VOEvent notices format discussion
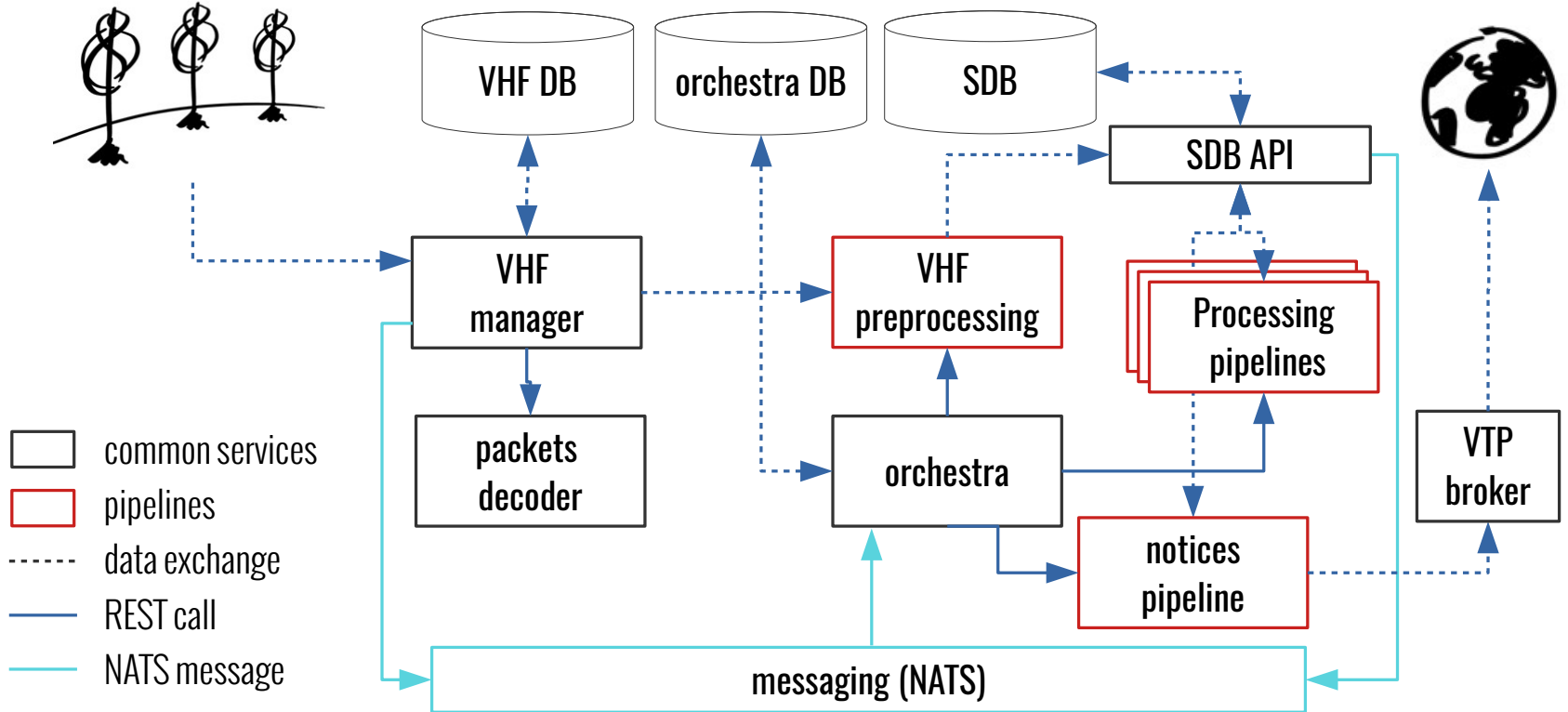
Henri Louvin (CEA)

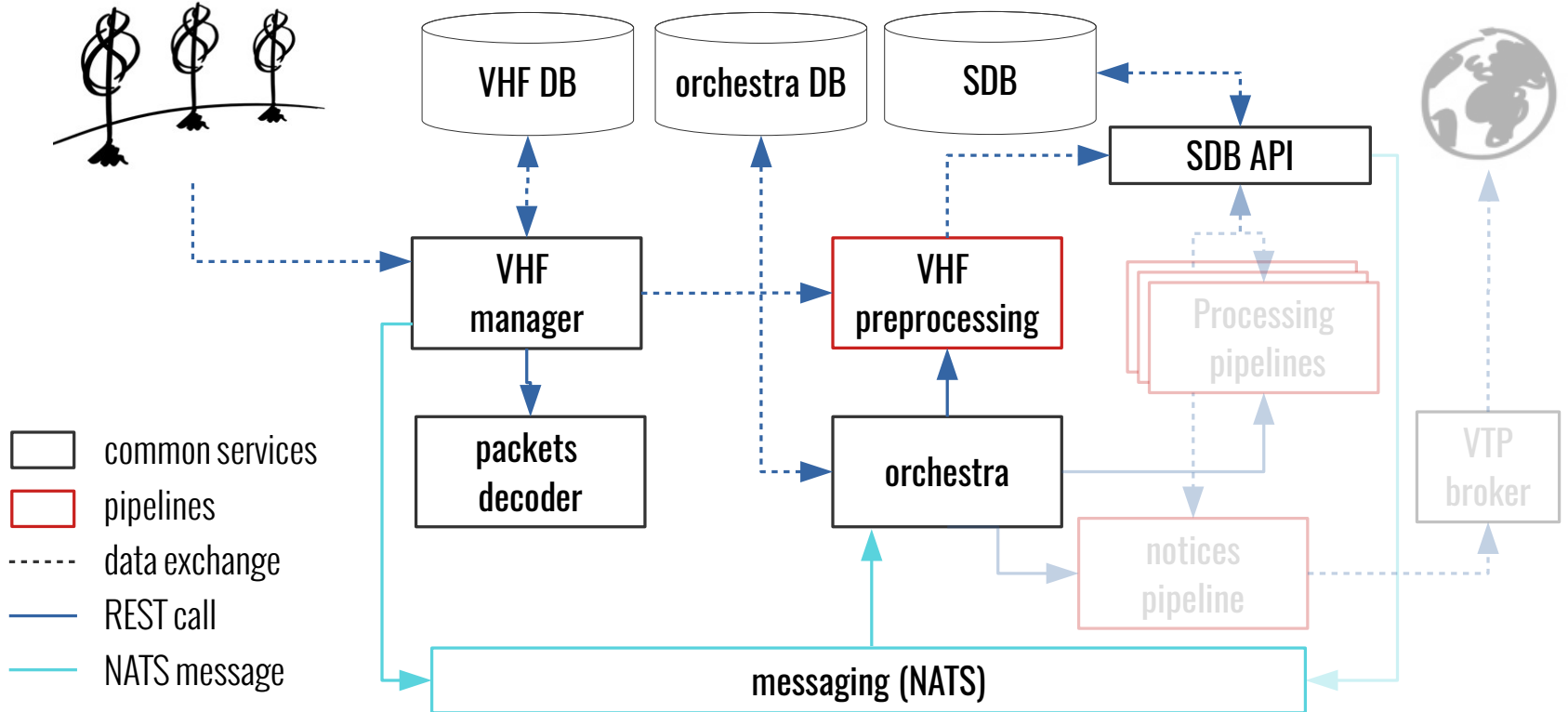# FSC real-time alert processing

Overview of the complete VHF data flow:
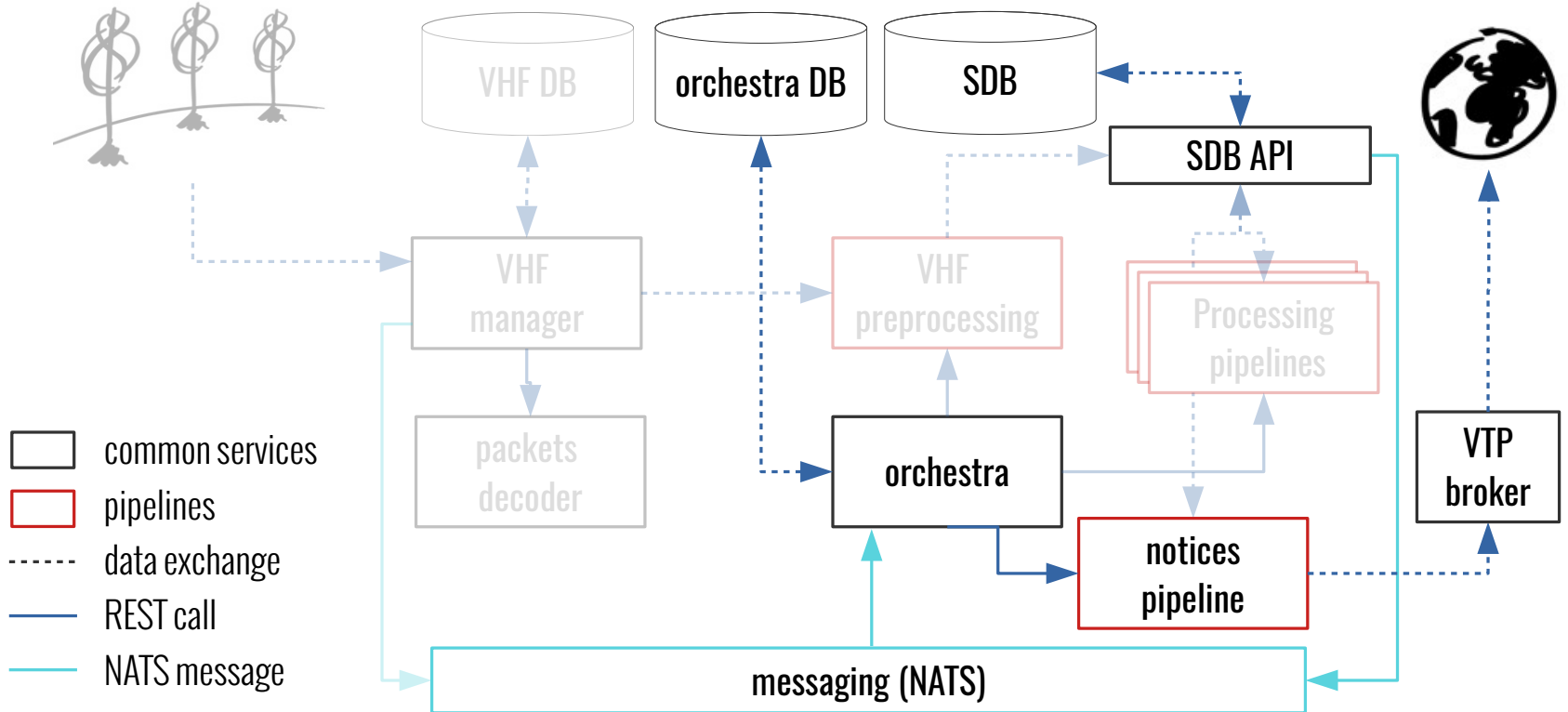
FSC real-time alert processing

Focus on the preprocessing step :

FSC real-time alert processing

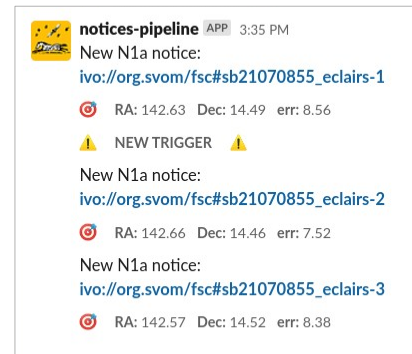Focus on the notices generation step :

FSC notice pipeline

The notice pipeline is responsible of producing notices in VOEvent format

- Is triggered **by the orchestrator** when Q1 products are available in SDB

- Uses the BURST_ID to **retrieve data from the SDB** in FITS format. In the case of an ECLAIRs alert loop, uses TT_ECL, QPO_ECL and QCL_ECL

- Generates notice(s) in **VOEvent format**

- **Broadcasts notices** using VTP protocol on a Comet broker located within FSC

- Stores broadcasted notices **in a dedicated voeventdb**

- Sends a message on the **Slack channel #voevent-notices** when new notices are broadcasted

FSC notices broker

All notices broadcasted through the FSC broker are visible on the notices webUI :
https://fsc.svom.org/notices/ (with access-control and permission handling)

Subscribe to the FSC broker

The FSC broker can be reached from anywhere in the world and is up and running 24/7 at

svom-fsc-0.lal.in2p3.fr:20099

Usage example using comet:
twistd -n comet --local-ivo=ivo://myivo --receive --remote=svom-fsc-0.lal.in2p3.fr:20099 --print-event

Svom VOE Notices and Circulars

level	description	Provided by	
N1	ECLAIRs localization (SNR above threshold)	FSC	
N1a	ECLAIRs localization (SNR below threshold)		
N1b	GRM-only detection (no localization)		
N2a	Burst parameters derived from subset of ECLAIRs and GRM data		Eclgrm-vhf
N2b	MXT localization and (only if platform slew)		mxt pip
N2c	VT localization (only if platform slew)		vhf pip
N2d	F-GFT results distributed by FSC C-GFT/GWAC results distributed by CSC	FSC or CSC	colibri pip
N3	- Final results for a validated trigger, or - Cancellation of previous notices for a false trigger, or - New burst detected by the ground data processing or confirmed after counterpart has been found (N1a, N1b)	FSC, CSC, GRM-IC	IS
C3	Similar to N3 but human readable		BA

Svom VOE Notice format - overview

```xml
Tilix: doclouvin@draconis:~/project/svom/vhf-simulator/data/ohp
1 <?xml version='1.0' encoding='UTF-8'?>
2 <voe:VOEvent xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:voe="http://www.ivoa.net/xml/VOEvent/v2.0"
3     xsi:schemaLocation="http://www.ivoa.net/xml/VOEvent/v2.0 http://www.ivoa.net/xml/VOEvent/VOEvent-v2.0.xsd"
4     version="2.0" role="observation" ivorn="ivo://org.svom/fsc#sb21110985_eclairs-1">
5     <Who>
6         <AuthorIVORN>ivo://org.svom/FSC</AuthorIVORN>
7         <Date>2021-11-09T20:30:01</Date>
8     </Who>
9     <What>
10        <Param name="Packet_Type" value="576" ucd="meta.id" dataType="int"/>
11        <Param name="msg_level" value="N1a" ucd="meta.code.class"/>
12        <Param name="msg_num" value="1" ucd="meta.id" dataType="int"/>
13        <Param name="burst_id" value="sb21110985" ucd="meta.id"/>
14        <Param name="instrument" value="eclairs" ucd="instr"/>
15        <Group name="Instrument_data">
16            <Param name="obs_id" value="9663787401" ucd="meta.id"/>
17            <Param name="slew_request" value="false" ucd="meta.code"/>
18            <Param name="sky_count" value="628.0" unit="ct" ucd="phot.count"/>
19            <Param name="det_count" value="0" unit="ct" ucd="phot.count"/>
20            <Param name="det_background" value="0" unit="ct" ucd="instr.background"/>
21            <Param name="quality" value="0" ucd="meta.code"/>
22            <Param name="attitude_q0" value="0.9782037182859046" ucd="instr.param"/>
23            <Param name="attitude_q1" value="0.0133011942168850" ucd="instr.param"/>
24            <Param name="attitude_q2" value="-0.1963387723302031" ucd="instr.param"/>
25            <Param name="attitude_q3" value="0.0662695273482941" ucd="instr.param"/>
26        </Group>
27        <Group name="Satellite_data">
28            <Param name="x" value="0.0" unit="m" ucd="pos.cartesian.x"/>
29            <Param name="y" value="0.0" unit="m" ucd="pos.cartesian.y"/>
30            <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31        </Group>
32    </What>
33    <WhereWhen>
34        <ObsDataLocation>
35            <ObservatoryLocation id="GEOLUN"/>
36            <ObservationLocation>
37                <AstroCoordSystem id="UTC-FK5-GEO"/>
38                <AstroCoords coord_system_id="UTC-FK5-GEO">
39                <Time unit="s">
40                    <TimeInstant>
41                        <ISOTime>2021-11-09T20:30:00</ISOTime>
42                    </TimeInstant>
43                </Time>
44                <Position2D unit="deg">
45                    <Name1>RA</Name1>
46                    <Name2>Dec</Name2>
47                    <Value2>
48                        <C1>9.7001841</C1>
49                        <C2>21.1595463</C2>
50                    </Value2>
51                    <Error2Radius>0.4815162342</Error2Radius>
52                </Position2D>
53                </AstroCoords>
54            </ObservationLocation>
55        </ObsDataLocation>
56    </WhereWhen>
57    <How><Reference uri="http://data.svom.fr/FSC.rtml"/></How>
58    <Why importance="1." expires="2021-10-10T10:11:56">
59        <Inference probability="1.">
60            <Name>sb21110985</Name>
61            <Concept>process.variation.burst;em.gamma</Concept>
62        </Inference>
63        <Description>N1a notice (data from ECLAIRs)</Description>
64    </Why>
65 </voe:VOEvent>
```

Svom VOE Notice format - overview

```
Tilix: doclouvin@draconis:~/project/svom/vhf-simulator/data/ohp
1  <?xml version='1.0' encoding='UTF-8'?>
2  <voe:VOEvent xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:voe="http://www.ivoa.net/xml/VOEvent/v2.0"
3     xsi:schemaLocation="http://www.ivoa.net/xml/VOEvent/v2.0 http://www.ivoa.net/xml/VOEvent/VOEvent-v2.0.xsd"
4     version="2.0" role="observation" ivorn="ivo://org.svom/fsc#sb21110985_eclairs-1">
5  <Who>
6     <AuthorIVORN>ivo://org.svom/FSC</AuthorIVORN>
7     <Date>2021-11-09T20:30:01</Date>
8  </Who>
9  <What>
10    <Param name="Packet_Type" value="576" ucd="meta.id" dataType="int"/>
11    <Param name="msg_level" value="N1a" ucd="meta.code.class"/>
12    <Param name="msg_num" value="1" ucd="meta.id" dataType="int"/>
13    <Param name="burst_id" value="sb21110985" ucd="meta.id"/>
14    <Param name="instrument" value="eclairs" ucd="instr"/>
15    <Group name="Instrument_data">
16       <Param name="obs_id" value="9663787401" ucd="meta.id"/>
17       <Param name="slew_request" value="false" ucd="meta.code"/>
18       <Param name="sky_count" value="628.0" unit="ct" ucd="phot.count"/>
19       <Param name="det_count" value="0" unit="ct" ucd="phot.count"/>
20       <Param name="det_background" value="0" unit="ct" ucd="instr.background"/>
21       <Param name="quality" value="0" ucd="meta.code"/>
22       <Param name="attitude_q0" value="0.9782037182859046" ucd="instr.param"/>
23       <Param name="attitude_q1" value="0.0133011942168850" ucd="instr.param"/>
24       <Param name="attitude_q2" value="-0.196338772302031" ucd="instr.param"/>
25       <Param name="attitude_q3" value="0.0662695273482941" ucd="instr.param"/>
26    </Group>
27    <Group name="Satellite_data">
28       <Param name="x" value="0.0" unit="m" ucd="pos.cartesian.x"/>
29       <Param name="y" value="0.0" unit="m" ucd="pos.cartesian.y"/>
30       <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31    </Group>
32  </What>
33  <WhereWhen>
34    <ObsDataLocation>
35       <ObservatoryLocation id="GEOLUN"/>
36       <ObservationLocation>
37          <AstroCoordSystem id="UTC-FK5-GEO"/>
38          <AstroCoords coord_system_id="UTC-FK5-GEO">
39             <Time unit="s">
40                <TimeInstant>
41                   <ISOTime>2021-11-09T20:30:00</ISOTime>
42                </TimeInstant>
43             </Time>
44             <Position2D unit="deg">
45                <Name1>RA</Name1>
46                <Name2>Dec</Name2>
47                <Value2>
48                   <C1>9.7001841</C1>
49                   <C2>21.1595463</C2>
50                </Value2>
51                <Error2Radius>0.4815162342</Error2Radius>
52             </Position2D>
53          </AstroCoords>
54       </ObservationLocation>
55    </ObsDataLocation>
56  </WhereWhen>
57  <How><Reference uri="http://data.svom.fr/FSC.rtml"/></How>
58  <Why importance="1." expires="2021-10-10T10:11:56">
59     <Inference probability="1.">
60        <Name>sb21110985</Name>
61        <Concept>process.variation.burst;em.gamma</Concept>
62     </Inference>
63     <Description>N1a notice (data from ECLAIRs)</Description>
64  </Why>
65  </voe:VOEvent>
```

IVORN
notice identifier

<Who>
author details

<What>
notice context

<Where>
burst localization

Svom VOE Notice format - WhereWhen

Svom VOE Notice format - WhereWhen


```
Tilix: doclouvin@draconis:~/project/svom/vhf-simulator/data/ohp
30              <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31          </Group>
32      </What>
33      <WhereWhen>
34          <ObsDataLocation>
35              <ObservatoryLocation id="GEOLUN"/>
36              <ObservationLocation>
37                  <AstroCoordSystem id="UTC-FK5-GEO"/>
38                  <AstroCoords coord_system_id="UTC-FK5-GEO">
39                      <Time unit="s">
40                          <TimeInstant>
41                              <ISOTime>2021-11-09T20:30:00</ISOTime>
42                          </TimeInstant>
43                      </Time>
44                      <Position2D unit="deg">
45                          <Name1>RA</Name1>
46                          <Name2>Dec</Name2>
47                          <Value2>
48                              <C1>9.7001841</C1>
49                              <C2>21.1595463</C2>
50                          </Value2>
51                          <Error2Radius>0.4815162342</Error2Radius>
52                      </Position2D>
53                  </AstroCoords>
54              </ObservationLocation>
55          </ObsDataLocation>
56      </WhereWhen>
57      <How><Reference uri="http://data.svom.fr/FSC.rtml"/></How>
58      <Why importance="1." expires="2021-10-10T10:11:56">
59          <Inference probability="1.">
60              <Name>sb21110985</Name>
61              <Concept>process.variation.burst;em.gamma</Concept>
62          </Inference>
63          <Description>N1a notice (data from ECLAIRs)</Description>
64      </Why>
65 </voe:VOEvent>
```

STANDARD: Burst date
ISO date of the burst

NORMAL   ⑂ master⑂   1-ZTF21aciwkzc_startnight/notice_model.xml   xml   utf-8[unix]   100% ☰   65/65 **ln** : 14

Svom VOE Notice format - WhereWhen


```
Tilix: doclouvin@draconis:~/project/svom/vhf-simulator/data/ohp
30              <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31          </Group>
32      </What>
33      <WhereWhen>
34          <ObsDataLocation>
35              <ObservatoryLocation id="GEOLUN"/>
36              <ObservationLocation>
37                  <AstroCoordSystem id="UTC-FK5-GEO"/>
38                  <AstroCoords coord_system_id="UTC-FK5-GEO">
39                      <Time unit="s">
40                          <TimeInstant>
41                              <ISOTime>2021-11-09T20:30:00</ISOTime>
42                          </TimeInstant>
43                      </Time>
44                      <Position2D unit="deg">
45                          <Name1>RA</Name1>
46                          <Name2>Dec</Name2>
47                          <Value2>
48                              <C1>9.7001841</C1>
49                              <C2>21.1595463</C2>
50                          </Value2>
51                          <Error2Radius>0.4815162342</Error2Radius>
52                      </Position2D>
53                  </AstroCoords>
54              </ObservationLocation>
55          </ObsDataLocation>
56      </WhereWhen>
57      <How><Reference uri="http://data.svom.fr/FSC.rtml"/></How>
58      <Why importance="1." expires="2021-10-10T10:11:56">
59          <Inference probability="1.">
60              <Name>sb21110985</Name>
61              <Concept>process.variation.burst;em.gamma</Concept>
62          </Inference>
63          <Description>N1a notice (data from ECLAIRs)</Description>
64      </Why>
65 </voe:VOEvent>
```

STANDARD: Burst date
ISO date of the burst

STANDARD: Position
RA/Dec/Err in degrees

NORMAL   ⌥ master   1-ZTF21aciwkzc_startnight/notice_model.xml   xml   utf-8[unix]   100%   65/65 ln : 14

Svom VOE Notice format - What

```xml
 1 <?xml version='1.0' encoding='UTF-8'?>
 2 <voe:VOEvent xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:voe="http://www.ivoa.net/xml/VOEvent/v2.0"
 3     xsi:schemaLocation="http://www.ivoa.net/xml/VOEvent/v2.0 http://www.ivoa.net/xml/VOEvent/VOEvent-v2.0.xsd"
 4     version="2.0" role="observation" ivorn="ivo://org.svom/fsc#sb21110985_eclairs-1">
 5     <Who>
 6         <AuthorIVORN>ivo://org.svom/FSC</AuthorIVORN>
 7         <Date>2021-11-09T20:30:01</Date>
 8     </Who>
 9     <What>
10         <Param name="Packet_Type" value="576" ucd="meta.id" dataType="int"/>
11         <Param name="msg_level" value="N1a" ucd="meta.code.class"/>
12         <Param name="msg_num" value="1" ucd="meta.id" dataType="int"/>
13         <Param name="burst_id" value="sb21110985" ucd="meta.id"/>
14         <Param name="instrument" value="eclairs" ucd="instr"/>
15         <Group name="Instrument_data">
16             <Param name="obs_id" value="9663787401" ucd="meta.id"/>
17             <Param name="slew_request" value="false" ucd="meta.code"/>
18             <Param name="sky_count" value="628.0" unit="ct" ucd="phot.count"/>
19             <Param name="det_count" value="0" unit="ct" ucd="phot.count"/>
20             <Param name="det_background" value="0" unit="ct" ucd="instr.background"/>
21             <Param name="quality" value="0" ucd="meta.code"/>
22             <Param name="attitude_q0" value="0.9782037182859046" ucd="instr.param"/>
23             <Param name="attitude_q1" value="0.0133011942168850" ucd="instr.param"/>
24             <Param name="attitude_q2" value="-0.196338772302031" ucd="instr.param"/>
25             <Param name="attitude_q3" value="0.0662695273482941" ucd="instr.param"/>
26         </Group>
27         <Group name="Satellite_data">
28             <Param name="x" value="0.0" unit="m" ucd="pos.cartesian.x"/>
29             <Param name="y" value="0.0" unit="m" ucd="pos.cartesian.y"/>
30             <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31         </Group>
32     </What>
33     <WhereWhen>
34         <ObsDataLocation>
35             <ObservatoryLocation id="GEOLUN"/>
36             <ObservationLocation>
```

Svom VOE Notice format - What


```
Tilix: doclouvin@draconis:~/project/svom/vhf-simulator/data/ohp
1  <?xml version='1.0' encoding='UTF-8'?>
2  <voe:VOEvent xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:voe="http://www.ivoa.net/xml/VOEvent/v2.0"
3      xsi:schemaLocation="http://www.ivoa.net/xml/VOEvent/v2.0 http://www.ivoa.net/xml/VOEvent/VOEvent-v2.0.xsd"
4      version="2.0" role="observation" ivorn="ivo://org.svom/fsc#sb21110985_eclairs-1">
5      <Who>
6          <AuthorIVORN>ivo://org.svom/FSC</AuthorIVORN>
7          <Date>2021-11-09T20:30:01</Date>
8      </Who>
9      <What>
10         <Param name="Packet_Type" value="576" ucd="meta.id" dataType="int"/>
11         <Param name="msg_level" value="N1a" ucd="meta.code.class"/>
12         <Param name="msg_num" value="1" ucd="meta.id" dataType="int"/>
13         <Param name="burst_id" value="sb21110985" ucd="meta.id"/>
14         <Param name="instrument" value="eclairs" ucd="instr"/>
15         <Group name="Instrument_data">
16             <Param name="obs_id" value="9663787401" ucd="meta.id"/>
17             <Param name="slew_request" value="false" ucd="meta.code"/>
18             <Param name="sky_count" value="628.0" unit="ct" ucd="phot.count"/>
19             <Param name="det_count" value="0" unit="ct" ucd="phot.count"/>
20             <Param name="det_background" value="0" unit="ct" ucd="instr.background"/>
21             <Param name="quality" value="0" ucd="meta.code"/>
22             <Param name="attitude_q0" value="0.9782037182859046" ucd="instr.param"/>
23             <Param name="attitude_q1" value="0.0133011942168850" ucd="instr.param"/>
24             <Param name="attitude_q2" value="-0.196338772302031" ucd="instr.param"/>
25             <Param name="attitude_q3" value="0.0662695273482941" ucd="instr.param"/>
26         </Group>
27         <Group name="Satellite_data">
28             <Param name="x" value="0.0" unit="m" ucd="pos.cartesian.x"/>
29             <Param name="y" value="0.0" unit="m" ucd="pos.cartesian.y"/>
30             <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31         </Group>
32     </What>
33     <WhereWhen>
34         <ObsDataLocation>
35             <ObservatoryLocation id="GEOLUN"/>
36             <ObservationLocation>
```

STANDARD(ish): Context
Packet_Type (GCN standard) → type of notice
msg_level (Svom) → Svom notice level
msg_num (standard-ish) → message number
for this alert
burst_id (Svom) → alert identifier
instrument (Svom) → instrument that took the data

```
NORMAL    ∠ master₡    1-ZTF21aciwkzc_startnight/notice_model.xml          xml    utf-8[unix]    55% ☰    36/65 ln : 33
```

Svom VOE Notice format - What

```
Tilix: doclouvin@draconis:~/project/svom/vhf-simulator/data/ohp

1  <?xml version='1.0' encoding='UTF-8'?>
2  <voe:VOEvent xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:voe="http://www.ivoa.net/xml/VOEvent/v2.0"
3      xsi:schemaLocation="http://www.ivoa.net/xml/VOEvent/v2.0 http://www.ivoa.net/xml/VOEvent/VOEvent-v2.0.xsd"
4      version="2.0" role="observation" ivorn="ivo://org.svom/fsc#sb21110985_eclairs-1">
5      <Who>
6          <AuthorIVORN>ivo://org.svom/FSC</AuthorIVORN>
7          <Date>2021-11-09T20:30:01</Date>
8      </Who>
9      <What>
10         <Param name="Packet_Type" value="576" ucd="meta.id" dataType="int"/>
11         <Param name="msg_level" value="N1a" ucd="meta.code.class"/>
12         <Param name="msg_num" value="1" ucd="meta.id" dataType="int"/>
13         <Param name="burst_id" value="sb21110985" ucd="meta.id"/>
14         <Param name="instrument" value="eclairs" ucd="instr"/>
15         <Group name="Instrument_data">
16             <Param name="obs_id" value="9663787401" ucd="meta.id"/>
17             <Param name="slew_request" value="false" ucd="meta.code"/>
18             <Param name="sky_count" value="628.0" unit="ct" ucd="phot.count"/>
19             <Param name="det_count" value="0" unit="ct" ucd="phot.count"/>
20             <Param name="det_background" value="0" unit="ct" ucd="instr.background"/>
21             <Param name="quality" value="0" ucd="meta.code"/>
22             <Param name="attitude_q0" value="0.9782037182859046" ucd="instr.param"/>
23             <Param name="attitude_q1" value="0.0133011942168850" ucd="instr.param"/>
24             <Param name="attitude_q2" value="-0.196338772302031" ucd="instr.param"/>
25             <Param name="attitude_q3" value="0.0662695273482941" ucd="instr.param"/>
26         </Group>
27         <Group name="Satellite_data">
28             <Param name="x" value="0.0" unit="m" ucd="pos.cartesian.x"/>
29             <Param name="y" value="0.0" unit="m" ucd="pos.cartesian.y"/>
30             <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31         </Group>
32     </What>
33     <WhereWhen>
34         <ObsDataLocation>
35             <ObservatoryLocation id="GEOLUN"/>
36             <ObservationLocation>

NORMAL    ∠ master⁵    1-ZTF21aciwkzc_startnight/notice_model.xml        xml    utf-8[unix]    55% ☰   36/65 ln : 33
```

STANDARD(ish): Context
Packet_Type (GCN standard) → type of notice
msg_level (Svom) → Svom notice level
msg_num (standard-ish) → message number
for this alert
burst_id (Svom) → alert identifier
instrument (Svom) → instrument that took the data

Svom-specifics
obs_id → Svom internal observation ID
slew_request → Indicator of ECLAIRs slew request

Svom VOE Notice format - What


```
 1  <?xml version='1.0' encoding='UTF-8'?>
 2  <voe:VOEvent xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:voe="http://www.ivoa.net/xml/VOEvent/v2.0"
 3      xsi:schemaLocation="http://www.ivoa.net/xml/VOEvent/v2.0 http://www.ivoa.net/xml/VOEvent/VOEvent-v2.0.xsd"
 4      version="2.0" role="observation" ivorn="ivo://org.svom/fsc#sb21110985_eclairs-1">
 5      <Who>
 6          <AuthorIVORN>ivo://org.svom/FSC</AuthorIVORN>
 7          <Date>2021-11-09T20:30:01</Date>
 8      </Who>
 9      <What>
10          <Param name="Packet_Type" value="576" ucd="meta.id" dataType="int"/>
11          <Param name="msg_level" value="N1a" ucd="meta.code.class"/>
12          <Param name="msg_num" value="1" ucd="meta.id" dataType="int"/>
13          <Param name="burst_id" value="sb21110985" ucd="meta.id"/>
14          <Param name="instrument" value="eclairs" ucd="instr"/>
15          <Group name="Instrument_data">
16              <Param name="obs_id" value="9663787401" ucd="meta.id"/>
17              <Param name="slew_request" value="false" ucd="meta.code"/>
18              <Param name="sky_count" value="628.0" unit="ct" ucd="phot.count"/>
19              <Param name="det_count" value="0" unit="ct" ucd="phot.count"/>
20              <Param name="det_background" value="0" unit="ct" ucd="instr.background"/>
21              <Param name="quality" value="0" ucd="meta.code"/>
22              <Param name="attitude_q0" value="0.9782037182859046" ucd="instr.param"/>
23              <Param name="attitude_q1" value="0.0133011942168850" ucd="instr.param"/>
24              <Param name="attitude_q2" value="-0.196338772302031" ucd="instr.param"/>
25              <Param name="attitude_q3" value="0.0662695273482941" ucd="instr.param"/>
26          </Group>
27          <Group name="Satellite_data">
28              <Param name="x" value="0.0" unit="m" ucd="pos.cartesian.x"/>
29              <Param name="y" value="0.0" unit="m" ucd="pos.cartesian.y"/>
30              <Param name="z" value="0.0" unit="m" ucd="pos.cartesian.z"/>
31          </Group>
32      </What>
33      <WhereWhen>
34          <ObsDataLocation>
35              <ObservatoryLocation id="GEOLUN"/>
36              <ObservationLocation>
```

Now what?
Most of those fields where defined by me and are derived from the scientific products created from ECLAIRs alert packets.

Are they useful?
Are some information missing?
Should they be grouped differently?
What about other notice levels?

Which of those should appear in GCN notices?

… discuss.