面向 FC-以太网融合网络的嵌入式网关设计

李　龙　　1,2　,曹素芝　　2　,席　隆　　2

（1 中国科学院大学 计算机与控制学院，北京 100049；

2 中国科学院 空间应用工程与技术中心，北京 100094）

摘　要：为了降低网络维护成本和统一网络架构，实现面向 FC 的多协议融合型网络.本文给出 IP over FC 网关的设计方案和实现方法，详细介绍基于 FPGA 的嵌入式网关其系统架构和数据处理流程.同时对千兆以太网与 FC 之间帧格式的转换与地址映射进行仿真分析，并结合某型号航天器具体应用场景完成前期工程验证.结果表明，嵌入式 IP over FC 网关能够高效实现数据帧的解析与路由，协议转换最小时延为 25 μs，完好地实现 FC 与千兆以太网的无缝衔接与协议转换.

关键词：多协议融合网络；IP over FC 协议；协议栈模型；网关；嵌入式系统

Design of Embedded Gateway for FC-Ethernet Convergence Network

LI Long　　1,2　，CAO Su-zhi　　2　，XI Long　　2

(1 School of Computer and Control Engineering, University of Chinese Academy of Sciences, Beijing 100049, China;

2 Technology and Engineering Centre for Space Utilization, Chinese Academy of Sciences, Beijing 100094, China)

Abstract：In order to reduce network maintenance costs and unify network architecture, a multi-protocol convergence network oriented to FC is realized, the design scheme and implementation method of IP over FC gateway are presented, and the system architecture and data processing flow of embedded gateway based on FPGA are introduced in detail. The simulation and analysis of the frame format conversion and address mapping between Gigabit Ethernet and FC are carried out, and the preliminary engineering verification is carried out in combination with the specific application scenario of the manned spacecraft. The results show that the embedded gateway efficiently realize the data frame analytical and routing, the minimum delay of protocol conversion is 25μs, which perfectly realize FC and Gigabit Ethernet seamless convergence and protocol conversion.

Key words：multi-protocol convergence network; IP over FC protocol; protocol stack model; gateway; embedded system

作者简介：

李　龙　男，（1993-），硕士研究生.研究方向为异构网络融合技术、IP over FC 技术、空间电子学等.

E-mail:lilong15@csu.ac.cn.

曹素芝　女，（1982-），副研究员，硕士生导师.研究方向为空间信息网络技术，在轨光纤网络技术，空间光交换与路由技术，天基边缘计算.

席　隆　男，（1972-），研究员，硕士生导师.研究方向为空间电子学.〖FL)〗