From Science Gateways to Papers

Palermo, May 23 – 26, 2022

- **Workshop day 1**: overview of existing international SG and commercial solutions; description of INAF science-support infrastructures (ALMA-ARC, IA2, Rosetta); examples of SG applied to projects (SKARC, ESAP, Radio Archive, ASTRI Mini-Array Archive System, LBT)

- **Workshop day 2**: existing HW and SW infrastructures (Gaia, IRA computational infrastructure, ASTRI onsite ICT); emerging infrastructures (ICSC national centre on HPC, BD and QC, SRT ICT, INAF ICT, Pleiadi); pipeline and pipeline management (GIANO-B DRS, GAPS/GAPS2, YABI); SG applications in INAF (SKADC2, genEGSE, VisiVo&c., Jupyter Notebooks)

- **Workshop day 3**: FAIRness, definition and "virtuous" examples (Open Science); examples of FAIR systems (ESO, Open Access, IA2); ideas for INAF

- Many ongoing activities related to SG/science platforms, either associated to telescopes/**projects** or designed as **services** (more) oriented to multiwavelength/data distribution.

- Similar, partly overlapping experiences. Possibility to test and compare multiple solutions (different projects, different needs), however it is important to work towards the optimization of resources especially in view of new challenges like SKARC, PNRR.

- A well-organized infrastructure offering end-to-end support significantly contributes to the exploitation of archival data (example: ALMA ARC). **Constant and active community formation and information** by means of not only documentation but also events, schools, training, seminars.

- Such activities will not produce for the involved staff as many scientific papers as it happens for other, "classical" research topics. (Also) for this reason they should be intended as services with **dedicated** personnel. Leaving their organisation to the initiative of groups/single INAF Structures may result in loss of resources, staff and expertise.

- **Authority**. Establish shared rules for quality control and control metrics, to be applied by the SG/archive staff but also by other people in charge of processing of data to be later archived (for instance the PIs). To be successful, who sets the rules must be authoritative enough to "convince" others to adopt standard procedures. How can this authority be built?

- On one side: SG/archive data scientists & c. should build trust by interacting with the community and establishing common rules. On the other side: authority should be **created/promoted/sponsored/supported at a national level by the Institution** (INAF in this case). This is accomplished not only by means of dedicated personnel but also with actions aimed at the identification of these as **infrastructural INAF entities**.

- **Huge economical effort in the field of astrophysics and computation during the next years:** SKARC, PNRR. Unprecedented fundings involved, that will require a comparable effort in terms of FTE and administrative/management support. Ongoing analysis on solutions for the management of such large projects. **Planning needed not only on the financial front.** Which professional profiles? Different roles for different areas of expertise: all are necessary.

- Where can we find such professional figures? **Strategies for recruitment**? Is it possible we are not advertising in the right/best way?

- Interesting experience: **Cloud commercial solutions** experimented by INAF (AWS, Google Cloud). Suitable for small-scale/individual projects, at the moment not viable for a general application. Critical: HPC and storage costs, impractical mostly for big radio data and/or large-scale reprocessing (example: SKA, Gaia). In many cases: software stay close to the data. (However, keep an eye open on how these solutions will evolve in the future)

- Give the possibility of teamwork on a scientific result that must be analyzed and discussed by a geographically distributed team before publishing. Many people in the same project: focus on the use of **collaborative tools**. Requirements on collaborative tools may vary in the different phases of a project.

- **FAIRness** is also an economical issue. Both being FAIR and non-FAIR have a cost. It certainly is a matter of **choosing an approach**, sort of "philosophical" method one wants to apply. Astrophysical research seems to be in advantage with respect to other fields, **IVOA** activities are leading.

- **Reproducibility** is a key theme. Reproducibility issues are "physiological" when experimenting with new technologies/platforms, nevertheless must be handled. **DOI** creation: univocal associating DOI and dataset, criticalities wrt versioning in some approaches. INAF IA2 approach: preserve the univocity.

- INAF invested a considerable effort towards **Open Access** in recent years. Open Access Repository: various types of publications/collections. A wealth of information for the Institution: it helps in sharing know-how also within INAF, adding value beyond OA itself.

- Interesting discussion on how to ask for **Editors** to apply a OA-like mechanism, in terms of transparency. It has to do with the rules for the evaluation of scientific research, which makes use of commercial bibliometric indicators that are, by definition, non-FAIR.

- **What is needed to achieve FAIRness:** a specific institutional policy; a Data Management Plan scheme; a 'place' where to save all intermediate products and assign a DOI; dedicated staff and instructions for correct citation of datasets, software and related products. It is **crucial** that **INAF supports** all these activities.