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Jupyter-based service for JUNO analysis

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The JUNO (Jiangmen Underground Neutrino Observatory) is designed to determine the neutrino mass hierarchy and precisely measure oscillation parameters. The JUNO central detector is a 20 kt spherical volume of liquid scintillator (LS) with 35m diameter instrumented with 18,000 20-inch photomultiplier tubes (PMTs). Neutrinos are captured by protons of the target via the inverse beta decay reaction which produces a positron and a neutron. The time correlation between the prompt signal from the annihilation and ionization of the positron and the delayed signal from the gamma rays produced by the neutron capture is the crucial feature that makes it possible to detect neutrinos. Analysis of time correlations to separate neutrino candidates from background sources of coincident signals is crucial to JUNO.

This contribution presents the design and implementation of a Jupyter-based web client and server that facilitates the JUNO correlation analysis using a distributed processing middleware developed to provide a uniform interface to event data from a cluster of local nodes. Jupyter is an open source project providing a framework for interactive analysis, backend services and communication infrastructure. Selection criteria are defined within the Jupyter web client. The middleware provides a unified view of events in the correct event order using the resources of multiple cluster nodes. At initialization of each node, a list of event files in ROOT format are assigned to the node and registered into the middleware, which subsequently automatically loads and caches events in memory as needed. The performance advantages of distributed approach are presented.

Consider for promotion

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