universities and Research (MIUR)
- INFN conducts theoretical and experimental **research in the fields of subnuclear, nuclear and astroparticle physics**, in close collaboration with Italian universities and with foreign research institutes and universities

INFN and its organization

- Strong experience and know-how also in cutting-edge technology and instruments. Among them, **long-standing experience on HPC, distributed storage and computing** (Grids and Clouds)
- Strong focus also on technology transfer programs.
- Transfer of technologies and know-how to Italian and European companies, developed within INFN scientific programs.

A distributed organization

- 4 national laboratories
- 20 divisions
- 11 groups linked to the divisions or laboratories
- National Centre for Research and Development in Information Technology (CNAF)
- Gran Sasso Science Institute (GSSI)
- Trento Institute for Fundamental Physics and Application (TIFPA)



Experiences with ownCloud

- Many INFN sites have their own ownCloud installation
- Used mainly for personal data synchronisation and group sharing
- **Different technologies** chosen as for storage backend, authentication, db engine, virtualization platform, load balancing, high availability, ...
- **Different experiences** are precious
- Time to **wrap up and rationalize**

Experiences with other sync & share tools

- Presently INFN offers its staff and associates a **centrally managed cloud storage** system based on Pydio
- Used mainly for software and document distribution
- Relying on the INFN AAI for user authentication/authorization
- Deployed on a single site

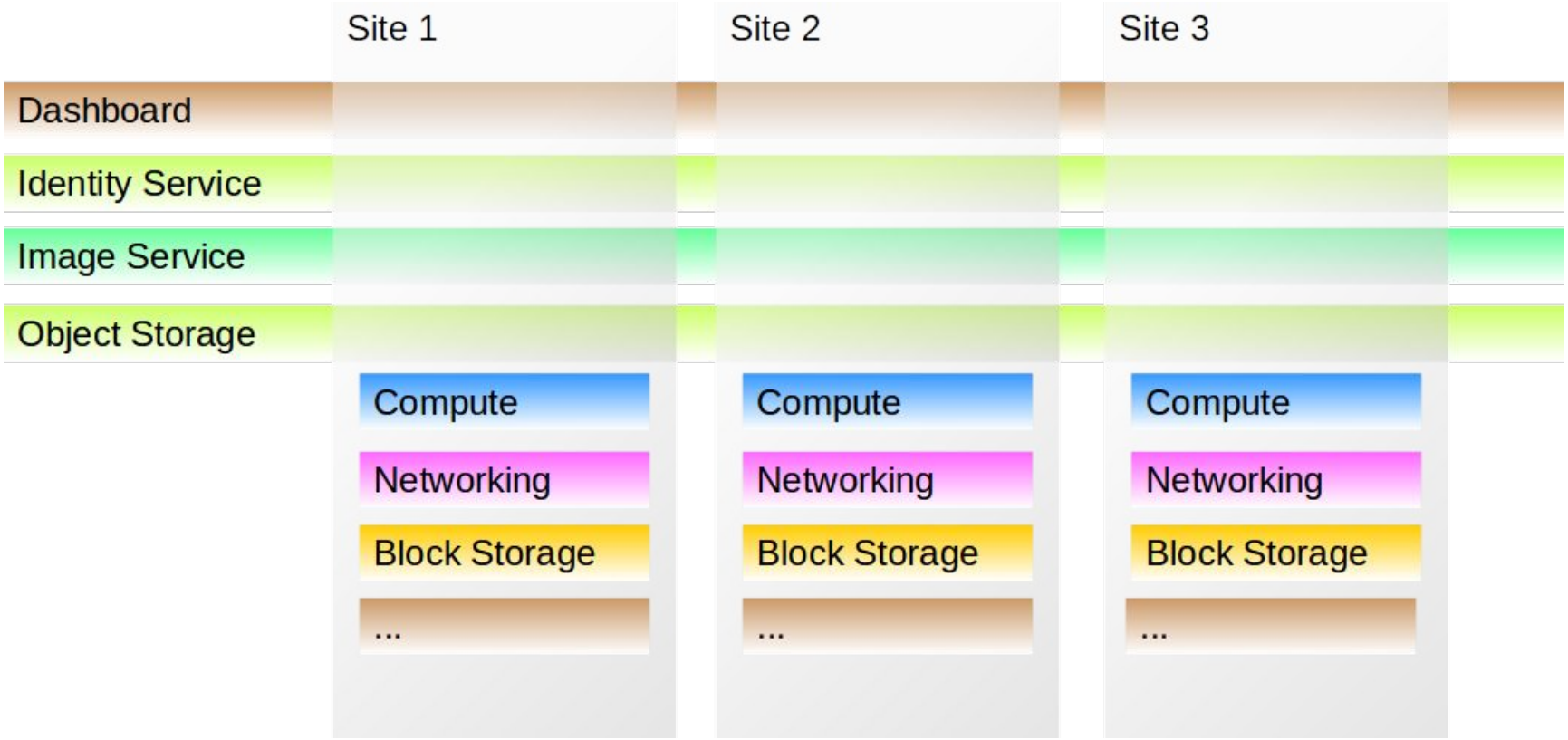
Related experiences - cloud

- INFN is involved in several Cloud project both at national and European Level
- National:
  - PON Smart Cities: PRISMA, OCP
  - Investments for about 30M€
  - Public and private body involved
  - IaaS and PaaS layer developed
- H2020
  - INDIGO-DataCloud: 11M€, 26 Partners
  - IaaS and PaaS layer for supporting scientific applications

The INFN Corporate Cloud

- **INFN-CC** is a project for a **multi-regional OpenStack installation** where some services are common to all regions while other services are local and associated to a single region
- The main goal is to provide users with standard IaaS interfaces to an homogeneous but distributed cloud environment **focused on the deployment of highly available, distributed network services and applications**
- **INFNbox** and **INFN-CC** will probably be deployed on the same INFN sites and will share part of the infrastructure: posix storage, object storage, network, authentication. INFN-box might exploit the INFN-CC IaaS capabilities.

The INFN Corporate Cloud



INFN-CC highlights

- One of the highlights of INFN-CC is the **distributed object storage infrastructure** that allows for transparent geographic data replication. Has many useful applications
- **Geographically distributed SQL server** with Percona XtraDB

Both technologies have been thoroughly tested and are ready to be put in production. Both very useful for the deployment of a **geographically distributed cloud storage** service.

INFN-AAI

- INFN-AAI provides a **single AuthN and AuthZ infrastructure for the whole INFN**
- A huge work, mainly for the integration of Identity Management of 4 National LABs and 30 units into a single one: GODiVA (Gestione Ospiti, DIpendenti, Visitatori ed Associati)
- **INFN-AAI services are accessible via LDAP and SAML2 protocols**, through a network of distributed 389-DS servers and some SAML2 IdPs.
- All INFN Kerberos5 REALMs involved into AuthN phase, via a private plug-in of 389-DS
- AuthZ data (entitlement and group) provided via LDAP and SAML2, comes directly from the INFN's IDM

INFN DNS-HA

- **A distributed, resilient DNS infrastructure** able to maintain full functionality in case of “disaster” in any of the INFN Computing centers hosting it;
- Nagios (or similar) can dynamically update the ip address(es) pointed to by a hostname providing a certain network service;
- **INFN DNS-HA acts as HA system and/or load balancer** for geographically redundant services.

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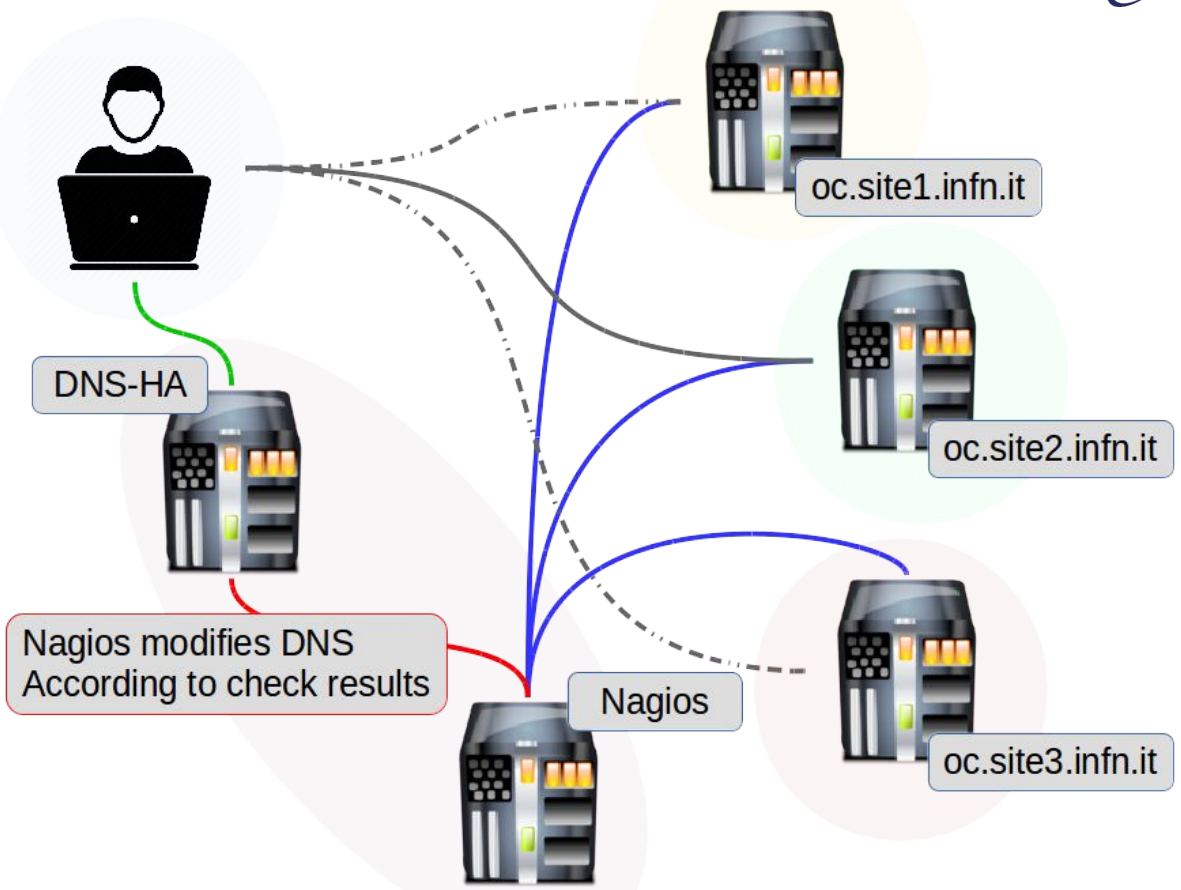
INFN DNS-HA

The nagios service for DNS-HA is deployed in a separate INFN site and has an *external view* of the system status

DNS-HA is distributed itself

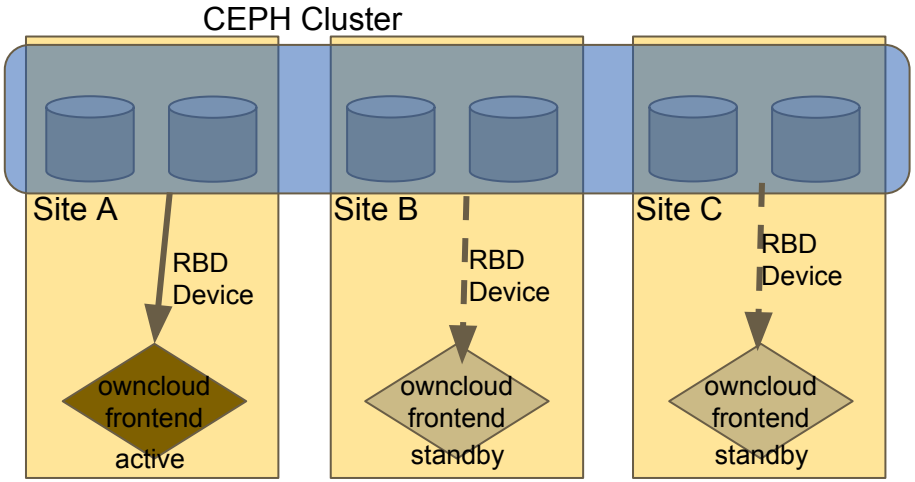


CEPH

- CEPH can provide very big block devices that the ownCloud frontend can use as local file-system
- In addition to the standard posix storage, ownCloud users or admins could add external CEPH (object) storage
- Using CEPH block storage is possible in order to create different devices for different scientific groups
- Limits of a geographically distributed CEPH cluster, although with large bandwidth and relatively low latency, still to be fully understood

CEPH

The CEPH Cluster will be split across different sites in order to provide the redundancy needed for the high-availability of data



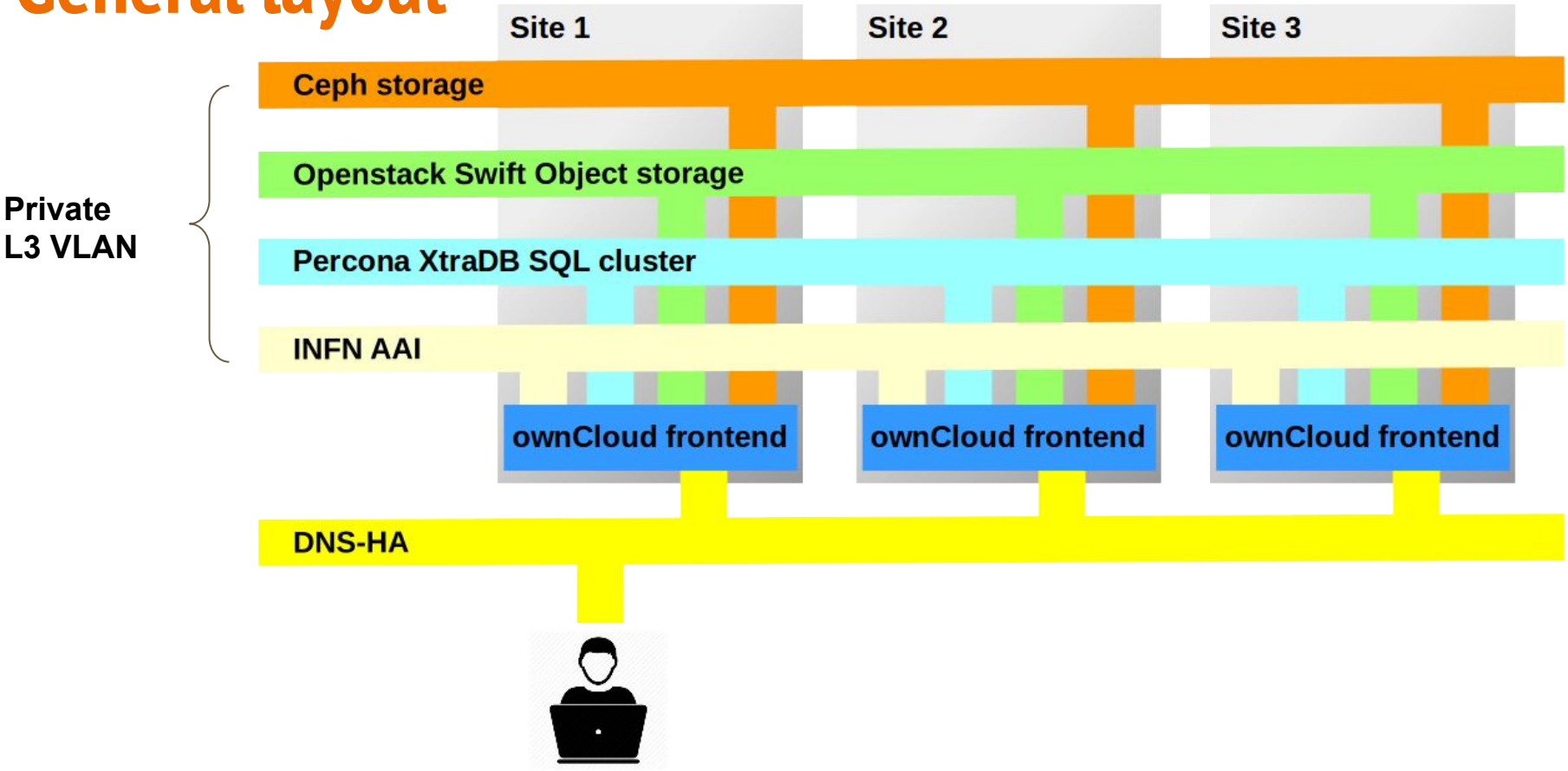
Advantages of an organization-wide s&s system

- The GARR network connection will provide a **highly performant and reliable backbone** that will also be used to provide disaster recovery & geographically distributed HA solutions
- **Exploiting skills and expertise** as persons based in different INFN departments
- End-users will use the service for **sharing documents and small experiments datasets** with colleagues all over the agency
- The service could be easily exploited to **share files with colleagues from other organizations**

Putting it all together

- Single sync & share infrastructure
- Distributed over two or three INFN sites
- Full geographic data and access redundancy
- Exploiting INFN/GARR network infrastructure
- Exploiting INFN-CC object storage infrastructure
- CEPH
- Percona Xtradb Cluster
- INFN DNS-HA for geographic load balancing and HA
- Integrated with INFN-AAI

General layout



Status, roadmap and conclusions

- We are now finalizing the general architecture as well as that of each component of the infrastructure
- In a couple of months we will submit our project to INFN National Computing Commission (CCR) for the formal approval
- At least 3 different sites have already provided the availability to work on this project (Bari, CNAF, LNGS)
- INFNbox service would like to be part of **OpenCloudMesh** initiative
    - To facilitate the interactions and sharing among the major research institution

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