SNEWS Update

Neutrino 2018

Kate Scholberg (for the working group)

- What's new since Nu2016
- Review of operational mode/nomenclature
- Operational mode history
- Other notes
- Proposals

20 years since the first “proto” SNEWS meeting in 1998!

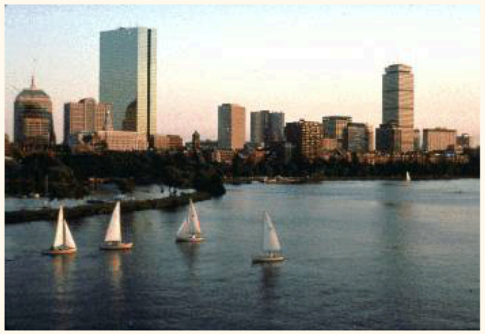
NEUTRINO'98

SUPERNOVA EARLY ALERT NETWORK

First International Workshop

Boston University
Boston, MA

September 11-12, 1998



A meeting of neutrino experimenters, supernova theorists and astronomers to plan the world-wide response to the next Galactic core collapse supernova.

Topics for Discussion:

- **The neutrino signal and triangulation:** what will the individual experiment signals look like? How well will it be possible to point to the supernova by combining neutrino burst timing information from different neutrino experiments?
- **Inter-experiment connection:** alert implementation and data exchange issues.
- **Connection with the astronomical community**: how can we organize astronomer responses to have the best possible chance of observing early supernova light?

Since last SNEWS meeting at Neutrino 2016:

- **Server code has been running with very little downtime at BNL;**
  regular shift checks by SNEWS 'subgroup'

- **Backup server at the U. of Bologna also running smoothly**

  - receives alarms from clients
  - email output only enabled if other server
    or BNL network disabled (few times per year)
  - part of regular shift check

- **Grant from NSF extended through mid-2019**
  (undergrad+outreach+travel)

Operational Mode History

Fall 2013: operational mode **5.0**
SK+LVD+Borexino+IceCube+KamLAND

November 2014: **6.0**, add Daya Bay

October 2015: **7.0**, add HALO

Privacy agreement in effect:

- only well defined output propagated
- only subgroup members have access to alarms

Packet Types

Packet types

PING: test only
ALARM: action depends on level flag
RETRACTION: remove alarm from queue in time windows (for given expt)

Level flags (decided by individual experiment)

TEST: for test queue
POSSIBLE: for alarm queue, lower quality
GOOD: for alarm queue, all OK
RETRACTED: removal packet (redundant)
OVERRIDE: for alarm queue, confirmed good

Coincidence Alert Types

GOLD alert: clean, unambiguous AUTOMATED alert, to experimenters and astronomers

SILVER alert: coincidence with one or more problems, to experimenters only (NOT lost, just delayed)

- calibration or other tag on any alarm
- too few in coincidence at distant locations
- history of high rate

Experiments define procedure for each

GOLD alert must have *all* of the following conditions met: (otherwise, it's SILVER)

1. A two- or more fold coincidence within 10 seconds

   ➔modify for more experiments?

2. At least two experiments at different laboratories

3. Two or more alarms flagged as GOOD

4. Rate of alarms in past time intervals for at least 2 experiments involved must not be too high
   (require **<1/100 yr accidental coincidence**)

Notes on Rate Lookback Criterion

For intervals $\{T_i\}$={10 min, 1 hr, 10 hr, 1 d, 3 d, 1 wk, 1 mo}

require *consistency with specified rate,*
depending on no. of active experiments

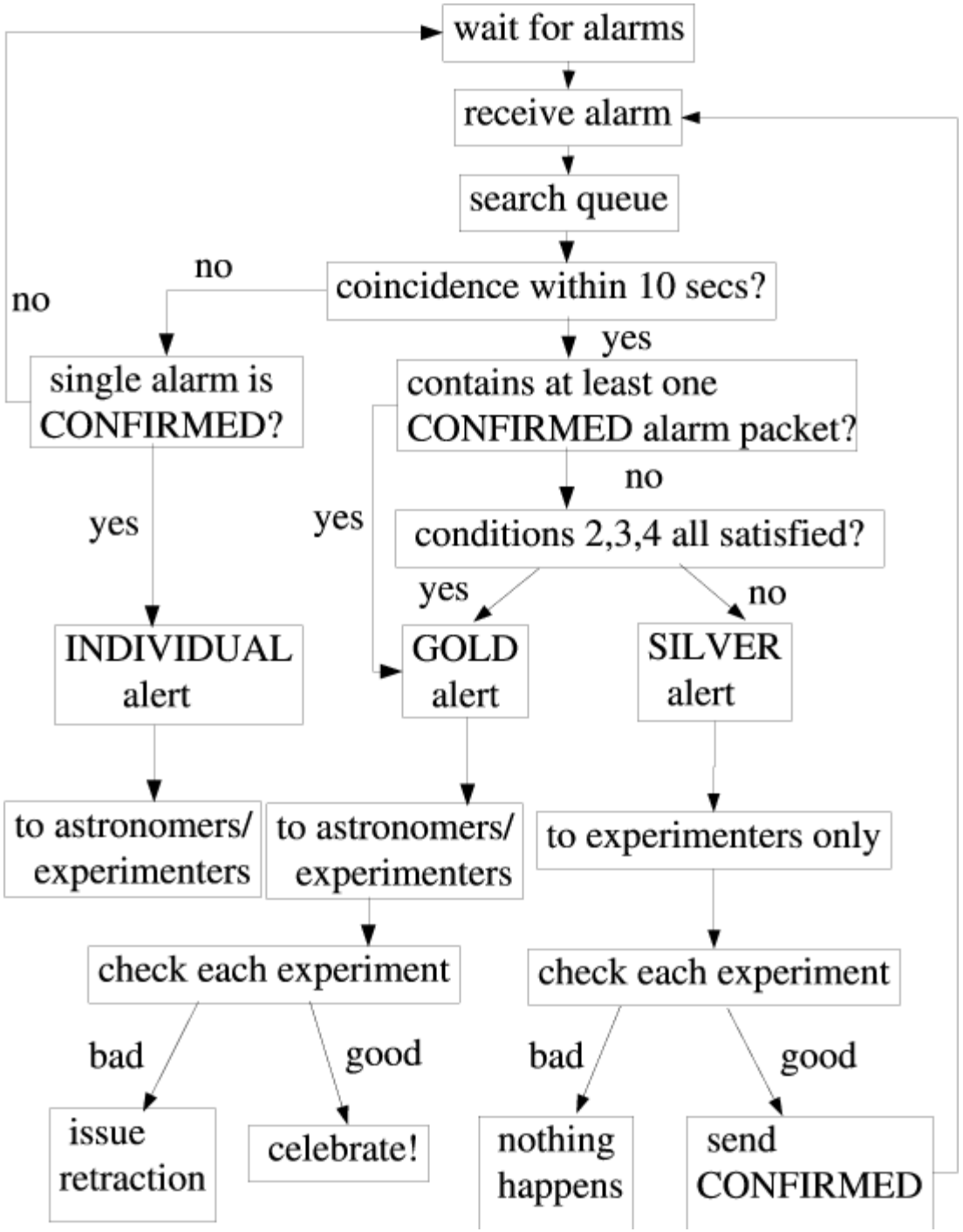
For the $\{n_i\}$ alarms sent by each experiment,
require the Poisson probabilities $\{P_i\}$

$$\mathcal{P}_i = \sum_{n=n_i}^{\infty} (\lambda_{\max} T_i)^n e^{-\lambda_{\max} T_i} / n!$$

each to be greater than P_{thr} =0.002

[Current λ_{max} is 1/14 days, for 7 experiments]

Flowchart


wait for alarms
receive alarm
search queue
coincidence within 10 secs?
no
no
yes
single alarm is CONFIRMED?
contains at least one CONFIRMED alarm packet?
yes
yes
no
conditions 2,3,4 all satisfied?
yes
no
INDIVIDUAL alert
GOLD alert
SILVER alert
to astronomers/ experimenters
to astronomers/ experimenters
to experimenters only
check each experiment
check each experiment
bad
good
bad
good
issue retraction
celebrate!
nothing happens
send CONFIRMED

Alert Dissemination

- **PGP-signed** email sent to **`snews-alert`** mailing list maintained at BNL (anyone can sign up)
  ...currently has 3576 members

- Addresses include Sky&Telescope AstroAlert mailing list (needs updating)

- Subscriber list is private for SPAM/security reasons but is available upon request

- `Express-line' output to *experiments* upon request (+ ANTARES, LIGO)

- New: **GCN connection** (GRB coordinates network) formally established December 2015: formatted email with same info as SNEWS alert made available

  GCN Test emails Tuesdays, noon Eastern

Planned Downtime Table

This table is automatically generated.

NOTE THAT ALL TIMES ARE IN UTC

Only recent entries are printed.

Entry No.	Experiment	Start Date and Time				End Date and Time				Grade	Comment
		Year	Month	Day	Hour	Year	Month	Day	Hour		
234	Super-Kamiokande	2018	May	31	23:00	2018	September	20	14:00		Tank open for Gd upgrade
236	Super-Kamiokande	2018	September	20	15:00	2018	December	10	14:00		water fill, some data taking

Grading corresponds to the following rough levels:

- Red: Detector is completely dead.
- Yellow: Detector is mostly sensitive to a supernova burst but alarm is offline (e.g. during calibrations).
- Green: Detector is on but alarm is offline.

Click here to download an entry form.

Problems, questions, suggestions? Send email to snews-downtime@snews.bnl.gov

Planned Downtime Entry Form

Entry number:
176 (•) New ( ) Modify ( ) Delete

Name of person entering record:

E-mail:

Experiment:
ANONE (The Almost Never Off Neutrino Experiment)
IceCube
KamLAND
LVD
Borexino
Super-Kamiokande

Short descriptive comment (e.g., "Calibration", "Power Outage", etc.):

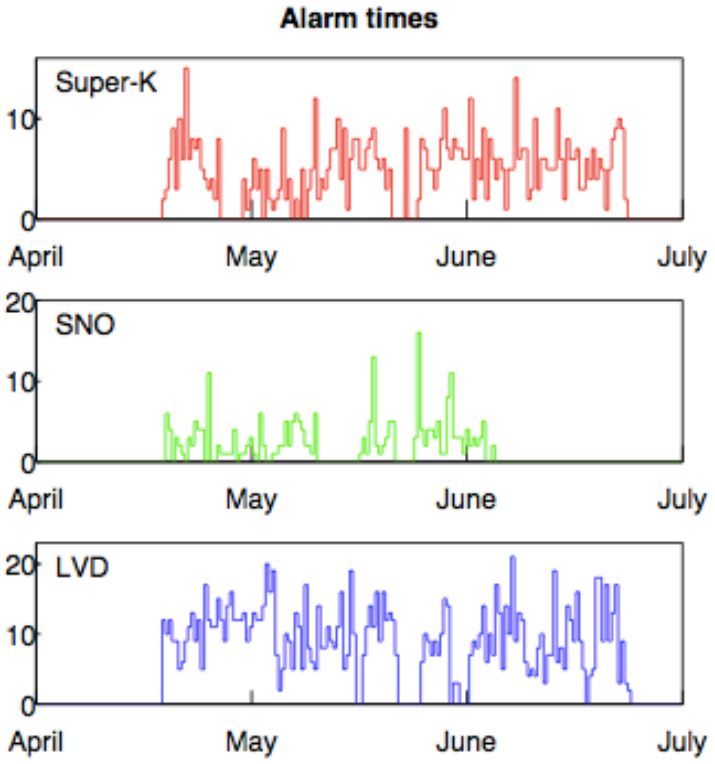
Start of Downtime:

Year:	Month:	Day:	Hour:	Minute:	Time Zone:
2010	January	1	00	00	UTC
2011	February	2	01	15	America/Montreal
2012	March	3	02	30	Asia/Tokyo
2013	April	4	03	45	US/Eastern
2014	May	5	04		US/Central
	June	6	05		US/Mountain
	July	7	06		US/Pacific
	August	8	07		Europe/Rome

On the to-do list

- **SNEWS app:** project for student in fall

- New “high-rate” test, as per 2004 paper (fall?)
- make it more standard?



7 expts,
new paper

SNEWS 2.0

Gravitational waves now seriously in the game;
- "GWNU group" is active; mostly focused on offline searches, but good connections for real-time alert

"Multimessenger astronomy" is a thing
- Communication channels getting better

Detectors getting bigger, better soon...
time to revisit triangulation/other directionality, high rate alerts, more sophisticated fast analysis, (true) presupernova alerts

Time to update

Many considerations...

SNEWS 2.0 Workshop

Topics

- multimessenger update
  - coincidences
  - alert channels
- presupernova alert
- pointing: intrinsic, triangulation, combination of these
- optimizing worldwide sensitivity

Propose week of March 11, 2019
~2 days
Location?

Summary

SNEWS server running smoothly at BNL
with backup at Bologna:
SK IV, LVD, Borexino, IceCube, KamLAND
DB, HALO

Version 7.0 of operational mode in effect

SNEWS 2.0!

Don’t forget about the downtime page