



EUROPEAN PROCESSOR INITIATIVE

FRAMEWORK PARTNERSHIP AGREEMENT IN EUROPEAN LOW-POWER MICROPROCESSOR TECHNOLOGIES

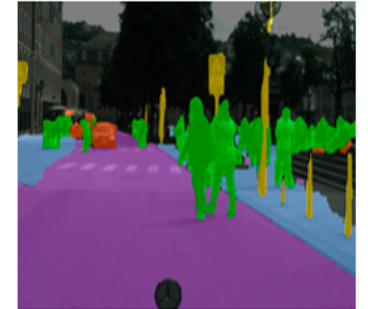
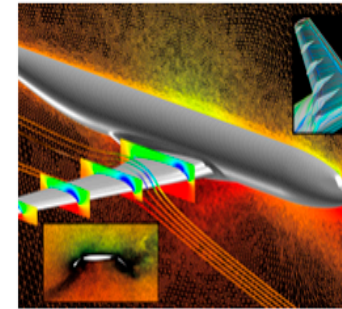
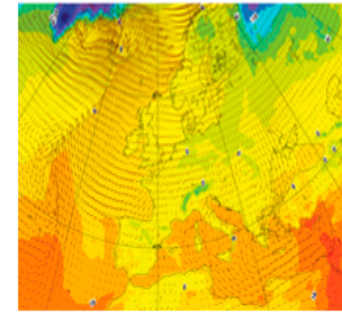


THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION
PROGRAMME UNDER GRANT AGREEMENT NO 826647

DRIVERS OF THE EPI PROPOSAL 1

Societal challenges

- Aging population
- Climate change
- Cybersecurity
- Increasing energy needs
- Intensifying global competition
- Sovereignty (data, economical, embargo)
- Innovation (ROI for \$1 spent in HPC is \$500)



Images courtesy of The PRACE Scientific Steering Committee,
“The Scientific Case for Computing in Europe 2018-2026”

DRIVERS OF THE EPI PROPOSAL 2

- Connected mobility & **AD Autonomous Driving** computing needs beyond 2025 (Class 4+ & 5)
- Develop customized processors able to meet the performance needed for autonomous vehicles that would offer:
 - implementation of vehicle perception tasks in real-time in a fail-operational manner
 - increased computing performance, fail-operational, functional safety, cyber-security and real-time behaviour (RT)
 - compute resources with the same characteristics as their “big brothers” in exascale class supercomputers
- Sovereignty (data, economical, embargo)
- EU car manufacturing supremacy



DRIVERS OF THE EPI PROPOSAL 3

- Servers and Cloud Low Power CPU needs:
 - energy efficiency - lower power consumption
 - new generation of secure and safety-aware virtualization capabilities
- Sovereignty (data, economical, embargo)



WHY EUROPE NEEDS ITS OWN PROCESSORS

- Processors now control almost every aspect of our lives
- **Security** (back doors etc.)
- Possible **future restrictions on exports to EU** due to increasing protectionism
- A **competitive EU supply chain for HPC technologies** will create jobs and growth in Europe
- **Sovereignty** (data, economical, embargo)

Amazon exec and Super Micro CEO call for retraction of spy chip story

'[Tim Cook] is right. Bloomberg story is wrong about Amazon, too.'



NSA May Have Backdoors Built Into Intel And AMD Processors



The US Cloud Act v The EU's GDPR - Data Privacy & Security

A group of researchers showed how a Tesla Model S can be hacked and stolen in seconds using only \$600 worth of equipment

A jet sale to Egypt is being blocked by a US regulation, and France is over it



USA TODAY
Car hacking remains a very real threat as autos become ever more loaded with tech

Image sources:

<https://www.theverge.com/2018/10/22/18011138/china-spy-chip-amazon-apple-super-micro-ceo-retraction>
<https://www.businessinsider.in/a-group-of-researchers-showed-how-a-tesla-model-s-can-be-hacked-and-stolen-in-seconds-using-only-600-worth-of-equipment/articleshow/65761310.cms>
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<https://www.pearse-trust.ie/blog/the-us-cloud-act-v-the-eu-gdpr-data-privacy-security>
<https://www.defensenews.com/global/europe/2018/08/01/a-jet-sale-to-egypt-is-being-blocked-by-a-us-regulation-and-france-is-over-it/>

HOW EUROHPC WILL HELP TO MAKE EU STRONGER

- Developing a new European supercomputing ecosystem: HPC systems, network, software, applications, access through the cloud
- Making HPC resources available to public and private users, including SMEs.
- Stimulating a technology supply industry



EUROPEAN PROCESSOR INITIATIVE

- High Performance General Purpose Processor for HPC
- High-performance RISC-V based accelerator
- Computing platform for autonomous cars
- Will also target the AI, Big Data and other markets in order to be economically sustainable

EUROPEAN PROCESSOR INITIATIVE

EPI PARTNERS

BMW
GROUP



Rolls-Royce
Motor Cars Limited

Atos



Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación



KALRAY



JÜLICH
Forschungszentrum



semidynamic^S
silicon design and verification services



TÉCNICO
LISBOA



Fraunhofer



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



CHALMERS



UNIVERSITÀ DI PISA



FER

E4

COMPUTER
ENGINEERING



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FORTH
INSTITUTE OF COMPUTER SCIENCE

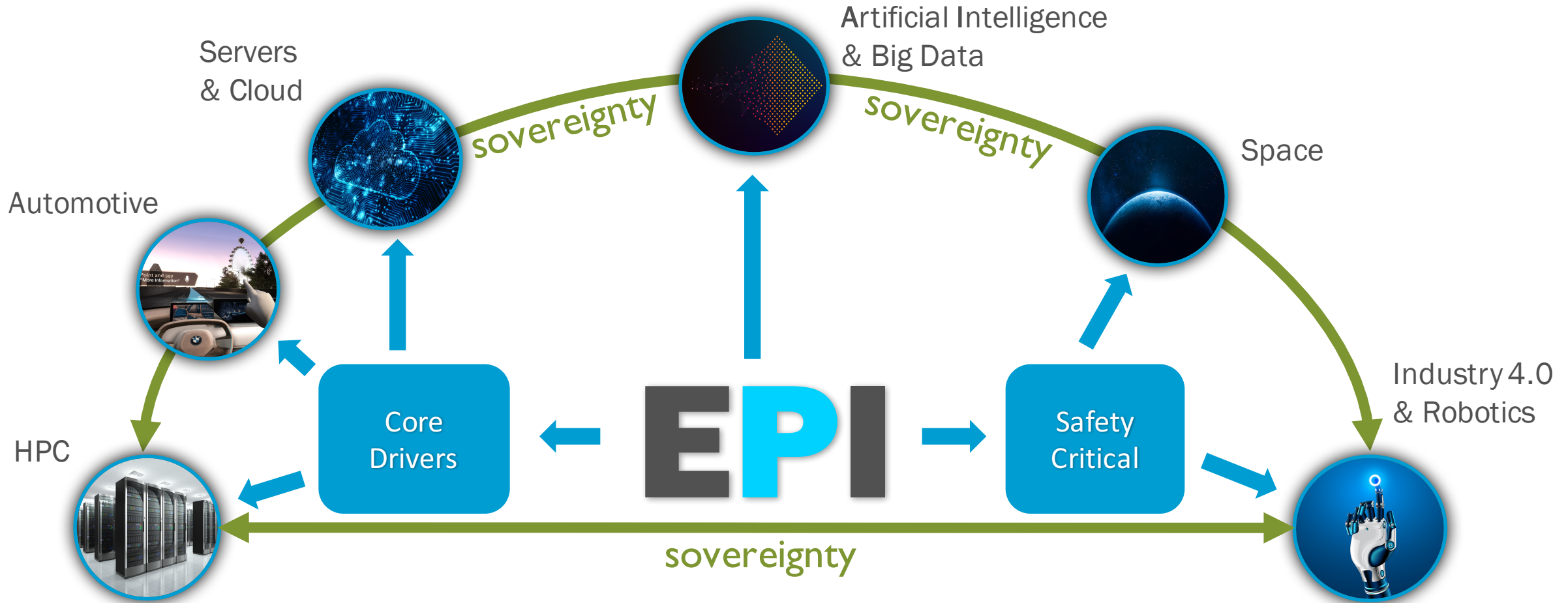


EXTOLL
latency matters.

ETH zürich

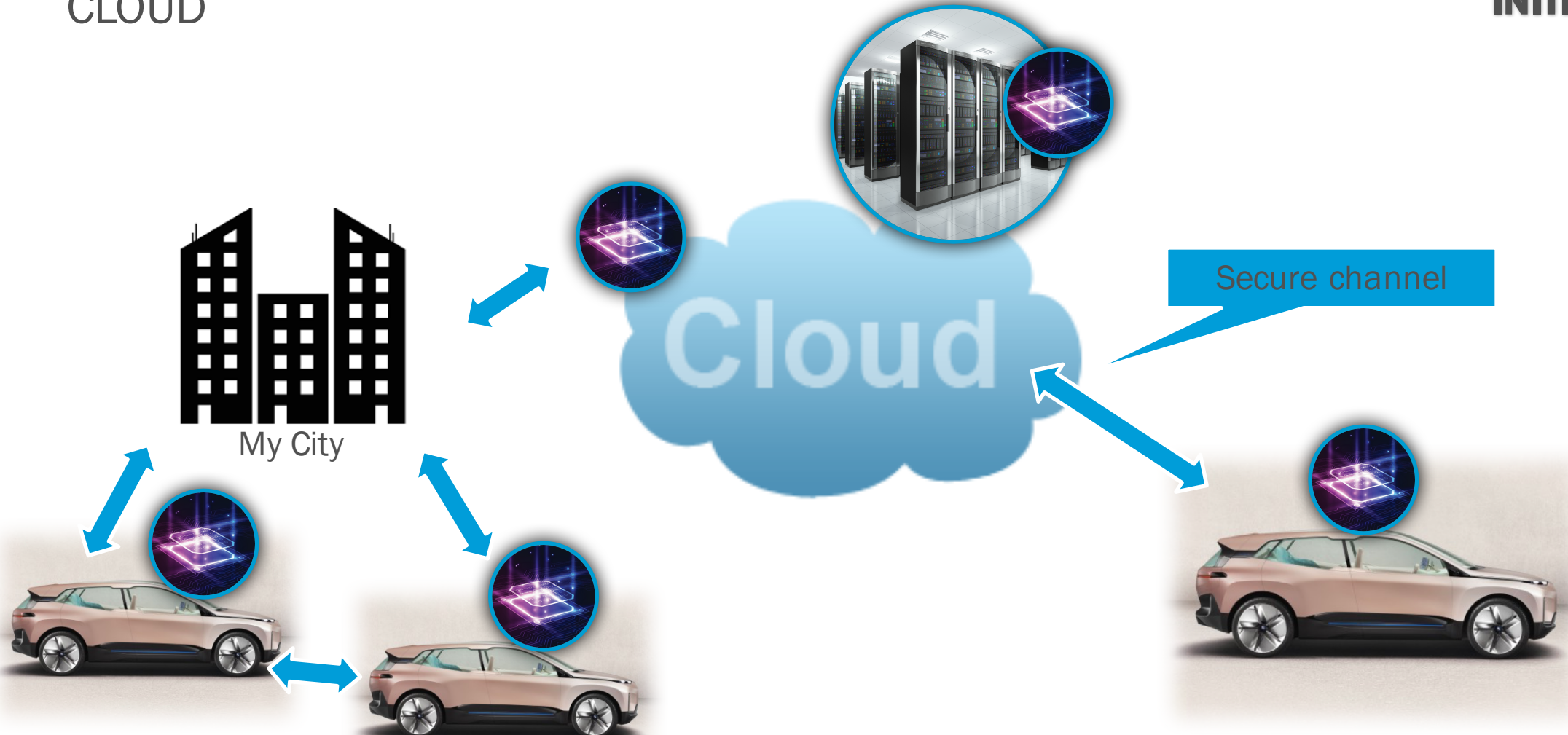
EB Elektrobit

SCALABILITY ALLOWS WIDE MARKET POTENTIAL COVERAGE



END2END SECURITY - FROM THE AUTOMOTIVE SYSTEM TO THE CLOUD

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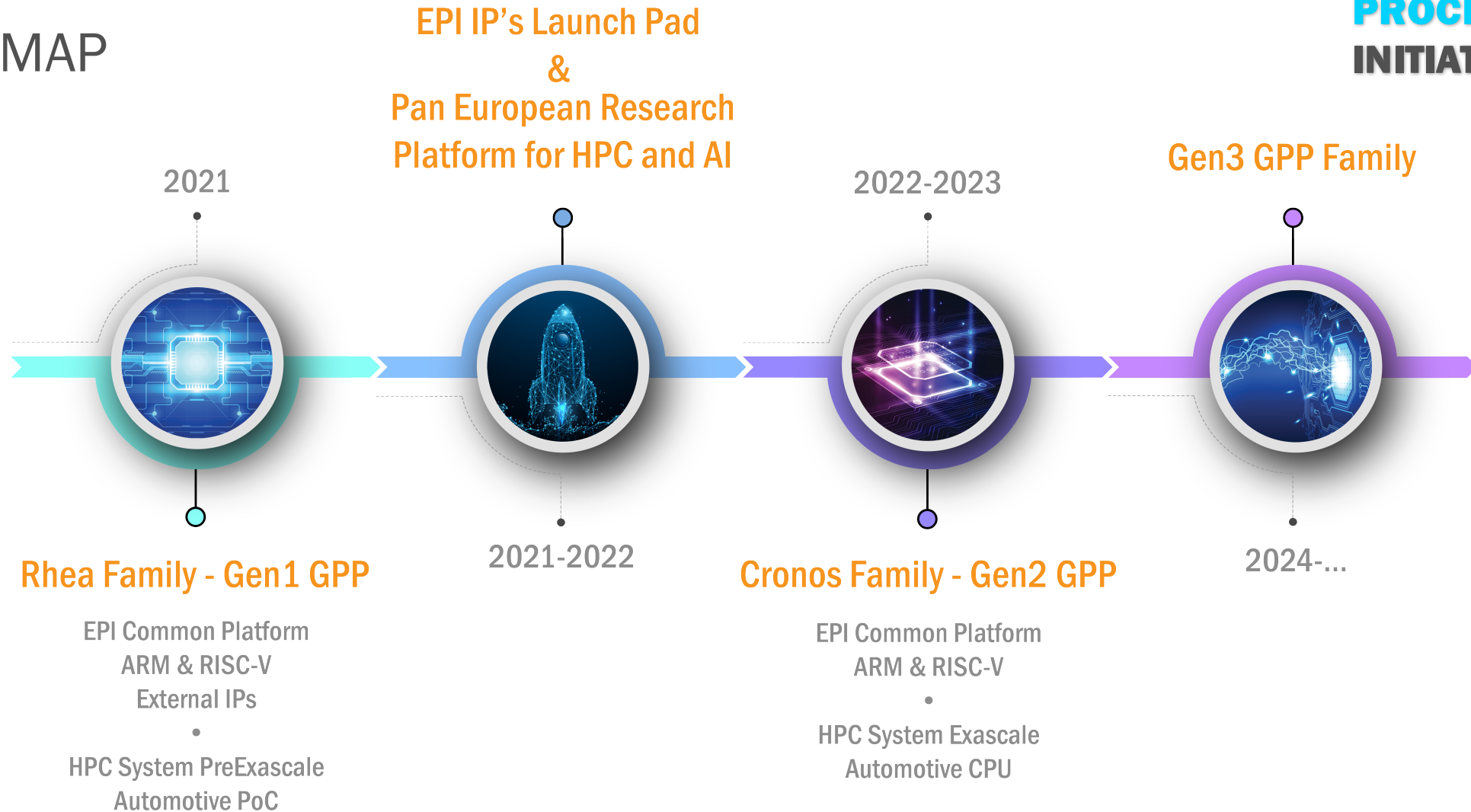
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TECHNOLOGY

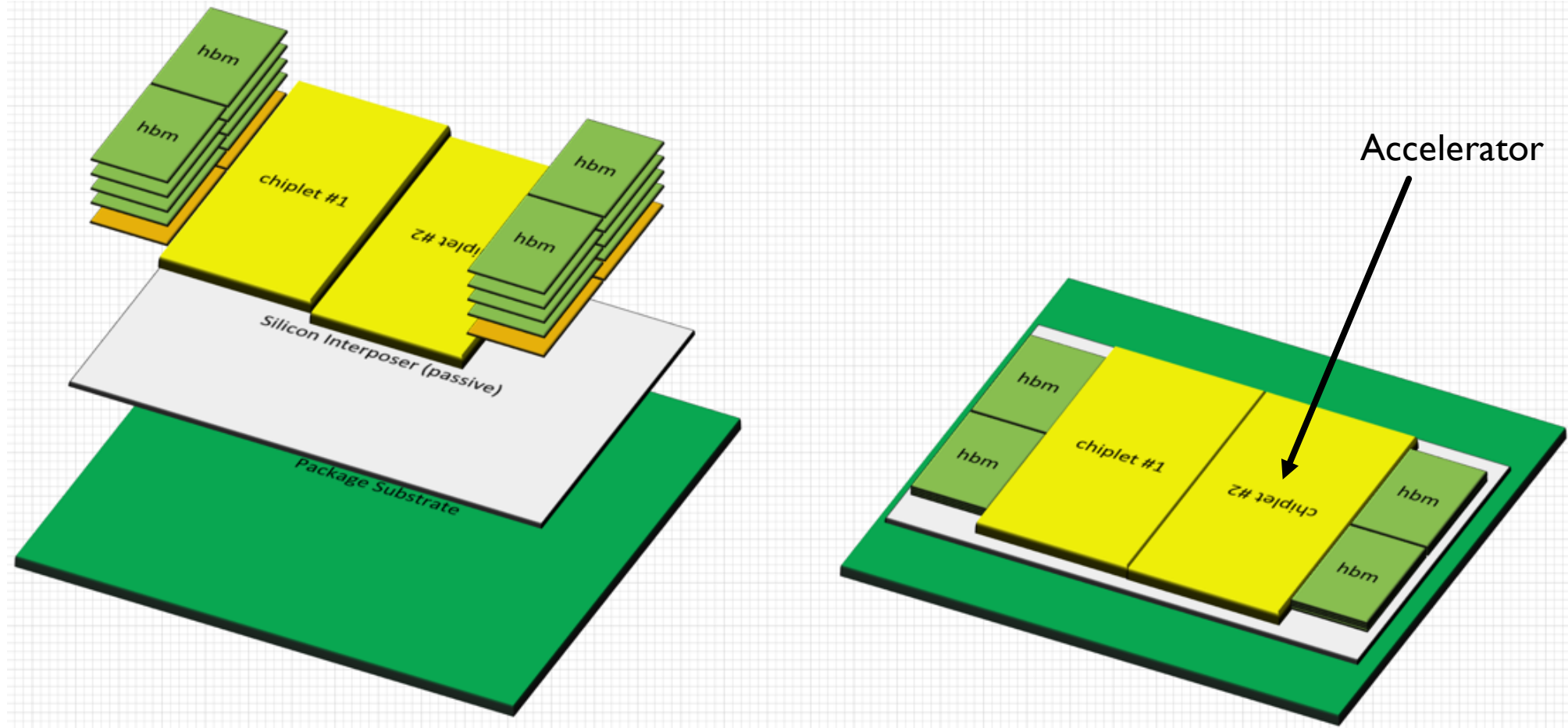
CONCEPT OF COMMON PLATFORM

ROADMAP

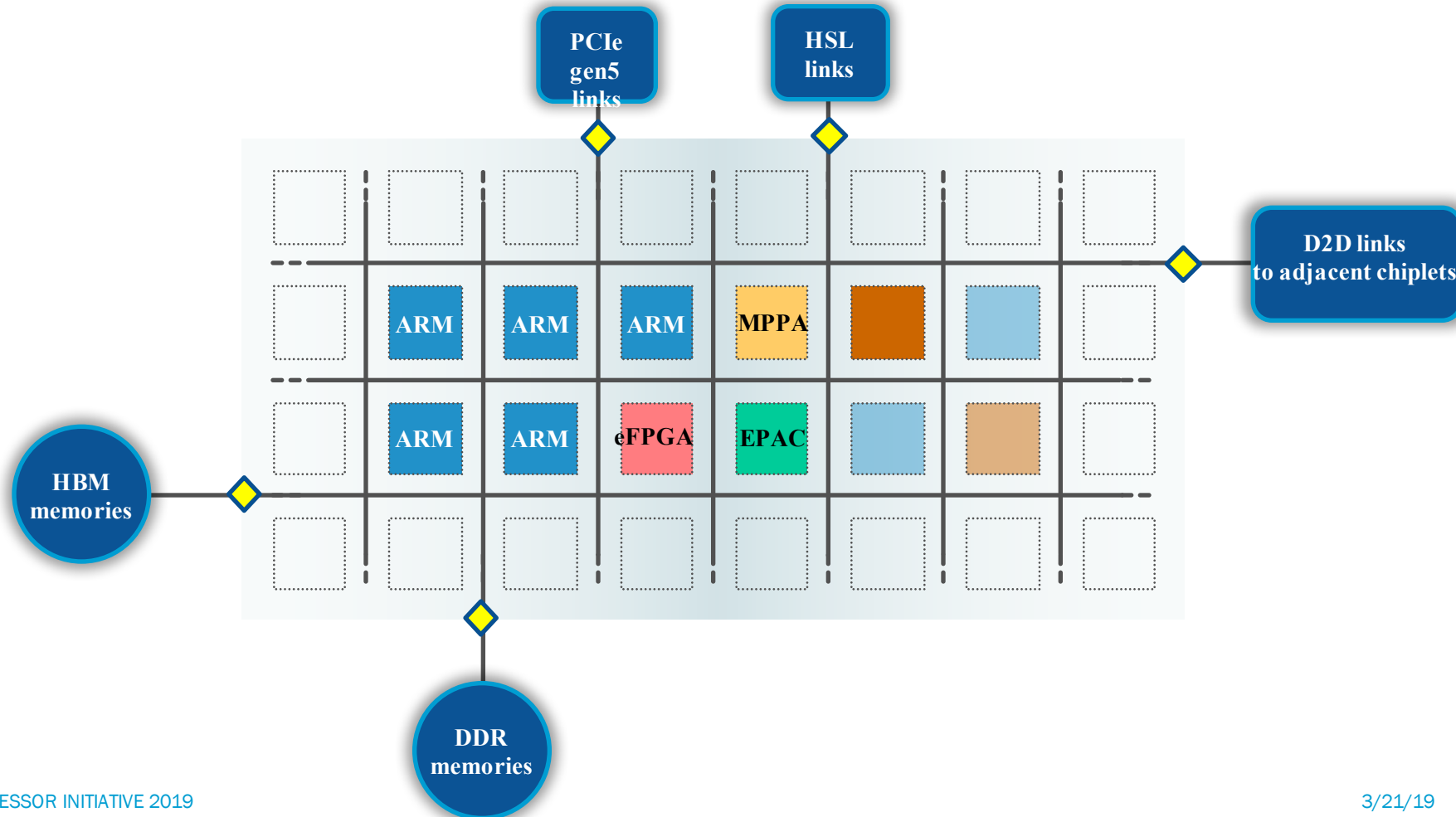
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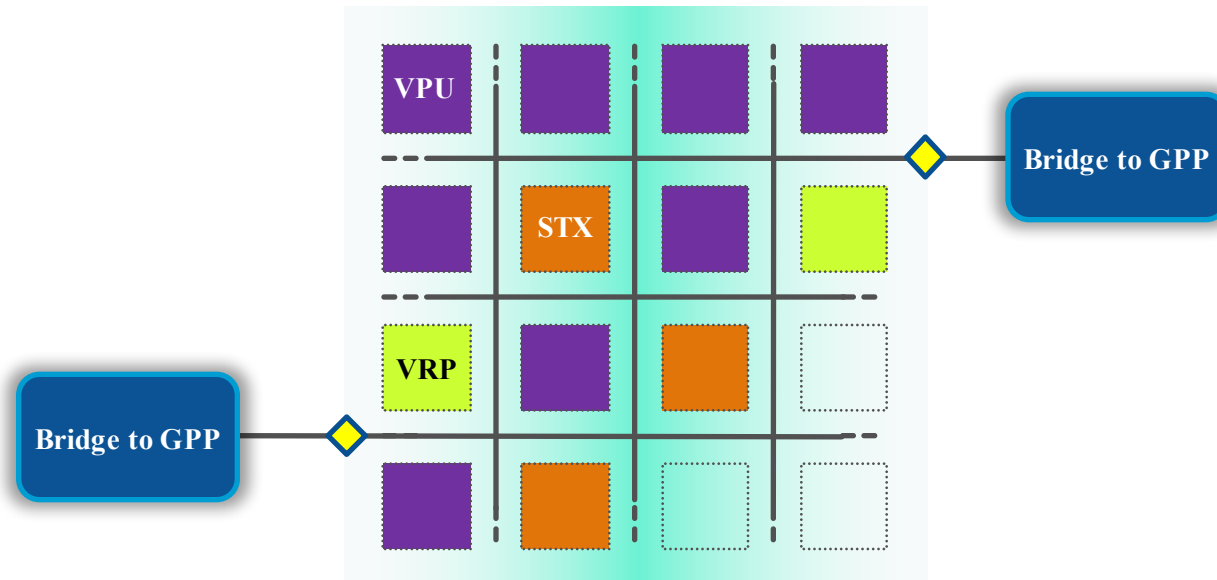
CONCEPT OF COMMON PLATFORM : INTERPOSER



GPP AND COMMON ARCHITECTURE



EPAC – RISC-V ACCELERATOR



- EPAC - EPI Accelerator
- VPU – Vector Processing Unit
- STX – Stencil/Tensor accelerator
- VRP - VaRIable Precision co-processor

IT'S THE ARITHMETIC INTENSITY, STUPID!

	INTEL	AMD	MARVELL	RHEA	
SKU	SKL-8168	7601	THX2	1 Chiplet	2 Chiplets
#cores	24	32	32	36	72
Freq (GHz)	2,7	2,2	2,2	1.5 - 3	1.5 - 3
TDP (w)	205	180	180	50-100	100-200
FCS	Q1-I8	Q1-I8	Q2-I8	Q3-21	Q3-21
Byte/ Flops (=1/(arithmetic_intensity))	0,11 09.1	0,30 3.33	0,36 2.78	1.0 1.0	0.5 2.0

- Target: best in class byte per Flops
- Real performances close to peak
- ➔ Any library / application performs with reduced optimization effort
- ➔ Reduce complexity of compilers and libraries
- ➔ Open source compilers and libraries deliver high performances
- ➔ open ecosystems are possible for high-end computing

THANKS FOR YOUR ATTENTION

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