



Motivation

With the explosive growth of the Internet and related services, network traffic has been increasing at a greater pace than Moore's law. The power consumption of routers has also been rapidly increasing (over 40% annually). At this rate, by 2020, it will be comparable to the total power generated domestically. Therefore, when developing carrier-class routers, power consumption must be greatly reduced and capacity increased. To meet these challenging and contradictory requirements, we have proposed and are developing a hybrid optoelectronic packet-switched router.



Originality

A hybrid optoelectronic packet-switched router, which optimally combines the intelligence of electronics with the high capacity and speed of optics, is promising in terms of reducing power, size and latency, while maintaining the ability to support flexible network services. We have developed an 8x8 hybrid optoelectronic router prototype with the ability to process 10-Gbps arbitrary-length asynchronous optical packets. We have used it to demonstrate error-free routing operation.

The power consumption of the router prototype is 360 W. This is far less than that of the conventional carrier-class electric router. In addition, the 3R regeneration of degraded packets and highly functional packet processing functions (e.g. policy routing, multicast routing, priority queuing), which are difficult to perform with all-optical routers, can be easily achieved by employing CMOS technology.



Impact

The hybrid optoelectronic packet-switched router can reduce the environmental impact of networks and contribute significantly to the realization of environmentally friendly "Green ICT".



Hybrid optoelectronic packet-switched router prototype

