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DESIGN OF A HETEROGENEOUS FC-AE-1553 NETWORK FOR MANNED SPACEFLIGHT

Abstract

In order to meet the continually increasing demand of the manned space payload on the control and information service, reduce the complexity of the engineering project, improve the information service performance, this paper designs a heterogeneous FC-AE-1553 network which can be used in manned spaceflight. The payload network used in the ISS mainly choose MIL-STD-1553B, 10 BASE-T Ethernet and so on. The system design and implementation is very difficult, at the same time, the performance of the traditional network is very limited. MIL-STD-1553B applies copper wires, bus speed is 1Mbps, bus latency is up to dozens of ms, and only supports 31 nodes at most. Ethernet's rate is only 10Mbps, at the same time, in order to reduce network congestion, ISS reduces the network transmission rate. Heterogeneous FC-AE-1553 network applies dual fiber redundancy in communication, network bandwidth reaches 4Gbps, supports both fabric and bus topology. Payloads in the cabin mainly utilize fabric topology to access to the network, the communication bandwidth is 4Gbps to single node. External payloads mainly use the bus topology based on PON technology, the payload nodes share the bandwidth, and have the advantages of simple wiring, low system power consumption and strong real-time performance. Heterogeneous FC-AE-1553 network supports 2 of 24 th power nodes at most, its latency is less than 500us, and it can communicate with the MIL-STD-1553B through a network bridge. At last, this paper designed a test system of heterogeneous FC-AE-1553 network. The effective bandwidth of the system is up to 3.1Gbps, real-time performance is better than 200us, and the communication with MIL-STD-1553B is stable and reliable.