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Research on Synchronous Data Network of J-TEXT Plasma Control System

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PCS is one of the key systems in Tokamak. PCS contains many subsystems, which can be used to control the different plasma parameters quickly and effectively. There is a need for real-time communication between the subsystems of PCS, and it has high requirements on the delay and stability of data transmission.
In this paper, the overall design of PCS Synchronous Data Network is given. The network uses two kinds of technologies, hard Synchronous Data Network bases on the reflective memory（RFM）network and soft Synchronous Data Network bases on the 10G Ethernet network. RFM network data synchronization delay is deterministic and predictable, so it is more stable and reliable, but the cost is high and not as flexible as Ethernet. Ethernet data synchronization delay is not as deterministic as RFM network, but with 10G Ethernet the delay is small enough to be regarded as deterministic thus can be used for real-time control. It is also cheaper, more flexible and has higher throughput.
In this paper, transmission delay between nodes in different network with different kinds of load are tested under the new plasma control system based on JRTF. The test results show that the two kinds of the Synchronous Data Network which have been integrated into the new generation PCS system, can both satisfy the real-time control tasks, and enhance the stability of the power supply systems. But each with different characteristics, and J-TEXT PCS has chosen RFM network as its SDN network.

Eligible for student paper award?

Yes

Author: ZHENG, Wei (Huazhong university of science and technology)

Co-author: CHEN, Ming (Huazhong University of Science and Technology)

Presenter: PAN, Yuan (Huazhong University of Science and Technology)

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