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Distributed and parallel real-time control system equipped FPGA-Zynq and EPICS middleware

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Zynq series of Xilinx FPGA chips are divided into Processing System (PS) and Programmable Logic (PL), as a kind of SoC (System on Chip). PS with the dual-core ARM Cortex-A9 processor is performing the high-level control logic at run-time on linux operating system. PL with the low-level Field Programmable Gate Array (FPGA) built on high-performance, low-power, and high-k metal gate process technology is connecting with a lot of I/O peripherals for real-time control system. EPICS (Experimental Physics and Industrial Control System) is a set of open-source-based software tools which supports for the Ethernet-based middleware layer. In order to configure the environment of the distributed control system, EPICS middleware is equipped on the linux operating system of the Zynq PS. In addition, a lot of digital logic gates of the Zynq PL of FPGA-Zynq evaluation board (ZedBoard) are connected with I/O pins of the daughter board via FPGA Mezzanine Connector (FMC) of ZedBoard. An interface between the Zynq PS and PL is interconnected with AMBA4 AXI. For the organic connection both the PS and PL, it also used the linux device driver for AXI interface. This paper describes the content and configuration of the distributed and parallel real-time control system applying FPGA-Zynq and EPICS middleware.

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