



Co-packaging in future Microsoft data center networks

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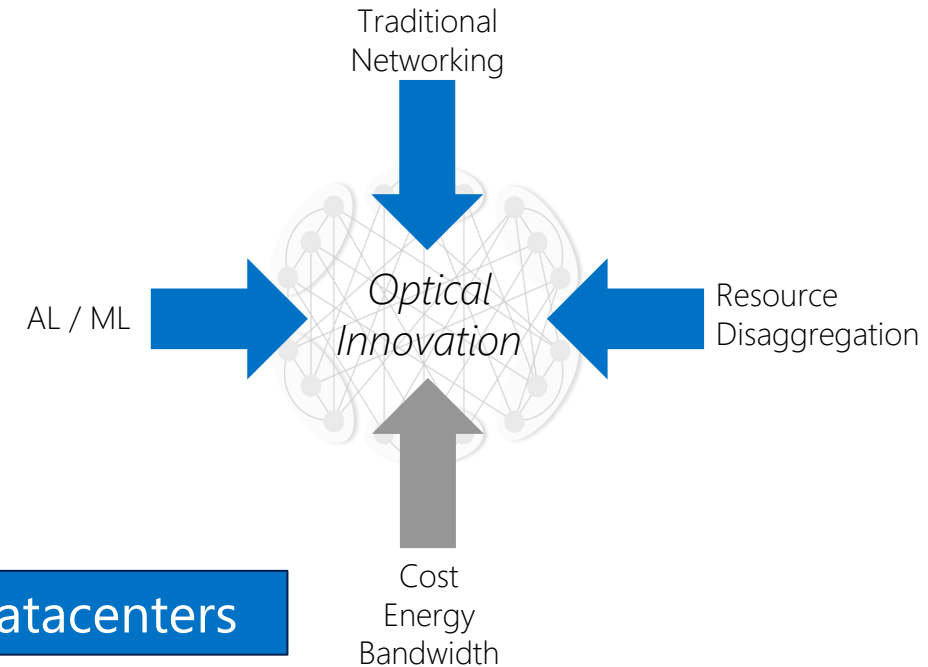
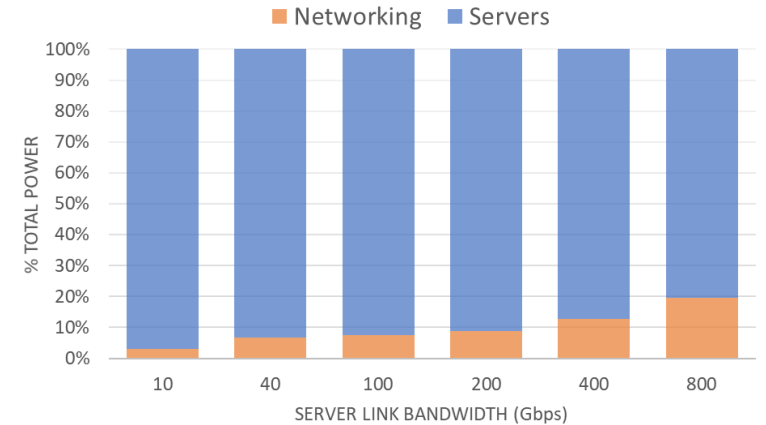


CPO key motivators

- Cost and power overheads of networking are beginning to noticeably limit compute capability
- Transition to 100G (and future 200G) electrical lanes pushing limits of copper
- New use cases have even greater network dependency:
 - High density systems with disaggregated resources
 - Data intensive applications: AI training, functions, media processing
 - Tbps+ per compute node

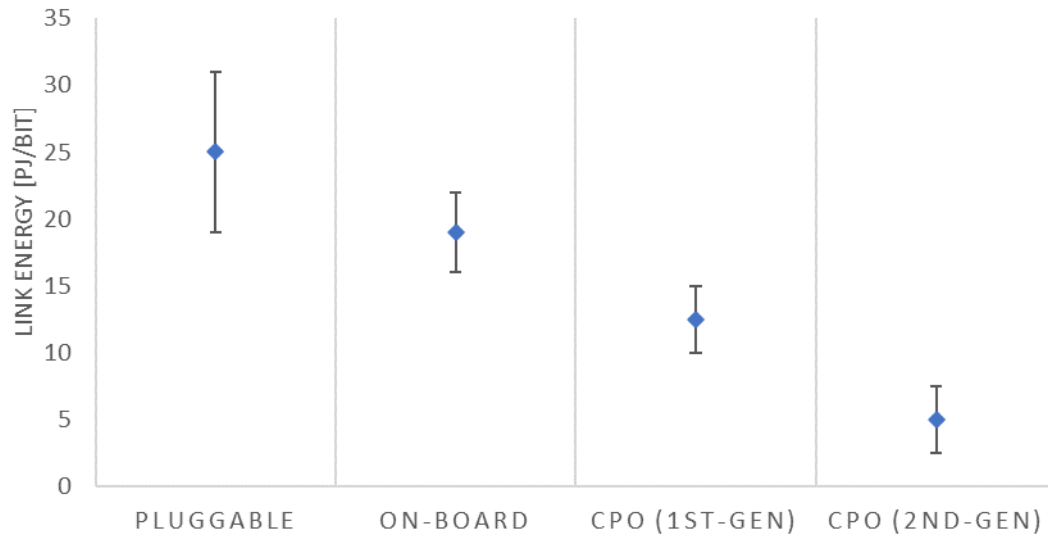
Optical innovations are key to future datacenters

NETWORK COMPONENT OF DATACENTER POWER



CPO benefits are multifaceted

LINK ENERGY VS TRANSCEIVER TECHNOLOGY



Aggregate energy savings expected to be significant at a datacenter level

(Energy / bit data includes module/chiplet-side electrical interface, DSP, PIC components, laser source. Excludes switch-side. Assume XSR for CPO.)

	Interconnect Metric	Desired Characteristics
	Optical Reach	10-1000s of meters
HW Cost	Component Cost	<< \$1 / Gbps
	Bandwidth Density	100s of Gbps / mm
Oper. Cost	Reliability	< 10 FIT & <i>Minimize Cable Handling Errors!</i>
	Energy Efficiency	< 10 pJ / bit
	Latency	Few ns + (prop. delay)

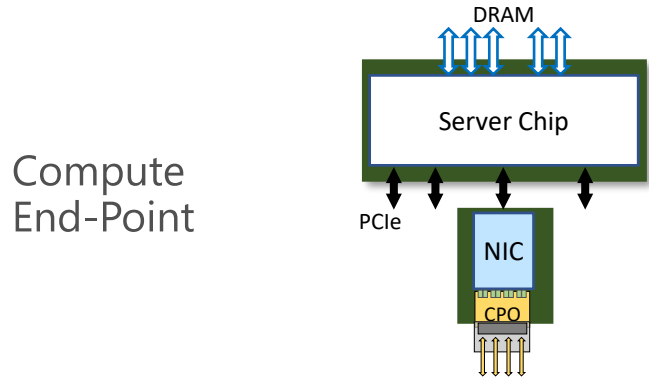
CPO

Multiple fundamental benefits can be enabled by package-level optical integration

CPO is a distinct step forward in datacenter communication efficiency

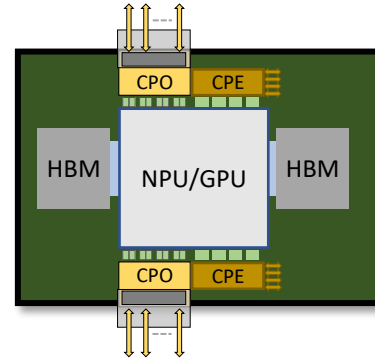
CPO applications

Traditional Datacenter Networking

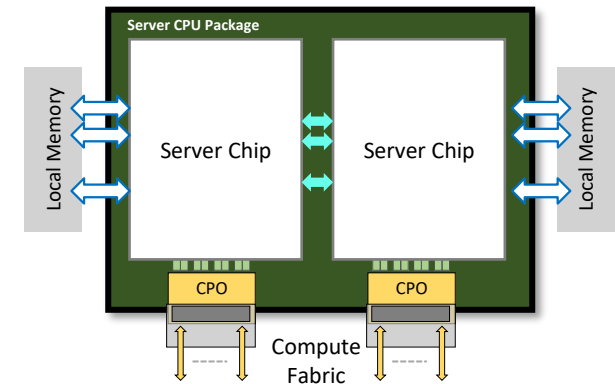


Compute End-Point

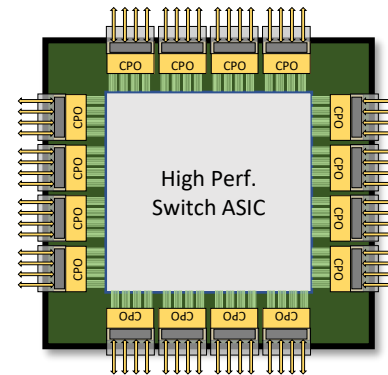
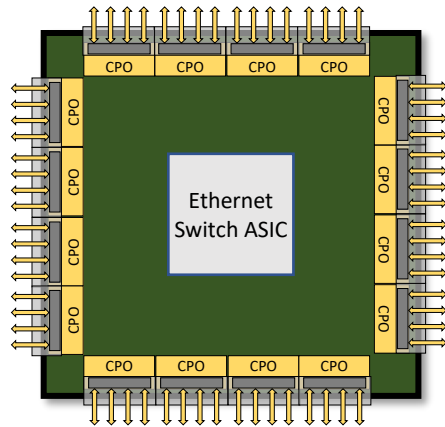
AI Training / HPC



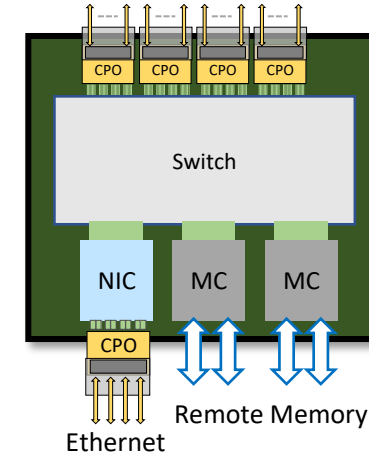
Future Systems w/ Disaggregation



Switches



Compute Fabric



Standardization of CPO

Standardization enables:

- Large scale volume at low cost
- Vendor interoperability (within any single use case)
- Re-use of CPO chiplets across different host ASICs

OIF has launched Co-packaging Framework project and 3.2T CPO module project

COBO focused on connectivity challenges

The logo for the Optical Interconnect Forum (OIF), consisting of the letters 'OIF' in a bold, blue, sans-serif font.The logo for the Co-packaged Optics Boarding Organization (COBO), featuring a green circular graphic made of small squares to the left of the word 'cobo' in a lowercase, black, sans-serif font.The text logo for the Institute of Electrical and Electronics Engineers (IEEE), consisting of the letters 'IEEE' in a bold, blue, sans-serif font.The text logo for the OPEN Compute Project, with the word 'OPEN' in a bold, black, sans-serif font above the words 'Compute Project' in a smaller, black, sans-serif font.

[OIF Launches-Co-packaging Framework Implementation Agreement Project - \[oiforum.com\]](https://oiforum.com)
[COBO announces formation of Co-packaged Optics Working Group - \[onboardoptics.org\]](https://onboardoptics.org)

Thank you.

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