基于 AWGR 的光电混合交换高性能计算互连网络

王　昭，裴秉玺，何卫锋

（上海交通大学 微纳电子学系，上海 200240）

摘　要：为了满足高性能计算机中互连网络的高吞吐量、低延迟需求，本文基于阵列波导光栅路由器（AWGR），提出了一种低延迟的光电混合交换的互连网络结构. 该网络以“天河二号”超级计算机的互连网络拓扑结构为基础，使用无竞争阻塞的 AWGR 替代了部分电路由器，通过改进设计电路由器的光端口来实现与原有高阶路由器内部的电交换方式兼容. 在此基础上，使用 OMNeT++软件框架编写了新的光电混合交换网络的仿真模型. 仿真结果表明，与原始网络相比，光电混合交换网络的总延迟降低了 8%~10%.

关键词：高性能互连网络；阵列波导光栅路由器；光分组交换；网络延迟

An optical-electrical hybrid switching high performance computing interconnect network based on AWGR

WANG Zhao, PEI Bing-xi, HE Wei-feng

(Department of Micro-Nano Electronics, Shanghai Jiao Tong University, Shanghai 200240, China)

Abstract：To satisfy the throughput and latency requirement of high-performance-computing interconnect network, a low-latency optical-electrical hybrid switching network structure based on arrayed waveguide grating router (AWGR) is proposed. On the basis of “Tianhe-II” supercomputer’s network topology, part of electrical high-radix routers are replaced by non-blocking and contention-free AWGRs. The optical port of electrical router is re-designed to interface the optical packets with router’s internal switching logics. To evaluate the performance of proposed network, a simulation model is developed using OMNeT++ software framework. The simulation shows that the data latency of hybrid switching network is 8%~10% lower than the electrical switching network.

Key words：high-performance interconnect network; arrayed waveguide grating router; optical packet switching; network latency

作者简介：

王　昭　男，（1994-），硕士研究生. 研究方向为高性能计算光互连网络分析与建模.

E-mail: wangzhaojack@163.com.

裴秉玺　男，（1994-），博士研究生. 研究方向为片上光互连网络分析与建模.

何卫锋　男，（1976-），博士，博士生导师，副研究员. 研究方向为光电混合集成电路技术，硅光互连网络.