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The IceCube Neutrino Observatory DAQ and Online System

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The IceCube Neutrino Observatory is a cubic kilometer-scale neutrino detector built into the ice sheet at the geographic South Pole. The online system for IceCube comprises subsystems for data acquisition, online filtering, supernova detection, and experiment control and monitoring. The observatory records astrophysical and cosmic ray events at a rate of approximately 3 kHz and selects the most interesting events for transmission via satellite to the experiment's data warehouse in the northern hemisphere. The system has been designed to run in a remote environment with minimal operator intervention. Its user interface permits remote control and monitoring of the experiment both locally and via satellite. Despite the remote location and complexity of the various subsystems interoperating, the system as a whole achieves an uptime in excess of 98%. We describe the design and implementation of the core detector online systems: the Data Acquisition Software (DAQ), including the in-ice and surface optical modules, the triggering system, and event builder; the distributed Processing and Filtering (PnF) system; the IceCube Live control and monitoring system; and SPADE, the data archival and transport system.

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