Experiments support at INFN-T1

International Symposium on Grids & Clouds (ISGC) 2023

Daniele Lattanzio, INFN - CNAF

March 24th, 2023

Outline

- The INFN-CNAF Centre
- The User Support unit
- Future plans
- Conclusions

The INFN-CNAF Centre

The WLCG collaboration

- The Worldwide LHC Computing Grid (**WLCG**) [1](https://wlcg.web.cern.ch/)
- Involves around 170 computing centres in more than 40 countries
- Provides computational resources to store, distribute and analyse the ~200 PB of data expected every year from the Large Hadron Collider (**LHC**) at CERN

4
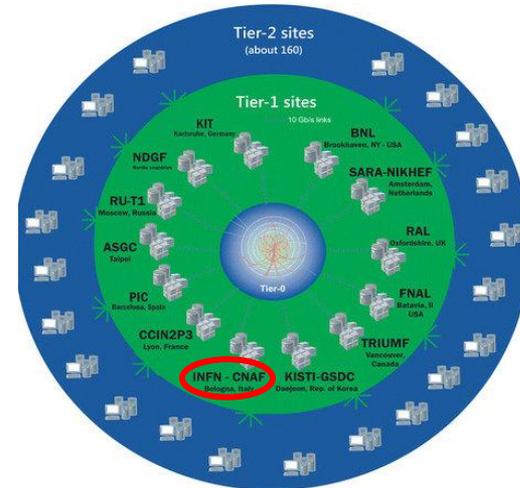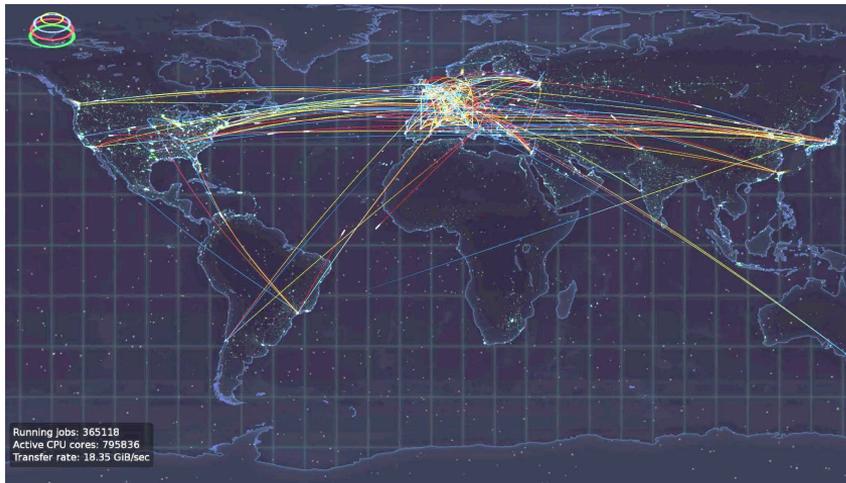
The Italian WLCG Tier-1

- The Italian WLCG Tier-1 is located in **Bologna** (**Emilia Romagna**)
- managed by **INFN-CNAF [2]**(https://www.cnaf.infn.it/)
- 60+ scientific communities using the data centre
  - not only LHC and not only from the physics field
- **~2.000 computing nodes** (physical and virtual machines)
  - **~60.000 core** managed by a batch system

The Italian WLCG Tier-1

- ~**70 PB of disk space** shared among all nodes via a distributed file system
- ~**130 PB of tape space** used as the main long-term storage medium

Not only WLCG

Supported scientific communities:

- High-Energy Physics: **8**
- Astroparticle Physics: **18**
- Gravitational Waves: **2**
- Nuclear Physics: **15**
- Dark Matter: **6**
- others: **10**
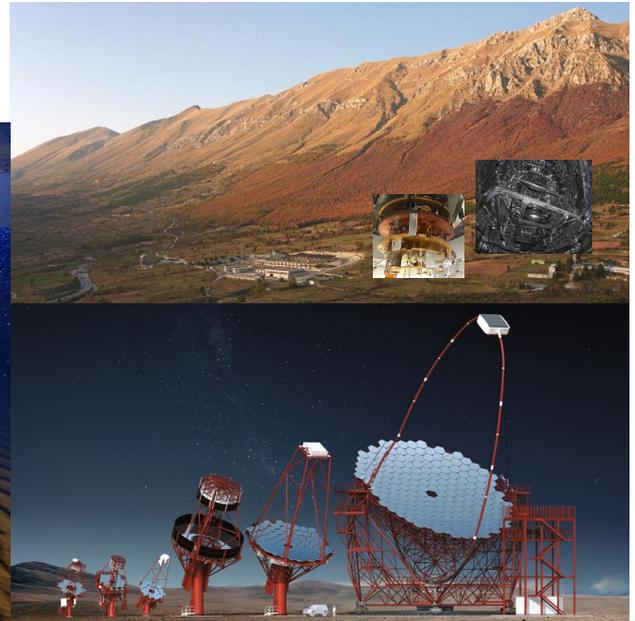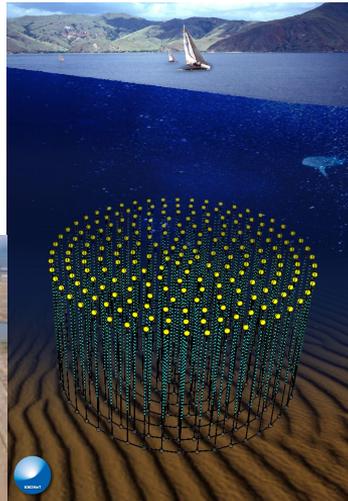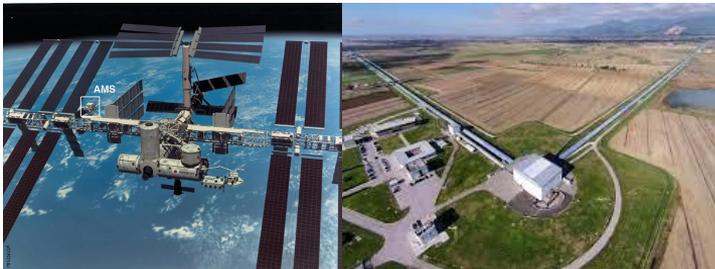
Local-users per experiment (since June 2017)
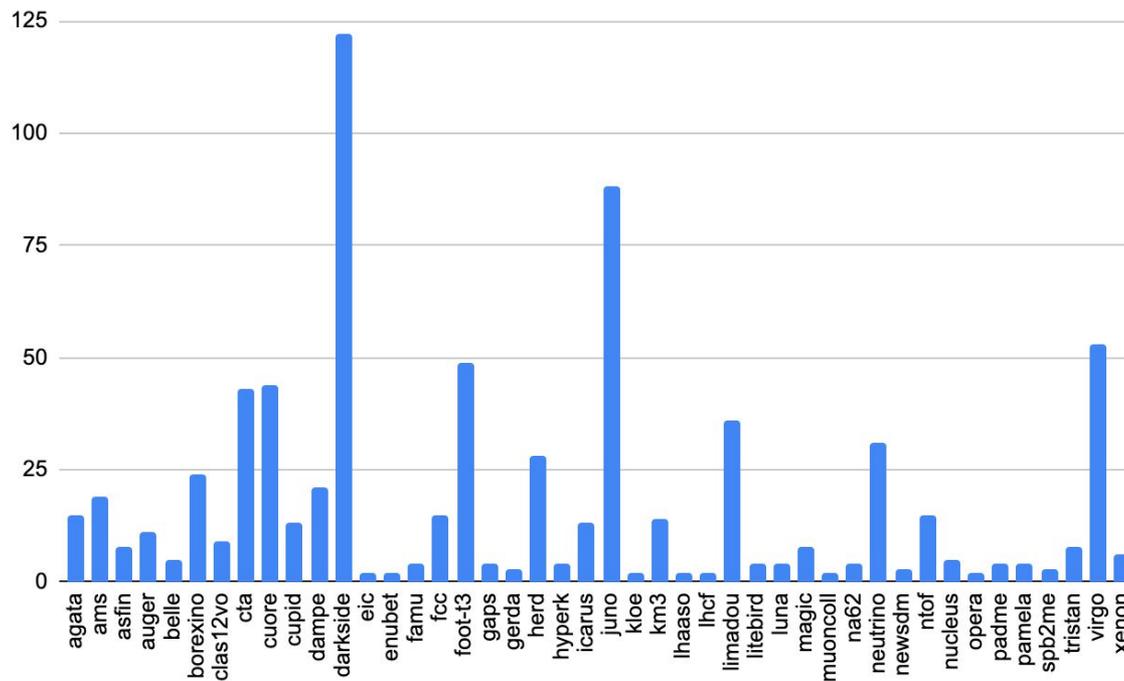
Local-users registration per month (since June 2017)
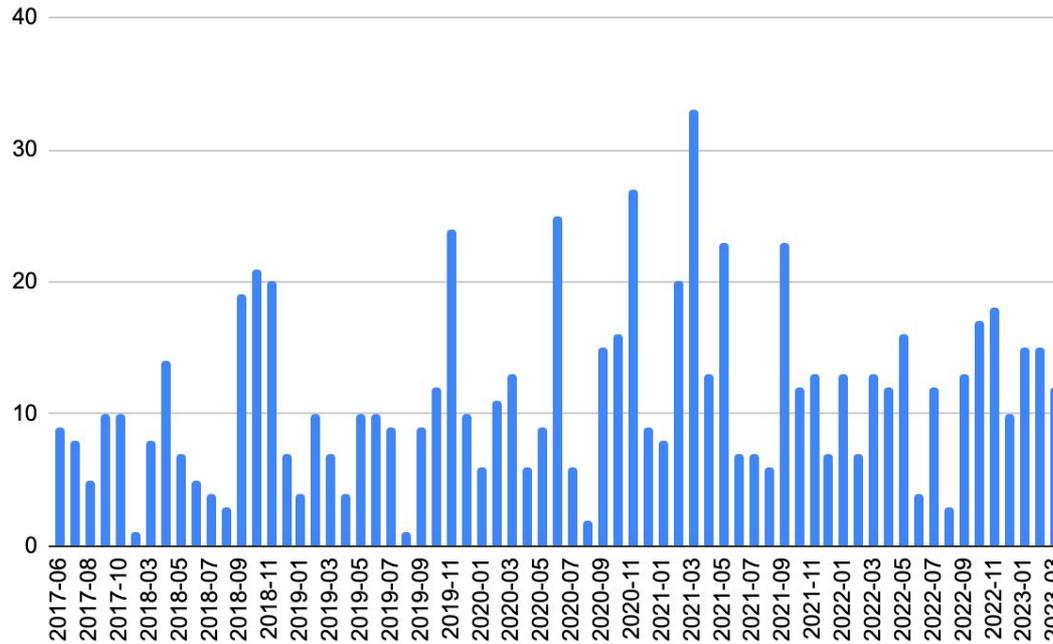
The User Support unit

INFN-T1 internal organization

user

Farming + **Cloud**

Infrastructure

User Support (first level)

Storage

Network
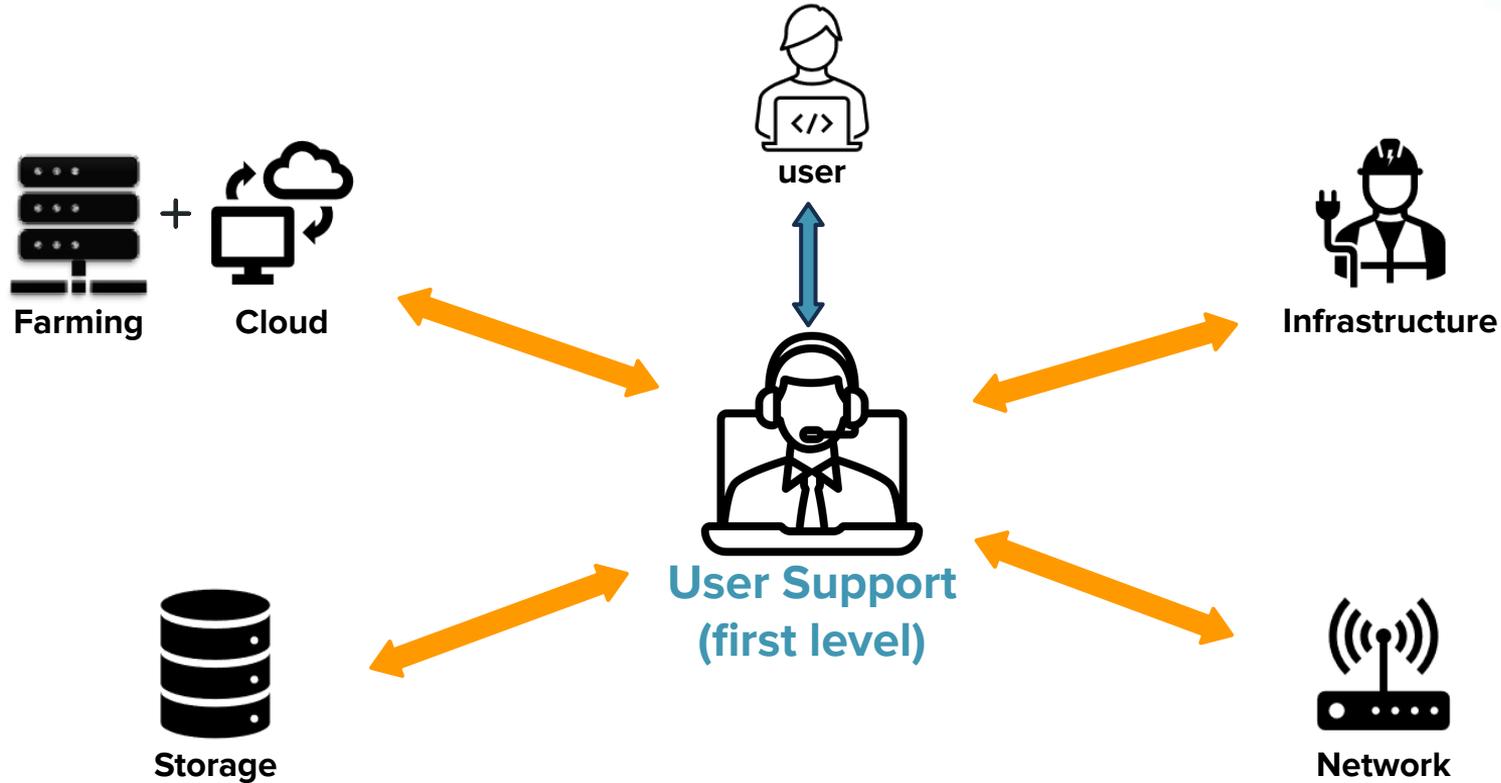
The User Support unit

- Acts as the primary interface for Tier 1 users (first level support)
- **Framework**: very **demanding** user base having **heterogeneous** needs and different use cases
- **Mission**: to provide **standard** tool-base and solutions. Examples:
  - **HTCondor** as the unique batch system for HTC and **SLURM** for HPC
  - **gfal2-util** as a tool for data transfer/management via Grid
  - **oidc-agent** as a CLI tool to retrieve JWT tokens from a token issuer (namely **indigo-iam**)
  - **singularity**/**apptainer** as the container solution
- **Supporting custom** software:
  - different dependencies and software needed to be installed on multiple and different user interfaces
  - personalised support on certain, specific, use cases

The User Support team

- **6 people** compose the team
- Broad scientific background (Astronomy, Astrophysics, Mathematics, Physics)
  - ability to speak the same *languages* of our users
- Daily activity in overlap with that of other CNAF teams

Support activities

- Trying to find a common factor to provide tools and guides that are as generic as possible to suit the users' needs.
- **Documentation for users**:
  - **INFN-T1 user guide [3]**
  - **Handy links to automatically updated useful pages [4]**
- **Communication:**
  - **Direct user communication**
  - **Announces**
  - **Periodic presentations**
  - **Aperiodic meetings with experiments' people**

Documentation

- **INFN-T1 User Guide**
- The group continuously maintains detailed knowledge base in the form of an online user guide
- The guide is public and organized in 14 chapters
- It contains suggestions with simplified and practical examples on how to use tools such as **conda**, **singularity/apptainer**, **HTCondor**, **SLURM**, **oidc-agent**, **gfal2-util**, and many others
- It explains also all the procedures and best practices needed to access and efficiently use the Tier-1 resources:
  - How to request a new account, how to access the user interfaces, how to requests x509 certificates, how to obtain JWT tokens, etc...

15

Documentation

https://l.infn.it/t1guide
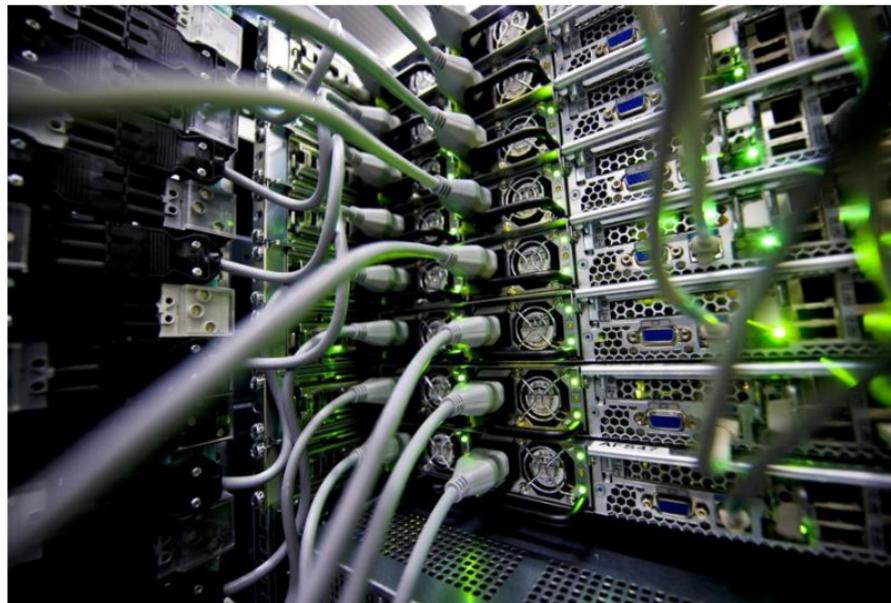
Documentation

- **Handy links to automatically updated useful pages**
- In addition to the user guide, the group also provides some useful links to advertise specific information about the services available to the communities in a form that is easy to access and use: https://www.cnaf.infn.it/~usersupport/

Welcome to the user support page of CNAF

The features of the storage areas are available at:

- StoRM storage areas
- StoRM webDAV storage areas
- StoRM webDAV storage areas with JWT authentication
- XrootD storage areas

LCG environments list

- LCG envs from CVMFS

Documentation

- **Handy links to automatically updated useful pages**
- LCG environments distributed via CVMFS:
  - https://www.cnaf.infn.it/~usersupport/cvmfs.html
  - LCG does not provide public documentation on individual environments
  - It might take long time to find the right environment
- Storage Areas
  - e.g.: https://www.cnaf.infn.it/~usersupport/Webdav_token.html
  - many storage servers, with different transfer protocols
  - not all VOs use the same protocols
- All these pages are **automatically** generated **every night**

StoRM WebDAV storage areas with JWT authentication

aa.wp6

StoRM WebDAV endpoint	Access point	Root path
xfer.cr.cnaf.infn.it	/DataCloud-TB	/storage/gpfs_escape/datacloud-tb

belle

StoRM WebDAV endpoint	Access point	Root path
xfer-archive.cr.cnaf.infn.it	/belle	/storage/gpfs_data/belle

cta-lst

StoRM WebDAV endpoint	Access point	Root path
xfer-archive.cr.cnaf.infn.it	/cta-lst	/storage/gpfs_data/ctadisk/cta-lst

Documentation

LCG Environments navigator

In the table below you find the updated list of LCG environments available through CVMFS.
Pick one of your choice from the list below, depending on the compiler version, root version etc..
and then run the following command on a user interface:

```
source /cvmfs/sft.cern.ch/lcg/views/<env>/<env_version>/setup.sh
```

env	env_version	compiler	root_version	python_version	python2_version	python3_version	cpp_version
LCG_97apython3_LHCB_4	x86_64-centos7-gcc9-opt	g++	6.22/04	2.7.16	2.7.16		cxx17
LCG_99	x86_64-ubuntu2004-gcc9-opt	c++	6.22/06	3.8.6		3.8.6	cxx17
LCG_99	x86_64-centos7-gcc8-opt	g++	6.22/06	3.8.6		3.8.6	cxx17
LCG_99	x86_64-centos7-gcc10-opt	g++	6.22/06	3.8.6		3.8.6	cxx17
LCG_99	x86_64-centos7-clang10-opt	clang++	6.22/06	3.8.6		3.8.6	cxx17
LCG_99	x86_64-centos8-gcc10-opt	g++	6.22/06	3.8.6		3.8.6	cxx17
LCG_99cuda	x86_64-centos7-gcc8-opt	g++	6.22/06	3.7.6		3.7.6	cxx17
LCG_geant4ext20210118	x86_64-centos8-gcc10-opt	g++	6.22/06	3.8.6		3.8.6	cxx17
LCG_geant4ext20210118	x86_64-centos7-gcc10-opt	g++	6.22/06	3.8.6		3.8.6	cxx17

Official communication channels

- **Mailing lists** to interact directly with users and for sending communications regarding the datacentre status

- **Ticketing systems**:
  - **GGUS** mainly used to interact with **WLCG VOs**
  - Internal ticketing system based on **Jira Service Desk**
  - External ticketing system, also based on **Jira Service Desk**

Procedures

- Handling **account requests**:
  - Following the required procedures for creating new accounts: users *de-visu* recognition, interaction with contact person(s) of that experiment, interaction with our system admins.
- Handling emails, tickets, and all the **support requests**, trying to reproduce user's problems
- Security and performance monitoring:
  - AUP violations report
  - user ban
- Broadcast of announces:
  - technical interventions
  - down times
  - new features

Typical problems

- First level support
  - disk quota exceeded
  - issues with batch jobs (not running, going killed, etc...)
  - explanations/documentation requests
- Second level support (usually escalated to other CNAF teams)
  - software and/or dependencies to be installed
  - wrong permissions on files: e.g. fix Storage Areas permissions in order to allow users to perform different types of operations based on their roles
  - network problems
- Due to the overlap with other teams, part of the second level support is also carried out by the User Support team in cooperation with them

Future plans

Upcoming challenges

- **LHC** experiments at CERN entered in **RUN 3**, foreseeing a period of massive data production
- very **demanding computational power** and **storage capabilities** also by no-LHC and other physics experiments
- Must looking for solutions in order to meet these continuously **increasing needs** of resources
- Challenges for the **User Support**:
  - increasing user base
  - multiple infrastructures (see next slides)
  - keep the central role in interfacing between the scientific communities and the INFN computing ones

CPU power (HS06)

RUN3

Storage capacity (TB)

Disk — Tape
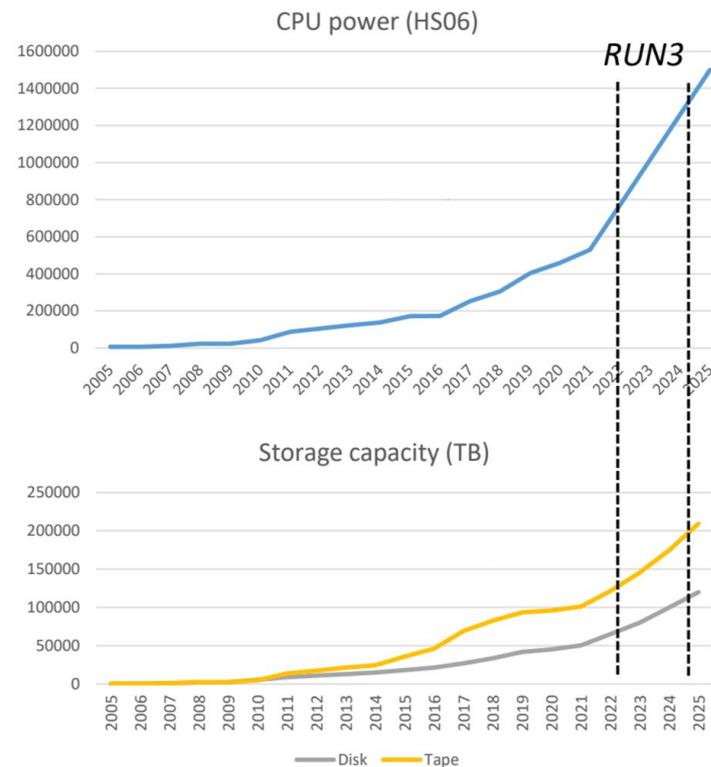
CNAF tomorrow: The Data Valley Hub

- Supercomputing facilities of **ECMWF**, **CINECA** and **INFN**
- The Italian Government and Emilia-Romagna Region largest investment in Big Data, Supercomputing and Research Infrastructure
- Hosting 80% of total computing capacity in Italy
- It will host important Italian and international research institutes
- The Centre will move to the new location starting from ~summer 2023

INFN-Cloud

- https://www.cloud.infn.it/
- INFN offers a comprehensive and integrated set of **Cloud services** through its dedicated infrastructure
- INFN-Cloud portfolio available via an user-friendly web interface: the **INDIGO-DataCloud PaaS**
- In production since March 2021

CENTRALISED SERVICES:

| INFN Cloud object storage | Notebooks as a Service (NaaS) | INFN Cloud Registry |

ON-DEMAND SERVICES:

Virtual machine	Docker-compose	Run docker
Elasticsearch and Kibana	Kubernetes cluster	Spark + Jupyter cluster
Jupyter with persistence for Notebooks	Sync&Share aaS	

From INFN-Cloud to DataCloud

- **INFN-Cloud**: the **initial seed** of a **"National Data Lake"** ➡ **DataCloud**
- **DataCloud**: main aim is to gather under the same umbrella all INFN computing resources, such as the Italian Tier-1, all Italian Tier-2s, HPC-bubbles, INFN-Cloud, and more.
- A strong involvement of the User Support unit is important more than ever
    - cooperation between other units
    - ability to suggest the best combination of computing services among a wider set of offers

User Support in DataCloud

- Significant **overlap** between the Tier-1 User Support and the INFN-Cloud one
  - more people are being hired to act as user support locally in all centres distributed along Italy
- Foreseeing an **integration** with the already provided T1 tools:
  - ticketing systems
  - documentation
  - procedures
  - automation

Conclusions

Conclusions

- The INFN-T1 User Support Unit plays a **central role** in favouring the interaction of users with the computing services provided by the Centre
- It is integrated with the other units, yet remaining independent
- Expansion of the workload in response to the DataCloud project through an increasing adoption of automation techniques and getting more people involved in order to keep a sustainable personal effort
- **Future plans**:
    - Harmonise the INFN-Cloud and T1 documentations
    - Gain good visibility of on both cloud and T1 usage.
    - This will allow an even better management of the various users requests, being able to suggest a linear combination of computing and storage solutions
    - Fostering the creation of a community of keen users who provide mutual support on common computing issues

References

1. WLCG website https://wlcg.web.cern.ch
2. INFN-CNAF website https://www.cnaf.infn.it/
3. INFN-T1 user guide https://l.infn.it/t1guide
4. Handy links to automatically updated useful pages
   https://www.cnaf.infn.it/~usersupport/

Thanks for the attention

感謝您的關注

Backup

The INFN-Cloud architecture

- Based on a **core backbone** and a multi-site, **federated Cloud infrastructure**
- The **backbone** is spanning the two main INFN computing sites (CNAF and Bari) connected at high bandwidth with each other
    - The backbone is used to host the **INFN Cloud core services**
- The set of distributed, **federated cloud infrastructures** are connected directly to the backbone