A Circuit-Based Scalable and Low-Complex Optical Datacenter Network

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BACKGROUND

The ever-increasing bandwidth requirements of modern datacenters have led researchers to propose networks based upon optical circuit switches, but these proposals face significant deployment challenges. In particular, previous proposals dynamically configure circuit switches in response to changes in workload, requiring network-wide demand estimation, centralized circuit assignment, and tight time synchronization between various network elements— resulting in a complex and unwieldy control plane. Moreover, limitations in the technologies underlying the individual circuit switches restrict both the rate at which they can be reconfigured and the scale of the network that can be constructed; a new approach is necessary.

TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have devised a new solution called RotorNet, a circuit-based network design to overcome the limitations listed above. While RotorNet dynamically reconfigures its constituent circuit switches, it decouples switch configuration from traffic patterns, obviating the need for demand collection and admitting a fully decentralized control plane. At the physical layer, RotorNet relaxes the requirements on the underlying circuit switches—in particular by not requiring individual switches to implement a full crossbar—enabling them to scale to 1000s of ports. RotorNet outperforms comparably priced Fat Tree topologies under a variety of workload conditions, including traces taken from two commercial datacenters. We've also demonstrated a small-scale RotorNet operating in practice on an eight-node testbed.

APPLICATIONS

This novel invention is useful as an interface to any circuit switched network and does not currently exist commercially or in the literature.

ADVANTAGES

- Scalable to 1000s of ports
- Decouples switch configuration from traffic patterns
- Fully decentralized control panel

STATE OF DEVELOPMENT

A working prototype of a small-scale RotorNet operating in practice on an eight-node testbed was constructed

INTELLECTUAL PROPERTY INFO

A provisional patent has been submitted and the technology is available for licensing.

RELATED MATERIALS

- William M. Mellette, Rob McGuinness, Arjun Roy, Alex Forencich, George Papen, Alex C. Snoeren, and George Porter. RotorNet: A Scalable, Low-complexity, Optical Datacenter Network In Proceedings of SIGCOMM '17, Los Angeles, CA, USA, August 21-25, 2017 - 08/21/2017

PATENT STATUS

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Additional Patent Pending

CONTACT

University of California, San Diego
Office of Innovation and Commercialization
innovation@ucsd.edu
tel: 858.534.5815.

OTHER INFORMATION

KEYWORDS

datacenter, optical, circuit-based network, RotorNet

CATEGORIZED AS

- **Communications**
  - Networking
  - Optical
- **Computer**
  - Hardware

RELATED CASES

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University of California, San Diego
Office of Innovation and Commercialization
9500 Gilman Drive, MC 0910, ,
La Jolla,CA 92093-0910

Tel: 858.534.5815
innovation@ucsd.edu
https://innovation.ucsd.edu
Fax: 858.534.7345