The 25 Years of TNG through the Archival Data

Andrea Bignamini and IA2 Team
INAF

Telescopio Nazionale Galileo: 25 years of Astronomy in La Palma
19 October 2021

IA2 Main Goals

Centro Italiano Archivi Astronomici (IA2) main goals are :

- archiving systems
- safety
- data curation and preservation
- distribution over geographical distributed sites
- providing services and tools (collaboration tools, workflow, etc..)
- data publication in the VO

IA2 manages data of several projects:

- Telescopes: TNG, LBT, Asiago, etc.
- Surveys: raw and/or calibrated
- Exoplanets (GAPS)
- Simulations (ITVO)
- EU Projects (GENIUS, VIALACTEA, INDIGO, ASTERICS)
- Radio Archives
- Educational (SVAS)

IA2 is part of INAF-ICT

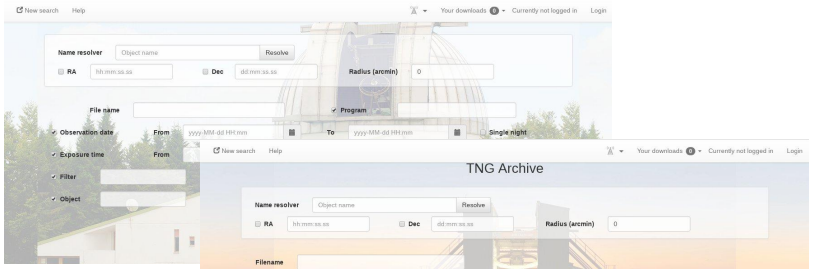
IA2 Services for the Astronomical Community

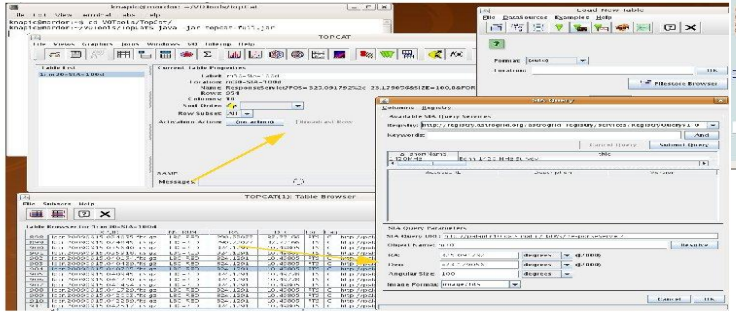
ownCloud

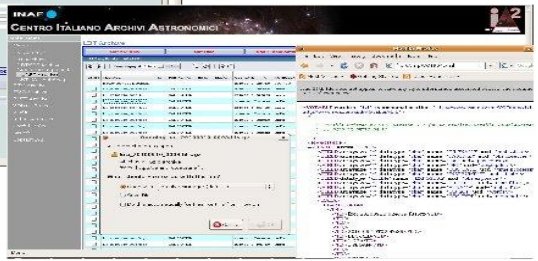
easyREDMINE

GitLab

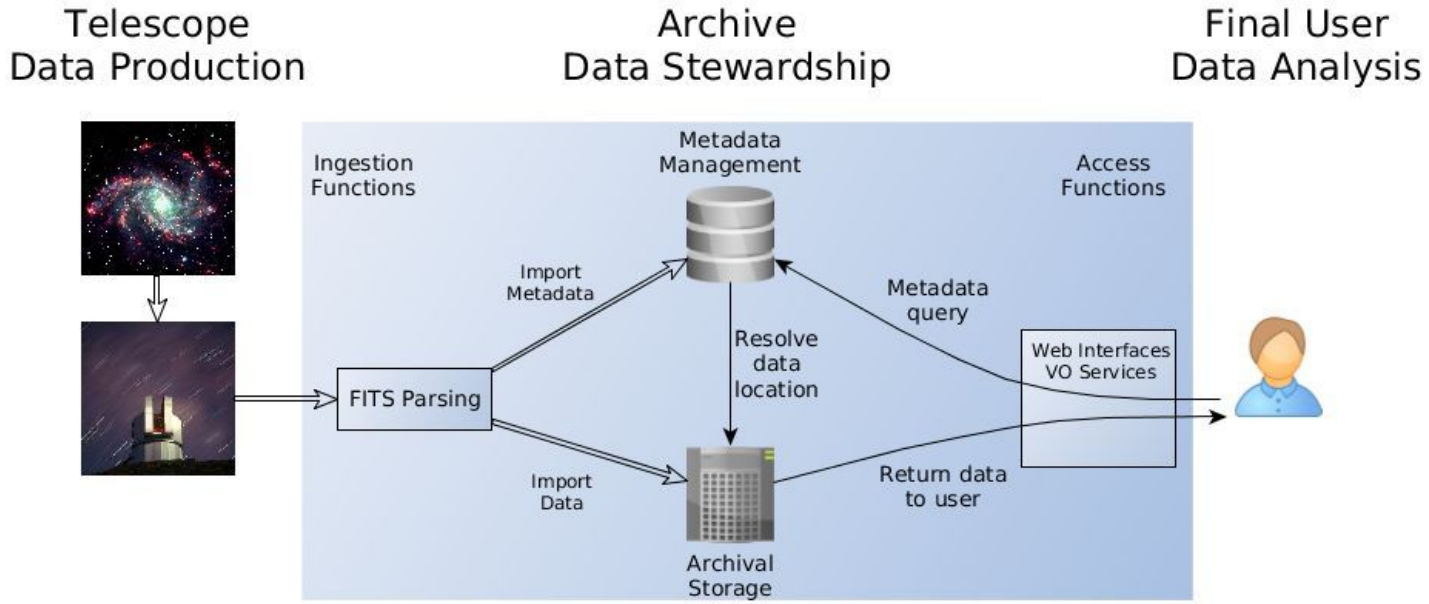
VO Service & TopCat







TNG Archive Schema



Brief History of TNG Archive - part 1

- 1993 CRA nominated a task force named “TNG Archives Working Group” to define system requirements and basic architecture for the “Archives at the TNG” and the “General Archive”
- 1995 Work concerning the Archives at the Telescope (AaT) started at the Astronomical Observatory of Trieste (OATs)
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- 2001 Pilot study for Long-Term Archive (LoTAr) started at OAT
  - Persistent archive
  - Provide access to users and to the astronomical community

A PILOT PROJECT FOR THE IMPLEMENTATION OF THE ITALIAN “TELESCOPIO NAZIONALE GALILEO” LONG-TERM ARCHIVE

Principal Investigator : Fabio Pasian

OATg People:
Riccardo Smareglia, Alessandro Caproni, Andrea Zacchei, Claudio Vuerli

Coordinating Institute :
Osservatorio Astronomico di Trieste;

Participating Institutes :
Osservatorio Astronomico di Roma;
Osservatorio Astronomico di Catania;
Osservatorio Astronomico di Capodimonte;
Centro “Galileo Galilei” (TNG) – La Palma;
Istituto di Radio-Astronomia CNR – Bologna;
Centre Données astronomiques de Strasbourg;
Space Telescope European Coordinating Facility, ESO, Garching

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- 2003 IA2 created with the main goal to set up a Long-Term Archive for TNG

Brief History of TNG Archive - part 1

	"CENTER FOR ASTRONOMICAL ARCHIVES" ***Response to the INAF Announcement of Opportunity***	Document No. Issue/Rev. No. Date Page	IA^2-OATs-RF-001 1.0 10 November 2003 29 of 87

2.2.2.3 Ingestion of TNG data

2.2.2.3.1 Ingestion of TNG scientific data

Files containing scientific exposures are sent by CGG to LTA via mail or courier [22]. The ingestion procedure reads all CD-Rs loaded on the juke-box and dumps their content on magnetic disk to allow on-line access.

Brief History of TNG Archive - part 1

About 1000 CD-ROM

The AWS data transport solution

AWS Snowball—petabyte scale data transport

E-ink shipping label

RE:INVENT 2015 LAUNCH

- Rugged 8.5G impact case
- Rain and dust resistant
- Data encryption end-to-end
- 50 TB capacity/10G network
- E-ink label

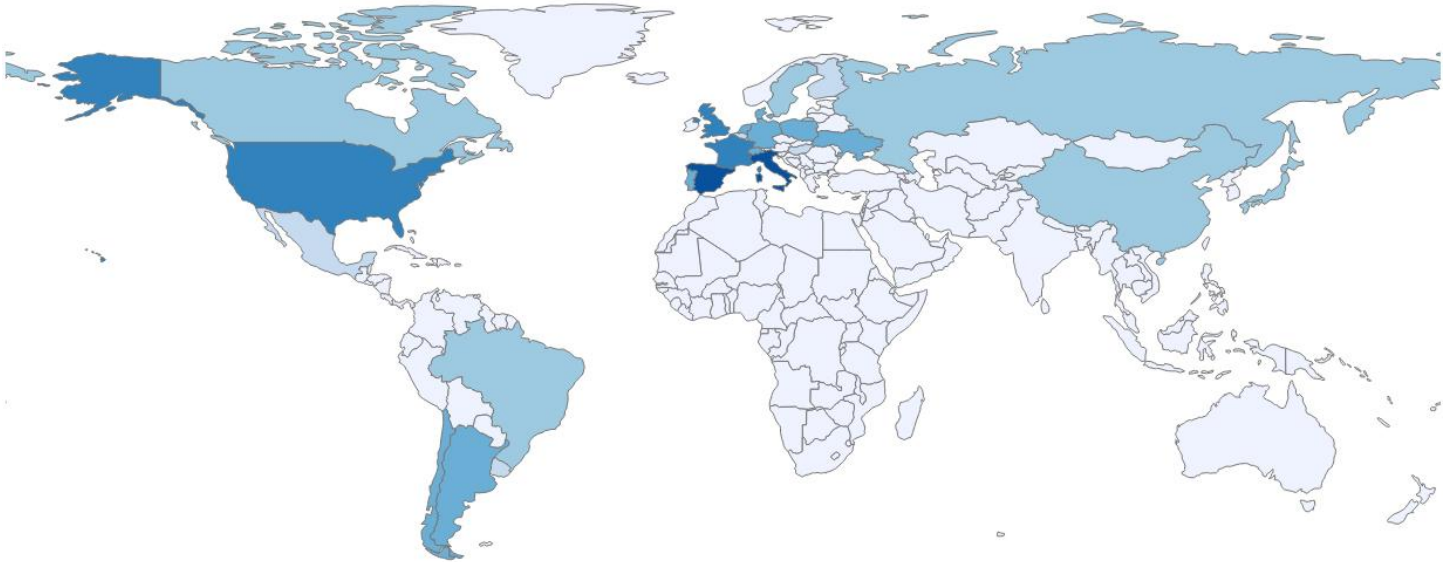
aws

Credit to CM Vahid
Principal Solutions
Architect AWS AI

Brief History of TNG Archive - part 2

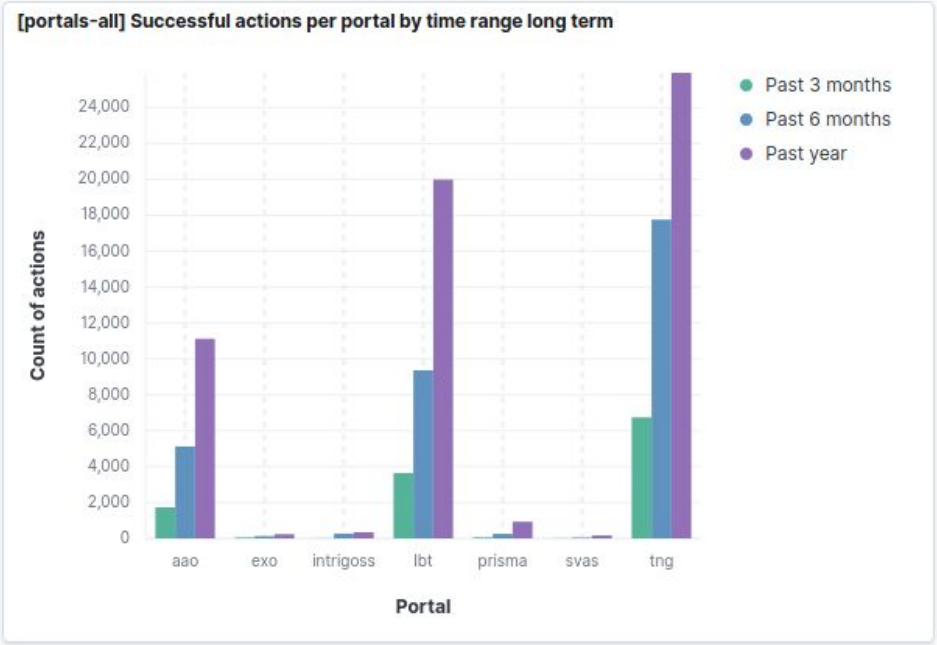
- 2006 TNG LTA started at IA2
  - Based on DBMS Oracle 8i Enterprise Edition
  - Already with interoperability features (e.g. SIMBAD Name Resolver)
- 2012 Second phase of TNG Archive
  - New Java Data Ingester + MySQL + new web interfaces
- 2015 NADIR (New Archiving Distributed InfrastructuRe) and Third phase of TNG Archive
  - Archiving functions treated as “devices” managed by Tango Controls
  - Modular, scalable and designed to manage large distributed archives, multiversion of observations, and data distribution according to well defined access policy
  - On the top of the archive many other services have been developed:
    - Apogeo and Portal Generator
    - User Management Tools: Archive Program Manager (APM), Group Membership Service (GMS), Single Sign-On (SSO)

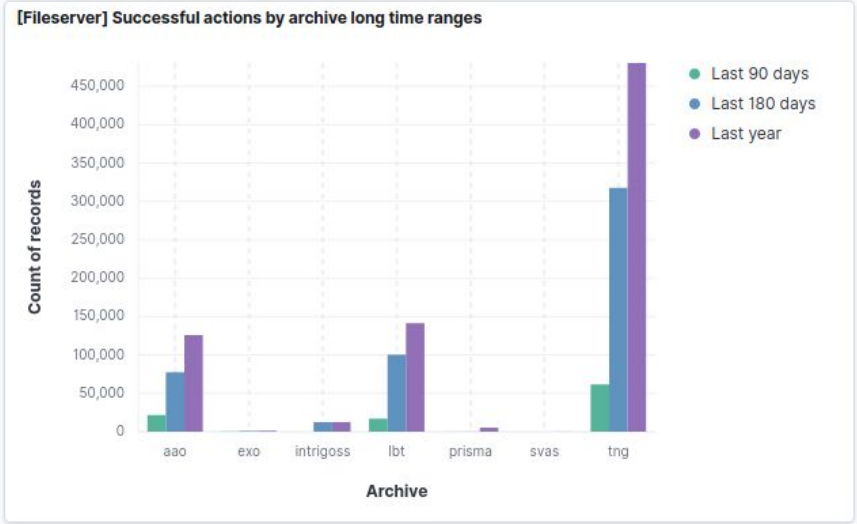
TNG Archive Map of Accesses



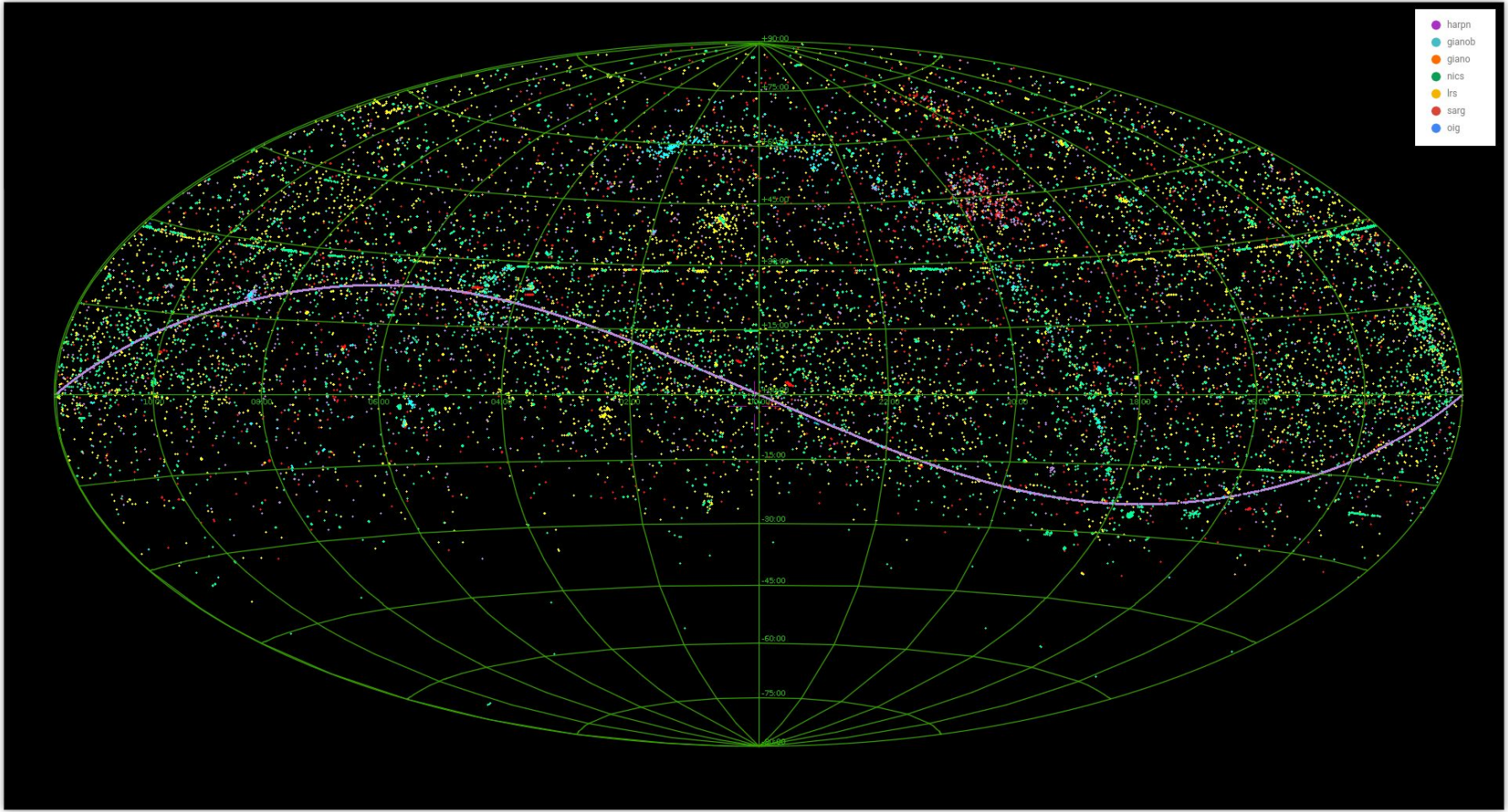
ITA: 2879	NLD: 161	DNK: 71	RUS: 26	URY: 8	FIN: 3	LTU: 1
ESP: 1367	CHE: 148	PRT: 70	SWE: 24	MEX: 6	ROU: 2	IND: 1
GBR: 517	ARG: 94	POL: 68	CHN: 24	BEL: 6	AUS: 2	ARM: 1
USA: 488	DEU: 92	UKR: 61	CAN: 17	ISR: 5	TWN: 1	
FRA: 288	CHL: 76	BRA: 28	JPN: 14	HUN: 5	MUS: 1	

Archive Access Statistics





Updated at 15/10/2021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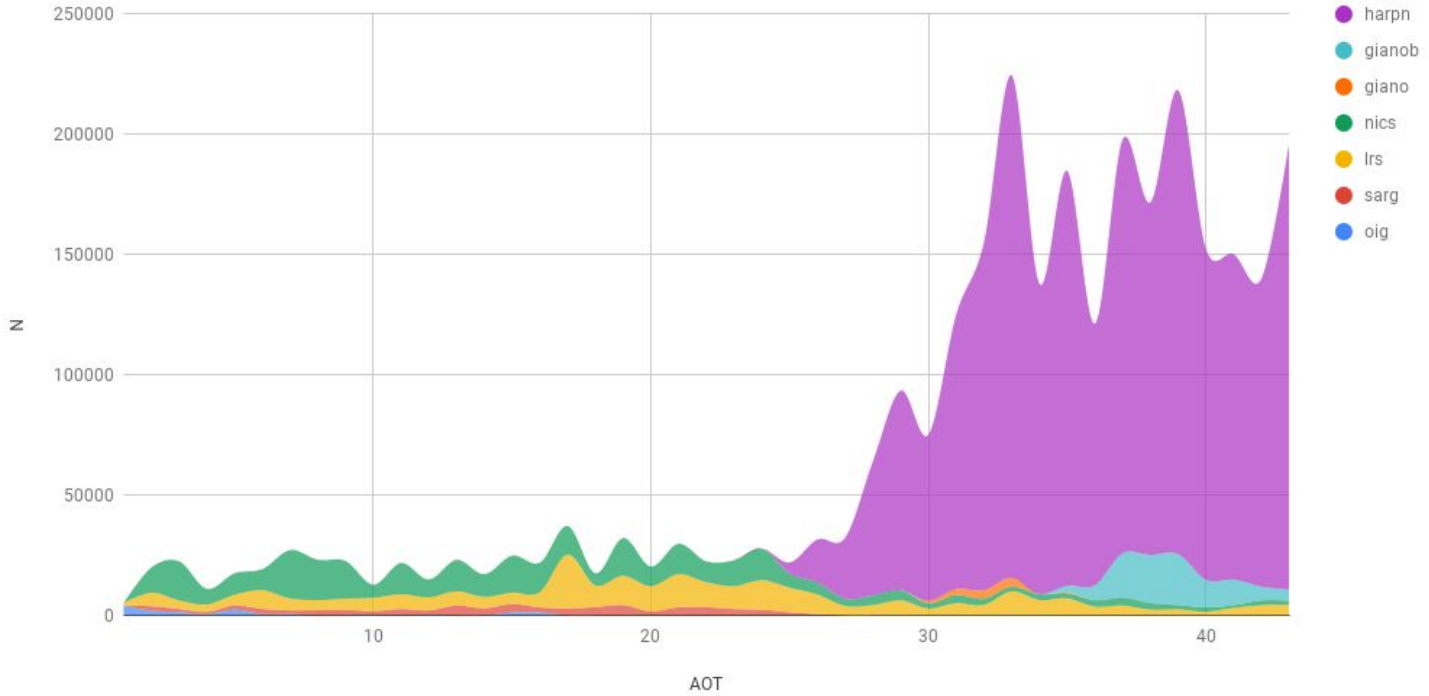
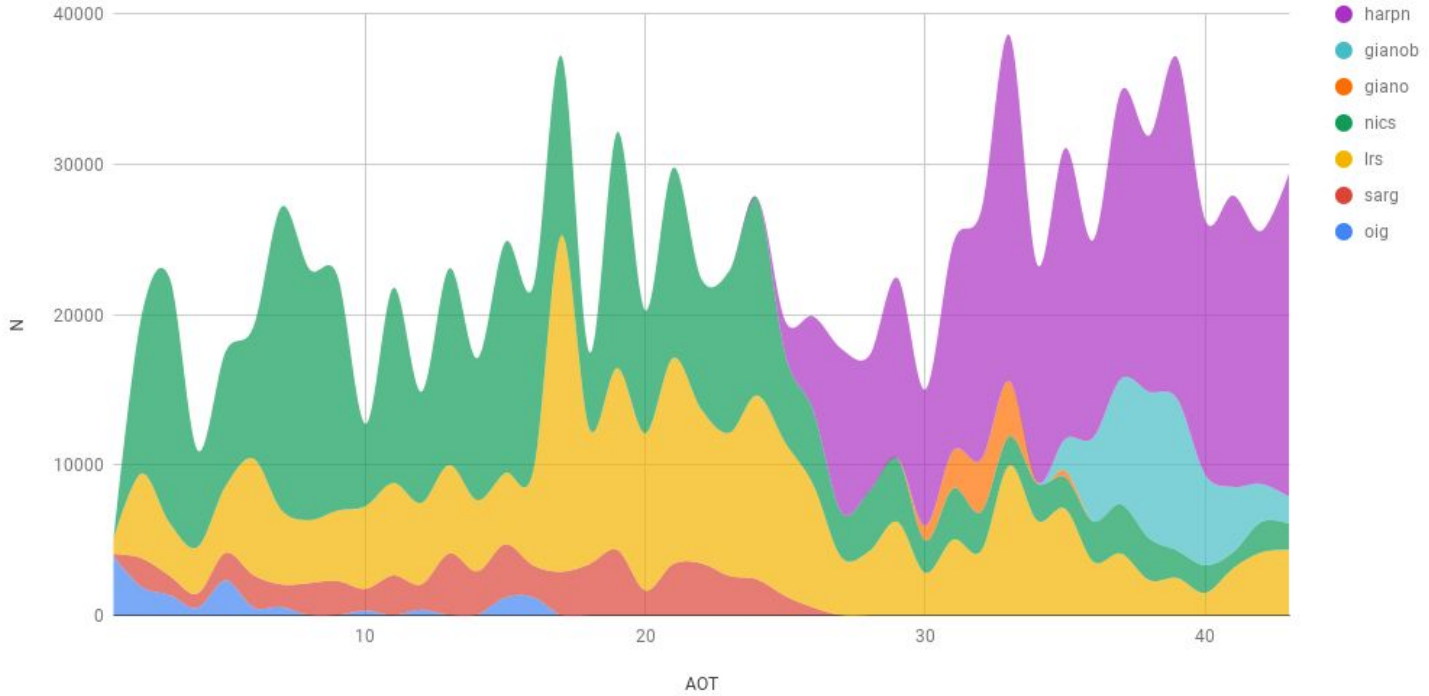
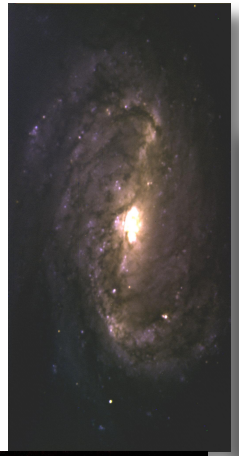
Number of Files per Instrument

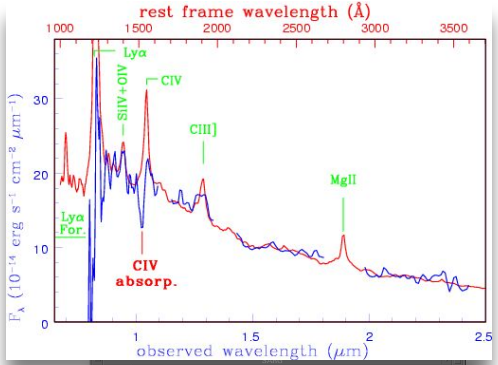


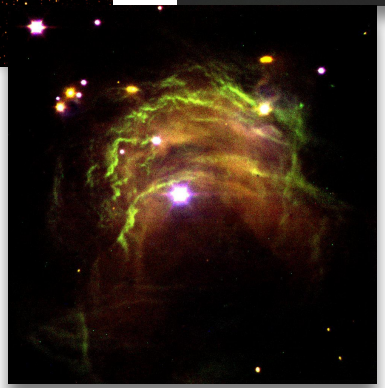
Number of Raw Files per Instrument

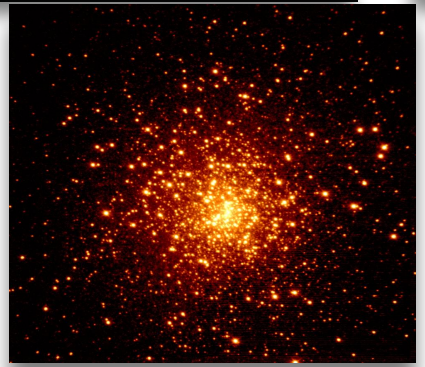


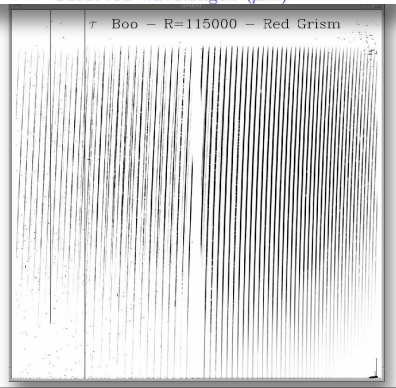
Many Images, Spectra and Scientific Results











GAPS@IA2

GAPS (Global Architecture of Planetary Systems) is a long-term program for the comprehensive characterization of the architectural properties of planetary systems as a function of the hosts' characteristics (mass, metallicity, environment):

- more than 80 INAF and associated scientists in Italy, and from foreign institutes
- more than 23.000 spectra at TNG since August 2012

GAPS required a strong interaction with its private data

- Customizable re-process of GAPS data with appropriate spectral line mask and options;
- Perform queries on additional metadata content;
- A flexible and collaborative tool to manage additional info about the project and the observations;
- A repository where to access, synchronize, share and search for interesting data.

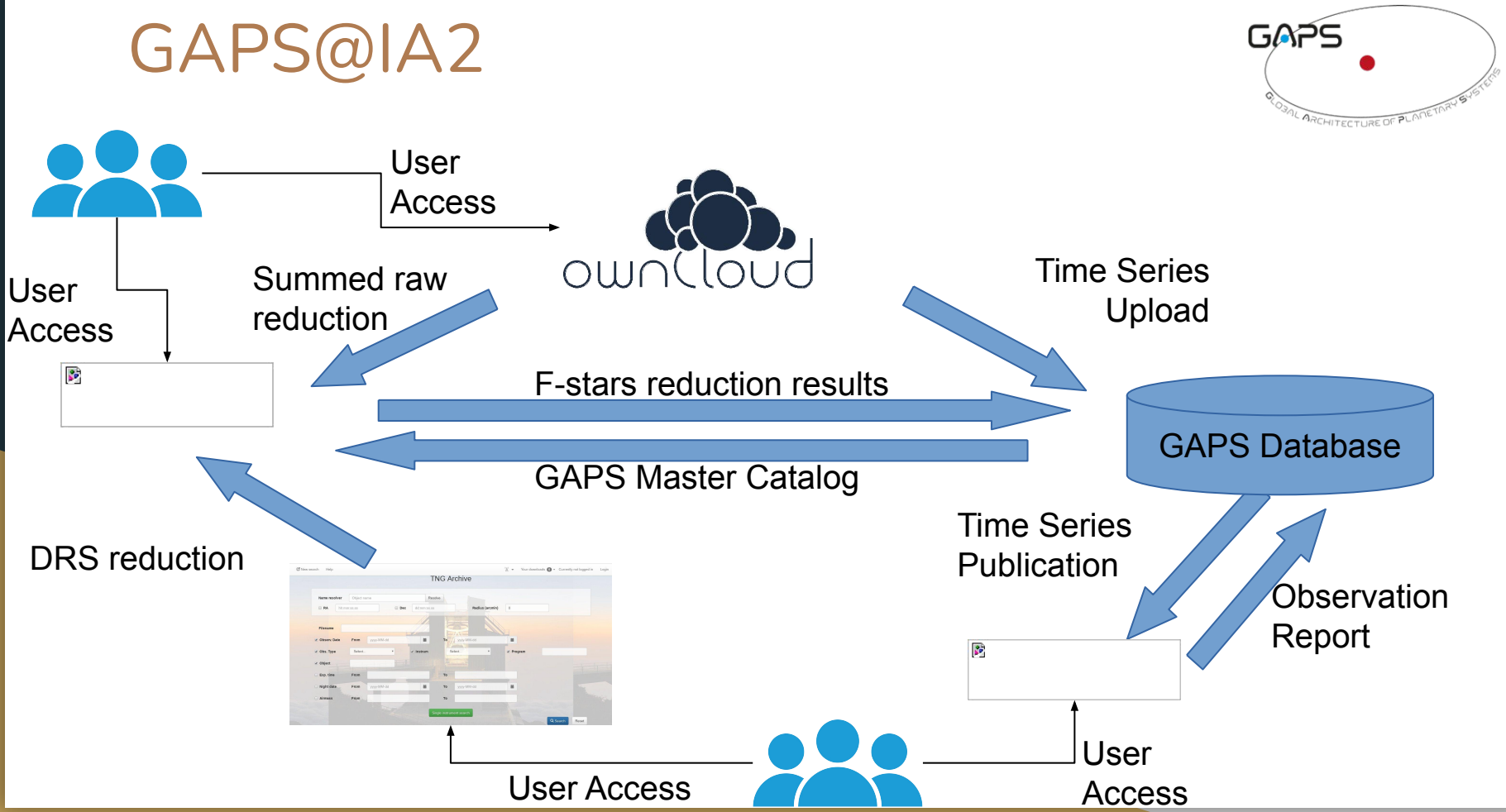
GAPS@IA2

Scientific results are not only raw or reduced data:

- Observation reports
- Time series
- Catalogs
- New masks
- Alternative reduced data
- Summed raw files
- Scientific and ancillary data shared

Solution is a custom framework of services managed by IA2 and content managed by GAPS members

GAPS@IA2

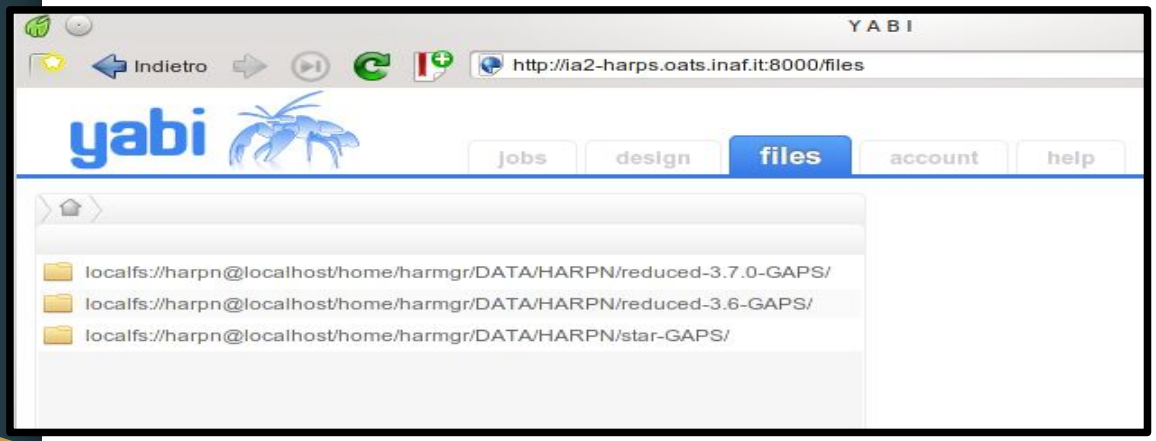

User Access
User Access
Summed raw reduction
Time Series Upload
F-stars reduction results
GAPS Master Catalog
GAPS Database
DRS reduction
Time Series Publication
Observation Report
User Access
User Access

Yabi

- Yabi is a 3-tier application stack to provide users with an intuitive, easy to use, abstraction of compute and data environments. Developed at the Centre for Comparative Genomics and Murdoch University, Yabi has been deployed across a diverse set of scientific disciplines and high performance computing environments
- Yabi deployed at IA2 allows users to run custom data reduction with the HARPS-N DRS pipeline
- Raw data are automatically reduced in Trieste and saved on the Yabi storage (available 6 hours after end of observations)
- In the Yabi interface directories TNG users can find:
  - Reduced data subdivided by observation night and targets
  - Proprietary custom masks and tools

https://ccgapps.com.au/yabi/

Yabi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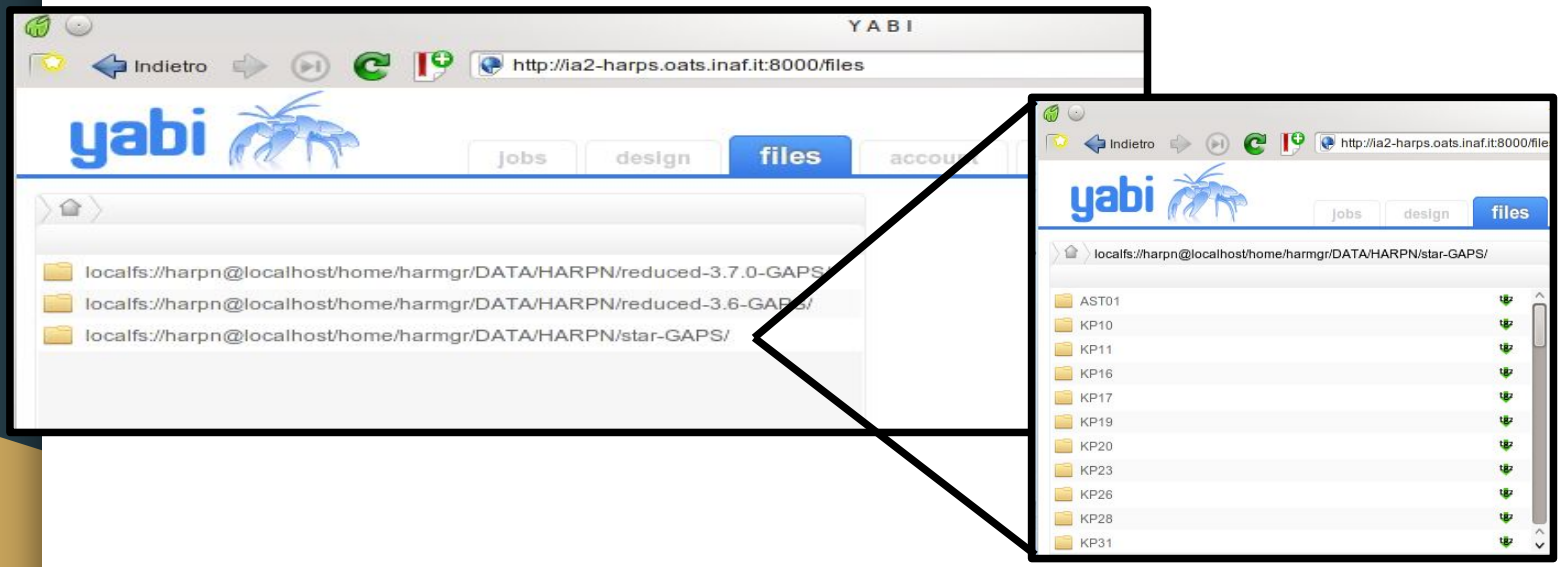
Yabi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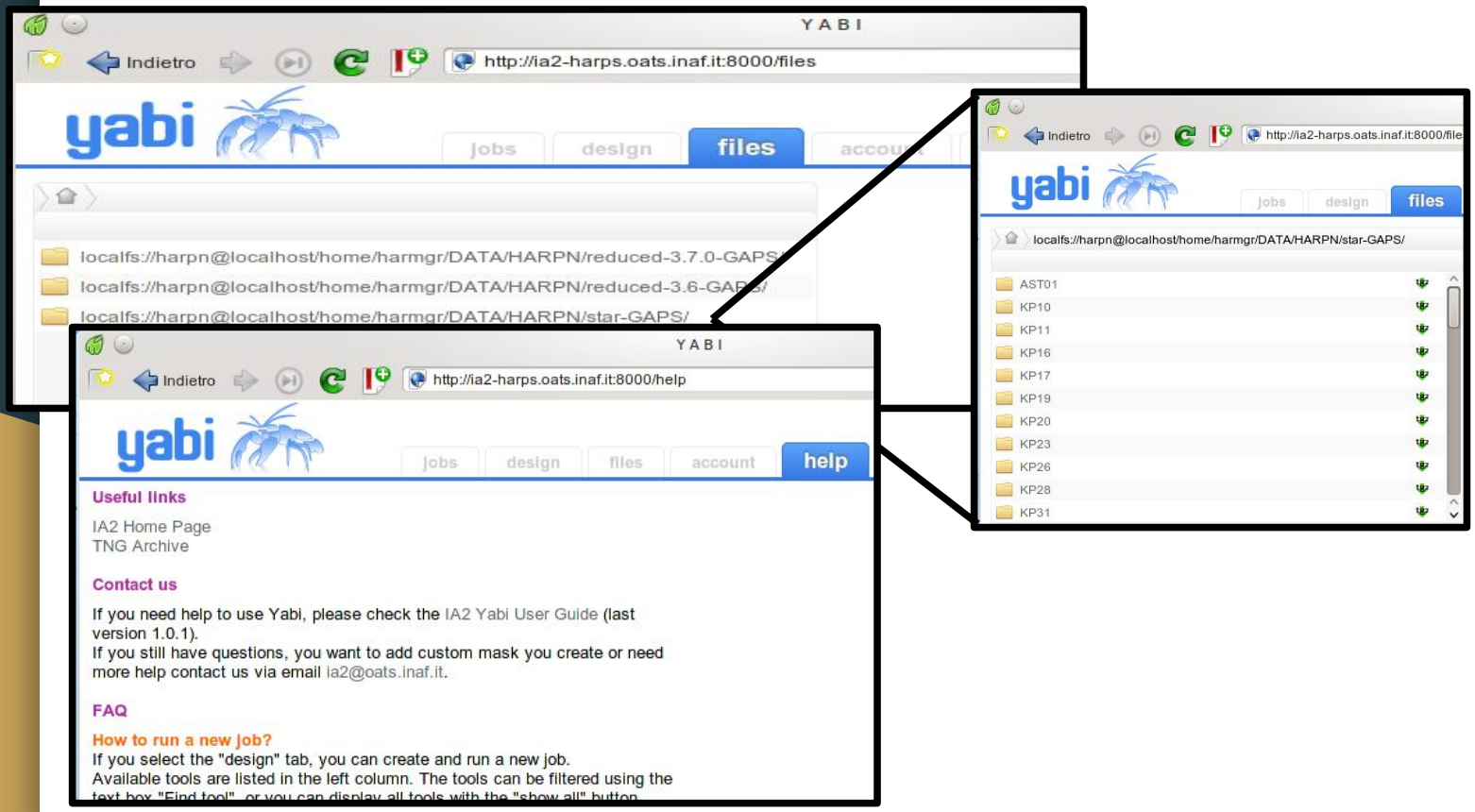
Yabi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Useful links
IA2 Home Page
TNG Archive
Contact us
If you need help to use Yabi, please check the IA2 Yabi User Guide (last version 1.0.1).
If you still have questions, you want to add custom mask you create or need more help contact us via email ia2@oats.inaf.it.
FAQ
How to run a new job?
If you select the "design" tab, you can create and run a new job.
Available tools are listed in the left column. The tools can be filtered using the
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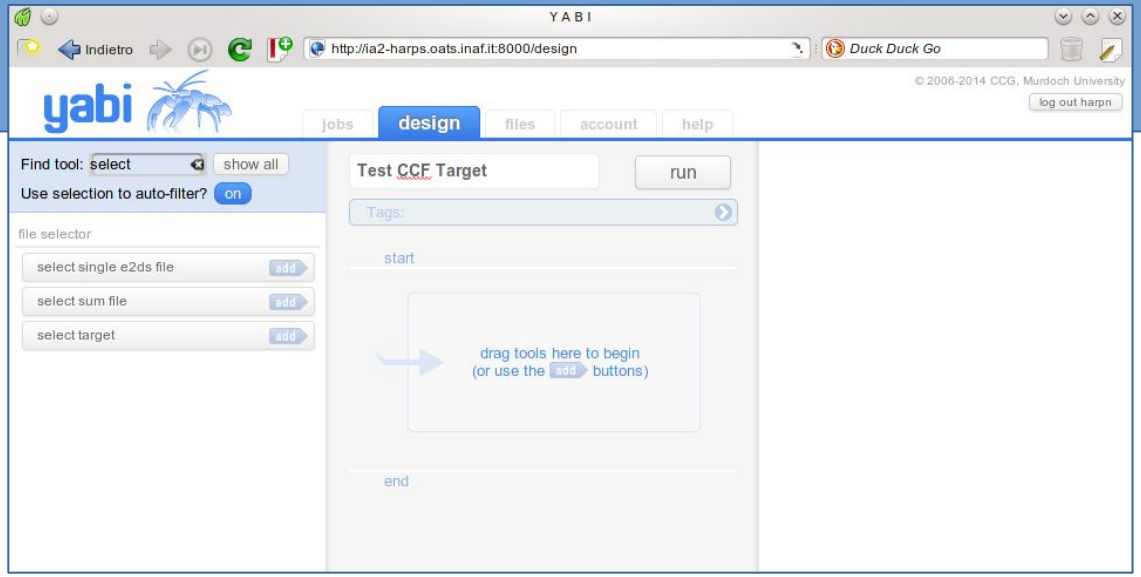
Yabi

- From the “design tab” add a select tool to the workflow (e.g. select target)



Yabi

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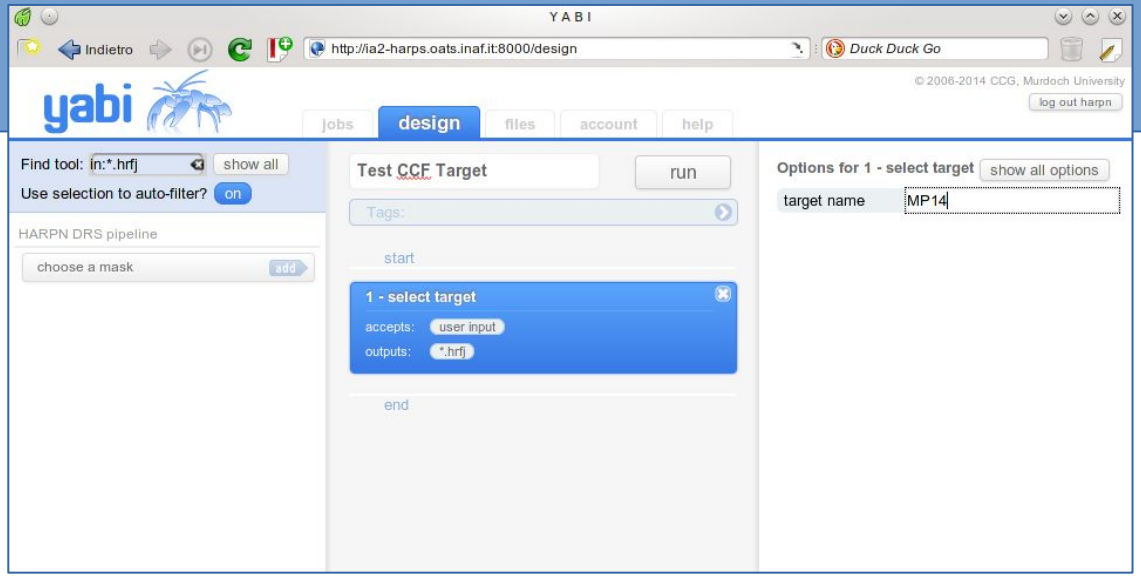
- Automatically Yabi suggests the next tool to add: choose a mask



Yabi

- From the “design tab” add a select tool to the workflow (e.g. select target)
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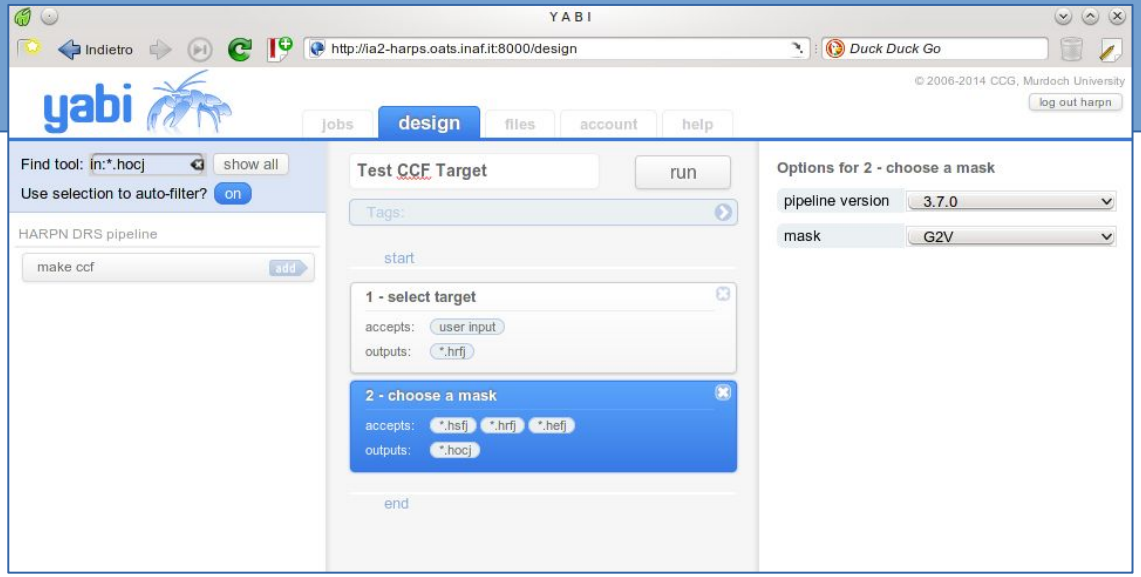
- Finally, add the tool “make ccf” and set the last input parameters



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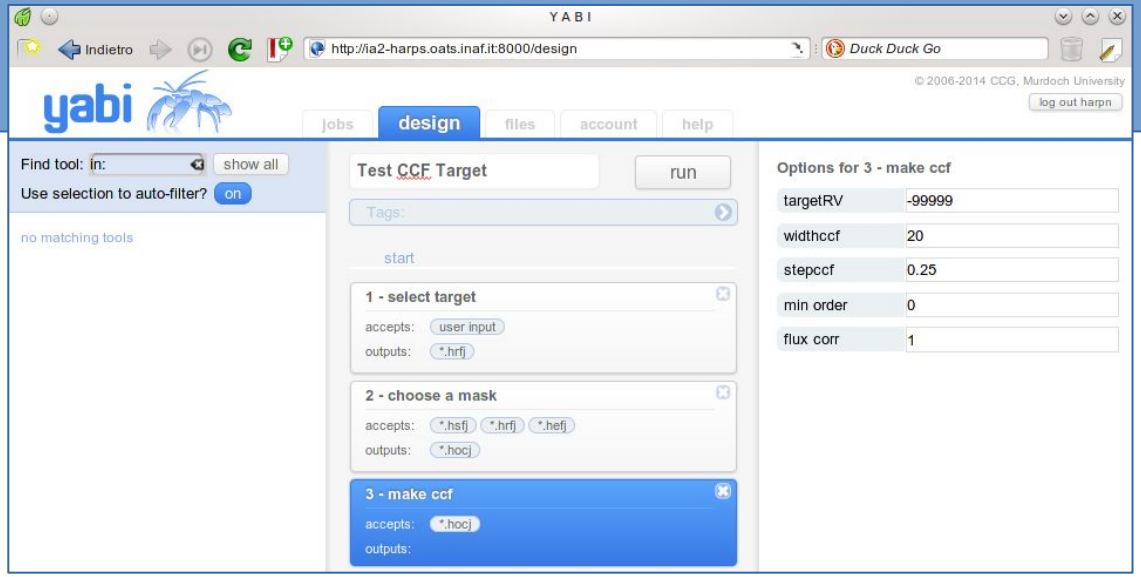

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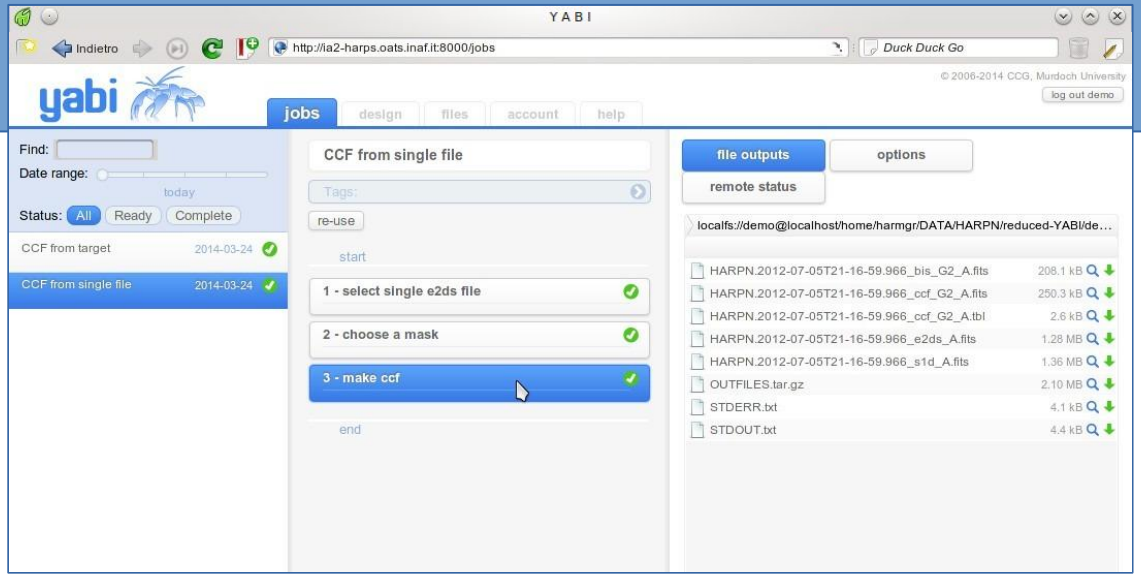
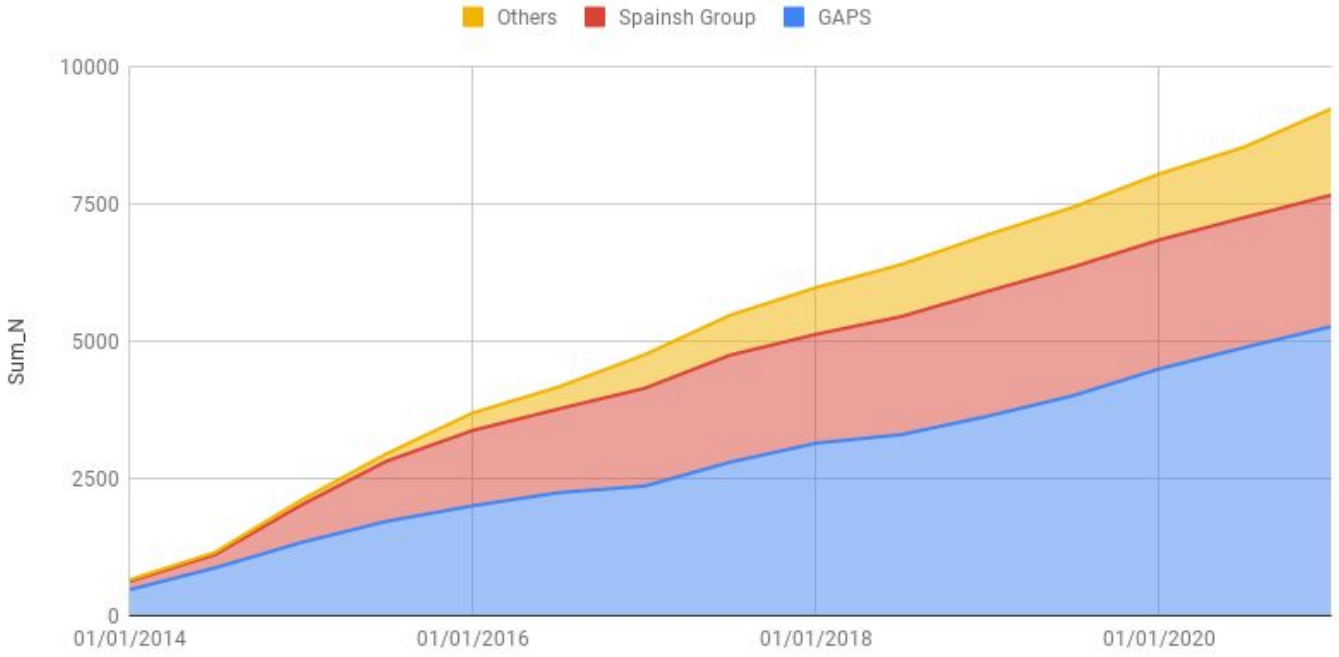


Yabi Statistics

- Yabi access extended to all HARPS-N users
  - 260 total users
  - 97 active users
- Tools and masks developed
  - 14 tools, 8 different kind of workflows
  - 38 custom masks developed by users
- 9490 workflows executed since March 2014

Updated at
15/10/2021

Yabi Workflows per User



Yabi PoC on Google Cloud and CWL

- Proof of Concept “Yabi Workflow Execution on Google Cloud Platform” to run data reduction pipelines on TNG archive data
  - Goals: simplify infrastructure management (SaaS/PaaS) and software deployment (Docker), optimizing and balancing the scalability of the service (Slurm and Kubernetes)
  - Results: excellent scalability and good costs (total estimated charges of 200 EUR/month to maintain architecture up and running on GCP)
  - Criticalities: needs to write data reduction pipeline optimized for containerization
- CWL (Common Workflow Language) integration in Yabi
  - CWL is a standard, it can provide an high level of interoperability between WMS and portability across different hardware environments
  - CWL supports natively Docker
  - CWL is not user friendly, it has a steep learning curve and it lacks a graphical interface to design workflows

Discover and Access GAPS Time Series within the VO Framework

- Increasing interest in the IVOA (International Virtual Observatory Alliance) for Time Domain data
- IA2 is developing a TAP VO service to publish GAPS public HARPS-N time series (with an eye on GIANO-B/GIARPS)
- Identified 8 use cases for RV Time Series discovery:
  - Number of points
  - Exoplanet properties
  - Discovery method
  - Host star properties
  - Photometry
- Exoplanets time series discovery and access using VO ObsCore Standard looks feasible… but
- Some information, useful when dealing with spectroscopic RV time series may be misleading
- Reference tables and dictionary needed

ASTERICS is a project supported by the European Commission Framework Programme Horizon 2020
Research and Innovation action under grant agreement n. 653477

Asterics
Astronomy ESFRI & Research Infrastructure Cluster

Conclusions

- Target of the archive:
  - Make services and maintain them
- Target of the archive user:
  - Use archive services and check their functionalities
  - Reporting problems
  - Suggest upgrade and new ideas to analyse data
- TNG archival data very fruitful for technological research at IA2 Data Centre:
  - New experience acquired to create and manage new archive services
  - Extend access to new services to the astronomical community