

Research on Transparent Access Method for Multiple Types of Data Acquisition Device in EAST PCS

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With the development of EAST physics experiment, more and more diagnostic signals need to be acquired in real-time for advanced plasma control. Due to the distributed characteristics of diagnostic systems, different types of data acquisition device with suitable sampling rate need to be deployed nearby the diagnostic signals. In order to obtain these distributed signals effectively and provide a transparent access to multi-type data sources for the control algorithms in the plasma control system(PCS), a deployment specification for standard acquisition cabinet and the transparent access middle layer with device virtualization technology are designed and implemented. Each standard acquisition cabinet is configured with signal conditioning device, Ethernet network, external clock and trigger device, data acquisition server and low latency digital transmission network, etc. The reflective memory(RFM) high-speed network is chosen to realize data communication between distributed data acquisition cabinet and PCS. For the transparent access middle layer, a mapping file for the diagnostic signal names and the channels of specific data acquisition device is defined, as well as a set of data transmission specifications between the PCS and distributed data acquisition cabinets. The mapping relationship between signal names and channels allows real-time control algorithms to obtain data through signal names without caring about the specific data source. The design of the RFM message header implements the data transmission specifications, it specifies the available memory range for distributed data acquisition. Before transmitting the effective data, PCS will define the RFM message header information according to the mapping file designed in transparent access middle layer, the header information includes the name of the data acquisition device, the offset address and the number of signal channels. After receiving this message, data acquisition cabinets can write data to the memory space according to the address and the number of channels. This transparent access method provides a specification for flexibly expand multiple types of data acquisition devices. Using this method, a new data acquisition device DTACQ2106 has been successfully added, which has higher acquisition performance and low latency, which plays a great role in fast control.

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