

# Technical Change Control & Operational Procedures



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IceCube M&O Mid-Term Review

# Deliverables

Provide stable and well-understood hardware, software, and detector configurations via:

- Effective change control, testing, and release procedures
- Well-defined operations procedures providing oversight and ensuring data quality
- Detector configuration review and management that balance the needs of science working groups

# Testing Resources



DOM power supplies  
tested at SPTS

- South Pole Test System (SPTS)
  - scaled-down replica of ICL hardware and software
  - small number of real DOMs, full string of DOM mainboards
  - ability to “replay” hitspool data through entire system
- PSL Cable Test System (PCTS)
  - full-length cable for communications testing
- Modular Dark Freezer Labs (mDFLs)
  - walk-in freezers for hardware cold-testing

# Hardware Procedures

- Candidate hardware always installed first at SPTS
  - full system testing using replay data
  - validation and documentation of upgrade procedures
- Testing coordinated via operations group
  - important upgrades presented at collaboration-wide teleconferences
- Hardware upgrades at pole typically staged
  - e.g. 50% server upgrade this year, 50% next year
  - old hardware may remain at pole over winter
- All hardware changes recorded to logbook ([logbook@icecube.wisc.edu](mailto:logbook@icecube.wisc.edu))

# Online Software Development

- All source code under revision control (subversion, git)
- Bugs / features tracked in issue tracking system (Mantis, Trac)
  - severity, owner, detailed description, etc.
  - ticket numbers referenced in code check-ins and release notes
- Changes discussed on weekly development teleconferences

<a href="#">0008540</a>		bugs	minor	<u>new</u> ( <a href="#">jkelly</a> )	<b>2018-12-18</b>	config-scripts: running outside of script directory doesn't work
<a href="#">0008560</a>		<a href="#">[pdaq-user]</a> software	minor	<u>new</u>	2018-12-10	Run `ssh-keyscan` as part of pdaq install?
<a href="#">0008559</a>		software	minor	<u>new</u>	2018-12-07	Replay runs should write to HitSpool
<a href="#">0008558</a>	<a href="#">3</a>	<a href="#">[dash]</a> software	minor	<u>resolved</u> ( <a href="#">dglo</a> )	2018-12-03	We need a way to switch between Python virtualenv instances
<a href="#">0008551</a>	<a href="#">1</a>	<a href="#">[dash]</a> bugs	minor	<u>resolved</u> ( <a href="#">dglo</a> )	2018-11-26	RemoveHubs - Dave broke this!
<a href="#">0008519</a>	<a href="#">1</a>	<a href="#">[pdaq-user]</a> bugs	minor	<u>resolved</u> ( <a href="#">dglo</a> )	2018-11-26	Add RemoveHubs.py as a `pdaq` subcommand

# Software Testing + Release

- Testing emphasized in development
  - unit tests for individual components / functionality
  - integration and system testing at SPTS
- Releases named, numbered, and tagged in version control system
- All major changes (DAQ, DOM mainboard software) reviewed at collaboration-wide teleconference before rollout
- 8- to 24-hour test runs of release candidates at pole
  - data quality vetted by operations group

# Operations: Day-to-Day

- Non-standard procedures (including software releases) require a **Non-Standard Operations Request** form
  - reviewed / approved by the Run Coordinator (M. Kauer)
- All changes to the detector / online systems recorded in the logbook ([logbook@icecube.wisc.edu](mailto:logbook@icecube.wisc.edu))
- Changes affecting data-taking also recorded in IceCube Live with associated run number

## IceCube Non-Standard Operation Request

The purpose of this questionnaire is to collect summary information about requests for special runs (such as flasher runs, debugging and commissioning runs, etc..) in a uniform way. It can also serve as a check list to ensure all aspects of the special run mode are clarified.

\* Required

### General information

#### Title \*

Short working title of the request

Your answer

#### Point of contact \*

Provide the email address of the person to contact regarding feedback

Your answer

#### Description \*

Give a description of your request, including the purpose or goal.


Your answer


# Operational Communications


## #sps-ops

★ | 👤 86 | 🔖 2 | SPS operations coordination.


Sunday, December 16th


 **eberhab** APP 2:36 PM  
(via I3Live) Can we put approx 25GB of SpiceCore data into the jade debug queue?


 **eberhab** APP 4:54 PM  
(via I3Live) reverse thinlinking to retrieve an ARA config file from SPTS

 **eberhab** APP 5:05 PM  
(via I3Live) done

Yesterday

 **jkelley** 7:46 AM  
No problem on the SPICE data

 **jkelley** 7:56 AM  
Kathrin and Benjamin: I did not see indications of a manual page, did the test work?

 **eberhab** APP 2:48 PM  
(via I3Live) Thanks John, the manual page worked fine on the radio. I did not see an email either though.

- Communications with pole is mission-critical
  - facilitated by Iridium satellite link
  - winterovers can send/receive e-mail 24/7
  - IceCube Live / Slack chat integration for real-time messaging
- Emergency contact list provides mobile phone numbers for subject-matter experts



# Run Metadata

- Detector **G**eometry, **C**alibration, and **D**etector status metadata stored in GCD database
  - mirrored from pole to northern data center
- Calibration results vetted on operations calls before insertion into database
- Metadata tagged with validity dates

# Operations: Week-to-Week

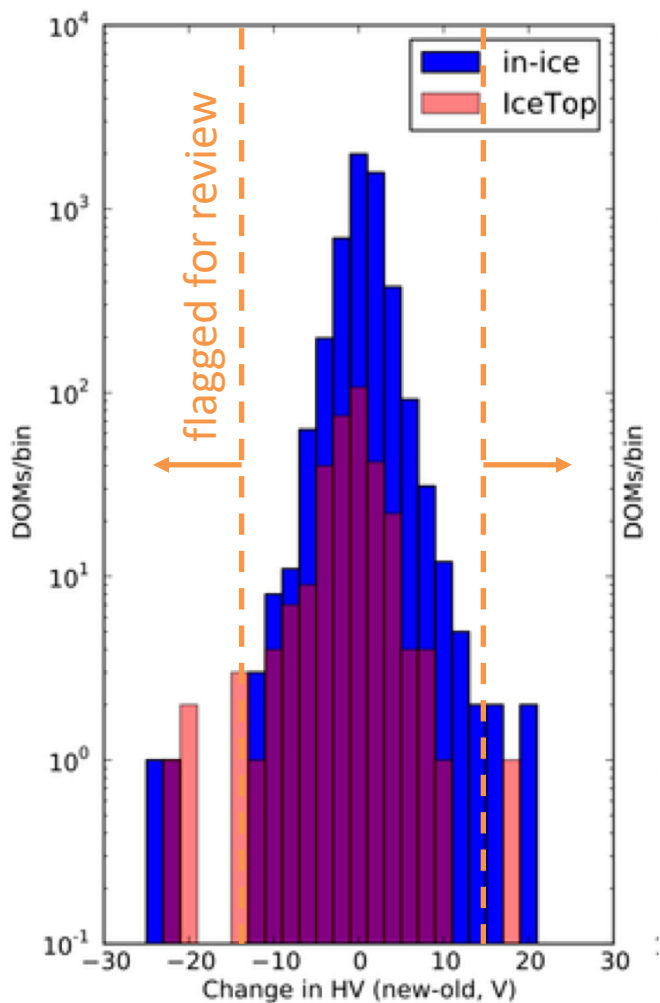
- Weekly operations teleconference
  - report by monitoring shifter (typically grad student) on data quality
  - discussion of pending non-standard operations
  - minutes / action items recorded
- Review of weekly data quality triggers “Good Run List snapshot”
  - run coordinator makes final decision on run goodness
  - recorded in IceCube Live database
  - snapshot triggers Level 2 data processing
  - L2 data ready for working group use 1.5–2 weeks after data-taking

## Good Run List

<a href="#">131910</a>	GOOD	+
<a href="#">131909</a>	GOOD	baseline settling run +
<a href="#">131908</a>	GOOD	blessed ARA pulsing on 01 and 22 partial 13 +
<a href="#">131907</a>	GOOD	stopped for ARA pulser... new PnF:
<a href="#">131906</a>	GOOD	stopped to update PnF +
<a href="#">131905</a>	GOOD	+
<a href="#">131904</a>	GOOD	+
<a href="#">131903</a>	GOOD	+
<a href="#">131902</a>	GOOD	+
<a href="#">131901</a>	GOOD	+
<a href="#">131900</a>	GOOD	baseline settling run full detector so
<a href="#">131899</a>	BAD	down +
<a href="#">131898</a>	GOOD	DOMCal IT +
<a href="#">131897</a>	GOOD	DOMCal IT +
<a href="#">131896</a>	GOOD	stopped for DOMCal IT +
<a href="#">131895</a>	GOOD	+

# Operations: Year-to-Year

yearly high voltage change



- Major detector configuration is constant for an entire year (physics run)
  - DOM settings (high voltage, threshold, etc.)
  - DAQ triggers
  - PnF filters
- Configuration changes validated with automated tests and review by calibration group
- Configuration XML files are named, numbered, and version-controlled in repository
  - never changed after use in data-taking
  - run configuration information tracked in IceCube Live

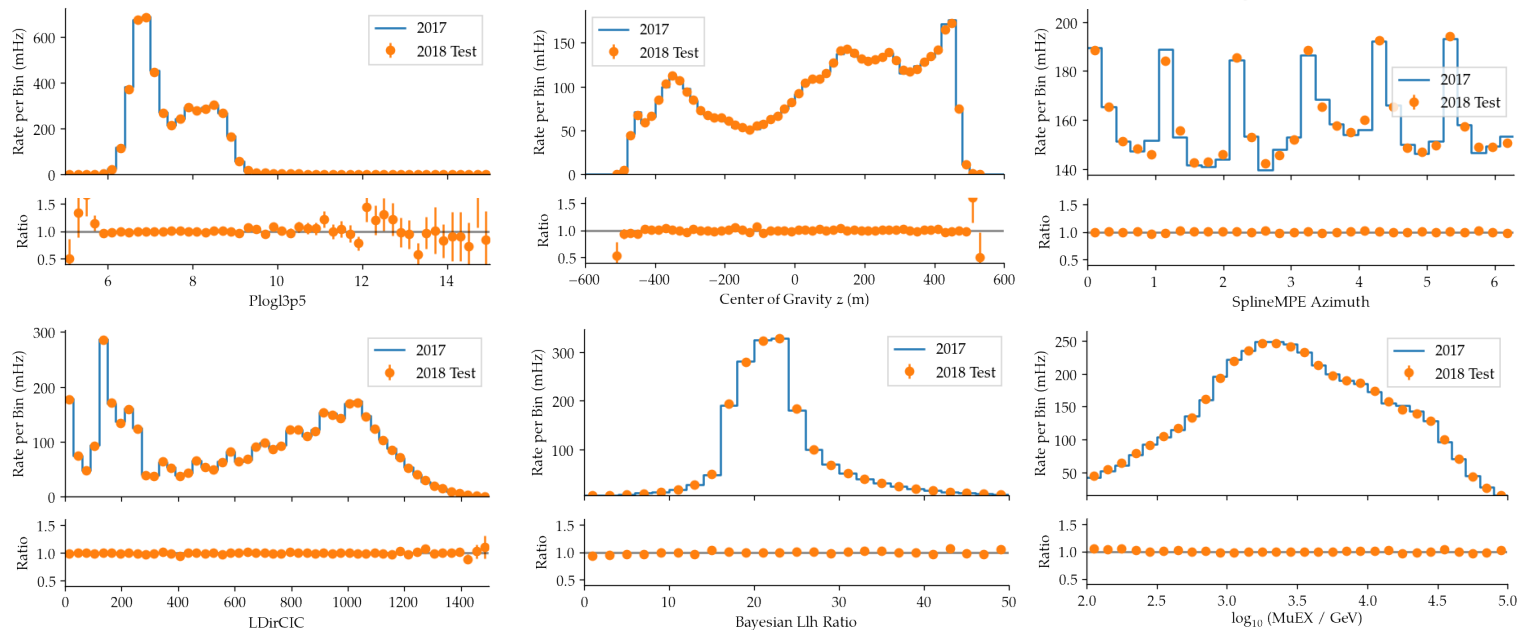
# TFT Board

- Trigger and filter change requests managed by the Trigger Filter Transmission Board
  - balance competing needs for CPU and satellite bandwidth
- Proposals for trigger / filter changes submitted to TFT for yearly review
  - science case justification
  - resource requirements
- TFT presents physics run season plan to collaboration
  - implemented by operations group

# Physics Run Start

- Calibration runs performed, vetted, and used to tune configuration
- SPTS used to validate trigger and filter changes
- 24-hour test run data reviewed and approved by working groups
  - reviewed regardless of major changes to filter selections

## 2017 to 2018 example comparison



# Summary

- Testing procedures and validation on SPTS contribute to high uptime
- Traceable, reproduceable data flow in online software and detector configuration
- Operations procedures balance stability with year-to-year flexibility in physics runs
  - support continued science expansion

Thank you!



M. Wolf / NSF

# Examples

## IceCube Live Run History

132224	2019-02-20 01:47:34	0:10:34	2888.42	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	FS	PP	★★★★★	mkauer	GOOD	GOOD	baseline settling run +
DOWN	2019-02-20 01:42:38	0:04:56												down
132223	2019-02-20 01:32:00	0:10:38	2878.66	-	sps-IC86-2018-re...za-no-iDOMs-V281	Urban_Harvest2 M	dark	FS	PP	★★★★★	mkauer	GOOD	GOOD	iDOM run +
DOWN	2019-02-20 01:28:01	0:03:59												down
132222	2019-02-19 20:45:29	4:42:32	2887.00	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	aporcelli	GOOD	GOOD	stopped for iDOM run +
132221	2019-02-19 12:45:28	8:00:01	2884.59	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	FS	PP	★★★★★	aporcelli	GOOD	GOOD	+
132220	2019-02-19 04:44:00	8:00:19	2882.69	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	aporcelli	GOOD	GOOD	+
132219	2019-02-18 20:43:44	8:00:16	2883.55	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	aporcelli	GOOD	GOOD	new domcals: domcal-20... +
132218	2019-02-18 12:43:31	8:00:13	2883.92	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	aporcelli	GOOD	GOOD	+
132217	2019-02-18 04:43:25	8:00:06	2884.02	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	FS	PP	★★★★★	aporcelli	GOOD	GOOD	+
132216	2019-02-17 20:41:57	8:00:17	2883.99	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	aporcelli	GOOD	GOOD	+
132215	2019-02-17 12:41:45	8:00:12	2882.30	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	aporcelli	GOOD	GOOD	+
132214	2019-02-17 04:41:28	8:00:17	2880.54	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	tkontrimas	GOOD	GOOD	+
132213	2019-02-16 20:41:23	8:00:05	2883.60	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	FS	PP	★★★★★	tkontrimas	GOOD	GOOD	+
132212	2019-02-16 12:39:58	8:00:11	2886.32	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	tkontrimas	GOOD	GOOD	+
132211	2019-02-16 04:39:48	8:00:10	2888.38	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	tkontrimas	GOOD	GOOD	+
132210	2019-02-15 20:39:41	8:00:07	2890.60	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	SR	PP	★★★★★	tkontrimas	GOOD	GOOD	PFServer7 crashed, res... +
132209	2019-02-15 12:39:38	8:00:03	2892.39	-	sps-IC86-2018-re...ana-Hogatza-V281	Urban_Harvest2 M	dark	FS	PP	★★★★★	tkontrimas	GOOD	GOOD	new domhub-tools-pytho... +

## Logbook Archive

**Starting:** Tue Jan 1 19:52:52 CST 2019

**Ending:** Thu Jan 31 21:36:08 CST 2019

**Messages:** 57

- [\[logbook\] PnF stopped working in run 131990](#) *Kathrin Mallot*
- [\[logbook\] start/stop times for 131986](#) *Matt Kauer*
- [\[logbook\] Restarted PnF](#) *Erik Blaufuss*
- [\[logbook\] run crash 131995 - 131998](#) *Kathrin Mallot*
- [\[logbook\] Fwd: RunLivetime](#) *Benjamin Eberhardt*
  - [\[logbook\] Fwd: RunLivetime](#) *Matt Kauer*
- [\[logbook\] DOMs 67-49/50 Gulkana River/Hogatza River](#) *Matt Kauer*
  - [\[logbook\].\[Run coordination\] DOMs 67-49/50 Gulkana River/Hogatza River](#) *John Kelley*
- [\[logbook\] 2018-12 Monthly Performance Stats](#) *Matt Kauer*
- [\[logbook\] New standard config sps-IC86-2018-remove-Gulkana-Hogatza-V281 used starting with run 132002](#) *Kathrin Mallot*