VOEvent for PSWS

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PSWS: Catalogues of events

- PSWS teams will produce predictions, forming catalogues of past and future events in the solar system.
- PSWS predicted event catalogues are targetoriented, time-tagged and should include an occurrence probability per event.

Event Broadcasting

• Professional astrophysics: **VOEvent**.

Developed by IVOA (International Virtual Observatory Alliance, i.e., the Astrophysics VO).
Used for observation campaigns triggered by transients (e.g., Gamma Ray Bursts, LSST, LOFAR Transient Key Project, Solar Dynamic Observatory).
Adapted to observations and predictions. Forged for astronomy. Structured information.

- General Public: **Twitter**.
 - Very widely used. No specification (free text).

VOEvent

Standard specification:

<u>http://www.ivoa.net/documents/VOEvent/</u> Current implementation: XML document.

VOEvent types:

- Observation (default type): Event already occurred.
- Prediction: Event will or may occur.
- Utility: Event is a instrumental change.

VOEvent structure:

- < Who> Identification of scientifically responsible Author
- < What> Event Characterization modeled by the Author
- < Where When> Space-Time Coordinates of the even
- <How> Instrument Configuration
- <Why> Initial Scientific Assessment
- <Citations> Follow-up Observations
- < Description> Human Oriented Content
- <Reference> External Content

• <who>

The author of the event = the PSWS team producing the prediction. Minimal content:

- Author ID (as registered in IVOA registry)

- Date

More complete content:

- Full description of author (name, phone, address)

Minimal

<Who>

<AuthorIVORN>ivo://uraniborg.hven/Tycho</AuthorIVORN>
<Date>1573-05-05T01:23:45Z</Date>
</Who>

Full

<who></who>	
<^	Author>
	<title>Rapid Telescope for Optical Response</title>
	<pre><shortname>Raptor</shortname></pre>
	<pre><logourl>http://www.raptor.lanl.gov/images/RAPTOR_patchLarge.jpg</logourl></pre>
	<contactname>Robert White</contactname>
	<contactemail>rwhite@lanl.gov</contactemail>
	<contactphone>+1 800 555 1212</contactphone>
</td <td>Author></td>	Author>
<d< td=""><td>Date>1573-05-05T01:23:45Z</td></d<>	Date>1573-05-05T01:23:45Z

• <what>

Event Characterization = the PSWS event types. List TBD by PSWS teams:

- CME
- CIR
- Meteor shower
- Fireball
- Lunar impact
- Cometary tail crossing
- Cometary activity
- High radiation on Mars (threshold TBD)
- Jupiter radio emissions
- Solar radio emissions
- Planetary Storm
- Planetary Lightning

- ...

• <wherewhen>

- target name (planet, satellite, comet, moon, spacecraft, rover...): use standard names!

- location (coordinate on target, or/and on sky at time of event)
- time range (min+max)
- List of coordinate systems (time scale + reference frame + spatial origin) to be compiled by PSWS teams:
 - UTC + Solar Carrington Coordinate + Heliocenter
 - UTC + HRTN + STEREO-A
 - SCET + HRTN + STEREO-A
 - UTC + Mars Planetographic + Mars

- ...

Coordination required with VESPA and IVOA on this list!

• <**how**> + <**why**>

- how = tool/model used to derive the prediction
- why = original event/observation used as input of "how" to derive prediction

- Example: Solar wind event propagated at Saturn from ACE data, derived by IRAP using C.Tao propagation model:
 - <who> = IRAP
 - <what> = CIR
 - <wherewhen> = UTC date at Saturn
 - <how> = C. Tao 1D-MHD propagation model
 - <why> = event observed by ACE at UTC date.

Architecture

- Author = each PSWS team
- Broker = 1 or a few teams installing the broker software
- Subscriber = whoever interested in PSWS events



Software

- Existing software:
 - Comet: <u>http://arxiv.org/abs/1409.4805</u> (most used)
 - Dakota: <u>http://voevent.dc3.com</u>
 - 4piSky: <u>http://4pisky.org/voevents/</u>
- Each PSWS data provider shall:
 - write a script that produce VOEvent XML files
 - install a VOEvent "Author" interface to send them to the PSWS broker(s)
- Obs. Paris will test "Comet" soon.
 NB: "Comet" can be run as "Author" or "Broker".

Outreach

- Link with Twitter ?

 Script could be set up to transform all VOEvent from PSWS into tweets.
 - PSWS "twitter" subscriber would receive all events and resend them on twitter.
 - Other social networks could be reached.

