

IceCube Live Feature List

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The following are most of the features implemented in IceCube Live as of August 1, 2010.

1. Display Detector Status and History

- 1.a. *Show current status in LiveView ('Status' page)*
 - 1.a.i. Show current run status, including DAQ state, run number, time elapsed in run, run configuration, DAQ release, event count, and number of active DOMs.
 - 1.a.ii. Show current 'light mode' (dark / LID)
- 1.b. *Provide command line tools for checking current status*
 - 1.b.i. 'livecmd check' shows current run, subrun, run configuration, run start time, number of DAQ events, DAQ release, current light mode, and status of stand-alone components
- 1.c. *Show detector history in LiveView*
 - 1.c.i. Graph quantities of interest on 'Status' page, over the past 24 hours: event rate, number of active DOMs, outside ambient temperature, CPU load on main experiment control machine, and deviation of current rate
 - 1.c.ii. Provide 'Recent' page showing detector run history
 - 1.c.ii.1. Present overview of recent runs in tabular format, showing run number, start time, duration, trigger rate, "zombie" DOMs¹, run configuration, pDAQ release, and light mode (LID/dark)
 - 1.c.ii.2. Allow users to specify start and end times of run list (default is one week), back to the beginning of 2007 (IC22)
 - 1.c.ii.3. Show detector live time for selected runs
 - 1.c.ii.4. Show missing runs and dead time (e.g., 27 minutes), highlighted as a colored gap
 - 1.c.ii.5. Allow operators to add and delete comments on individual runs. Run comments are synchronized immediately between hemispheres via ITS. Only operators can delete comments. 'icecube' user can view but cannot add comments.
 - 1.c.ii.6. Interface with DAQ logs transmitted to the Data Warehouse to show detailed DAQ log information for all available runs; link to DAQ monitoring/logging files (with file sizes), Verification plots (with abbreviated summary shown) and I3Moni analysis pages.
 - 1.c.iii. Show global event rate history ('Rates' page)
 - 1.c.iii.1. Show three different time scales (last two hours, last 24 hours, last 60 days)
 - 1.c.iv. Show detector uptime ('Uptime' page)
 - 1.c.iv.1. Provide year-by-year graphs of monthly uptimes going back to 2007 (IC22)
 - 1.c.v. Provide alert history
 - 1.c.v.1. Show "ticker-like" graphical history snapshot over 24 hours on main (status) page

¹ 'Zombie' DOMs are DOMs which were communicating at the start of the run and which were in the pDAQ run configuration but which did not contribute to data taking throughout the entire run.

- 1.c.v.2. Show detailed alert history on separate 'alerts' page
- 1.c.v.3. Show complete triggering history of each individual alert on its own page, as well as who is to be notified by email when the alert is triggered and whether the alert sends pages to the Winter-Overs
- 1.c.vi. Provide paginated, low-level view of individual monitored quantities
- 1.c.vi.1. Implement search by service, variable name, variable type, priority; allow wildcards for service and variable name
- 1.c.vii. Provide paginated view of log messages sent by LiveControl as well as pDAQ, SNDAQ and other subsystems, color-coded by subsystem
- 1.d. *Show current UTC time on all pages*

2. Control Data Acquisition and Stand-alone Systems

- 2.a. *Enable control of detector via LiveView or 'livecmd'*
 - 2.a.i. Start/stop runs, specifying duration, number of runs, run configuration, filtering options, and one or more optional run comments
 - 2.a.ii. Multiple DAQs ('synchronous components') supported (e.g. TWR, Radio, ...)
 - 2.a.iii. Scriptable interface via 'livecmd,' with options to block (wait) until run finishes (used for DAQ testing and flasher operation)
 - 2.a.iv. Perform single run, a specified number of runs, or run indefinitely. Attempt to recover and restart runs up to eight times in case of DAQ error
- 2.b. *Allow for control of non-DAQ components*
 - 2.b.i. Components which run independently of DAQ can be started or stopped, or reset in case of error
- 2.c. *Enable control of 'light mode' (dark / LID) via LiveView or 'livecmd lightmode'*
 - 2.c.i. When light mode changes, all light-sensitive components (e.g. DAQ) are stopped and restarted for clean separation of "dark" and LID running periods
 - 2.c.ii. Indicate light mode status via XML-RPC function, as well as via a disk file on the Experiment Control node. Transmit light mode changes to LiveView
- 2.d. *Enable flasher operations via 'livecmd flasher' command*
 - 2.d.i. Parse user-created XML files indicating which DOMs to flash and the flasher parameters. Transmit this information to DAQ and make sure the subrun transition is successful.
 - 2.d.ii. Support 'immediate' subrun transitions (where DOM parameters are changed without disabling flasher boards)
 - 2.d.iii. Provide interlock to guarantee that flashing is not possible unless light mode is set to 'LID'

3. Alert triggering and transmission features (alert history features described above)

- 3.a. *LiveControl alerts*
 - 3.a.i. Provide facility for alerting when individual runs fail, and when runs repeatedly fail (i.e. the detector cannot be restarted)

- 3.a.ii. Allow users to define new alerts based on minimum or maximum values received from monitoring stream
 - 3.a.ii.1. Implement Schmitt trigger on same to prevent flapping
- 3.a.iii. Alerts can be configured to email one or more recipients when triggered
- 3.a.iv. Alerts can be configured to page the Winter-Overs
- 3.a.v. Persist LiveControl alert settings so that they come into effect every time LiveControl is restarted
- 3.a.vi. Alerts are transmitted to LiveView
- 3.b. *Implement Subsystem Alerts*
 - 3.b.i. Individual subsystems can send alerts at will, optionally notifying recipients by email, with relevant payload data included in the alert.
 - 3.b.ii. Alerts are transmitted to LiveView
- 3.c. *Implement Northern Data Flow Alert*
 - 3.c.i. Cron job in North verifies data is flowing through Live and emails the current Live administrator if there is an outage
 - 3.c.ii. When data stops flowing, clearly indicate that fact on the main 'Status' page of LiveView

4. System Integration Features (features implemented in IceCube Live core system in support of other systems; see also "Infrastructure Features," below)

- 4.a. *Integrate with IceCube Online Database ("I3OmDb")*
 - 4.a.i. Update run_summary table with run start/stop times and DAQ event counts, continuously as data arrives from DAQ
 - 4.a.ii. Update flasher configuration tables when flasher subruns are started
 - 4.a.iii. Transmit SQL query statements to North via SPADE for synchronization with Northern database
- 4.b. *Implement flexible plug-in architecture for control and monitoring of subsystems*
 - 4.b.i. Components can be brought in 'hot' or removed at any time via the 'livecmd control' and 'livecmd ignore' commands
 - 4.b.ii. Components can run on any machine inside the SPS network
 - 4.b.iii. Components can send monitoring data to IceCube Live for alerting and/or for transmission to the LiveView Web Sites
 - 4.b.iii.1. Support basic scalar data types (int, float, str, None)
 - 4.b.iii.2. Support structured data types (JSON)

5. Subsystem-Specific Features

- 5.a. *pDAQ (does not include the DAQ functions described above)*
 - 5.a.i. Monitor rate deviation
 - 5.a.i.1. Collect current event counts from pDAQ in real time via monitoring stream

- 5.a.i.2. Calculate fractional deviation from the current rate versus the last twenty-four hours
- 5.a.i.3. Alert when rate deviation exceeds 10%, except during the first 15 minutes of runs
- 5.a.i.4. Show alerts and graph of rate deviation on main Status page in LiveView
- 5.b. **'SNDAQ'**
 - 5.b.i. Start/stop component via 'livecmd' or LiveView
 - 5.b.ii. **'SNDAQ'** page in LiveView
 - 5.b.ii.1. Show current status
 - 5.b.ii.2. Show recent alarms (highlight alarms less than 24 hours old in red)
 - 5.b.ii.3. Show machine-specific performance metrics for sps-2ndbuild
 - 5.b.ii.4. Show tabular summaries of recent indicators of SNDAQ performance
- 5.c. **'ICL/B2' Monitoring Page**
 - 5.c.i. Show graphs of minimum and maximum temperatures as measured by ICL "weather geese"
 - 5.c.ii. Show humidity in B2 science lab and air flow readout from Goose 2
 - 5.c.iii. Show historical minima and maxima for all quantities.
 - 5.c.iv. Generate alert when temperatures go out of range.
- 5.d. **PnF**
 - 5.d.i. Start/stop/recover nine subsystems via 'livecmd' or LiveView
 - 5.d.ii. (Detailed PnF Displays in LiveView are in progress)
- 5.e. **SPADE**
 - 5.e.i. Display current status on SPS and recent TDRSS data transfer rates in LiveView
- 5.f. **ITS**
 - 5.f.i. Show time of ITS heartbeat in LiveView and display warning if heartbeats are delayed; also show recent heartbeat history
- 5.g. **I3Moni**
 - 5.g.i. Start/stop seven I3Moni components via LiveView or 'livecmd'
 - 5.g.ii. Display graphs and statistics for current disk usage on sps-i3moni
 - 5.g.iii. (Full integration of I3Moni Web site is in progress)
- 5.h. **Weather**
 - 5.h.i. *Show graphs and current values for South Pole temperature, pressure, wind speed and direction*
- 5.i. **Meteor Radar**
 - 5.i.i. Show graphs of Meteor Radar signal strength as picked up by the DOM 'Discworld', over two hour, 24 hour and 7 day timescales.

6. Infrastructure Features

- 6.a. *Transmit data between detector/test systems and LiveView Web sites at South Pole and Madison*
- 6.a.i. Make use of ITS (northbound & southbound), SPADE email and SCP queues (northbound only) and direct TCP/IP (local only) when available
- 6.a.ii. Allow messages to be sent according to 4 “priority” levels:
 - 6.a.ii.1. 1 (ITS) ~2 minute latency
 - 6.a.ii.2. 2 (SPADE email) ~5 minute latency
 - 6.a.ii.3. 3 (SPADE SCP) ~0-12 hour latency
 - 6.a.ii.4. 4 (TCP/IP direct only) immediate
- 6.a.iii. Higher priority messages are copied to lower priority queues for redundancy
- 6.a.iv. Bandwidth limits apply to each queue
 - 6.a.iv.1. When bandwidth is saturated, the “noisiest” services lose data first
- 6.b. *Implement hooks for custom data flows*
- 6.b.i. “Filewatcher” program scans for incoming files of interest in Data Warehouse (DW), can be extended to look for new file types/locations
- 6.b.ii. “DBServer” program receives incoming data stored in DW or transmitted directly over TCP/IP or ITS. A handler for structured JSON data can be added for special handling of incoming data (e.g. for directly notifying a service running in Madison)
- 6.c. *Implement direct access to LiveView Database*
- 6.c.i. Django admin panel allows for administrative users (e.g. Run Coordinator) to browse and edit data in database
- 6.c.ii. Direct, read-only MySQL access to most tables available to users on UW cluster
- 6.d. *Multi-cluster support for LiveView*
- 6.d.i. Both SPS and SPTS clusters supported on production server in Madison
- 6.d.ii. ‘Localhost’ cluster used for end-to-end testing on e.g. laptops
- 6.d.iii. Cluster selectable via ‘Comms->Settings’ menu option; connection testable via ITS to South Pole or directly via TCP/IP to SPTS
- 6.e. *“Messages” page in LiveView shows control messages sent to/from LiveView with alert, control, and run annotation information*
- 6.f. *“Stats” page in LiveView shows communications and database statistics and status of Data Warehouse files used for Live*
- 6.g. *“Chat” feature allows users to communicate via ITS if the Jabber chat room is not working.*
- 6.h. *Show IceCube Live user status and history in LiveView*
- 6.h.i. Show current users on status page
- 6.h.ii. ‘User’ page
 - 6.h.ii.1. Currently active users are highlighted
 - 6.h.ii.2. ‘Operators’ can see privileges of other users
- 6.h.iii. Detailed user info pages show login history for individual users

- 6.i. *Online Documentation*
- 6.i.i. 'Overview' page
- 6.i.ii. 'Installation' how-to
- 6.i.iii. 'Monitoring and alerts' how-to
- 6.i.iv. 'Subsystem control' how-to
- 6.i.v. Developers guidelines
- 6.i.vi. Advanced topics
- 6.i.vii. Supporting infrastructure
- 6.i.viii. User manual (PDF) for winter-over scientists and other detector operators
- 6.j. *Repeatable, turn-key installation procedure for Web servers (kickstart based)*
- 6.j.i. Includes database import, software dependencies, Python 2.6 installation, security settings, Apache configuration, SSL certificates
- 6.k. *Misc. helpful command-line options for SPS/SPTS Experiment Control nodes ('livecmd')*
- 6.k.i. 'launch' and 'kill' commands for stopping/starting livecontrol
- 6.k.ii. 'reset daq' command for resetting DAQ thread without restarting I3Live
- 6.k.iii. 'tail' function starts continuously monitoring the I3Live log file (helpful for troubleshooting)

7. Security Features

- 7.a. *LDAP/PAM interface for authentication of Web site users*
- 7.b. *Operator Privileges accrue automatically to users in IceCube 'pdaq' LDAP group*
- 7.c. *Secure HTTP (HTTPS) used for all Web pages, with rewrite rule to map all HTTP URLs to HTTPS*
- 7.d. *User logins timeout after 24 hours of inactivity*

8. Public Outreach Features

- 8.a. *Twitter feed (currently tweets temperatures at Pole every 3 hours, see <http://twitter.com/i3live>), easily expandable to include more data types*
- 8.b. *RSS feed for run transitions and alerts*