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MIRTA

an Interactive Map for the Technological Resources in Astrophysics

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Abstract. The Italian National Institute for Astrophysics (INAF) groups together 16 Observatories and Institutes. They host laboratories and workshops to support technological research, operations, maintenance as well as outreach and educational activities. This results in a vast range of facilities, equipment and skills. Recently, the INAF technological community clearly expressed the need to share information in order to more easily find tools, facilities, skills, to increase the working efficiency and minimize dead times and costs. We addressed this need and proposed an interactive tool called MIRTA (Interactive Map for Technological Research in INAF), aimed to effectively collect and share all this information. Its use cases can be very simple, such as, for example, solving a contingent problem or finding a specific device, or more complex, such as finding a staff member with the necessary skills to collaborate in a new or existing project. Here, we describe the main outcomes of the feasibility study.

Key words. Database, interactive map, sharing resources, community, sinergy

1. Introduction

The MIRTA project is designed to enhance and support the networking and sharing capabilities of the technology research community within the Italian Institute for Astrophysics (INAF), with potential interactions and extensions to other institutions. This initiative originated during the first national forum on technology research organized by INAF in June 2022 (Becciani et al. (2022)). The project focuses on creating a database, an interactive search engine, and an online community forum to connect individuals and facilitate the sharing of tools, knowledge, instruments, and expertise. INAF comprises 17 structures in 13 cities,

with 1500 staff members and over 50 laboratories and facilities. It leads and participates in numerous scientific and technological research projects on an international scale. In recent years, not differently from the overall technological community, even people focused on outreach and education have acquired devices and instruments for a wide range of activities, developing and gaining high-level skills. The knowledge and sharing of these resources are fully in line with the spirit of MIRTA. To manage such a vast array of activities effectively, an operational approach to sharing information and resources and facilitating community contacts is essential. MIRTA aims to develop an online tool that simplifies and enhances the search for resources, skills, and assistance within the community. The project involves developing an interactive map that is easy to consult, where information on technological research at INAF is collected. This information will include details about laboratories, research and technical personnel, skills, facilities, industry relationships, areas of interest and application, collaborations, and other shareable community resources. Behind the user interface will be a database, fed and updated by the INAF community. The database will include structured metadata documents detailing individual skills, knowledge, tools, etc.. These documents will populate the database - potentially, a relational one - that the interactive map will query to respond to user searches.

2. General concept

To ensure the correct and effective use of MIRTA, it is crucial to clearly define its intended purposes: MIRTA aims at collecting information only on the equipment and skills that the community wants to share, facilitating contacts and collaborations. The model must reflect the use cases serving this purpose.

This is particularly important in a community frequently involved in surveys and the compilation of various databases for goals such as management, administration, ranking, and awarding. Table 1 summarises the general concept of MIRTA.

2.1. Use cases

A comprehensive database of shareable technology-related resources could address a wide range of needs, from equipment searches to more complex quests for specific expertise. During the project's design phase, it is crucial to identify the use cases to develop an effective tool that encompasses all its intended functions.

Here are some basic examples of the questions the IM is expected to answer, as an example, for the education/outreach community:

- where can I find a recording studio provided with green screen?
- are there portable planetariums available for my event?
- does anyone possess a spare lamp for my old projector?
- is there someone skilled in the use of the device/software I need help with?

2.2. Scheme

The structured information behind the IM interface follows a simple conceptual model, where the main resources are categorised in two types: equipment and skill. We envisage for those resources a structured set of metadata elements and attributes (linked to other elements in the high-level conceptual schema, see Figure 1). That means that metadata schemata should be provided by the community for the two resource types and, in turn, the database starts out of document objects for each resource, that are then parsed and ingested into a relational database to allow for a more flexible query approach.

The scheme is based on the following:

- an INAF structure has at least one physical location;
- each location can have none, one or more laboratories and groups (aggregations) of skills;
- equipments and skills are the basic Resources in MIRTA;
- the laboratories have equipments;
- skills can be (or not) associated to the equipments.

Table 1. The MIRTA concept

What MIRTA is	What MIRTA is not
A tool wanted by the community, curated by the community, dedicated to the community	A management tool, or a replica of other databases that INAF employs for management and internal funding purposes
A means to connect people, ease the exchange of information, collaborations and issue-solving	A showcase for individual or collective curricula
A database of resource metadata (to describe facilities, laboratories, equipment and expertise) that are available for sharing	A detailed inventory of all that exists
A collective resource that, through time, is going to help highlighting needs, availabilities and shortages	A tool to establish rankings

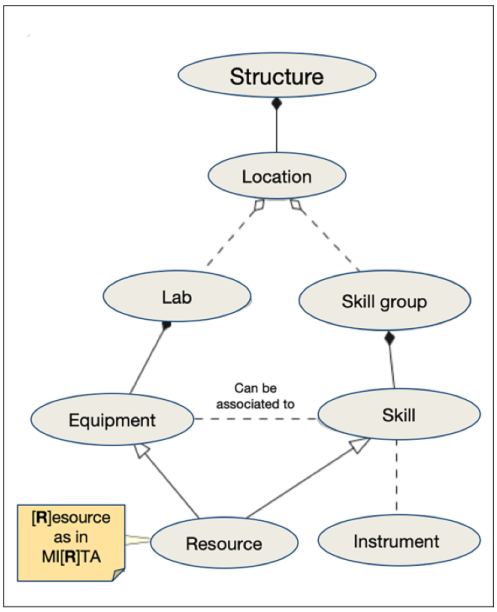

Fig. 1. UML conceptual diagram for the MIRTA database. The Resource concept (bottom) is the driver of the model, while Equipment and Skill are the main implementations of it.

In order to properly structure the database, the concepts of equipment and skill were defined and characterised. More details on the feasibility study can be found in Vitali et al. (2024)

3. Management

MIRTA is being developed under the "Comitato del Raggruppamento Scientifico Nazionale 5" (CSN5), INAF's national technology committee. The project will be managed by a working group, with local coordinators from each INAF structure overseeing data entry and periodic updates.

The primary goal of MIRTA is to facilitate direct communication among individuals, allowing them to discuss details and evaluate solutions in real-time. Therefore, MIRTA will not provide detailed information such as the current availability of each instrument or the specific expertise of individual group members. The information, collected at the lab or group level, will be limited to a set of parameters and descriptions, conceived to allow the users to effectively search for a first level of suitable records. Further details and time-dependent information will be accessible through interactions with designated contact points, as shown in Figure 2.

Although MIRTA is mainly intended as an internal tool for INAF staff, it will also share selected information with external entities to

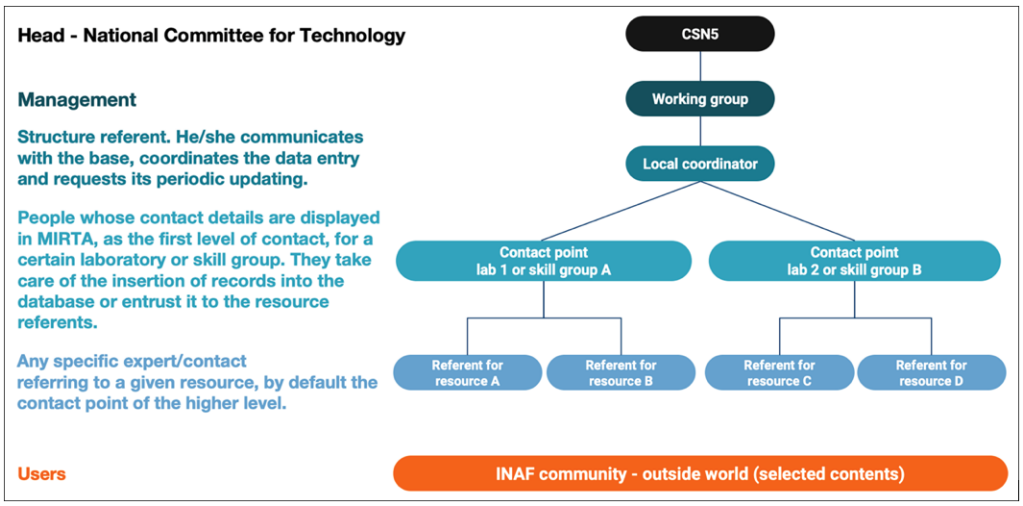

Fig. 2. Working hypothesis for the management of MIRTA

promote collaborations with other research institutes, universities, and private companies.

4. Roadmap

The MIRTA working group visited all INAF facilities to introduce the project to the community and gather suggestions for its optimal development. The project is expected to launch in 2025. We suggest to hire a full-time expert for one year to work on the database implementation, while the GUI development will likely be outsourced to a private company. After releasing a beta version, the community will assist with data entry, which will help debug the system and provide suggestions for improvements. In a subsequent phase, MIRTA will be opened to external entities to foster new collaborations with other institutions.

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