



## VOEvent and IVOA standards

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ASTERICS multi-messenger symposium  
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## The role of the IVOA

<http://www.ivoa.net/>

*“The Virtual Observatory (VO) is the vision that astronomical datasets and other resources should work as a seamless whole.”*

*“The International Virtual Observatory Alliance (IVOA) is an organisation that debates and agrees the technical standards that are needed to make the VO possible.”*

W3C defines the HTTP, HTML, XML and CSS standards

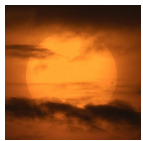


Microsoft, Apple, Google, Mozilla and Opera create web browsers.



So who does write the software ?

We do – we create the tools we need  
(and hopefully share them with others)



J Swinbank - Comet

<https://github.com/jdswinbank/Comet>

<http://comet.transientskp.org/en/stable/>



4 Pi Sky research group

<https://github.com/4pisky>

<https://4pisky.org/about/>

Does anyone have SW to share ?

Do we need to publish a list ?



Where we are now

**VOEvent 2.0** – accepted as recommendation\*

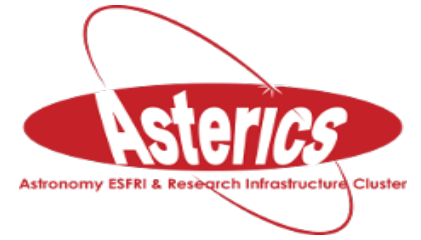
<http://ivoa.net/documents/VOEvent>

**Transport Protocol 2.0** – accepted as recommendation\*

<http://ivoa.net/documents/VOEventTransport>

(\*) *“accepted as recommendation” == “an IVOA standard”*





## VOEvent – Current change requests

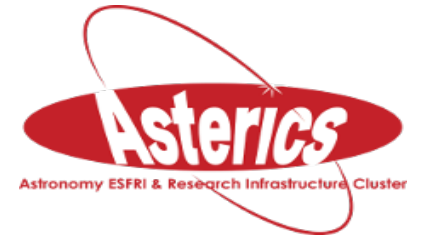
### VOEvent for Fast Radio Bursts arXiv:1710.08155v1 [astro-ph.IM]

- Event type field, anyURI.
- Repository or registry for derived schema

### VOEvent for planetary science Observatoire de Paris

- Small changes to WhereWhen to support solar system and planetary reference frames.
- Any changes should be backwards compatible with existing 2.x software.





VOEvent – New change requests

*“Who do I contact if I want something changed ?”*

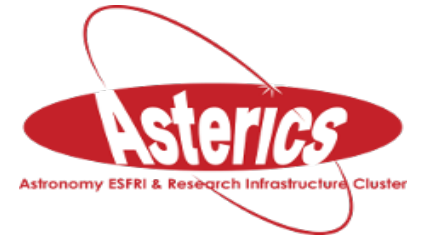
IVOA time-domain mailing list

<voevent@ivoa.net>

Mailing list history

<http://mail.ivoa.net/pipermail/voevent/>





VOEvent – New change requests

*“Who do I contact if I want something changed ?”*

Ada Nebot <ada.nebot@astro.unistra.fr>

IVOA time-domain - chair

Dave Morris <dmr@roe.ac.uk>

IVOA time-domain – vice chair

Roy Williams <roy@roe.ac.uk>

VOEvent - editor and author

**Right now !**

**Today only !!**

**One time  
special  
offer**

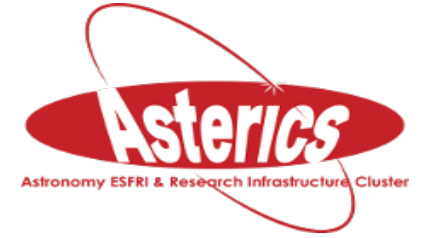
**Three experts  
at your service**



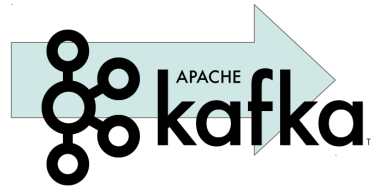
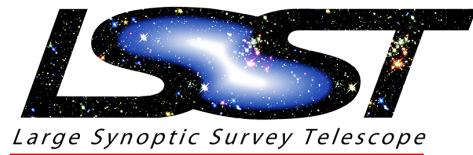
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VOEvent – The next generation ?



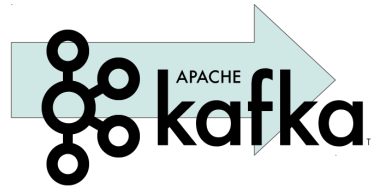
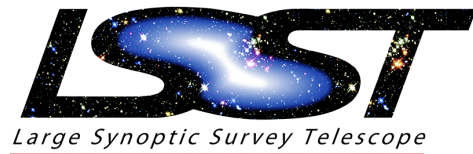
Not using VOEvent ?

High data rate ( $> 10^3$  Hz)





## VOEvent – The next generation ?



Not using VOEvent, because these are not events.

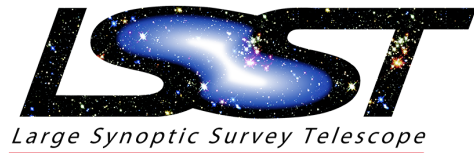
High data rate ( $> 10^3$  Hz)

This is raw data.

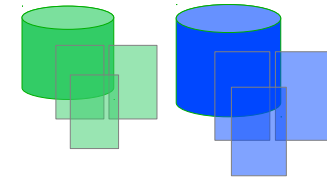
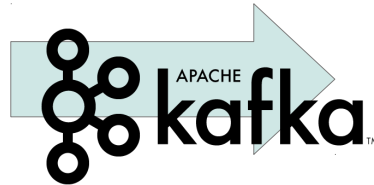
~250,000,000 detections per night

Lots of <what> no <why>

*“VOEvent defines the content and meaning of a standard information packet for representing, transmitting, publishing and archiving information about a transient celestial event, **with the implication that timely follow-up is of interest.**”*



High data rate ( $> 10^3$  Hz)



crossmatch  
characterization  
annotation  
filtering

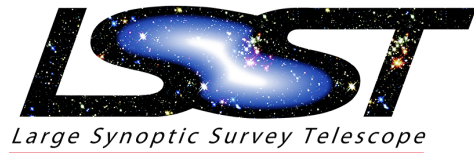


High value, well characterized events

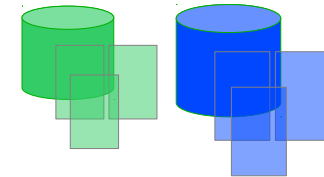
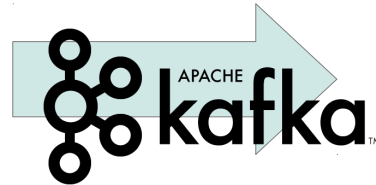
80% probability supernova candidate

Low data rate (10 per day ?)





High data rate ( $> 10^3$  Hz)



crossmatch  
characterization  
annotation  
filtering

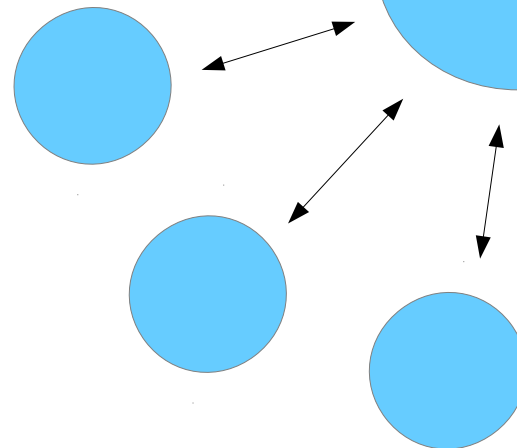
Existing VOEvent  
community

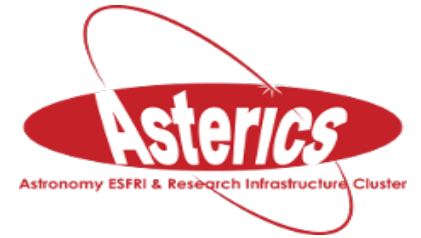


High value  
well characterized events  
80% probability supernova  
candidate

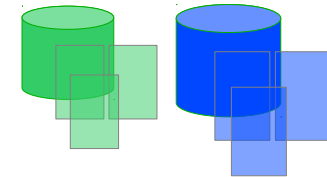
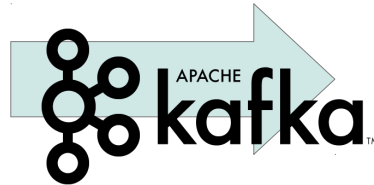
Low data rate ( $< 1$  Hz) ?

Standard VOEvent  
format





Medium data rate ~250,000/night



crossmatch  
characterization  
annotation  
filtering

# Lasair

<https://lasair.roe.ac.uk/>

Historical database

User watch lists

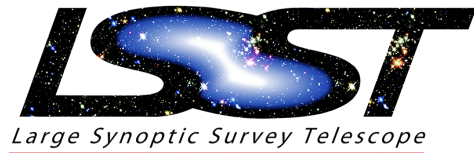
Cross match

Characterization

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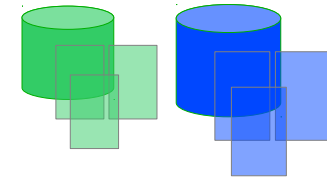
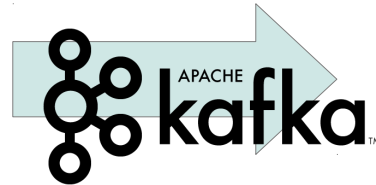


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## FAIR data

- Findable
- Accessible
- Interoperable
- Reuseable



crossmatch  
characterization  
annotation  
filtering

High value, well characterized events  
*“80% probability supernova candidates”*

How well do we do ?





VOEvent  
stream

*“80% probability supernova candidates”*

## FAIR data



- Findable
- Accessible
- **Interoperable**
- Reuseable



*“Metadata use a formal, accessible, shared, and broadly applicable language for knowledge representation.”*

VOEvent specification



*“80% probability supernova candidates”*

# FAIR data



- Findable
- Accessible
- Interoperable
- **Reuseable**



- Who says they are supernova ?
- Based on what criteria ?
- What algorithm was used ?

*“Data and collections have a clear usage licenses and provide accurate information on provenance.”*

- Can I publish this data ?
- Who should I cite ?



*“80% probability supernova candidates”*

# FAIR data



- Findable
- Accessible
- Interoperable
- **Reuseable**



*“Data and collections have a clear usage licenses and provide accurate information on provenance.”*

Do we define this in the event, or use a link to refer to an external resource ?

- Who says they are supernova ?
- Based on what criteria ?
- What algorithm was used ?
- Can I publish this data ?
- Who should I cite ?

Each event has a URL for provenance and license ?

No changes to the XML schema, just two new properties.





*“80% probability supernova candidates”*

# FAIR data



- Findable
- **Accessible**
- Interoperabl  
e
- Reuseable

*“Metadata and data are  
understandable to humans  
and machines.”*

<what>



<why>



What does “80% probability” mean ?

What does “supernova” mean ?



*“80% probability supernova candidates”*

# FAIR data



- Findable
- **Accessible**
- Interoperabl
- e
- Reuseable

Each event has a URL pointing to metadata about the event type ?

No changes to the XML schema, just a new property.

*“Metadata and data are understandable to humans and machines.”*

<what>



<why>



What does “80% probability” mean ?

Do we need some more terms ?

What does “supernova” mean ?

Would an “event type” identifier help ?



*“80% probability supernova candidates”*

## FAIR data



- **Findable** 
- Accessible
- Interoperable
- Reuseable

*“Data and supplementary materials have sufficiently rich metadata and a unique and persistent identifier.”*

We need to define the metadata for services and streams\*.

(\*) One event *service* may provide multiple *streams*.

- Where do I find events happening in [region] ?
- Where do I find events from [last year] ?
- Where do I find events for [wavelength] ?
- Where do I find events from [instrument] ?
- Where do I find events about [supernova] ?
- Where do I find events matching [criteria] ?
- Where do I find events filtered by [algorithm] ?

