IMAPS SiPho Summit 2026

From Theory to Foundry: Scaling Co-Packaged Optics through Packaging & Test

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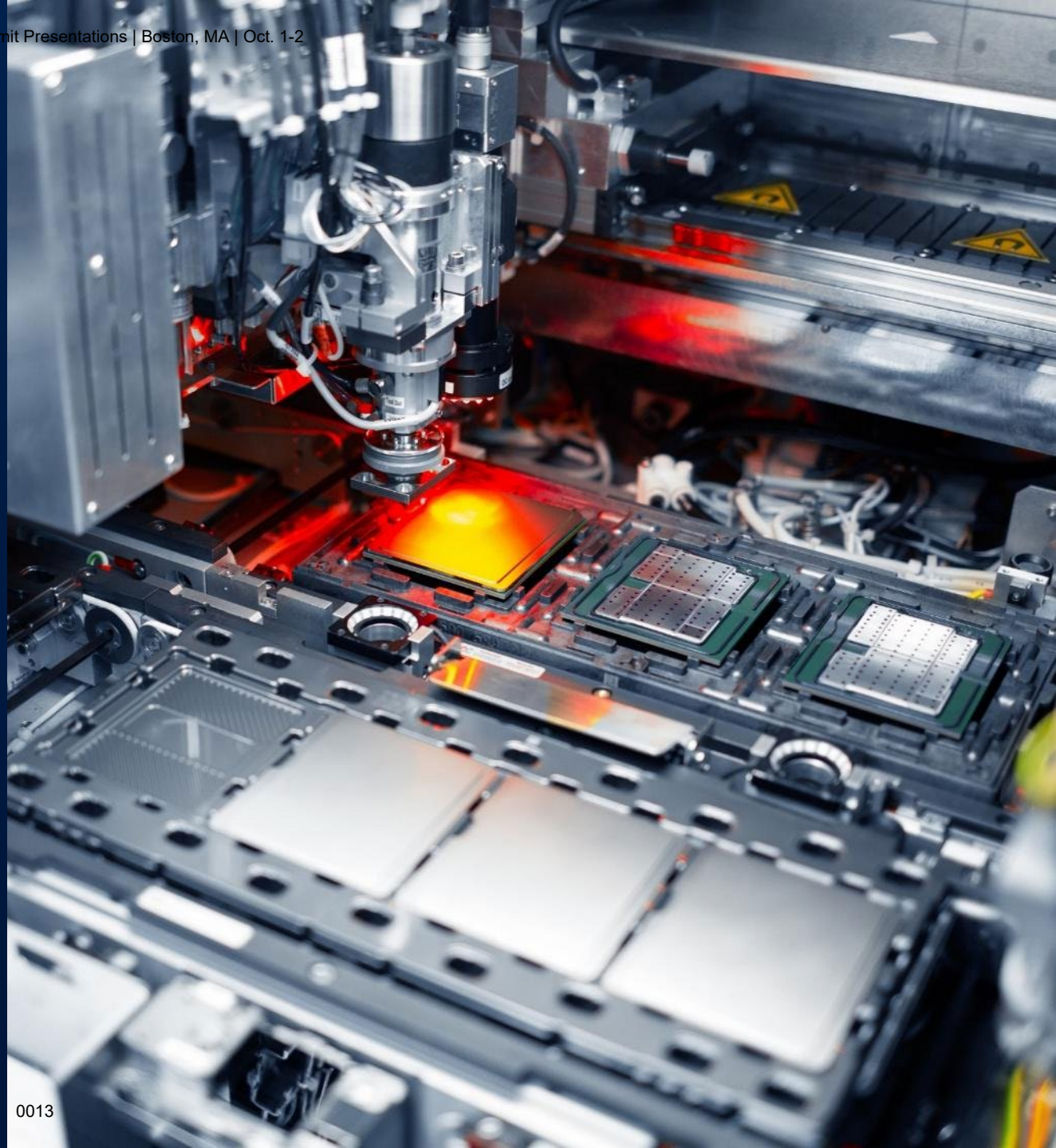
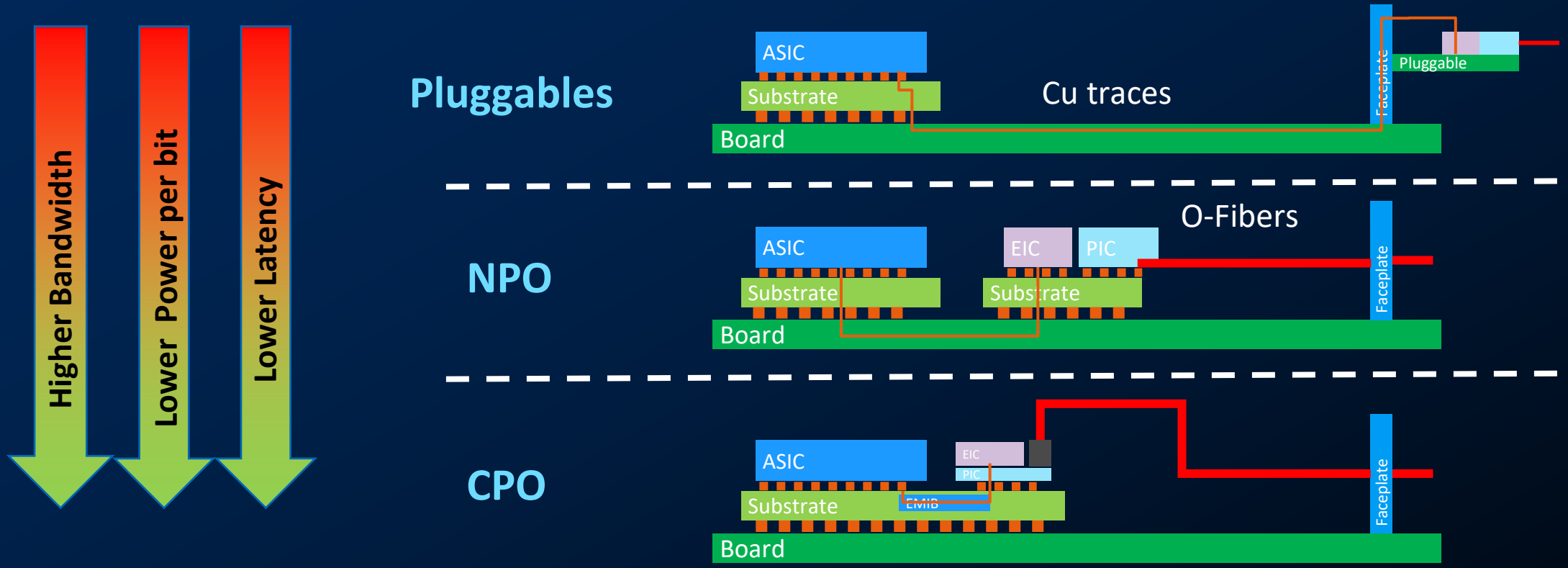


Preaching to the choir

CPO enables AI Scale-up

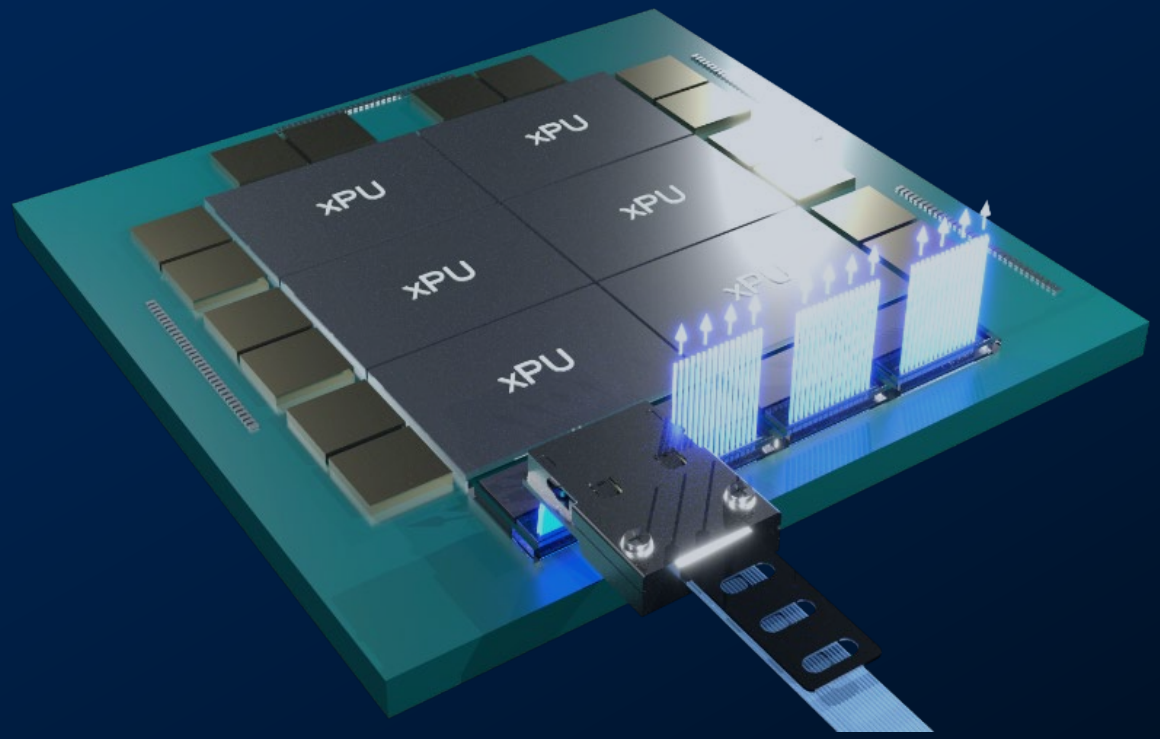


Moving optics closer to compute improves scale-up connectivity

Theory

Compelling Benefits

Higher Bandwidth
Lower Latency
Lower Power



Foundry

Scaling Challenges

Yield compounding
Reliability
Cycle time
Serviceability

The benefits are compelling. The scaling challenges are real.

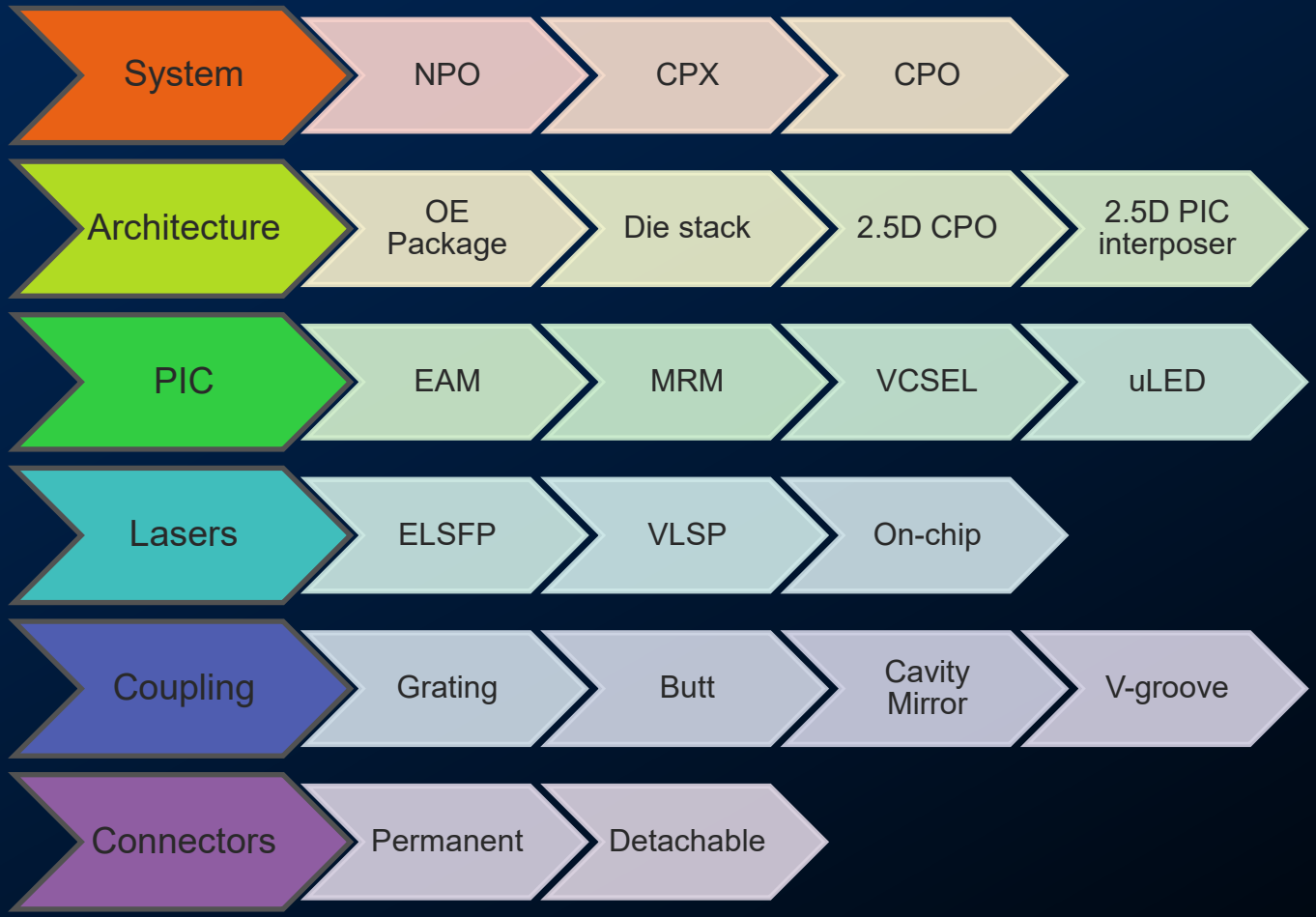
Betting on CPO, but which architecture?

Every interface choice multiplies the solution space

Architecture choices depend on

- Target use cases
- Performance requirements
- Reuse potential
- Commercial model
- Manufacturing readiness

Industrializing any one combination is resource-intensive



The CPO design space is broad, but R&D capacity is limited

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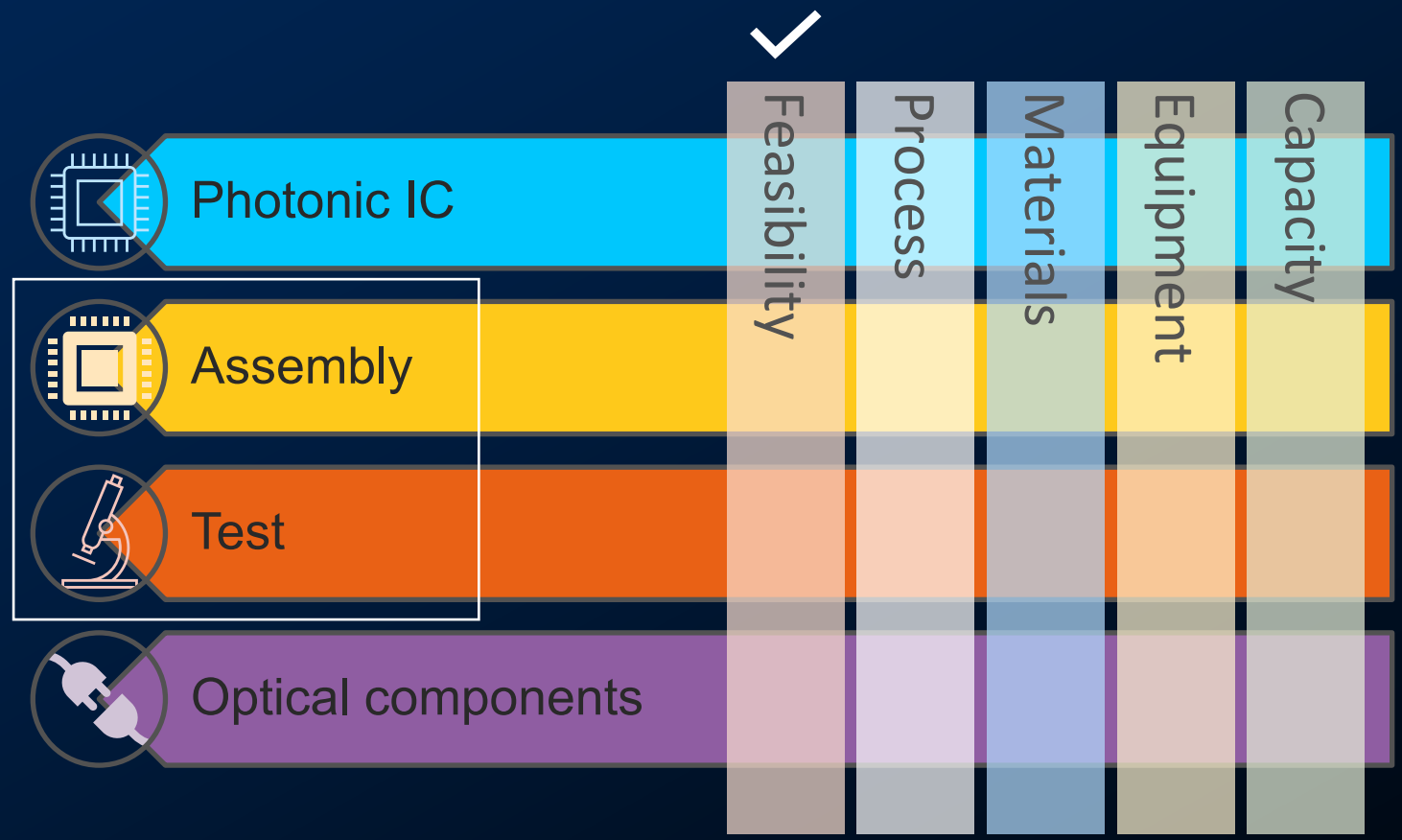
What does it take to scale CPO?

- Multidisciplinary system challenge
- Technical feasibility demonstrated
- Manufacturing readiness remains in progress



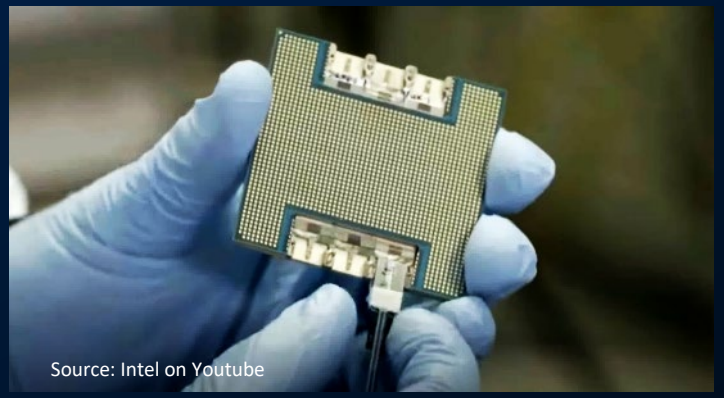
The manufacturing system scales only when its building blocks scale together

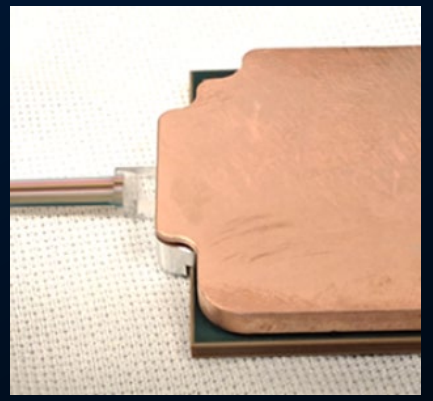
Optical assembly must scale like advanced packaging

- Alignment & cure scaling
- 3D process compatibility
- Detachable FAU scaling
- Optical metrology scaling
- Design for manufacturing









Advanced packaging has scaled complexity before. Optics is next.

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Test is the yield guardrail from wafer to system

Where test protects value

- **Photonic wafer test**

Before adding EIC and coupler

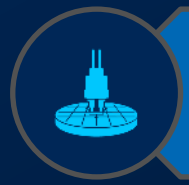
- **Optical-engine stack test**

Before adding XPU, HBM, and package

- **Final and system-level test**

Package quality and system functionality

What must scale



Repeatable, automated optical probing



Standardized opto-mechanical interfaces



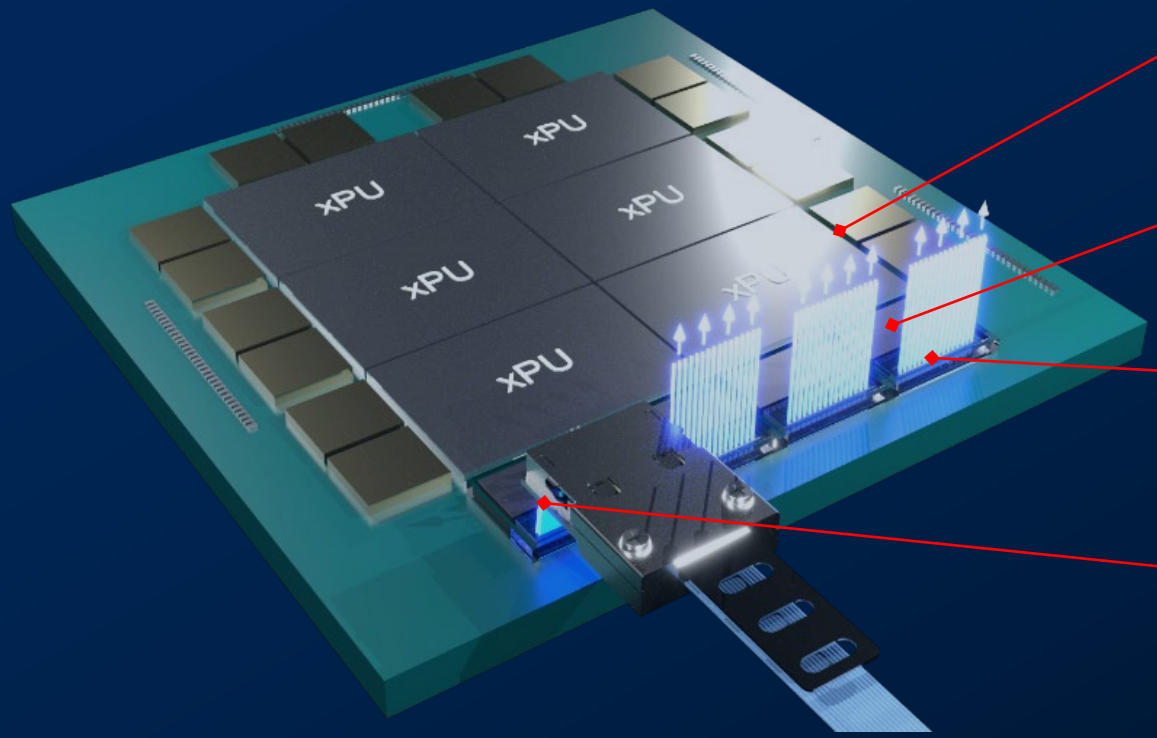
Production-ready photonic test equipment



Architect product for testing

Scalable CPO test must be designed into the product and manufacturing flow

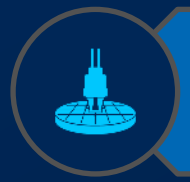
Scalable CPO requires standardized, testable interfaces



- Standard electrical die to die connectivity
- Standard electrical-to-optical modulation interface
- Defined optical coupling and beam-array interface
- Modular, testable receptacle interface
- Common reliability and qualification methods

Standardization enables reuse, independent development

Intel Foundry: End-to-End Product Lifecycle Support



Co-pathfinding

- Early access, learn together



Architect for manufacturing

- Electrical and thermo-mechanical modeling



Design for manufacturing

- Substrate, bridge, test vehicle, test chip, board



Co-development

- Close collaboration



Production

- Controlled, scalable manufacturing

Design for manufacturing from co-pathfinding through production

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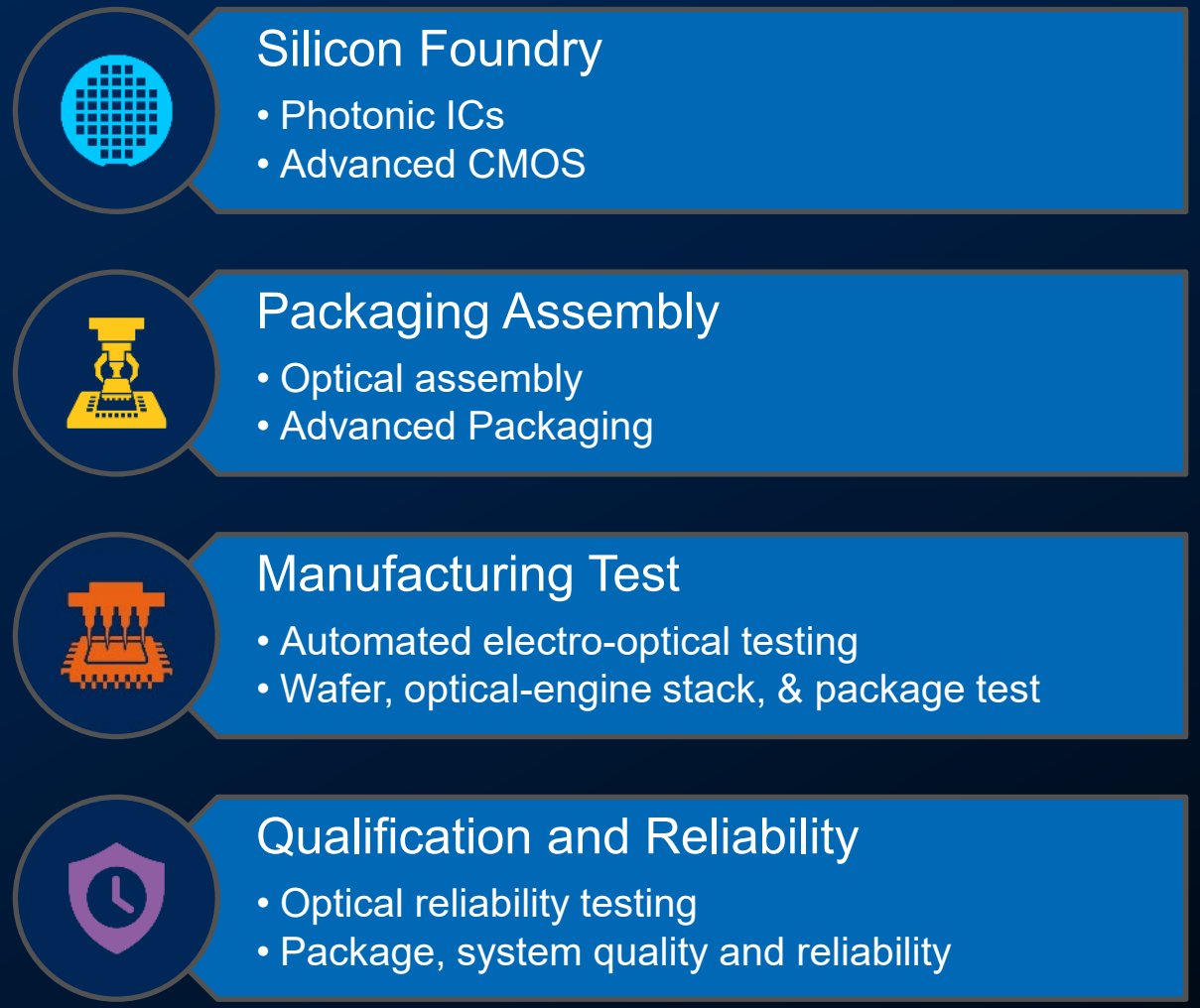
Intel Foundry: End-to-end manufacturing support

Designed to support an open ecosystem

Integrated capabilities accelerate learning and execution

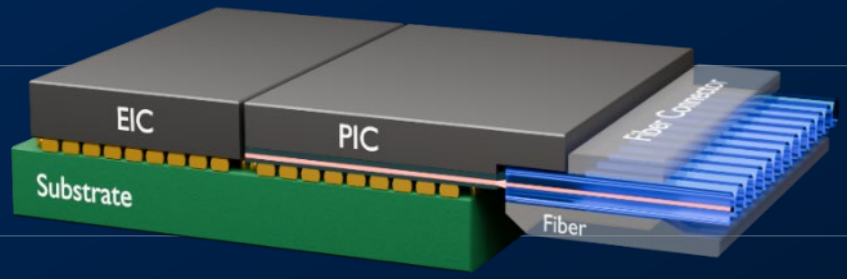


Integrated capabilities & close collaboration accelerate CPO manufacturing

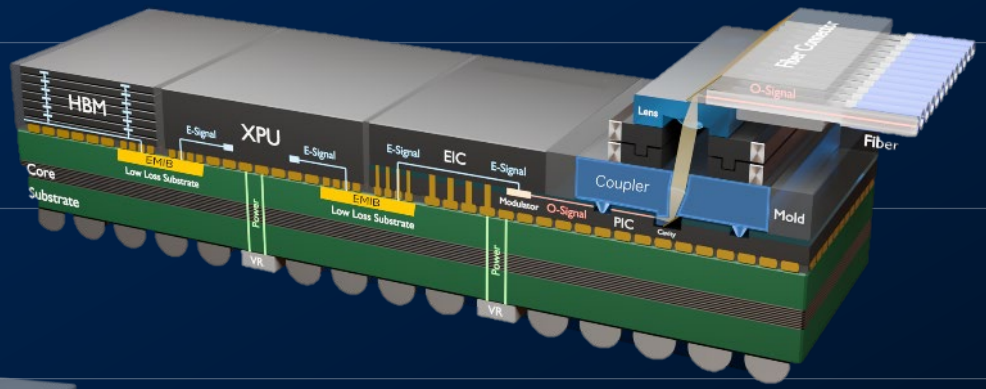
Intel Foundry: Development Roadmap

Increasing optical integration

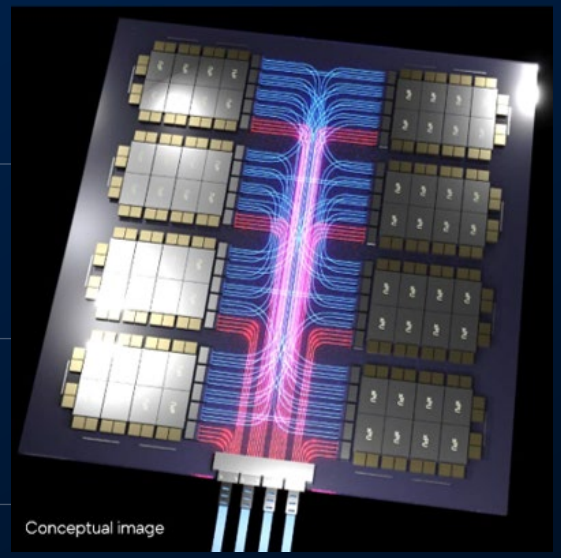
Gen 1 CPO - 2D PIC



Gen 2 CPO – 3D stack



Gen 3 CPO – In-Package Optical Network



Solid technology roadmap for solution convergence and scalability

Four actions to scale CPO



Focus the bets

Prioritize architectures with credible paths to HVM



Scale the full system

Mature every critical building block for HVM



Standardize the boundaries

Enable reuse, independent development



Close ecosystem collaboration

Architect system for collaboration, integrate capabilities

No one scales CPO alone.

Together, we can turn CPO innovation into manufacturing scale.

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