Istituto di Radioastronomia - INAF
Il Data Center

Claudio Gheller (in rappresentanza del Data Center Team)

Data Center Team

- **Stefano Giovannini:** Primo Tecnologo — Coordinatore del Team, Responsabile SID
- Francesco Bedosti: CTER — Gestione Sistemi // Alma
- Vincenzo Galluzzi: Ricercatore — Data Steward // Servizi IA2
- Claudio Gheller: Tecnologo — Sviluppo Software HPC // LOFAR, SKA
- Matteo Stagni: CTER — Sviluppo Software, Network // VLBI, SKA
- Simona Tubertini: CTER — Servizi informatici di Area, Network
- Marco Tugnoli: CTER — Gestione Sistemi e acquisti
- Marco Baldini CTER — SID Applicazioni sistema informativo Ente
- Andrea Cibelli: CTER — SID Applicazioni sistema informativo Ente
- Barbara Neri: Coll.Ammin — SID Applicazioni sistema informativo Ente

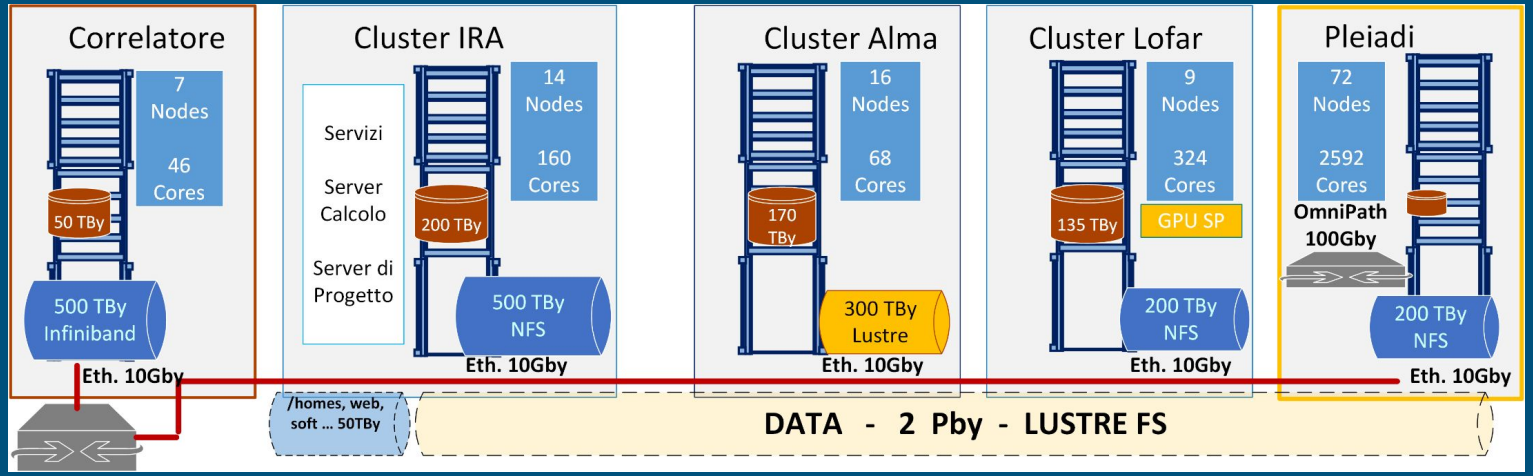
Associati : Mauro Nanni, Franco Tinarelli

Attivita’ di Servizio

IRA-DC provides for all users as basic services:

- Personal workstation and shared computing resources in cluster
- Hosting of single servers dedicated to projects.
- Availability and updating of basic radioastronomical software
  - Big packages developed as an integral part of the antenna by staff
  - Astronomical and statistical library, imaging and calibration software, pipelines

Sistemi di Calcolo



- Uniche **credenziali di accesso** (LDAP) e identificativi di **proprieta' dei dati** (UIC) condivise dall'intero sistema (workstation, server…)
- **Software** (packages, tools, librerie) condivisi sulla rete come eseguibili e **containers** per tutti i sistemi.
- Due collegamenti alla **rete geografica** a 10 Gbit/s (servizi e correlatore VLBI)
- Attualmente **aree di storage** dedicate su diversi file system.

R&D

Service and technological R&D activities carried out with national (ICT, IA2, GARR) and international (Jive, NRAO, ... SKAO, SRC NET, LOFAR) collaborations.

- VLBI-IT correlator
- LOFAR software and pipelines
- Alma Regional Center
- Proposal submission webform and relative admin tool (PropADM)
- Archiving software NADIR and web interfaces for INAF radio telescope data
- SKA simulations and data visualization

Correlatore VLBI-IT

- VLBI-IT correlator is used for most of the VLBI observations and carried out with the INAF antennas (Mc-Nt-SRT) + Partners
- The Correlator is used in ad-hoc observations of international astronomical and geodynamic projects.
- VLBI-IT take part in the comparison between the time / frequency signals generated by the Medicina atomic clock and the one transmitted over fiber by the INRIM metrology institute in Torino

Antennas stream data to the correlator via network up to 4 Gbit/s

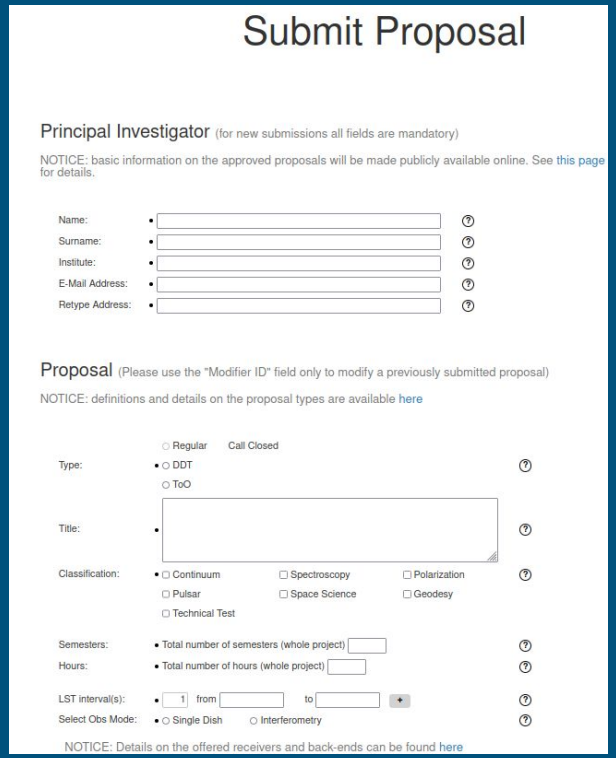
Hardware
- 5 nodes
- 160 cores
- 28 TB NVME - 33 TB SSD - 500 TB disks Storage
- Infiniband interconnect 40 Gbit/s
- 10 Gbit/s external data link

Software
- DiFX efficiently uses MPI to process large amounts of data (~10 TB)

Alma Regional Center

- 13 Servers, 64-256 GB RAM; 318 TB storage; high-speed connection 10Gbit/s
- On the ARC cluster the major data reduction and visualization tools for interferometric data (mostly related to ALMA, but not only), are maintained, updated and offered to the users: at least CASA (all the versions), Miriad, CARTA, ADMIT and related libraries.
- The ARC staff offers support for the usage of the ALMA-related tool and on best effort to support with data from any other radio-submm interferometer.
- The ARC staff is involved in the definition of pipelines for EHT-VLBI data calibration, ALMA pipeline for polarized data calibration, ALMA archival data re-imaging (through the ARI-L ESO ALMA Development Project, PI: Massardi), development of tools for archival data analysis (e.g. KAFE)

Proposal webform & PropADM



Submit Proposal

Principal Investigator (for new submissions all fields are mandatory)

NOTICE: basic information on the approved proposals will be made publicly available online. See this page for details.

Name:
Surname:
Institute:
E-Mail Address:
Retype Address:

Proposal (Please use the "Modifier ID" field only to modify a previously submitted proposal)

NOTICE: definitions and details on the proposal types are available here

Regular Call Closed
Type: DDT ToO
Title:
Classification: Continuum Spectroscopy Polarization Pulsar Space Science Geodesy Technical Test
Semesters: Total number of semesters (whole project)
Hours: Total number of hours (whole project)
LST interval(s): 1 from to
Select Obs Mode: Single Dish Interferometry

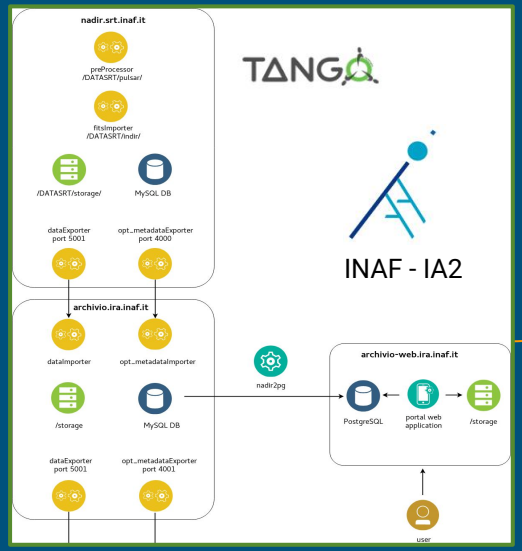
NOTICE: Details on the offered receivers and back-ends can be found here

The proposal webform allows to apply for INAF radio telescope observing time (Regular, ToO or DDT)

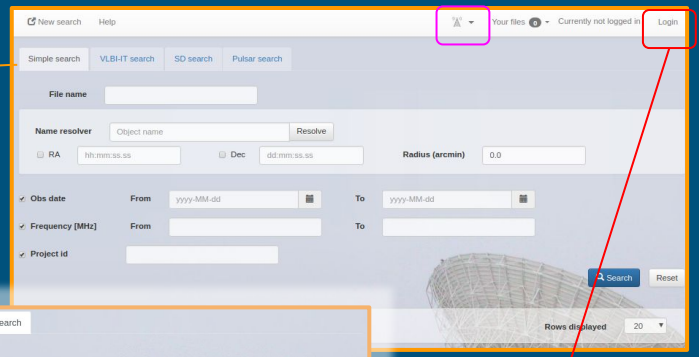
PropADM is an admin tool designed for the Time Allocation Committee (TAC)

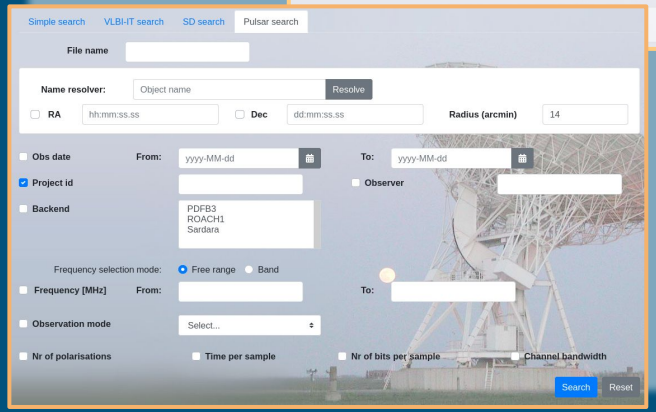
INAF Radio archive: NADIR and WI

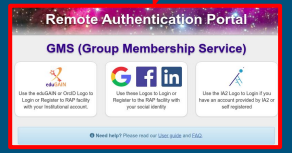
The **archival system** is based on the ***New Archiving Distributed InfrastructuRe*** **(NADIR)**, explicitly designed to be **flexible** in order to cope with **evolving data models**, **formats**, **publication policies**, **versions and metadata contents**, **keeping consistencies** among different sites.



SAMP broadcast (to VO tools)







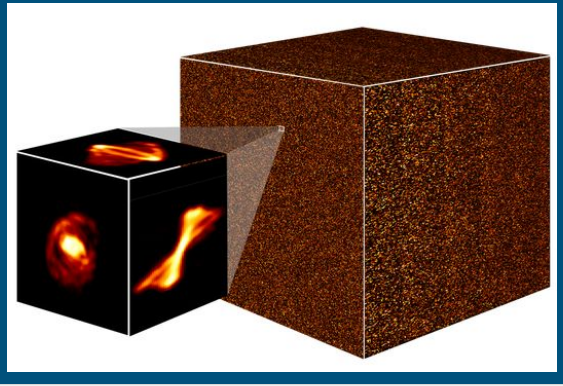
Pleiadi

- Where: IRA, Trieste and Catania
- Model: IBM NeXtScale cluster
- High Perf. Network: Intel OmniPath (100Gb/s)
- Nodes: 72 (Intel Broadwell) per Rack
- Racks: 3 (one per site)
- Processors: 2 x 18-cores Intel Xeon E5-2697 v4 at 2.30 GHz (~200-250 GFlops)
- Cores: 36 cores/node, 2572 cores in total per Rack
- GPUs: K80, P100 NVIDIA Tesla (12)
- RAM: 128/256 GB/node
- Filesystem: Parallel HPC filesystem

Prima assegnazione di risorse appena completata:

- 23 progetti supportati
- ~27 milioni di core hours assegnati per il semestre giugno-dicembre 2022
- vari campi applicativi: simulazioni cosmologiche, turbolenza, formazione galattica, sistemi planetari, analisi dati radio astronomici…
- 6 progetti assegnati ad IRA

SKA Data Challenge



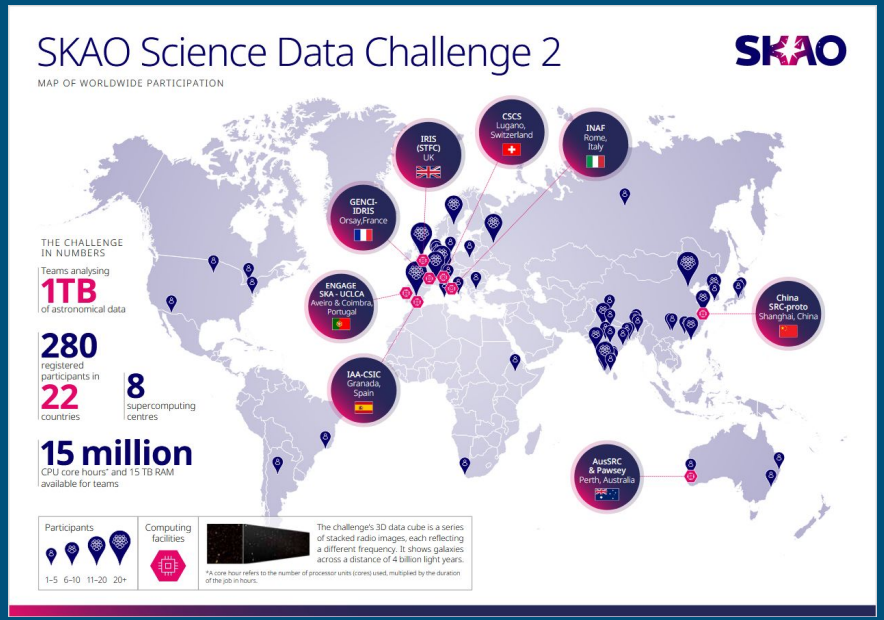
La challange prevedeva l’analisi di un “cubo” di 1 TB di dati.

Predisposte 4 VM con RAM da 128 GB, accesso via Science Gateway alle risorse ed al software radioastronomico.

Il team ospitato si e’ piazzato al 4^ posto nella challenge utilizzando il software SOFIA

Science Gateway

- Accesso ai sistemi remoti via web in modalita’ terminale e grafica
- Autenticazione con differenti set di credenziali
- Autonomia dei P.I. nel autorizzare i membri del progetto.



Verso lo SKA Regional Center (SRC)

Experimenting with technologies to create the computing infrastructures that will be required by future projects (SKA precursor and SKA)

- Investigate the management of large data sets on geographical networks, file systems, storage system.
- Investigate the computational use of HPC and use of GPU in the analysis of radio astronomy data.
- Contributing to the setup of the Italian SRC (Tier3 → Tier1 @ Tecnopolo Bo)

Actively contributing to the SRC NET international collaboration

Attivita’ in divenire

- Messa in opera di un sistema efficiente e capace di storage su diversi livelli
- Ottimizzazione dell’accesso e sfruttamento del sistema Pleiadi e successori
- Contributo allo sviluppo del software e delle pipeline per LOFAR
- Contributo allo sviluppo dello SKA Regional Center Italiano
- Supporto al calcolo e archiviazione per ALMA
- Supporto allo sviluppo e mantenimento del correlatore VLBI-IT
- …e molto altro…