S6/VSR2 online GRB search for inspiral signals

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Goal

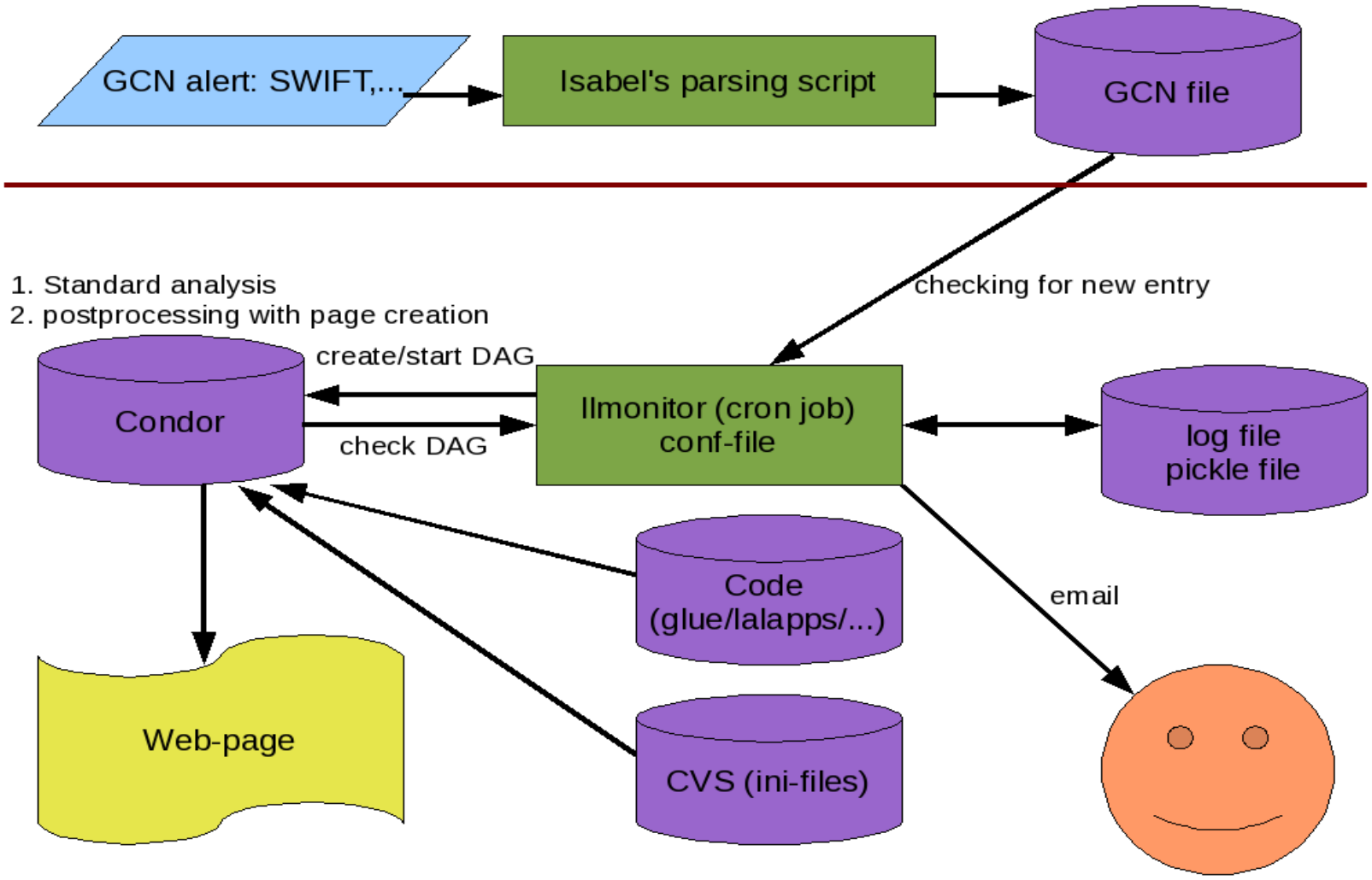
- Low latency search
- First results after 1 day:
  - Publication in GCN
  - Fast followup with telescopes
- Full results within a week

- Currently:
  - First results might be as fast as one day (but box closed)
  - Full results: many weeks

Infrastructure

- Almost identical reviewed code used as for the S5/VSR1 analysis
- Upper code to handle the whole analysis is completely new:
  - pylal_exttrig_llmonitor
  - pylal_exttrig_llsummary
  - pylal_exttrig_llutils.py

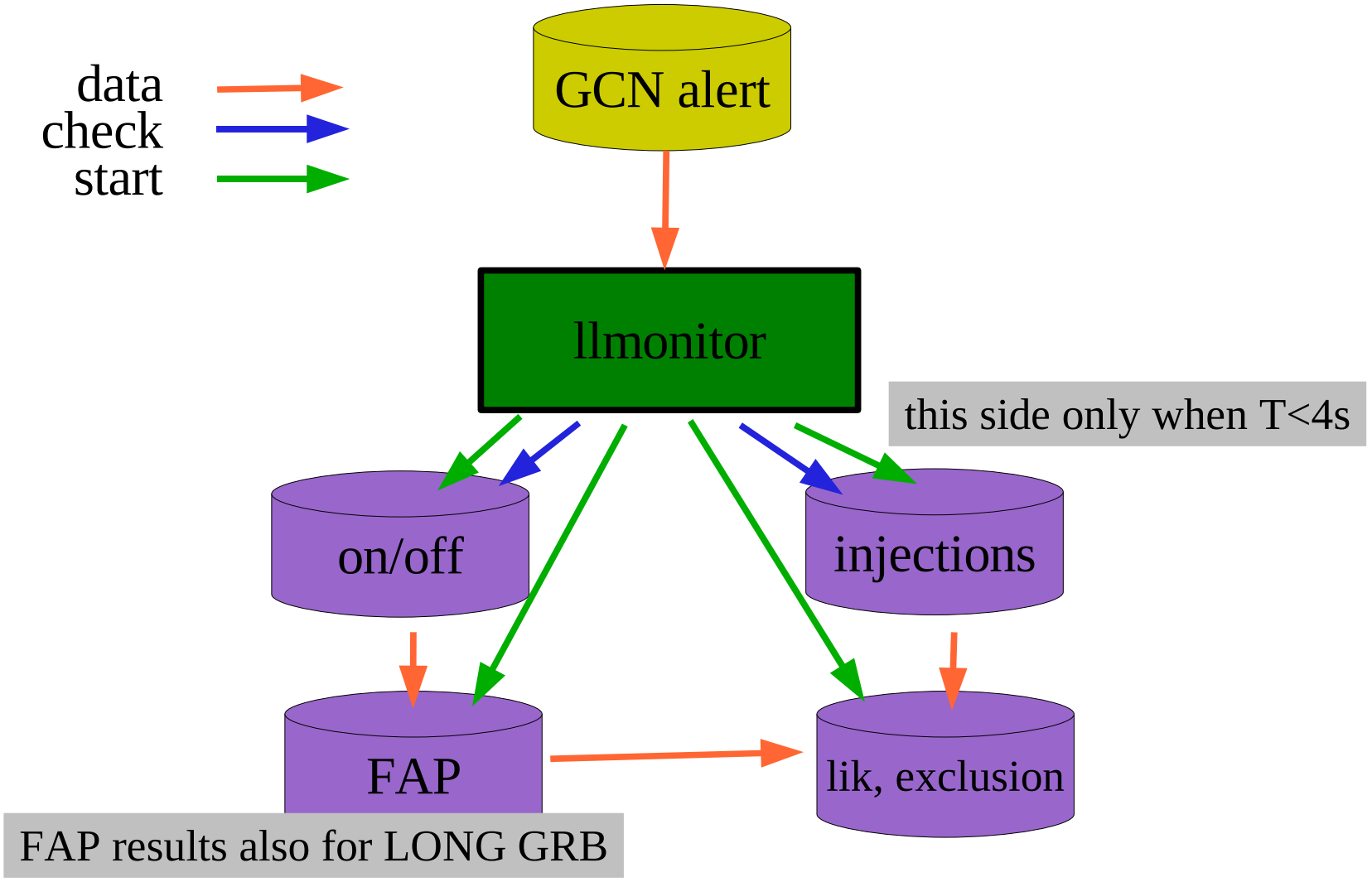
Workflow


GCN alert: SWIFT,...
Isabel's parsing script
GCN file
1. Standard analysis
2. postprocessing with page creation
checking for new entry
create/start DAG
Condor
check DAG
llmonitor (cron job)
conf-file
log file
pickle file
Code
(glue/lalapps/...)
email
Web-page
CVS (ini-files)

Parameters

- Basic search parameters: basically the same as used for S5
  - SNR threshold: 4.50 for each (3.50, 4.25, 5.50 before)
  - Coincidence parameter (0.8 to 1.0)
- Injections:
  - Also basically the same
  - Three waveforms, masses 1-40, uniform cos(i)
  - NEW: injections into three mass spaces:
    - Full: 1-40
    - Low: 1.4/1.4
    - High: 1.4/10

How is it run?


data
check
start
GCN alert
llmonitor
this side only when T<4s
on/off
injections
FAP
lik, exclusion
FAP results also for LONG GRB

Inspiral search on long GRBs?

- For all non-short GRBs the onsource and offsource is analyzed
- Should we open these boxes?

Inspiral search on long GRBs?

- For all non-short GRBs the onsource and offsource is analyzed
- Should we open these boxes?

YES!

- Models on GRBs not accurate, there are many issues, unsolved problems...
- I don't expect any real inspiral GW associated with LGRB, but *if* there is a signal we should not miss it...

Current status

- Using GCN circulars instead of alerts (avoid analysis of glitches)
- Test runs underway
  (with fake GRB time, at HW injection times)
- Injection run takes a very long time (~3 weeks)
- monitor code still in development
- Analysis of all GRB between mid Sep 09 and mid Jan 10 must be started.

- But: code running online sine mid Jan 10
- And: Injection run on one real short GRB almost finished

Manpower limited

Summary page

https://ldas-jobs.phys.uwm.edu/~dietz/S6_tagged/total_summary.html

35	090817	NoData NoData	None None	934505508	Mon Aug 17 00:51:48 2009	—	250.00	65.97 44.12	0.40	0.44	0.62	—	—	—
34	090815C	Complete inspiral	None None	934413714	Sat Aug 15 23:21:54 2009	—	0.30	64.49 -65.94	**0.85**	**0.80**	**0.68**	onoff —	box closed	box closed
33	090815B	Complete Not started	None None	934367456	Sat Aug 15 10:30:56 2009	—	30.00	21.40 53.40	**0.97**	0.92	**0.44**	onoff —	box closed	box closed
32	090815	Complete Not started	None None	934355547	Sat Aug 15 07:12:27 2009	—	200.00	41.70 -2.00	**0.12**	**0.43**	**0.55**	onoff —	box closed	box closed
31	090814C	NoData NoData	None None	934274996	Fri Aug 14 08:49:56 2009	—	0.25	332.50 58.90	0.98	**0.83**	**0.34**	—	—	—
30	090814B	Complete Not started	s6_exttrig_100127b None	934248108	Fri Aug 14 01:21:48 2009	—	50.00	64.75 60.58	0.43	**0.37**	**0.74**	onoff —	box closed	box closed
29	090814	Complete Not started	None None	934246354	Fri Aug 14 00:52:34 2009	—	30.00	239.61 25.60	0.89	**0.99**	**0.48**	onoff —	box closed	box closed
28	090813	NoData NoData	None None	934171858	Thu Aug 13 04:10:58 2009	—	8.00	227.02 88.57	**0.74**	0.60	**0.70**	—	—	—
27	090812	Complete Not started	None None	934092143	Wed Aug 12 06:02:23 2009	—	70.00	353.19 -10.60	0.36	**0.65**	**0.14**	onoff —	box closed	box closed
26	090809B	Complete Not started	None None	933895709	Sun Aug 9 23:28:29 2009	—	15.00	95.30 0.10	0.11	**0.50**	**0.51**	onoff —	box closed	box closed
25	090809	Complete Not started	None None	933874289	Sun Aug 9 17:31:29 2009	—	10.00	328.64 -0.08	**0.56**	**0.83**	**0.34**	onoff —	box closed	box closed
24	090807B	NoData NoData	None None	933710294	Fri Aug 7 19:58:14 2009	—	3.00	326.90 7.20	0.62	0.75	0.60	—	—	—
23	090807	Complete Not started	None None	933692442	Fri Aug 7 15:00:42 2009	—	—	273.74 10.28	**0.60**	0.78	**0.41**	onoff —	box closed	box closed
		Complete	None		Sun Aug 2			267.00				onoff	box	box

Outlook

- Goal for the near future:
  - Timeslide of the ~300 offsource segments:
    Can reach background estimation on the 10^{-4} level
  - Parameter investigation
  - Time consuming injection runs outsourced
  - Live online test in S6/VSR2 with LIGO/Virgo in summer
- Mid-term future:
  - Bayesian distance exclusion
  - Coherent analysis
  - Use of GPU processors
  - Code for better distribution of injections

Advanced detectors

- And finally:
  - Complete revision of the driver code for advanced detectors (more simple, robust code with all the updates)
  - Gaining confidence, so we really can send a GCN

Basic search parameters

parameter	used in S6	used in S5	S6 lowmass
minimum-mass	1.0	1.0	1.0
maximum-mass	40.0	40.0	35.0
max-total-mass	40.0	40.0	35.0
minimal-match	0.97	0.97	0.97
snr-threshold	4.50	3.50, 4.25, 5.50	5.50
chisq-threshold	10.0	10.0	10.0
chisq-delta	0.2	0.2	0.2
rsq parameters	same as S6 lowmass		
e-thinca-parameter	1.0	0.8	0.5

Injections

Injections only started when
there is a duration available
the duration is smaller than 4 seconds

inclination distribution (i-distr)	uniform
location distribution (l-distr)	exttrig
distance distribution (d-sistr)	uniform
maxx distribution	componentMass
min-distance	500.0
max-distance	50000.0
f-lower	30.0
min-mass2	1.0
max-mass2	3.0
min-mtotal	2.0
max-mtotal	43.0

Name	waveform	number inj
Taylor	TaylorT1twoPN	3 X 3000
PPN	GeneratePPNtwoPN	3 X 3000
Spin	SpinTaylorthreePointFivePN	3 X 6000

New mass areas in S6:

Name	m-distr	min-mass2	max-mass2	mean-mass2	stdev-mass2
Full	componentMass	1	40	---	---
Low	gaussian	1.0	3.0	1.4	1.0
High	gaussian	5.0	15.0	10.0	1.0