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Optically connected memory for disaggregated data centers

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10.1016/j.jpdc.2022.01.013 ↗

Highlights

- Optical memory disaggregation for data centers achieves low energy-per-bit consumption.
- Main memory disaggregation using state-of-the-art optical devices.
- First evaluation of both energy-per-bit and system-level performance for main memory disaggregation with optical devices.

Abstract

Recent advances in integrated photonics enable the implementation of reconfigurable, high-bandwidth, and low energy-per-bit interconnects in next-generation data centers. We propose and evaluate an Optically Connected Memory (**OCM**) architecture that disaggregates the main memory from the computation nodes in data centers. OCM is based on micro-ring resonators (MRRs), and it does not require any modification to the DRAM memory modules. We calculate energy consumption from real photonic devices and integrate them into a system simulator to evaluate performance. Our results show that (1) OCM is capable of interconnecting four DDR4 memory channels to a computing node using two fibers with 1.02 pJ energy-per-bit consumption and (2) OCM performs up to 5.5× faster than a disaggregated memory with 40G PCIe NIC connectors to computing nodes.

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