WP4 DADI report

AGA 2, 11 February 2016

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WP4 Report, ASTERICS AGA 2, 11 February 2016

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1. ASTERICS Work Package 4 Data Access, Discovery and Interoperability (DADI) and its foreseen schedule for May 2015 – January 2016

As described in the Grant Agreement, DADI objectives are to make the ESFRI and pathfinder project data available for discovery and usage by the whole astronomical community, interoperable in a homogeneous international framework, and accessible with a set of common tools. More specifically:

- Train and support ESFRI project staff in the usage and implementation of the Virtual Observatory (VO) framework and tools, and make them active participants in the development of the VO framework definition and updates, thus contributing to relevance and sustainability of the framework (Task 4.1, led by INAF and UHEI).
- Train and support the wider astronomical community in scientific use of the framework, in particular for pathfinder data, and gather their requirements and feedback (Task 4.2, led by CNRS/UMR 7550-CDS and INTA).
- Adapt the VO framework and tools to the ESFRI project needs, and make sure European astronomers remain lead actors in the IVOA, influencing it in the interest of the European infrastructures and the European scientific community (Task 4.3, led by CNRS/UMR 7550 and UEDIN).

DADI gathers VO specialists from CNRS/UMR 7550/UNISTRA (CDS, WP lead), INAF, INTA, UEDIN and UHEI and representatives of the ESFRI and ESFRI-like projects and their pathfinders, CTA (CNRS/LUTH/OBSPARIS), EGO/VIRGO/ET (CNRS/APC), KM3Net (CNRS/CPPM) and SKA (ASTRON). Each task is led by two partners as shown in the list above and all partners are participating in all activities.

Most DADI deliverables are **Workshops**, including all the deliverables scheduled for the first eighteen months of the project. The aim is to hold the meetings in the foreseen schedule as far as possible, and then several weeks are needed to prepare the "text" deliverable submitted to the European Commission. This explains why two dates appear in the milestone table.

Each WP4 task had a deliverable during the first nine months of DADI. The May 2015 – January 2016 deliverable schedule was the following:

Deliverable Number	Deliverable Title	Lead Beneficiary	Due Date	Actual Date and Location
D4.1	First ASTERICS DADI Technology Forum	CNRS/UMR7550 (Task 4.3)	September 2015	Meeting held 17-18 September 2016 in Strasbourg (France) D4.1 submitted 3 November 2015
D4.2	First ASTERICS European School	INTA (Task 4.2)	November 2015	Meeting held 15-17 December 2015 in Madrid (Spain) D4.2 in progress
D4.3	First ESFRI Forum & Training Event	INAF (Task 4.1)	November 2015	Meeting held 3-4 December 2015 in Trieste (Italy) D4.3 in progress

The **IVOA Interoperability meetings** are DADI Milestones. Two were held during the period, the first one in Sesto (Italy) just after the beginning of the project (14-19 May 2015, http://www.sexten-cfa.eu/en/conferences/details/54-ivoa-interoperability-workshop--spring-2015.html) and the second one in Sydney, Australia (29 October- 1 November 2015, http://www.caastro.org/international-virtual-observatory-alliance-ivoa-meeting). The "Northern Fall" IVOA meeting is attached to the **Annual Astronomy Data Analysis and Software System (ADASS) Conference**, which gathers astronomical data providers from all around the world, in particular the large ground- and space based projects. It is thus important that DADI staff also participate in the ADASS conference.

Task 4.3 includes liaison with the Research Data Alliance, and participation in the six-monthly **RDA Plenary meetings** is foreseen. The Sixth RDA Plenary meeting (https://rd-alliance.org/plenary-meetings/rda-sixth-plenary-meeting.html) was held in Paris, France, during the reference period.

All these meetings plus some of the meetings which will be held during the coming period, and some of their relationship, are shown in the Figure below. The activities performed during the first nine months of the project will be described in Section 2. Activities foreseen

during the following period (February – October 2016) will be discussed in the Section 3 of this report.
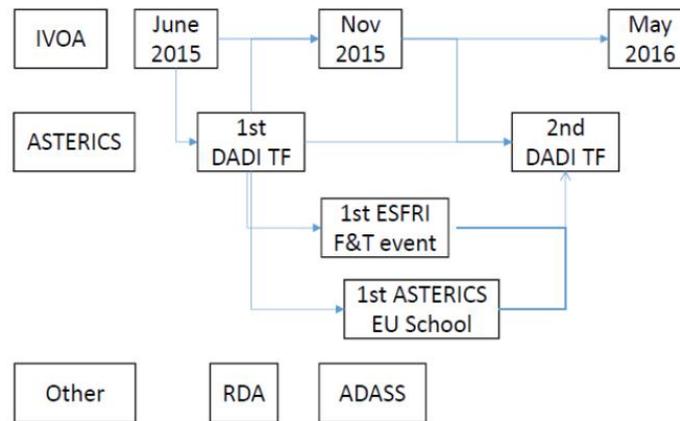
Some of DADI participants had been working together for a long time to build the Virtual Observatory framework and to organize European participation in the VO development, but others are new to the topic. A relatively heavy activity programme had thus been foreseen for the first months of the project, to introduce newcomers to the topic, to share information about the partners' activities, and to begin to build a DADI community. Participation in the relevant external event, the IVOA, ADASS and RDA meetings, was also scheduled. Another reason to begin the activities as soon as possible is that defining standards and agreeing on them is a long term process, and bringing the ESFRI and pathfinder requirements had to begin as early as possible in the project. The aims have been fulfilled. The three deliverables have been successful. DADI already has a sizeable impact on the IVOA. The partners collaborate on technical developments and topics of common interest have been identified. As explained in section 2.9, the work programme for 2016 will be slightly adjusted to be less heavy during the second part of the year.

2. DADI activities, May 2015 – January 2016

The activities will be presented in chronological order, including the deliverables, milestones, ADASS and RDA meetings.

2.1 IVOA meeting, 14-19 May 2015, Sesto (Italy)(ASTERICS Milestone 2)

As explained, this meeting was held at the very beginning of the project, before ASTERICS kick-off. The meeting web site is here: http://www.sexten-cfa.eu/en/conferences/details/54-ivoa-interoperability-workshop--spring-2015.html. Since it took place at a very early stage, only a short report on this meeting is given here to set the scene. The IVOA activities most relevant to ASTERICS were discussed later in the two first DADI Workshops, the Technology Forum (D2.1) and the ESFRI forum and Training Event

(D2.3). They will be addressed in the sections concerning these Workshops below. ASTERICS relevant activities during the Sydney IVOA meeting will be also described in details below.

ASTERICS was discussed during the first IVOA Executive Board meeting on May 14th. The current IVOA priorities, multi-dimensional data and time domain, fit very well with the initial priorities of ASTERICS. Technical work in these domains was pursued, in particular by staff engaged in ASTERICS. The process of integrating big projects' requirements in the VO development was discussed at the meeting. IVOA partners are encouraging collaboration with LSST and with the ASTERICS ESFRI & pathfinder projects. The role of the IVOA Committee for Science Priorities (CSP), chaired by M. Allen (ASTERICS, CDS), was updated as part of defining the processes to best engage with these projects. ASTERICS of course was expected to play a major role, which is confirmed by the preparation of the May 2016 IVOA meeting (Milestone 7, Section 3).

2.2 RDA Sixth Plenary meeting, 23-25 September 2015, Paris (France)

CDS, ESO and INAF attended the DataCite meeting organized before the RDA Plenary. The implementation of DOIs for astronomy is currently a hot topic. It has been tackled at the Sydney IVOA Interoperability meeting (see below).

Staff from CDS (including WP4 lead), CTA, EGO, INAF, UHEI participated in the RDA Plenary meeting (https://rd-alliance.org/plenary-meetings/rda-sixth-plenary-meeting.html). IVOA Provenance activities (see below), involving CDS, CTA and GAVO, were presented at the Research Data Provenance Interest Group meeting (https://rd-alliance.org/ig-research-data-provenance-p6-meeting-session.html) and very well received.

2.3 First ASTERICS DADI Technology Forum, 17-18 September 2015, Strasbourg (France) (D4.1)

The First ASTERICS DADI Technology Forum was held successfully in Strasbourg on 17-18 September 2015. The meeting gathered 34 participants. All WP4 partners except KM3Net were represented, i.e. representatives from ASTRON (LOFAR), CNRS/CDS, CNRS/LUTH (CTA), CNRS/APC (VIRGO/EGO), INAF, INTA, UEDIN and UHEI attended the meeting. The UK partner was successful in bringing relevant experts from several Universities in addition to Edinburgh (Bristol, Glasgow, Manchester). KM3Net was unable to attend because the Technology Forum was held at the same time as a major conference in the domain, the so-called VLVvT[1] (Very Large Volume Telescope) 2015 Workshop, and they have not yet hired staff dedicated to WP4. ASTERICS Project Manager presented the project at the VLVvT Workshop. For logistical reasons it was not possible to organise the Technology Forum at another time. ESO, which is associated to ASTERICS, and especially to WP4 for E-ELT, and ESA, were also represented. The current IVOA Chairperson, Christophe Arviset from ESA, gave one of the introductory talks, on the IVOA architecture.

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[1] http://www.phys.uniroma1.it/fisica/archivionotizie/vlvvt-2015-workshop

The meeting program and participants, as well as the viewgraphs presented, can be found on the meeting page https://www.astron.nl/asterics/doku.php?id=open:wp4:wp4techforum1. It was the first occasion to gather ASTERICS WP4 team. The meeting was organised to allow sharing of information about the ASTERICS project and ASTERICS WP4, about the partners' expertise, and about the Virtual Observatory framework and work currently on-going in the partners' teams. The "hack-a-thon" sessions allowed participants to hold informal discussions on points of common interest.

The meeting fulfilled its objectives, and was an efficient first step to build ASTERICS WP4 community. A fist list of topics of interest for the ESFRIs and pathfinders was established, some of them already tackled in collaboration with VO teams, i.e. Provenance. The strategy with respect to the next IVOA Interoperability meeting was also discussed. The status of the IVOA Data Access layer (DAL) standards which are being prepared to support better multi-dimensional data in the VO, which is one of the current priorities of the IVOA as well as one of the initial strands of work of ASTERICS WP4, was assessed. The strategy to discuss the Hierarchical Progressive Survey (HiPS) in the IVOA framework was also debated.

The D4.1 deliverable report was prepared by CNRS/CDS and UEDIN, and then following a review by all of the WP4 partners and by the project, it was submitted to the EC on 3 November 2015. As explained the DADI Technology Forum event was designed to enable discussions between VO and ESFRI (and pathfinder) partners about the development and implementation of the Virtual Observatory framework. The delivered report provides a description of the event including the details of the program and an analysis of the topics that were presented and discussed. The report also identifies the next steps to be taken, and a number of these have now occurred.

The DADI Technology Forum prepared the European input for the IVOA Interoperability meeting held in Sydney, Australia (30 October-1 November 2015). The forum also served to coordinate contributions by DADI partners to the ADASS XXVth conference that was also held in Sydney (25-29 October 2015).
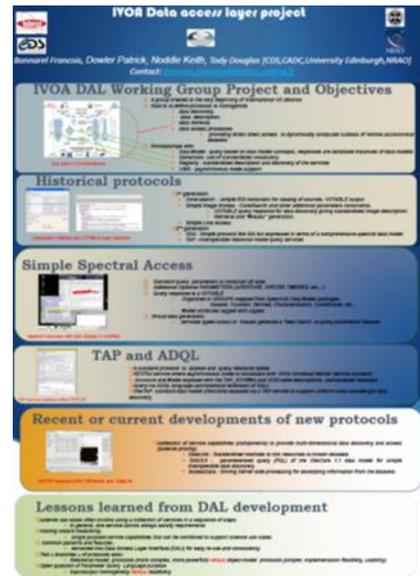
2.4. ADASS XXVth meeting, 25-29 November, Sydney (Australia)

Staff from CDS (including WP4 lead), CTA, LOFAR, INAF, INTA, UHEI, and of the UK VO team (as well as from Euclid), participated actively in the meeting, as well as ESO and ESA.

ADASS conferences are the place to be to discuss data from large projects in astronomy with the data providers. ADASS 2015 (http://www.caastro.org/event/2015-adass) was the XXVth of the conference series. Fabio Pasian (ASTERICS GA Chair, WP3, WP4) presented a talk on behalf of ASTERICS at the Conference, and Christophe Arviset one about the IVOA (*The VO: a powerful tool for global astronomy*). It can be noted that the VO was ubiquitous in the talks and posters presented by space and ground-based projects, and was very positively mentioned in the keynote address presented by Nobel Prize winner Brian Schmidt "Big Data and Big Astronomy".

An ASTERICS WP4 talk was presented by Allen (CDS) et al., "An Hierarchical Approach to Big Data". Two ASTERICS WP4 posters, shown below, were displayed: "IVOA Provenance data model. Hints from the CTA provenance prototype" by Sanguillon et al. (CTA and CDS), and "IVOA Data Access Layer project" by Bonnarel (CDS), Dowler, Noddle (UEDIN), Tody.

It is important to note that HiPS (the subject of Allen's talk), Provenance and the DAL standards were among the key topics discussed during the First Technology Forum.
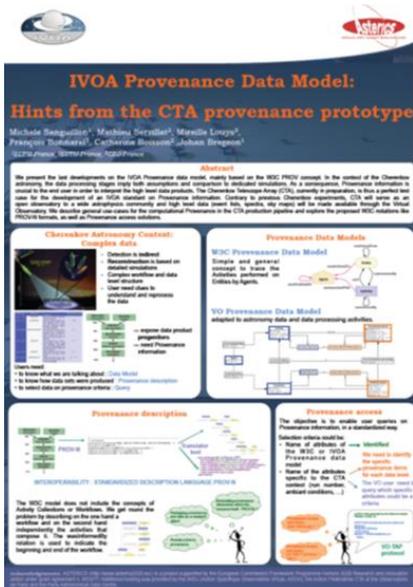
2.5 IVOA Interoperability meeting, 30 October – 1 November 2015, Sydney (Australia) (ASTERICS Milestone 5)

The programme of the IVOA meeting can be found here: http://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpOct2015. Staff from CDS (including WP4 lead), CTA, INAF, INTA, UHEI, and of the UK VO team (as well as from Euclid), as well as from ESA, participated actively in the meeting. The talks presented by participants from Europe are listed in Annex 1 as a means of verification of MS5, showing the European and DADI's influence in the IVOA.

Here we identify a number of the highlights on topics of particular interest for DADI that were addressed during the meeting, and which had been discussed during the First Technology Forum:

- Applications Working Group (WG): HiPS was a major topic of discussion at the Interoperability meeting, as it was at the ADASS conference. As prepared during the Strasbourg DADI Technology Forum, consensus was reached within IVOA to "promote" the HiPS Note to a Working Draft (WD) as a step towards a future IVOA Recommendation (schedule: WD for Cape Town Interoperability meeting)

- Data Access Layer WG: Multi-dimensional science is an IVOA priority, with a "caravan" of standards being developed to deal with it. This is also one of DADI top priorities. DataLink has been an IVOA Recommendation since 17 June 2015; SIAPv2.0 was being finalized at the time of the Interoperability meeting (the IVOA Executive Committee endorsed it as an IVOA Recommendation on 24 December 2015); the next Working Draft of SODA (Server-Side Operations for Data Access, previously called AccessData) was foreseen for soon after the Interoperability meeting and is currently being discussed. The VOEvent Transport Protocol, also of interest for ASTERICS, is nearly ready for the Request for Comment process, but we note that there is a lack of resources in this domain.
- Data Model WG: Discussion of Provenance
- Grid & Web Service WG: Half a session was dedicated to the presentation and discussion of the various aspects of Authorisation and Authentication within the VO framework, building on the discussion held during the ASTERICS DADI Technology Forum and paving the way for the further discussions held during the ASTERICS DADI ESFRI Forum and Training Event.
- Registry WG: Work on pgsphere (UHEI); HiPS registry extension
- Data Curation and Preservation Interest Group (IG): The status of the RDA and the IVOA/RDA interaction was discussed.
- Digital Object Indentifiers (DOIs) as discussed during the Technology Forum Hack-a-Thon session were a hot topic of the meeting (Data Curation and Preservation and Registry sessions). It was concluded that data services and archives should be in charge of requesting DOIs for their data holdings. On the other hand, an assessment of a better alignment of the IVOA VOResource metadata schema with the DataCite one should be performed.

One key point is the definition of IVOA scientific priorities. As explained the current IVOA priority areas of "multi-dimensional data" and "time domain" are currently well aligned with the ASTERICS' priorities.

2.6 First ESFRI Forum and Training Event, 3-4 December 2015, Trieste (Italy) (D4.3)

The First DADI ESFRI Forum and Training Event was successfully held at the Osservatorio Astronomico di Trieste on 3-4 December 2015. The meeting web page is here: https://www.astron.nl/asterics/doku.php?id=open:wp4:wp4esfriforum1. It contains the list of the 25 participants and their affiliations, as well as the programme and a link to the viewgraphs of the talks and to the summary of the discussions.

The aim of this first "Forum & Training Event" was to gather the requirements of the ESFRIs and pathfinders with respect to the Virtual Observatory framework. The programme topics were identified during the First Technology Forum and the projects were asked to provide comments and contributions. All of the VO partners and DADI projects were represented (EGO/VIRGO by INFN staff), as well as the associated partner ESO. Fruitful discussions were held. The meeting was introduced by an overview of DADI, followed by project contributions (EGO, ESO and LOFAR) and an overview of the VO Science priority areas and of the VO technical developments around multi-dimensional data and time domain. The most prominent topics that were discussed were: multi-dimensional data access, VO registry, Authentication and Authorisation, time domain data access.

The Trieste ESFRI workshop was attended by ASTERICS WP3 representatives in the framework of the liaison task between the two WPs led by INAF in WP4. In particular, a presentation of work on an Authorisation & Authentication prototype for the SKA was presented with the WP3 perspective. Also, the discussion on time domain and alerts demonstrated that liaisons should be established with WP5 in that domain. F. Genova and A. Lawrence contacted A. Szumoru after the meeting. Contact is established and will be followed up.

More information about the Workshop and its findings will be gathered in the formal D4.3 deliverable which is being prepared by INAF.

2.7 First DADI School, 15-17 December 2015, Madrid (Spain) (D4.2)

The First ASTERICS School was held in Villafranca del Castillo at the Centro de Astrobiología, 15-17 December. It gathered 43 participants, mostly graduate/PhD students and Post-docs, and 11 tutors. All the DADI VO teams sent tutors and CTA, LOFAR and ESO sent participants from their scientific staff. The 43 participants came from the countries of the VO partners, France, Germany, Italy, Spain, UK, and also from Belgium, Greece, Lithuania, Poland, Portugal and Slovakia. A list of contacts to be used to disseminate information about the schools in the European countries needs to be consolidated before the next school. The first announcements about the school were disseminated via a list of contacts established by the previous Euro-VO projects, but the initial response was not sufficient. This was followed by asking ASTRONET to disseminate information through their own list of contacts, which was found to be efficient.

Preparatory work was performed beforehand by the DADI VO teams to update tutorials and prepare new ones, to identify participants from the ESFRI/pathfinder teams, and to induce discussion with the participants about their own scientific topics to prepare the school sessions devoted to the participant's science projects.

The school web page is here:
https://www.astron.nl/asterics/doku.php?id=open:wp4:school1#program, and the page containing the detailed programme and a link to the tools and tutorials is here:
https://www.astron.nl/asterics/doku.php?id=open:wp4:here. The goal was for the

participants to become familiar enough with the VO tools to use them in their own research. The feedback received after the Workshop was mostly very positive. The school included short introductions, 6 tutorials to be performed by the participants with support from the tutors, a "Treasure Hunt" (a set of scientific questions to be answered using the VO in a limited time), and time given to the participants to work on their own scientific projects. Some of these works were summarized at the end of the school in nice public presentations which can be found on the school web site. Feedback and requirements on the VO tools were also gathered.

Meeting follow-ups:

The School will be described in detail in the formal deliverable D4.2, which is currently being prepared.

The updated tutorials have been posted in the sustainable Euro-VO web site at http://www.euro-vo.org/?q=science/scientific-tutorials.

To measure the school impact the participants will be polled after one year and on a yearly basis until the end of ASTERICS to get information on their usage of the VO at that time and eventual publication of "VO-enabled" papers.

2.8 Additional meetings, new insights and contacts

- CTA and Provenance Meeting (6-7 July, Paris, France). Informal meeting organized by C. Boisson (CNRS/LUTH). The activity was presented at the 6th RDA Plenary, at the ADASS conference (poster) and at the Sydney IVOA meeting (see above). The aim of the meeting was to discuss the Provenance concept developed by W3C and IVOA in the context of CTA. This concept is useful to efficiently trace the various processing activities performed to generate final data products. At the moment "IVOA" provenance model (or W3C) is very generic. The main question is how the CTA model is portable to other domains and experiments. Answer this question requires to have other use cases and compare all of them.
- Collaboration between CDS and EGO/VIRGO (INFN) on Aladin customization
- Authentication & Authorisation
  - This is a topic on which ASTERICS WP3 and WP4 cannot work in isolation. Contacts will be taken as required with external projects. A preliminary liaison was e.g. established with EUDAT, AARC and the CTA and SKA projects.
  - CTA organized a meeting on this topic on 11 December 2015, with representatives of SKA, IVOA and ASTERICS WP3.
- Collaboration with EUDAT. EUDAT (http://eudat.eu) is a major European project which builds generic building blocks for the scientific data infrastructure. The IVOA Registry of Resources was included in the EUDAT B2FIND Registry. A public release is

available, thanks to a collaboration with Heinrich Widmann, Hannes Thiemann and Damien Lecarpentier (EUDAT):

B2FIND Global search: http://b2find.eudat.eu/
B2FIND Communities: http://b2find.eudat.eu/group
B2FIND IVOA datasets: http://b2find.eudat.eu/group/ivoa

2.9 Deviations and difficulties

D4.2 and D4.3 were initially scheduled in October 2015, and it was not possible to hold the meetings during that month for practical reasons. They were both held the month after, and D4.2 was held a few days after D4.3. The Project Officer was informed of the scheduling difficulties by the Project Manager.

Meetings had been scheduled during the last four months of 2015 for the three WP4 tasks to start the work as early as possible in the project life. Some of WP4 participants were well aware of the interoperability questions and already participated in the IVOA, but not all. It was also necessary for the participants to get to know each other and for WP4 to build its community. These key aims have been fulfilled, but the meeting schedule, which in four months also included the ADASS conference and its companion IVOA meeting and a RDA Plenary, was too tight and too demanding, especially for the teams who organize the meetings. The meeting schedule for 2016 was adapted to mitigate this difficulty, as it will be explained in the next section.

3. DADI plans February – October 2016

The deliverables foreseen until the end of the year are as follows:

Deliverable Number	Deliverable Title	Lead Beneficiary	Due Date	Actual Date and Location
D4.4	Second ASTERICS DADI Technology Forum	UEDIN (Task 4.3)	March 2016	7-8 March, Edinburgh (UK)
D4.5	Second ASTERICS European School	CNRS/UMR 7550 (Task 4.2)	November 2016	Strasbourg (France), date TBD
D4.6	First European Data Provider Forum & Training Event	UHEI (Task 4.1)	November 2016	15-16 June 2016, Heidelberg (Germany)

It was decided to move D4.6 forward to June instead of November to lighten the workload and meeting schedule between the Summer and Christmas, taking into account the lessons learnt from 2015.

One IVOA Interoperability meeting will be held in Cape Town (South Africa) on 9-13 May 2016 (http://ivoa2016.sa3.ac.za/), and another one in Trieste (Italy) on 21-23 October 2016, preceded by the annual ADASS conference (16-20 October 2016). Two RDA Plenaries will take place, the seventh one in Tokyo on 1-3 March 2016 (https://rd-alliance.org/plenary-meetings/rda-seventh-plenary-meeting.html) and the eighth one in Denver during the International Data Week on 11-16 September 2016.

The next deliverable of task 4.3, the Second ASTERICS DADI Technology Forum D4.4, will be organised by the UEDIN partner and held in Edinburgh on 7-8 March 2016. The first Technology Forum allowed WP4 partners to build knowledge about the partners' activities and to start discussion and collaboration on technological topics. The second one will focus on discussion of on-going technological work, status report on the topics identified for ESFRI-VO collaboration, informal exchange on topics defined on the spot through the hack-a-thon sessions, and preparation of the Cape Town IVOA Interoperability meeting which will be held on 8-13 May 2016.

ASTERICS participants are also active in the preparation of the Cape Town IVOA meeting. The last element of the Data Access Layer "caravan" for multi-dimensional data, SODA, is being discussed in the IVOA framework. One important aspect of the meeting will be the "Focus Sessions" that are being organized in support to the IVOA priorities, which are also ASTERICS'. 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. These sessions will review the first steps towards multi-dimensional standards and their implementation, and will discuss the definition of minimal requirements and the IVOA role with respect to time domain science (capturing current use, identify relevant projects). The time domain is of particular interest for both ASTERICS WP4 and WP5 as explained.

Preparation of the Data Provider Forum and Training event is on-going, with the constitution of an organising committee which includes representatives of all WP4 partners and likely from ESA.

ANNEX 1: Talks presented by participants from Europe at the Sydney Interoperability meeting

All the talks presented by participants from Europe are listed here, to show the European influence in the IVOA. Many of them are directly associated to DADI (indicated by a *). ESA is also working closely with it.

Opening plenary

C. Arviset (ESA)	State of the IVOA
M. Allen* (CDS)	Science priorities
Charge to the Groups	
P. Fernique* (CDS), T. Donaldson	WG Applications
F. Bonnarel* (CDS), M. Molinaro* (INAF)	WG Data Access Layer
M. Cresitello-Dittmar, L. Michel (OAS, France)	WG Data Model
B. Major, G. Taffoni* (INAF)	WG Grid & Web Services
M. Demleitner* (UHEI), T. Dower	WG Registry
M. Louys* (CDS), A. Accomazzi	WG Semantics
F. Genova* (CDS)	IG Data Curation & Preservation
T. McGlynn, M. Taylor* (Bristol, UK)	IG Operations
F. Le Petit (Paris Observatory,France), C. Rodrigo* (INTA)	IG Theory

Application Working Group (8 talks with authors from Europe on a total of 9) – chaired by P. Fernique* (CDS) and T. Donaldson

K. Polsterer (HITS, Germany)	Virtual Observatory Virtual reality
S. Derriere* (CDS)	HiPS for the ASTRODEEP portal
B. Merin (ESA) et al. (all from ESA)	ESA sky: a new astronomy multi-mission interface
P. Fernique* (CDS)	HiPS – State of the art
P. Skoda, J. Nadvornik, D. Andresic (all from Czech Republic)	Exploring the handling of light curves in VO tools
Mickael Boiziot (IRAP, France)	VO technologies in CASSIS
Regis Haigron, F. Royer, I. Jeguzo (all from Paris Observatory)	Connecting GIRAFFE archive to VO tools
Mark Taylor* (Bristol)	Web SAMP over HTTPS: Impossible?

Data Access Layer Working Group (7/12 talks) – chaired by F. Bonnarel* (CDS) and M. Molinaro* (INAF)

M. Taylor* (Bristol, UK)	TAP : what's missing?
M. Molinaro* (INAF) (on behalf of D. Morris, UEDIN)	ADQL status
M. Demleitner* (UHEI)	DataLink in the browser
M. Demleitner* (UHEI)	TAPRegExt
F. Bonnarel* (CDS)	AccessData Status

C. Rodrigo* (INTA)	SimDAL implementation report
F. Bonnarel* (CDS), M. Molinaro* (INAF)	DAL issues and future

Data Model Working Group (5/8 talks) – chaired by M. Cresitello-Dittmar and L. Michel (OAS)

J. Salgado (ESA)	SourceDM status
M. Sanguillon (LUPM, France),J. Bregeon (LUPM), C. Boisson* (LUTH), M. Servillat* (LUTH), M. Louys* (CDS), F. Bonnarel* (CDS)	ProvenanceDM: hints from the CTA provenance prototype
F. Bonnarel*, M. Louys* (CDS), I Chilingarian, L. Michel (OAS)	Characterisation 2.0 : Advocating for a new start
F. Bonnarel* (CDS)	VODML - generating utypes from vo-dml-xml
M. Louys* (CDS) et al., incl. F. Bonnarel* (CDS), A. Micol (ESO)	ObsCore DM v 1.1

Registry Working Group (6/6 talks) – chaired by M. Demleitner* (UHEI) and T. Dower

P. Le Sidaner, R. Savalle, J. Normand (Paris Observatory)	MOC coverage in VOResource/VOParis
M. Demleitner* (UHEI)	Data collection/Table registration
M. Taylor* (Bristol)	Data discovery in TOPCAT's TAP Window
M. Demleitner* (UHEI)	Identifiers 2.0 RFC results
P. Le Sidaner, R. Savalle, J. Normand	Service validation

(Paris Observatory)	
Common with Data Curation and Preservation Interest Group	
M. Demleitner* (UHEI)	DOIs – Technical : Introduction, state, to do

Grid and Web Services Working Group (4/6 talks) – chaired by B. Major and G . Taffoni (INAF)*

K. Polsterer (HITS)	Preview of the EMU Wide Field Outlier Finder (WTF)
S. Nieto, J.C. Segovia, R. Gutierrez, J. Salgado (ESA)	ESDC VOSpace-Gaia Integration and Services Interoperability
A. Schaaff* (CDS)	Experiments with Hadoop & Spark, discussion
G. Taffoni* (INAF)	Authorization profile for IVOA?

Semantics Working Group (2/3 talks) – chaired by M. Louys (CDS) and A. Accomazzi*

M. Louys* (CDS)	Unique identifiers for Observatory/Spacecraft nomenclature standardization
M. Demleitner* (UHEI)	DataLink Vocabulary revisited

Data Curation and Preservation Interest Group – chaired by F. Genova(CDS)*

F. Genova* (CDS)	Status of the Research Data Alliance – Possible liaisons with Astronomy
F. Genova* (CDS)	DOI Overview session : introduction
M. Demleitner* (UHEI)	Registry point of view

Operations Interest Group (6/9 talks) – chaired by T. McGlynn and M. Taylor (Bristol)*

I. Zolotukhin (IRAP, France)	Building Complex UWS Services
P. Le Sidaner, R. Savalle (Paris Observatory)	Removing Non-Responsive Services from the Registry
P. Le Sidaner, R. Savalle (Paris Observatory)	Registry "Weather Report" and Validation from VO Paris
C. Arviset, M, Perdikeas (ESA)	Euro-VO Registry Report and Validation Top 10
T. McGlynn, R. Savalle (Paris Observatory), M. Perdikeas	Comparison of VO Validation Tests and Results
C. Arviset (ESA), T. McGlynn	How should we summarize Operations status of the VO

Closing Plenary

P. Fernique* (CDS), T. Donaldson	WG Applications
F. Bonnarel* (CDS), M. Molinaro* (INAF)	WG Data Access Layer
M. Cresitello-Dittmar, L. Michel (OAS, France)	WG Data Model
B. Major, G. Taffoni* (INAF)	WG Grid & Web Services
M. Demleitner* (UHEI), T. Dower	WG Registry
M. Louys* (CDS), A. Accomazzi	WG Semantics
F. Genova* (CDS)	IG Data Curation & Preservation

T. McGlynn, M. Taylor* (Bristol)	IG Operations
F. Le Petit (Paris Observatory,France), C. Rodrigo* (INTA)	IG Theory
M. Allen* (CDS)	Science priority areas
C. Arviset (ESA)	Closing remarks

ANNEX II : Acronyms used in the document

AGA	ASTERICS General Assembly
ADASS	Astronomical Data Analysis Software and Systems
ADQL	Astronomical Data Query Language
APC	AstroParticule et Cosmologie
AARC	Authentication and Authorisation for Research and Collaboration
ASTERICS	Astronomy ESFRI & Research Infrastructure Cluster
ASTRODEEP	Unveiling the power of the deepest images of the Universe
ASTRON	Netherlands Institute for Radio Astronomy
B2FIND	Metadata catalogue of research data collections stored in EUDAT data centres and other repositories
CASSIS	Centre d'Analyse Scientifique de Spectres Infrarouges et Sub-millimétriques
CDS	Centre de Données astronomiques de Strasbourg
CNRS	Centre National de la Recherche Scientifique
CPPM	Centre de Physique des Particules de Marseille
CSP	Committee for Science Priorities
CTA	Cherenkov Telescope Array
DADI	DATA Access, Discovery and Interoperability (ASTERICS WP4)
DAL	Data Access Layer
DataLink	Means of connecting one location to another for the purpose of transmitting and receiving digital information
DM	Data Model
DOI	Digital Object Identifier
E-ELT	European Extremely Large Telescope
EGO	European Gravitational Observatory
EMU	Evolutionary Map of the Universe
ESA	European Space Agency
ESDC	ESA Science Data Centre
ESFRI	European Strategic Forum on Research Infrastructures
ESO	European Southern Observatory
ET	Einstein Telescope
EUDAT	European Data Infrastructure
GA	General Assembly
HiPS	Hierarchical Progressive Survey
HTTPS	Hypertext Transfer Protocol over Secure Socket Layer
IG	Interest Group
INAF	Istituto Nazionale di Astrofisica
INFN	Istituto Nazionale di Fisica Nucleare
INTA	Instituto Nacional de Tecnica Aeroespacial
IVOA	International Virtual Observatory Alliance
KM3Net	Cubic Kilometre Neutrino Telescope
LSST	Large Synoptic Survey Telescope
LUTH	Laboratoire de l'Univers et de ses Théories
MOC	Multi-Order Coverage
OBSPARIS	Paris Observatory

pgsphere	Provides spherical data types, functions, and operators for PostgreSQL
PostgreSQL	Postgres "After Ingres" SQL
RFC	Request For Comments
SAMP	Simple Application Messaging Protocol
SimDAL	Simulation Data Access Layer
SKA	Square Kilometre Array
SODA	Server-Side Operations for Data Access (previously AccessData)
SQL	Structured Query Language
TAP	Table Access Protocol
TAPRegExt	Table Access Protocol Registry Extension
TOPCAT	Tool for Operations of Catalogues And Tables
RDA	Research Data Alliance
UEDIN	The University of Edinburgh
UHEI	Ruprecht-Karls-Universität Heidelberg
UMR	Unité Mixte de Recherche
UNISTRA	Université de Strasbourg
UWS	Universal Worker Service
VIRGO	Interferometer for detection of Gravitational Waves
VLVvT	Very Large Volume Telescope
VO	Virtual Observatory
VODML	Modeling Language for Data Models
VOEvent	Standardized library to report astronomical events
VOResources	an XML encoding standard for IVOA Resource Metadata
W3C	World Wide Web Consortium
WD	Working Draft
WG	Working Group
WP	Work Package
XML	Extensible Markup Language