Co-packaging in future Microsoft data center networks

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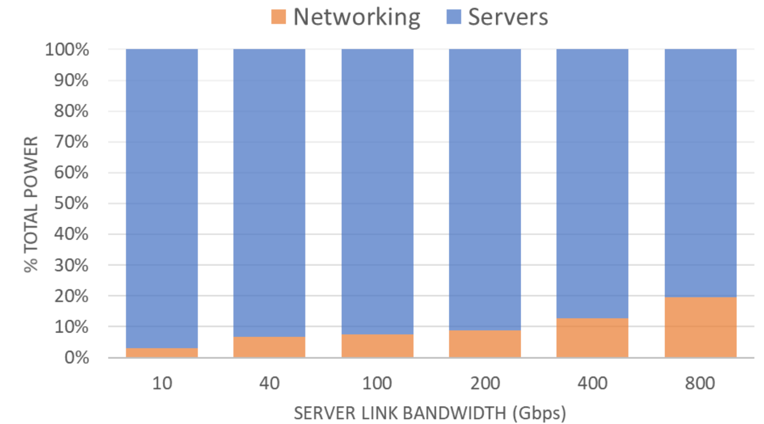
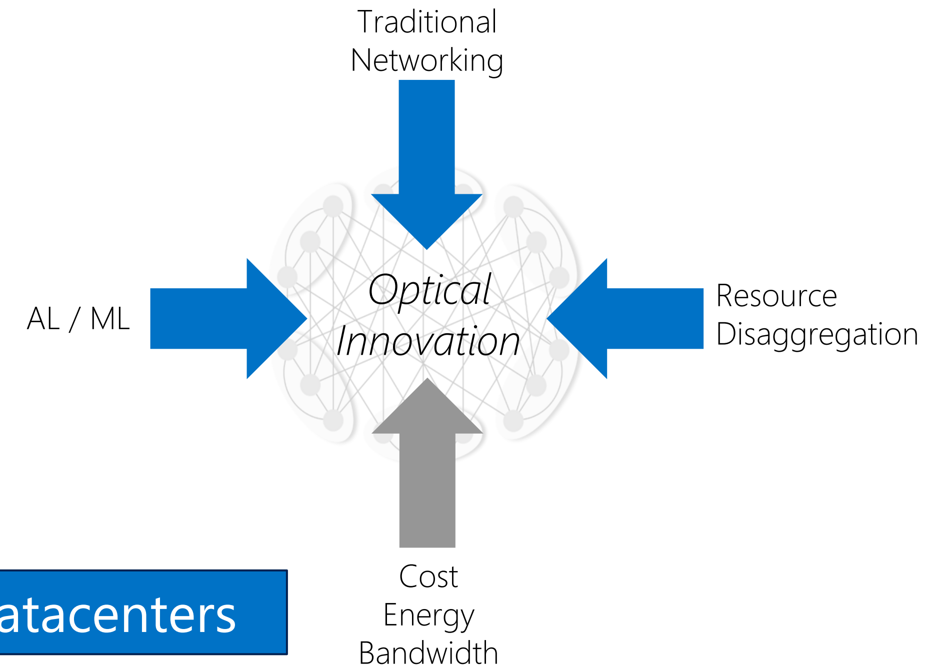
CPO key motivators

- 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

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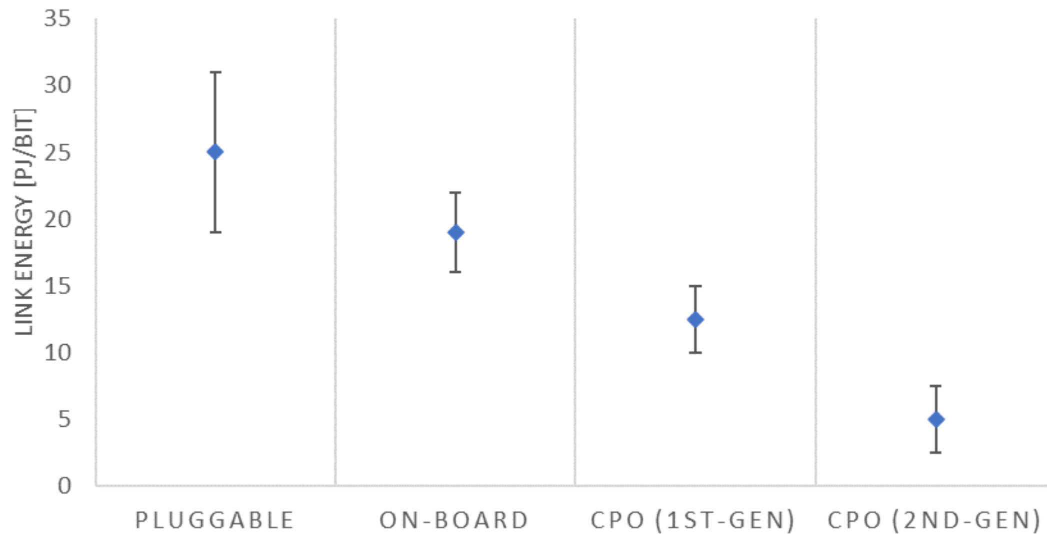
CPO benefits are multifaceted



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
HW Cost	Bandwidth Density	100s of Gbps / mm
Oper. Cost	Reliability	< 10 FIT & *Minimize Cable Handling Errors!*
Oper. Cost	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

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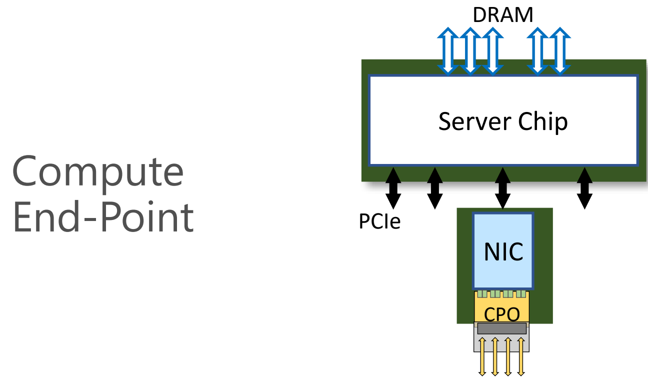
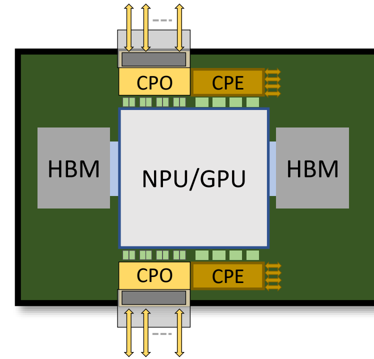
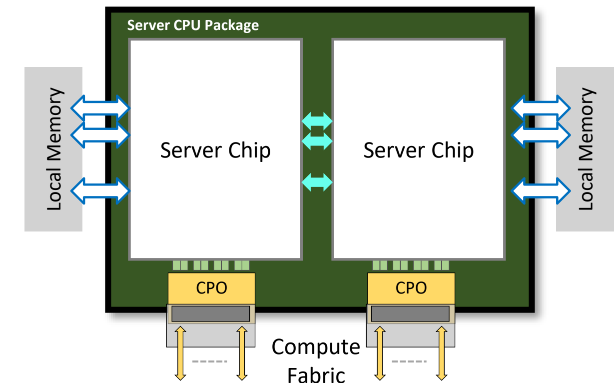
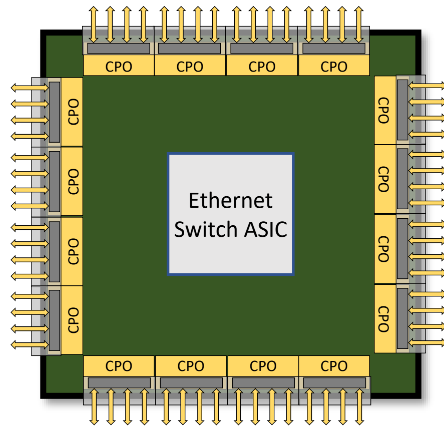
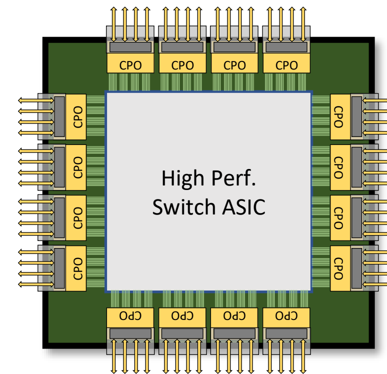
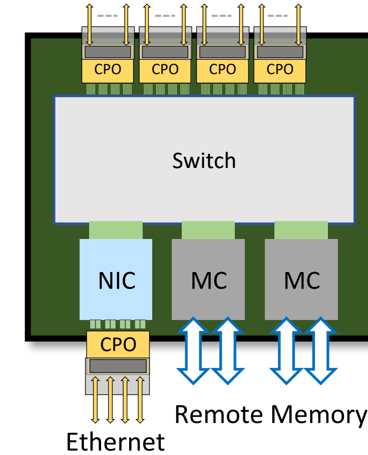
CPO applications

	Traditional Datacenter Networking	AI Training / HPC	Future Systems w/ Disaggregation
Compute End-Point			
Switches			

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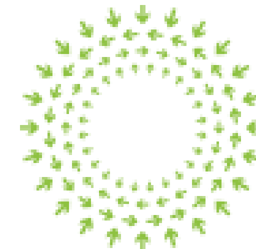
Standardization of CPO

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



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

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Thank you.
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