Future Needs of Advanced Packaging Research

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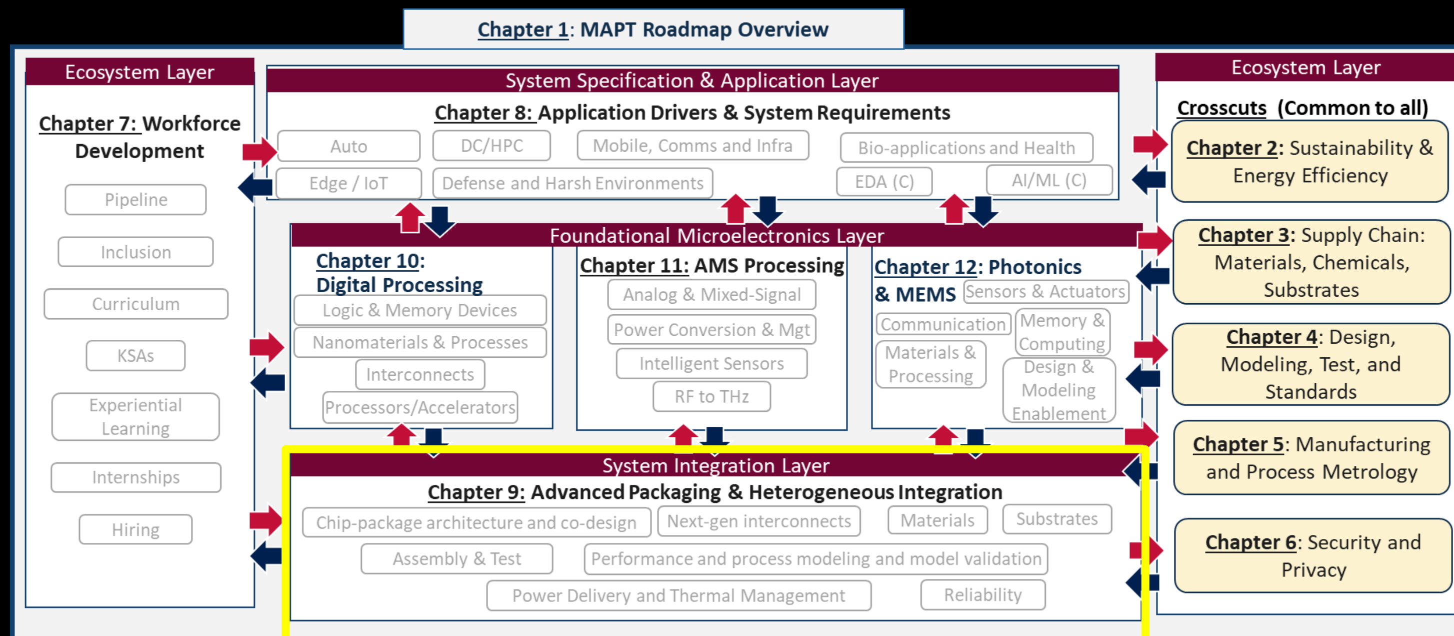
Future Needs of Packaging Research

Microelectronic and Advanced Packaging Technologies (MAPT) is fast evolving to meet the demanding challenges of future products

1. Analog Data Deluge / Intelligent Sensor Systems
2. Growth of Memory and Storage Demands
3. Communication Capacity vs. Data Generation
4. Information and Communication Technologies (ICT) Security Challenges
5. Compute Energy vs. Global Energy Production



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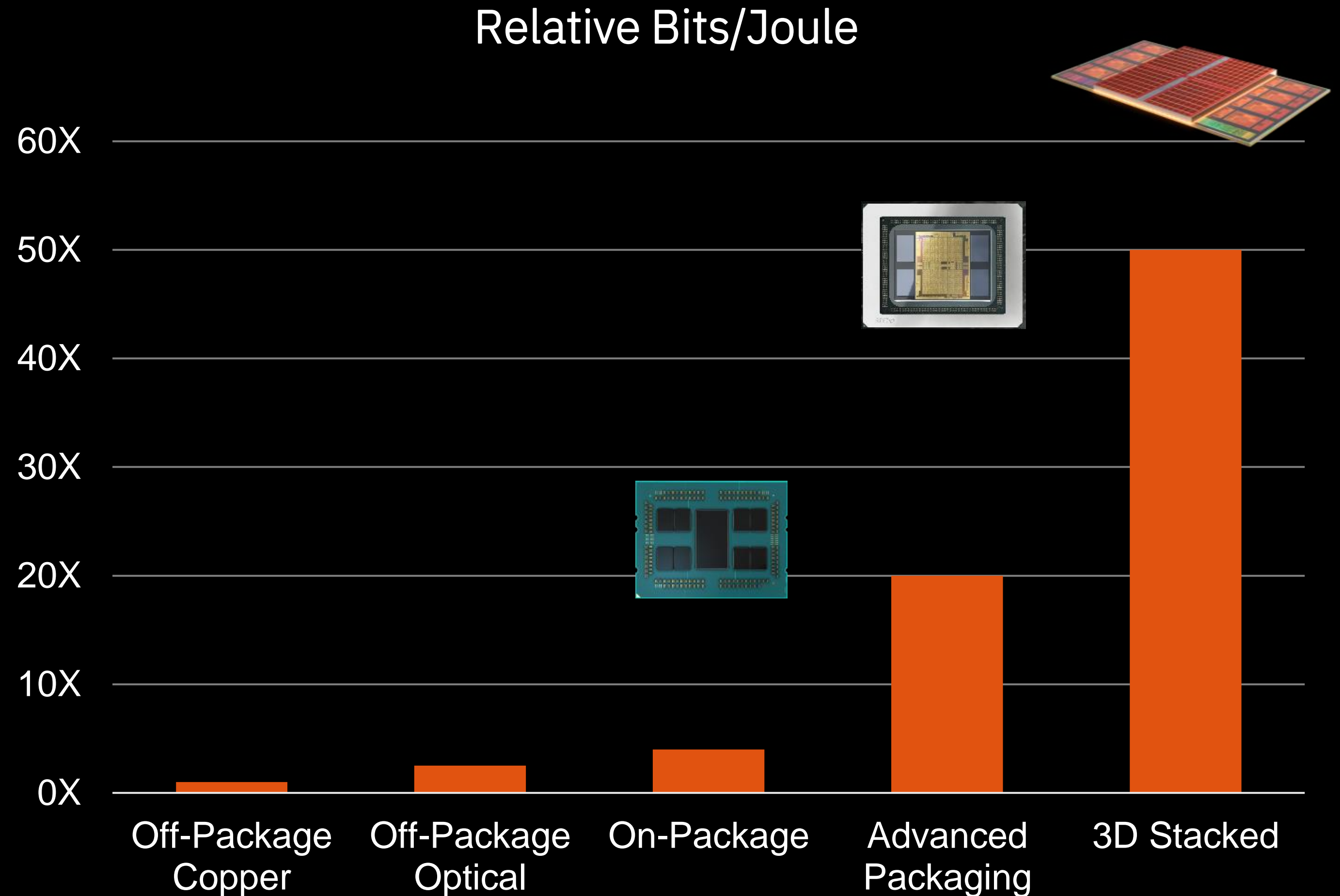
Advanced Packaging and 3D Motivation

- The key to power-efficient performance is tight integration
- Advanced 3D Hybrid bonding provides by orders of magnitude the densest, most power efficient chiplet interconnect
- Advanced 2.5D enables more compute and HBM in a package
- Increased system-level efficiency



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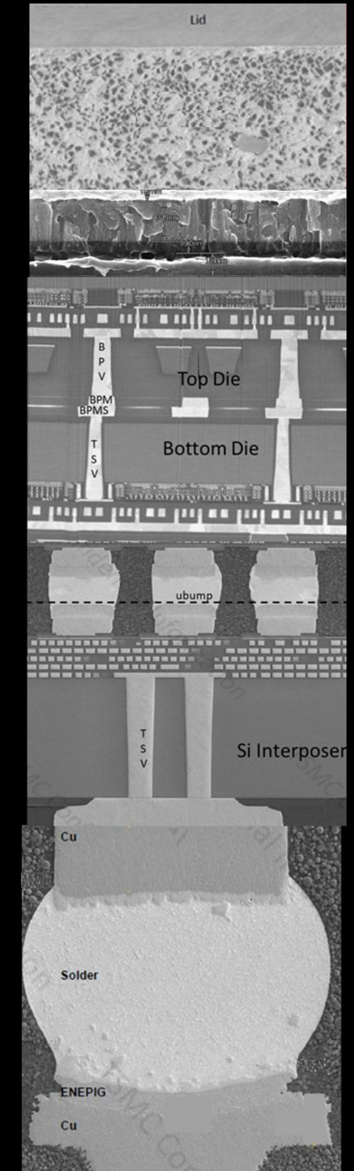
Heterogeneous integrated products introduce new challenges to packaging solutions

1. High bandwidth architectures for high die-to-die bandwidth and decreased latency
   - *novel methods for connecting die in package, low-loss materials*

2. Efficient and compact interconnect PHYs to minimize overhead of chiplets
   - *feature scaling, interconnect pitch, high layer count RDL, power integrity*

3. High-Speed IO solutions to support data fabric at the system level
   - *co-packaged optic integration, architecture, improving signal integrity*



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Heterogeneous integrated products introduce new challenges to packaging solutions (cont.)

4. Materials and processes capable to manufacture complex packaging system at high yield
   - *scalable in volume and assembly format*

5. Meet reliability requirements with new materials used in advanced packaging architectures
   - *resistance to thermal degradation, warpage management*

6. Overcome thermal challenges of 3D and embedded systems with increasing power density
   - *thermal interface materials, microfluidics, thermal architecture*

7. EDA tools enhancing complex package design
   - *improving efficiency in design processes, optimized performance*

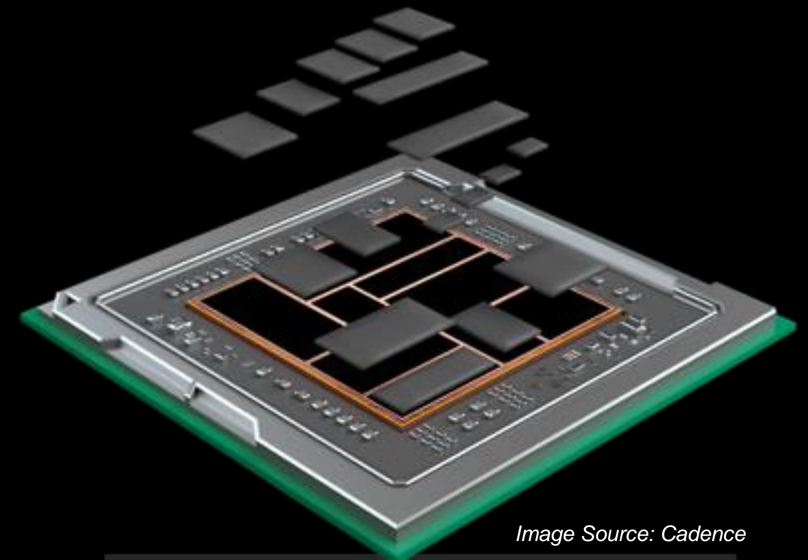

Image Source: Cadence

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