



LIGHTELLIGENCE

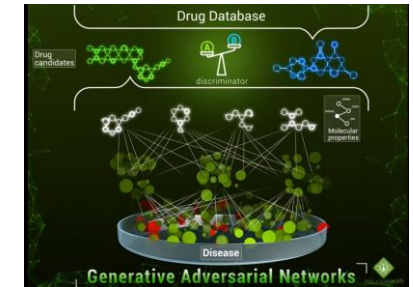
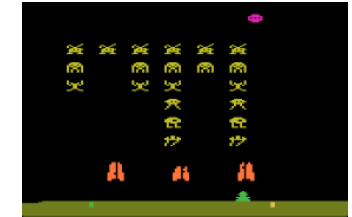
Photonics Compute and Interconnect

Hal Conklin, Vice President, Business Development

Exponential Growth of Machine Learning Market

Breakthroughs in deep learning:

- Computer Vision
- Natural Language Processing (NLP)
- Game Playing (Go, Atari)
- Autonomous Vehicles Control
- Advertisement Placement
- Drug or Material Discovery
- Large Language Models (ChatGPT)
- ...



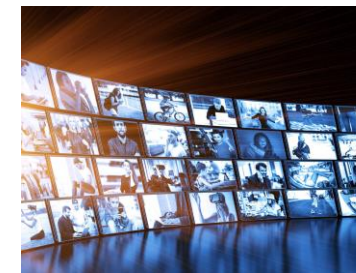
Cloud AI



Finance



Telecom



Intelligent Surveillance

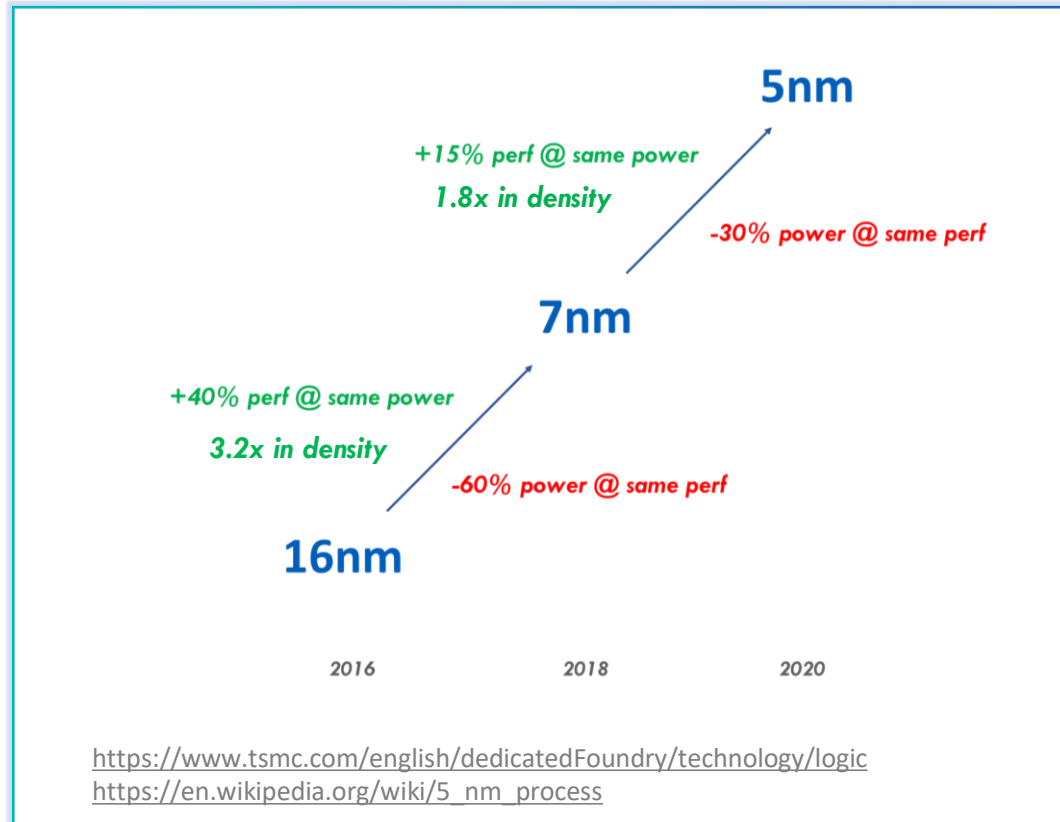


Smart Retail

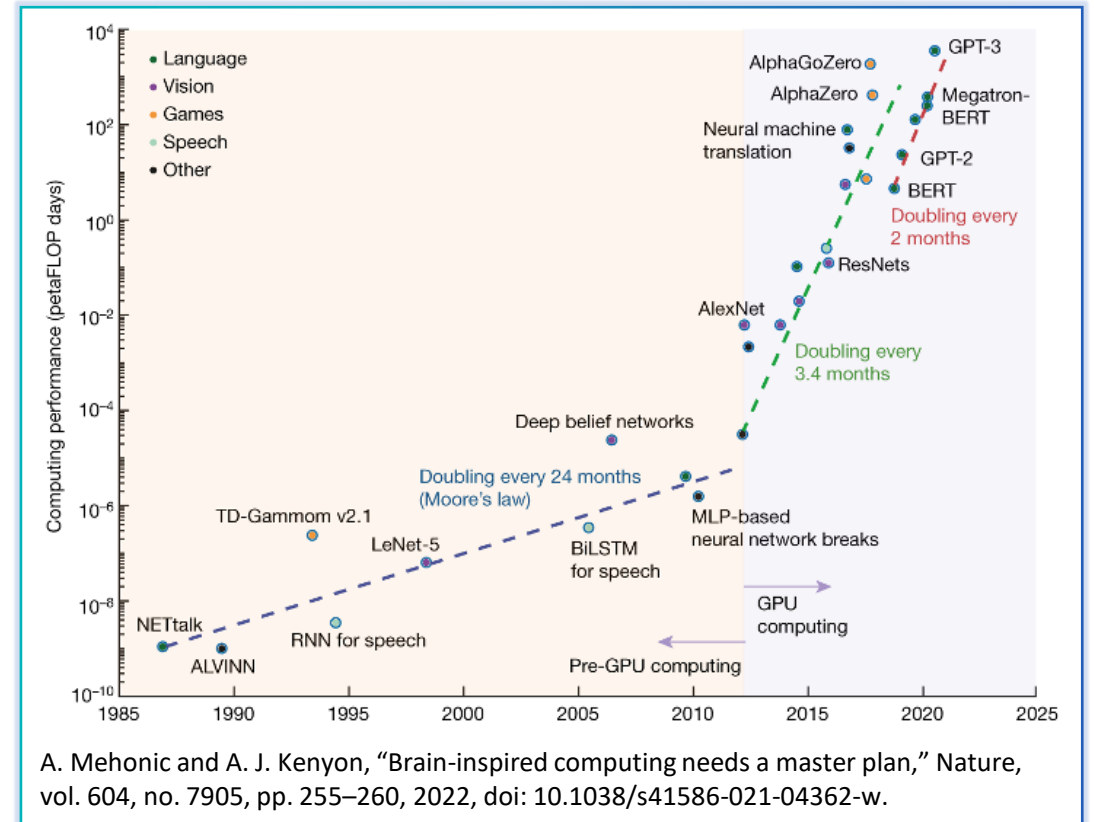
- Deep learning has extended its application to multiple aspects of our daily life.
 - Machines are getting better at tasks typically done by humans.

Transistor Scaling Falling behind Demand

Single Transistor Level Improvement



AI Model Computing Performance Requirement



- Electronics approaching physical limits, hitting walls on power, communication and memory access
- AI model and its computing resource requirement is increasing at a much quicker pace
- Large language models cost millions of dollars to train

Photonics Introduces New Computing Paradigm

Optical Compute

Optical MAC

Process Data



Special Purpose Accelerators:

- NP Complete Problems
- 100X faster than GPUs
- Lower TCO

Optical NOC

Share Data



Flexible Topologies:

- Low Latency Interconnect
- Greater Density/Less Power
- Simplifies SW Development

Optical Fabric

Optical NET

Transfer Data

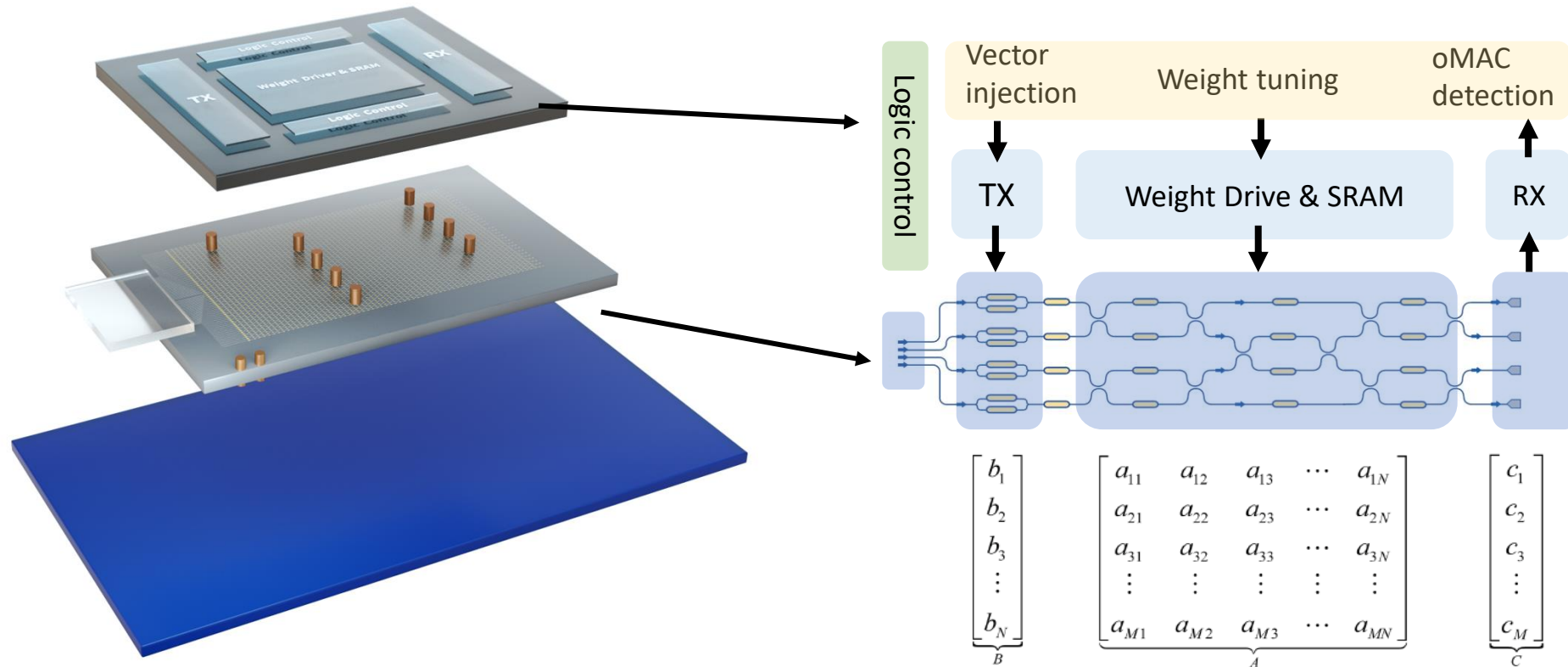


Access to more Memory:

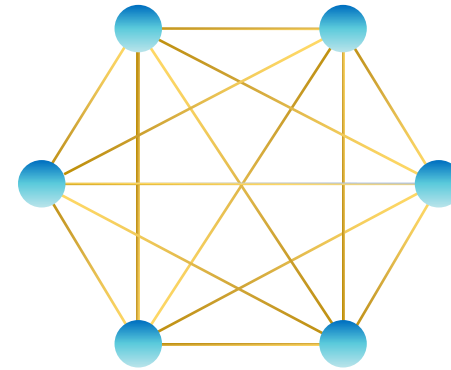
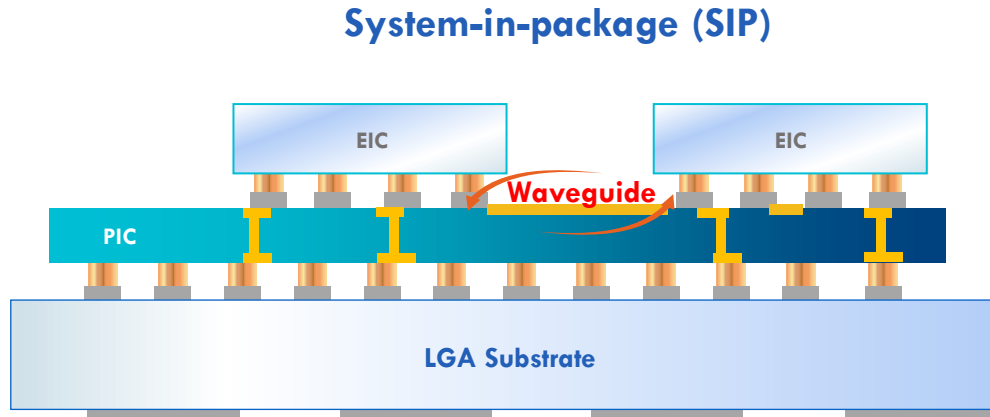
- High Bandwidth Memory Pools
- Rack to Rack Connections
- Lower cost of Model Training

Optical Compute (oMAC)

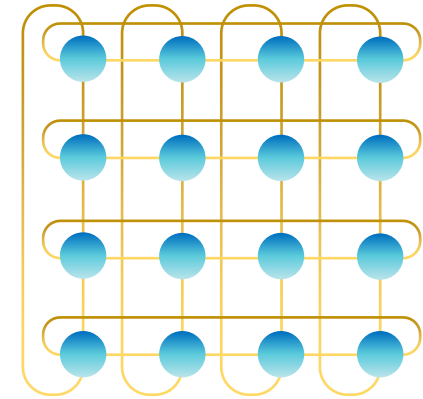
- Very Low Latency Compute using Optical MAC
- Solves Compute Problems not addressed by CPU, GPU, XPU
- Enables 10-1000X Performance Advantage to lower AI/ML training costs



Optical Network-on-Chip (oNOC)



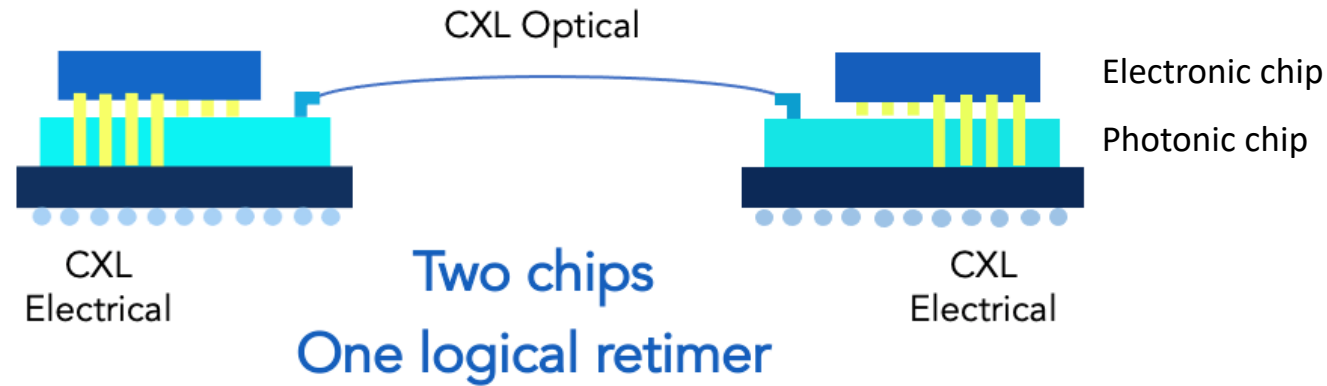
Full mesh



2D Torus

- Power and latency are independent of distance
- Inter-chiplet connectivity no longer limited to nearest neighbors
- Enables higher density and higher performance compute

Optical Fabric Interconnect (oNET)



Use Cases

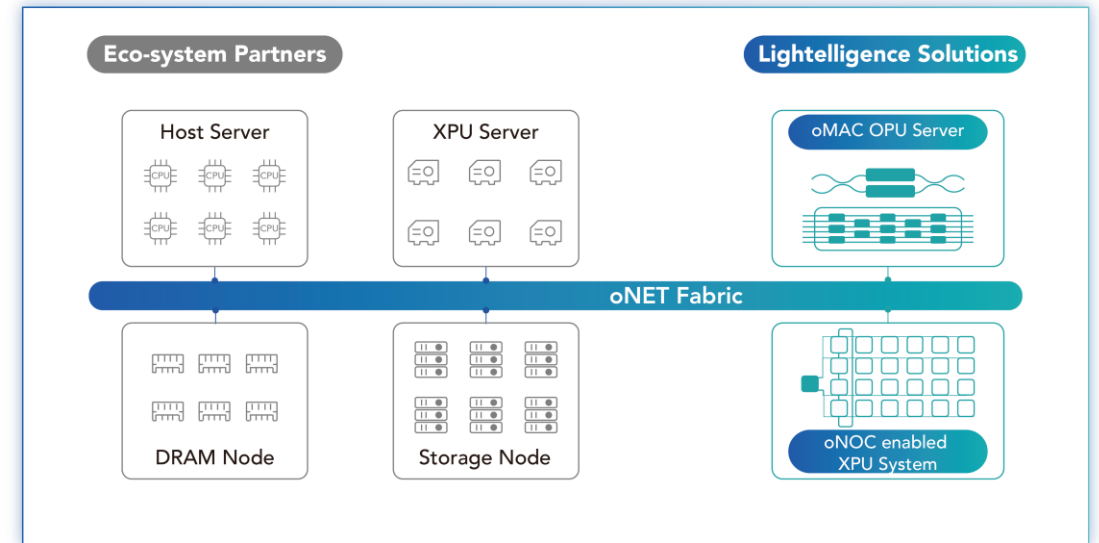
- Memory appliance to reduce Large Language Model (LLM) training time
- GPU appliance and system clustering to boost AI/ML model performance

Benefits

- Enable across-rack compute resource sharing but with intra-rack performance
- Boost utilization of devices (CPU, GPU, memory, storage, etc.)
- Make on-premise deployment flexible

Scaling Compute with Photonics

- AI and Large Language Models will continue to consume more compute
- New approaches and technology are needed to continue to scale
- oMAC, oNOC and oNET platforms are providing value to our partners
- Is photonic compute in your strategic plan?



oMAC: Optical Multiply Accumulate Operation

oNOC: Optical Network on Chip

oNET: Optical Inter-Chip Networking



LIGHTELLIGENCE

Thank you