



# ***EUROPEAN PROCESSOR INITIATIVE: The Industrial Cornerstone EuroHPC for Exascale Era***

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*European Union*



European  
Processor  
Initiative

is all about this !!

*Deep Learning*

*Supercomputing*

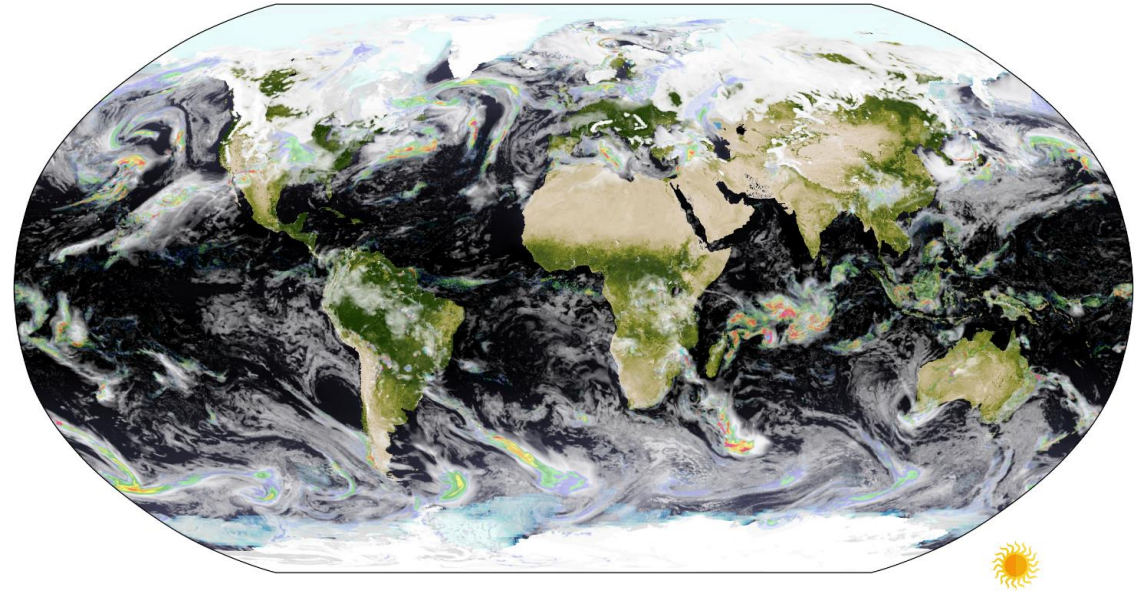
*ADAS*

# ***THE STRATEGIC INTERPLAY***

# DRIVERS OF THE EPI PROPOSAL (1)

## Societal challenges

- Aging population
- Climate change
- Cybersecurity
- Increasing energy needs
- Intensifying global competition
- Sovereignty (data, economical, embargo)



Image/video: courtesy of P.L.Vidale, M.J. Roberts, G.Perez, NCAS, Met Office, University of Reading

## DRIVERS OF THE EPI PROPOSAL (1)

- HPC can save billions by helping us to adapt to climate change
- HPC can improve human health by enabling personalized medicine
- HPC can improve fuel efficiency of aircraft & help design better wind turbines
- HPC can help us to understand how the human brain works

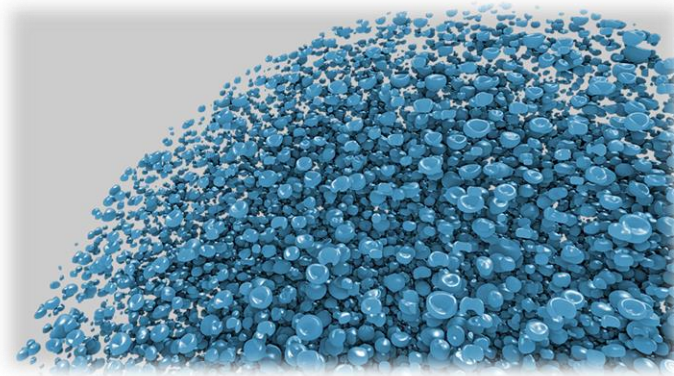


Image courtesy of Petros Koumoutsakos, ETH Zurich

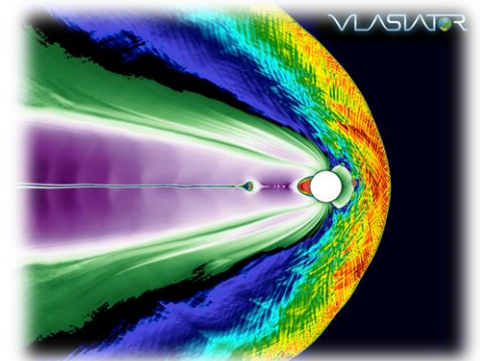


Image courtesy of Minna Palmroth, University of Helsinki

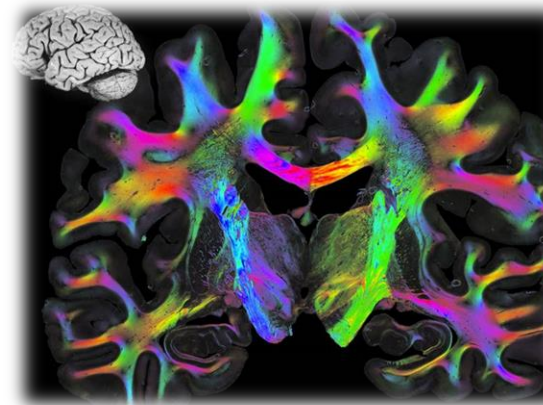


Image courtesy of Axer & Amunts, INM-I, Forschungszentrum Jülich

# EUROHPC DECLARATION

- March 2017, Rome: EC launched the *EuroHPC declaration*
- Agreement of signatory countries to commit to work together with each other and with the EC to acquire, build and deploy an integrated world-class High Performance Computing infrastructure in Europe
- January 2018: EC proposal to invest jointly with Member States €1 billion in world-class European supercomputers through a new legal and funding structure – the EuroHPC Joint Undertaking.



## EUROHPC JU

- Legal instrument that allows the EU, Member States and associated countries and private partners to:
  - efficiently combine joint procurement and ownership of supercomputers
  - make joint investments in the development of leading technology, software and applications in Europe
- FOCUS:
  - **INFRASTRUCTURE**
  - **R&I**



# EUROHPC JU PARTICIPATING STATES

 **EuroHPC JU**  
EuroHPC JU Participating States

## **EuroHPC JU Participating States**

Austria, Belgium, Bulgaria, Croatia,  
Czech Republic, Denmark, Estonia,  
Finland, France, Germany, Greece,  
Hungary, Ireland, Italy, Latvia, Lithuania,  
Luxembourg, the Netherlands, Norway,  
Poland, Portugal, Romania, Slovakia,  
Slovenia, Spain, Sweden and  
Switzerland.





## EUROHPC JU FOCUS

- Acquisition of world-class supercomputers, including
  - at least two petascale systems
  - two pre-exascale systems
  - Providing access to this new European supercomputing infrastructure to users from academia, industry and small and medium-sized enterprises, and the public sector, no matter where they are located in the EU.
- The Joint Undertaking will support the **European Processor Initiative** to develop, using European technologies, the low-power microprocessors needed to power supercomputers. This will make Europe less reliant on foreign technology in a field that is essential for many areas of the digital economy in high-performance computing and beyond

# 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



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.defensenews.com/global/europe/2018/08/01/a-jet-sale-to-egypt-is-being-blocked-by-a-us-regulation-and-france-is-over-it/>

***WE GO BEYOND THAT...***

## DRIVERS OF THE EPI PROPOSAL (2)

- Connected mobility & *Autonomous Driving computing needs beyond 2023*
- 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)





# European Processor Initiative



BMW  
GROUP



Rolls-Royce  
Motor Cars Limited

Atos



Barcelona  
Supercomputing  
Center  
Centro Nacional de Supercomputación



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA



CHALMERS



UNIVERSITÀ DI PISA



ETH zürich

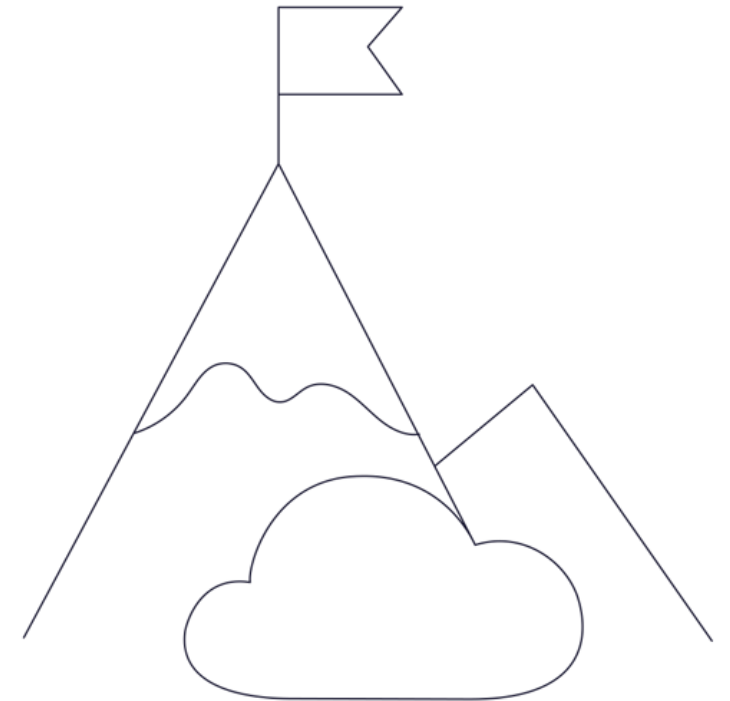


## EUROPEAN PROCESSOR INITIATIVE

- 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

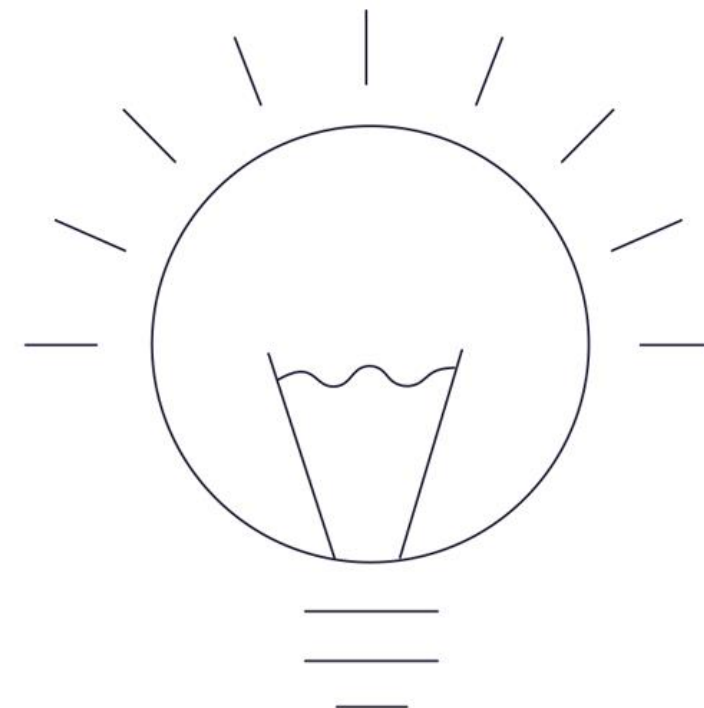
# MISSION

- European independence in High Performance Computing Processor Technologies
- EU Exascale machine based on EU processor by 2023
- Based on solid, long-term economic model, Go beyond HPC market
- Address the needs of European industry (car manufacturing market)
- End-to-end data security



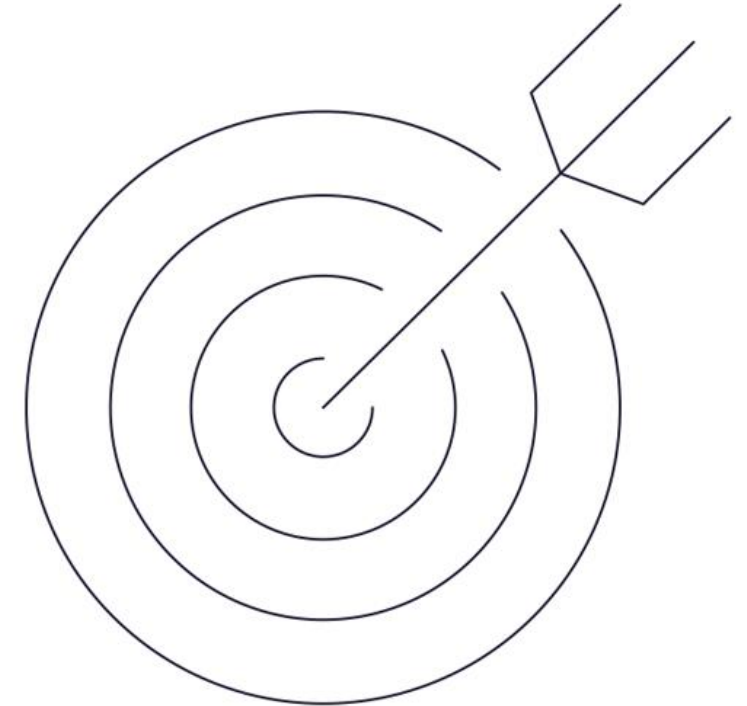
# VISION

- High Performance Computing needs for Exascale machines beyond 2022
- Connected mobility & Autonomous Driving computing needs beyond 2023
- Low power CPU needs for Servers and Cloud
- Other markets under exploration (Server and Cloud)



## EXPECTED IMPACT

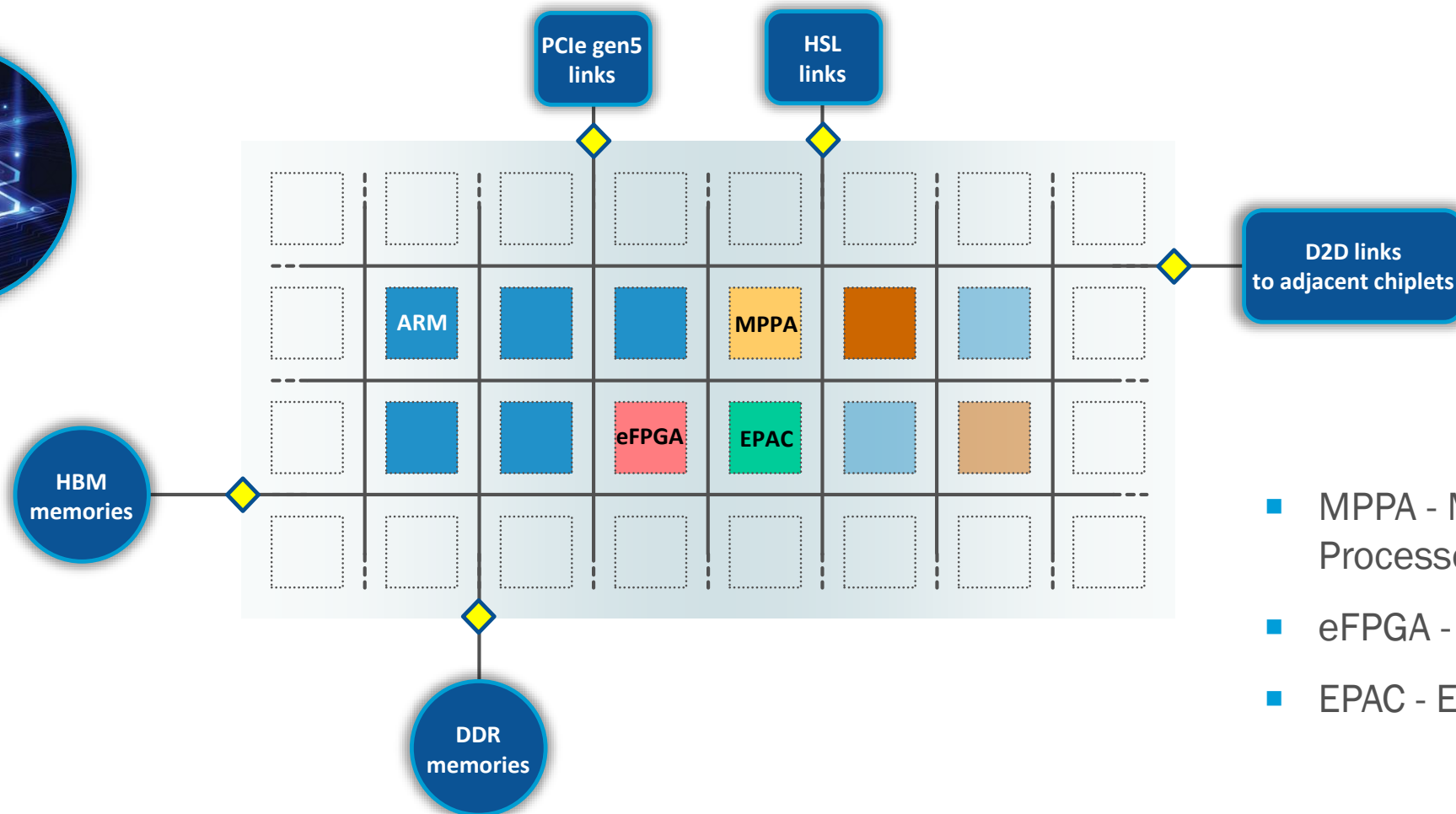
- Strengthening the competitiveness and leadership of European industry and science
- European microprocessor technology with drastically better performance/power ratios
- Tackling important segments of broader and/or emerging HPC and Big-Data markets



# ***COMMON PLATFORM***

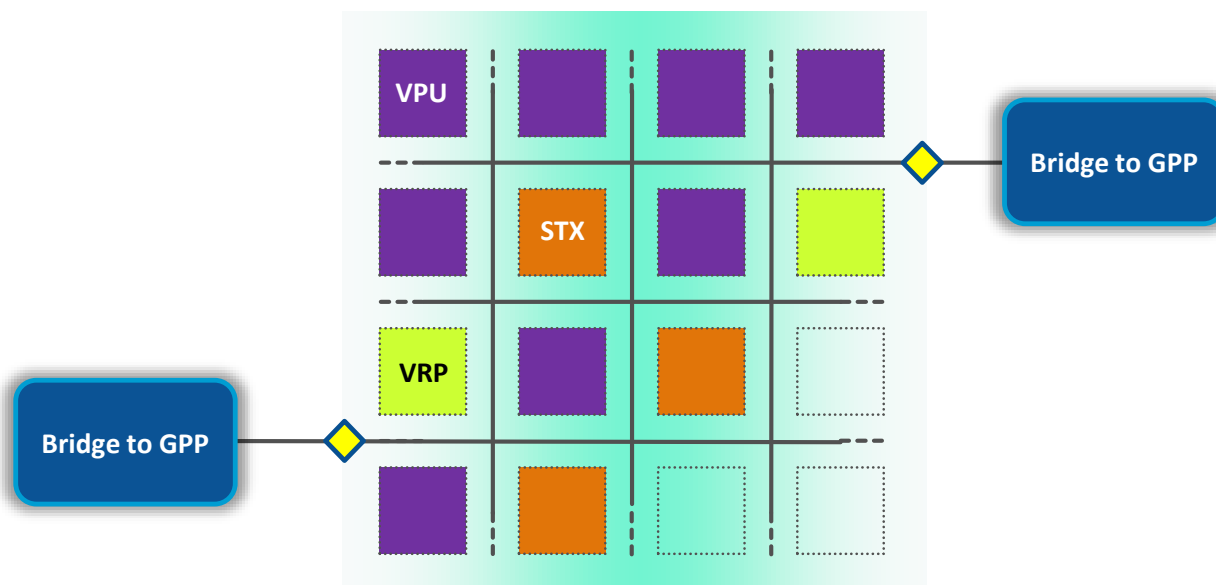
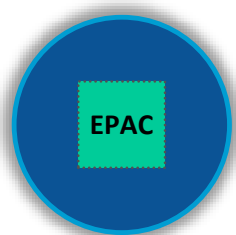


# GPP AND COMMON PLATFORM ARCHITECTURE



- MPPA - Massively Parallel Processor Array
- eFPGA - embedded FPGA
- EPAC - EPI Accelerator

# EPAC – RISC-V ACCELERATOR



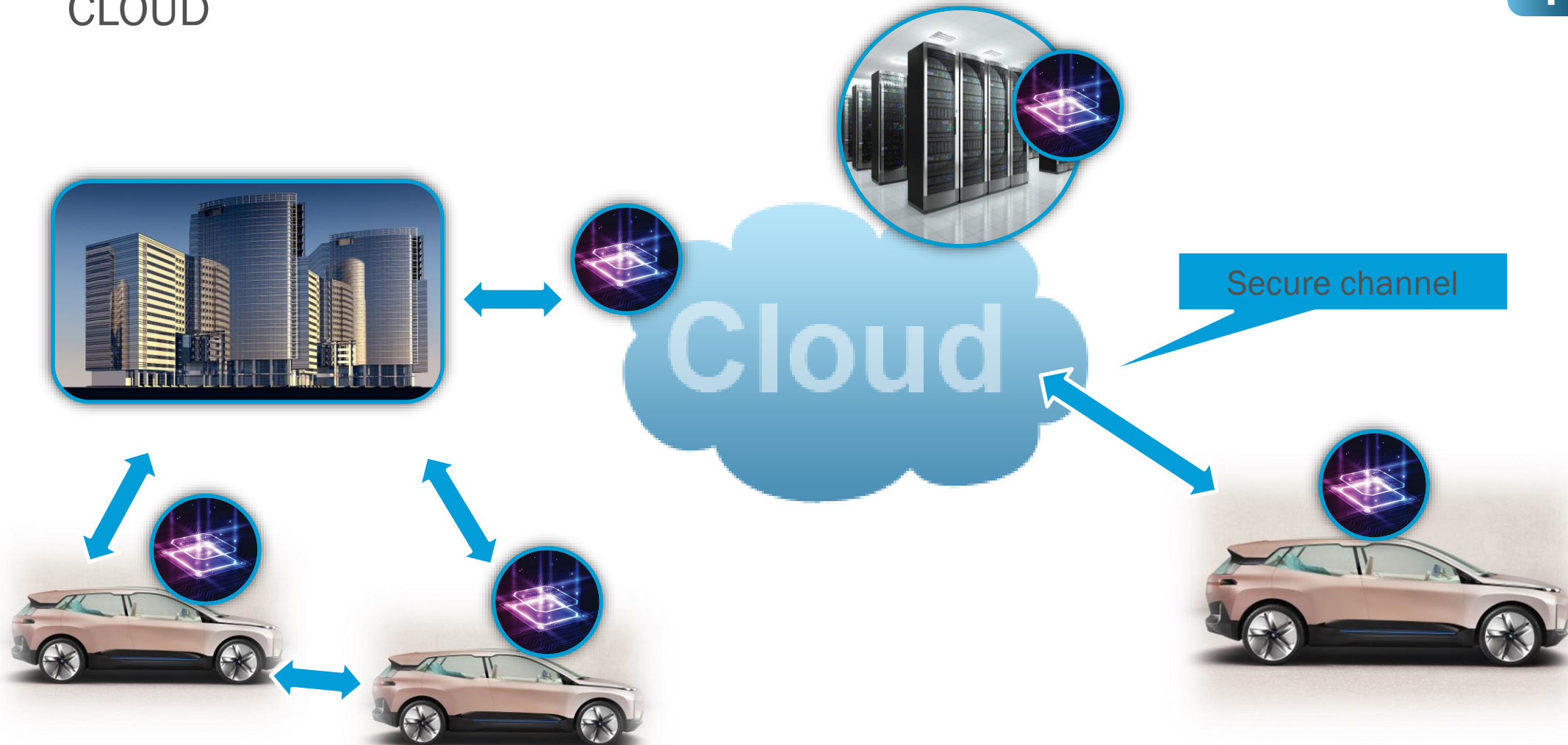
- EPAC - EPI Accelerator
- VPU – Vector Processing Unit
- STX – Stencil/Tensor accelerator
- VRP - VaRiable Precision co-processor

# EPI AUTOMOTIVE

- Autonomous driving systems
- Connected mobility
- EPI: A powerful data fusion platform – the automotive embedded HPC platform
- EPI heterogeneous multicore architecture can provide enough performance and low power consumption in parallel

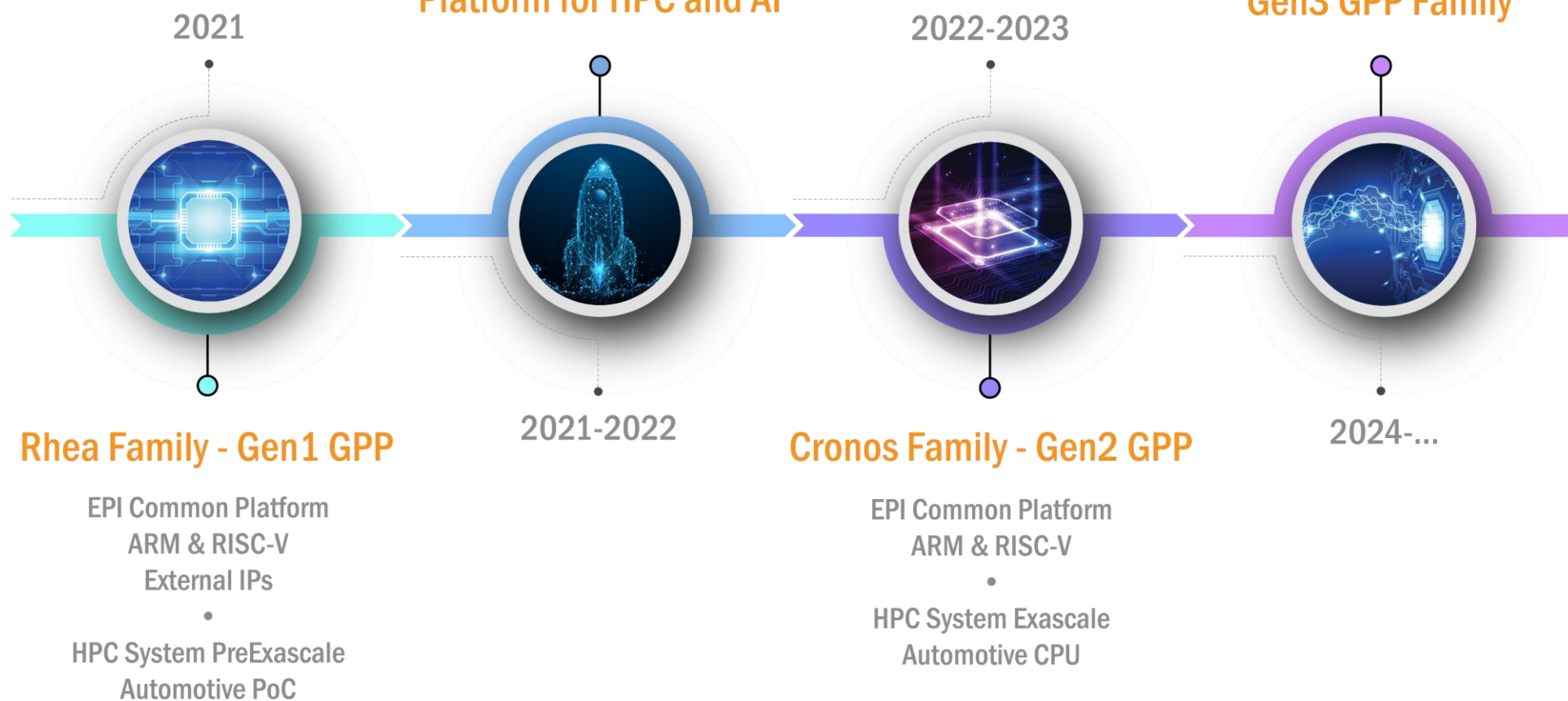


# END2END SECURITY - FROM THE AUTOMOTIVE SYSTEM TO THE CLOUD



# ***EPI ROADMAP***

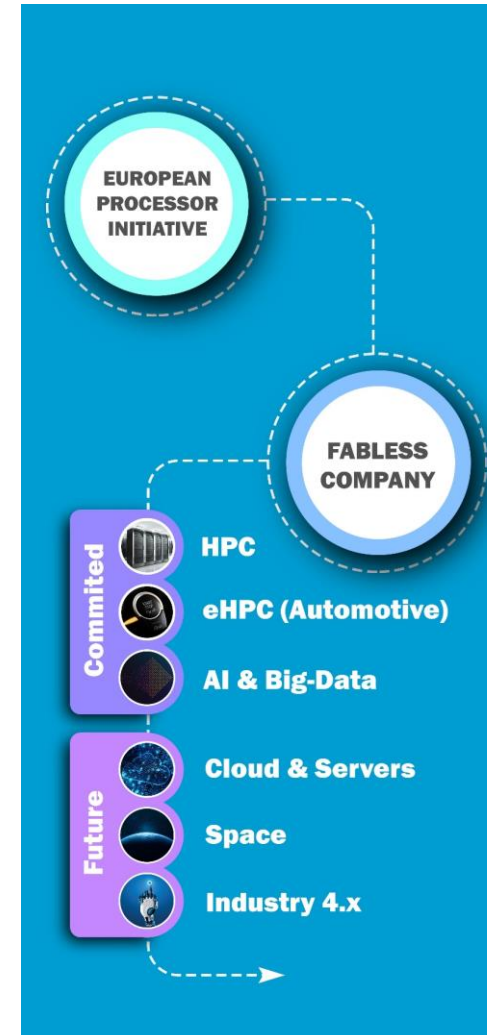
## EPI IP's Launch Pad & Pan European Research Platform for HPC and AI



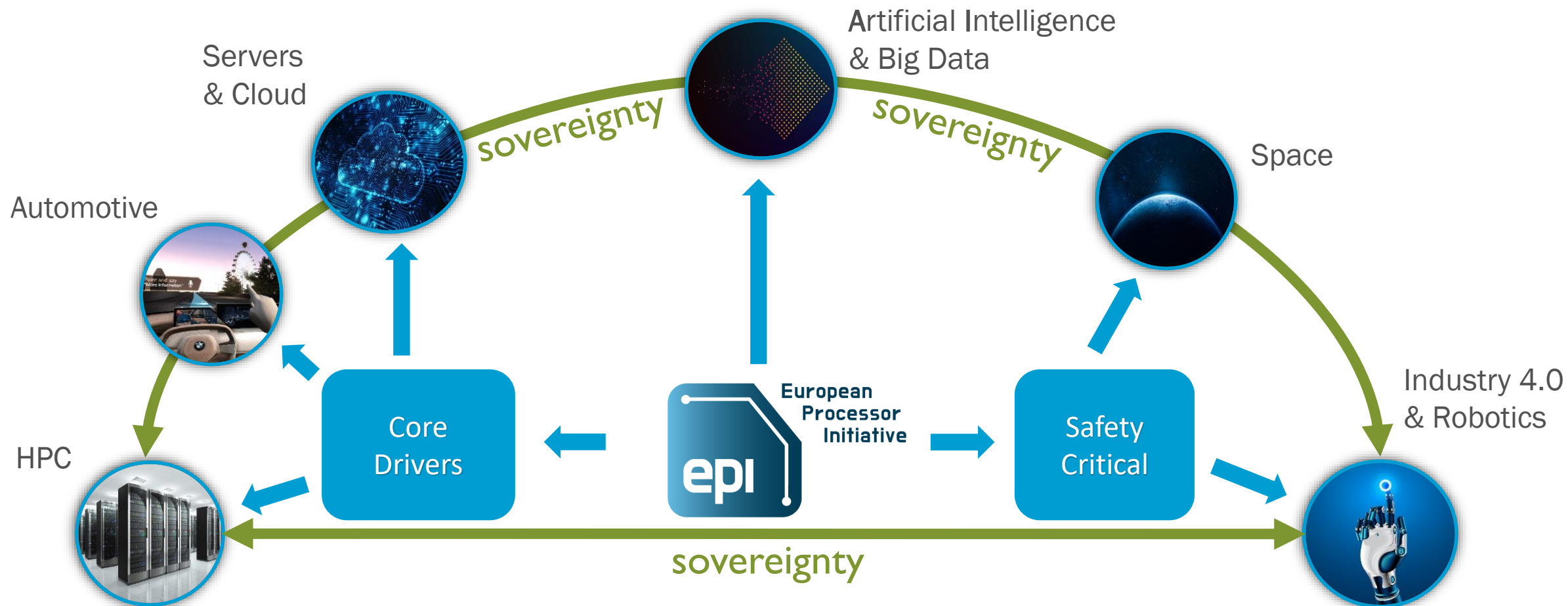


# EPI FABLESS COMPANY

- EPI's Fabless company
  - licence of IPs from the partners
  - develop own IPs around it
  - licence the missing components from the market
- generate revenue from both the HPC, AI, server and eHPC markets
- integrate, market, support & sales the chip
- work on the next generations



# SCALABILITY ALLOWS WIDE MARKET POTENTIAL COVERAGE



***TO CONCLUDE***

- HPC is crucial to resolve societal challenges and preserve European competitiveness
- Europe is going in the right direction with EuroHPC. This must be sustained in the long-term
- The chip design effort must continue for the EU's security and competitiveness, and should create a processor ecosystem covering IoT, servers, cloud, autonomous connected vehicles and HPC



[www.european-processor-initiative.eu](http://www.european-processor-initiative.eu)