



Post Silicon Validation: Ripe Area for Teaching & Research

*For AICTE Training And Learning FDP on
“VLSI to system design : Silicon to end application approach”*

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Silicon Validation: Increased Spotlight

Number of spins before production

Decline in first silicon success combined with increasing wafer and mask cost

76%

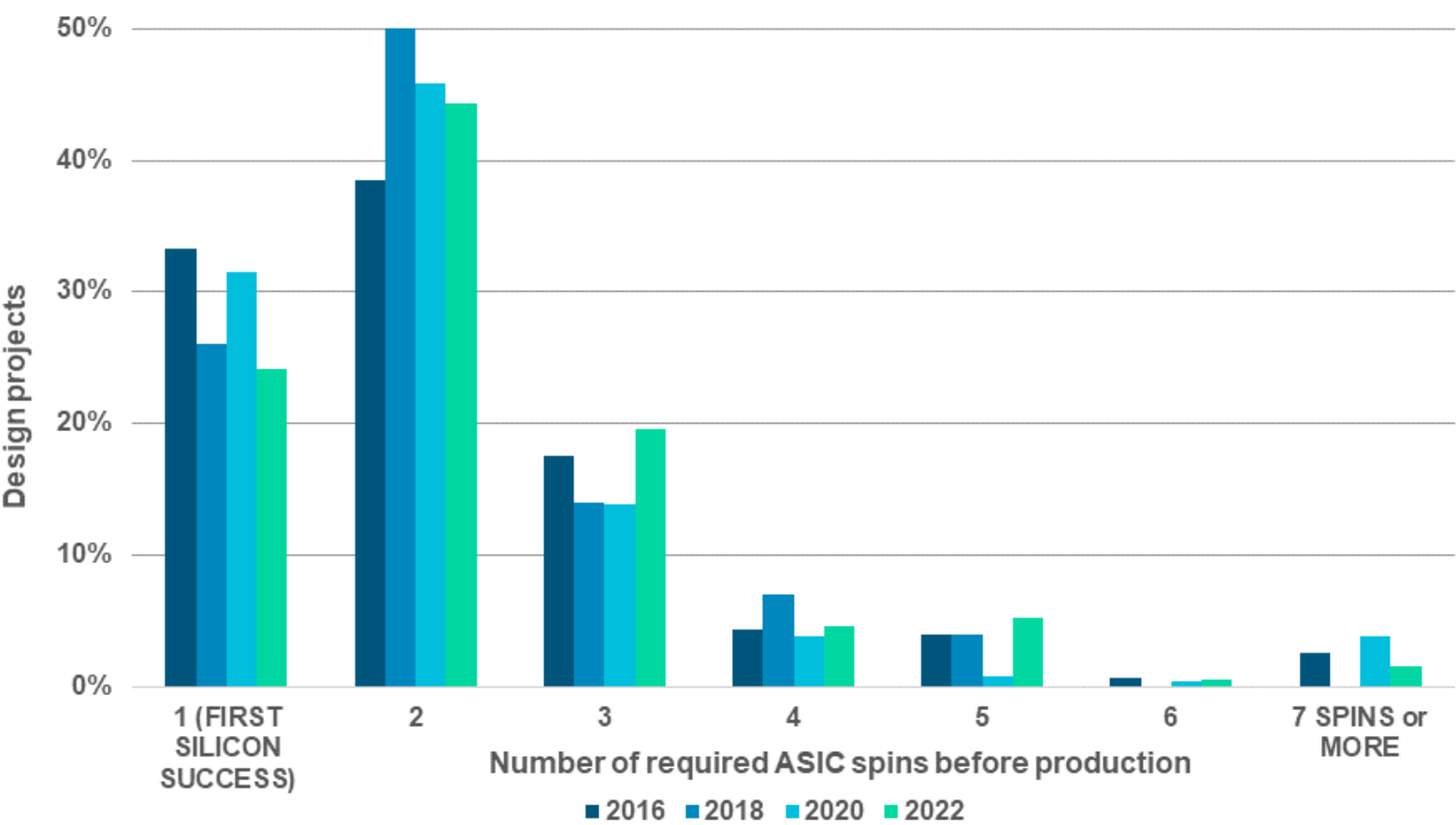
ASICs require 2 or more respins

Wafer costs (vs 28nm):

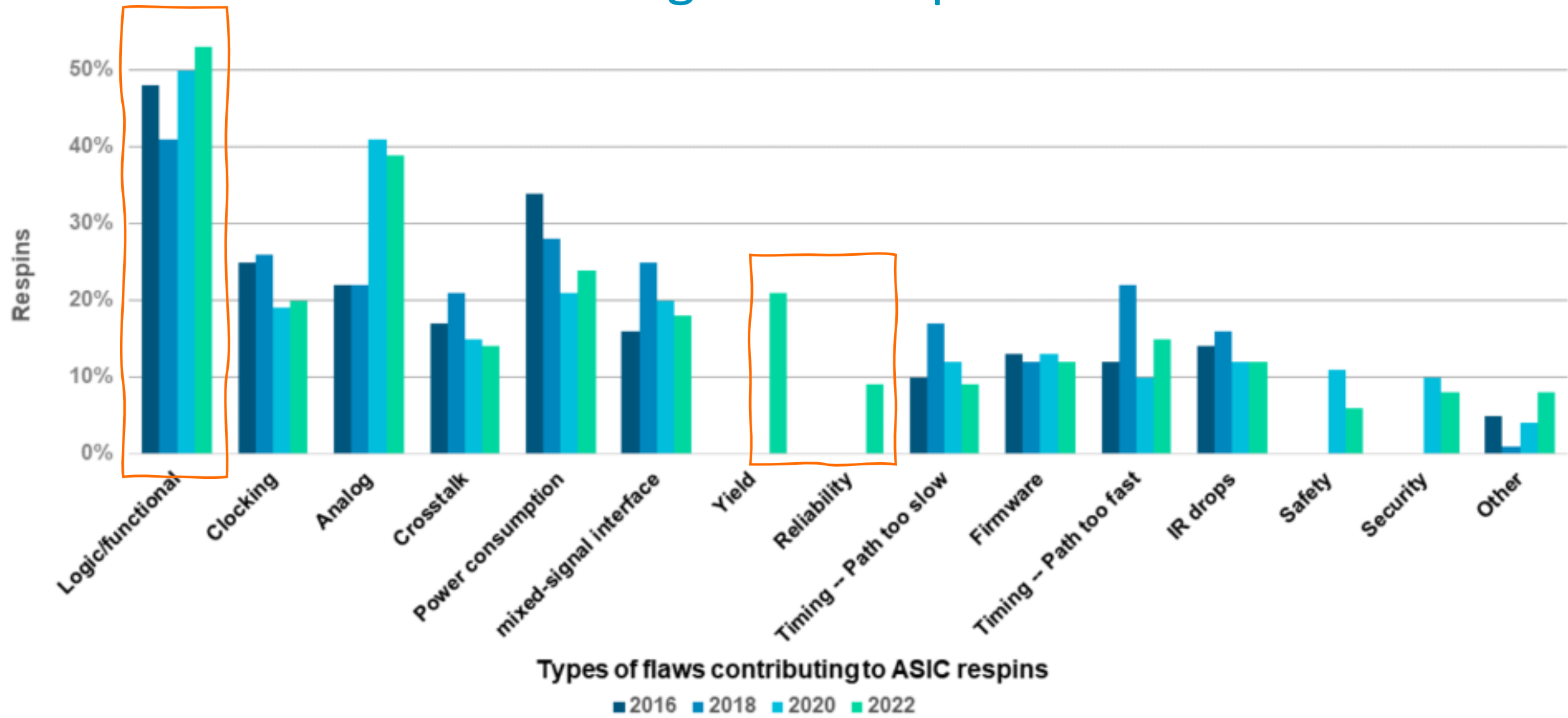
12nm 1.5X
5nm 5.5X
3nm 10X

Mask costs (vs 28nm):

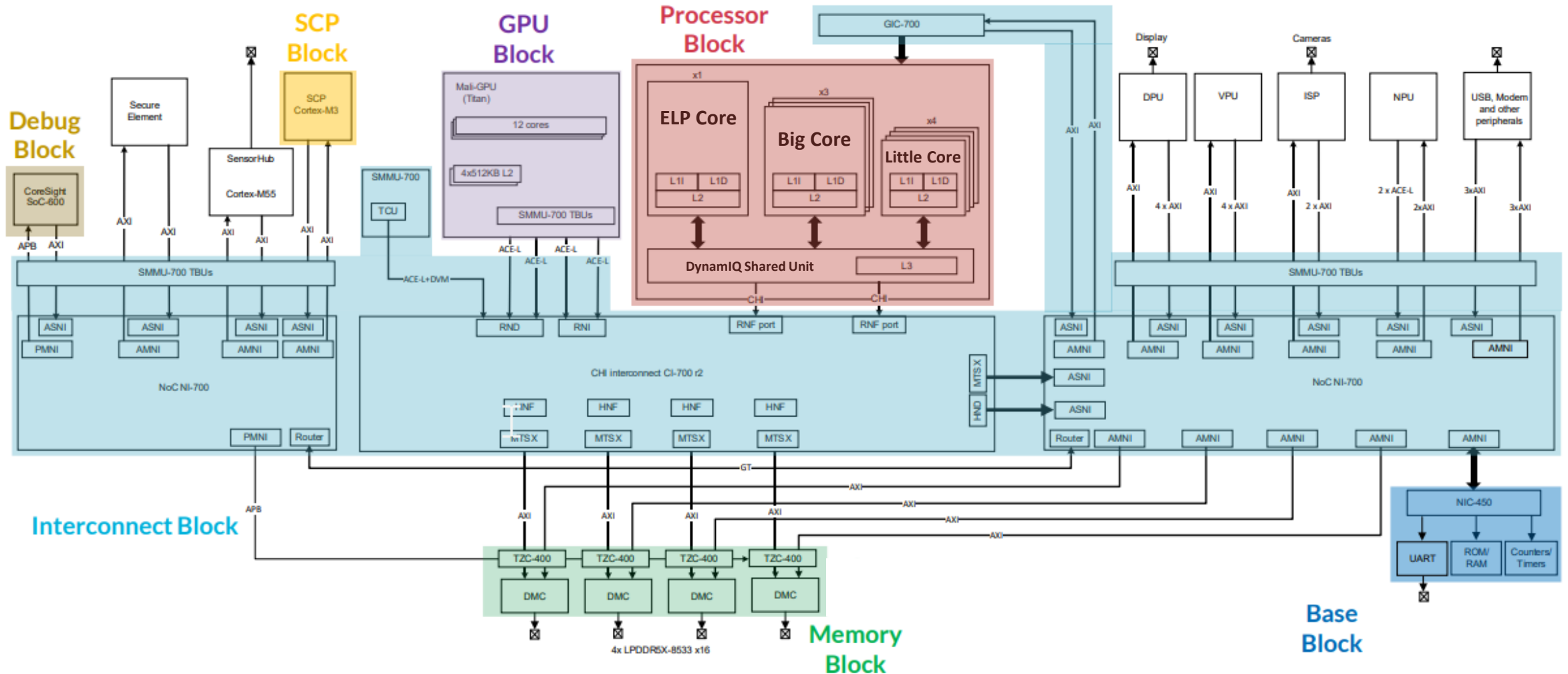
12nm 2.5X
5nm 15X
3nm 25X



Silicon Validation: Challenge Landscape



Functional Complexity



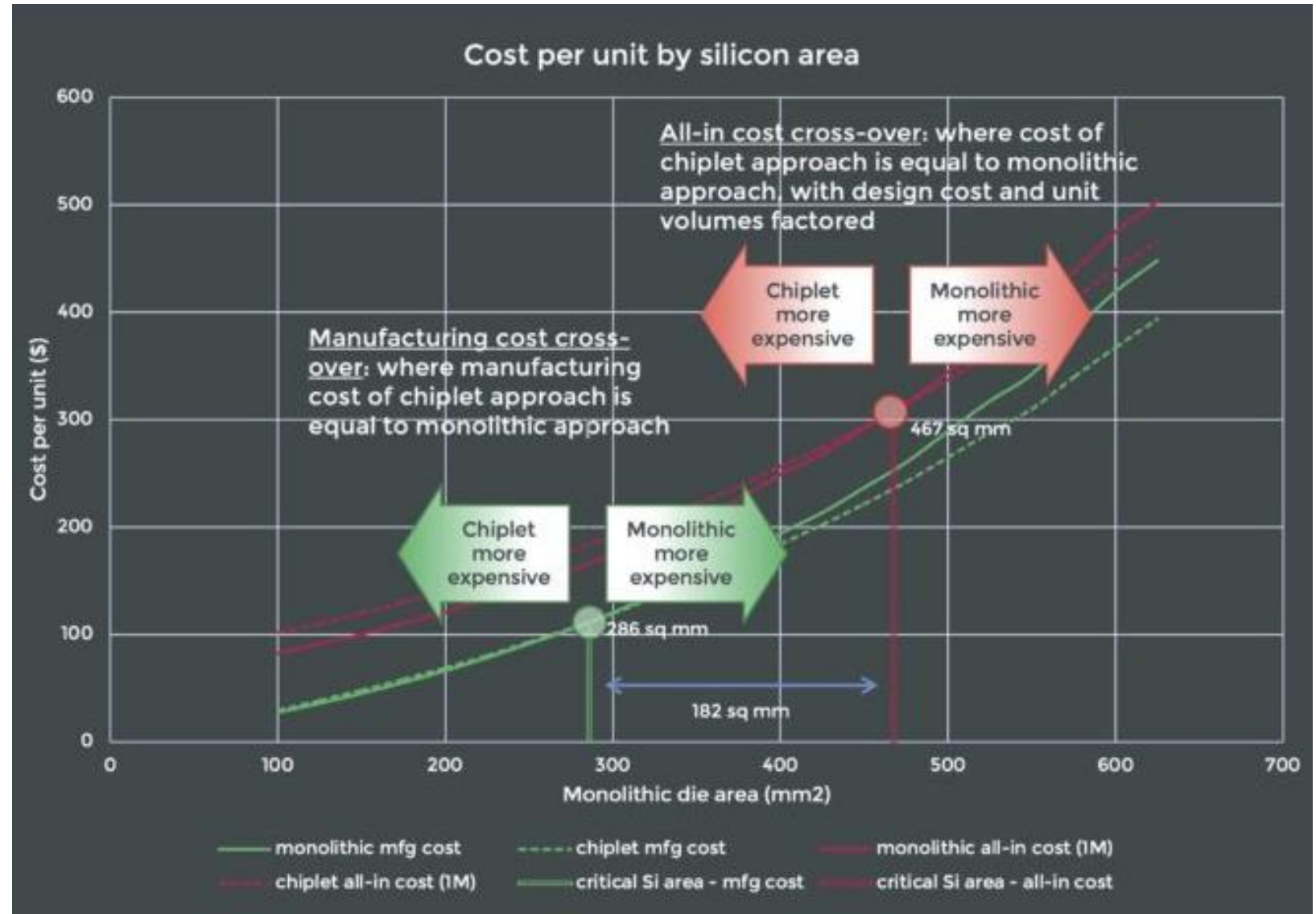
Packaging

+ Drivers:

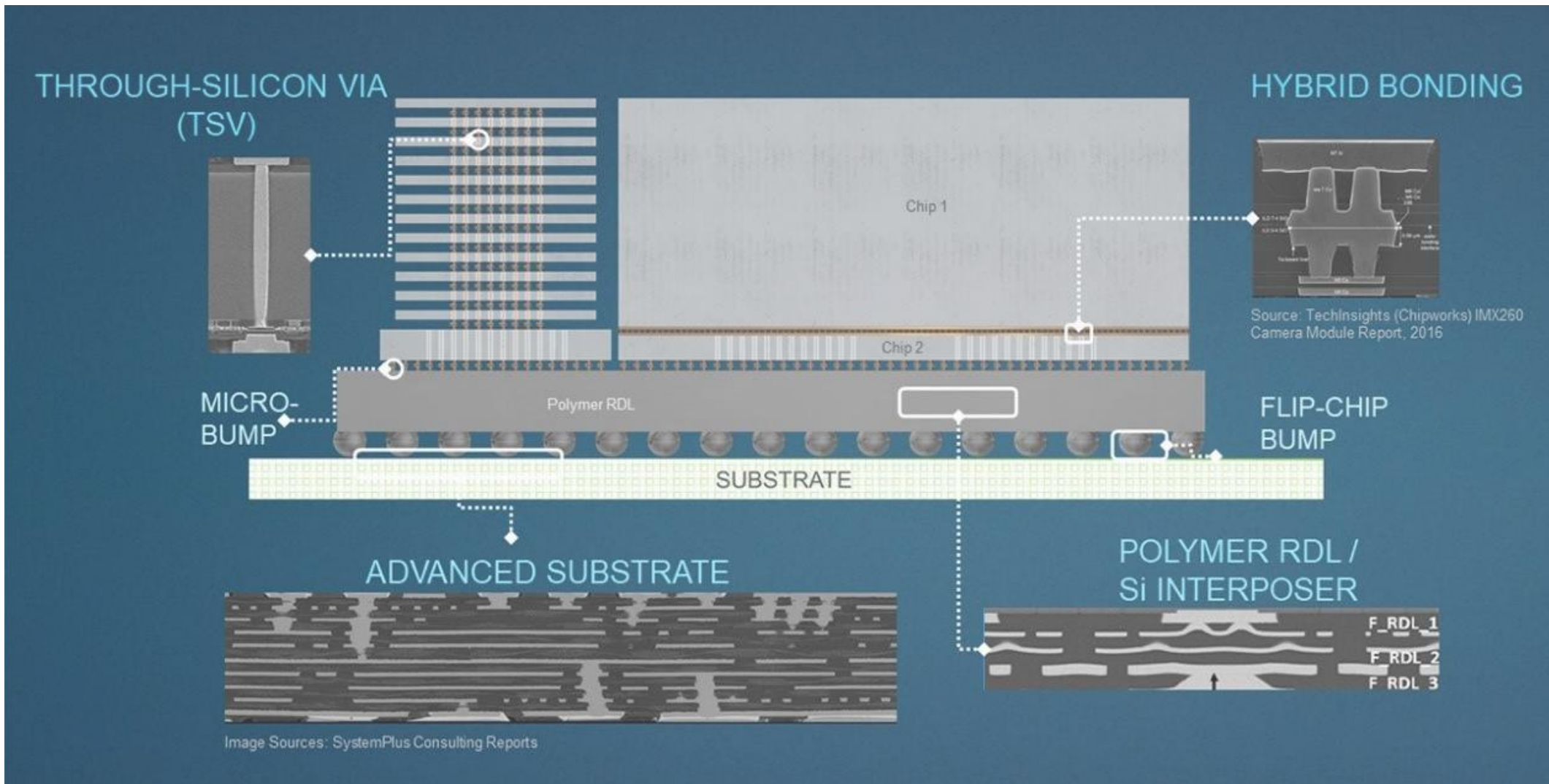
- Monolithic Die versus Chiplet based Systems
- Die Disaggregation

+ Impact:

- More complex electrical systems. Also impacts Yield
- Mechanical & Thermal aspects



Electrical Complexity: Packaging



Debugging: Hardware Support

+ Hardware Support

- Reuse DFT Capability
 - + Single Chain Scan
- Internal Logic Analysers
- Signal Selection for Triggering/Visibility
- Hardware Assertions
- Programmability of critical shared resources

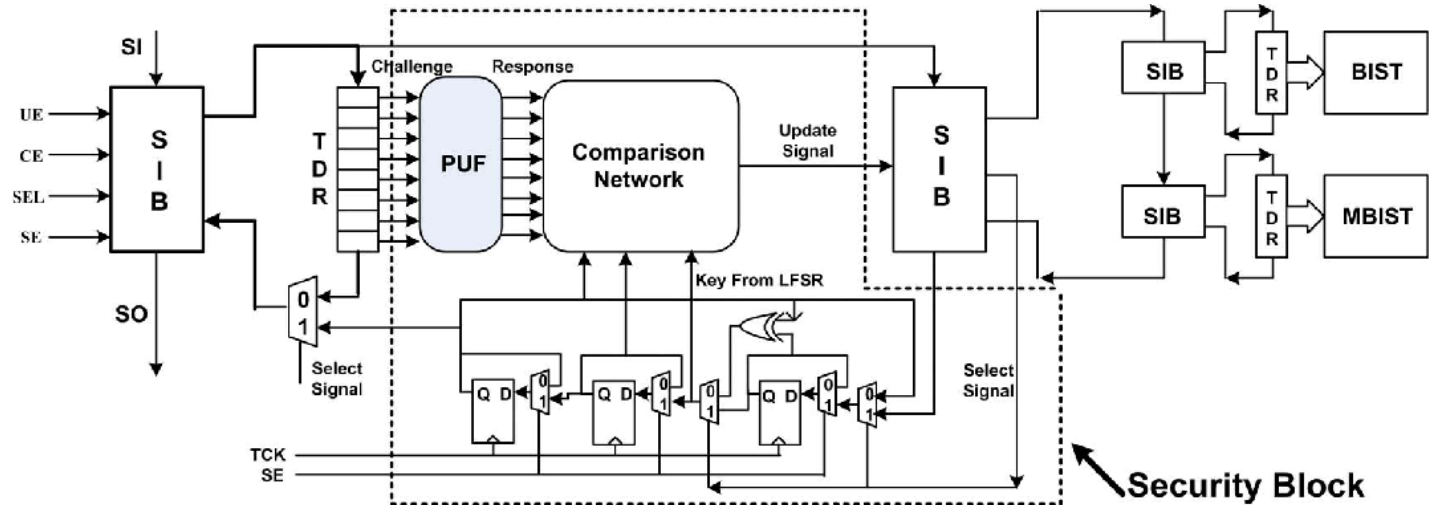


Fig. 3. Segment Insertion Bit (SIB) with Security Block

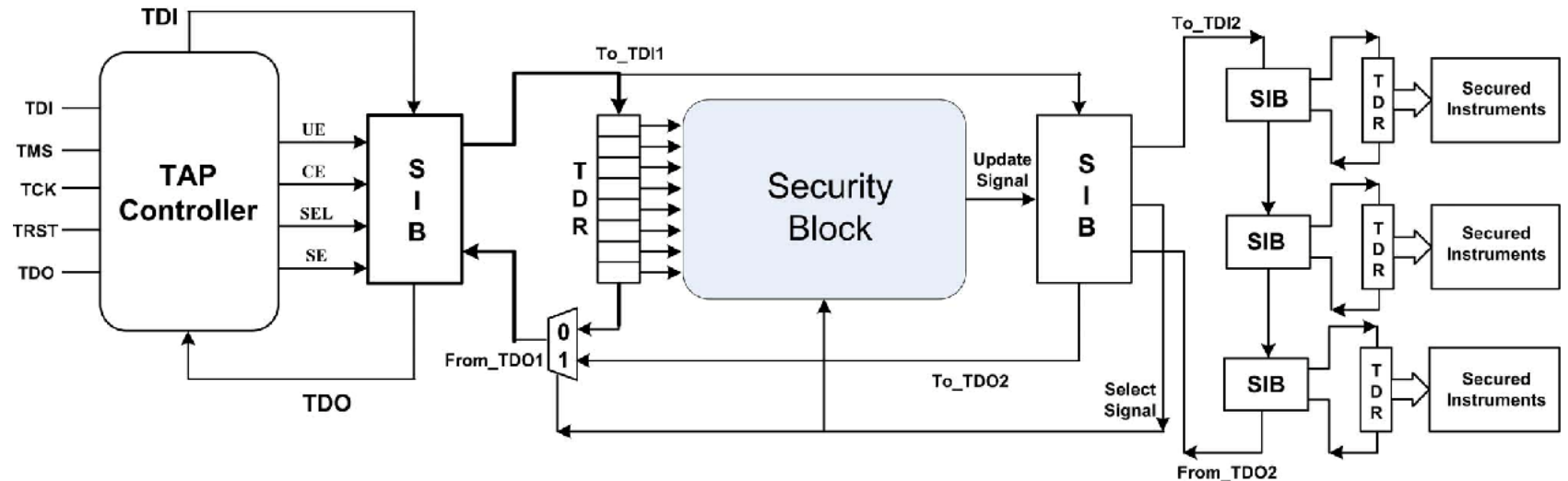
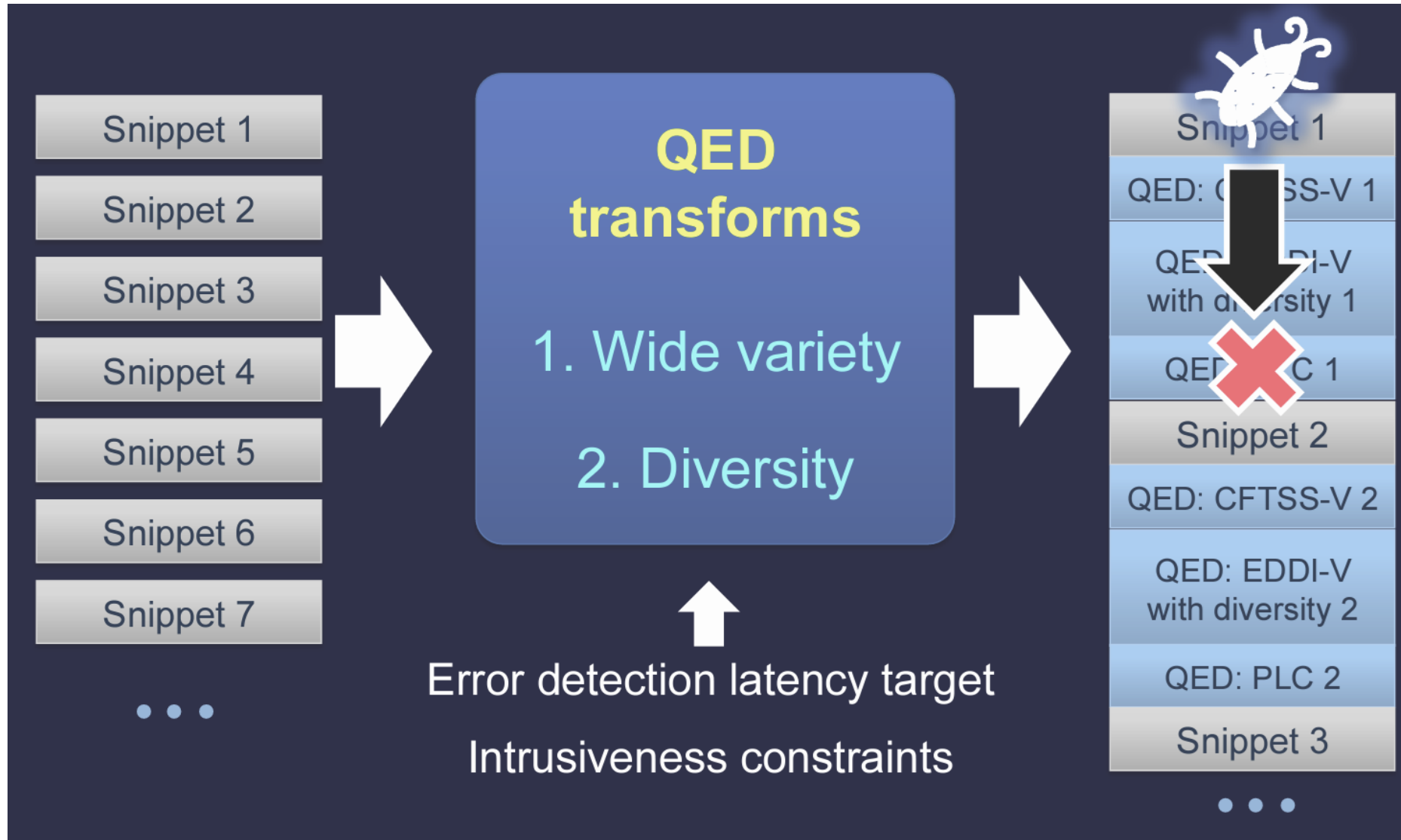


Fig. 4. Proposed Secure JTAG network

Debugging Techniques: Algorithmic



Debugging: Strong Methodology

Vision: Single Flow Feeds All

Emulator

(Visibility ↑, Speed ↓)



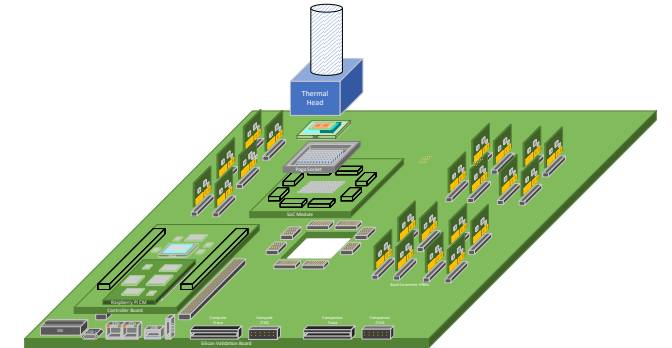
FPGA Prototyping

(Visibility ↔, Speed ↔)

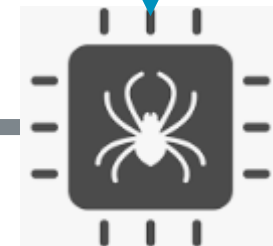


Si Validation Platform

(Visibility ↓, Speed ↑)



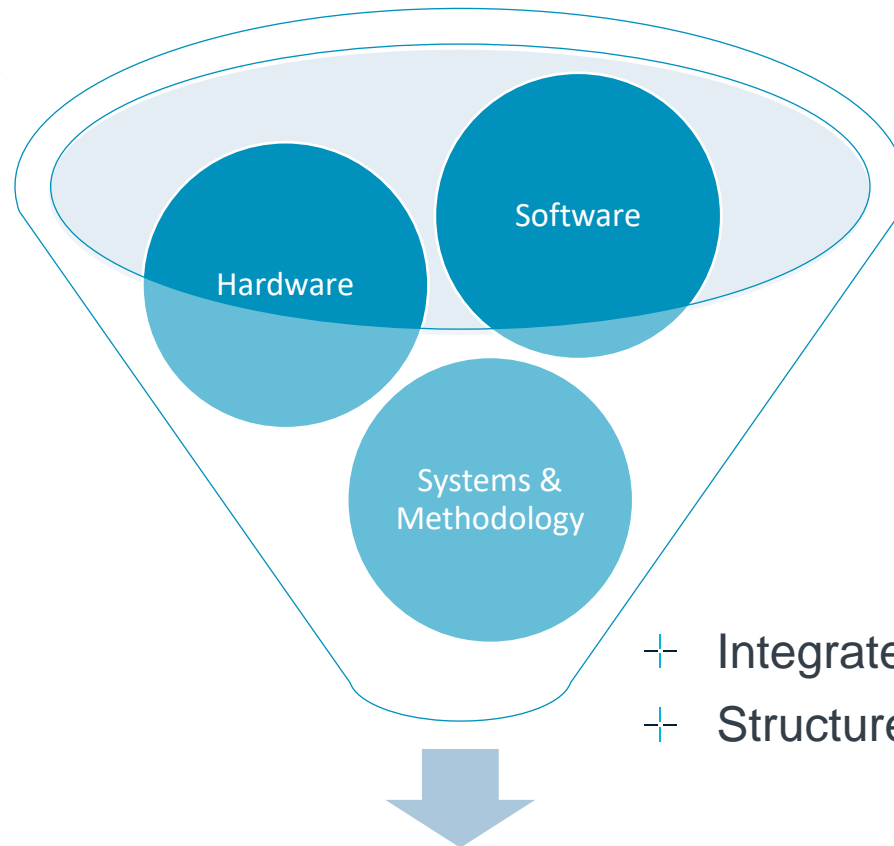
Find Bugs



Drive debug into higher visibility platform
(For difficult debug)

University Engagement

- + Debug units Architecture (distributed, triggering mechanisms)
- + Support for ML based techniques



- + Random Instruction Set (RIS) Tool Generators for MC/MP Tests
- + AI Based Debug Techniques
- + Formal Methods
- + Coverage Mechanisms/ Tools
- + Integrated approaches to models/analysis
- + Structured Approach (Pre to Post Silicon)

Teaching & Research

- + Some books but few textbooks today
- + Research in new areas
- + Few Courses (Interdisciplinary nature)
- + Research at Scale

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Thank You

Danke

Gracias

Grazie

谢谢

ありがとう

Asante

Merci

감사합니다

धन्यवाद

Kiitos

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