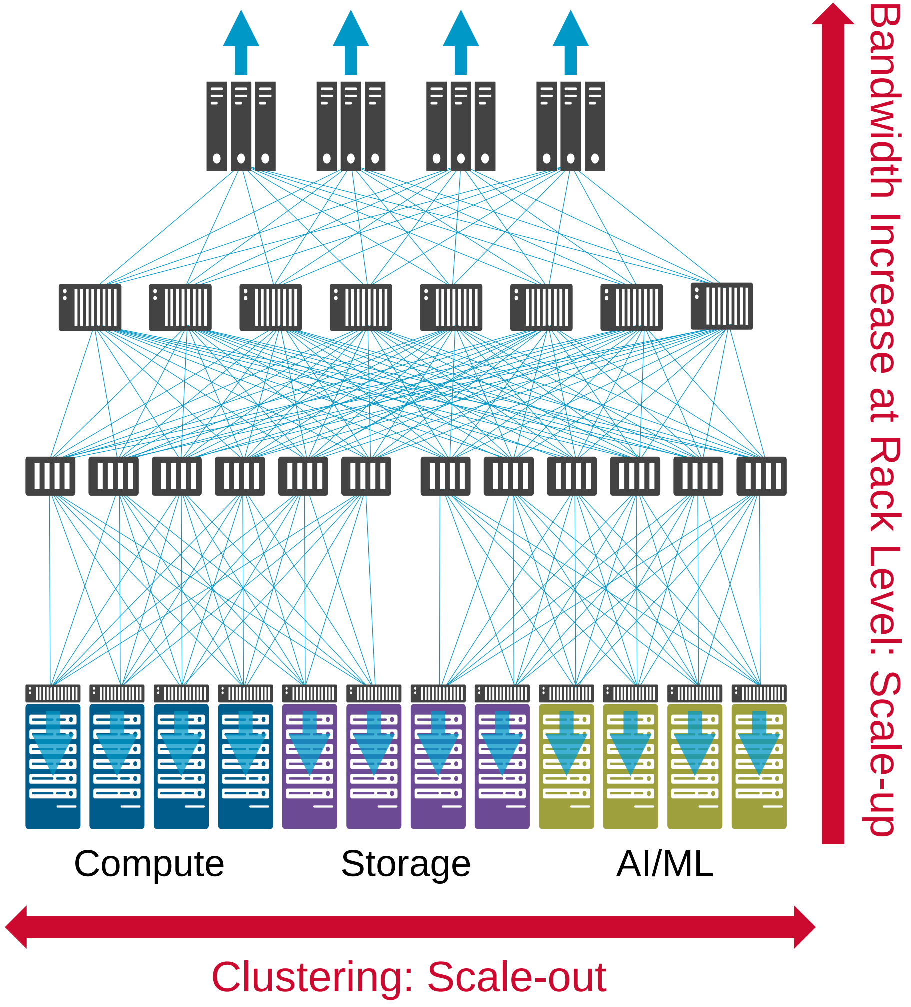
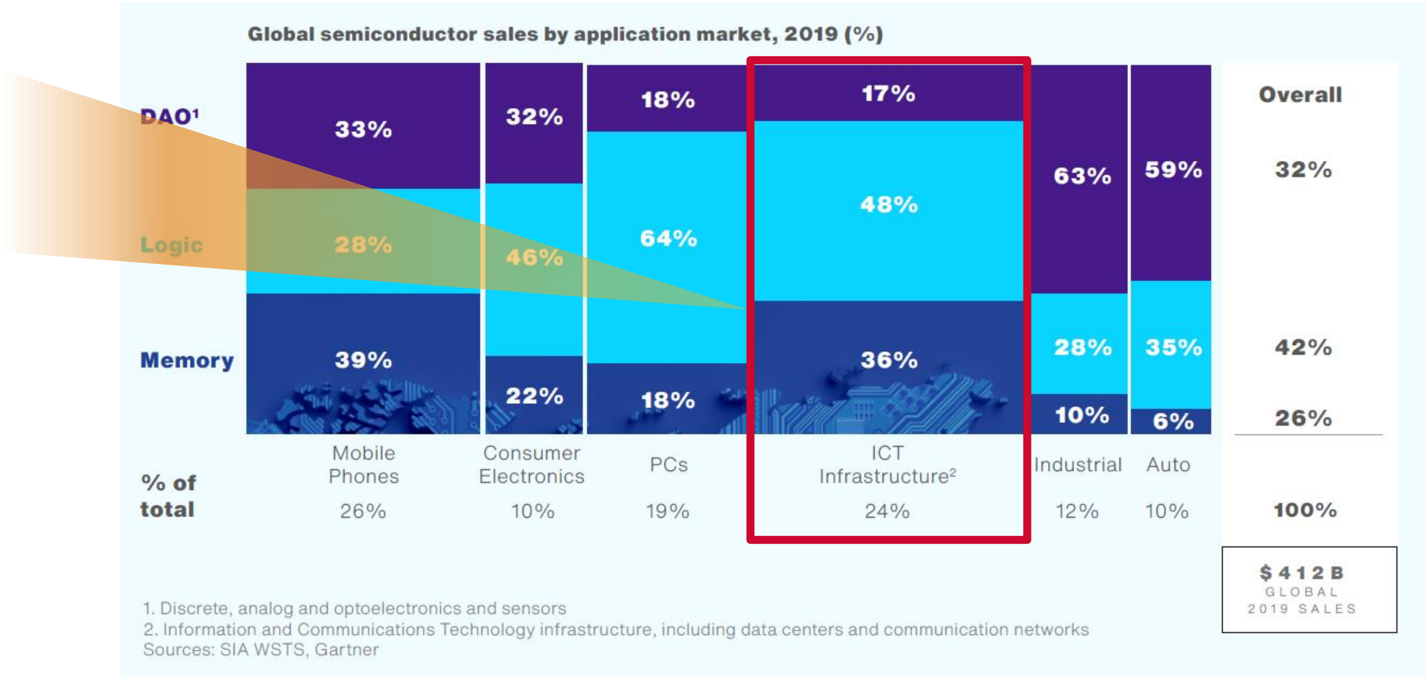
TH5 51.2T Bailly CPO (Co-Packaged Optics)

Optical Systems Division

March 2023

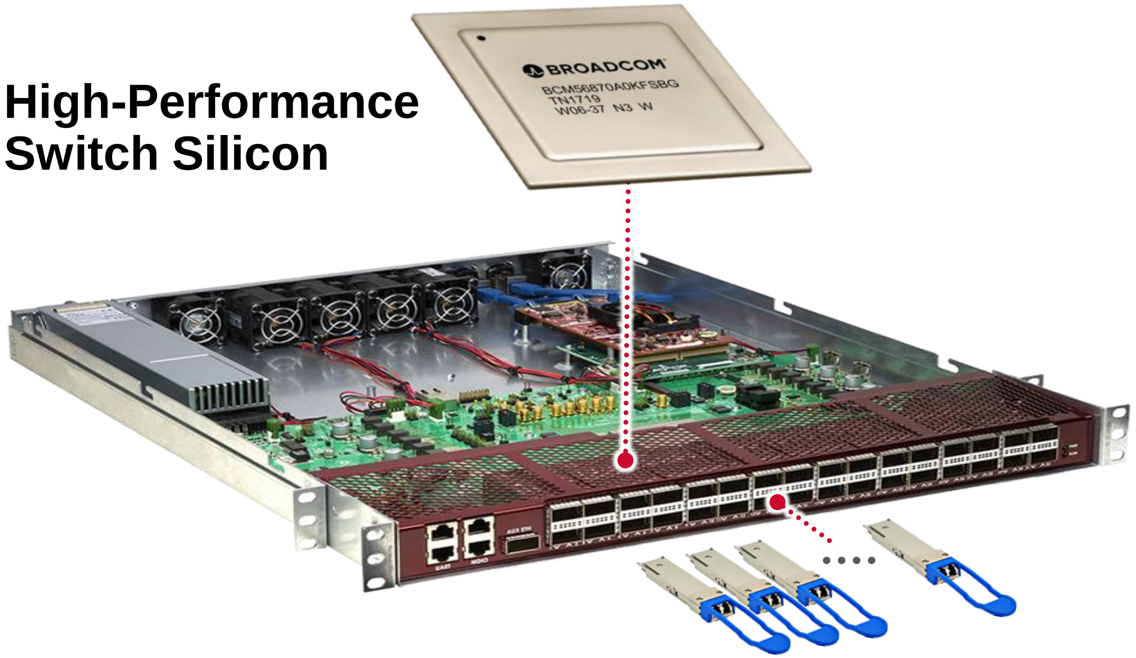
Compute Systems Trends Require More Data Movement





Source: SIA/BCG Report:
Strengthening the Global Semiconductor Supply Chain in an Uncertain Era, April 2021

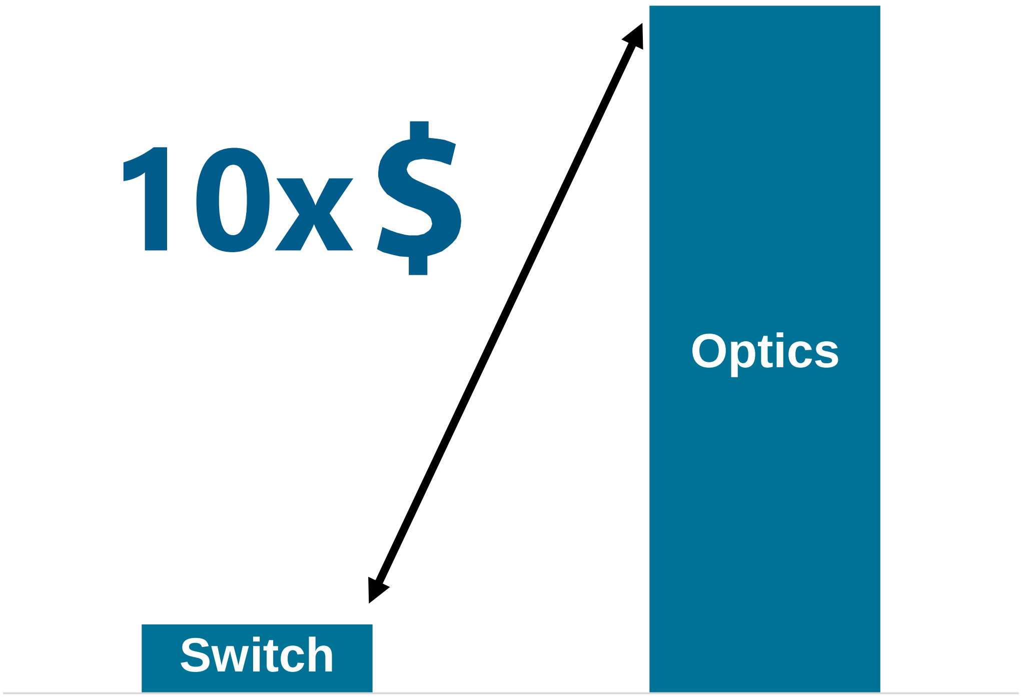
Optical Interconnect Dominates Fabric Silicon Spend



High-Performance Switch Silicon

Optical Transceivers

Current Customer Spend*

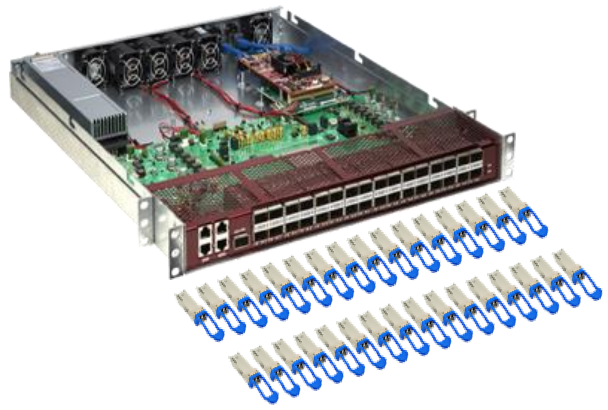


Opportunity for Step Function Improvement in Optical Connectivity

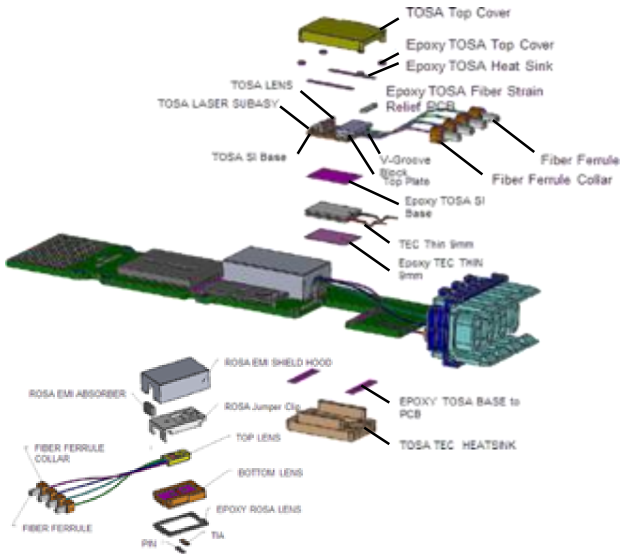
* Source: LightCounting, Dell'Oro, 650 Group and Broadcom internal estimates

Current Market Solution for Network Connectivity: Pluggables

Current Networking Switch with Optical Modules



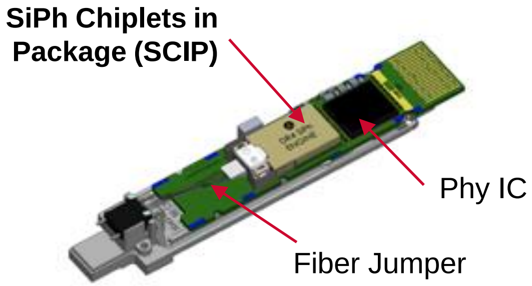
Conventional Module Design



Engineering and manufacturing limits to scale

Integrated SiPh Module Design

Silicon Photonics



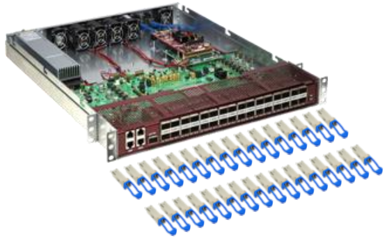
30% fewer Piece Parts!

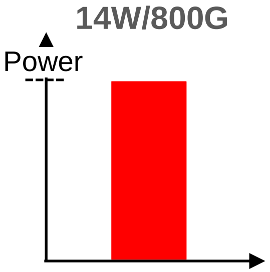
Module Integration = First step to improved scale

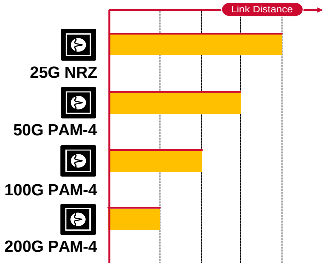
Module solutions are still limited by face plate density, MFG costs, and power constraints

Co-Packaged Optics vs. Pluggables

Current Pluggables



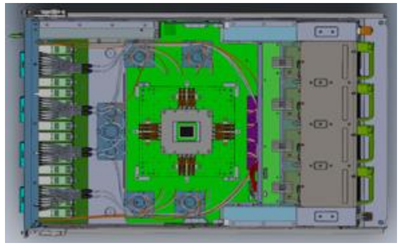


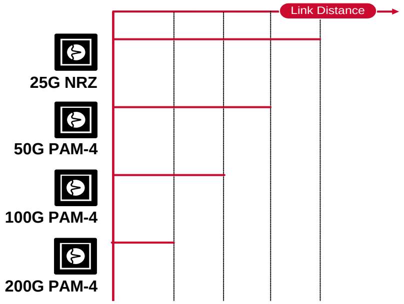


Reach decreases with increasing rate

Power does not scale

Co-Packaged Optics

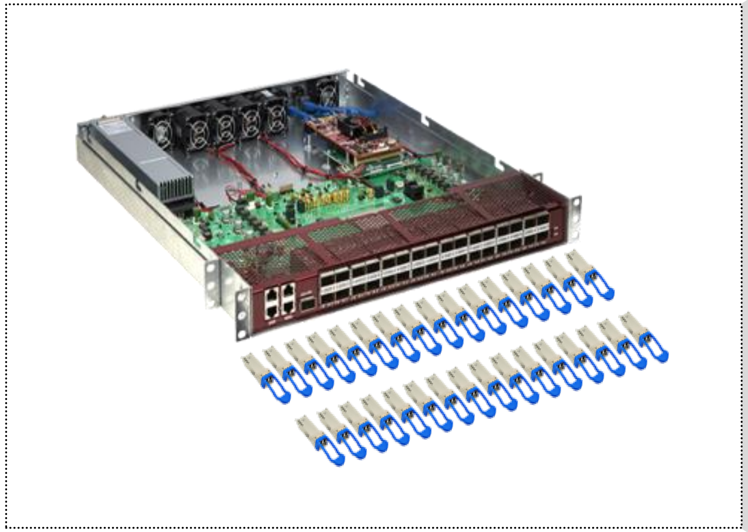




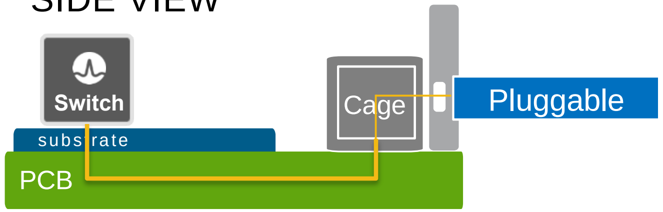
The solution for next generation interconnects

CPO provides Lower Power, Architecture Scaling to 200G/lane, 50% less components

Current Market Solution for Network Connectivity: Pluggables

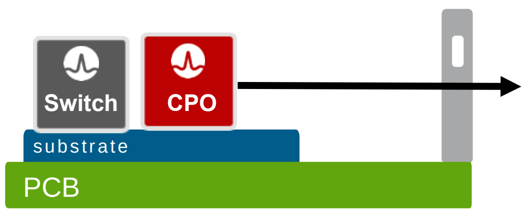


Current Pluggables



High power required to equalize signal through PCB and multiple connector discontinuities

Co-Packaged Optics



CPO platform drives optics directly from Switch and reduces cost and power per bit.

CPO Provides the path to the lowest cost/bit and scalability to 200G/lane

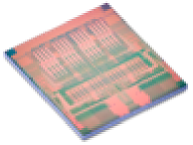
Broadcom's CPO Timeline…

ANNOUNCING TODAY

hp

AVAGO TECHNOLOGIES

CYOPTICS



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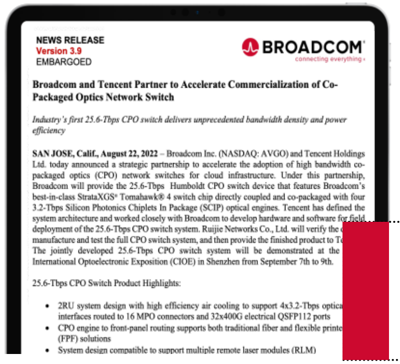
Silicon Photonics 2019

MAR'22

OFC The future of optical networking and communications is here.

25.6T CPO SVK Demo

AUG'22



NEWS RELEASE
Version 3.9
EMBARGOED

BROADCOM connecting everything

Broadcom and Tencent Partner to Accelerate Commercialization of Co-Packaged Optics Network Switch

Industry's first 25.6-Tbps CPO switch delivers unprecedented bandwidth density and power efficiency

SAN JOSE, Calif., August 22, 2022 – Broadcom Inc. (NASDAQ: AVGO) and Tencent Holdings Ltd. today announced a strategic partnership to accelerate the adoption of high bandwidth co-packaged optics (CPO) network switches for cloud infrastructure. Under this partnership, Broadcom will provide the 25.6-Tbps Humboldt CPO switch device that features Broadcom's best-in-class StrataXGS® Tomahawk® 4 switch chip directly coupled and co-packaged with four 3.2-Tbps Silicon Photonics Chiplets In Package (SCIP) optical engines. Tencent has defined the system architecture and worked closely with Broadcom to develop hardware and software for field deployment of the 25.6-Tbps CPO switch system. Ruijie Networks Co., Ltd. will verify the
manufacture and test the full CPO switch system, and then provide the finished product to
The jointly developed 25.6-Tbps CPO switch system will be demonstrated at the
International Optoelectronic Exposition (CIOE) in Shenzhen from September 7th to 9th.

25.6-Tbps CPO Switch Product Highlights:

- 2RU system design with high efficiency air cooling to support 4x3.2-Tbps optica interfaces routed to 16 MPO connectors and 32x400G electrical QSFP112 ports
- CPO engine to front-panel routing supports both traditional fiber and flexible printe (FPF) solutions
- System design compatible to support multiple remote laser modules (RLM)

Tencent

Ruijie

CPO Partnership Announced

OCT'22

OCP GLOBAL SUMMIT

25.6T CPO ODM Demo

MAR'23

OFC The future of optical networking and communications is here.

51.2T CPO Prototype Demo

Fully Functional CPO

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Broadcom’s Disruptive Silicon + Photonics Platform …

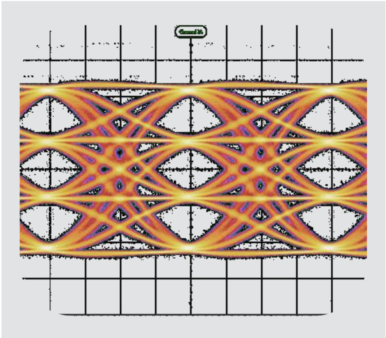
Highest Density Photonic Integrated Circuits

Advanced Semiconductor Packaging

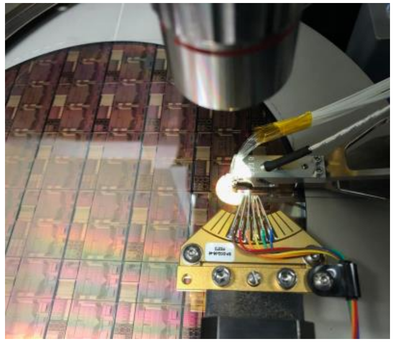
Fiber Connectivity

Best-in-Class SerDes

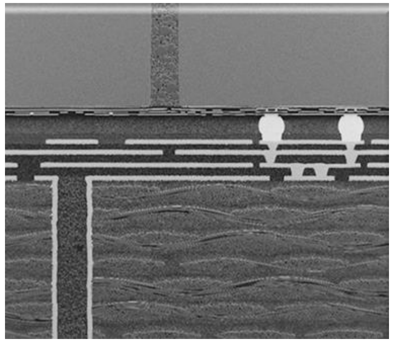
Switch Silicon



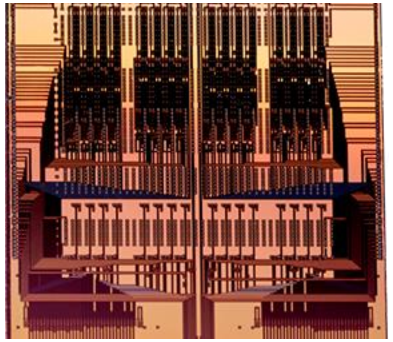
Mixed Signal IC



Optical Devices & Fabs



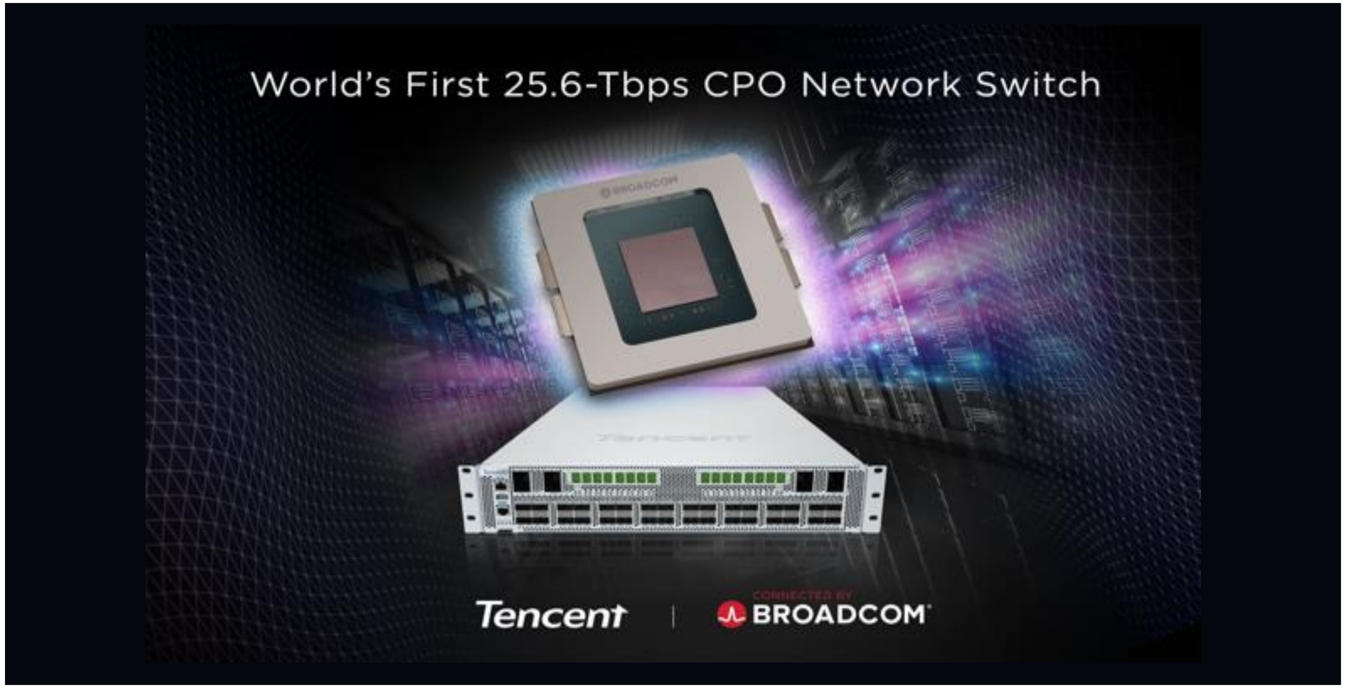
Advanced Packaging & Test



Silicon Photonics

Industry-Leading Economics, Volume, Power Efficiency at Scale

Tomahawk 4 – Humboldt 25.6T CPO



The future of optical networking
and communications is here.

2023 Performance Demonstration

Final 25.6T CPO qualification systems shipping to end-customer

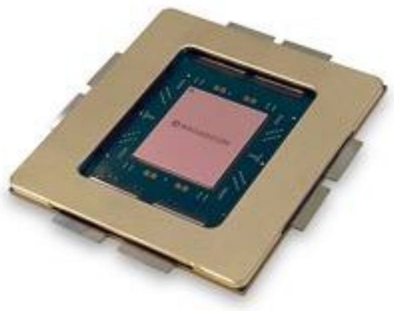
- CPO boxes are fully compliant
- **Error free across all 128 lanes**

25.6T CPO Power	Units	Measured Result
TH4 Power	W	367
CPO Power (128 lanes)	W	102
Air Temp	C	24

→ **6.4W/800G**

Tomahawk 5 – Bailly 51.2T CPO

Bailly CPO



51.2T Switch **FR4**

8 Silicon Photonic Engines
@ 6.4T (64ch)

51.2T CPO links, no
electrical links

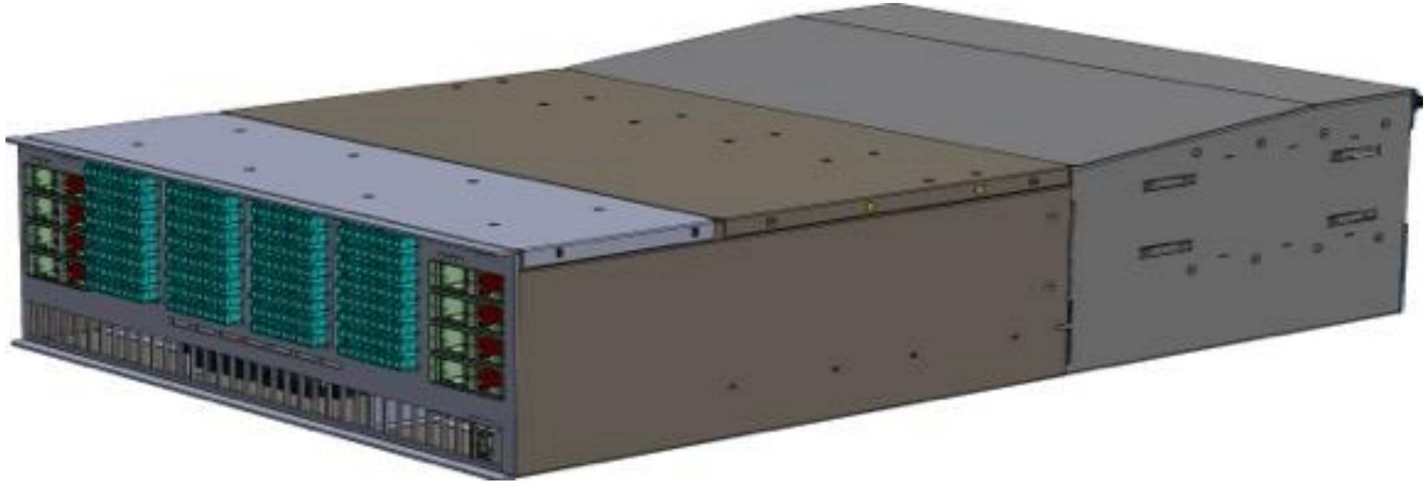
Optical Power: **5.5W/800G**

OFC

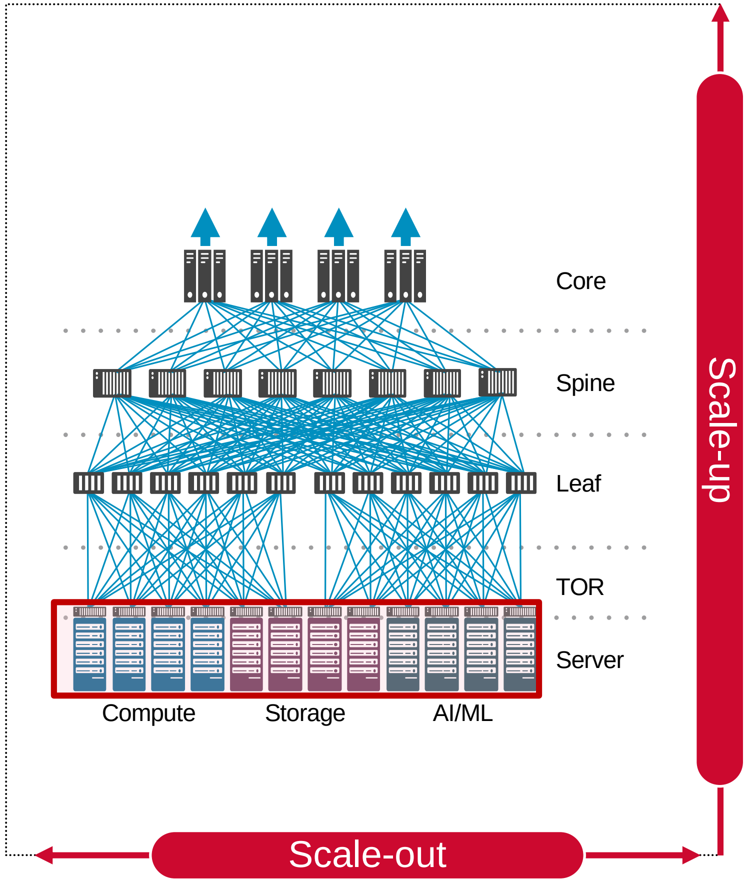
The future of optical networking
and communications is here.

2023 Performance Demonstration

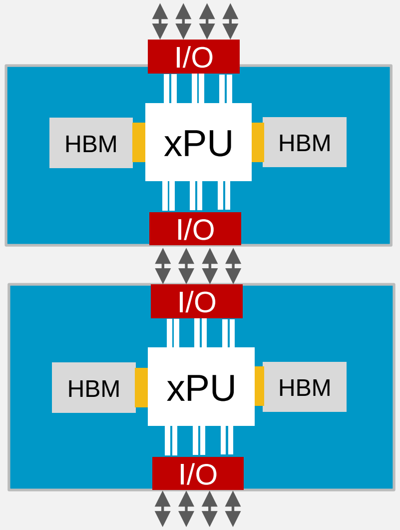
30%
Power Savings



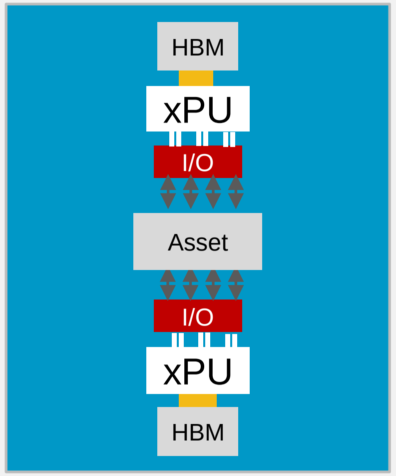
…will Launch the Industry's Explosive Adoption of the Integrated Optical Interconnect



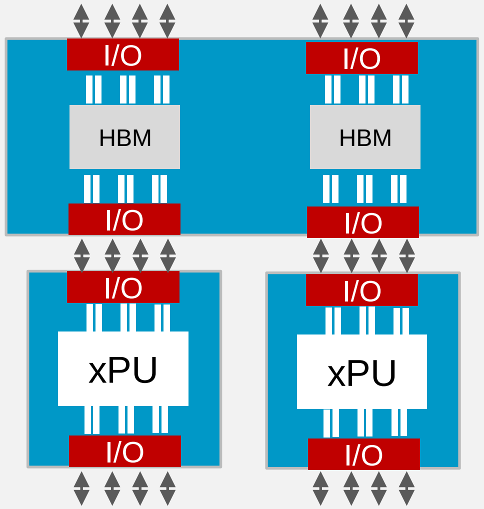
GPU to GPU Interconnect



Resource Pooling



Memory Disaggregation



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