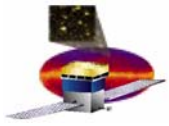# GLAST Large Area Telescope Transient Communications

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**GLAST Large Area Telescope
Multiwavelength Coordinator**

1. Importance of fast alerts

2. VO-GCN: one possible communications approach

Introduction

GLAST needs to handle two types of transients efficiently in order to maximize the scientific return:

- **Gamma-ray bursts (GRB)**

    - **BACODINE, now GRB Coordinates Network (GCN), is a success story. Scott Barthelmy deserves a lot of credit for this.** It has allowed rapid exchange of information about gamma-ray bursts.

    - **For GLAST studies of gamma-ray bursts, GCN is still the way to go.**

- **Other transients**

    - Blazar flares, possible flares from microquasars, and other new types of flare are possible. The time scale is longer and intensity is smaller than GRBs. Probably not detected on board GLAST.

   - **We need some sort of automated system to distribute information about such transients.**
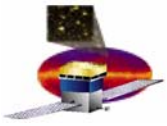
Why An Automated System?

- ## The GCN example:

  - **GCN alerts are now used routinely by many observatories, resulting in rapid follow-up of gamma-ray burst detections to determine redshifts and start tracking afterglows quickly. The science return has been remarkable.**

- ## A principal reason for this success has been the emergence of robotic telescopes.

  - **In the EGRET era, many flare follow-up opportunities were lost because people were not in place to handle the observations.**

  - **Telephone, e-mail, IAU Circulars, Astronomer's Telegrams, etc. are all hit-or-miss and can be slow relative to the desired response time.**
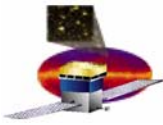
VO-GCN – One Possible Communications Path

- ## VOEvent – the packet definition

  - VOEvent is the standard adopted by the International Virtual Observatory Association last November, defining the content and meaning of a packet for exchange of information about transient celestial events.

- ## VOEventNet - a communications network

  - VOEventNet uses the VOEvent packet to exchange information about transients

  - Currently carries information from OGLE, SDSS, ESSENCE, and GCN, distributing it as XML and RSS.

- ## VO-GCN – a proposed implementation for NASA

  - As the name implies, VO-GCN is connected to GCN
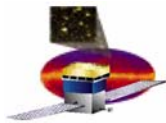
The VO-GCN Network

VOEvent Packet Flow for NASA Transient Alerts
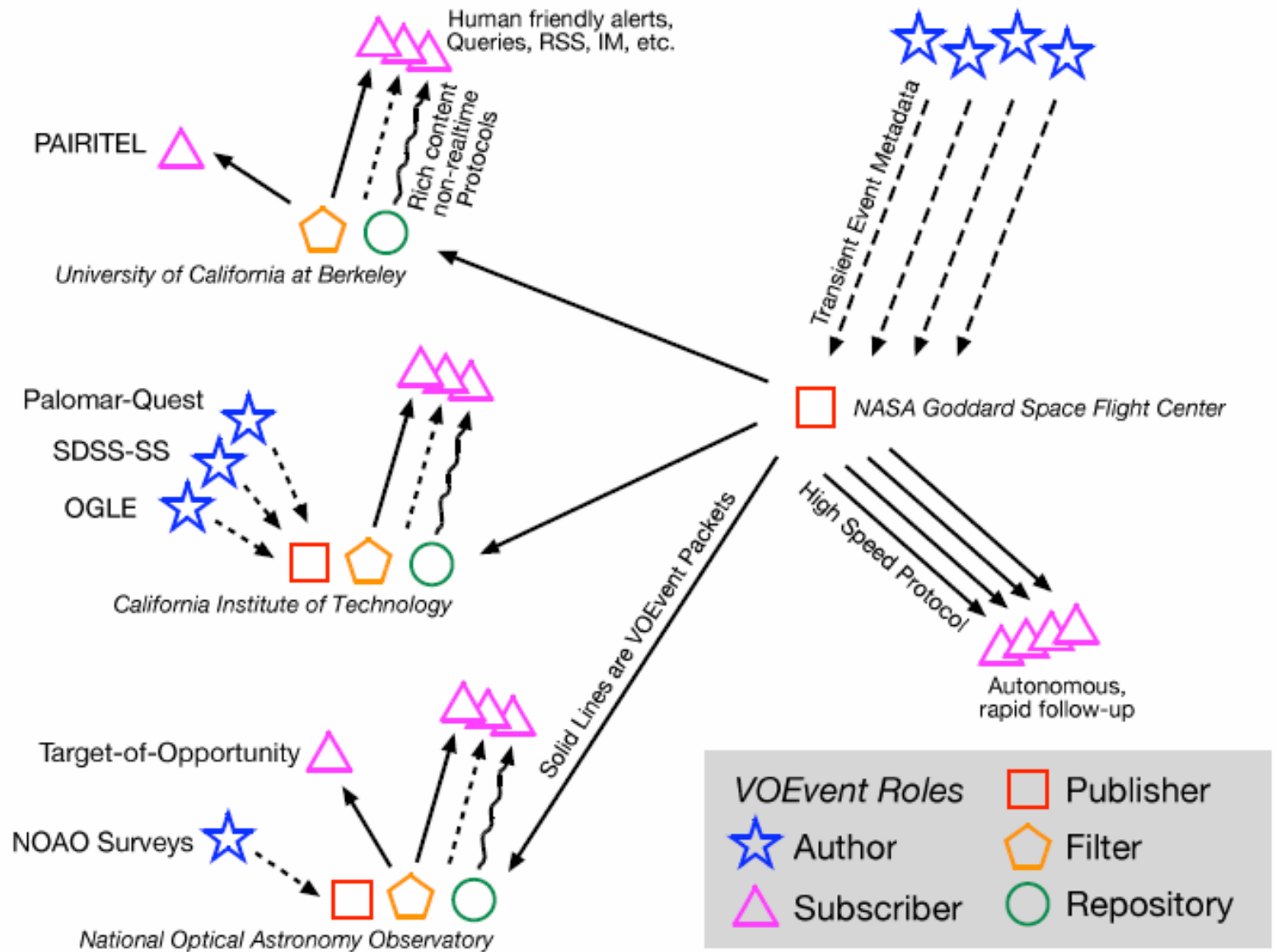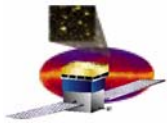
VO-GCN Operation

Note from Roy Williams of the VOEventNet Team:

Events from NASA missions, including GLAST, appear at GSFC and Scott Barthelmy will be supervising two networks, old (GCN) and in parallel the new (VO-GCN). A VOEvent packet is built for the event which contains:

-- A global identifier that can be used to retrieve the event
-- Who is the author
-- Where/when was the event in the sky
-- What are the parameters
-- How was it observed (instrument config)
-- Why did this event occur (i.e. hypothesis with probability)
-- Citation to other observations of the same event
-- References to other data
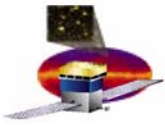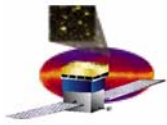
GUC Actions?

- **Be aware of VOEvent**

- **Talk to Joshua Bloom at the GLAST Symposium. He has a poster about VOEventNet.**

- **VO-GCN group has a proposal in to NASA now**

  The GUC could send the VO-GCN group a letter expressing interest (similar to the ones the GLAST Project and LAT team sent to radio astronomers in support of pulsar timing and blazar studies).
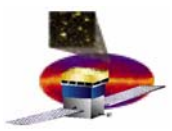
Backup

Description of VOEvent

VOEvent defines the content and meaning of a standard information packet for representing, transmitting, publishing and archiving the discovery of a transient celestial event, with the implication that timely follow-up is being requested. The objective is to motivate the observation of targets-of-opportunity, to drive robotic telescopes, to trigger archive searches, and to alert the community. VOEvent is focused on the reporting of photon events, but events mediated by disparate phenomena such as neutrinos, gravitational waves, and solar or atmospheric particle bursts may also be reported.

Structured data is used, rather than natural language, so that automated systems can effectively interpret VOEvent packets. Each packet may contain one or more of the "who, what, where, when & how" of a detected event, but in addition, may contain a hypothesis (a "why") regarding the nature of the underlying physical cause of the event. Citations to previous VOEvents may be used to place each event in its correct context. Proper curation is encouraged throughout each event's life cycle from discovery through successive follow-ups.

VOEvent packets gain persistent identifiers and are typically stored in databases reached via registries. VOEvent packets may therefore reference other packets in various ways. Subscribers, human or machine, receive immediate notification of events, based on previously defined criteria. Packets are required to be small and to be processed quickly. This standard does not define a transport layer or the design of clients, repositories, publishers or brokers; it does not cover policy issues such as who can publish, who can build a registry of events, who can subscribe to a particular registry, nor the intellectual property issues. http://www.ivoa.net/Documents/latest/VOEvent.html
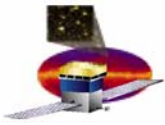
Description of VOEventNet

VOEventNet is a peer-to-peer cyberinfrastructure to enable rapid and federated observations of the dynamic night sky. VOEventNet is a network of telescopes and computers working synergistically, under the watchful eye of humans, to find and study interesting astronomical events. It includes a common language for describing transient events, generation of event streams from current surveys, publication, archiving and persistent identifiers for events; and transportation of events to interested subscribers, with all of this happening automatically in seconds or minutes after discovery.

http://voeventnet.caltech.edu/project_description.html