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Unified software architecture for the slow control system in the Belle II experiment

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The slow control system in the Belle II experiment was developed based on a unified software framework which consists of Network Share Memory 2 (NSM2), Experimental Physics and Industrial Control System (EPICS), and Control System Studio (CSS).

NSM2 is an upgrade of the NSM inter-process communication software that was used as the slow control framework of the former Belle experiment. We adopted NSM2 for controls of the COPPER based detector readouts, backend computing farms, high voltage power supplies and environment monitors such as temperature monitor at the electronics hut.

EPICS is a widely used framework for accelerator control including SuperKEKB and former KEKB. We adopt EPICS to control the readout, power supply and other subsystems of the pixel and silicon strip vertex detectors and related background and environmental monitors.

On top of NSM2 and EPICS, CSS is used as the interface to human operators and for long term storage. CSS is originally developed to seamlessly work with EPICS with a flexible plugin interface. We introduce another plugin, to communicate with the NSM2 based systems, which makes all information of NSM2 and EPICS available in the same way. In other words, the both EPICS and NSM2 information is handled in the form of Process Variables of CSS, for graphical user interface, data archiving, and alarm systems. In addition to the control framework, viewers of data quality monitor analyzing online data at the computing farms and user interface for configuration database are also unified by the CSS plugin.

We present the details of the unified architecture of the Belle II slow control system, and experiences during the detector commissioning using cosmic rays in 2015 and the beam test operation for the Belle II vertex detector at the DESY electron test beam facility in 2016.

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