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# Energy Efficient and Scalable Reconfigurable All-to-All Switching Architecture

Tech ID: 31654 / UC Case 2018-490-0

## ABSTRACT

Researchers at the University of California, Davis have developed a hierarchical optical switch architecture that is low latency and energy efficient.

## FULL DESCRIPTION

While the energy consumption of data centers worldwide is currently estimated at 26 GW, the amount of data processed is growing at approximately 2 dB per year. Unless energy efficiency in data centers is drastically improved, their energy consumption worldwide will increase to approximately 2600 GW in the next decade. Current architectures heavily rely on point-to-point optical interconnects for high bandwidth communication, but their switching operations rely on many power-hungry electronic packet switches interconnected in hierarchical tree-based communication architectures. Reducing congestion and latency to speed up the execution time of different application threads is a key aspect for energy saving, since a significant amount of power is consumed in the servers and not just in the communication network.

Researchers at the University of California, Davis have developed an all-to-all switching architecture that is low latency, energy efficient, and scalable reconfigurable. This architecture is based on a combination of optical wavelength and spatial routing to achieve dynamic topology and bandwidth reconfiguration between network end-points. Significant energy savings are achieved by exploiting all-to-all communication offered by compact silicon photonic arrayed waveguide grating routers.

## APPLICATIONS

- ▶ Increases energy efficiency in data centers

## FEATURES/BENEFITS

- ▶ Consumes much less power
- ▶ Allows finer grain reconfiguration and bandwidth assignment between pairs of nodes in the network

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,265,627	03/01/2022	2018-490

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## INVENTORS

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## OTHER INFORMATION

### KEYWORDS

Reconfigurable, optical interconnects, optical switching, application-driven reconfiguration, wavelength routing

### CATEGORIZED AS

- ▶ **Communications**
  - ▶ Optical
  - ▶ Other

### RELATED CASES

2018-490-0

## 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
- ▶ Multi-Wavelength, Nanophotonic, Neural Computing System
- ▶ Athermal Nanophotonic Lasers
- ▶ 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
- ▶ 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

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