



ASTERICS - H2020 - 653477

First ESFRI Forum and Training Event

ASTERICS GA DELIVERABLE: D4.3

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|----------------------|--------------------------------------------------------|
| Document identifier: | ASTERICS-D4.3-Final.docx |
| Date: | 25 February 2016 |
| Work Package: | WP4 Data Access, Discovery and Interoperability |
| Lead Partner: | INAF |
| Document Status: | Final Version |
| Dissemination level: | Public |
| Document Link: | |

Abstract

The First ASTERICS DADI ESFRI Forum and Training Event was held in Trieste on 3-4 December 2015. It gathered technical staff from all the DADI partners, the ESFRI key projects as well as the Virtual Observatory (VO) teams. The event began with quick introductory talks to describe the ASTERICS DADI work package and explain the goals of the forum and training event itself. The format of the core part of the event was that of open discussion around specific topics, introduced during focused presentations held by representatives of the ESFRI projects or experts on data access, interfaces and interoperability from the partner projects. The discussions focused on multi-dimensional data access, resources discovery, authentication and authorization, and time domain data access. These fields were the outcome of the Strasbourg's First ASTERICS DADI Tech Forum (D4.1). The discussion highlighted topics useful in preparation of the next Technology Forum (D4.4) to be held in Edinburgh (7-8 March 2016). Thus, this first ESFRI Forum and Training event served to gather preliminary requirements from the ESFRI projects and consolidate connections between the various technical groups from the ESFRI and VO partners. Also, the event allowed for identifying the need for specific visits to ESFRI partners to better define technical requirements by involving the scientific and technical staff and/or to provide support on specific aspects of relevance to DADI.

I. COPYRIGHT NOTICE

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II. DELIVERY SLIP

| | Name | Partner/WP | Date |
|-------------|-----------------|--------------------|----------------|
| From | F. Pasian | INAF | 2016, Feb 2nd |
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| Approved by | R. van der Meer | | 2016, Mar 6th |

III. DOCUMENT LOG

| Issue | Date | Comment | Author/Partner |
|-------|------------------|----------------------------------------------------------------------|--------------------------|
| 1 | 02 February 2016 | First draft, based on ESFRI Forum & Training Event notes and minutes | M. Molinaro, INAF |
| 2 | 07 February 2016 | Updated draft by WP4 lead | F. Genova, CNRS/CDS |
| 2.1 | 17 February 2016 | Commented draft from the Project Manager and Project Scientist | R. Van der Meer (ASTRON) |
| 2.2 | 25 February 2016 | Updated draft by WP4 lead and M. Molinaro | M. Molinaro/F. Genova |
| Final | 25 February 2016 | Final check | M. Molinaro/F. Genova |

IV. APPLICATON AREA

This document is a formal deliverable for the GA of the project, applicable to all members of the ASTERICS project, beneficiaries and third parties, as well as its collaborating projects.

V. DOCUMENT AMENDMENT PROCEDURE

Amendments, comments and suggestions should be sent to the authors. The procedures documented in the ASTERICS “Document Management Procedure” will be followed:

<https://wiki.asterics2020.eu/wiki/Procedures>

VI. TERMINOLOGY

| | |
|---------|----------------------------------------------------------------------|
| ANTARES | Astronomy with a Neutrino Telescope and Abyss environmental Research |
| ASTRON | Netherlands Institute for Radio Astronomy |
| CNRS | Centre National de la Recherche Scientifique |
| CTA | Cherenkov Telescope Array |
| DADI | Data Access, Discovery and Interoperability (ASTERICS WP4) |
| EGO | European Gravitational Observatory |
| ESA | European Space Agency |
| ESFRI | European Strategy Forum on Research Infrastructures |
| ESO | European Southern Observatory |
| Euro-VO | European Virtual Observatory |
| FITS | Flexible Image Transport System |
| HEALPix | Hierarchical Equal Area isoLatitude Pixelization of a sphere |
| INAF | Istituto Nazionale di Astrofisica |

| | |
|------------|----------------------------------------------------------------------------|
| INFN | Istituto Nazionale di Fisica Nucleare |
| INTA | Instituto Nacional de Tecnica Aeroespacial |
| IVOA | International Virtual Observatory Alliance |
| OATs | Osservatorio Astronomico di Trieste |
| Pan-STARRS | Panoramic Survey Telescope And Rapid Response System |
| SAMP | Simple Application Messaging Protocol |
| SODA | Server-Side Operation for Data Access (previously AccessData) |
| TOPCat | Tool for Operations of Catalogues And Tables |
| UEDIN | University of Edinburgh |
| UHEI | Ruprecht-Karls-Universität Heidelberg |
| VO | Virtual Observatory |
| VOEvent | Sky Event Reporting Metadata |
| WCS | World Coordinate System |
| WP4 | ASTERICS Work Package 4 Data Access, Discovery and Interoperability (DADI) |

A complete project glossary is provided at the following page:

<http://www.asterics2020.eu/about/glossary/>

VII. PROJECT SUMMARY

ASTERICS (Astronomy ESFRI & Research Infrastructure Cluster) aims to address the cross-cutting synergies and common challenges shared by the various Astronomy ESFRI facilities (SKA, CTA, KM3Net & E-ELT). It brings together for the first time, the astronomy, astrophysics and particle astrophysics communities, in addition to other related research infrastructures. The major objectives of ASTERICS are to support and accelerate the implementation of the ESFRI telescopes, to enhance their performance beyond the current state-of-the-art, and to see them interoperate as an integrated, multi-wavelength and multi-messenger facility. An important focal point is the management, processing and scientific exploitation of the huge datasets the ESFRI facilities will generate. ASTERICS will seek

solutions to these problems outside of the traditional channels by directly engaging and collaborating with industry and specialised SMEs. The various ESFRI pathfinders and precursors will present the perfect proving ground for new methodologies and prototype systems. In addition, ASTERICS will enable astronomers from across the member states to have broad access to the reduced data products of the ESFRI telescopes via a seamless interface to the Virtual Observatory framework. This will massively increase the scientific impact of the telescopes, and greatly encourage use (and re-use) of the data in new and novel ways, typically not foreseen in the original proposals. By demonstrating cross-facility synchronicity, and by harmonising various policy aspects, ASTERICS will realise a distributed and interoperable approach that ushers in a new multi-messenger era for astronomy. Through an active dissemination programme, including direct engagement with all relevant stakeholders, and via the development of citizen scientist mass participation experiments, ASTERICS has the ambition to be a flagship for the scientific, industrial and societal impact ESFRI projects can deliver.

VIII. EXECUTIVE SUMMARY

The First ASTERICS DADI ESFRI Forum and Training Event was the first networking event organised around the requirements of the DADI ESFRI projects. The aim was to start collaborations and to identify common topics among the DADI ESFRI and VO partners' technical staff. The introductory session allowed for familiarizing with the WP goals on data access, discovery and interoperability, while the subsequent discussion sessions allowed to identify the first needs and requirements of the various projects, with the goal of sharing efforts and best practices. This is a crucial point for a more efficient usage of the resources available to each project.

Since DADI is dedicated to data access, discovery and interoperability, the topics for discussion proved to be a mixture of data provider needs in data distribution, resource discovery, data policy enforcement, multi-dimensional resource consuming, and time domain data and alerts issuing. All of these topics were discussed both in terms of custom implementation practices and as VO recommendation for usability and improvement.

To shorten the out-of-office time for the Forum's participants, a one-day-and-a-half schedule was defined, letting breaks between sessions and a working dinner fill the need for direct contact between the participants. This proved useful to set up personal contacts to disseminate, e.g., the VO experience and lessons learnt among ESFRI projects' technical staff.

The Forum and Training event's objectives were reached allowing for a preliminary networking phase among ESFRI projects and VO partners, built upon the preceding Technology Forum in Strasbourg and preparing the next Technology Forum in Edinburgh. The meeting was dedicated to requirement gathering rather than actual technical collaboration, which will be more the topic for the Technology Forum.

Among the topics addressed, a great deal of discussion was devoted to data access on multi-dimensional data and the time domain, allowing for multi-messenger scientific research, and also to data policies enforcement, in terms of authentication and authorization for users. This latter topic involves privileged/priority access to scientific data before public release, but also to properly manage computational resources for the various projects. Another topic was data discovery and interoperability through the registry of resources.

The next meetings of interest to the DADI initiatives will include the 7th RDA Plenary meeting, to be held in Tokyo 1-3 March 2016, and the IVOA “Northern Spring” Interoperability meeting, which will take place in Cape Town in May 2016. Preparation of the IVOA meeting will be a discussion topic for the oncoming WP4 deliverable, the Second Technology Forum (D4.4, Edinburgh, 7-8 March 2016).

A second ESFRI Forum and Training Event is scheduled at M31 (end of 2017, D4.10) and should finalize ESFRI project requirements as they will be better defined and collected in the progress of the ASTERICS DADI work, thus moving from a preliminary gathering meeting (this Forum/Deliverable) to a real delivery of requirements for software and standards (next one). That event will also include more “training” aspects adapted to the ESFRI needs. A parallel view of the data provider requirements inclusive of also the non-ESFRI projects and European astrophysical data centres will be pursued by the *First European Data Provider Forum and Training Event* (D4.6), which will be held in Heidelberg on 15-16 June 2016.

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Content of Deliverable

1. Introduction

Technology Forums, successfully operated by European VO initiatives since the beginning of the VO experience, are devoted to building collaborations aimed at the development of software and architecture for the VO framework of standards and tools, following up their developments and sharing the results and lessons learnt. DADI continues them, widening the scope to ESFRI projects. *ESFRI Forum and Training Events*, a new experience, are meant to help developing the collaborations by identifying the core and common areas of interest of the ESFRI projects and their requirements, on the topics specific to WP4: data access, discovery and interoperability. The Events are also used to disseminate and discuss the pre-

existing expertise of the VO partners, with specific connection to the IVOA activities and standards. For the first meeting the focus was on gathering requirements from the ESFRI teams. At a later stage, these events will include more specifically training of the ESFRI teams on the implementation and usage of the VO framework in their domains of interest, once those will be properly identified.

ESFRI Forums are networking and training events that fall within Task 4.1 of DADI, activity co-led by the INAF-OATs and UHEI partners. The requirements gathered at these meetings should pass on to Task 4.3 to improve the VO framework. The networking activity should lead to actual technical support during DADI Workshops and during dedicated visits to projects sites. All this effort is meant to facilitate the uptake of the VO standards by the ESFRI projects.

The ESFRI Forum programme was built around a list of topics defined during the Technology Forum in Strasbourg, which was refined by asking the ESFRIs to provide input on the topics before the meeting: their requirements were at the core of the ESFRI Forum. The topics identified to be discussed in first priority in Strasbourg were proposed in the First Announcement: multidimensional data and time domain interoperability and data access, authentication and authorization mechanisms and practices, NO-SQL technologies, software sharing and collaborative platforms. The preliminary discussions focused the meeting on four subjects which had already been identified during the Technology Forum but were not all in the initial list: multi-dimensional data and time domain, authorization and authentication, resource registry. Topical experts were invited to lead the discussions. Contributed talks were solicited to present the challenges each partner project is facing, both scientifically and from the information technology point of view. The results of this forum will lead into the next Technology Forum. They are also used to discuss specific support with the ESFRIs.

ASTERICS Deliverable 4.3 “First ESFRI Forum and Training Event” was organized by INAF-OATs in the Villa Bazzoni building of the INAF-Astronomical Observatory of Trieste on 3 – 4 December 2015. Participation in the event is described in Section 2 of this document, Section 3 is devoted to detailing the meeting programme while Section 4 describes the meeting development and outcome and Section 5 briefly describes the next steps.

The meeting web site

<https://www.asterics2020.eu/dokuwiki/doku.php?id=open:wp4:wp4esfriforum1>

displays the agenda with the viewgraphs presented during the meeting, notes taken during the discussion of the topics and the list of participants.

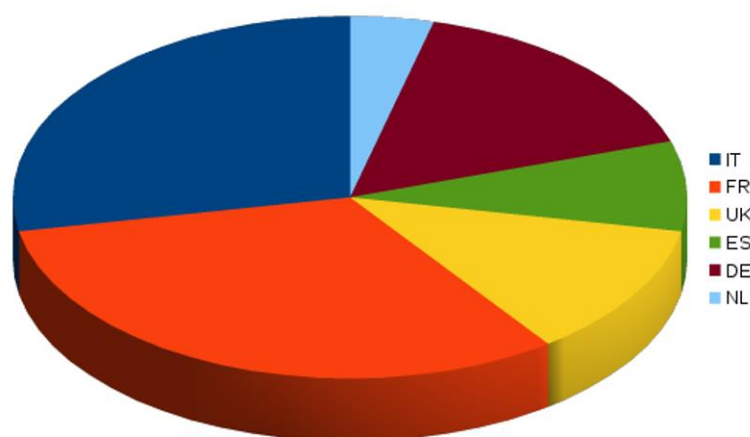
2. Participants

The forum gathered 25 participants representing INAF, CNRS/CDS, UEDIN and Bristol University, INTA, UHEI as well as the CTA, EGO, LOFAR/SKA and KM3NeT projects, with participants respectively from CNRS/LUTH, INFN, ASTRON and CNRS/CPM, and the ESO associate partner. The ESA associate partner couldn't attend the event due to overlapping meeting duties. All the teams involved in DADI were thus represented, for the first time in a DADI event.

Two points are worth mentioning on the participation and contribution to the meeting. One is the effort made by ESFRI projects to identify specific technical people to bring useful contribution and requirements to the event. The other is the participation of topic specialists to lead the discussion on the themes which had emerged in the Strasbourg's Tech Forum, as well as during the event's programme preparation. Those specialists were both people involved in DADI and external people invited specifically, including staff involved in ASTERICS WP3.

The majority of the attendees have technical profiles, as required by the meeting goal, but with the presence of scientist and people having also a scientific background in the ratio of about 4 to 1, thus ensuring that the scientific requirements were fully taken into account. Figure 1 reports the pie chart of the countries of origin (in terms of affiliation) of the attendees.

Figure 1: Country of affiliation of the participants



3. Meeting programme

The ESFRI Forum and Training Event programme (see Table 1 below) was as explained initially drafted out of the topics identified during the Technology Forum in Strasbourg. Subsequently the projects were asked to propose their topics of interest. The programme was then refined given the various contributions submitted by the attendees after the Event's announcement.

The schedule was mainly organised as a set of discussions driven by introductory talks by project members or field experts. Exceptions to this scenario were the introductory session and the VO Overview one. The introductory talks gave an overview of the DADI work package and described the goals of the Event itself, which were summarized as follows by F. Pasian (INAF):

Gather needs that shall evolve into requirements the VO development teams can then implement within existing standards and tools or as new ones.

The VO Overview session aimed at providing a means to understand which part of the VO architecture the requirements would help to improve and develop.

The blocks of discussion were: Multi-dimensional data access, Authentication & Authorization, Time Domain data access, and astrophysical VO resource registering for interoperability. Details about the outcome of these discussions are reported in the next Section.

To allow a better travel schedule to the attendees, the Event was organized as a one full day and a half meeting. However, for those who wished to prolong the discussion, another half day was available. During this second afternoon some more discussion took place, mainly contact for dedicated visits, but also a VO internal discussion about the SODA protocol under development.

Table 1: Meeting agenda

| <i>Time</i> | <i>Title</i> | <i>Speaker</i> |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Day 1 - Thursday December 3 | | |
| 09:00-09:45 | Introduction | |
| 09:00-09:15 | Welcome & Logistics | M. Molinaro |
| 09:15-09:30 | ASTERICS DADI Overview | F. Genova |
| 09:30-09:45 | ESFRI Forum & Training Event 2015: Goals | F. Pasian |
| 09:45-11:15 | Projects Contribution | |
| 09:45-10:20 | Gravitational waves and the VO | G. Greco & M. Razzano |
| 10:20-11:00 | ESO Phase 3 operations and the 3D data standard | J. Retzlaff |
| 11:00-11:15 | LOFAR data products and management: towards the SKA | R. Pizzo |
| 11:15-11:45 | break | |
| 11:45-12:45 | VO Overview | |
| 11:45-12:00 | Science Priority Areas - capturing use cases and requirements | M. Allen |
| 12:00-12:30 | Current status of VO solutions for discovering, pre-visualising, describing and accessing multidimensional and time domain massive data | F. Bonnarel |
| 12:30-12:45 | DataLink Overview (TBC) | M. Demleitner |
| 12:45-13:45 | break | |
| 13:45-15:15 | Multi-D Data Access | |
| 13:45-15:15 | Discussion fired up by previous sessions | ALL (chair M. Allen) |
| 15:15-15:45 | break | |
| 15:45-17:00 | VO Registry | |
| 15:45-16:15 | Registry overview | M. Demleitner |
| 16:15-17:00 | Discussion | ALL (chair M. Demleitner) |
| 19:30 | Working Dinner | |
| Day 2 - Friday December 4 | | |
| 09:00-10:30 | Authentication & Authorization | |
| 09:00-09:15 | A&A overview and IVOA perspective | G. Taffoni |
| 09:15-09:30 | A&A prototype for the SKA (WP3 presentation) | C. Knapic |
| 09:30-10:30 | Discussion | ALL (chair G. Taffoni) |
| 10:30-11:00 | break | |
| 11:00-12:30 | Time Domain Data Access | |
| 11:00-11:30 | PanSTARRS and the Edinburgh LSST data centre | A. Lawrence |
| 11:30-11:50 | The Antares/KM3net Neutrino Telescope projects and real time alerts | J. Brunner |
| 11:50-12:30 | Discussion | ALL (chair A. Lawrence) |
| 12:30-13:30 | break | |
| 13:30-15:00 | Final discussion / Splinter sessions | |
| 15:00-15:30 | close | |
| 15:30-17:00 | rooms available to continue discussion | |

4. Proceedings & Analysis

As explained in Section 2, the topics tackled during the ESFRI Forum had all been identified during Strasbourg Technology Forum, but the ESFRIs had better defined their more immediate subjects of interest. The questions linked to NO-SQL and collaboration platforms will be kept in mind for eventual discussion at a later stage.

Contributed talks presenting the challenges each partner project is facing, both scientifically and from the information technology point of view, lead to lively discussions by the other ESFRI projects and the VO teams. The topics dealt with during the Forum were clearly of common interest for several or all the ESFRIs.

Priority areas for the VO framework development were confirmed: both multi-dimensional and time domain data access were largely discussed.

Data policy management, in terms of user authentication and authorization, has been clearly raised to a higher priority than the one previously granted, and mainly with relation to VO (and generic) client side application's credential management.

The registry session was a proficient one to disseminate how data discovery and resource interoperation is taken care of inside IVOA and the connection between data and user/service interfaces.

Figure 2: View of the meeting room



2:

Figure 3: Another view of the meeting room

More into details, the introductory talks highlighted the need for requirements to evolve into existing and new standards and the need to put in place joint efforts in software and framework development. This should be an iterative process, nonetheless convergence and delivery of results has to be fulfilled.

Project presentations showed that using the VO framework is something that projects aim at, but also that they already use it in their data access solutions. E.g. gravitational waves projects already use VOEvent for alerts, HEALPIX (largely adopted among VO providers) for localization, and Aladin as image visualizer. More generally, Aladin and TOPCAT are well known applications, and communication standards like SAMP are also in use. The ESO talk focused on their Phase 3 standard, which is inspired by other existing ones and has clear connection to VO recommendations. Time series standardization was also a point for discussion.

The discussion on Multi-dimensional data access raised questions on which dimensions one should consider and how to consider event collections in a multi-dimensional fashion (sparse cubes, for instance). Discovery methods (target based, positional, time filtering, sparse coverage, etc.) and provenance are considered important, the latter requiring probably further developments besides the current standards. Formats were also brought up in this discussion, WCS and FITS are good ones, but question was raised whether they are good enough. Data interoperability is seen as an aid both in preparing observations and in analysing the data. DADI has to assess whether existing tools are sufficiently connected.

The Authentication&Authorization session discussion, starting out of an overview of the topic and a use case provided by an SKA prototype developed in ASTERICS WP3, focused on identifying clearly the steps involved in the data policy and resource management scenario.

Identifying the user (authentication) seems a simple problem, pointing towards federated identity providers to ease user's experience. Authorization, on the other hand, dealing with granting permissions and access to data and computational resources, is considered more complex and, given each data provider should take care at managing authorizations properly, a common profile or standard seems difficult to reach. However enabling authentication and authorization on the existing client applications, and standards for clients, seems to be a pressing issue.

The Time Domain discussion, introduced by presentations on Pan-STARRS, KM3NeT and (the day before) gravitational waves, showed that VOEvent has already an uptake. Time alerts are of great importance, especially in follow-up observations. Time Series was another point, probably seen as a use case for a simple access scenario to develop light curves, at least.

5. Conclusion and next steps

The First ESFRI Forum and Training Event was a successful meeting to continue to bring together DADI partners' staff and start gathering requirements to bring forward to Technology Forums and technological developments performed in Task 4.3. It continued networking both the ESFRI based and VO based expertise in data access, discovery and interoperability, the first time all DADI teams were present.

The ESFRI Forum and Training Event was the first occasion to identify topics of interest for DADI and other ASTERICS Work Packages. Identification and Authorisation were discussed with staff involved in WP3 invited to attend the meeting. It is worth noting here that INAF is explicitly in charge of WP3/WP4 liaison in WP4 since it was expected that common topics would emerge. In addition, the time domain and alerts are also tackled by WP5.

Among the follow-up activities, the two last ones involving other ASTERICS Work Packages:

- CDS and EGO/VIRGO (INFN) collaborate on Aladin customization.
- ANTARES data was included in the German Astronomical Virtual Observatory service through collaboration between CNRS/LPPM and UHEI, and are thus available in the VO.
- CTA organised a meeting on Authentication & Authorisation on 11 December 2015, with representatives from SKA, IVOA and ASTERICS WP3.
- F. Genova and A. Lawrence contacted A. Szumoru (WP5 lead) to establish a contact on alerts and eventual requirements on VOEvent. WP5 input received on 17 February 2016 after an internal discussion is that for the moment VOEvent fits WP5 needs on alerts. WP4 will be informed if new requirements are identified.

The project requirements for the VO framework and software libraries and applications gathered during this Event have been complemented by those gathered during the subsequent First VO School (ESAC, Madrid, 15-17 December 2015). This was the immediate step after the ESFRI Forum and Training Event.

In 2016 one Technology Forum will take place, working on the topics arisen from Event and the previous Technology Forum (Strasbourg). This Second DADI Technology Forum will be held in Edinburgh on March 7-8. It will build on the ESFRI Forum outcome. The subsequent one scheduled in April 2017 will take advantage also of the Data Provider Forum of June 2016.

Outside the events organised directly by ASTERICS, the first half of 2016 will see an RDA Plenary in Tokyo in March and an IVOA Interoperability Meeting held in Cape Town (South Africa) in May. The IVOA event will be prepared also by the Edinburgh's Technology Forum. One key component of this Interoperability meeting will be the "Focus Sessions" which will be organised in support to the IVOA priorities, which are also ASTERICS's. The sessions are being designed to attract the participation of several large projects including the ASTERICS partners, and their preparation is led by M. Allen (ASTERICS/CDS). The last element of the Data Access Layer "caravan" for multi-dimensional data, SODA, is discussed in the IVOA framework and will be a major topic for the Cape Town meeting.

As for the ESFRI networking and training activity inside DADI, contacts need to be kept among the projects to refine requirements and continue the data access, discovery and interoperability development improvement. This is also true for the interfacing tasks between the various work packages.

In addition to the Workshops, DADI will also organise specific activities in direct support to the ESFRIs. The ESFRI Forum concluded the first run of Workshops, which allowed the ESFRIs to have a complete view of the VO framework status and of the VO teams' expertise and to identify subjects of interest. DADI lead is currently (February 2016) discussing with the ESFRIs to build a programme of support activities.