

Building Web-Database Applications with Django

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Django is



A: Famous guitarist Django Reinhardt

B: A technology to build "web-science"

C: Getting a job without flipping burgers

2-Lecture Plan

- Webapps and history
- Django in detail

- Example: Skyalert
- Deploy to the cloud – Google and Django
- Web services and the VO

What is a web-database application?

- Answer: almost all websites!
 - well past the era of static.html pages

THE DAILY PRINCETONIAN

Login | Create Account
Thursday, April 16, 2009

Google Custom Search

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

Advanced Search

The Prox: 20 Sweet: Animal Songs



Students perform in the dance by Alison Goldblatt '12 in the e... Body, Soul." For a review of the performed on Thursday, Friday please see the front page of to...

TOP STORIES

[Graduate students angered by transit cuts](#)

By Sophia Jih

The University's announcement last Thursday that it was reducing services of the TigerTransit system has

OPINION

[Do more than 'aspire'](#)
(Brendan Carroll)

[What I wish I'd known](#)
(Charlie Metzger)

Today's Paper



http://www.djangosites.org/



Sheppard and Lapsley Presbyterian University of Congo

UPRECO

Educating Christian Leaders for a New Congo



Home

Theology

Law

Faculty

Students

Campus

Partners

Needs

NEWS

[Study: Eliminating S diversity](#)

By Paige Kestenman

Eliminating standardized test s... admissions process would lead socioeconomically diverse unde according to a recent study by t sociology professor Thomas Esp Population Research statistical

[Entrepreneurs juggl](#)

Find out more about UPRECO

How to Support UPRECO

UPRECO is the Sheppard and Lapsley Presbyterian University of Congo. Founded in 1987, UPRECO is a leading university in the central part of the Democratic Republic of Congo (DRC). UPRECO grants undergraduate degrees in Theology and Law.



UPRECO Students

The mission of UPRECO is to educate leaders for the Congolese church and nation as Pastors, Educators, and Lawyers in a Christian environment.

Quick Facts

- **Founded** in 1897 as a Bible school in 1891 by Presbyterian missionaries. Became a school for preachers in 1962, accredited as a seminary in 1976, became a university in 1988 with the formation of the school of law.
- **Location:** Ndesha, near Kananga, a large city in central Congo (DRC). Ndesha is about 10 kilometers from Kananga, a province capitol of the Democratic Republic of Congo.
- **Number of students (2007-2008 school year):** 180

Faculty Update

Welcome to the UPRECO website!



We invite you to explore this website and find out more about UPRECO. One of the main goals of

UPRECO is to train Christian leaders to improve life in the Congo. We invite you to consider how you can help the people of Congo by supporting UPRECO.

Student Update

Students at UPRECO



Students are the heart of UPRECO. Most

http://www.djangosites.org/



Get the very latest news on your mobile

\$1,580* BEIJING/FUKUOKA HONG KONG/SHANGHAI

\$1,759* BANGALORE/CHENNAI COLOMBO/DELHI/MUMBAI

\$2,202* BARCELONA/LONDON MILAN/PARIS/ZURICH

[BOOK NOW](#)

*Low season Economy Class return ex AKL inclusive of taxes as at 26 Mar 09, conditions apply.

Blogs

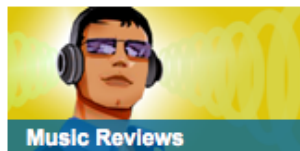
Blogs by subject

Featured Posts



Mel Gibson's alleged 'affair'
1:22PM Thursday April 16, 2009
The mystery woman alleged to be-divorced star Mel Gibson...

[Blogger Bites Back](#)



The Veils - Sun Gangs
3:59AM Thursday April 16, 2009
Delivers an intriguing, in-depth review of The Veils' best thus far. Review...

[Music Reviews](#)

Los Angeles Times | Data Desk

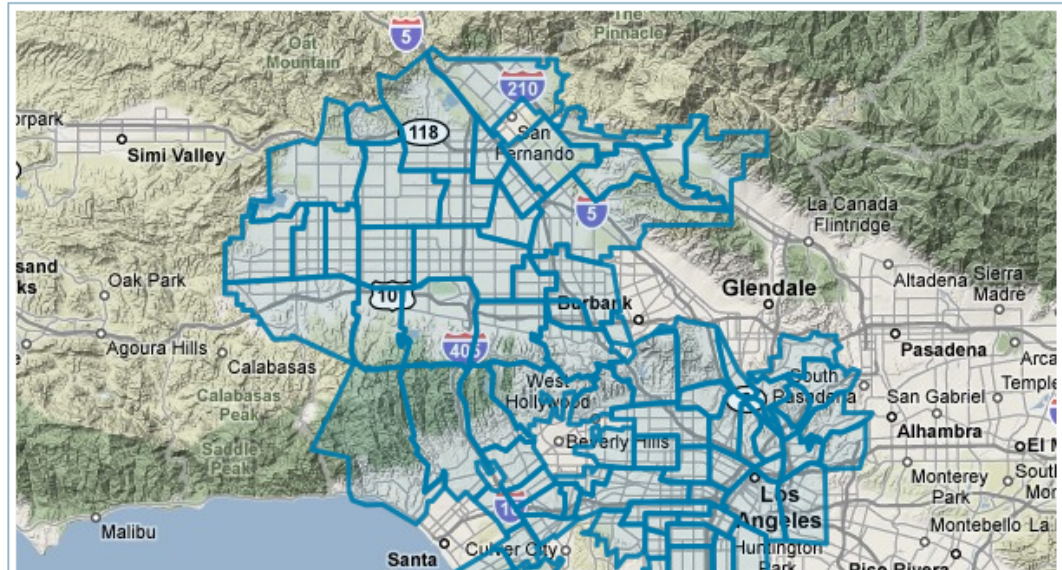
You are here: [LAT Home](#) > [California | Local](#) > [Data Desk](#) > [Mapping L.A.](#)



MAPPING L.A.

Neighborhoods

Select one of L.A.'s 87 neighborhoods



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you
2
with

Capita

Find

Search

Street

Select

- » Cent
- » Harb
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Track **Scheherazade Opus 35 by Nikolay...**

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Hall of Fame 2009

The nation's favourite classical works - as voted for by you - have been revealed. Take a look at the Top 300 in full.

Music



Odes to Joy

We've teamed up with the Radio Times to find your Odes to Joy – the pieces of music that brighten your day.



Venezuelan Spirit throughout the UK

The world renowned Simon Bolivar Youth Orchestra will reach further than the concert hall during its Southbank Residency...

[See all Music](#)

Behind the Scenes...



The MD's Blog

Classic FM's Managing Director takes you behind the scenes, updating you with his blog.



The New Releases Blog - 16 April

Experience the magic of the Simon Bolivar Youth Orchestra with their new disc of works by Tchaikovsky.

[See all Blogs](#)

Playlist Search

What was that track?

Day: Time:

[Full playlist](#)



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Web-database technology: a Personal History

Static pages

http forms and CGI

ASP and SQLServer

Coldfusion

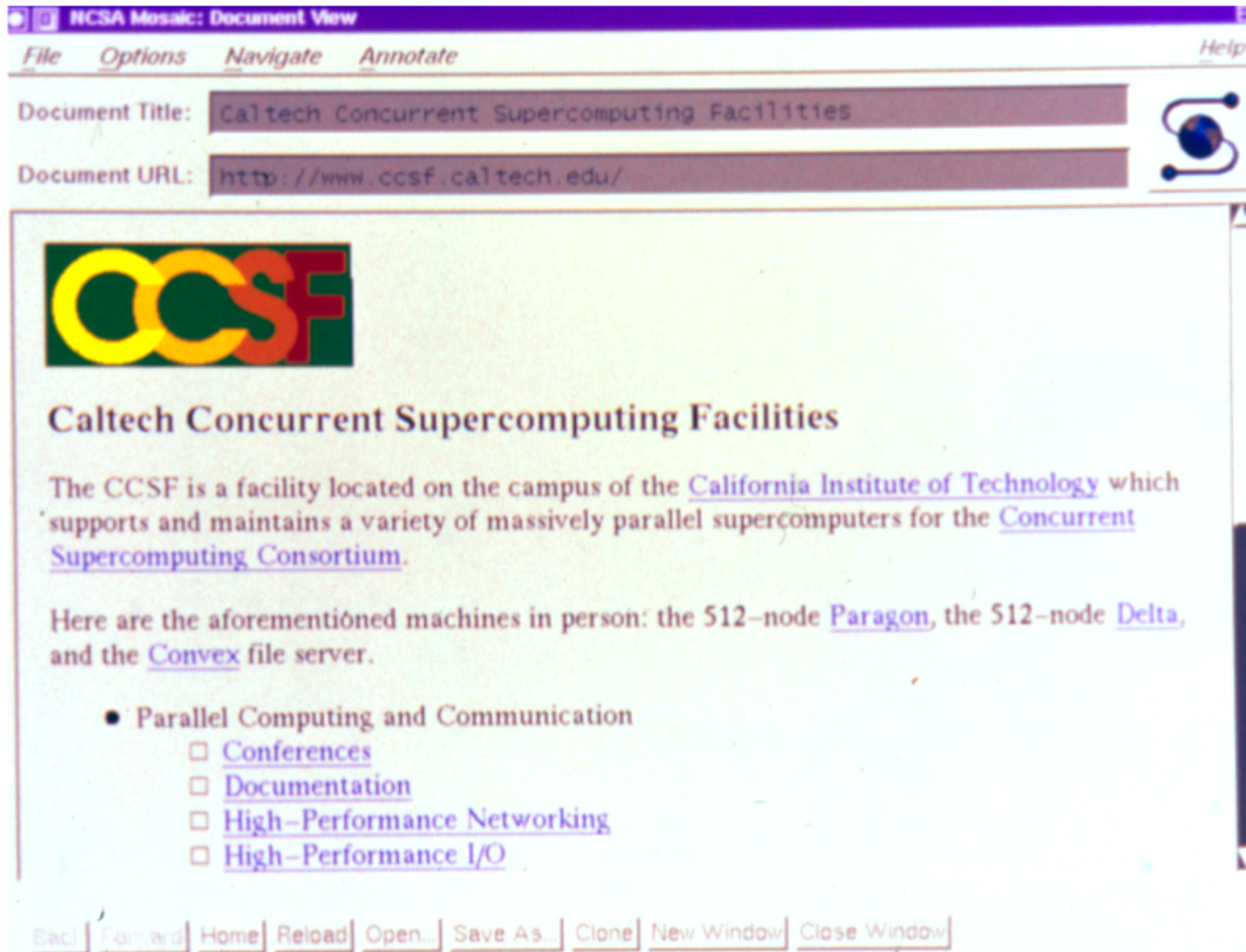
Java Servlets

CherryPy and YahooUI

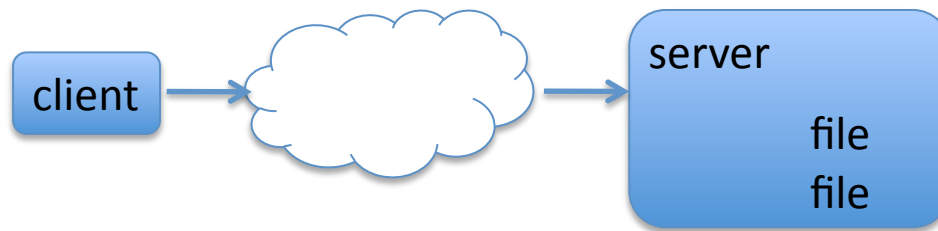
Javascript and AJAX

Django

1994: first caltech web



static files



1995: shopping!



cgi script



1996: science data access

Digital Puglia Synthetic Aperture Radar Atlas

Hyperlinked Finding Maps
Cities, Roads, Rivers, ...

Dynamic Datasets

Multichannel

1 to 8 channels

Format Selection

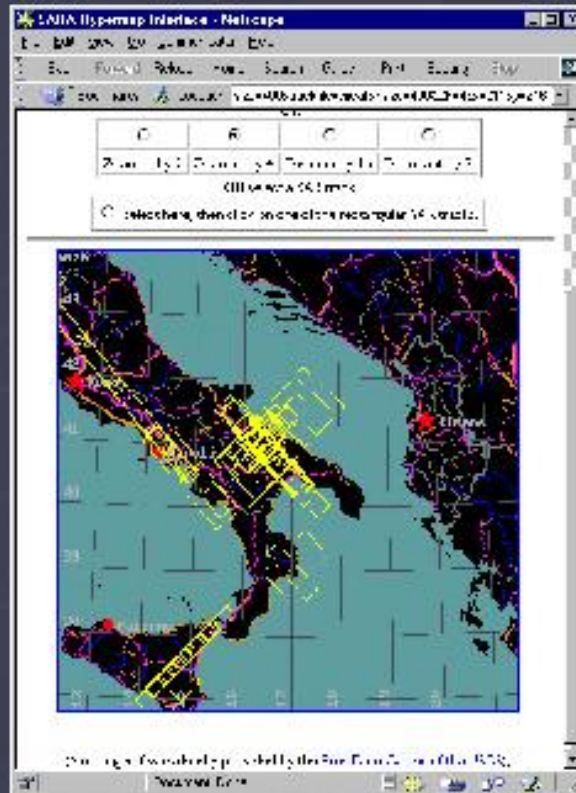
Jpeg

Portable Pixmap

Photoshop Multichannel

Processing Menu

Principle Components

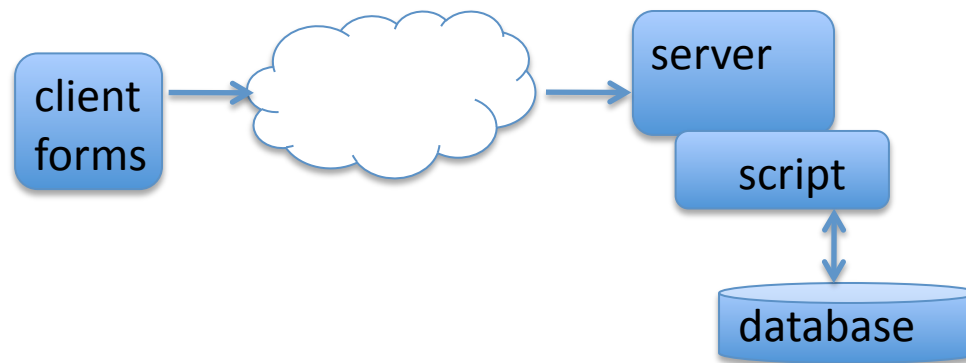


CGI scripts in C

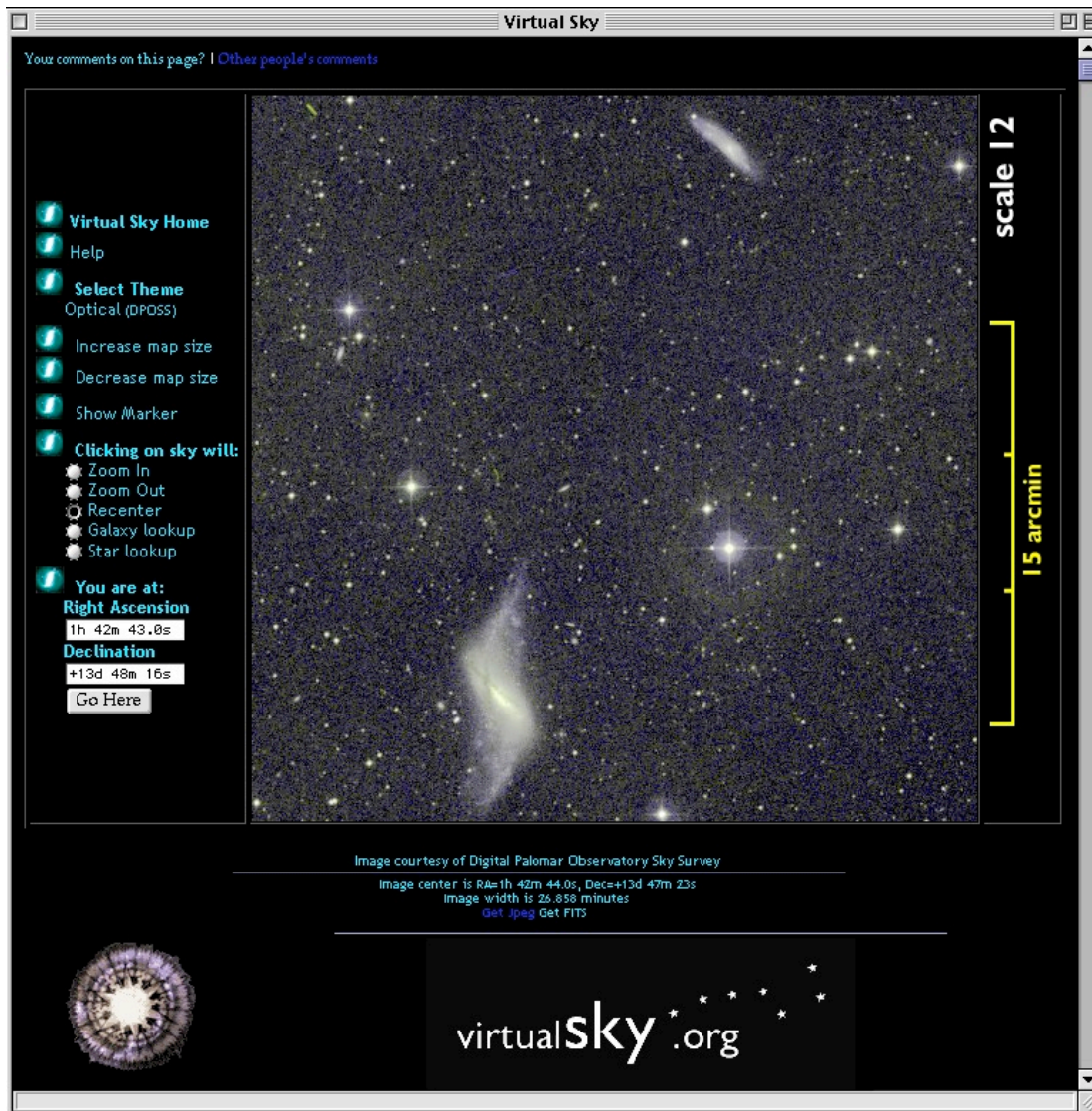
SQL and ODBC to get data

Makes HTML directly

cgi with database



2002: virtual sky



ASP and SQLServer
SQL to get data
HTML built directly

2002: coldfusion



- [Main Page](#)
- [User List](#)
- [Project List](#)

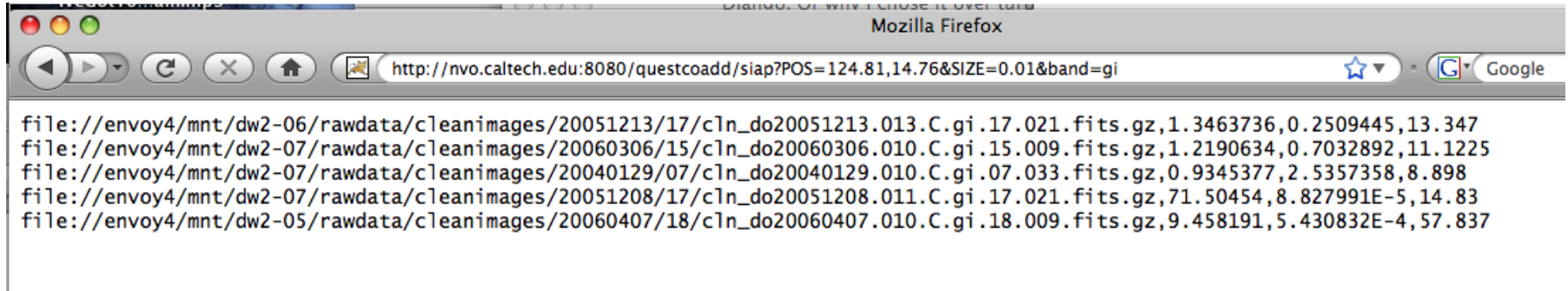
Project us-vo

Correct the information and click on "Save Changes", or ch

| | |
|----------------------------|--|
| ProjectID | us-vo |
| Leader First Name | Roy |
| Leader Last Name | Williams |
| Leader Email | roy@cacr.caltech.edu |
| Leader Username | roy |
| Duration (months) | 5 years |
| Date Approved | 2005/01/24 |
| Affiliation to CACR | Caltech |
| Requested Resources | cvs.cacr.caltech.edu |
| Title | National Virtual Observatory |
| Discipline | |
| Abstract | Users of <u>NVO</u> resources. |
| Status | Current <input type="button" value="v"/> |
| PGID | 25310 |
| Notes | Date: 2004/12/02 2005/01/27: <u>ProjectID</u> changed |

```
<cfquery name="projectresources" datasource="cacrusers">
SELECT ResourcesForProjects.prid,
ResourcesForProjects.ResourceName,
ResourcesForProjects.Allocation,
Resources.Notes
FROM Resources INNER JOIN ResourcesForProjects
ON Resources.Name = ResourcesForProjects.ResourceName
WHERE (ResourcesForProjects.prid)=#prid#;
</cfquery>
<hr>
<h1>Resources</h1>
This project is authorized for the following resources:<br>
....
<cfoutput query="projectresources">
<tr>
<td><b>#resourcename#</b> (#notes#)</a></td>
<td>#allocation#</td>
<td><a href=delresourceproj.cfm?resource=#...
</tr>
</cfoutput>
```


2005: java servlets



Servlets and Tomcat SQL to get data

```
String query = "select * from imgtbl I, frame F where "  
+ "I.logical = F.logical and "  
+ "centerra between " + ramin + " and " + ramax + " and "  
+ "centerdec between " + demin + " and " + demax
```

```
ResultSet rs = statement.executeQuery(query);  
if (!rs.next()) {  
    return abort("The query returned no results. It was: " + query);  
} else {  
    encode(response, rs);  
    while (rs.next())  
        encode(response, rs);
```

2007: CherryPy and YahooUI



VIM: Virtual Observatory Integration and Mining

Position list is from: / **New Hard XRB Candidates Identified by ClassX** /

Status: At Mon Dec 24 11:51:54 2007: Bench write enabled

This page is <http://nessi.cacr.caltech.edu/cgi-bin/vim.cgi?benchID=65849910012986899318407545103137>

| | | |
|---|----------------------------|---|
| Fetch Data | ▶ | Find Catalog Objects Near My Sky Positions Search radius, arcseconds: <input type="text" value="120"/> Catalog: <input type="text" value="The NASA/IPAC Extragalactic Database"/> New Table Name: <input type="text"/> Please be patient... <small>minutes to complete</small> |
| Mine Data | ▶ | |
| View Data | ▶ | |
| Download | ▶ | |
| Administer | ▶ | |
| Help | ▶ | |
| | | |
| Bench has 51 sources: below is from 1 to | | |
| sources | | |
| RAJ2000 | DEJ2000 | VIM_SOURCE |
| 0.35630 00h 01m 25.51s | 62.49440 +62d 29m 39.8s | J0001.4+622 |
| 50.88960 03h 23m 33.50s | 48.78880 +48d 47m 19.7s | J0323.5+4847 |
| 55.00000 03h 23m 33.50s | 48.78880 +48d 47m 19.7s | J0323.5+4847 |

2007: Javascript and AJAX

- Javascript: code runs in browser
- checking forms
 - fancy popups and effects
 - live tables instead of static
 - status of running jobs (AJAX)



NVO National Virtual Observatory

VIM: Visual Integration and Minir

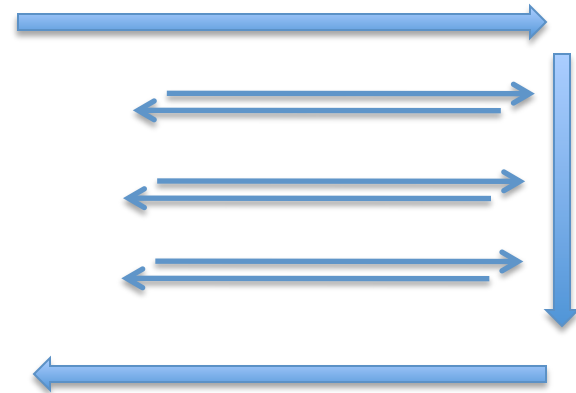
*Restart VIM NVO Home Help

(Source table has no description available)

This page is <http://envoy5.cacr.caltech.edu:8888/?benchID=65853621288102>

Fetch Data
Catalogs
Mine Data

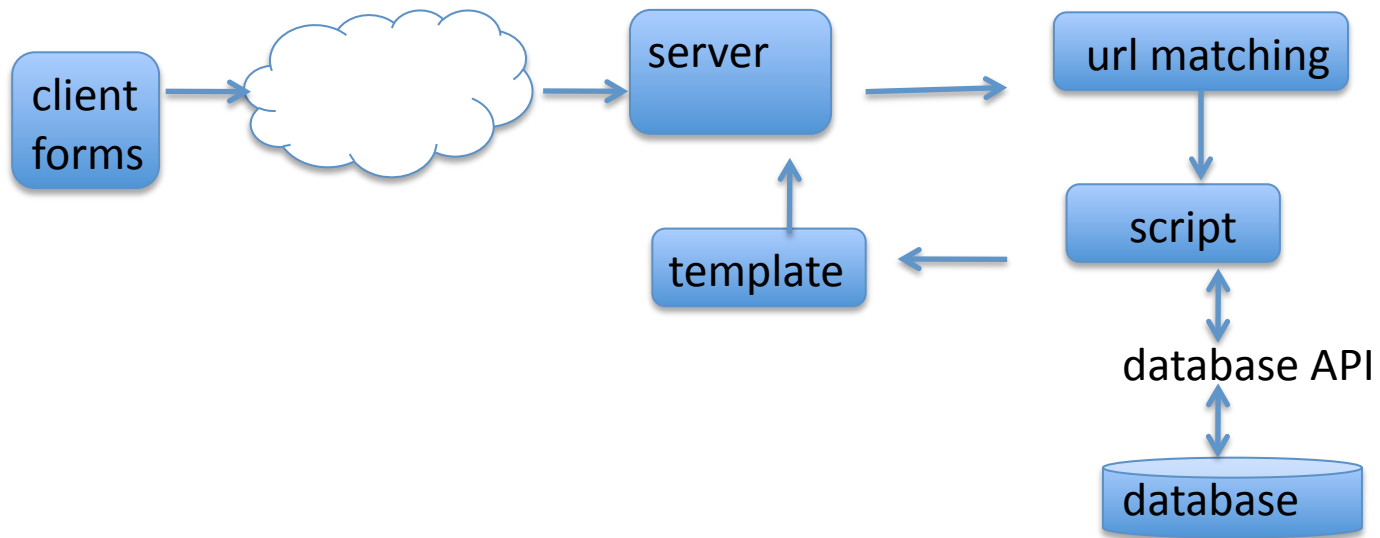
Making cutout for source 1 (of 6) with survey 2 (of 2)
elapsed time 6 seconds



UGH

```
function initRequest() {  
  if (window.XMLHttpRequest) {  
    r = new XMLHttpRequest();  
  } else if (window.ActiveXObject) {  
    isIE = true;  
    r = new ActiveXObject("Microsoft.XMLHTTP");  
  }  
  return r;  
}
```

2008: Django



[SkyAlert.org](#) >> [View Streams](#) | [View All Events](#) | [View Alerts](#)

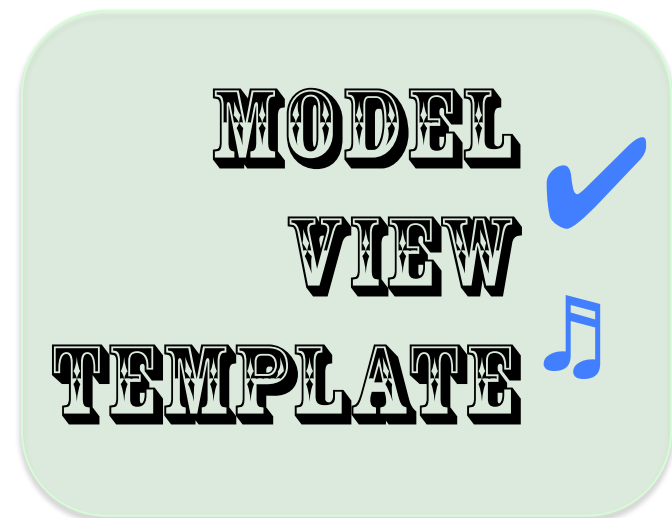
Logged in as: roy
(Roy Williams)
([logout](#))

django

- “The web framework for perfectionists with deadlines”
- djangoproject.com
 - download, tutorial, documentation
- djangobook.com
- djangosnippets.org
 - cookbook wiki

maintenance

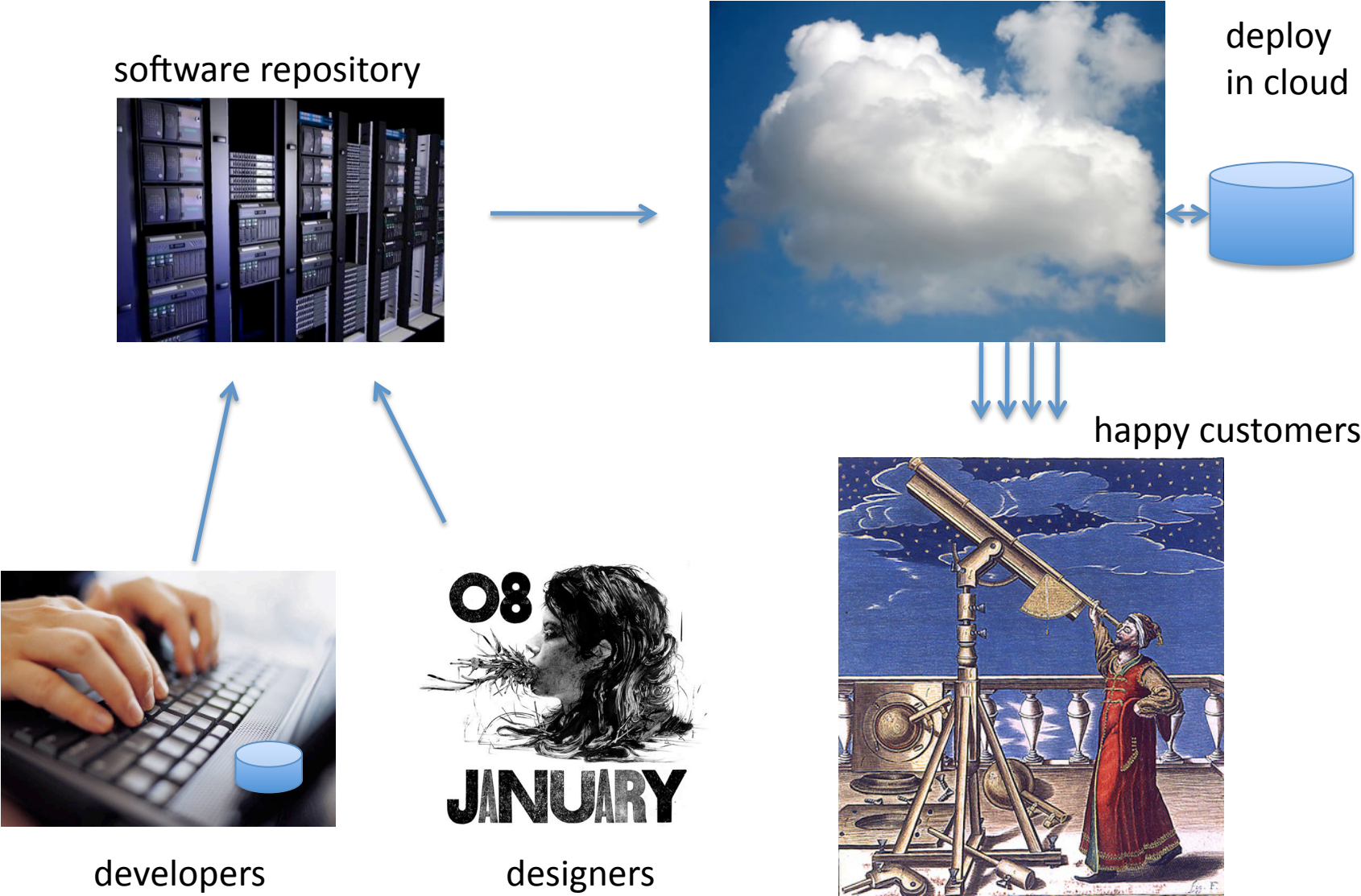
- Most difficult part of software
 - easier with separation of function (subroutines)
 - separation of languages
 - and good design pattern (who does what)



fast development

- Need to add eg. RSS feed in hours
 - or ... authenticate, internationalize, SOAP, Google App, etc
- Automate form handling
 - validation and defaults
- Put the database in the basement
 - python classes of persistent objects
- Admin interface
 - very powerful feature

webapp work environment



django key features

- db in basement, no SQL
- url mapping
- admin interface
- forms and validation
- templates
- users and groups

db in the basement

```
from django.db.models import *
```

```
class Photo(Model):  
    image = ImageField()  
    title = CharField(maxlength=150)  
    uploaded = DateTimeField()
```

can now do

`Photo.objects.all()` an iterator

`Photo.objects.filter(uploaded = today())`

-- can express nearly all SQL constructs in python

-- QuerySet is lazy evaluation

Installing

- get python, pref 2.5
 - type “python” in your shell to check
- set up a database
 - python 2.5 already has SQLite
 - or mySQL or PostgreSQL or Oracle ...
- download Django-1.0.2-final.tar.gz
 - extract and cd then
 - `$ sudo python setup.py install`

basic poll application

- * A public site that lets people view polls and vote in them.
- * An admin site that lets you add, change and delete polls.

```
% django-admin.py startproject pollapp
```

creates

```
% pollapp/  
__init__.py  
manage.py  
settings.py  
urls.py
```

cmd line for start server, sync db, etc etc

where is everything

directs URL to corresp. code

start the server

```
% cd pollapp  
% python manage.py runserver
```

```
Validating models...  
0 errors found.
```

```
Django version 1.0, using settings 'pollapp.settings'  
Development server is running at http://127.0.0.1:8000/  
Quit the server with CONTROL-C.
```

now point your browser to <http://127.0.0.1:8000>
but no code or db or anything yet!

settings

DATABASE_ENGINE -- Either 'postgresql_psycopg2', 'mysql' or 'sqlite3'.

DATABASE_NAME -- The name of your database. If you're using SQLite, the database will be a file on your computer;

DATABASE_USER -- Your database username (not used for SQLite).

DATABASE_PASSWORD -- Your database password (not used for SQLite).

INSTALLED_APPS contains the following apps, all of which come with Django:

- * django.contrib.auth -- An authentication system.
- * django.contrib.contenttypes -- A framework for content types.
- * django.contrib.sessions -- A session framework.
- * django.contrib.sites -- A framework for managing multiple sites with one Django installation.

```
if host == "localhost":
    DATABASE_ENGINE = 'sqlite3' # 'postgresql_psycopg2', 'postgresql', 'mysql', 'sqlite3' or 'oracle'.
    DATABASE_NAME = '/Users/roy/Documents/skyalert/sqlite.db' # Or path to database file if using sqlite
    DATABASE_USER = '' # Not used with sqlite3.
    DATABASE_PASSWORD = '' # Not used with sqlite3.
    DATABASE_HOST = '' # Set to empty string for localhost. Not used with sqlite3.
    DATABASE_PORT = '' # Set to empty string for default. Not used with sqlite3.
    ROOT_URLCONF = 'VOEventNet.urls'
    MEDIA_ROOT = '/Users/roy/Documents/skyalert/VOEventNet/static'
    TEMPLATE_DIRS = ('/Users/roy/Documents/skyalert/VOEventNet/templates')
    BASE_URL = 'http://localhost:8000/'
```

Models and Views


`% python manage.py syncdb`
creates relevant database tables

`% python manage.py startapp poll`

and it creates
poll/

`__init__.py`
`models.py`
`views.py`

defines the database, NOT by SQL
logic and rules of the application



code to build presentations



models.py

```
from django.db import models
```

```
class Poll(models.Model):
```

```
    question = models.CharField(max_length=200)
```

```
    pub_date = models.DateTimeField('date published')
```

```
class Choice(models.Model):
```

```
    poll = models.ForeignKey(Poll)
```

```
    choice = models.CharField(max_length=200)
```

```
    votes = models.IntegerField()
```

now add 'pollapp.poll' to INSTALLED_APPS in settings.py

see the SQL dance

this is what django can do for you

```
% python manage.py sql polls
```

```
CREATE TABLE "poll_poll" (  
    "id" serial NOT NULL PRIMARY KEY,  
    "question" varchar(200) NOT NULL,  
    "pub_date" timestamp with time zone NOT NULL  
);  
CREATE TABLE "poll_choice" (  
    "id" serial NOT NULL PRIMARY KEY,  
    "poll_id" integer NOT NULL REFERENCES "polls_poll" ("id"),  
    "choice" varchar(200) NOT NULL,  
    "votes" integer NOT NULL  
);
```



now actually make the tables for these:

```
% python manage.py syncdb
```

taste of the database api

interactive shell: [manipulate your db live](#)

```
% python manage.py shell
```

```
>>> from mysite.polls.models import Poll, Choice
```

```
# Create a new Poll.
```

```
>>> import datetime
```

```
>>> p = Poll(question="What's up?", pub_date=datetime.datetime.now())
```

```
# Save the object into the database. You have to call save() explicitly.
```

```
>>> p.save()
```

```
# Access database columns via Python attributes.
```

```
>>> p.question
```

```
"What's up?"
```

```
>>> p.pub_date
```

```
datetime.datetime(2007, 7, 15, 12, 00, 53)
```

```
# Change values by changing the attributes, then calling save().
```

```
>>> p.pub_date = datetime.datetime(2007, 4, 1, 0, 0)
```

```
>>> p.save()
```

```
# objects.all() displays all the polls in the database.
```

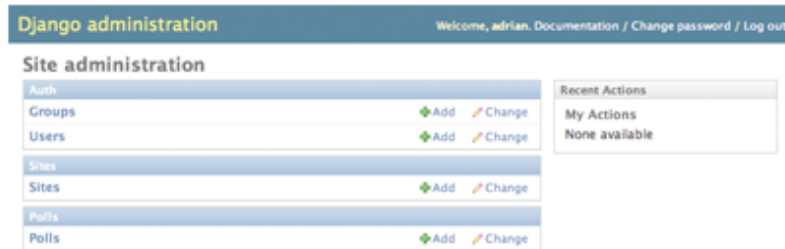
```
>>> Poll.objects.all()
```

```
[<Poll: Poll object>]
```

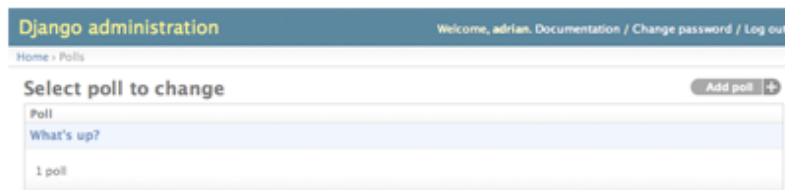
automatic admin interface

Explore the free admin functionality

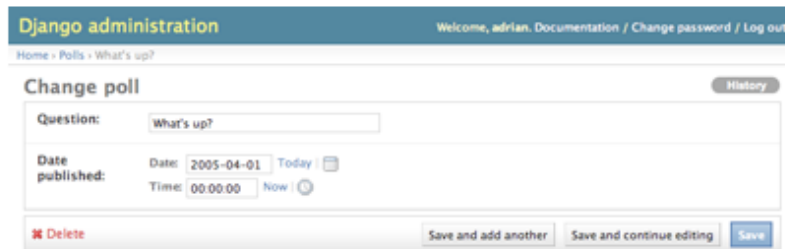
Now that we've registered Poll, Django knows that it should be displayed on the admin index page:



Click "Polls." Now you're at the "change list" page for polls. This page displays all the polls in the database and lets you choose one to change it. There's the "What's up?" poll we created in the first tutorial:



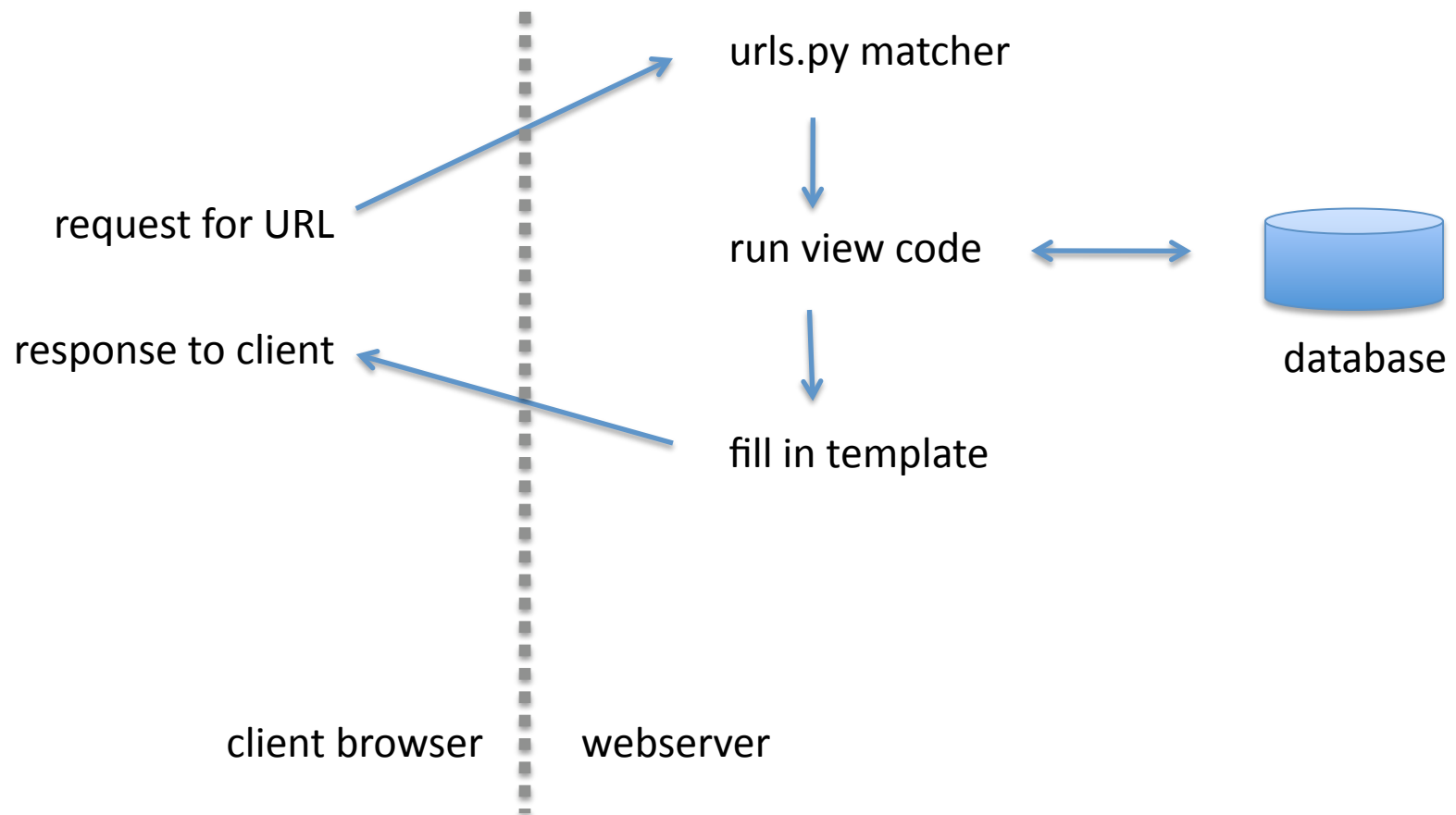
Click the "What's up?" poll to edit it:



three roles in project:
develop, design, content

-- content guy needs a way
to put things in

django architecture: model-view-template



views and templates

Try to separate content from presentation: THESE ARE DIFFERENT PEOPLE

Template inheritance: patterns can be combined for teamwork
eg news/ and data/ might be different people.

"HTML and Javascript with database lookups and webservice calls"
-- can be difficult to maintain!

Big distinction between
What data you see and
How that data is displayed

url design

Designing URLs seems boring, but it is your interface. If you do it properly, you can let people code against your webapp in a mashup. It looks really ugly to show your implementation
page.php or script.cgi?pageid=34 or story.cfm

Make them refer to the objects in a REST way\

[/polls](#)

[/polls/23](#)

[/polls/23/results](#)

[/polls/23/vote](#)

or even better with description or global identifier

[/photos/nvo.caltech.edu/voeventnet/CATOT#2726273637](#)

URLs be clean and beautiful and guessable (chop, test, mash)

as important as any other part of the UI

force developer to really think about the interface

(feature of Django is email the admin when a 404 comes up)

url design

```
/polls  
/polls/23  
/polls/23/results  
/polls/23/vote
```

```
urlpatterns = patterns('',  
    (r'^polls/$', 'pollapp.polls.views.index'),  
    (r'^polls/(?P<poll_id>\d+)/$', 'pollapp.poll.views.detail'),  
    (r'^polls/(?P<poll_id>\d+)/results/$', 'pollapp.poll.views.results'),  
    (r'^polls/(?P<poll_id>\d+)/vote/$', 'pollapp.poll.views.vote'),  
)
```

Be careful with this, it is part of your interface to your public.

building a view

in file poll/views.py

```
from mysite.polls.models import Poll
from django.http import HttpResponseRedirect

from django.shortcuts import render_to_response, get_object_or_404

def detail(request, poll_id):
    p = get_object_or_404(Poll, pk=poll_id)
    return render_to_response(
        'polls/detail.html',
        {'poll': p})
```


templates

- Gets data from a dictionary, array, list, etc
- Simple logic
- Filtering
- Inherit from base
- Made for designers, not developers

template

in file templates/poll/detail.html

```
<h1>{{ poll.question }}</h1>
<ul>
  {% for choice in poll.choice_set.all %}
    <li>{{ choice.choice }}</li>
  {% endfor %}
</ul>
```

black for HTML

green for variable substitution

orange for control

html form as template

in file templates/poll/detail.html

```
<h1>{{ poll.question }}</h1>
```

```
{% if error_message %}<p><strong>{{ error_message }}</strong></p>{% endif %}
```

```
<form action="vote/" method="post">
```

```
{% for choice in poll.choice_set.all %}
```

```
  <input type="radio" name="choice" id="choice{{ forloop.counter }}" value="{{ choice.id }}" />
```

```
  <label for="choice{{ forloop.counter }}">{{ choice.choice }}</label><br />
```

```
{% endfor %}
```

```
<input type="submit" value="Vote" />
```

```
</form>
```

form is submitted to url pattern called “vote”

template inheritance

Parent template:

```
<html><head><title>My site</title></head>
<body><h1>My site</h1>
{% block content %}{% endblock %}
</body></html>
```

Child template:

```
{% extends "base.html" %}
{% block content %}
{% for event in events %}
<li>{{ event.title }} -- {{ event.day }}</li>
{% endfor %}
{% endblock %}
```

block defines
content template

templates for designers

Every time a developer asks "why doesn't the template language do X"
the answer is "templates are not for you!"
(eg no function calls, no string magic, no boolean logic)

Designers want something without all the programming,
they don't want dictionaries and function calls and iterators and lists
("whats the difference anyway?")

This separation of tasks is the usual thing in webapp development

a few more django things

- Generic Views
 - list things, create thing, show thing
 - date and calendar, today, this month, this year etc
- Authorization/Authentication
 - Users and groups
 - different permissions for different object types
- Internationalization
 - 23 languages including Welsh

a few more django things

- RSS feed

url patterns direct RSS requests to these functions

```
from django.contrib.syndication.feed import feed
```

```
class PhotoFeed(feed):  
    title = "My photo feed"  
    link = "/photos/"  
    description = "Photos from my site"  
    def items(self):  
        return Photo.objects.all()[:20]
```

a few more django things

- Comments
 - any object can have a wiki
 - build into templates in just a few lines

```
{% load comments %}
{% for comment in comments %}
  <H3>{{ comment.person_name }} said:</H3>
  <p>{{ comment.comment }}</p>
{% endfor %}
```


a few more django things

- Caching
 - a particular view, cache a whole site, or use the low-level API
 - In config, choose cache type: Memcached, Database, Filesystem, Local memory

example: skyalert



SkyAlert.org

Real-time Astronomical Events
for You and your Robot

Roy Williams

and

George Djorgovski

Andrew Drake

Matthew Graham

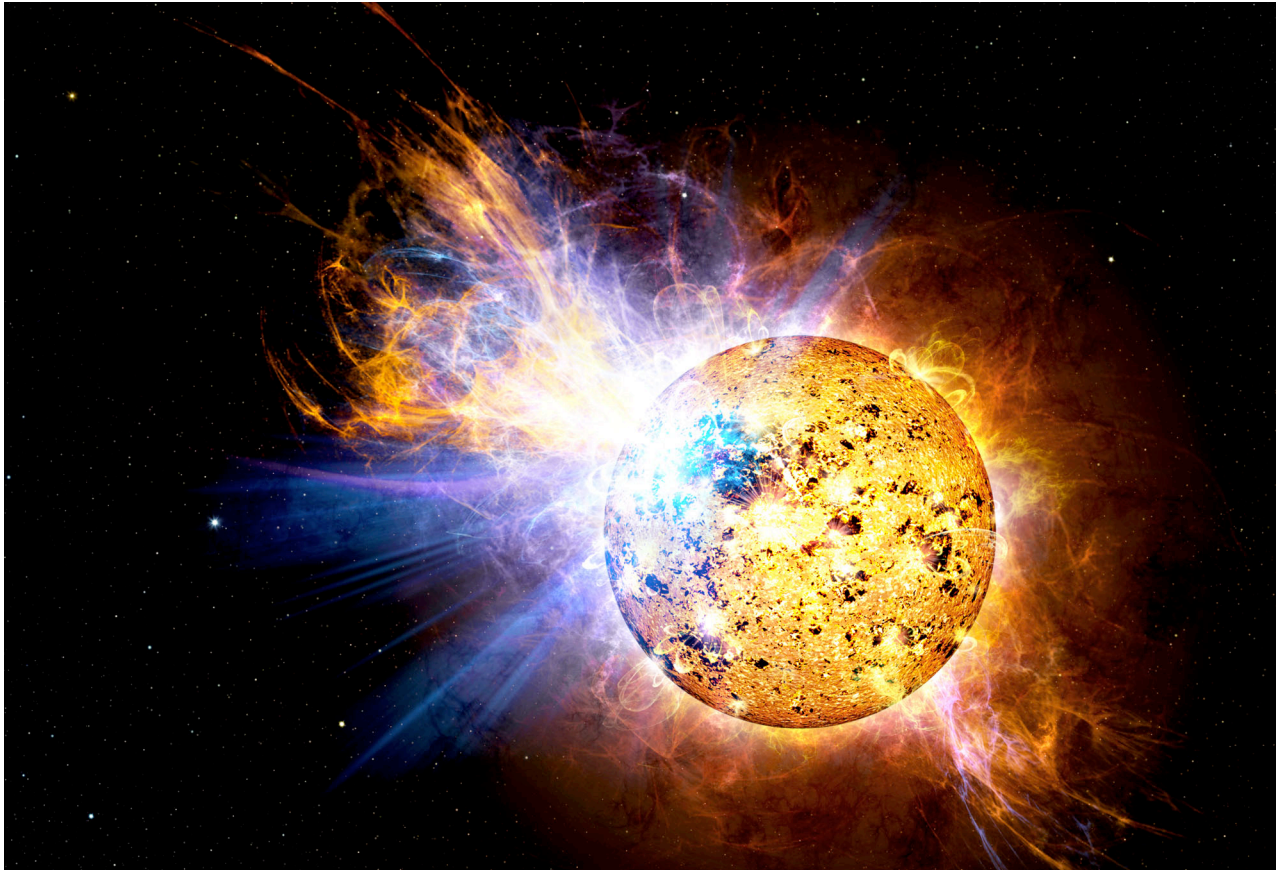
Ashish Mahabal

California Institute of Technology

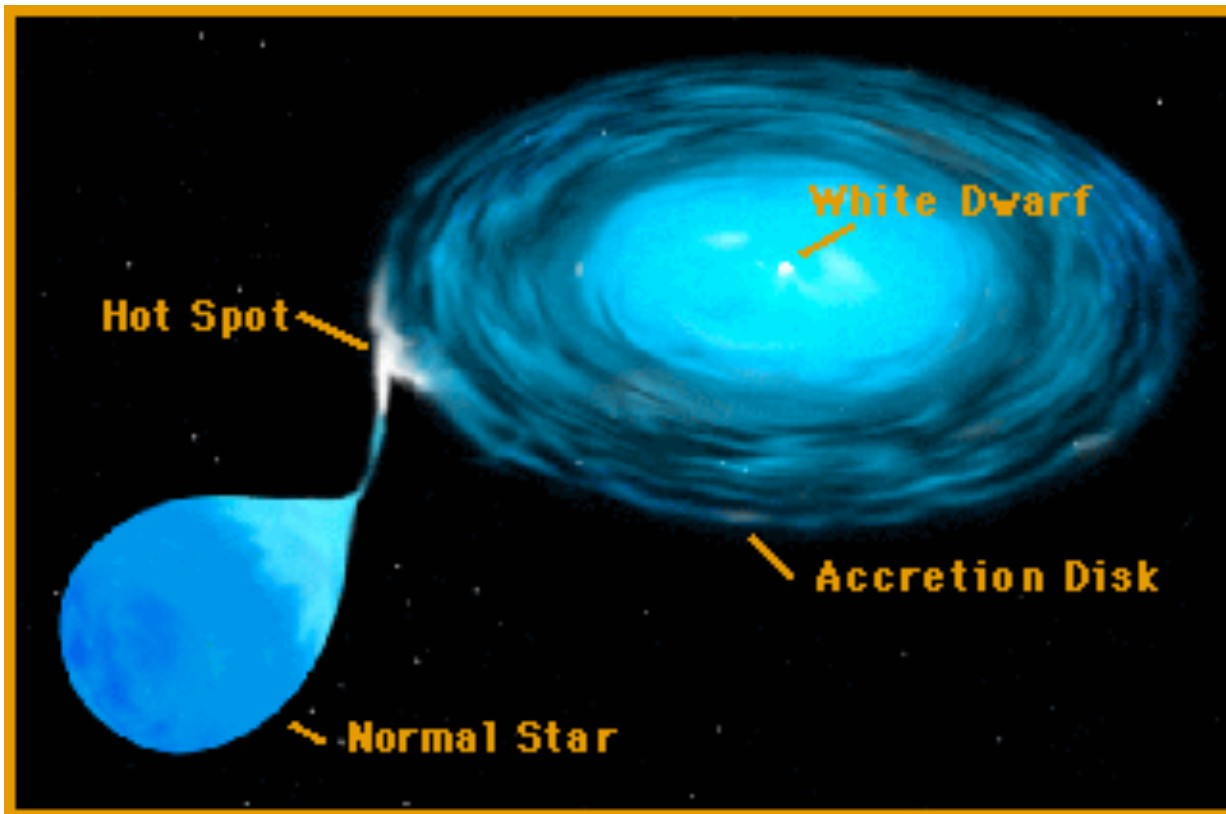
Transient Sources in the Sky

- Satellites (10000" per hour)
- Near Earth Objects (3000" per hour)
- Main Belt Asteroids (10" per hour)
- Jupiter & Saturn
- Comets
- Trans-Neptunians (1" per hour)
- Radial-velocity planet searching (10 - 100 pc)
- Planet transit searching (100 - 10000 pc)
- M-dwarf flares
- Microlensing + CV + novae (100000 pc)
- Pulsar glitches and RRAT
- RR Lyrae in the galactic halo
- Extragalactic microlensing (10 Mpc)
- Supernovae
- Black hole inspiral and merger
- AGN and blazar glitches (TeV ...)
- Gamma Ray Bursts, Gravitational waves,
- *And NOT YET THOUGHT OF?*

M-dwarf flare



Cataclysmic Variable

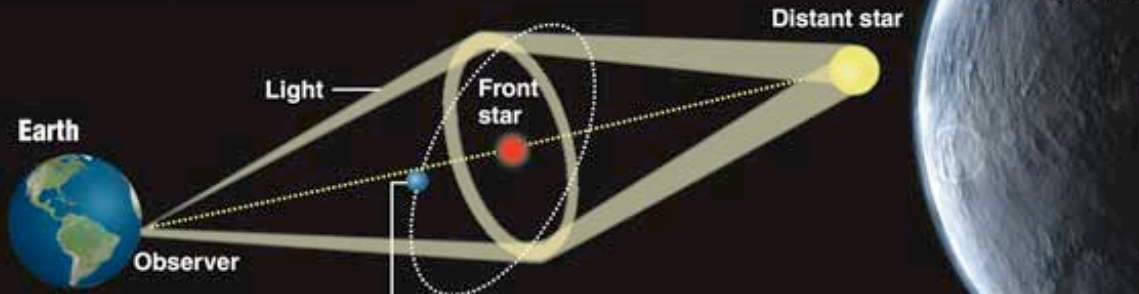


Microlensing

Spotting distant Earth-like planet

Discovery of distant Earth-like planet was made using a method called microlensing, which can detect far-off planets without actually seeing the object.

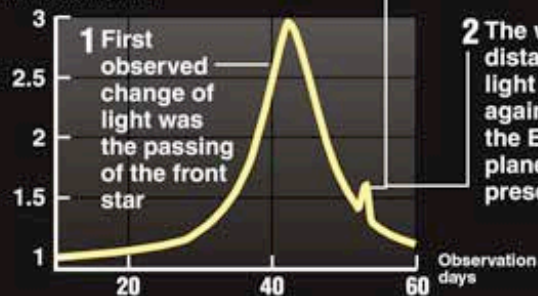
When a massive object crosses in front of a star shining in the background, the front star's gravity bends light rays from distant star and magnifies them like a lens:



What astronomers see

A magnification of light of distant star:

Times brighter than normal shine



Earth-like planet

When planet passes, an additional distortion of the light occurs

3 Computer analysis calculates planet's size and likely characteristics:

Size: Only five times as massive as Earth

Surface: Likely to be rocky/icy

Atmosphere: Likely to have a thin atmosphere

Temperature: Its relative cool parent star implies a surface temperature of -364°F (-220°C)

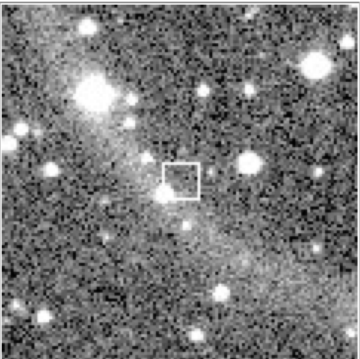
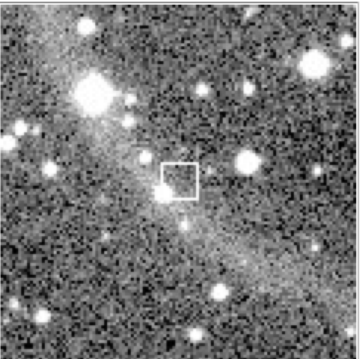
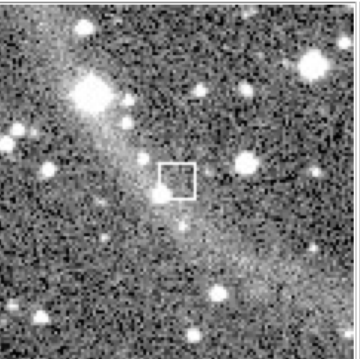
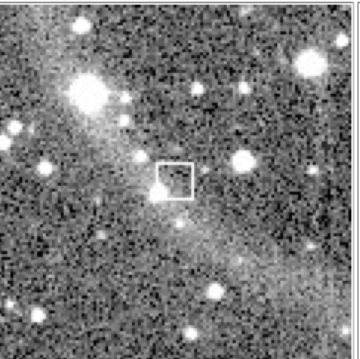
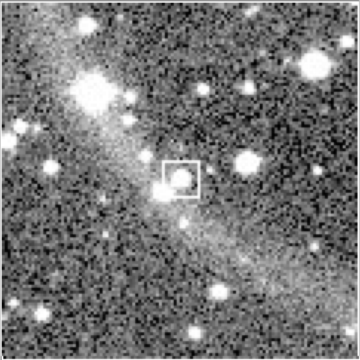
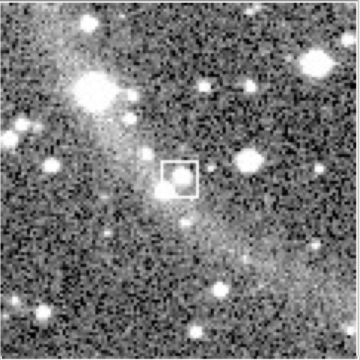
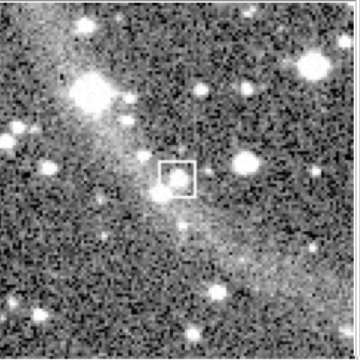
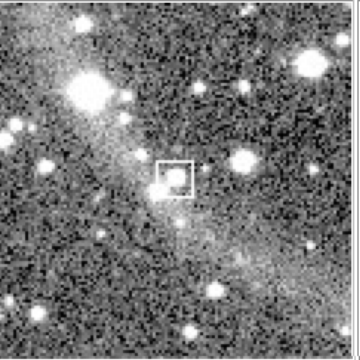
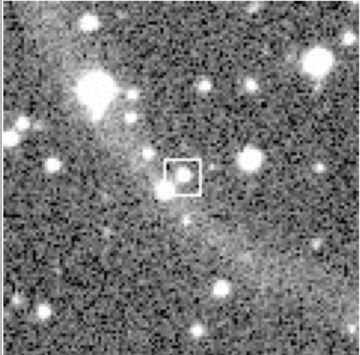
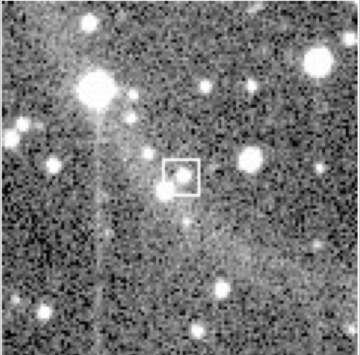
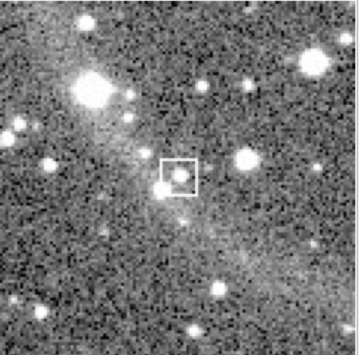
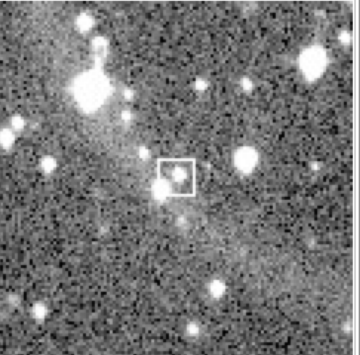
© 2006 MCT

Source: European Southern Observatory (ESO), Astronomer Uffe G. Joergensen, Microlensing Observations in Astrophysics Graphic: Elsebeth Nielsen, Isabel Sondergaard

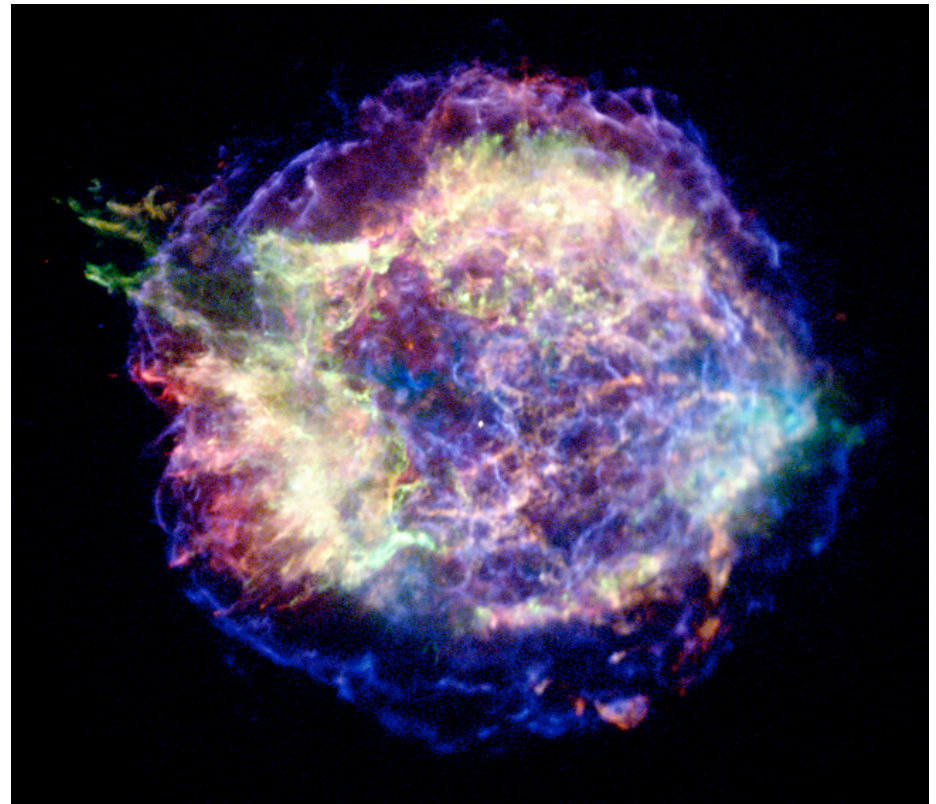
Catalina Sky Survey

Transient 712180180624111439

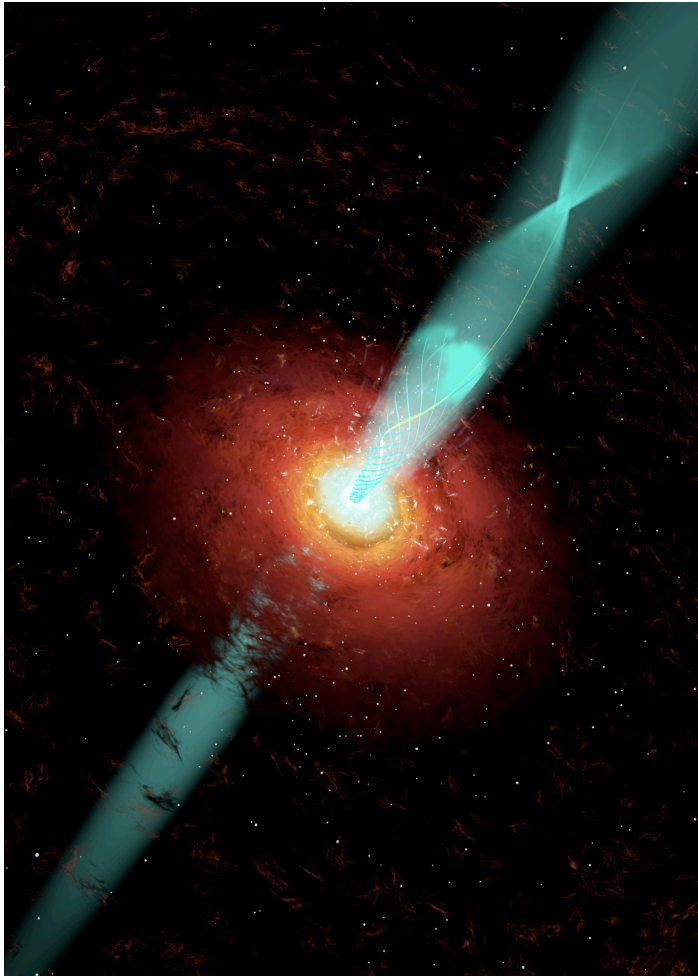
NASA funded event stream
Catalina Sky Survey

| Image | Obs | Image | Obs | Image | Obs | Image | Obs |
|---|----------|---|----------|---|----------|---|----------|
|  | 20070320 |  | 20070320 |  | 20070320 |  | 20070320 |
|  | 20080213 |  | 20080213 |  | 20080213 |  | 20080213 |
|  | 20080329 |  | 20080329 |  | 20080329 |  | 20080329 |

Kepler's supernova 1604

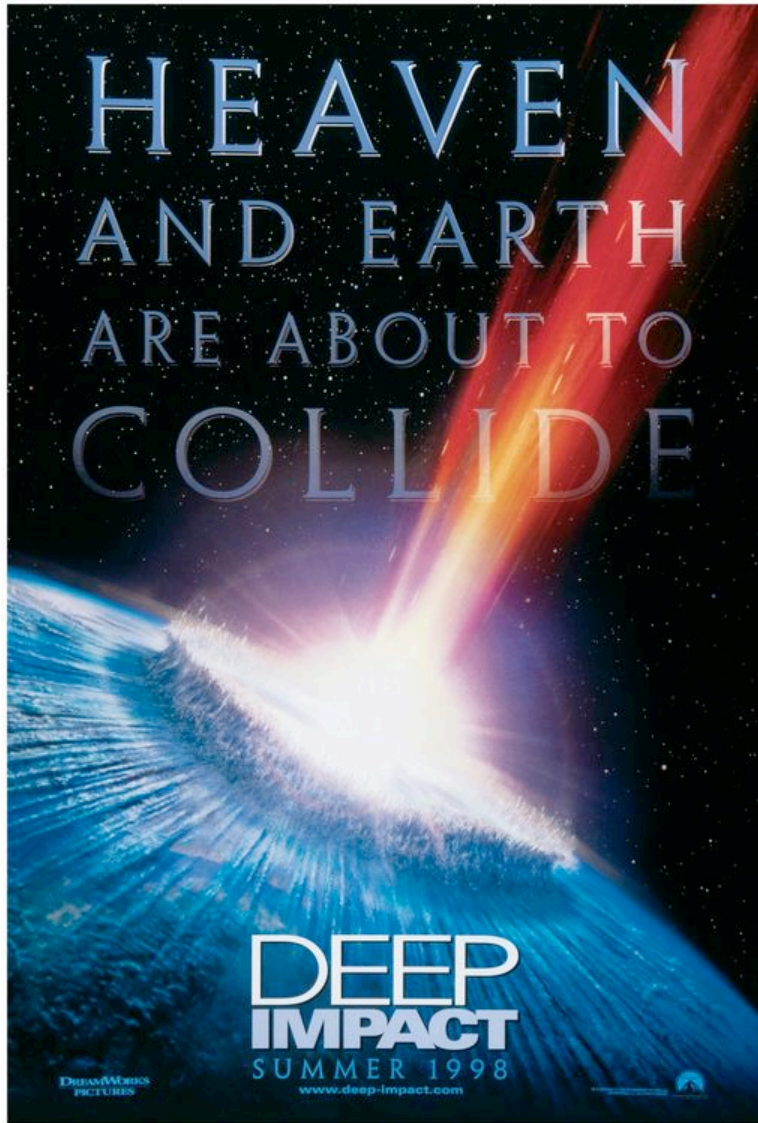


Blazar variability



side view = quasar
top view = blazar

Asteroid / NEO





[SkyAlert.org](#) >> [View Streams](#) | [View All Events](#) | [View Alerts](#)

Logged in as: roy
(Roy Williams)
([logout](#))

Streams

Here are the streams known to Skyalert. Click the Detail link to view or edit the stream. Some streams have filters associated to form a 'portfolio'. Click the All Events link to see all the events from the stream, and pointers to:

| Stream Name | Detail | Portfolios | All Events | Description |
|--------------------|--------------------------|------------------------------|------------------------------|---|
| CATOT | (Detail) | (Portfolios) | (All Events) | Catalina Real-time Transient Survey |
| Fermi | (Detail) | (Portfolios) | (All Events) | Fermi events |
| MOA | (Detail) | (Portfolios) | (All Events) | MOA Microlensing Survey |
| OGLE | (Detail) | (Portfolios) | (All Events) | OGLE Microlensing Survey |
| POSS | (Detail) | (Portfolios) | (All Events) | Possible Supernova from the Puckett Observatory Supernova Search |
| SWIFT | (Detail) | (Portfolios) | (All Events) | SWIFT GRB alerts |
| Galeq | (Detail) | | (All Events) | Computes galactic lon/lat |
| P60Followup | (Detail) | | (All Events) | P60 Follow-up photometry of transients |
| SDSS | (Detail) | | (All Events) | Lists the nearest star and galaxy and available images for an event |

[Make a new stream](#)

[Back to main page](#)

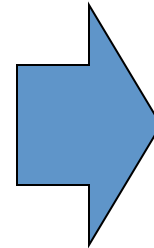
Stream as Event Template

stream

| | | |
|----------------------------|-----------------|---------------|
| Catalog Info | Imag | phot.mag |
| Catalog Info | Imagerr | phot.mag |
| Catalog Info | Nearest_star_ID | |
| Catalog Info | Separation | phot.mag |
| Links | Finder_fits | meta.ref.url |
| Links | Finder_jpg | meta.ref.url |
| Links | Lightcurve | meta.ref.url |
| Links | Photometry_data | meta.ref.url |
| Microlensing ID | MOA_ID | meta.dataset |
| Single lens model paramete | Amax | phot.mag |
| Single lens model paramete | lbase | string |
| Single lens model paramete | t0 | time.epoch |
| Single lens model paramete | t0cal | time.epoch |
| Single lens model paramete | t0err | time.interval |

event

| |
|-----------------|
| 16.73321619 |
| 0.064 |
| 192244 |
| 0.1152383482 |
| https://it01990 |
| https://it01990 |
| https://it01990 |
| https://it01990 |
| 2008-BLG-300 |
| 3.25 |
| 16.21 |
| 2454677.0846 |
| 2008-Jul-29.58 |
| 0.02 |



MOA Stream definition

Stream-specific Parameters

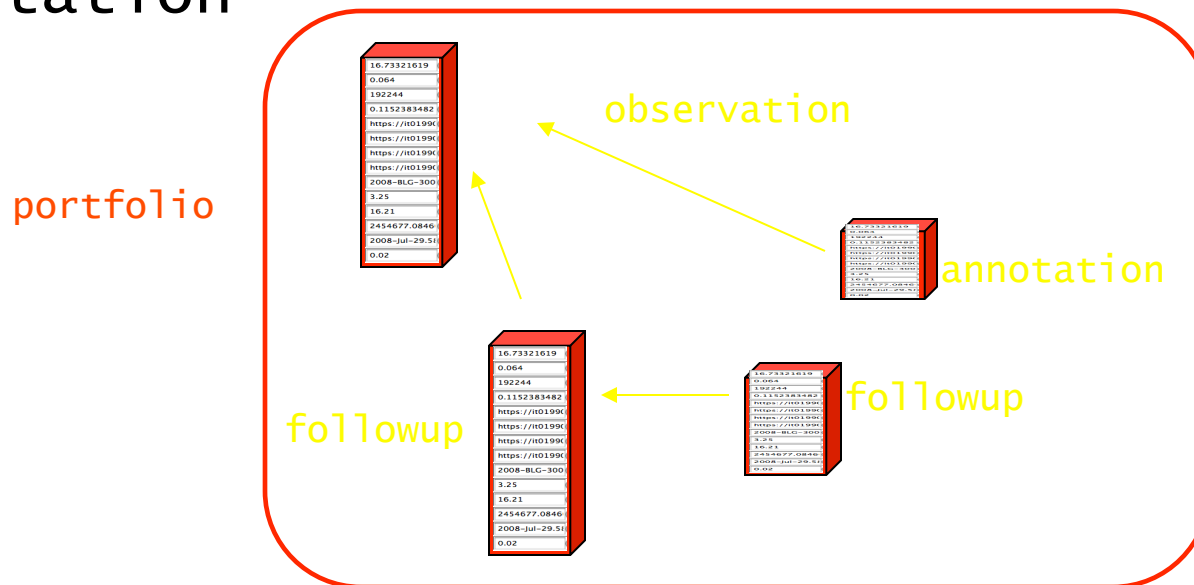
| Group Name | Parameter Name | | UCD | unit | Description |
|----------------------------|-----------------|---|---------------|------|-------------|
| | CCD | I | meta.dataset | | |
| | Field | I | meta.dataset | | |
| | Filter | I | meta.dataset | | |
| | MOA_serial_no | I | meta.dataset | | |
| | Run | I | meta.dataset | | |
| | SequenceID | I | meta.dataset | | |
| | Xposition | I | meta.dataset | | |
| | Yposition | I | meta.dataset | | |
| Catalog Info | Imag | I | phot.mag | mag | |
| Catalog Info | Imagerr | I | phot.mag | mag | |
| Catalog Info | Nearest_star_ID | I | | | |
| Catalog Info | Separation | I | | | |
| Links | Finder_fits | I | meta.ref.url | | |
| Links | Finder_jpg | I | meta.ref.url | | |
| Links | Lightcurve | I | meta.ref.url | | |
| Links | Photometry_data | I | meta.ref.url | | |
| Microlensing ID | MOA_ID | I | meta.dataset | | |
| Single lens model paramete | Amax | I | | | |
| Single lens model paramete | lbase | I | phot.mag | mag | |
| Single lens model paramete | t0 | I | time.epoch | days | |
| Single lens model paramete | t0cal | I | time.epoch | | |
| Single lens model paramete | t0err | I | time.interval | days | |
| Single lens model paramete | tE | I | time.scale | days | |
| Single lens model paramete | tEerr | I | time.interval | days | |
| Single lens model paramete | u0 | I | | | |

Citation makes Portfolio

- An event can cite another

```
<Citations><EventID cite="followup">  
    ivo://gcn.nasa/VOEvent#hete_389241a_20050808_230931  
</EventID> </Citations>
```

- Observations can be federated by mutual citation



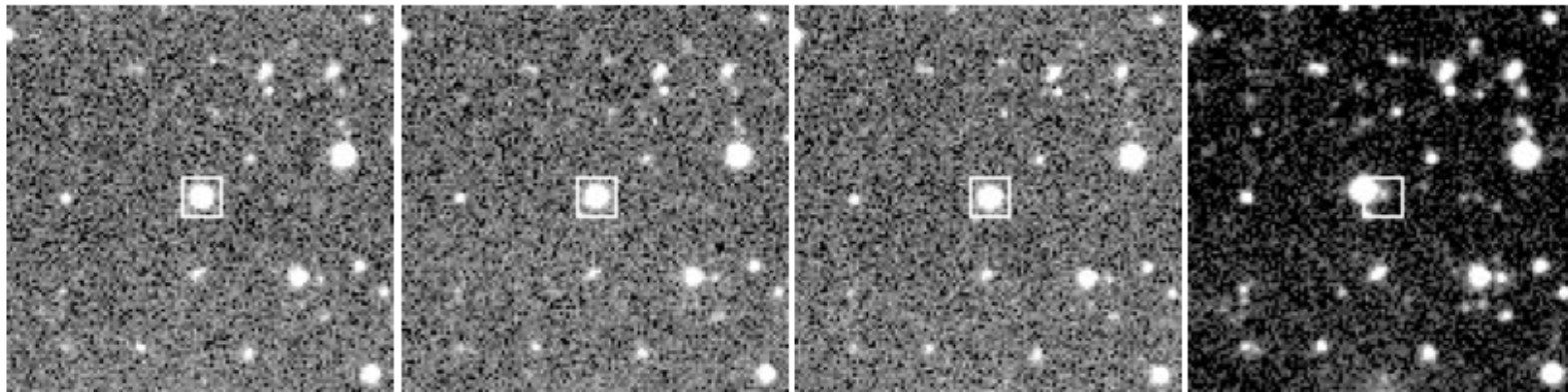
Portfolio

[ivo://ivo.caltech/voeventnet/catot#904171040734116838](http://ivo.caltech/voeventnet/catot#904171040734116838)

From the [CATOT](#) stream.
Catalina Real-time Transient Survey

This event has 0 comments.

CRTS (Catalina) Event identifier is 904171040734116838.



Position (204.12305,3.67649)
Time 2009-04-17T08:00:28 (MJD 54938.3336574)
Magnitude 14.394100
Magnitude 14.393000
Magnitude 14.399900
Magnitude 14.404100
Ast. Inner motion -0.682226
Ast. Outer motion -0.475430
X 1723.560059
Y 1318.295044
Portfolio [Click here](#)
[Click for SDSS cutout](#)
[Show Params / Hide Params](#)
[Show XML / Hide XML](#)

Google Sky has VOEvents

The screenshot shows the Google Earth interface with a star field. Several triggers are visible as colored circles with labels: "192:11 hours ago -- OGLE Trigger", "0:58 hours ago -- 2008 Trigger", "122:34 hours ago -- OGLE Trigger", "4:52 hours ago -- 2008 Trigger", "23:09 hours ago -- 2008 Tr", "13:11 hours ago -- 2008 Trigger", "69:55 hours ago -- OGLE Trigger", "122:34 hours ago -- OGLE Trigger", "17:26 hours", "23:04 hours ago --", "8:15 hours ago -- 2008 Trigger", "12:53 hours ago -- 2008 Tr", "3:47 hours ago -- SWIFT Trigger", "3:49 hours ago -- SWIFT Trigger", "3:49 hours ago -- SWIFT Trigger", "3:55 hours ago -- SWIFT Trigger", "3:55 hours ago -- SWIFT Trigger", "3:56 hours ago -- SWIFT Trigger", "4:00 hours ago -- SWIFT Trigger", "9:59 hours ago -- INTEGRAL", "12:57 hours ago -- INTEGRAL", "44:56 hours ago -- INTEGRAL", "11 hours ago -- SWIFT Trigger", "3:40 hours ago -- S", "3:40 hours ago --", "3:45 hours", "3:34 hours ago -- SWIFT Trigger".

3:45 hours ago -- SWIFT Trigger

Possible Gamma Ray Burst (GRB)

This [SWIFT](#) notice (SWIFT_XRT Position) contains an RA,Dec location for the burst/afterglow as determined by XRT. They are issued once per burst (or never if the position cannot be verified). The position comes from the XRT flight software scanning the initial quicklook image taken immediately after the slew to the new AT burst. If the on-board determination was a null, then ground-processing with humans-in-the-loop, an XRT_Position Notice can be generated and distributed.

Please see the [Gamma Ray Burst Coordinate Network homepage](#) for more details.

If a white circle is present, it represents an error estimate for the burst position.

Further Information:

| | |
|--------------|-------------------|
| PKT_SERNUM | 1 |
| TrigID | 318832 |
| TrigSegNumID | 0 |
| BURST_TJD | 14680 days |
| BURST_SOD | 54819.69 sec |
| Flux | 1470.79 arbitrary |
| Signif | 7.14 sigma |

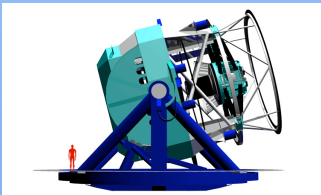
[GCN XML](#)

[<< Previous Trigger](#) [Next Trigger >>](#)

VO-GCN is sponsored by the National Aeronautics and Space Administration and includes collaborators at [California Institute of Technology](#), [National Optical Astronomy Observatory](#), and [University of Exeter](#)

Image © 2007 DSS Consortium

18h00m40.33s Dec -32°44'58.90" 6°48'12.71" arcdegrees



Microlensing
 Optical transients
 Radio transients
 X-ray transients
 Gamma transients
 Grav. waves
 Neutrinos



Event Authors

International

GCN Broker



Annotation from archives

SKYAlert

Events and
 annotation
 disseminated to
 subscribers in real
 time with
 intelligence



Astronomers
 Amateurs
 Students



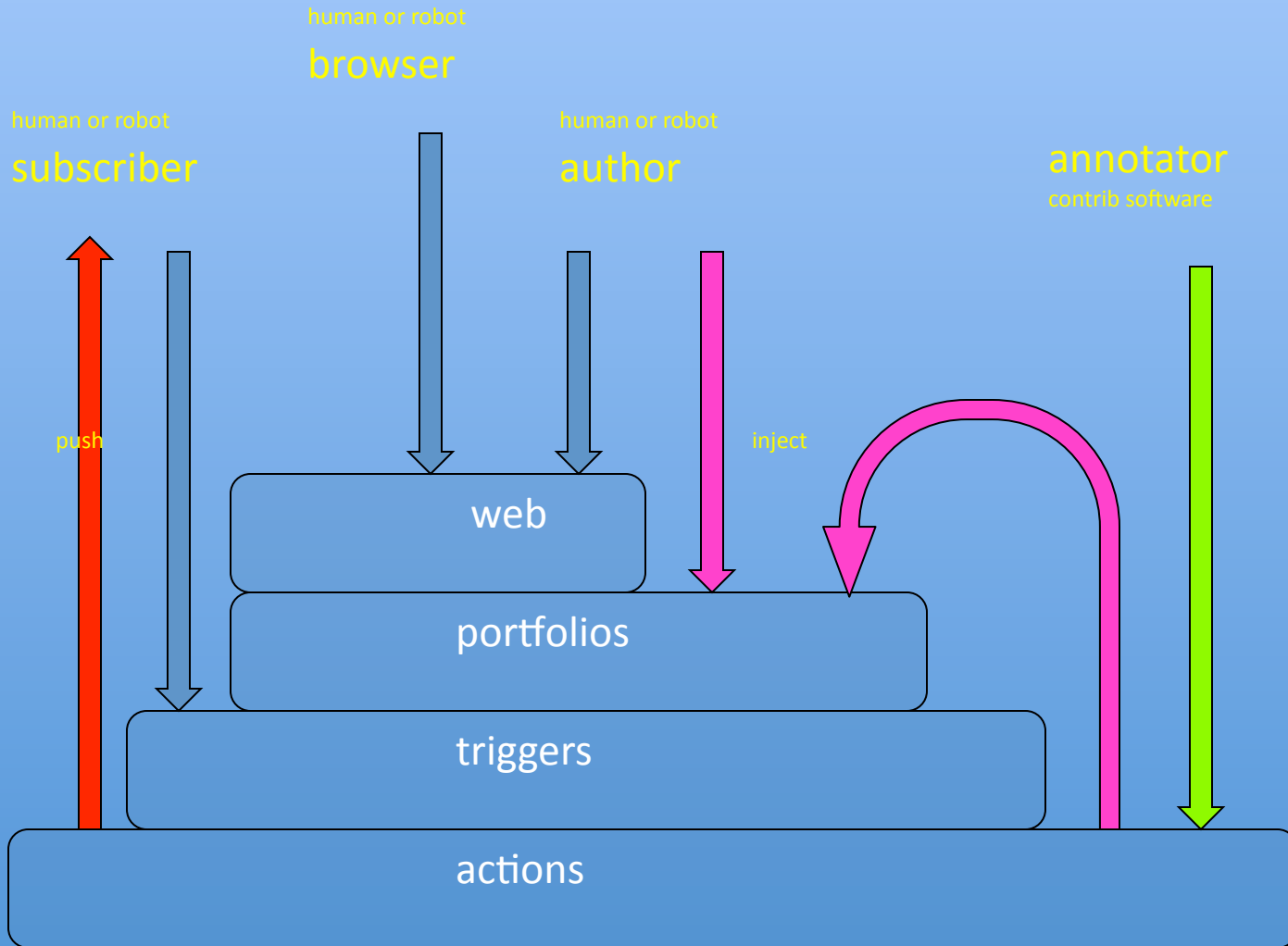
Followup
 Scheduler



Telescope
 Telescope
 Telescope

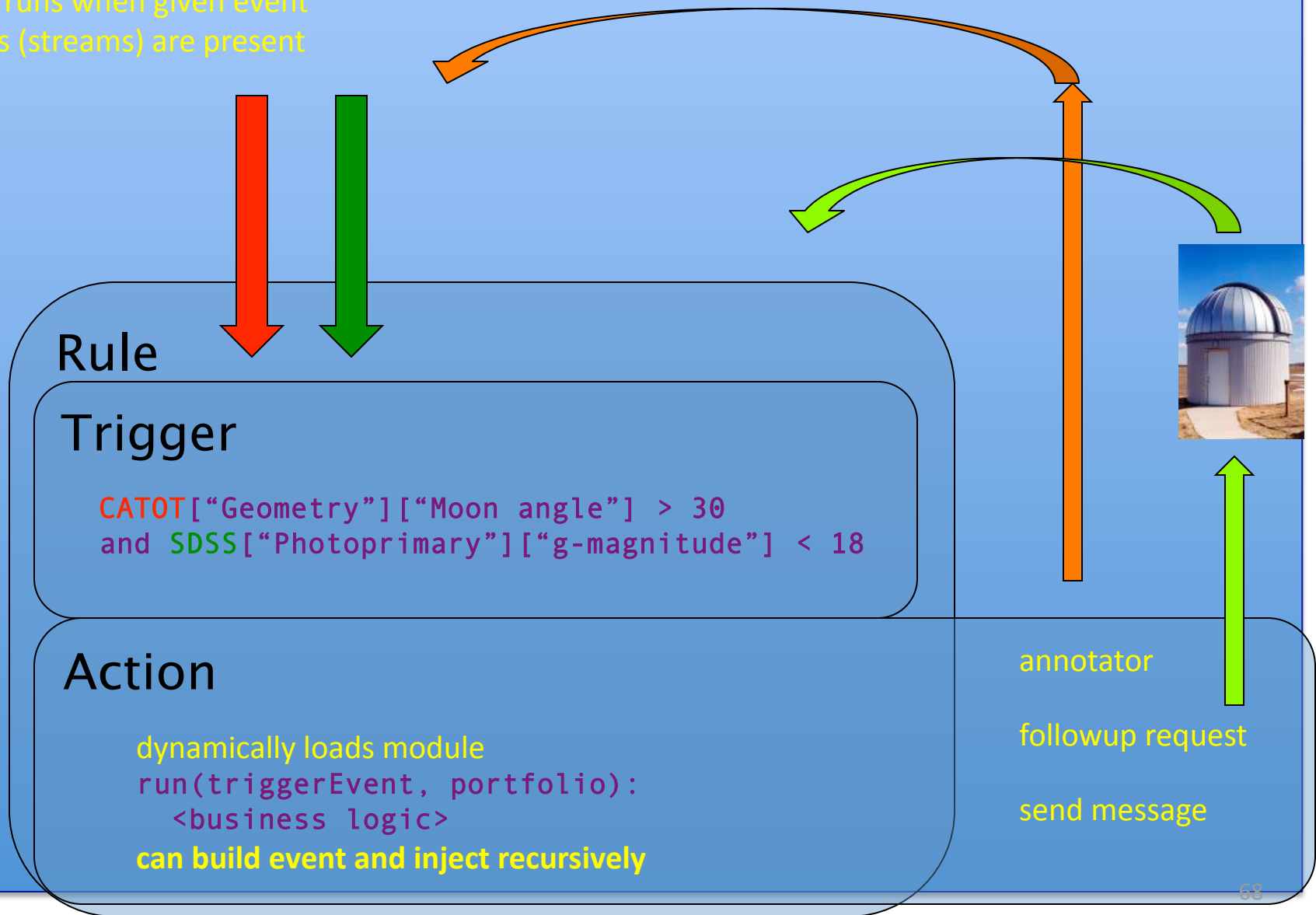
Event Subscribers

Roles



Rules and event cascade

Rule runs when given event types (streams) are present



Triggers: your personal event stream

Decision Formula

CATOT["First Detection params"]["magnitude"] < 19

Click to save:

Click to see past events that satisfy this rule:

Generic Event Parameters

| Name | UCD | dataType | Description |
|---------------------------------|-------------------|----------|---------------------------|
| RA | pos.eq.ra | float | Right Ascension of event |
| Dec | pos.eq.dec | float | Declination of event |
| positionalError | stat.error;pos.eq | float | Positional error of event |
| ISOtime | time.epoch | | Time (UTC) of event |

| | | | |
|-------------------------|-------------------------------------|---------------------|--------|
| First Detection params | average seeing | instr.det.psi | float |
| First Detection params | Dec | pos.eq.dec | float |
| First Detection params | ID | meta.id | string |
| First Detection params | JD | time.epoch | float |
| First Detection params | magnitude | phot.mag;em.opt.R | float |
| First Detection params | mag_error | phot.mag;stat.error | float |
| First Detection params | RA | pos.eq.ra | float |
| Fourth Detection params | average background4 | instr.background | float |



VOEventNet >> [View Streams](#) | [View Events](#) | [Subscribe](#)

Logged in as: Charles
(Charles Messier).
([logout](#))

Events

Chosen from stream SWIFT (SWIFT GRB alerts)

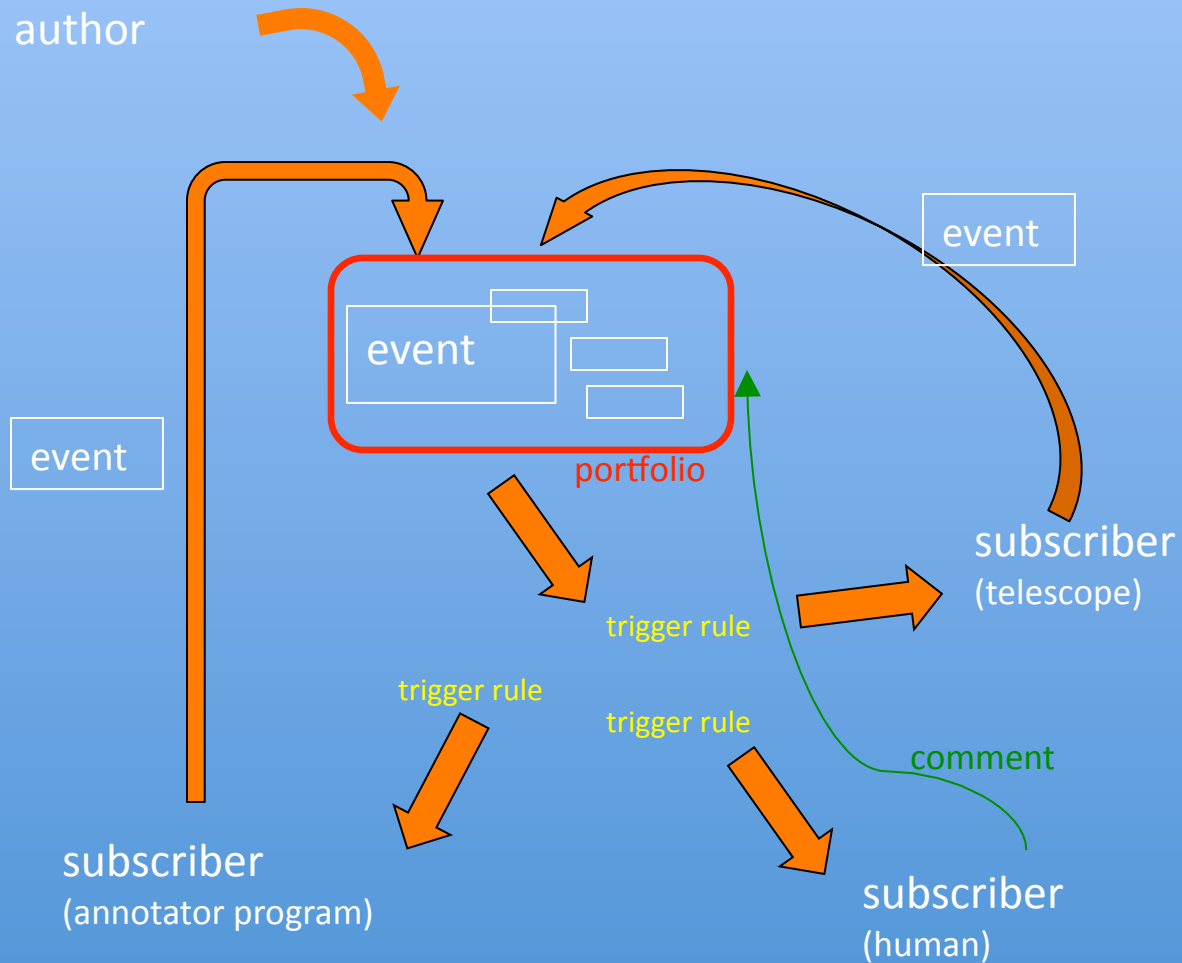
Chosen to satisfy rule: $\text{abs}(\text{Obs_S_c_Lat}) > 30$ and $\text{abs}(\text{Obs_S_c_Lat_1}) > 30$

Table has 1 events: below is from 1 to 1

| IVORN | RA | Dec | error | ISOtime | Reference | Galactic_Lat | Galactic_Long | Moon_RA |
|----------------------|----------|----------|-------|---------|----------------------|--------------|---------------|---------|
| FOM_Obs_33878330-393 | 301.7402 | -62.5613 | 0.0 | | link | -32.51 | 334.06 | 255.27 |

[Make a new event](#)
[Back to main page](#)

Event Cascade



subscribers

Streams
(event template)

Events
(template instance)

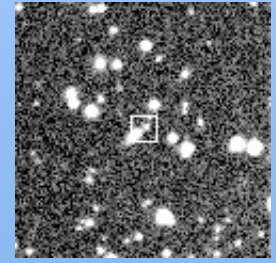
Triggers
(for action)

Annotation
(linked data)

Original detection

Catalina Sky Survey

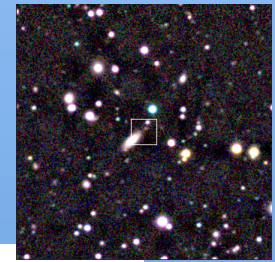
| | | |
|--------------|---|--------------|
| mag1 | → | 19.34 |
| mag2 | → | 19.32 |
| mag3 | | 19.39 |
| asteroidness | | 1% |
| stellarity | | 97% |
| cutoutURL | | http://..... |



Archive follow-up

SDSS archive

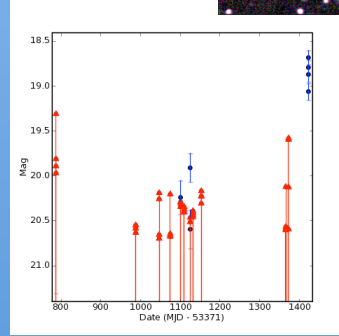
| | | |
|------------|---|--------------|
| uMag | → | 21.42 |
| gMag | | 20.96 |
| uCutoutURL | | http://..... |
| gCutoutURL | | http://..... |



Archive follow-up

Berkeley lightcurves

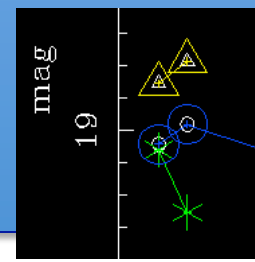
| | | |
|---------------|---|--------------|
| lightcurveURL | → | http://..... |
| probSN | | 87% |
| probCV | | 12% |



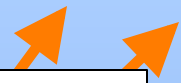
Telescope follow-up

Palomar 60" follow-up

| | | |
|----------------|---|--------------|
| gmag | → | 19.07 |
| rmag | | 18.03 |
| ipmag | | 18.57 |
| zpmag | | 18.94 |
| datapackageURL | | http://..... |



joint rule



Event can have complex data

16.73321619

0.064

192244

0.1152383482

<https://it01990>

<https://it01990>

<https://it01990>

<https://it01990>

2008-BLG-300

3.25

16.21

2454677.0846

2008-Jul-29.58

0.02

Likely Supernovae detected by CSS

| RA (J2000) | Dec (J2000) | Mag | del mag | Date | Time (MJD) | CSS images | SDSS | Others | Galex | LC | Classification |
|------------|-------------|-------|---------|----------|-------------|------------------------------------|-------|---------|-------|---------|-----------------------|
| 217.73557 | 22.36488 | 19.15 | 2.65 | 20080624 | 54641.30511 | 806241210744127594 ✓ | yes | 27594 ✓ | no | 27594 ✓ | SN SDSS mag 21.8 gal |
| | | | | 20080623 | 54640.26738 | 806231320664126667 ✓ | yes | 26667 ✓ | no | 26667 ✓ | SN SDSS mag 23 object |
| | | | | 20080614 | 54631.16079 | 806141090574116627 | yes | 16627 | no | 16627 | SN SDSS gal mag 21.5 |
| | | | | 20080611 | 54628.18752 | 806111400514116392 ✓ | yes | 16392 ✓ | no | 16392 ✓ | SN 2008di |
| | | | | 20080610 | 54627.40016 | 806100091194116339 | maybe | 16339 | | | |
| | | | | 20080608 | 54625.25119 | 806081230644120410 | yes | 20410 | | | |
| | | | | 20080608 | 54625.43861 | 806081230034109966 | no ✓ | 09966 | | | |
| | | | | 20080514 | 54600.18572 | | | | | | |

Values for object: 80611400514116392
 Date: 1261.189941
 Mag: 17.845942
 Error: 0.061486
 Pick a point
 Red points upper limits
 Blue points measurements

Data for CADC/CFHT Image Search

Quick Links: [ASCII](#) | [MetaData](#) | [XML](#) | [VOPlot](#) | [Overlay](#)

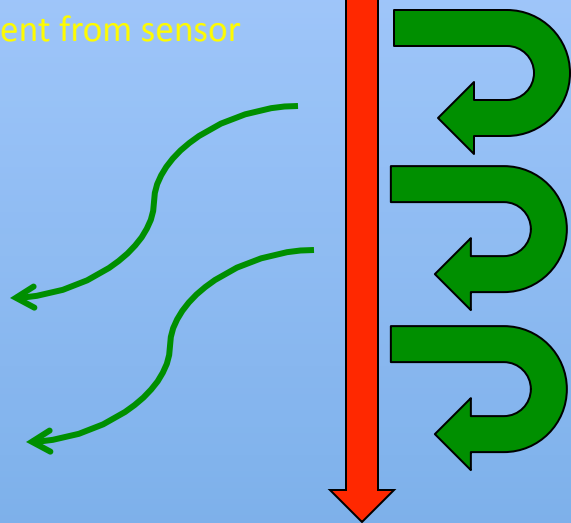
<<First <Prev| 1-25 |Next> Last>>

| <input type="checkbox"/> | All | collection | id | format | instrument | RA |
|-----------------------------|--------------------------|------------|--------|------------|------------|--------------|
| 1. <input type="checkbox"/> | View FOV | CFHT | 797163 | image/fits | MEGAPRIME | 16 23 00.6 3 |
| 2. <input type="checkbox"/> | View FOV | CFHT | 797163 | image/fits | MEGAPRIME | 16 22 29.8 3 |
| 3. <input type="checkbox"/> | View FOV | CFHT | 797163 | image/fits | MEGAPRIME | 16 21 56.3 3 |

This light-curve is anomalous!
 -- B. Obama

Event lifecycle

event from sensor



VO annotation:
catalogs, images, spectra

Mining:
is it special or is it trash

Subscriber rules:
Email me, phone me, SMS me etc

Automated
decisions on
multi-sourced
data

Custom
presentation
template for
each stream

| Likely Supernovae detected by CSS | | | | | | | | | | | |
|-----------------------------------|-------------|----------------------|---------|----------|-------------|--------------------|-------|--------|-------|-----------------------|----------------------|
| RA (J2000) | Dec (J2000) | Mag | del mag | Date | Time (MJD) | CSS images | SDSS | Others | Galex | LC | Classification |
| 217.7357 | 22.3948 | 19.15 | 2.65 | 20080624 | 54641.30511 | 805241210144127354 | ✓ | yes | 27594 | ✓ | SN SDSS mag 21.8 gal |
| 20080624 | 54640.28738 | 805231320056128567 | ✓ | yes | 26697 | ✓ | no | 25627 | ✓ | SN SDSS mag 23 object | |
| 20080614 | 54631.16379 | 805141090204118627 | ✓ | yes | 16227 | no | 16227 | no | 16227 | SN SDSS gal mag 21.5 | |
| 20080611 | 54628.18732 | 80511432014416392 | ✓ | yes | 16392 | ✓ | no | 16392 | ✓ | SN 2008f | |
| 20080610 | 54627.40016 | 805100091194116339 | maybe | 16339 | 20411 | | | | | | |
| 20080508 | 54625.29119 | 805081220064120410 | ✓ | yes | 20411 | | | | | | |
| 20080608 | 54625.43861 | 805081220004109995 | no | ✓ | 03996 | | | | | | |
| 20080514 | 54620.18912 | 80503189120004115392 | ✓ | yes | 15392 | | | | | | |

| Data for CADC/CFHT Image Search | | | | |
|---------------------------------|--------|-----------|------------|--------------|
| collection | id | format | instrument | RA |
| CFHT | 797163 | image/fit | MEGAPRIME | 16 23 00.8 3 |
| CFHT | 797163 | image/fit | MEGAPRIME | 16 22 29.8 3 |
| CFHT | 797163 | image/fit | MEGAPRIME | 16 21 56.3 3 |

comment
comment
comment

73

Portfolio

ivo://nasa.gsfc.gcn/SWIFT#BAT_GRB_Pos_349592-859

From the [SWIFT](#) stream.
SWIFT GRB alerts

This event has 1 comments.

Event IVORN is BAT_GRB_Pos_349592-859, packet type 61.
RA, Dec is (196.9758, -75.6086) ± 0.05.

Burst Intensity/Peak: 0/2106

[Show Params](#) / [Hide Params](#)
[Show XML](#) / [Hide XML](#)

Event IVORN is UVOT_Image_349592-914, packet type 72.
RA, Dec is (196.9879, -75.5931) ± 26184.228.

[Show Params](#) / [Hide Params](#)
[Show XML](#) / [Hide XML](#)

Event IVORN is UVOT_SrcList_349592-909, packet type 73.
RA, Dec is (196.9879, -75.5931) ± 0.2653.

[finding chart](#)

[Show Params](#) / [Hide Params](#)
[Show XML](#) / [Hide XML](#)

Event IVORN is UVOT_Proc_Image_349592-916, packet type 79.
RA, Dec is (196.9879, -75.5931) ± 26184.228.

[Show Params](#) / [Hide Params](#)
[Show XML](#) / [Hide XML](#)

This event has 1 comments.

- Roy Williams: What an exciting event!...

Comment from Roy Williams



A portfolio can have many events

A first event and other follow-up events

Real or Virtual

Presentation Template

Stream Specific

Template:

```
<h3>CRTS (Catalina) Event identifier is {{ e.localIVORN }}.</h3><br/>
<img src= {{ e.FirstDetectionparams.img }} width=250>
<img src= {{ e.SecondDetectionparams.img2 }} width=250>
<img src= {{ e.ThirdDetectionparams.img3 }} width=250>
<img src= {{ e.Asteroidparams.imgmaster }} width=250><br>
<table>
<tr><td>Position</td><td>{{ e.RA }},{{ e.Dec }}</td></tr>
<tr><td>Time</td><td>{{ e.ISOtime }} (MJD {{ e.MJDtime }})</td></tr>
<tr><td>Magnitude</td><td>{{ e.FirstDetectionparams.magnitude }}</td></tr>
<tr><td>Magnitude</td><td>{{ e.SecondDetectionparams.magnitude2 }}</td></tr>
<tr><td>Magnitude</td><td>{{ e.ThirdDetectionparams.magnitude3 }}</td></tr>
```

Save

Use the standard parameters and stream-specific parameters to build a template to present events from that stream.

Standard Parameters

[RA](#), [Dec](#), [streamIVORN](#), [globalIVORN](#), [localIVORN](#), [positionalError](#), [ISOtime](#), [MJDtime](#), [description](#), [referenceURL](#), [role](#), [contactName](#), [contactEmail](#), [contactPhone](#). [XML](#).

Please describe the meanings of the parameters that these events will use.

Stream-specific Parameters

| Group Name | Parameter Name | UCD | unit | Description |
|-----------------|------------------------|---------------------|------------------|-------------|
| Asteroid params | Aperture reject | I | stat.probability | |
| Asteroid params | Apparent motion | I | pos.pm | arcsec |
| Asteroid params | Ecliptic Inclination | I | pos.posAng | deg |
| Asteroid params | Ecliptic Latitude | I | pos.ecliptic.lat | deg |
| Asteroid params | Ecliptic Longitude | I | pos.ecliptic.lon | deg |
| Asteroid params | imgmaster | I | meta.ref.url | |
| Asteroid params | Inner motion | I | pos.pm | arcsec/min |
| Asteroid params | Known Asteroid | I | stat.probability | |
| Asteroid params | Motion uncertainty Dec | I | stat.error.sys | deg |
| Asteroid params | Motion uncertainty RA | I | stat.error.sys | deg |