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Repository of WP4 Products (final delivery)

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Abstract

The Repository of WP4 Products lists the products of ASTERICS Work Package Data Access, Delivery and Interoperability (DADI). This deliverable D4.15 is the final version of the Repository, produced at the end of the ASTERICS project. The Repository was created at the

project mid-term in April 2017 (D4.8), and has been maintained during the second half of the project.

I. COPYRIGHT NOTICE

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II. DELIVERY SLIP

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Approved by	AMST		1 May 2019

III. DOCUMENT LOG

Issue	Date	Comment	Author/Partner
1	25 April 2019	Initial version	F. Genova/CNRS-CDS
2			

IV. APPLICATION 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
ASTERICS	Astronomy ESFRI & Research Infrastructure Cluster
CDS	Centre de Données astronomiques de Strasbourg
CNRS	Centre National de la Recherche Scientifique
D	Deliverable
DADI	Data Access, Discovery and Interoperability (ASTERICS WP4)
ESFRI	European Strategic Forum for Research Infrastructures
GAVO	German Astrophysical Virtual Observatory
GLADE	Galaxy List for the Advanced Detector Era
HiPS	Hierarchical Progressive Survey
IVOA	International Virtual Observatory

Km3Net	Cubic Kilometre Neutrino Telescope
MOC	Multi-Order coverage
pgsphere	Provides spherical data types, functions, and operators for PostgreSQL
PostgreSQL	A relational database management system
UCD	Unified Content Descriptor
VizieR	CDS' database of astronomical catalogues and large surveys
VO	Virtual Observatory
WP	Work Package

A complete project glossary is provided at the following page:

<http://www.asterics2020.eu/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 Repository of WP4 Products lists products relevant to the three DADI strands of work: support to scientists in their usage of the Virtual Observatory (VO), support to the ESFRIs and pathfinders in their uptake of the VO, and technological activities to update the VO framework of standards and tools. These products are organised into several sections: scientific tutorials, VO-enabled tools, VO standards, data publication tools, other products of DADI work, plus relevant presentations presented by European participants in the Interoperability meetings of the International Virtual Observatory Alliance, and the presentations contributed by DADI to the ASTERICS final event, “The New Era of Multi-Messenger Astrophysics”, which was held in Groningen 26-29 March 2019. The initial version of the Repository delivered at ASTERICS mid-term, D4.8, has been maintained until the end of the project by adding new products and updating the provided information when needed, to produce this final version, which is the last deliverable of ASTERICS WP4, at the end of the project.

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1. Introduction

The Data Access, Discovery and Interoperability (DADI) Work Package of the ASTERICS project maintains a Repository of its "products", with a first delivery at the project mid-term (April 2017, D4.8). The Repository has then been regularly maintained with a final delivery at the end of the project, described in this deliverable. DADI has three strands of work:

- Support to ESFRIs and pathfinders in their uptake of the Virtual Observatory framework, including workshops involving the wider European data provider community
- Support to the scientific community in the usage of VO-enabled data and tools
- Technological activities to update the VO framework to optimize it to include ESFRI and pathfinder data and taking into account feedback from the ESFRIs and pathfinders and science users

The Repository keeps track of the “products” linked to all DADI activities. These “products” are described in Section 2.

2. Repository content

DADI has several kind of "products". Some have been developed totally or partially with DADI support. More generally, the Repository is aimed at providing useful information on DADI activity to stakeholders, so we included in addition some products which are also key components of the project with respect to the ESFRI facility and science needs.

The products in the Repository can be broadly classified in several categories:

- Scientific tutorials describing real use cases of VO-enabled data and tools, prepared by the DADI team and updated in particular in the framework of the annual DADI Schools
- VO-enabled tools in support to the ESFRI facility and science needs identified by DADI
- VO standards in support to the ESFRI needs identified by the project
- Tools in support to data publishing in the VO

- Other results of collaborative work in DADI

Two kinds of presentations in meetings are also listed, with links to the slides:

- Presentations of European participants in the Interoperability meetings organised twice a year by the International Virtual Observatory Alliance IVOA relevant to DADI
- DADI team members' contributions to the final ASTERICS event, [The New Era of Multi-Messenger Astrophysics](#), is also one of the final products of DADI.

DADI also organised many workshops which are direct products of its activities. The Repository provides a link to DADI wiki site, which lists the workshops, with a link to the meeting agenda and all the material presented:

https://www.asterics2020.eu/dokuwiki/doku.php?id=open:wp4:start#events_organised_by_asterics_wp4.

Some of the workshops were formal deliverables included in the project initial description of work, others were organised at the request of the ESFRI/pathfinder partners on topics of specific interest to them, with in particular a series of Provenance Workshops, or co-organised with other ASTERICS Work Packages.

Figure 1 displays the initial version of the Repository.

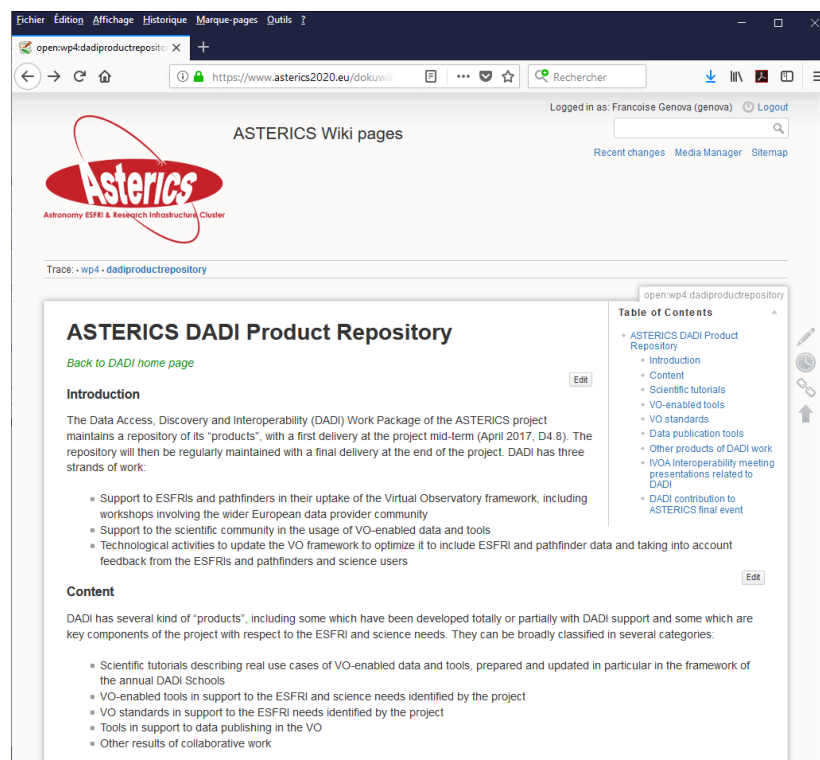


Figure 1: The Repository of WP4 products

2.1. Scientific tutorials

The scientific tutorials prepared for the DADI Schools are provided on a sustainable web page from the Euro-VO web site <http://www.euro-vo.org/?q=science/scientific-tutorials>. The Repository lists their last version to date, with the list of updates if any, as well as additional tutorials prepared for different occasions by the DADI teams.

For each tutorial, the title, a link to the tutorial, a short description and the date of the current version, of the updates, with information about the Schools during which it was used if relevant, are provided.

2.2. VO-enabled tools

The Repository lists the tools which were used in the scientific tutorials. A more complete list of VO-enabled applications can be found on the IVOA site at <http://www.ivoa.net/astronomers/applications.html>. The list shown in the Repository is wider than the list of tools developed by DADI partners, following a discussion at the ASTERICS General Assembly which stated that the Repository should be an inclusive resource for the stakeholders. The tools directly relevant to DADI are tagged with * in the list. Aladin, GWSky, SPLAT-VO, STILTS, TOPCAT, and VOSA, made significant progress during the course of ASTERICS. SIMBAD and VizieR are continuously maintained and upgraded as CDS services.

For each tool, the name, a link to the web site, a short description and the producer are provided.

2.3. VO standards

The VO standards and their history can be found in the IVOA Documents page: <http://www.ivoa.net/documents/>. The Repository provides a short description of these standards of particular interest for DADI. Some tackle DADI initial priorities, multi-dimensional data and time domain, and some deal with topics which appeared as priorities for the ESFRIs, in particular HiPS/MOC, Provenance and Single Sign On. Taking into account specific characteristics of facilities can lead to update the controlled vocabulary for quantities, the list of Unified Content Descriptors (UCDs). This is why the relevant standards are included in the list, following a discussion with large projects during the May 2017 IVOA meeting.

For each standard, their topic, the IVOA “category” (i.e. the IVOA Working Group in charge), the standard name, a link, a short description, and the current IVOA status, are provided.

2.4. Data publication tools

The list includes the data publication tools demonstrated during the Training sessions of DADI Workshops.

For each resource or set of resources, the name, a link, a short description, and the name of the producer, are provided.

2.5. Other products of DADI work

This category contains other data products, which cannot be classified in one of the previous categories. It includes for instance the maintenance of pgsphere, an extension of the PostgreSQL database system widely used by astronomical data providers, the publication of ANTARES data in the VO by GAVO, which resulted from a discussion at the First ESFRI Forum and Training Event¹, and the inclusion of the GLADE catalogue in Vizier, which was initiated at the Gravitational Wave workshop².

2.6. Presentations related to DADI in the IVOA Interoperability meetings

The first IVOA meeting during ASTERICS was held just after the beginning of the project, too early to report on “DADI products”. DADI has contributed significantly to all the other IVOA meetings held after that first one

- Sydney IVOA Interoperability meeting³ - 29 October - 1 November 2015
- Cape Town IVOA Interoperability meeting⁴ - 8-13 May 2016
- Trieste IVOA Interoperability meeting⁵ - 21-23 October 2016
- Shanghai IVOA Interoperability meeting⁶ - 14-19 May 2017
- Santiago IVOA Interoperability meeting⁷ - 26-29 October 2017
- Victoria IVOA Interoperability meeting⁸ - 27 May-1 June 2018
- College Park IVOA Interoperability meeting⁹ - 8-10 November 2018

¹ <https://www.asterics2020.eu/dokuwiki/doku.php?id=open:wp4:wp4esfriforum1>

² <https://www.asterics2020.eu/dokuwiki/doku.php?id=open:wp4:wp4gwstrasbourg2016>

³ <http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpOct2015>

⁴ <http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpMay2016>

⁵ <http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpOct2016>

⁶ <http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpMay2017>

⁷ <http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpOct2017>

⁸ <http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpMay2018>

⁹ <http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpOct2018>

The list of talks presented at each of these meetings by participants working in European laboratories on topics discussed during DADI meetings is provided from the Repository.

2.7. Presentations contributed by DADI to the ASTERICS final event

DADI contributions to the ASTERICS final event, [The New Era of Multi-Messenger Astrophysics](#), which was held in Groningen 26-29 March 2019, are an excellent illustration of DADI results, impact and legacy. They are listed with the names of the authors and a link to the slides/poster.