

IceCube Neutrino Observatory WBS Dictionary

2016.08.31 Rev G

2.1 Program Coordination

Activities related to the management, administration, and systems engineering.

2.1.1 Administration

Provide oversight and direction in managing and facilitating the IceCube Management & Operations program as well as interfacing to the IceCube collaboration structure. Act as focal point for ensuring continued support for stakeholder related issues and decision processes. Provide ongoing support for daily operations and review processes to ensure accuracy of reporting data while providing leadership. Coordinate and facilitate activities related to program involving subcontract management, financial reporting, and stakeholder related issues.

2.1.2 Engineering and R&D Support

The engineering and R&D tasks required to support day-to-day operations of the detector and ensure its long-term viability. R&D supports efforts to address electromagnetic interference (EMI) in the Dark Sector, enhancements to the performance of the IceCube Laboratory electronics and computing, and the ability to interface with externally funded R&D and science activities, especially those that intend to utilize the IceCube facilities, infrastructure, or data flow.

2.1.3 USAP Support and Safety

South Pole planning which includes grantee deployments, cargo, and detailed on-ice support plans coordinated with the Antarctic Support Contractor (ASC). Gather needed information to submit the Support Information Package (SIP) to ASC / NSF each April. Safety planning to ensure IceCube personnel and equipment operate in a safe and healthful workplace. Conduct yearly training prior to Pole deployments.

2.1.4 Education and Outreach

Provide for the education and public outreach responsibilities of IceCube's missions, projects, and programs. Includes management and coordinated activities, formal education, informal education, public outreach, and website maintenance.

2.1.5 Communications

Media support and dissemination of information about IceCube and its activities through press releases, news articles, and digital channels (website and social networks) to reach audiences that are growing both in number and in diversity.

2.2 Detector Operations and Maintenance

Daily operation, control, and monitoring of the physical systems composing the detector instrument.

2.2.1 Run Coordination

Coordinate and prioritize of special detector operations, calibration runs, and online software upgrades. Ensure data quality delivered to Offline Data Production, including determination of good/bad runs and good/bad DOMs. Track detector performance measures.

2.2.2 Data Acquisition

Maintain and update the data acquisition software including DOM software, DOR card device driver, StringHub, trigger, event builder, and secondary stream builder. Maintain the HitSpool untriggered data buffering and capture system. Interface with the TFT and working groups to define and implement new triggers.

2.2.3 Online Filtering

Maintain and update the processing and filtering system software, including incorporating new filters each physics run start, and interfacing with the TFT and working groups to determine filter CPU and bandwidth constraints. Identify candidate astrophysical events for the real-time alert system.

2.2.4 Detector Monitoring

Maintain and update the IceCube Live detector monitoring system, including the real-time web page status, backend databases, and data quality monitoring subsystem. Maintain system for tracking good/bad runs and good/bad DOMs. Support real-time alert program by providing detector status and alert interfaces.

2.2.5 Experiment Control

Maintain and update the online IceCube LiveControl experiment control system. Provide low-latency communications and messaging to/from the South Pole. Maintain and update the databases and other systems providing detector metadata (e.g. calibration constants).

2.2.6 Surface Detectors

Maintain the specialized calibration and operational systems required for the IceTop surface array. Develop and deploy new scintillator-based devices to mitigate the effects of snow accumulation on the surface array efficiency.

2.2.7 Supernova System

Maintain and update the parallel data acquisition system responsible for detecting Galactic core-collapse supernova. Generate timely alerts to the northern hemisphere including follow-up systems (e.g. SNEWS).

2.2.8 Real-time Alerts

Maintain and update software systems related to generation and reception of real-time alerts other than those generated by the online supernova system.

2.3 Computing and Data Management Services

2.3.1 Data storage and transfer

Definition: Hardware and software infrastructure that enables handling the IceCube data throughout its entire lifecycle: archiving the data at the South Pole, transferring it to the North via satellite, storing it in

the main Data Warehouse at UW-Madison and archiving it for long-term preservation. It includes data discovery, access and preservation.

Tasks:

- Maintain data handling software (JADE): Archive at the S. Pole, transfer, ingest to the Data Warehouse and long-term archive. - P. Meade
- Maintain data catalog. Data discovery and metadata web interface - P. Meade
- Operate data handling services - J. Bellinger
- Long term preservation and archive services. Data curation. - J. Bellinger
- Maintain and operate storage infrastructure at UW-Madison - I. Saunders
- Maintain and operate remote data access services at UW-Madison - V. Brik

2.3.2 Core data center infrastructure

Definition: Operation of the core IT infrastructure at UW-Madison. Includes Networking, core services (email, web, etc) and custom application services.

Tasks:

- Maintain and operate core computing infrastructure at UW-Madison - S. Barnet
- Manage computing facilities at UW-Madison - P. Wisniewski
- Manage networking infrastructure at UW-Madison - P. Wisniewski
- Cybersecurity - S. Barnet

2.3.3 Core computing resources

Definition: High throughput computing cluster at UW-Madison that provides data processing, analysis and simulation services for the IceCube collaboration.

Tasks: Maintain and operate data processing and analysis cluster - V. Brik

2.3.4 Distributed computing resources

Definition: Infrastructure that enables efficient use of heterogeneous distributed resources available for simulation, data processing and analysis. Includes software and operations of Grid services that provide IceCube users seamless access to distributed resources.

Tasks:

- Distributed resources coordination
- Maintain and operate distributed workload management infrastructure (Grid)
- Maintain and operate remote data access services at UW-Madison

2.3.5 SPS

Definition: Computing infrastructure at the South Pole, including commodity servers to host infrastructure services and online applications (DAQ, filtering, monitoring), OS and configuration for DOMhubs and networking.

Tasks:

- Maintain SPS computing infrastructure

- SPS networking and security

2.3.6 SPTS

Definition: Computing infrastructure at UW-Madison that provides a reduced size replica of the SPS.

Tasks:

- Maintain SPTS computing infrastructure
- SPTS networking and security

2.4 Data Processing and Simulation Services

2.4.1 Offline Data Production

Manage and execute production of offline data processing to generate general purpose Level 2 data (with refined event reconstruction) and science working group specific Level 3 data (with event reduction defined by channel working groups).

2.4.2 Simulation Production

Manage and execute production of simulation data to provide sufficient cosmic ray induced and neutrino induced events in the IceCube Observatory for all physics working groups. Produce simulation data at the general purpose Level 2 and provide the tools for working groups to produce Level 3 data.

2.4.3 Public Data Products

Coordinate the regular release of science level experimental data from refereed-journal published results, and the release of real-time alerts authorized by the Real Time Oversight Committee.

2.5 Software

2.5.1 Core Software

IceCube's core software library consists of the IceTray framework, a set of basic modules and data containers, and a wide range of open source tools that are used in the development of calibration, simulation, reconstruction, and analysis modules. A robust set of Python bindings is also included, which facilitates the use of advanced analysis environments and 3-D graphical event displays. This group is currently managed by the Software Coordinator.

Central databases, with mirrors in key locations to enhance efficiency of data access, store key IceCube information such as detector geometry and calibration, configuration, and run summaries. Database locations include the South Pole, Belgium, and Madison. Keeping the contents of these databases well organized, synchronized, operating, and available is key to ensuring that all parts of IceCube data analysis are well understood and repeatable. A software engineer will maintain and extend the database tables and will maintain all code to update and query the database. Continuous support for data insertion at the South Pole and in the Northern Hemisphere provides all necessary information for data processing. In order to simplify long-term maintenance and reduce redundant information, we will develop a new database system that will leverage detector status information already in the IceCube Live monitoring system.

2.5.2 Simulation Software

Simulation code not related to production infrastructure: physics generators, particle propagators, detector response simulation, photon propagators.

2.5.3 Reconstruction

Event reconstruction and filtering tools of general utility.

2.5.4 Science Support Tools

This new group is a spin-off from the reconstruction group, but is still tightly coupled with the reconstruction effort, since the software will still be bundled together in releases. The purpose of this group is to manage common software tools used at filter and analysis levels beyond L2, including IceCube's open source effort.

2.5.5 Software Development Infrastructure

Software development in IceCube is a worldwide, distributed effort with more than 100 contributors and running on several different platforms to maximize grid resources. Critical software development tools, such as a central repository, ticketing system, and continuous build test system, will be maintained by a computer scientist, using industry standards such as Subversion, Trac, and Buildbot.

2.6 Calibration

2.6.1 Detector Calibration

Tasks related to understanding of the response of the IceCube detector: coordination of flasher runs; detector geometry; DOM response / linearity; DOM noise studies.

2.6.2 Ice Properties

Bulk and hole ice studies including fitting programs.