Splitting the die: A modular approach to chiplet design and verification

Verification Futures Conference 2025

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Tuesday 1st July 2025, Reading, UK

Rev: A

Arm: Computing for All

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Arm is delivering the most power-efficient and most high-performance compute platform across multiple markets.

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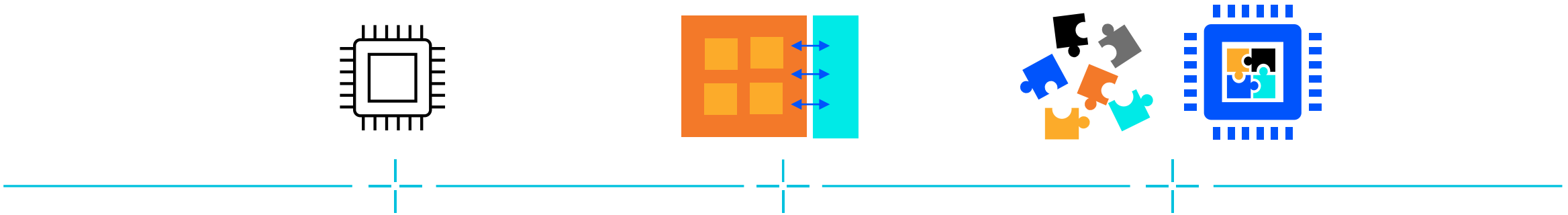
Vision for an Open Chiplet Marketplace

AI workloads are demanding application specific silicon with incredible advances in performance (general purpose compute, matrix compute, memory bandwidth, I/O, and power efficiency)

The cost of designing and manufacturing new highly performant custom SoCs has become a barrier to innovation

The cost of designing SoCs can be moderated and democratized by enabling a small number of highly optimized chiplets to be **combined** and **re-used** in a wide array of specialized SoCs

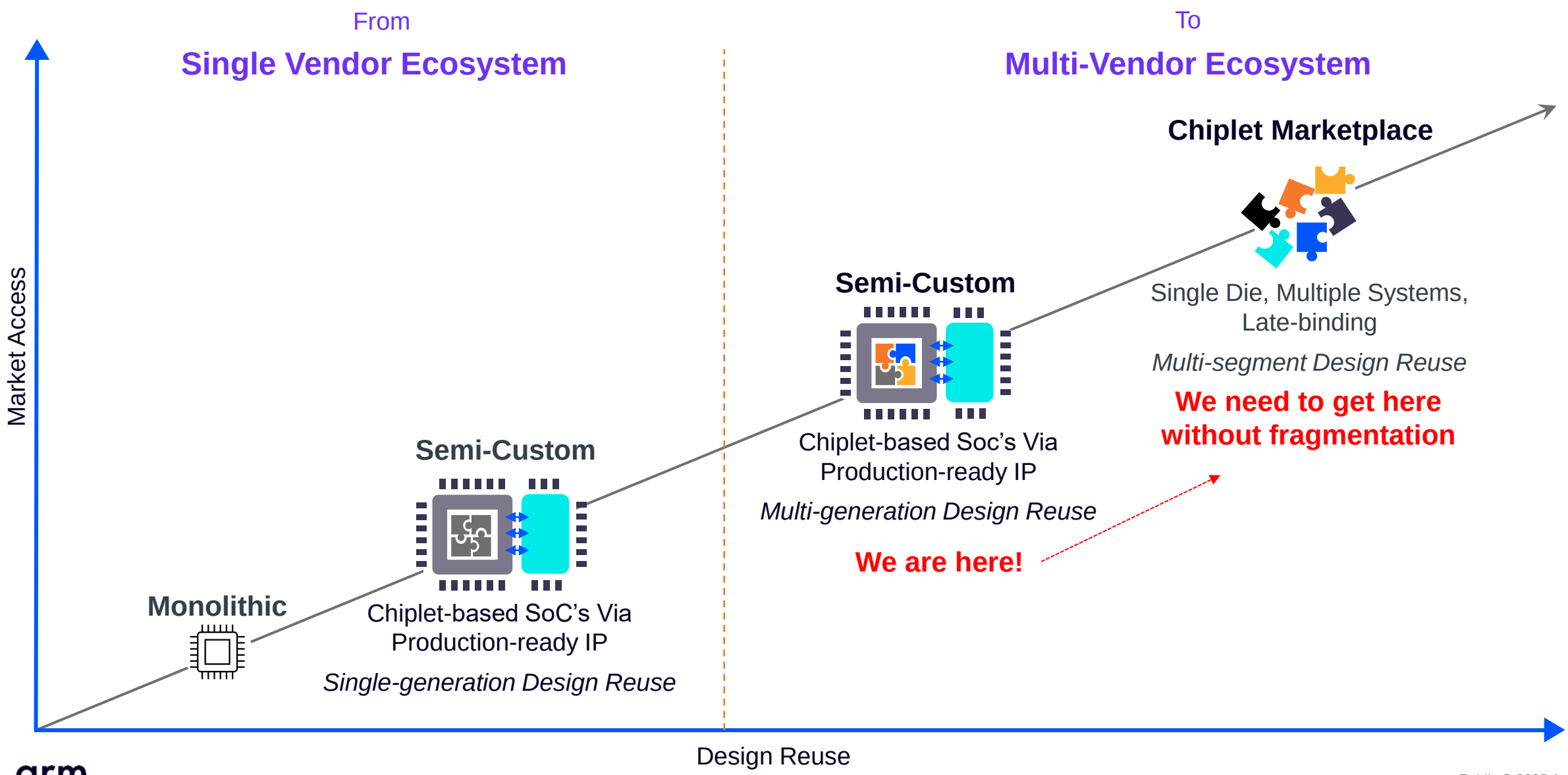


Past: Off-shelf silicon. Limited set of options to implement acceleration on PCB or in system

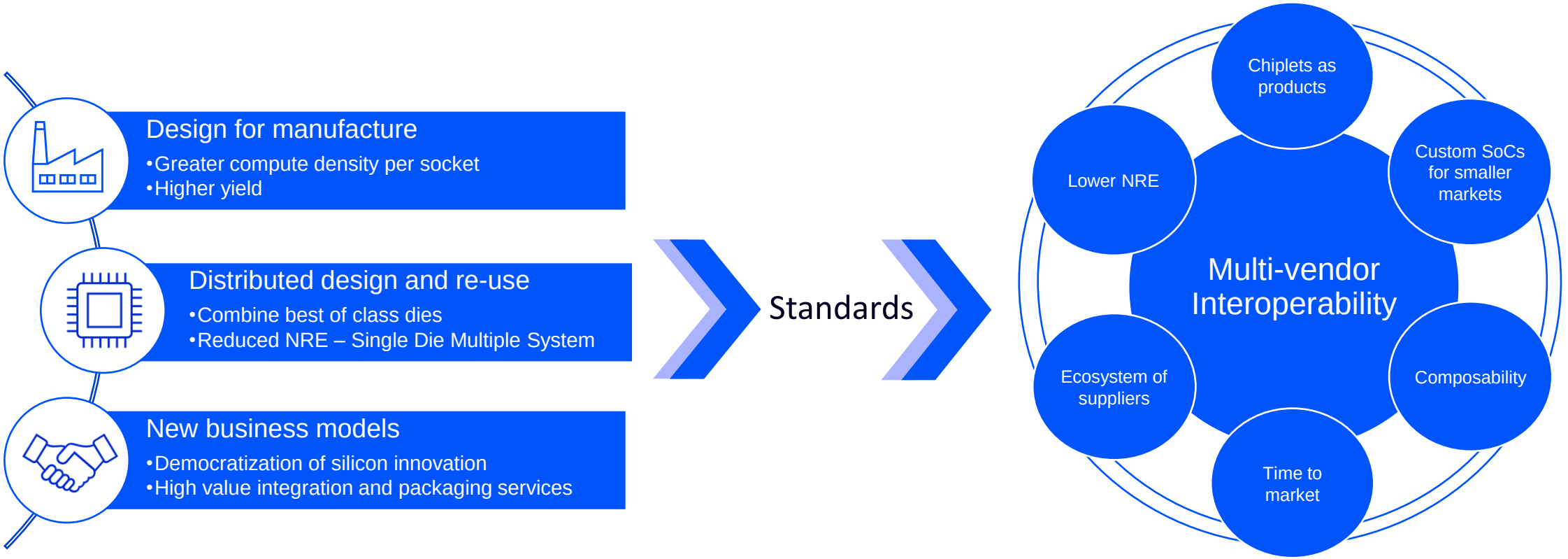
Today: Custom SoC's using IP that integrates acceleration chiplets

Future: Ecosystem of interoperable and reusable chiplets.

The Road to an Open Chiplet Marketplace



The Potential of a Chiplet Ecosystem

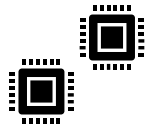


Opportunity of a Chiplet Marketplace ▶ Standardization as an enablement method ▶ Late binding of chiplets to SoCs enables new business models

Multi-die SoCs composed from Chiplets

Independent Chiplet Design

New interfaces need new architecture standards

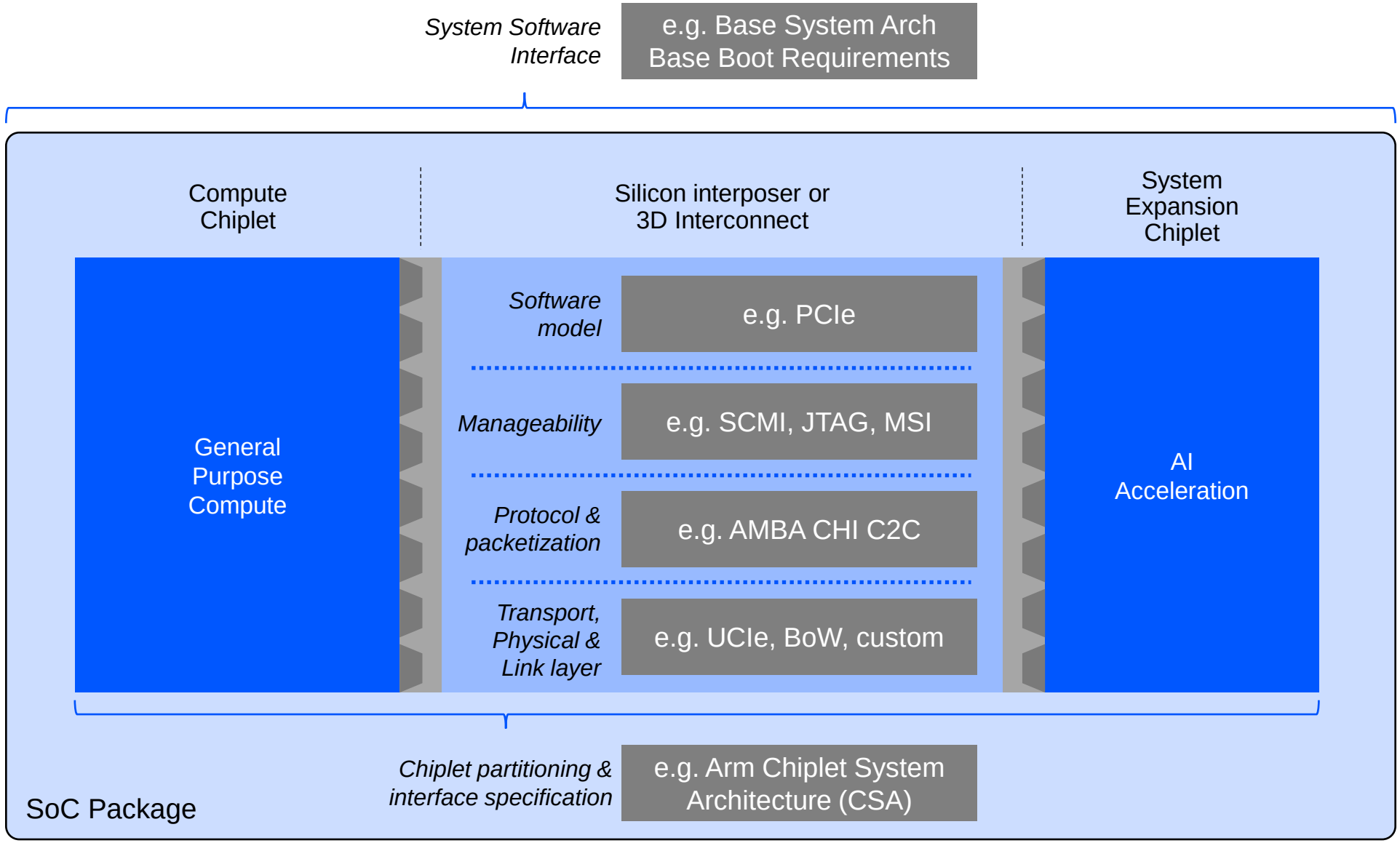


Known Good Dies

RTL IP, GDSII/OASIS, bare dies

The *verification and testing* of chiplets is an essential precursor to a reusable chiplet ecosystem

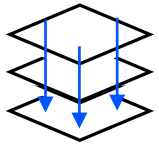
Layered standards for each die-to-die interface



Accelerating Multi-Die Design Development

Validation tools to build compliant systems

Need



Reduce design cycles through a ***layered*** approach to pre-verification of chiplet compatibility

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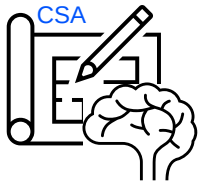
Method



EDA Tools & Standards Compliance

Architecture optimization

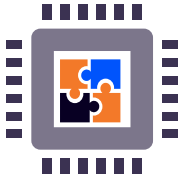
Compatibility with third party chiplets

SYNOPSYS®

cadence®

SIEMENS

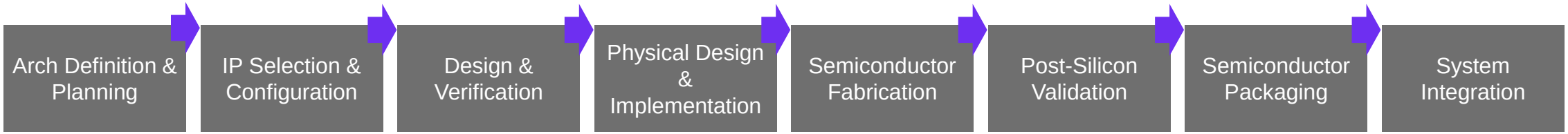
Outcome



Compatible systems with faster time to market

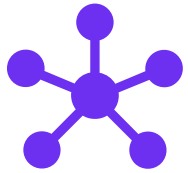
Chiplet Ecosystem

Multi-die systems create new opportunities in the semiconductor value chain



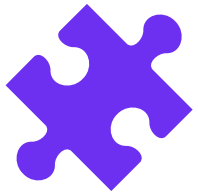
- Significant new market opportunities for in the semiconductor supply chain including IP vendors, EDA, and OSAT.
- A more modular, collaborative supply chain will emerge, requiring enhanced standardization and interoperability across multiple vendors.
- Chiplet marketplaces and brokerage services. Opportunity to specialize in integration, logistics, and supply chain management.
- New specialized testing methods and tooling to validate individual chiplets.
- Lower barriers to entry for smaller companies, as modular chiplet approaches reduce upfront capital expenditures.

Arm Chiplet System Architecture - Overview



Specification of system types

Based on a view of market requirements, partner feedback and an internal perspective of feasible chiplet topologies

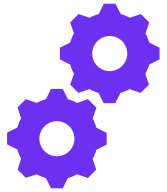


Specification of chiplet types

Provides a set of requirements that make the chiplet type specific for its purpose

These lead to a set of interfacing requirements that allow connection to one or more chiplet types

These requirement are expressed as high-level properties without reference to specific implementations



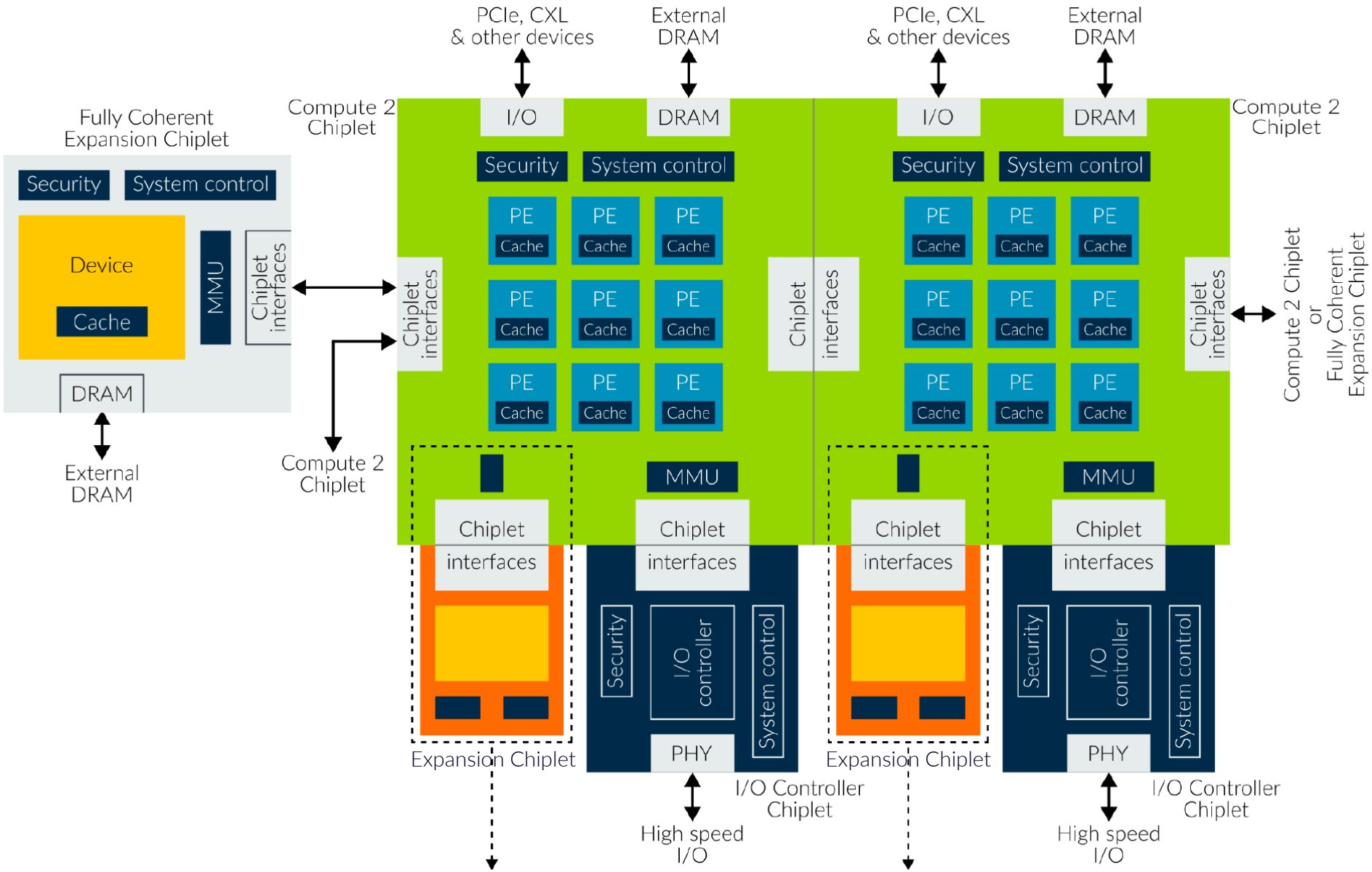
Interface implementation mapping

Mapping of interface requirements to specific implementations

The CSA references other standards and protocols to perform this mapping

The CSA is not specifying any new protocols or standards, although it might indicate a requirement for a standard where one does not currently exist

Arm CSA System Example



The Arm Chiplet System Architecture

Defines Chiplet Types, System Topologies, and Interface Requirements

Benefits

- **Interoperability**: Compliant chiplet designs can be customized and integrated with other CSA chiplets to create powerful and unique systems.
- **Market Access**: Partners designing CSA compliant chiplets and building custom SoCs have access to an ecosystem of companion chiplets.
- **Consistency**: Reduces the non-differentiating variance in high-level architectures between generations or suppliers.
- **Collaboration**: OEMs can reference the CSA chiplet definitions rather than writing their own specification. Partners can service that market by aggregating OEMs that share common requirements.

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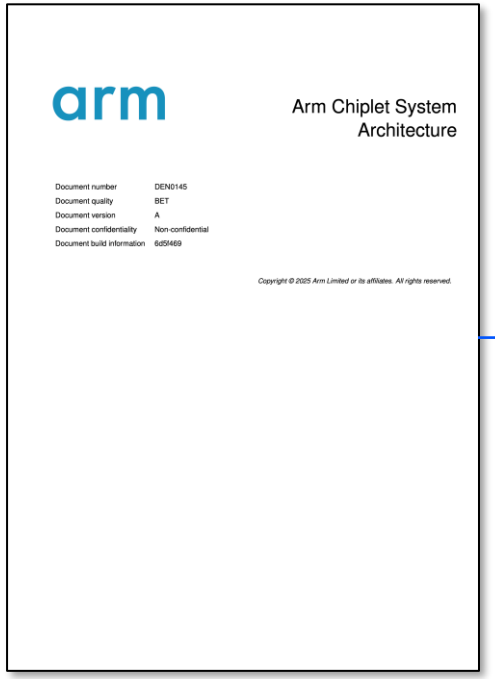

Over 65 Partners Engaged

Contact csa-feedback@arm.com for further information

Checklist to help partners verify their implementations

arm

Merci
Danke
Gracias
Grazie
谢谢
ありがとう
Asante
Thank You
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Kiitos
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