



# IVOA Technical Roadmap status

“what are the Alliance and its members doing?”

Marco Molinaro  
INAF – OATs

INAF ICT Workshop 2018  
Catania – 13.09.2018

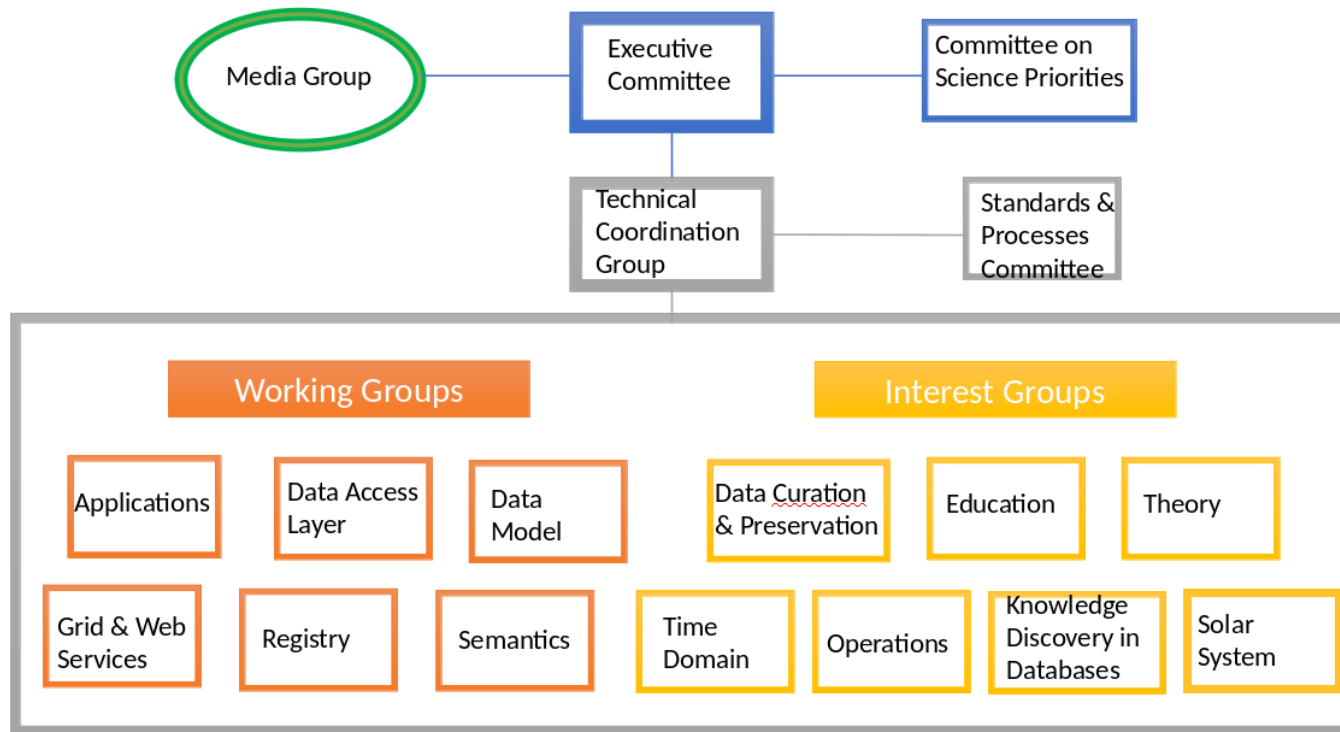


Astronomy ESFRI & RI Cluster  
ASTERICS - 653477 

# Outline

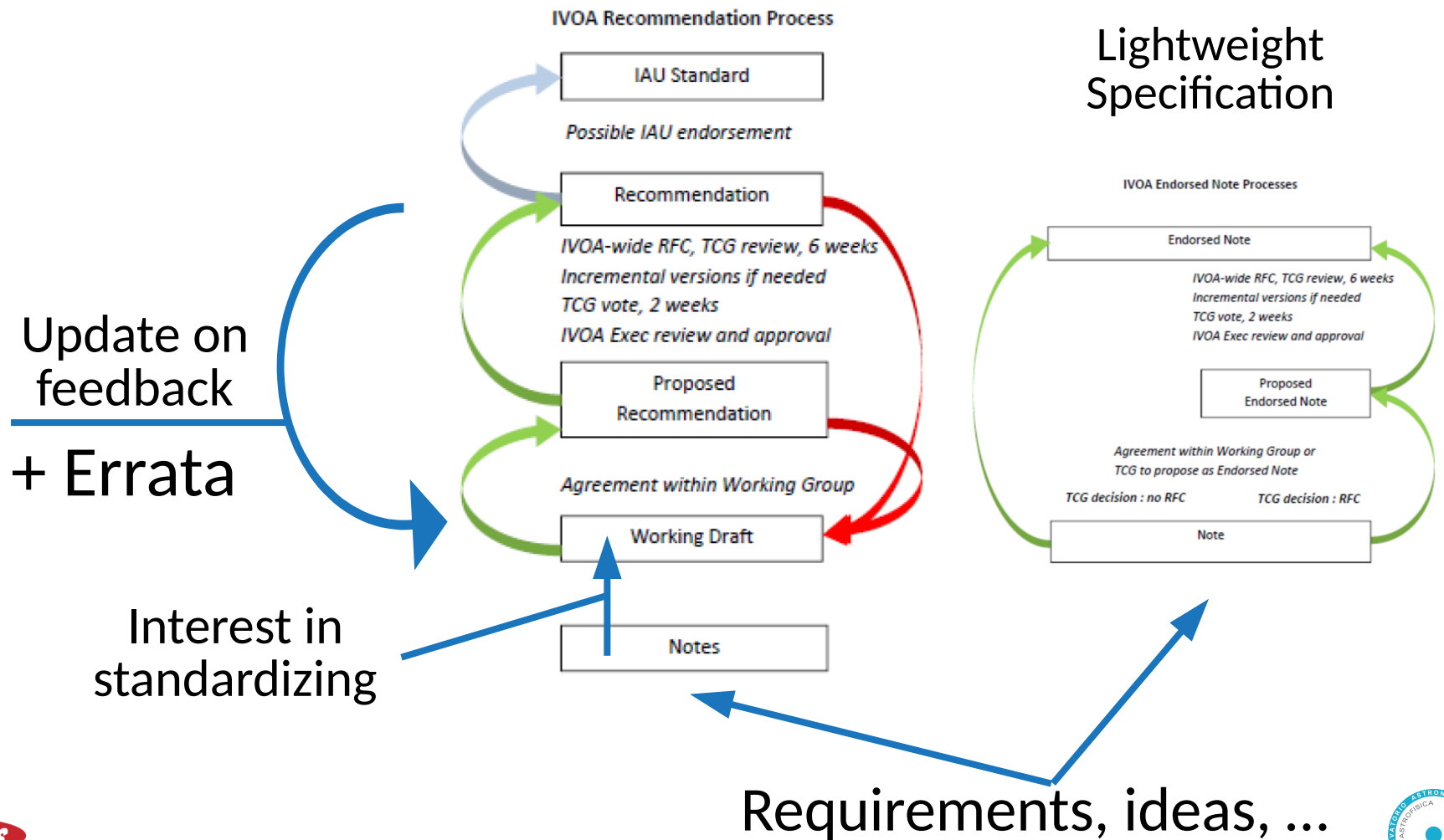
- What is IVOA
  - “IVOA is an international organisation defining standards to allow data interoperability in Astronomy and Astrophysics”
- How do VO members work/are organized
- **What are they working on**
- How can anyone help

# IVOA Organization

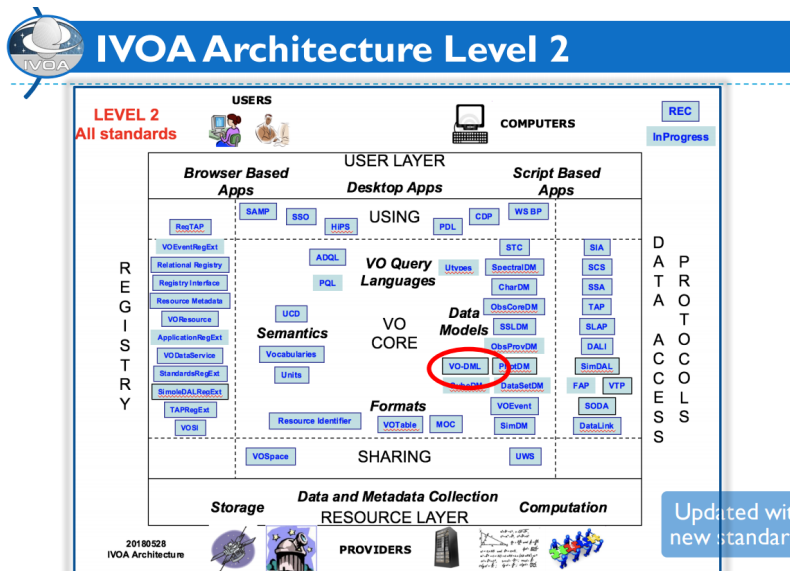


- IGs (WGs) bring in requirements
- WG build the architectural blocks
- Committee(s) steer & give advice
- TCG coordinates

# IVOA Documents Process



# IVOA Recommendations



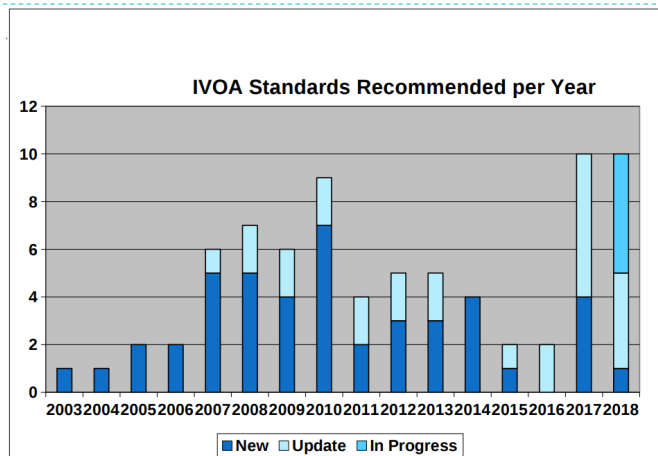
State of TCG 2018-05-28

Matthew Graham and Pat Dowler – 8

- RFC
- Reference implementations
- Validation suites
- TCG vote
- Exec approval

- SVN repository
  - GitHub?
- Mailing list
- Wiki
- Interop Sessions

## IVOA Standards per year

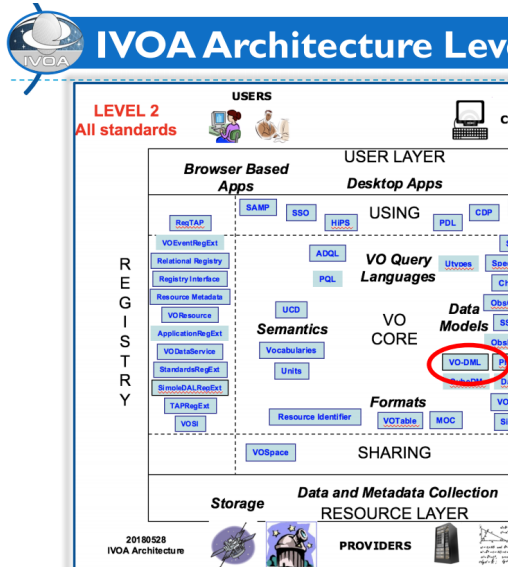


State of TCG 2018-06-01

Matthew Graham and Patrick Dowler – 3



# IVOA Recommen



State of TCG 2018-05-28

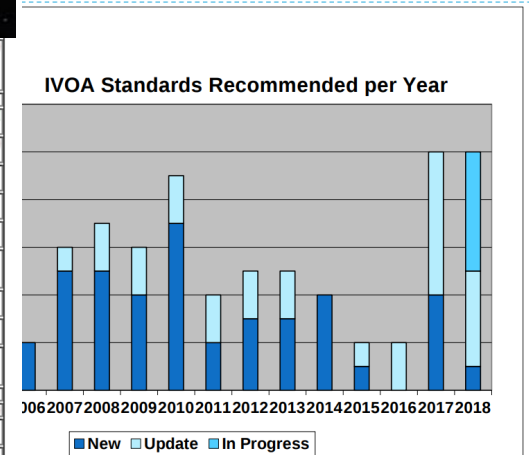
- RFC
- Reference implem
- Validation suites
- TCG vote
- Exec approval

Group	Title	Most Stable	In progress	Version history
App	SANP - Simple Application Messaging Protocol	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	VO Table - VO Table Format Definition	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	MOC - HEALPix Multi-Order Coverage Map	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	HIPS - Hierarchical Progressive Survey Map	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	DALI - Data Access Layer Interface	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
DAL	DataLink	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	Simple Cone Search	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	SLA - Simple Image Access	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	SLAP - Simple Line Access	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	SSA - Simple Spectral Access	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	STC-S: Space-Time Coordinate Metadata Linear String Implementation	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	TAP - Table Access Protocol	3.0	RFC	3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	TAPRegExt - A VOResource Schema Extension for Describing TAP Services	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	NDQL - Astronomical Data Query Language	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	SimDAL - Simulation Data Access Layer	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	VOEvent Transport Protocol	3.0	3.0	3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	BODA - Server-side Operations for Data Access	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	Reservation Locator Table Access Protocol	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	Object Visibility Simple Access Protocol	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
	PHOTDM - Photometry Data Model	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
SimDM - Simulation Data Model	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
STC - Space-Time Coordinate Metadata for the Virtual Observatory	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
VOEvent Reporting Schema for Collections of Events	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	



- VN repository
- GitHub?
- mailing list
- Wiki
- Interop Sessions

## Standards per year



Matthew Graham and Patrick Dowler - 3

Group	Title	Most Stable	In progress	Version history	
App	VOspace service specification	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	Eredentiale Delegation Protocol	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	IWS - Universal Worker Service	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	VOSI - IVOA Support interfaces	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	VOA Identifiers	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
DAL	VOA Registry interfaces	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	RM - Resource Metadata for the Virtual Observatory	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	StandardRegExt: a VOResource Schema Extension for Describing IVOA Standards	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	SimpleDALRegExt - Describing Simple Data Access Services	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	VOResource - an XML Encoding Schema for Resource Metadata	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	VODataService - A VOResource Schema Extension for Describing Collections and Services	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	RegTAP - Registry Relational Schema	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	UCD - An IVOA standard for Unified Content Descriptors	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	JCDI+ Controlled Vocabulary	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	Maintenance of the list of uCD words	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	Vocabularies in the Virtual Observatory	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	DocStd - IVOA Document Standards	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0	
	VOE	VOEvent - Sky Event Reporting Metadata (VOEvent)	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
		VOEventRegExt - An XML Encoding Schema for Resource Metadata for collections of Events	3.0		3.0 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0

3 September 2018



Molinaro - INAF IC

# IVOA Roadmap

- Roadmap updated every 6 months
  - Just after the interop
- Help focus on current matters
- Not a real progress check
  - Progress depends on available resources

## IVOA Technical Assessment and Roadmap Documents

- [2018A Roadmap](#)
- [2017B Roadmap](#)
- [2017A Roadmap](#)
- Previous Years Roadmaps - [2016B Roadmap](#), [2016A Roadmap](#), [2015B Roadmap](#), [2015A](#), [2014B](#), [2014A](#), [2013B](#), [2013A](#), [2012](#), [2010](#), [2009](#), [2008](#), [2007](#), [2006](#), [2005](#)

## Data Access Layer WG

(roadmap updated after 2018.07.05 TCG TConf)

- Expected progress by Fall 2018 Interop (College Park)
  - TAP-1.1: new PR with RFC extension, waiting UWSRegExt Note to be published
  - ADQL-2.1: pending 1 missing implementation, new PR and RFC
  - SLAP-2.0: missing SSLDM revision (source retrieval issues), otherwise near to PR
  - DALI-1.2: gathering input at [DALI-1.1-Next](#)
    - polygon issue ([see mail thread](#)) needs to be solved
  - Time Series discovery and access Note to cover TDIG DAL roadmap
- Additional efforts to follow through and beyond next Interop
  - ObsLocTAP & ObsVisSAP (were OLAP & OVAP) Observation Locator and Object Visibility protocols: WDs
  - ProvTAP & ProvSAP Provenance access protocols: WDs
  - SIA-2.1 consolidate feedback, possible revision start
  - DataLink-1.1 consolidate feedback, possible revision start
    - SIA & DataLink feedback will be gathered in a Note (by end of Summer)
- Still on the roadmap, but waiting for more feedback
  - SODA



# Current topics/goals (overview)

- VO-DML mapping
- Tessellation (including time)
- Multi-D take-up
- Time Domain as a whole
- Authentication & Authorization
- Vocabulary maintenance
- Solar System data interoperability
- Astropy engagement

random order

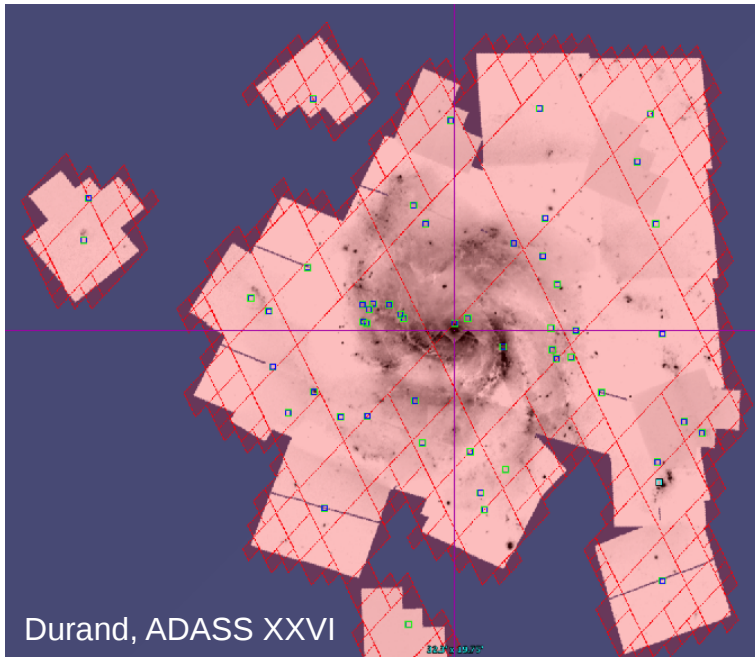


# Multi-D datasets: status & feedback

- Discovering and accessing multi-dimensional datasets in a common way
  - A 2-step solution applies
    - Filter the datasets you're looking for
    - Explicitly retrieve or access them through specific services
- A set of Recommendations exist
  - Simple “Image” Access (protocol) v. 2.0
  - Server-side Operations for Data Access v. 1.0
  - DataLink v. 1.0
- Flanking & completing general dataset discovery with
  - Table Access Protocol v. 1.0 (but 1.1 on its way)
    - ObsCore v. 1.1
- Feedback has been gathered, revisions are planned in the near future

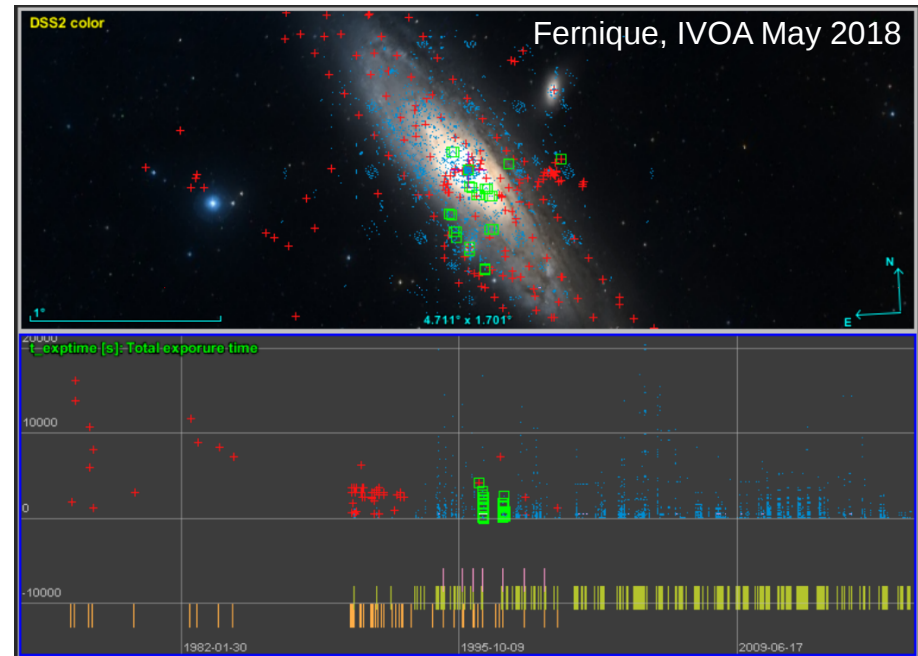


# Coverage Footprint Tessellation



- HEALPix Multi-Order Coverage Maps
  - MOC v. 1.0
- Hierarchical Progressive Survey
  - HiPS v. 1.0
- T-MOC for time axis tessellation?

- MOCs are also helping the Registry coverages
- HiPS take up went faster than expected



Scalable data inspection/discovery

# Time Series: data model, discovery, access

- Current top priority: Time Domain astronomy
  - Transient sky alerts
  - Time series interoperability
- An explicit Interest Group exists
- Time Domain IG provides requirements/input to
  - Data Model: common way to describe the time series datasets
  - Data Access Layer: how to discover and access those datasets
- Already provided
  - Test bed for the VO Data Modelling language framework (next slide)
  - Input to better describe time axis characterization in ObsCore
  - Basic requirements to evolve the Multi-D DAL specifications

# VO-DML: VOTable mapping

- Data Models are meant to describe common means to represents datasets/objects/relationships
- Data Models described in a *machine readable* common way allow interoperability through a self-describing solution
- VO-DML (v. 1.0) is the language used for the model description
- VOTable(s) are the exchange format
- We need a mapping of the VO-DML models into the VOTable format
  - Ongoing work...
  - DAL and Apps should really benefit from it!

# Solar System interoperability requirements

- Recently formed Interest Group
- Already active interoperability-driven community
- Providing requirements to the IVOA
  - e.g.: you cannot use ICRS framework to search a comet
  - e.g.: integrate vocabularies
- Using/adapting IVOA standards
  - e.g. EPN-TAP

# Authentication & Authorization

- The ideal research world (in astrophysics) would see only public data since the start
  - We live not in an ideal world
  - Resource accounting also plays a role
- Agreed solutions to let applications (client) and providers (server) interoperate smoothly
- Currently available: (partly) Authentication
  - Single Sign-On (v. 2.0) “profile”
  - A few elements in the Resource Metadata Model & Serialization
    - i.e.: securityMethod
- Planning: Authorization
  - Interoperable exchange solution of authorization
    - In the form of “group” (~roles)
- Working: Authentication
  - Server-side & registry descriptions useful for server-client handshaking

# ...and also...

- Vocabulary maintenance
- Astropy engagement
- Radio community
- Exoplanets research field
- Registry maintenance and improvement
- VOTable updates
- Observation Location and Object Visibility
- DAL protocols updates
- DM models updates & translations
- Science Platforms
- Connection with other Open Science communities and organizations
- Monitoring VO resources health status
- Theory (simulations) interoperability
- Transient events technology updates
- ...

“Avoid excessive bullet-pointing [...] the term <bullet-point> comes from people firing guns at annoying presenters.”  
(<https://www.youtube.com/watch?v=KbSPPFYxx3o>)



# How can I contribute

- IVOA, as an alliance, works thanks to the nation-wide members efforts and support
- VObs.it is the Italian member of the IVOA
  - Funding for the INAF component of VObs.it comes through the ICT Office
- Everyone is free to participate in the VO works
  - WG/IG mailing lists
  - (T)Wiki community
  - Interoperability meetings participation/contribution
  - National/European networking
- Scientific input is required, technology efforts are based on it

Media Group

