European Processor Initiative

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EPI
Europe strikes back on HPC (*)

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1st R-CCS International Symposium, Feb. 19th 2019

(*) to Top500

European Union

Automotive

Embedded Computing

Cyber Security

Artificial Intelligence

HPC

ckdoor Free

mputing

nce

Supercomputer

Supercomputing

Deep Learning

ADAS

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EPI - Europe's Ambition

- Design a roadmap of future European low power processors targeting
  - Extreme scale computing,
  - High performance big data, and
  - Emerging applications

- FPA answering EU Horizon 2020 (FP8) ICT-42-2017 call

* FPA : Framework Partnership Agreement
* FP8 : Framework Programmes 8 for 2014-2020, succeeding FP7 (2007-2013)

EPI Mission

- **European Independence** in High Performance Computing Processor Technologies
  - Goal: EU ExaScale machines based on EU processor by 2023
  - Tentatively, one pre-ExaScale machine in 2021 with Gen1 processor (RHEA)

AND

- Based on a **solid, long-term economic model**
  - Go beyond the HPC market (not large enough)
  - Address the needs of European Industry ➔ Car manufacturing market

EPI Vision

- Develop (and sell) an EU-made family of High-Performance Processors for:
  - High Performance Computers
  - Connected mobility & AD Autonomous (Driving computing needs beyond 2023)
  - Other markets under exploration (Server, Cloud)
- Leveraging technical synergies between the markets and aggregate financial efforts across these markets

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EPI Consortium

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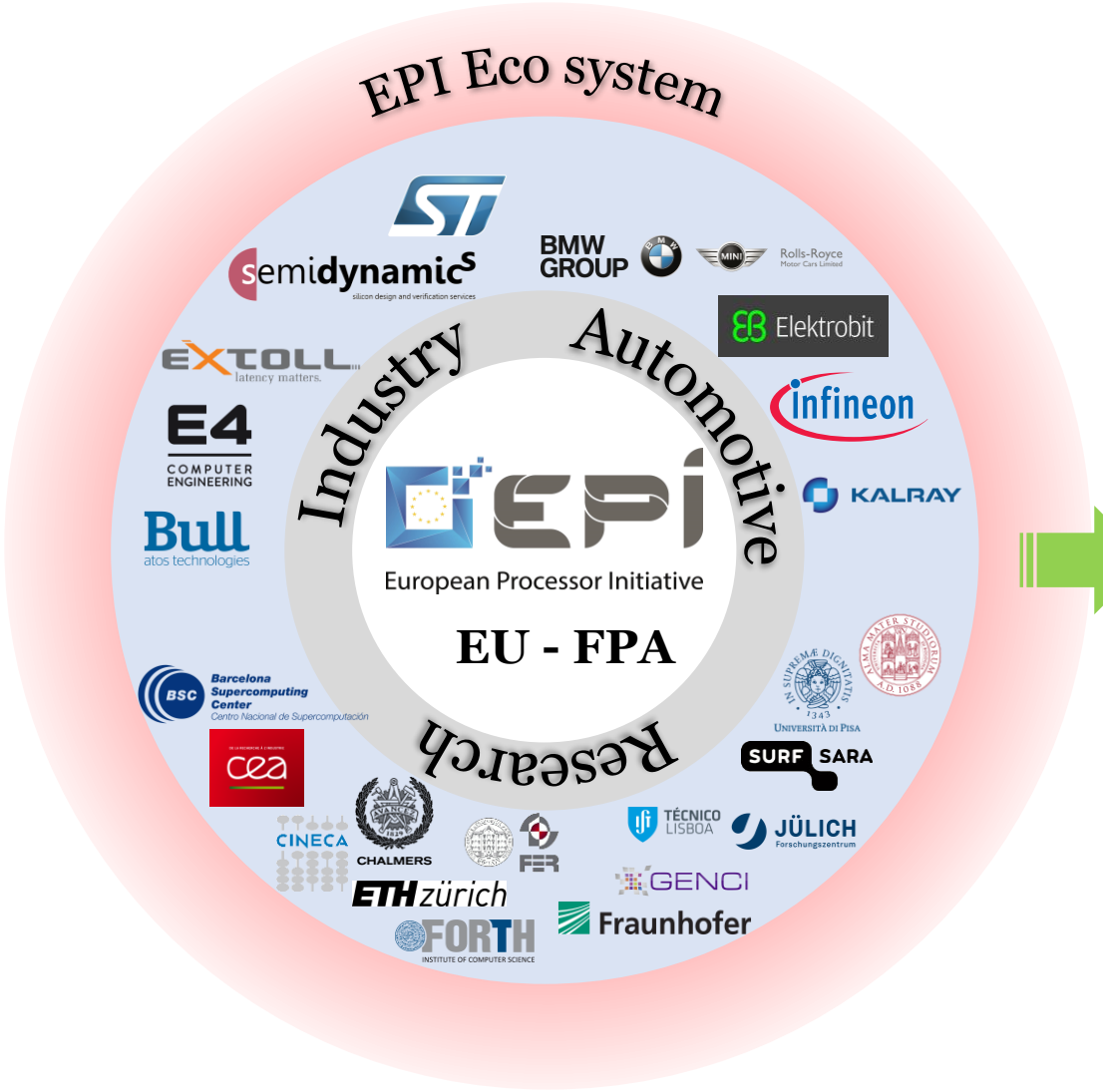
EPI 23 partners, from research to industry



E·S·T
European Silicon Technologies

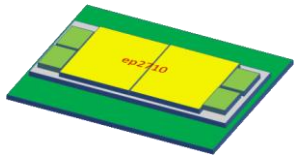
Proof of concept by EPI project

EPI
Common Platform
PCIe card

EPI HPC blade

EPI mother board

EPI BMW
ADAS demo.



System vendors

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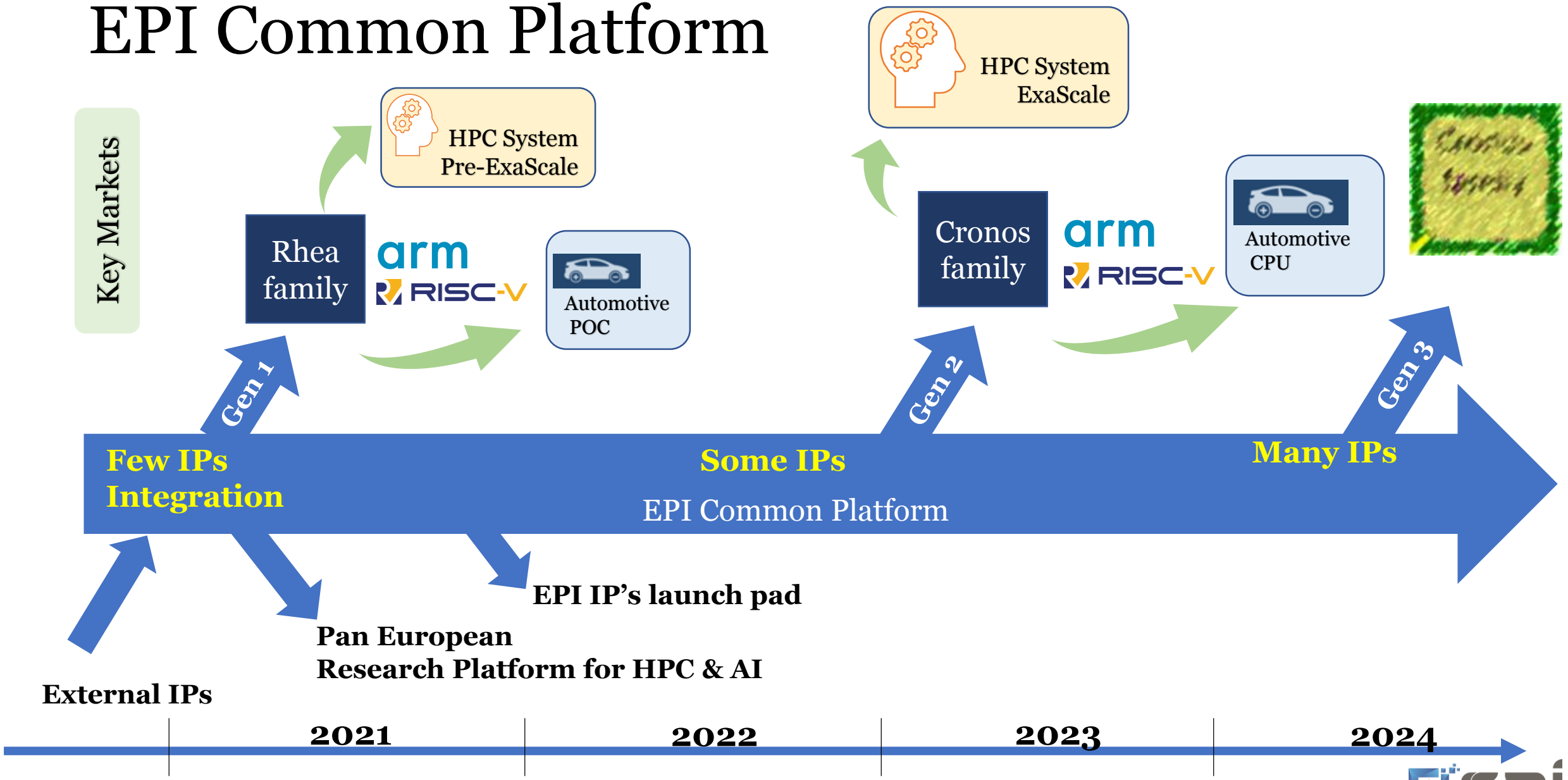
EPI Common Platform



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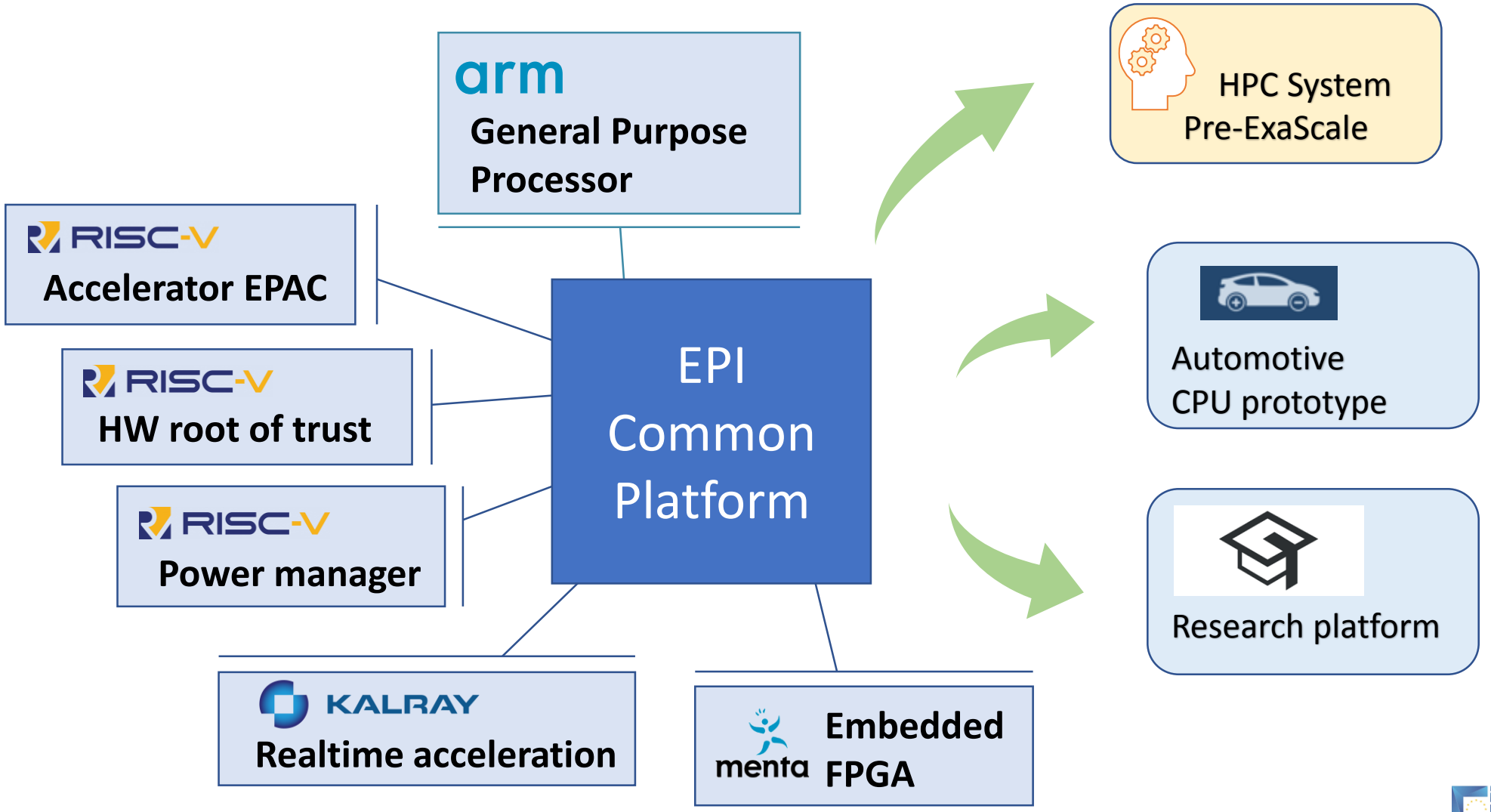
EPI Common Platform (gen1)



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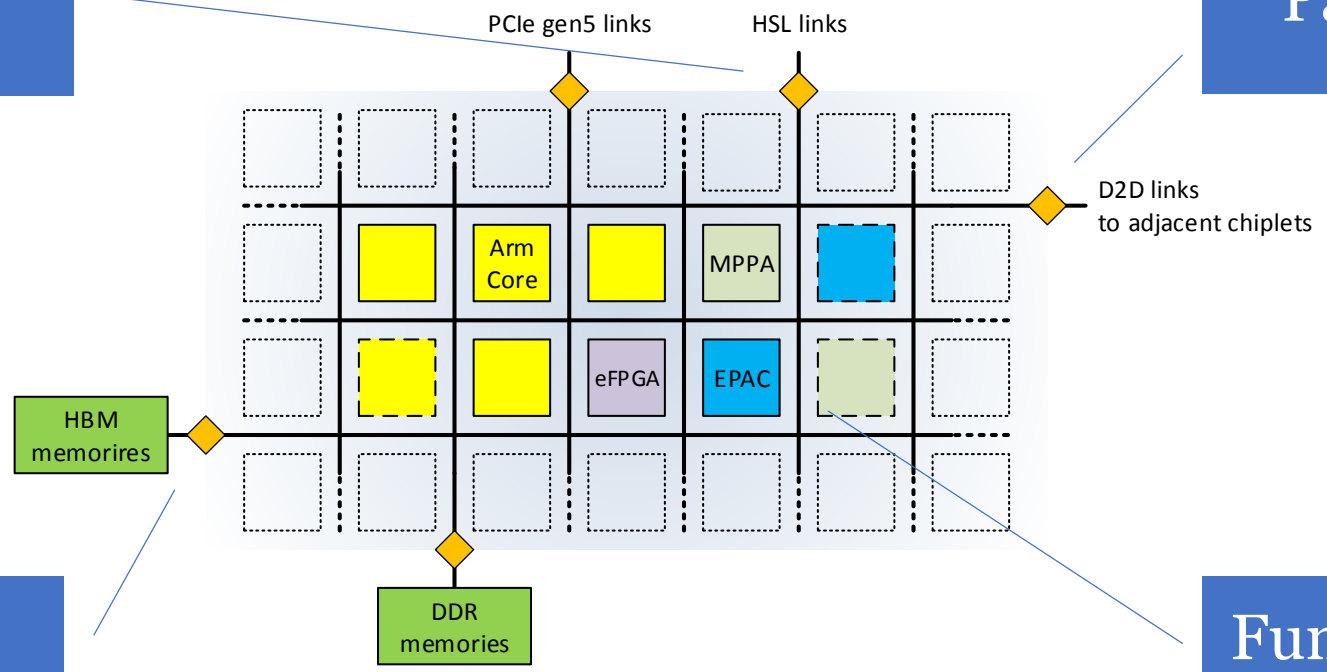
EPI Common Platform Scalability

Board / System level

Package level



Chip level

Functional Block level

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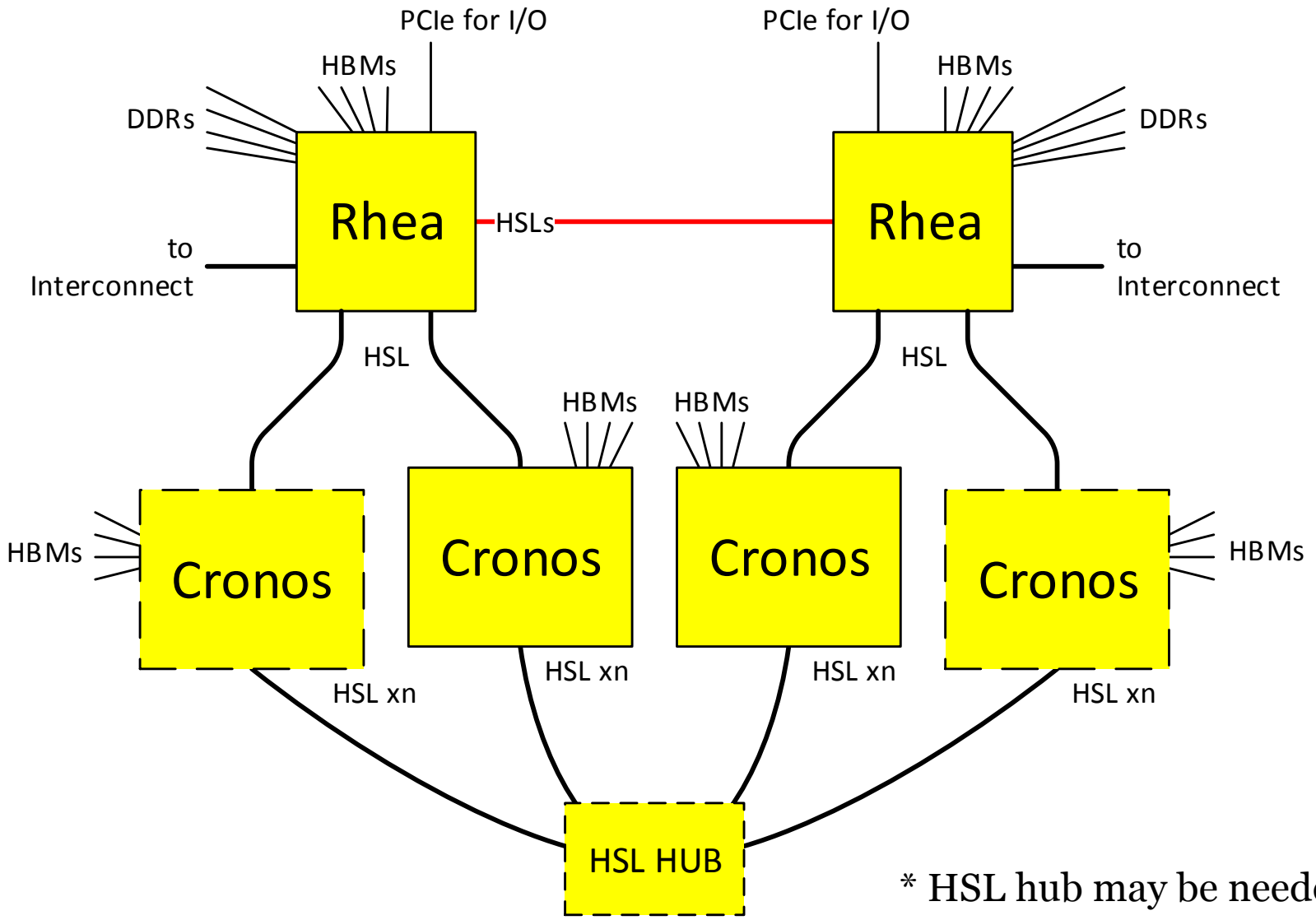
EPI view of ExaScale processors

- As an ExaScale processor
  - Specialization is the only way toward energy efficiency
  - Bytes/flops has to be improved for new HPC workloads
- As a consequence for processor implementation in EPI:
  - Use/Design specific computing units (ARM/SVE + EPAC + MPPA + ..)
  - Ease heterogeneous integration of above computing units thanks to a common design platform at SoC level and package level.
  - Put as much as possible large amount of memory close to the processing units (HBM)
  - Adapt the NoC and Die-2-Die BW requirements to the use of HBM with so many heterogeneous processing units



* HSL hub may be needed for more than 2 chips

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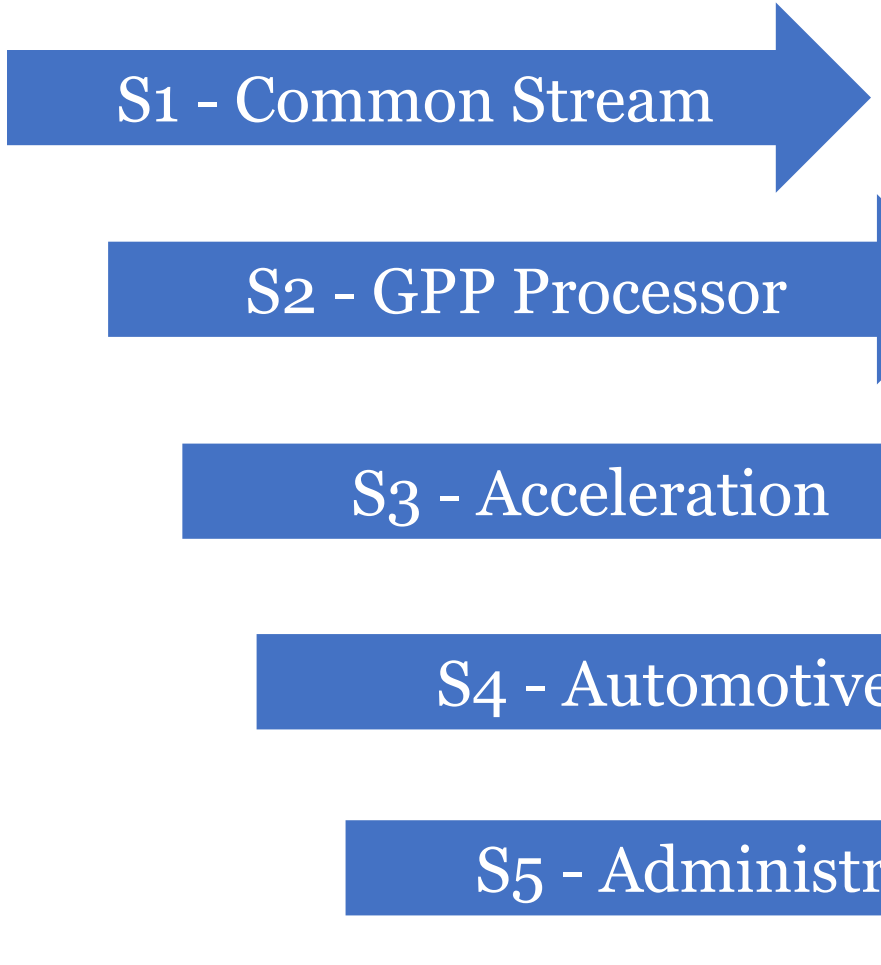
EPI Streams



Codesign, Architecture, System software and key technologies for the Common Platform

Design and implement of the processor chip(s) and PoC system

Foster acceleration technologies and create building blocks

Address automotive market needs and create a pilot eHPC system

Manage and support activities

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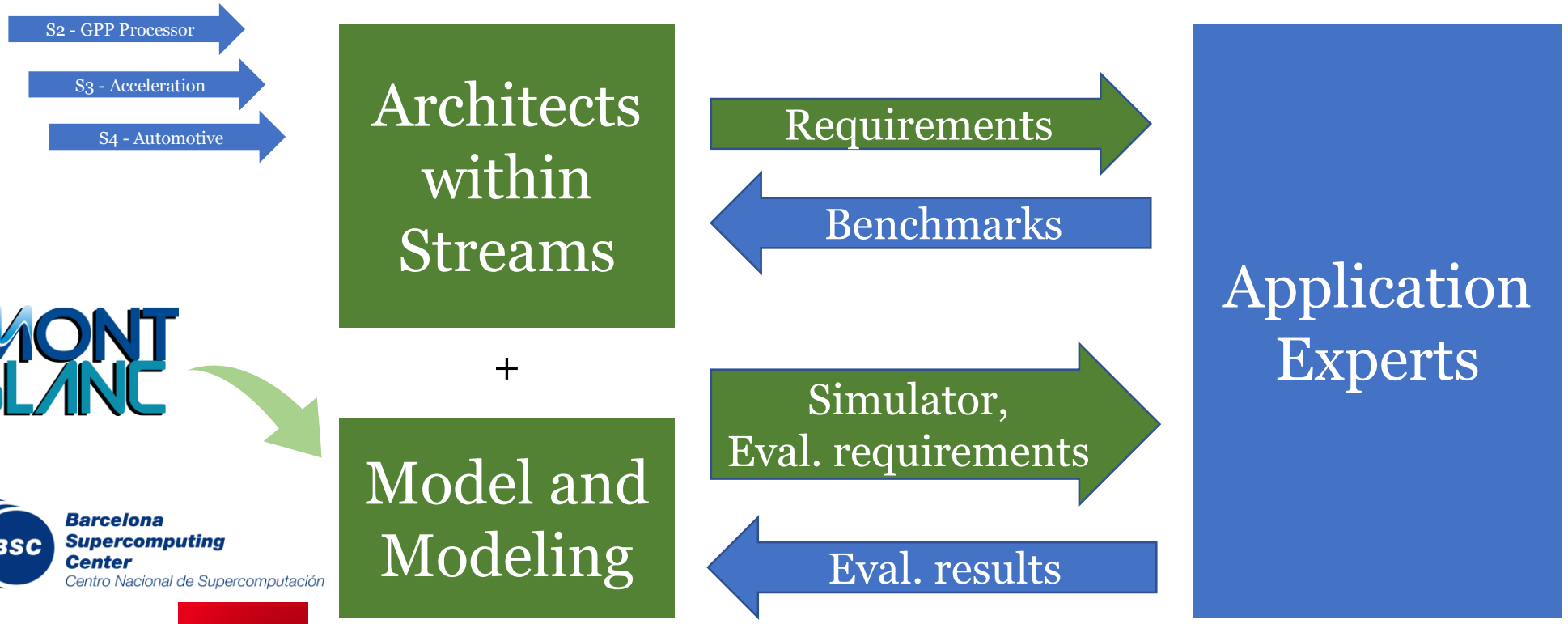
EPI Co-design



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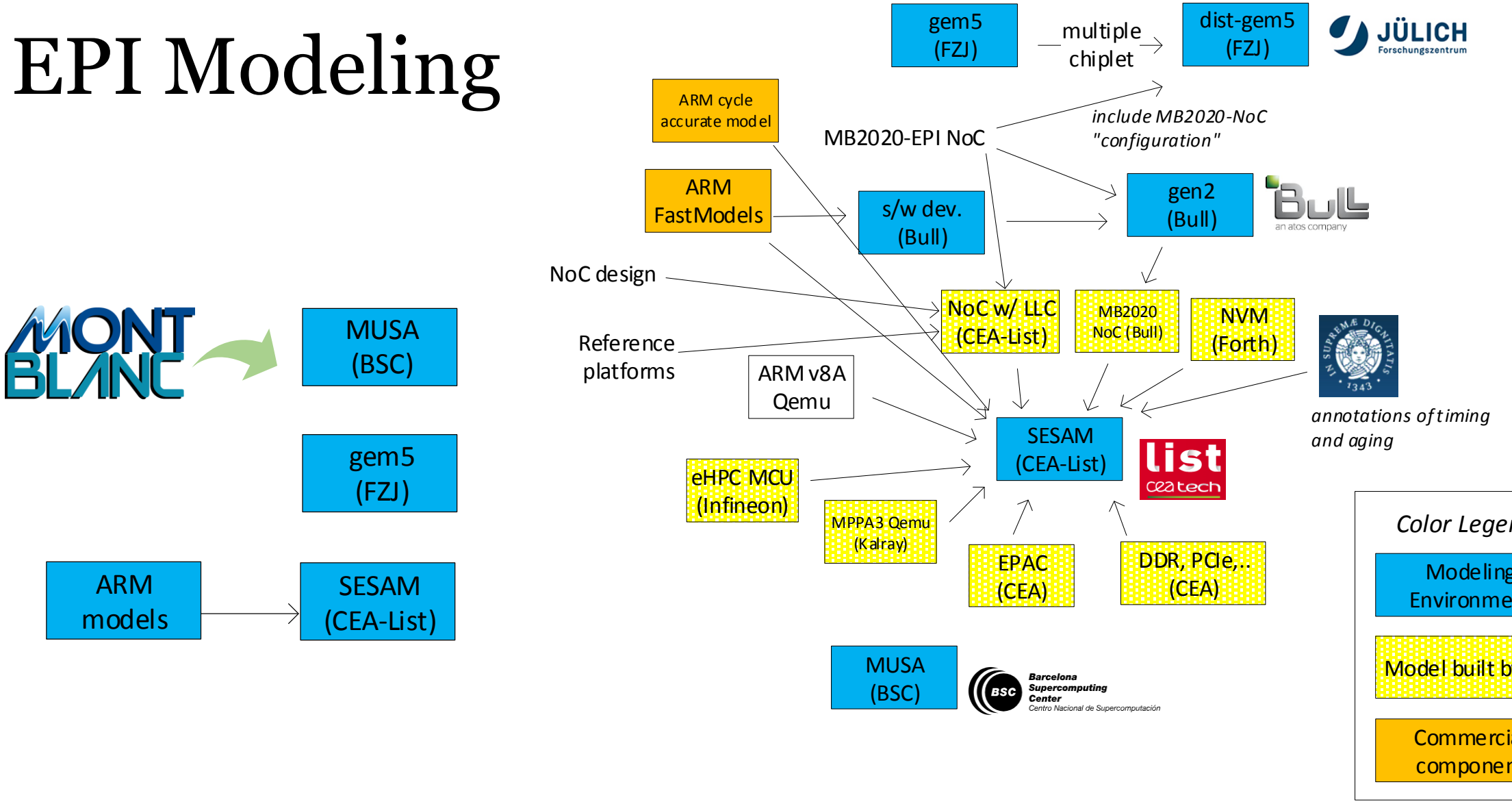
EPI Modeling



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Software Support

- EPI will supply the full software stack for the processor, from reference firmware and UEFI to end-user tools – compilers, libraries, runtimes, tools
  - Enabling direct use of the design
  - Enabling integration of EPI technology in derived designs
- Tools are developed in partnership between the project partners such as Atos and BSC and the ecosystem partners such as Arm and Linaro
  - Leverage ecosystem efforts & previous projects such as Mont-Blanc
  - Develop tools to fully support EPI specificities such as embedded accelerators, HBM or secure subsystem
- Major scientific codes are used as the basis for the co-design of the processor and accelerators
  - Ensure that the final design suits supercomputing needs
- Industrial partners supply the first reference platforms along with a full software environment for HPC & eHPC

EPI Software Infrastructure

Full HPC Environment for the Reference Platform

Co-design exploration space

Automotive eHPC software support

Programming tools & Libraries:
LLVM with OpenMP, OpenMPI,
FFTW, BLIS,
OpenBLAS, …

Low-level software & power management

Linux Operating System

EPI Processor

EPI Reference Hardware

* for simplification, only WP leaders and major components are listed.

With EPI, Europe has the ambition to repeat the Airbus success

20's Century

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21's Century

European Union

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is all about this !!

Make European HPC
European again !!

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