



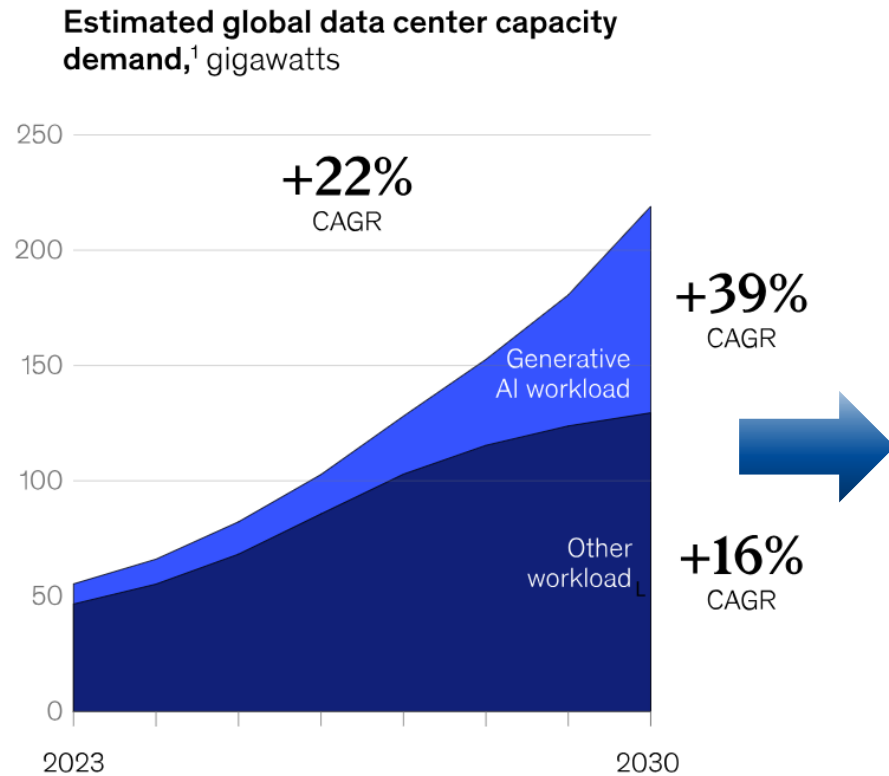
# Where Light drives Data

## Redefining PCBs for Datacenter

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Date: 05.09.2025, EPFL Lausanne

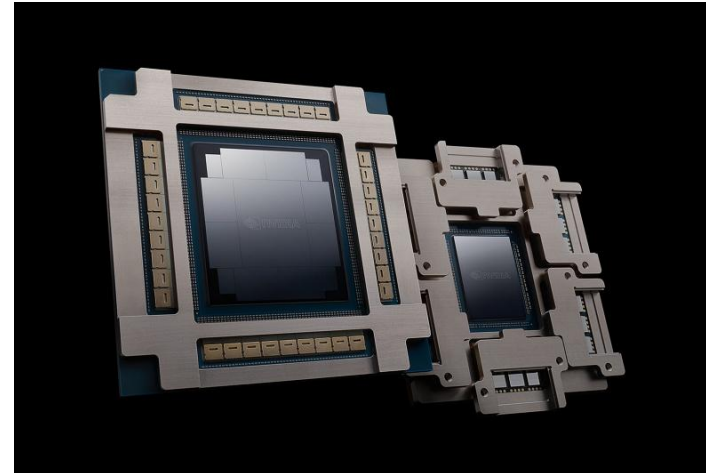
# AI Infrastructure Demands Optical

## – The Industry Responds



Source: McKinsey

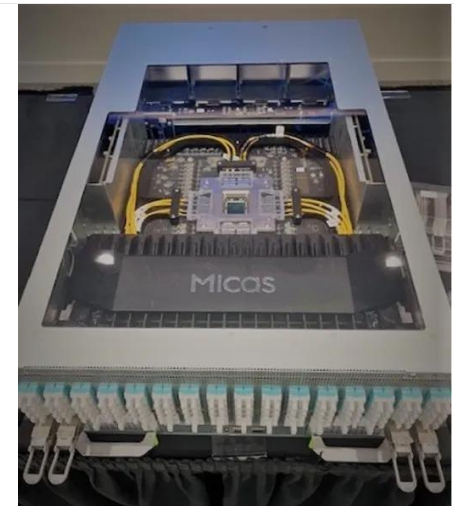
<https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/ai-power-expanding-data-center-capacity-to-meet-growing-demand>



**NVIDIA Quantum-X Photonics**

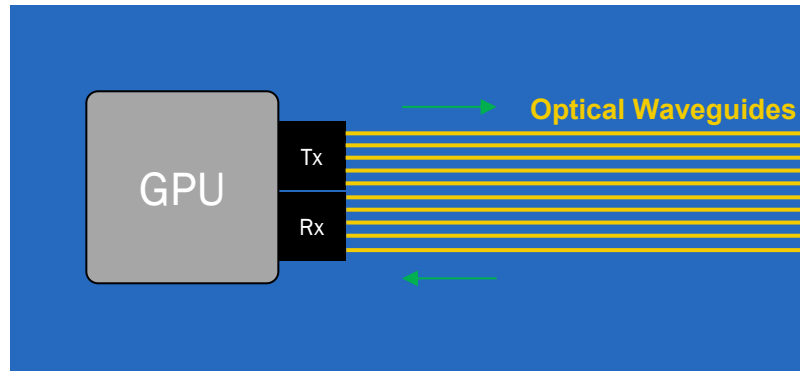


Broadcom Advances Optical Connectivity for AI Infrastructure with Industry-Leading Solutions at OFC 2025

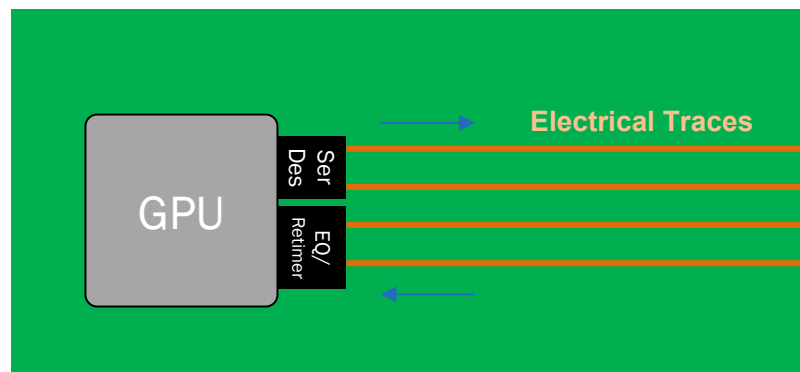


# The transition from Copper to Optical

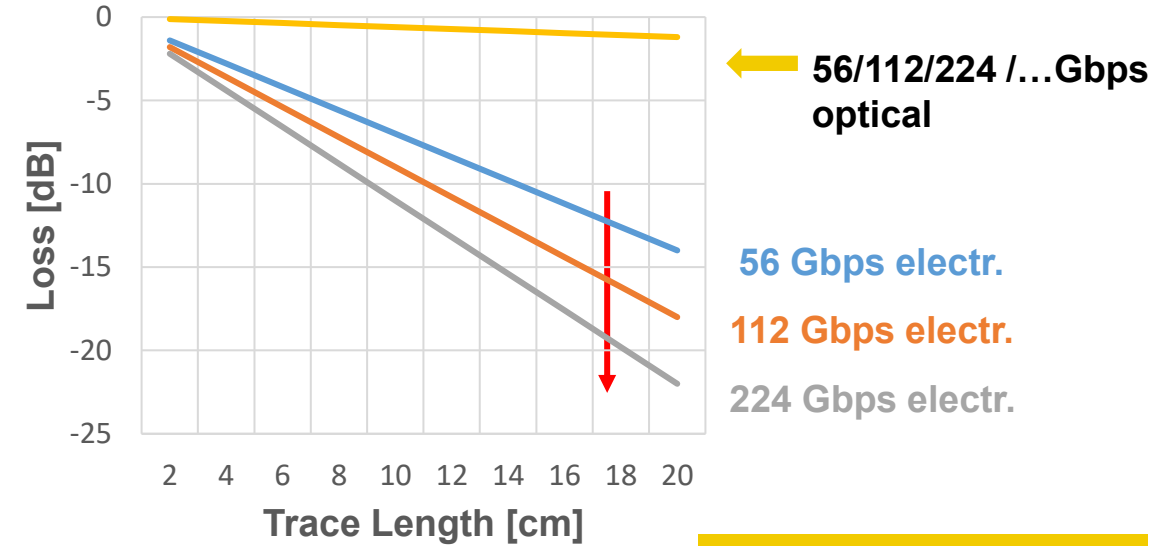
The growing number of GPU-GPU and within-server connections require **higher bandwidth-density**.



125/250  $\mu\text{m}$  Pitch (MM)  
10-15  $\mu\text{m}$  Pitch (SM)



0.8 - 1 mm Pitch



(1)

**>10x lower loss  
using optics/photonics**

(2)

**> 5-50x higher lane density**

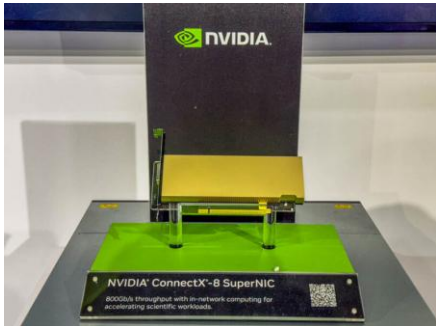
**> 10-100x  
higher BW-density**

# The transition from Copper to Optical

PCIe: the defacto standard of AI/Datacenter interconnects – moving to optical



- first **Gen6 PCIe-over-optics** demo for AI scale-up fabrics at **OFC 2025**
- Roadmap: **Atlas 3 (Gen6/CXL 3.1) → Atlas 4 (Gen7/CXL over PAM4)**; enabling full PCIe optical fabrics.

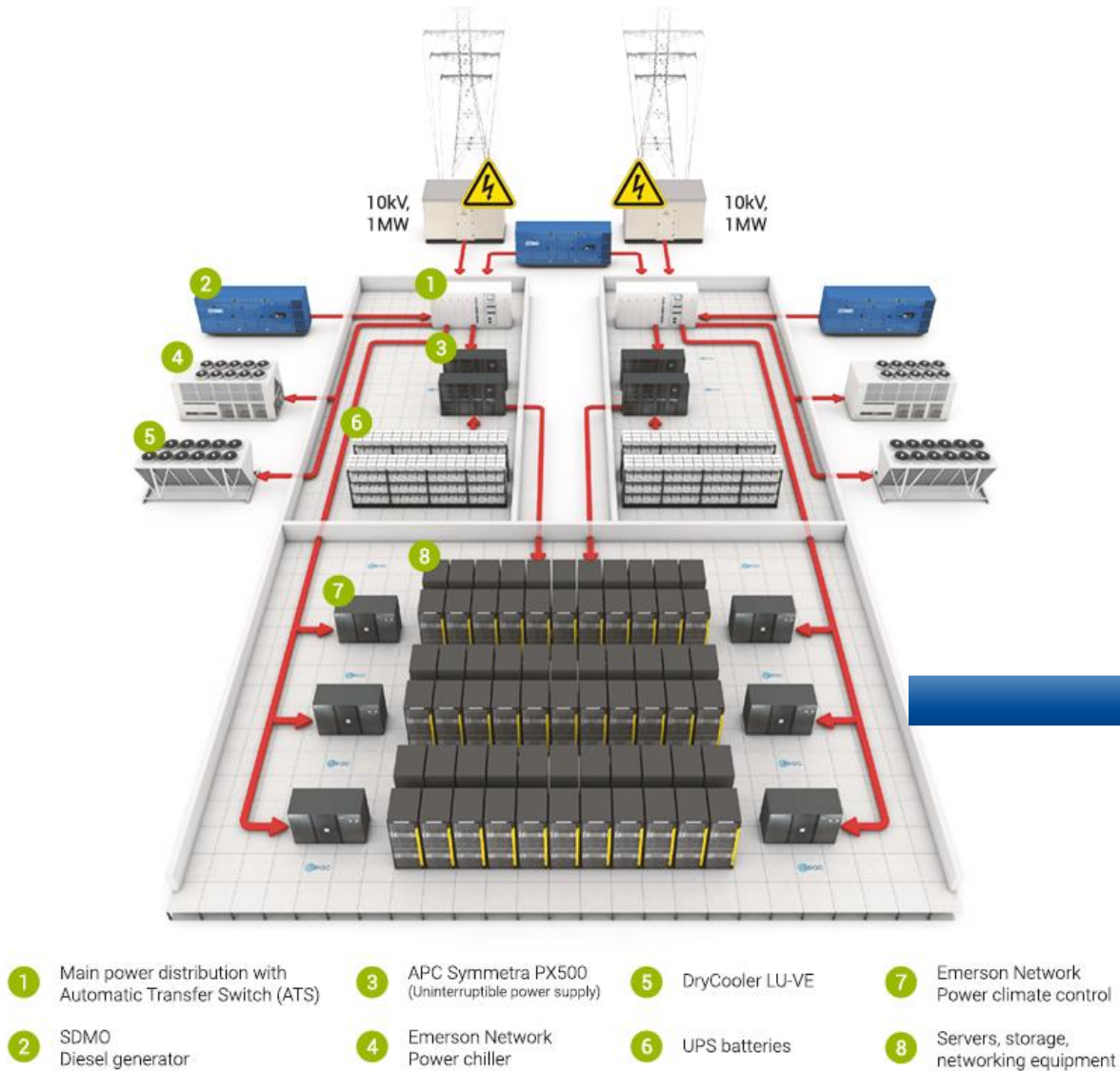


NVIDIA ConnectX-8  
**SuperNIC with PCIe 6.0**  
(Announced 2025 Nvidia GTC)

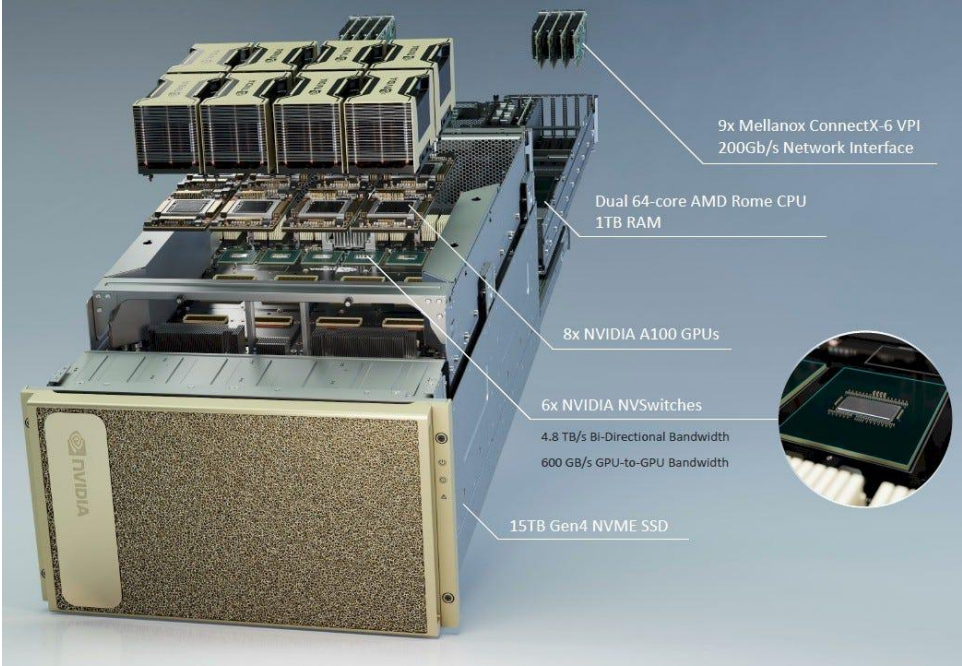
- **PCIe 7.0 Specification Released (June 2025)**
  - Integrates native support for **optical interconnects**
  - Doubled data rate to **128 GT/s** per lane



# Where do we find such interconnects in a DC

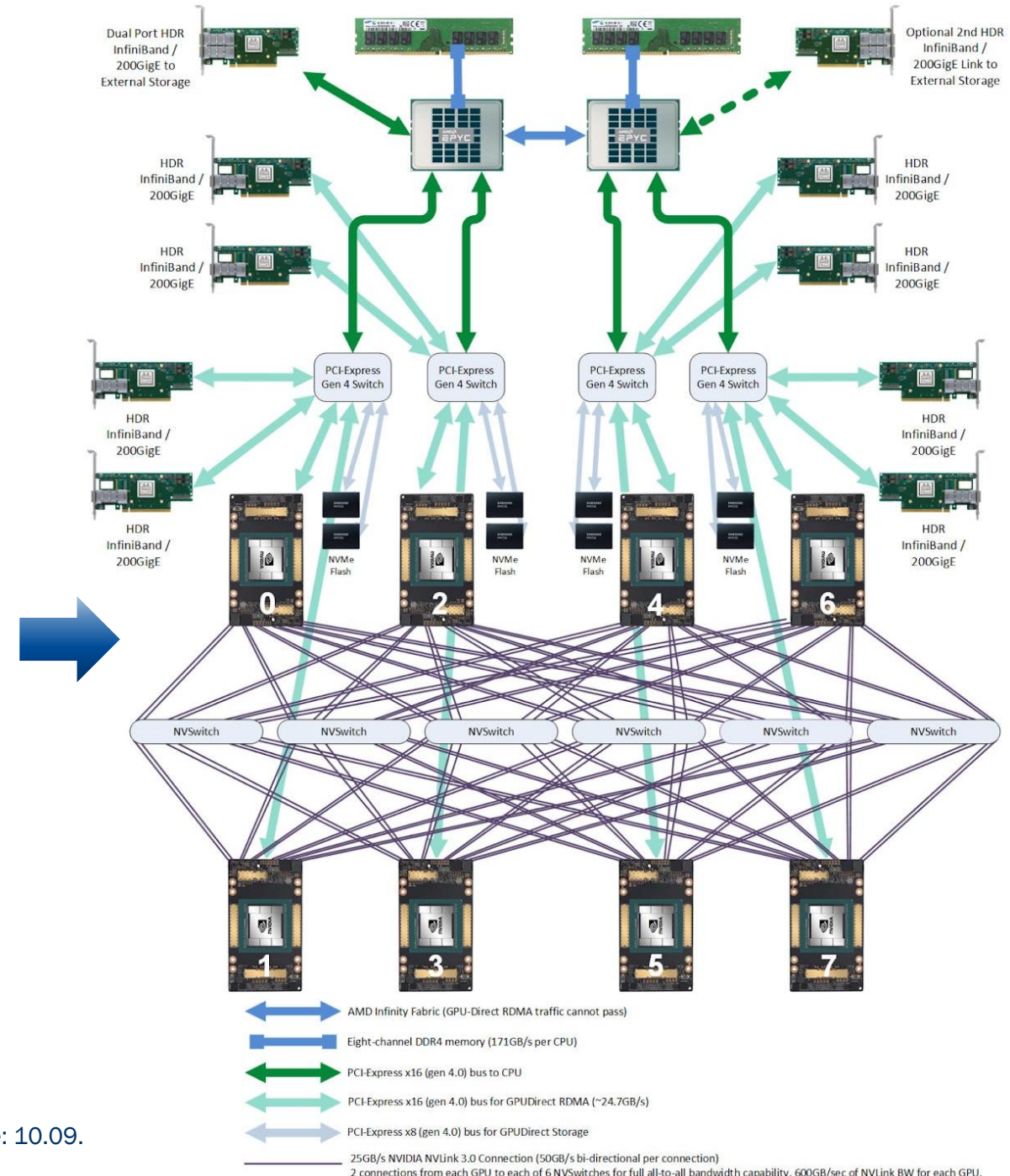
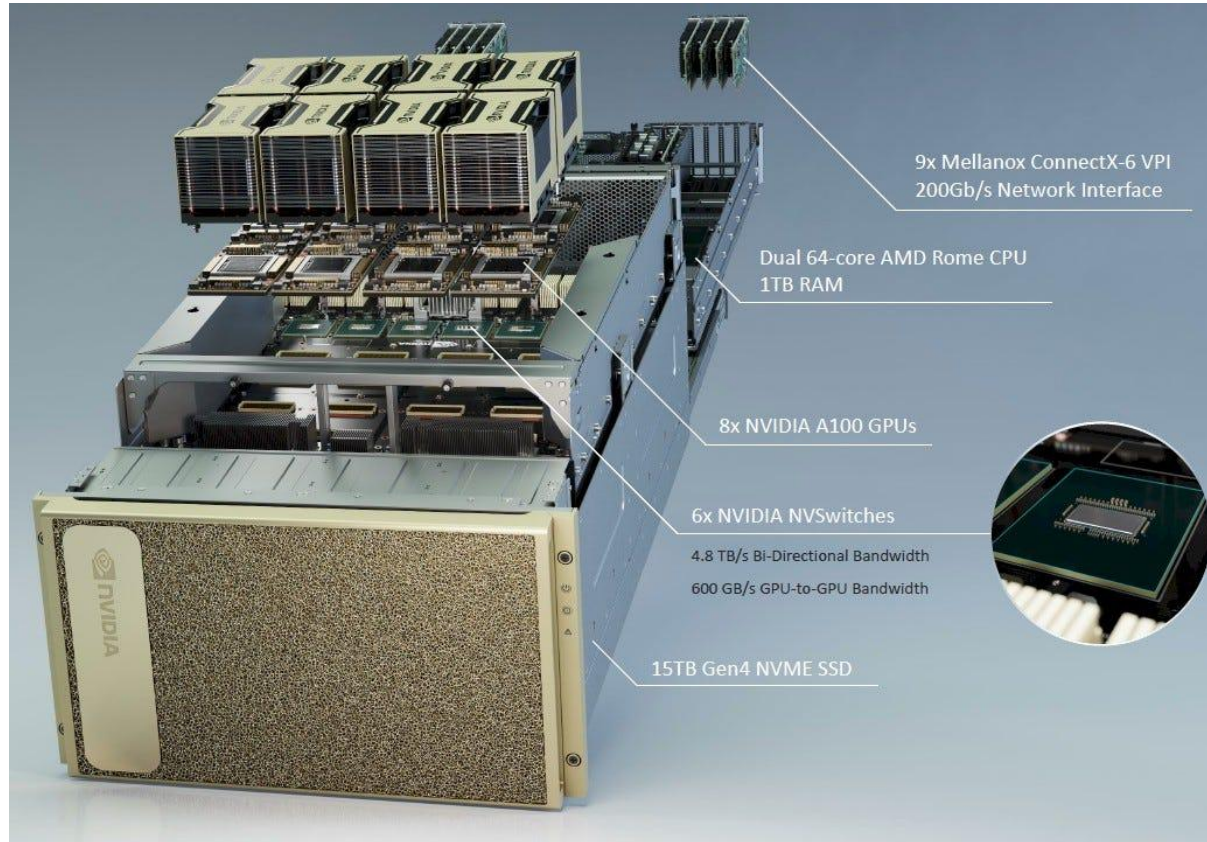


Nvidia DGX A100 System





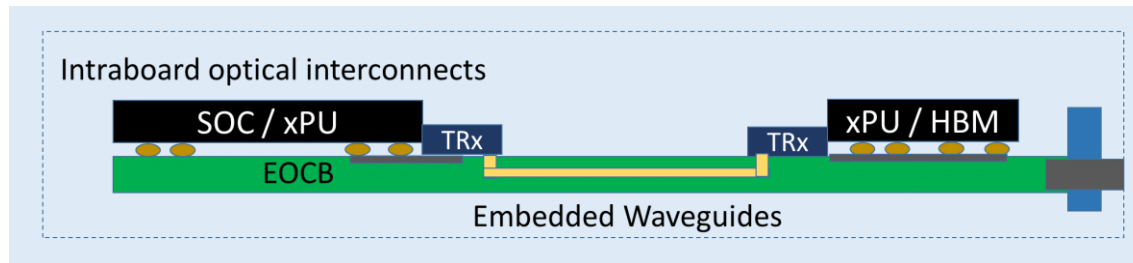
# Techn. Breakdown of DGX A100 System



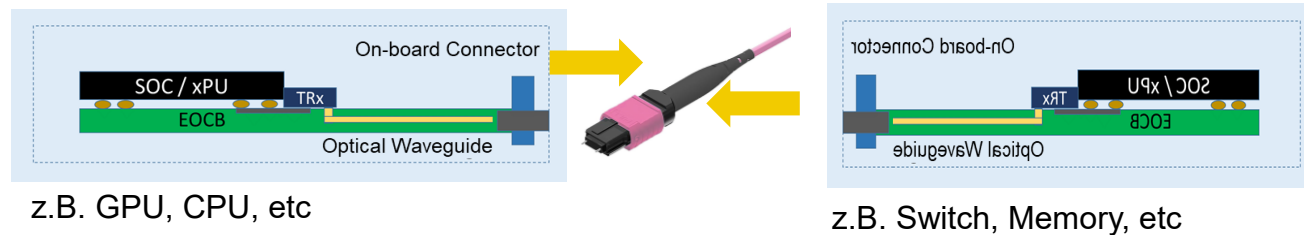
# Optical PCBs:

With our oPCB technology, you're not just upgrading links — you're unlocking a new class of high-density, high-efficiency compute infrastructure.

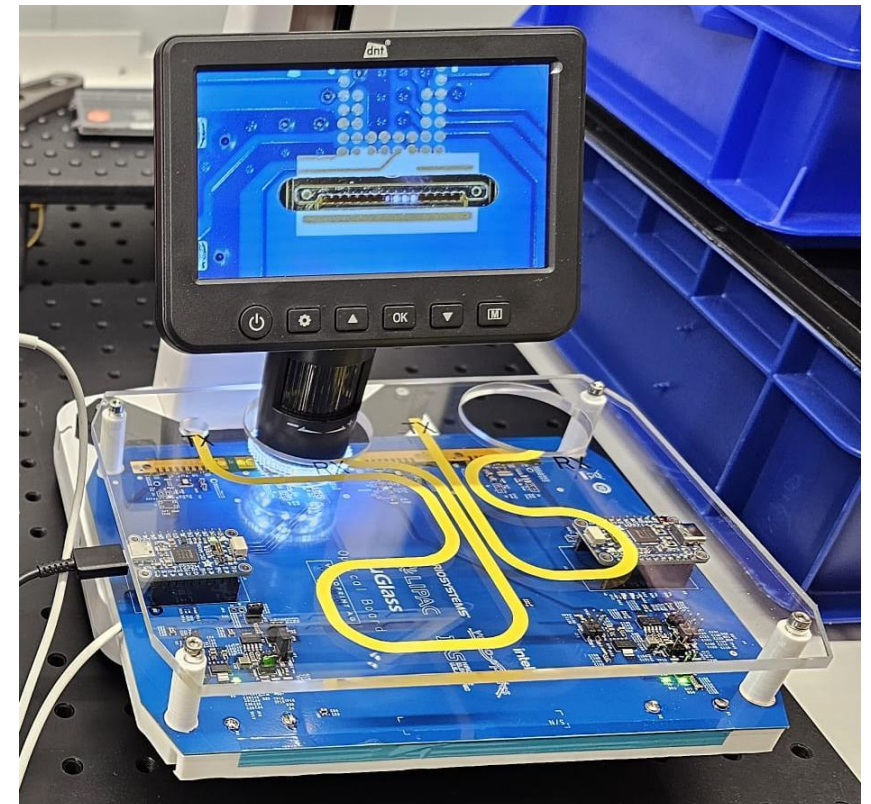
(1)



(2)



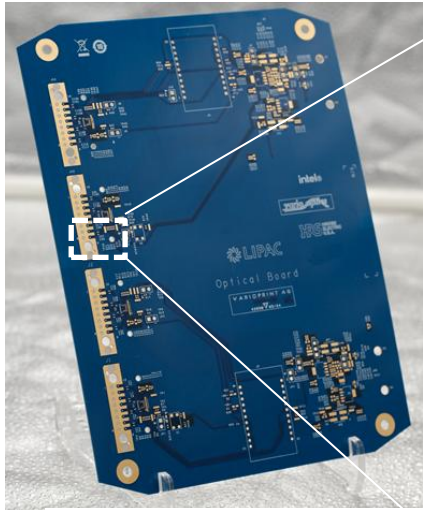
## Optical PCIe Gen.6/7 Demo-Board



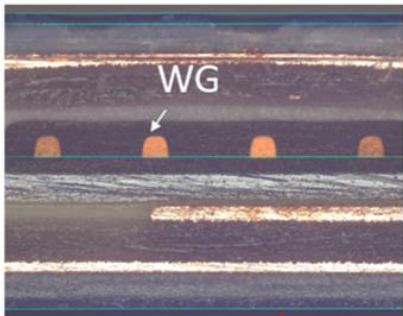


# Optical PCBs

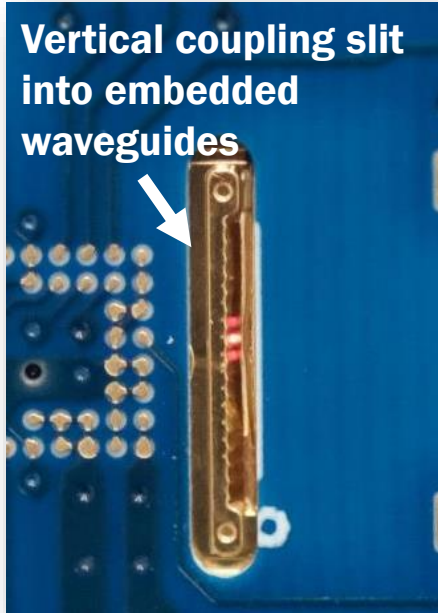
Delivering more Performance per Watt, per Dollar and per Rack



WG Cross Section

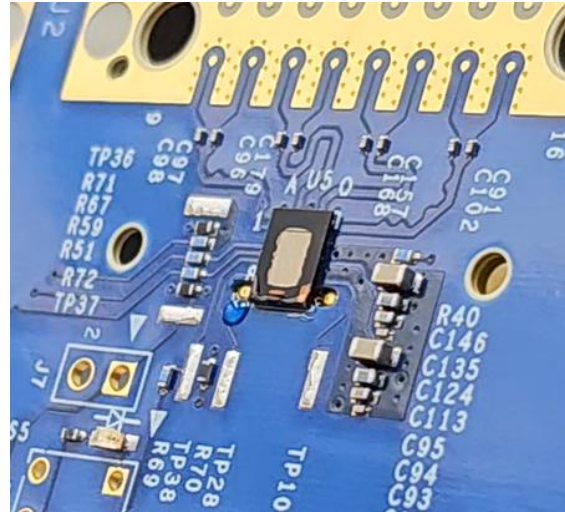


Vertical coupling slit  
into embedded  
waveguides



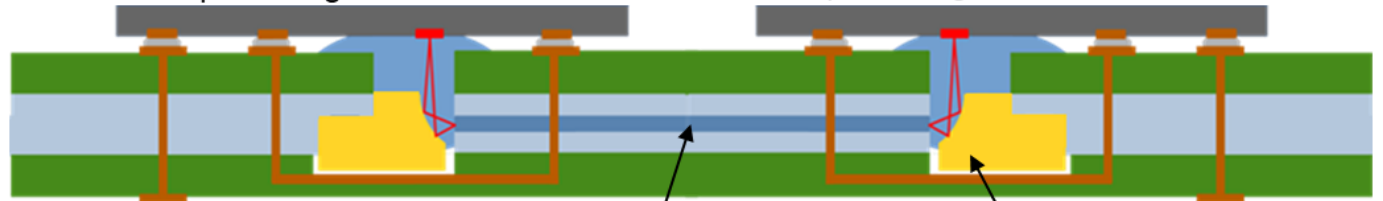
Embedded, low-loss  
(0.05 dB/cm) optical  
waveguide

direct-attached 4-channel  
VCSEL module



Optical engine module TRx

Optical engine module TRx



Embedded optical waveguide      Vertical coupling element



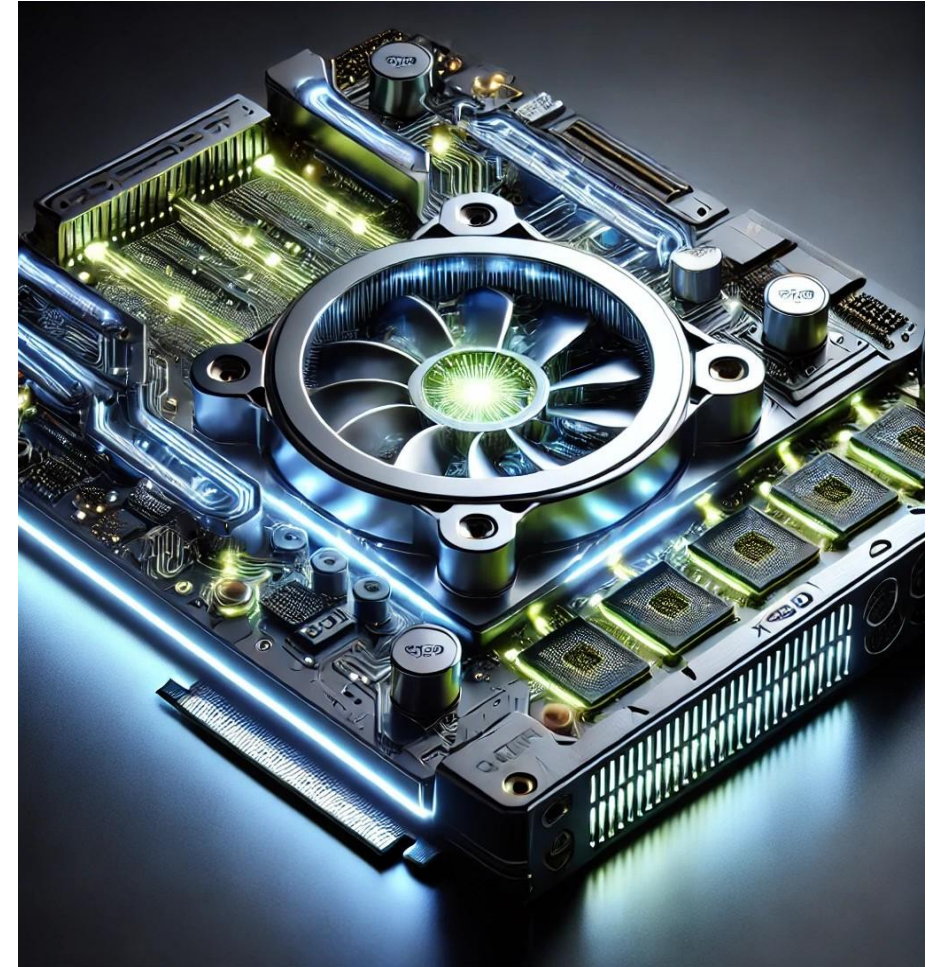
# Summary

The demands of AI and cloud computing are fundamentally reshaping data centre architectures, creating a critical need for optical interconnects since copper cannot sustain beyond 100 Gbps per lane.

Optical PCIe and Optical PCBs (oPCBs) are addressing this bottleneck, with the PCIe 7.0 Specification natively integrating optical support and doubling speeds to 128 GT/s per lane.

Optical interconnects realized in oPCBs offer ~10x lower channel loss, 5x higher lane density, and 10x higher bandwidth-density than electrical traces, significantly reducing power consumption and complexity.

Optics is unlocking a new class of AI infrastructure capable of future-proof scaling beyond 224 Gbps



Chatgpt-rendering of Optical PCB Motherboard

There is a huge potential

Let's get started!

Questions / Discussions