# VOEvent and IVOA standards

D.Morris

University of Edinburgh

# 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.

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Institute for Astronomy,
Edinburgh University
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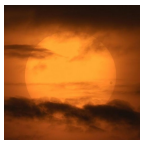
So who does write the software ?

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 ?

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Institute for Astronomy,
Edinburgh University
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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"*

D.Morris
Institute for Astronomy,
Edinburgh University
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# 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.

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Institute for Astronomy,
Edinburgh University
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# 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/

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Institute for Astronomy,
Edinburgh University
March 2019

# 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


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VOEvent – The next generation ?

Large Synoptic Survey Telescope

Not using VOEvent ?

High data rate (> 10^3 Hz)

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VOEvent – The next generation ?

Large Synoptic Survey Telescope

High data rate (> 10^3 Hz)

Not using VOEvent, because these are not events.

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.****"*

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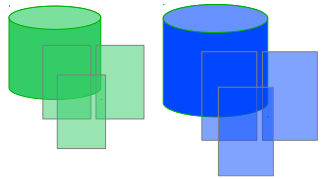
Large Synoptic Survey Telescope

APACHE kafka

Community broker



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 ?)

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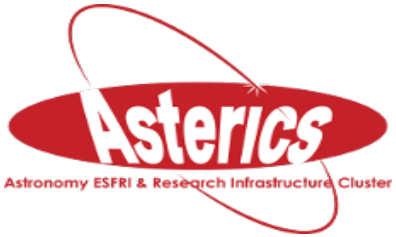
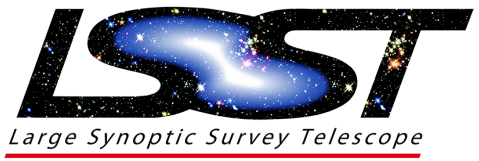
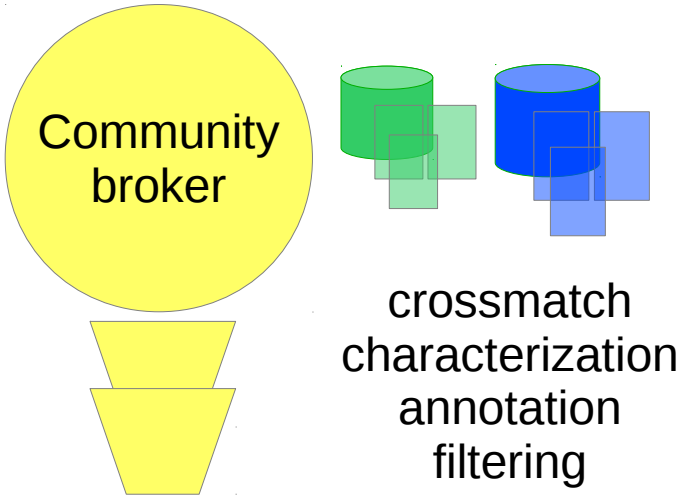


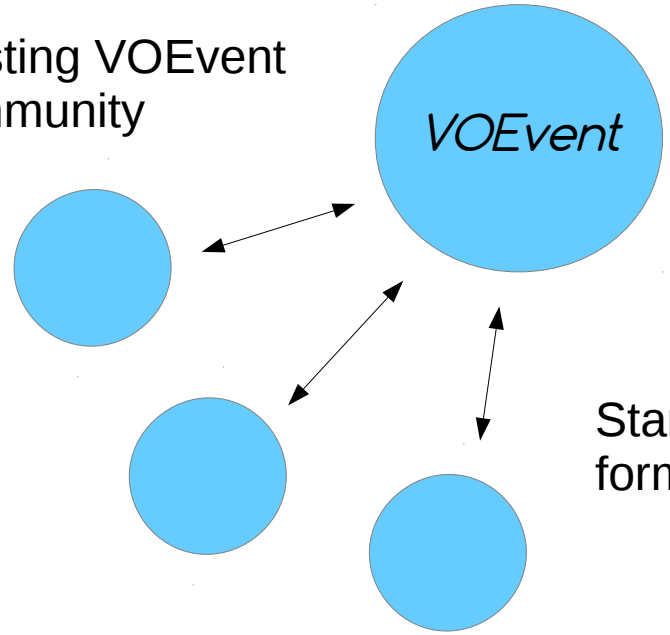


High data rate (> 10^3 Hz)




crossmatch
characterization
annotation
filtering

Existing VOEvent
community




High value
well characterized events

80% probability supernova
candidate

Low data rate (< 1 Hz) ?

Standard VOEvent
format

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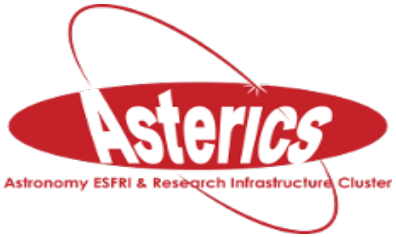





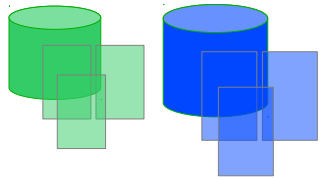

crossmatch
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Medium data rate ~250,000/night

# Lasair

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

Historical database

User watch lists

Cross match

Characterization

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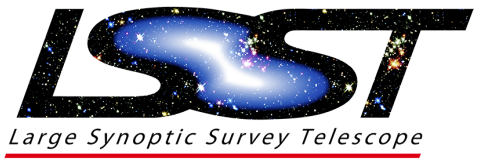


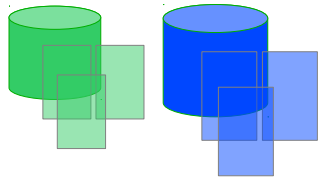

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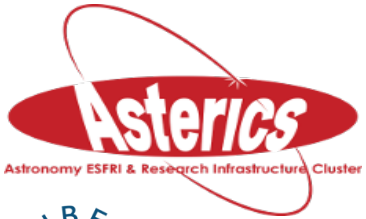

High value, well characterized events

*"80% probability supernova candidates"*

## FAIR data

- Findable
- Accessible
- Interoperable
- Reuseable

How well do we do ?

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Institute for Astronomy,
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VOEvent stream

*“80% probability supernova candidates”*

# FAIR data

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

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

VOEvent specification

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Edinburgh University
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VOEvent stream

*“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 ?

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Institute for Astronomy,
Edinburgh University
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VOEvent stream

Asterics
Astronomy ESFRI & Research Infrastructure Cluster

*"80% probability supernova candidates"*

# FAIR data

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- 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 ?

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

Each event has a URL for provenance and license ?

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

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Institute for Astronomy,
Edinburgh University
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VOEvent stream

*“80% probability supernova candidates”*

# FAIR data

- Findable
- **Accessible**
- Interoperabe
- Reuseable

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

<what>

<why>

What does “*80% probability*” mean ?

What does “*supernova*” mean ?

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Institute for Astronomy,
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VOEvent stream

*“80% probability supernova candidates”*

# FAIR data

- Findable
- **Accessible**
- Interoperabe
- Reuseable

*“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 ?

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

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

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Institute for Astronomy,
Edinburgh University
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*"80% probability supernova candidates"*

# FAIR data

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

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

- Where do I find events happening in [region] ?
- Where do I find events from [last year] ?
- Where do I find events for [wavelength] ?

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

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

- 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] ?

D.Morris
Institute for Astronomy,
Edinburgh University
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