VOEvent

Diamonds and firehose

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LSST - the fire hose

For the purposes of LSST data flow,
“transient” means “difference image source”.

The DPD states that at SNR=5, the expected average number of difference image sources per visit is ~2000.

Project policy is to scope the system to handle 10^4 transients per 30 second visit.

Note – this is the raw unfiltered event stream generated by the difference engine.

Only a few brokers will have access to this.

Most clients will subscribe to filtered streams from downstream brokers.

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LSST - the fire hose

Based on raw data volumes, we can make some basic technical assumptions.

Acknowledging every individual event is not an option.

Event sources will need to be 'robust' with slow or unresponsive clients.

Asking the server to replay the last 10 minutes is not an option.

Is it realistic to try to guarantee delivery of every event to every subscriber ?

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LIGO – the diamonds

Estimates vary, but most people expect them to be fairly rare.

Each one has the potential for a major discovery.

A replay facility would be extremely useful.

Missing **the one** event because your broker was offline for a few minutes could ruin your whole week.

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LIGO – the diamonds

Based on raw data volumes, we can make some basic technical assumptions.

Guaranteed delivery means every event needs acknowledging.

Event sources will need to be tolerant of slow or unresponsive clients.

Replay facility means the server needs to keep a cache of recent events.

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Is this one protocol ?

LSST and LIGO represent the extremes.

What about the cases in between.

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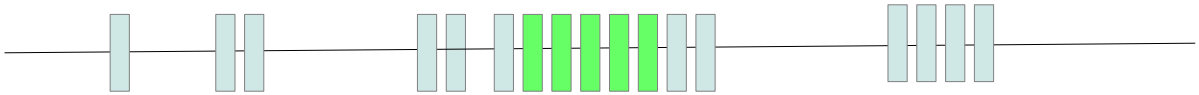
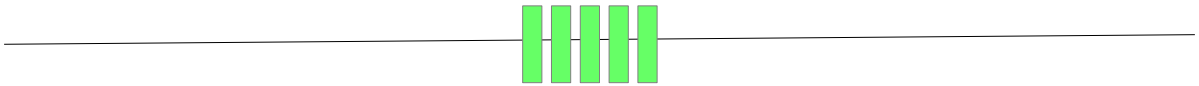
LSST filtered stream

A broker that filters out 98% of the events, and only passes on really interesting ones.



If the 'interesting' events occur close together, in the same/similar region of the sky.



Result is long periods of quiet followed by short periods of high activity.

Super special things may be rare.

But super special *candidates* may cluster in areas with similar conditions that trigger the AI filters in the same way.

Are super special *candidates* high value events ?

Do we need to guarantee delivery of high probability candidates ?

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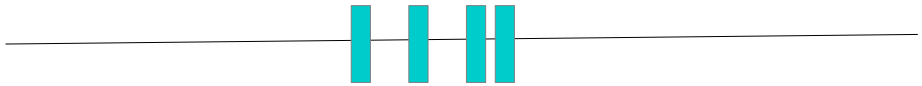
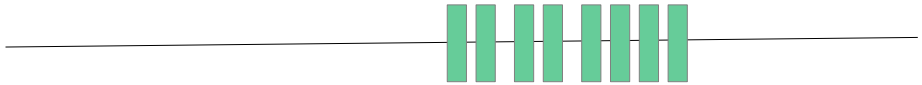
LIGO – follow-up cascade

One event triggers 10 .. 100 institutes to run follow-up observations.

Each institute performs 10 .. ? follow up observations.



Each follow up observation may in turn trigger additional events.



Result is long periods of quiet followed by short periods of high activity.

If the follow up observations are automated, then could this cause a chain reaction resulting in a short lived event storm.

Is it realistic to try to guarantee delivery of every event to every subscriber ?

2 orders of magnitude amplification ?
May change when events are public.

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Digital signatures

If we create complex networks of automated follow up observations all linked to each other.

How vulnerable will the automated system be to fake events ?

What would be the cost in resources, time and money of responding to a malformed event ?

Adding a digital signature is technically possible.
It costs a bit more in design and development time.
It costs a bit more in cpu time.

It it worth it ?

Not an issue yet, perhaps when we have public event feeds.

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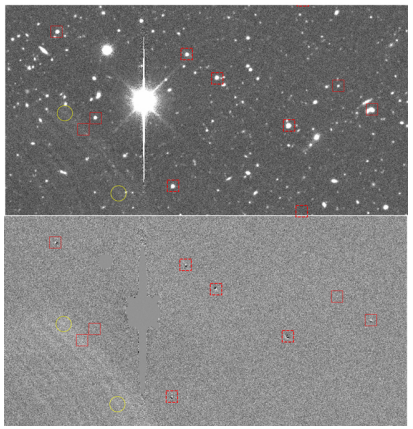
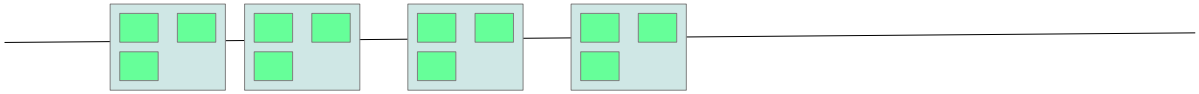


Images in events

If we include images in our events it makes our event packets very large ~1M byte.



Makes sense if the images are vital for interpreting the event, and everyone will need to see them anyway.

Alternatively, keep the images on a server and send very small events with URLs pointing to the images.

Makes sense if only a few people will need to see the images. High load on the server is everyone asks for the images.

Interesting to see the impact of public GW events ..

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Groups like Cleopatra may start to grow common definitions for content, filters and event types.

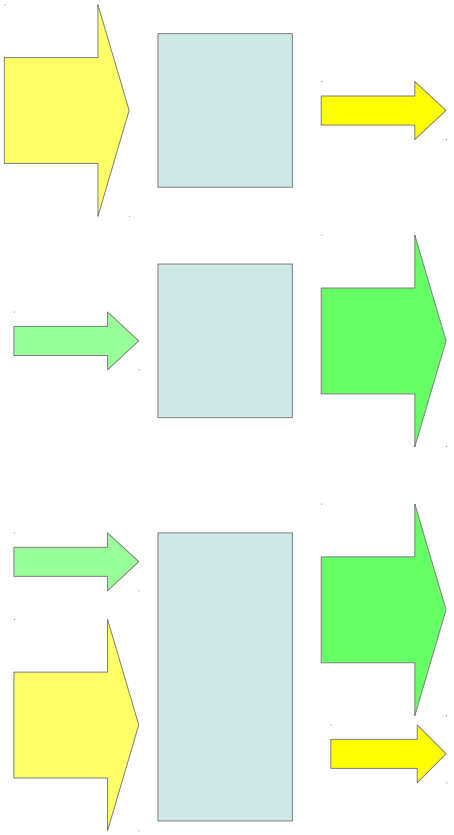
Discovery ...

How do we describe event streams so that people can find them.

How do we describe an event stream that filters LSST data to produce super special candidates ?

How do we describe an event stream that contains follow up observations of LIGO events ?

How do we describe a broker that provides both the filtered LSST and LIGO follow up events ?



IVOA can help as a forum for discussions

IVOA can help with standard vocabularies

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Flexible broker

Listens to the LSST stream

Webservice API for combining filters together

Create a custom stream for each client

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The next steps ..

More questions than answers at the moment.

Where VOEvent and VTP go from here needs
to be driven by science use cases.

- Existing users with feedback on their experiences.
- New projects with new requirements.

Time domain interest group <voevent@ivoa.net>

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