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)

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

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

Software Testing + Release

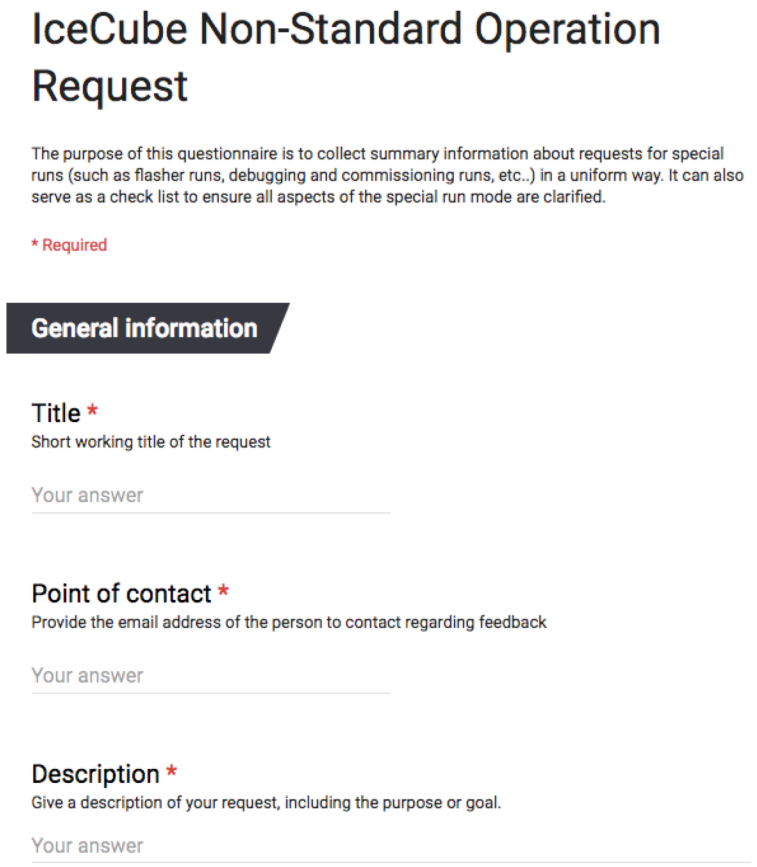
- Testing emphasized in development
  - unit tests for individual components / functionality
  - integration and system testing at SPTS
- Releases named, numbered, and tagged in version control system
- All major changes (DAQ, DOM mainboard software) reviewed at collaboration-wide teleconference before 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)

- 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

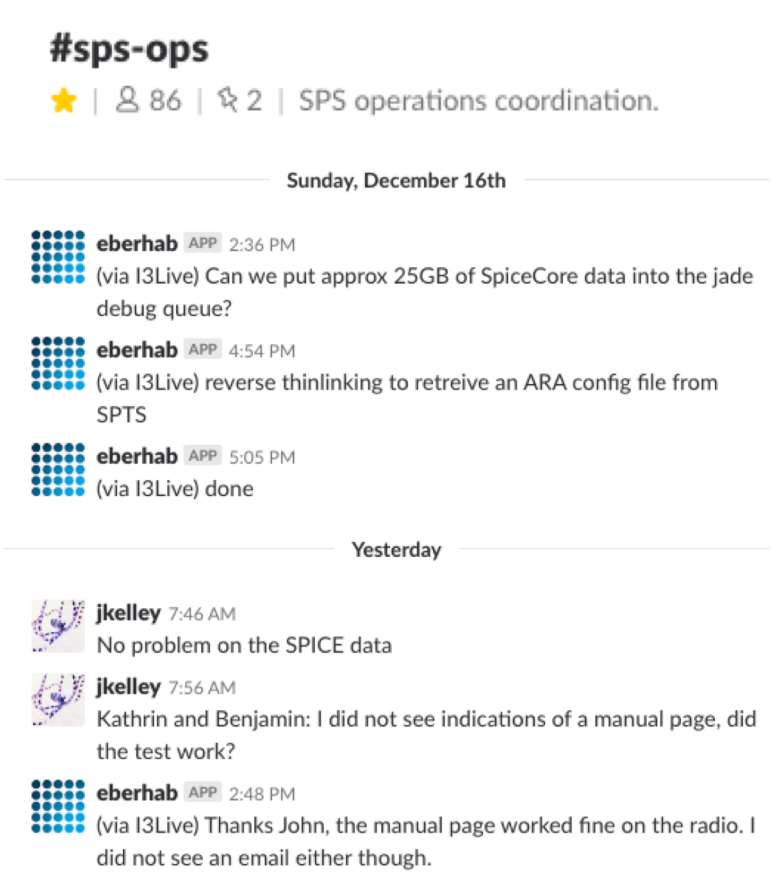
Point of contact *
Provide the email address of the person to contact regarding feedback

Your answer

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

Your answer

Operational Communications



- 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

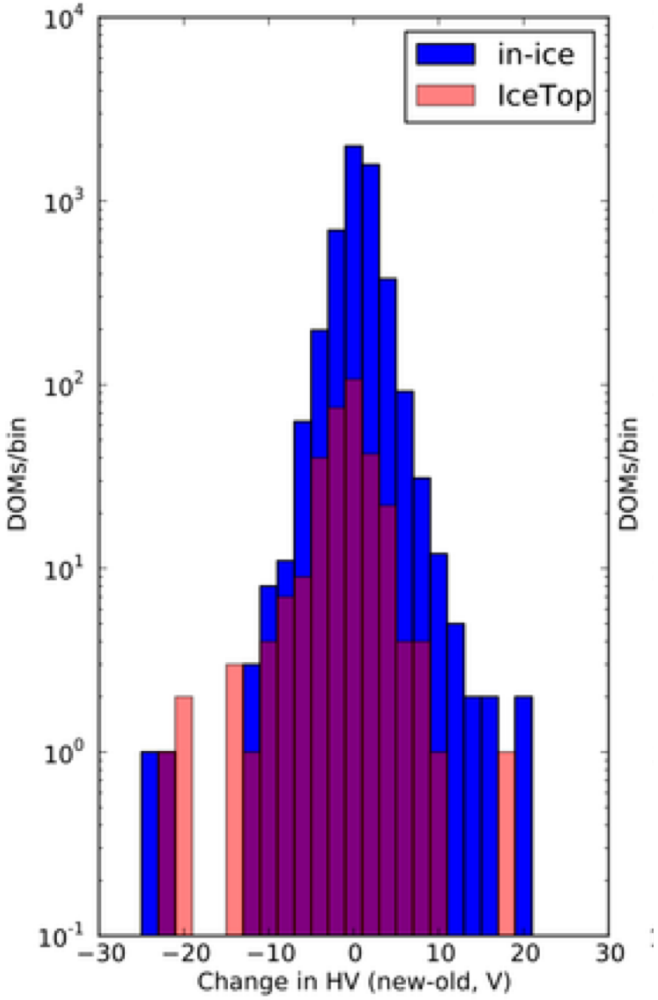
- Weekly operations teleconference
  - report by monitoring shifter (typically grad student) on data quality
  - discussion of pending non-standard operations
  - minutes / action items recorded
- Review of weekly data quality triggers "Good Run List snapshot"
  - run coordinator makes final decision 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

131910	GOOD	+
131909	GOOD	baseline settling run +
131908	GOOD	blessed ARA pulsing on 01 and 22 partial I3 +
131907	GOOD	stopped for ARA pulser... new PnF:
131906	GOOD	stopped to update PnF +
131905	GOOD	+
131904	GOOD	+
131903	GOOD	+
131902	GOOD	+
131901	GOOD	+
131900	GOOD	baseline settling run full detector so
131899	BAD	down +
131898	GOOD	DOMCal IT +
131897	GOOD	DOMCal IT +
131896	GOOD	stopped for DOMCal IT +
131895	GOOD	+

Operations: Year-to-Year

yearly high voltage change



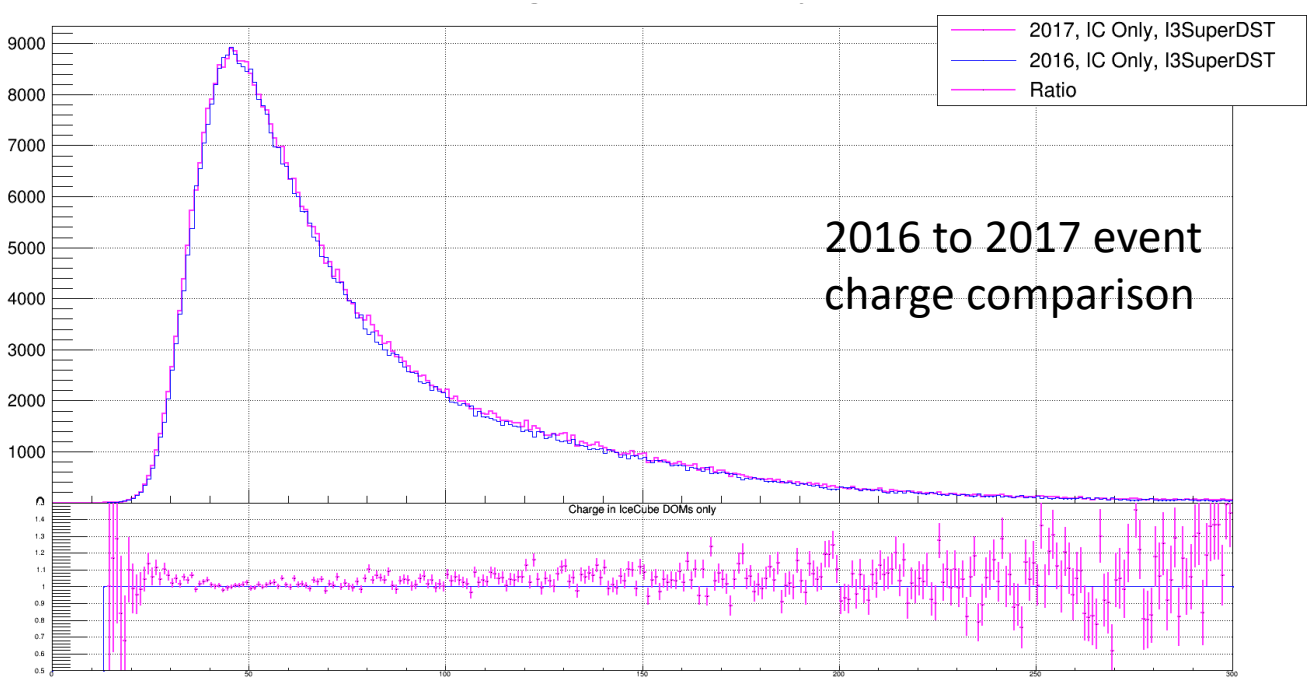
- Major detector configuration is constant for an entire year (physics run)
  - DOM settings (high voltage, threshold, etc.)
  - DAQ triggers
  - PnF filters
- Configuration XML files are named, numbered, and version-controlled in repository
  - never changed after use in data-taking
  - run configuration 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



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!