All-To-All Interconnection With Wavelength Routing Devices

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ABSTRACT

A method that uses wavelength routing devices such as arrayed waveguide grating routers (AWGR) and Echelle grating routers to realize a passive interconnection network with a reduced number of wavelengths to implement all-to-all interconnection.

FULL DESCRIPTION

Today's data centers, multi-processor/core based high performance computing systems rely on interconnection of many electronic switches or wires concatenated in multi-stage interconnection topologies with limited scalability. These electronic switch architectures result in poor performance in throughput, latency, scalability. All-optical switching supports the need for massive concurrency and scalability in parallel computing.

Researchers at the University of California, Davis have developed a technique that uses Arrayed Waveguide Grating Routers (AWGRs) and other routing devices to realize a reduced number of wavelengths needed for all-to-all communication among *N* nodes. The reduction in the number of wavelengths used increases scalability and operability. The methodology provides for a single hop distance between any two nodes providing for low latency communication and supports up to N^2 simultaneous contention-free connections resulting in a maximum bisection bandwidth of N^2. The resulting interconnection is passive increasing the power efficiency in comparison to electronic switches. The method addresses the need for increased bandwidth, high-throughput, and low latency data transmission.

APPLICATIONS

This invention has the following application:

- Telecommunication

FEATURES/BENEFITS

- Reduced amount of required wavelengths
- Flat hierarchy allowing for a single hop between nodes resulting in low latency
- Passive interconnection network allowing for power efficiency
- Increased bandwidth

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,401,774	07/26/2016	2012-846

INVENTORS

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OTHER INFORMATION

KEYWORDS

Router, Computer system, Network, Interconnection, Fiberoptics

CATEGORIZED AS

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

RELATED CASES

2012-846-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Higher-Speed and More Energy-Efficient Signal Processing Platform for Neural Networks
- Crystal Orientation Optimized Optical Frequency Shifter

- Hyperspectral Compressive Imaging
- Athermal Nanophotonic Lasers
- Photonic-Electronic Convolutional Neural Networks
- Ultra-High Resolution Multi-Platform Heterodyne Optical Imaging
- Multi-Wavelength, Laser Array
- Optical Interposers for Embedded Photonics Integration
- Ultrahigh-Bandwidth Low-Latency Reconfigurable Memory Interconnects by Wavelength Routing
- Development of a CMOS-Compatible, Nano-photonic, Laser
- Energy Efficient and Scalable Reconfigurable All-to-All Switching Architecture
- Compressive High-Speed Optical Transceiver
- All-Optical Regenerators
- Tensorized Optical Neural Network Architecture
- Silicon Based Chirped Grating Emitter for Uniform Power Emission
- Energy-Efficient All-Optical Nanophotonic Computing
- 3D Photonic and Electronic Neuromorphic Artificial Intelligence
- Adapting Existing Computer Networks to a Quantum-Based Internet Future

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