

EPI Forum

Paris, 6–7 October, 2025



TECHNICAL SESSION

The European General Purpose (Server) Processor Journey

Philippe Notton, Céline Scetbun & Craig Prunty



EPI FORUM

THE VISION...

Philippe Notton

IN THE BEGINNING (2018)... (1/2)

State of the HPC market^(*)

- 101 supercomputers in Europe
 - Versus 206 in China and 124 in the US
- Processors were mostly Intel
- Accelerators were an exception
 - 110 supercomputers had accelerators including 96 Nvidia

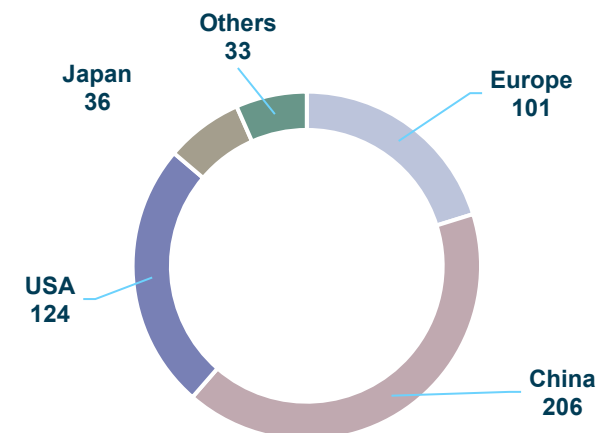
Arm server processor market was growing...

- Several product launches incl. AWS Graviton1 in 2018

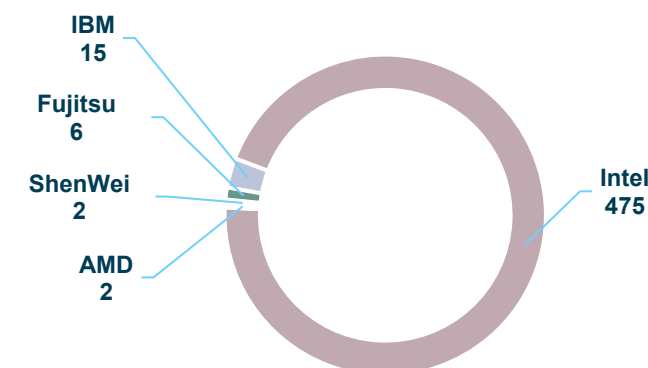
... but limited market adoption

- Many Arm server CPU companies had started and exited due to limited software ecosystem
 - Cavium (now Marvell), Qualcomm, Fujitsu are still alive
- 1st supercomputer to be equipped by Arm-based processor: Fugaku, No1 in the Global Top500 in June 2020

Europe accounted for 1/5 of Top500 supercomputers



Intel equipped 95% of the Top500 supercomputers



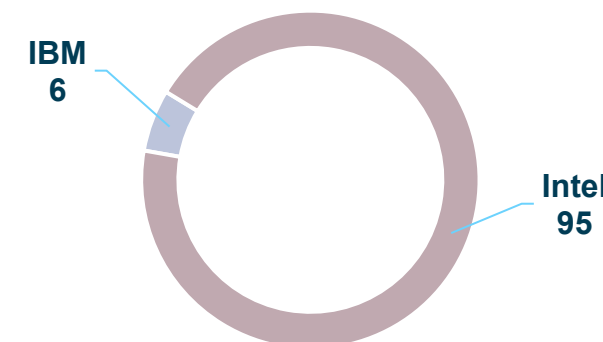
^(*) Top500 supercomputers list (June 2018)

IN THE BEGINNING (2018)... (2/2)

Europe is beyond the curve

- 101 supercomputers in Europe
 - No European country has ever ranked a supercomputer as global No1
 - Europe's most powerful supercomputer ranked No6: Piz Daint (Switzerland)
 - 6x less powerful than the N°1, Summit
- HPC equipment(**)
 - Europe used +1/3 of the world's resources
 - Europe produced -5% of the world's resources
 - All the processors used are non-European

0% of the processors
fueling the 101 Europe' supercomputers
are European(*)



**This lack of European processor technology
had serious implications in highly strategic markets**

(*) Top500 supercomputers list (June 2018)

(**) Hyperion Research 2019

WHY EUROPE NEEDS ITS OWN PROCESSORS?

- Processors now control almost every aspect of our lives
- Security** (backdoors, 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

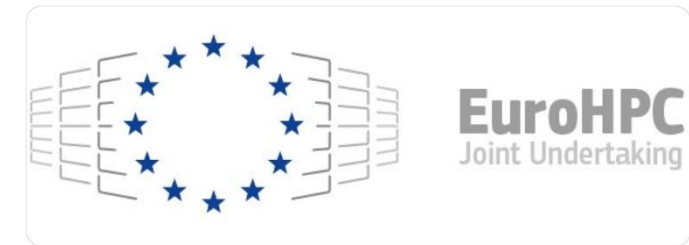
Image sources:

<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>
<https://eu.freep.com/story/money/2018/01/13/car-hacking-threat/1028270001/>
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THE RESPONSE OF THE EUROPEAN UNION

Establishment of EuroHPC JU to:

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



Launch of a call for projects to foster the development of high-end European processors

- Won at the end of 2018 by the European Processor Initiative consortium



DRIVERS OF THE EPI PROPOSAL (1/3)

- 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

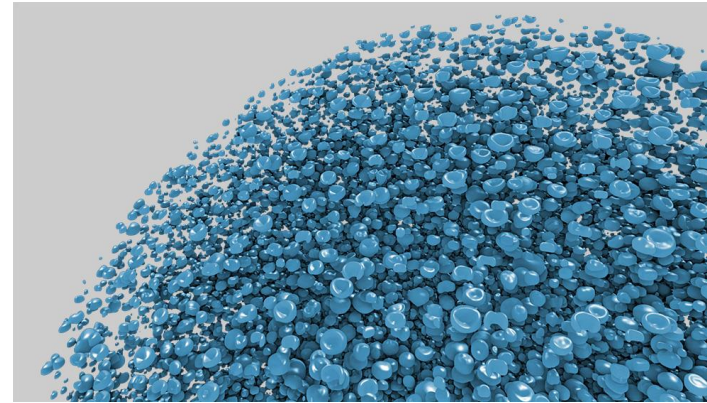


Image courtesy of Petros Koumoutsakos, ETH Zurich

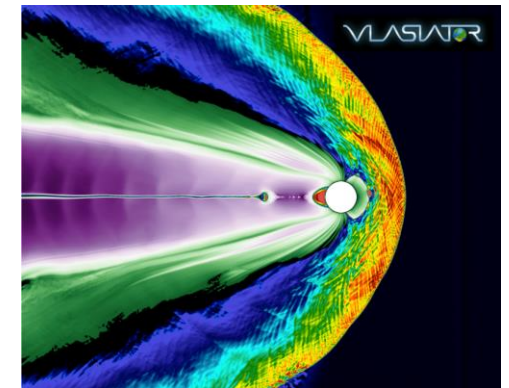


Image courtesy of Minna Palmroth, University of Helsinki

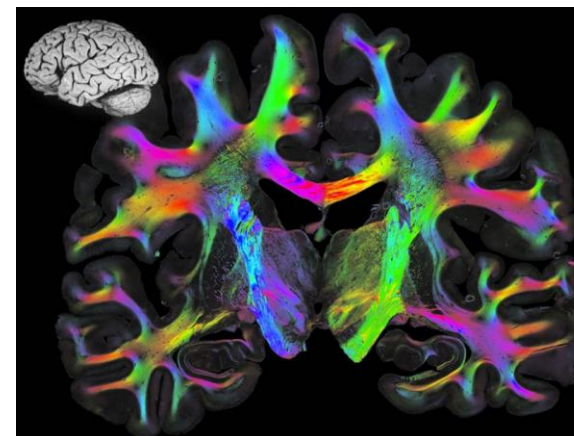
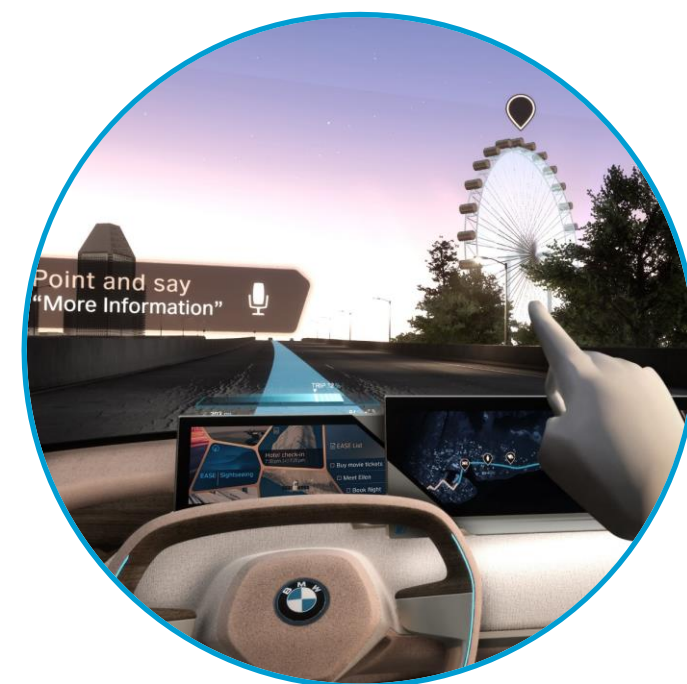


Image courtesy of Axer & Amunts, INM-1, Forschungszentrum Jülich

DRIVERS OF THE EPI PROPOSAL (2/3)

- Connected mobility & **AD 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 (3/3)

- 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

- 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

A WELL-BALANCED CONSORTIUM



AN AMBITION REAFFIRMED BY THE NEW EU COMMISSION

(DECEMBER 2019)



Letter of mission* (extracts)

- task for the next five years is to put in place the right framework to allow Europe to make the most of the digital transition, while ensuring that our enduring values are respected as new technologies develop.
- Enhance Europe's Technological Sovereignty
 - blockchain, high-performance computing, algorithms, and data-sharing and data-usage tools.
 - 5G-Networks
 - Artificial Intelligence & Digital Services Act
 - Single Market for cybersecurity
 - Joint Cyber Unit
 - Digital Education Action plan

* https://ec.europa.eu/commission/sites/beta-political/files/president-elect_von_der_leyens_mission_letter_to_thierry_breton.pdf

SIPEARL & EPI

**A private company incubated inside the EPI consortium
to launch the European high-performance energy-efficient processor for HPC workloads**



- Established in June 2019
- Operational launch in January 2020: 6 people
- Seed money: €6.2m out of €80m Horizon 2020 grants for EPI SGA1
- Close collaboration between all EPI members to define the characteristics of Rhea1...
- ... that remains very important today

SIPEARL FUNDRAISING JOURNEY

A complicated process that took us +3 years instead of the planned 1 year

- Covid-19
- A high-risk industry, little known to European private equity firms
- Fortunately, there was:
 - The French tax mechanism “CIR”
 - SGA1 and SGA2
 - The funding programme under Horizon Europe, EIC Accelerator, that offers support to start-ups and SMEs that have an innovative, game changing product that disrupt existing ones worldwide.



We raised the first round of our Series A in April 2023

SiPearl's total financing since its launch





EPI FORUM

6 YEARS IN EPI...

Céline Scetbun

6 YEARS IN EPI...

Phase 1 Grant agreement ID: 826647

- Kicked-off in **Dec-2018**
- 28 partners from 10 countries
- **€80 000 000**, 100% funded by EuroHPC
- SiPearl incubation

- Develop the roadmap for the full length of the EPI initiative
 - Definition & design of an HPC processors
 - Develop the first generation of technologies (IPs for GPP HPC, accelerators, software stacks and boards)

Phase 2 Grant agreement ID: 101036168

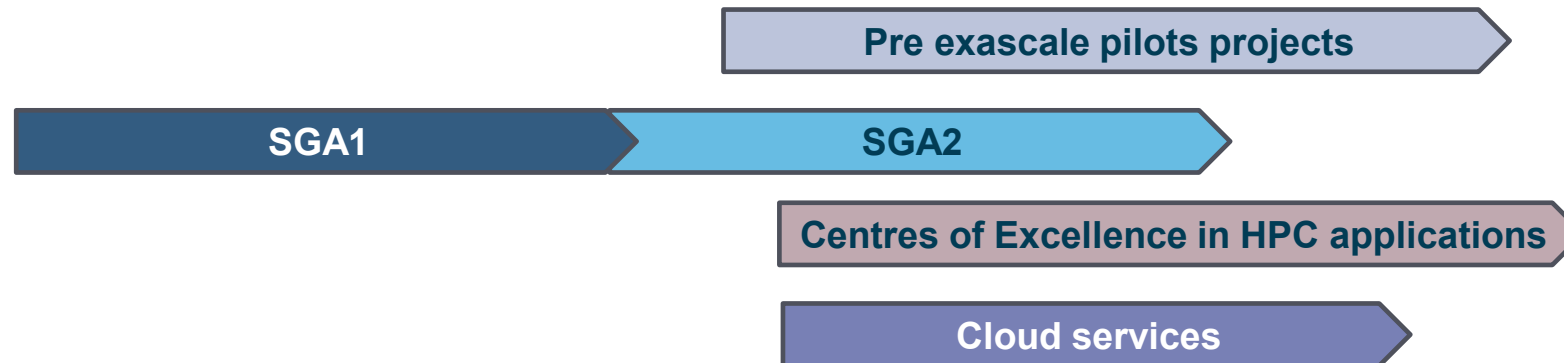
- Kicked-off in **Jan-22**
- 27 partners from 8 countries
- **€70 000 000**, co-funded by EuroHPC JU (50%) + **8 EU countries** (50%)

- Finalize the development of the 1st generation of low-power microprocessor units and accelerators
- Develop the 2nd generation
- Develop a Common Platform” at hardware and software levels in continuation

PROJECT HIERARCHY

A series of projects

- **SGA1 & SGA2** : Focusing on IP and hardware development along with the required software stacks up to prototypes
- **EUpex & EUPILOT** : Focusing on system integration, pre-deployment and delivery
- **Centre of Excellence & Cloud** : Foster adoption within the community of users and develop services toward cloud-based deployment



SIPEARL

- First incubated SME in July 2019, first employees hired in January 2020
- Many obstacles
 - Funding
 - Hiring talent in Europe
- Ambitious challenge from day1 and compounded complexity
 - Rhea
 - Infrastructure
- Learning curve of a newly assembled team
- Stop & Go development

TAKEAWAYS

#1 Achievements

- Rich portfolio of European IPs
- Taped-out products
- European ecosystem, with people from the whole value chain
- Effective co-design of hardware, software, system, applications
- Several growing European SMEs

#2 Challenges

- The road ahead is long and full of obstacle
- Money still is the Himalaya
- Time
- Changing environment

#3 What's next ?

- ✓ Successful project hierarchy
- ✓ Ambition was good
- ✗ Timeline wasn't realistic

→ Sustained support to strengthen growing companies

→ Bring developed EU IP and taped-out products to the next level



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THE FUTURE...

Craig Prunty

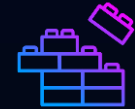
SiPearl, a startup seed funded by Europe

To provide sovereign high-performance energy-efficient processors for Europe's supercomputers, AI companies and data centres



Incorporated

In France in June 2019,
deployed in Spain, Italy



Financing

Series-A: €130m



200 employees

from **Atos** **MEDIATEK** **ST** **MARVELL**
NXP **Hewlett Packard Enterprise** **intel** **NOKIA**



Seed funded

By the European Union



Fabless IC design house

Manufacturing entrusted to TSMC with N6P



1st design win

JUPITER, 1st European exascale
supercomputer, financed by EuroHPC &
operated by Forschungszentrum Jülich



Technological partnership

Intellectual property

arm



1st tape-out done

June 2025

Our market: Strengthening Europe sovereignty



TODAY

a dramatic situation
for Europe's independence & sovereignty

1/3 of global supercomputing resources
are consumed
by Europe.

0% of the microprocessors
powering our supercomputers
are European.

TOMORROW

SiPearl's processors will fuel:

Europe's supercomputers
& HPC systems



EuroHPC
Joint Undertaking

Europe's data centres, AI factories, Cloud and beyond

(1) TAM 2024-2028 and estimated total Arm-based processors for the data centres market including traditional hyperscaler data centres and AI applications (Source: BCG)

+45% CAGR for \$8bn TAM in 2028⁽¹⁾

SiPearl Leadership Team



Leadership



Philippe Notton
CEO & Founder



Ying-Chih Yang
Chief Scientist Officer



Human Resources



Laure Perfetti
HR Director



Engineering



Gaël Paul
Senior VP Engineering



Finance



Jean-Luc Gilbert
Group CFO & IR



Research & Development



Vincent Casillas
Chief Technical Officer



Sales & Marketing



Craig Prunty
VP Marketing



International Dev. & Public Affairs



Anna Riverola
International Dev. & Public Affairs Director
Country Manager - Spain



Board



Ian Jenks
Chairman



arm

EVIDEN
an atos business

Directors
representing



Wayne Liang
Independent Director



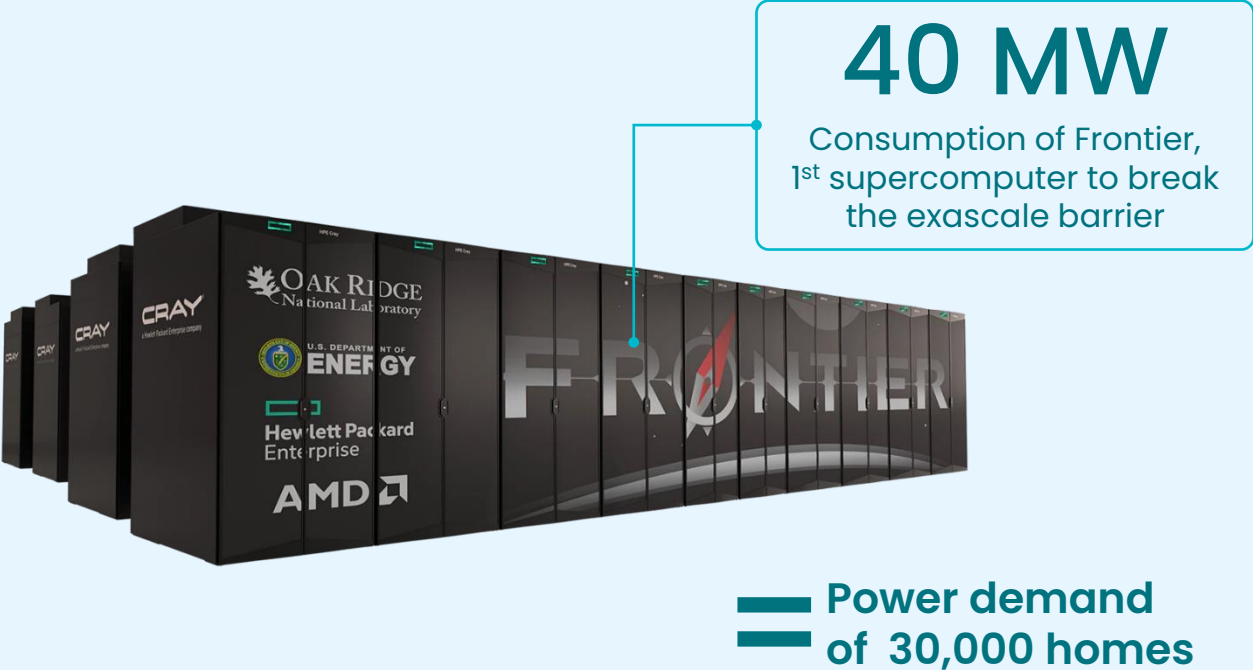
Jean-Michel Deligny
Advisor to SiPearl CEO



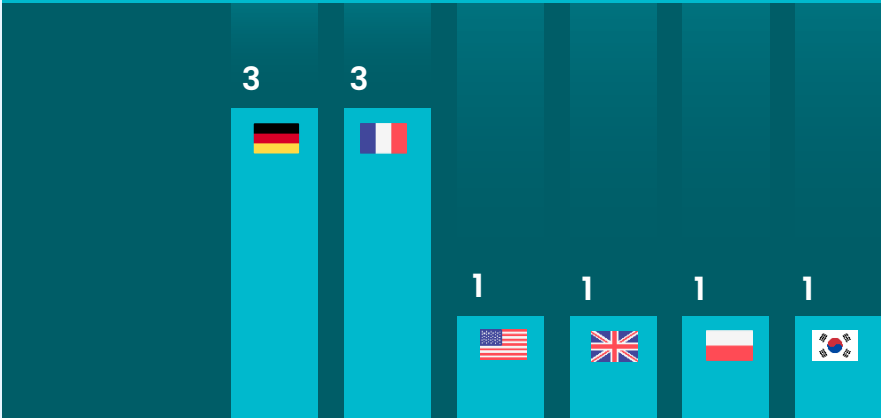
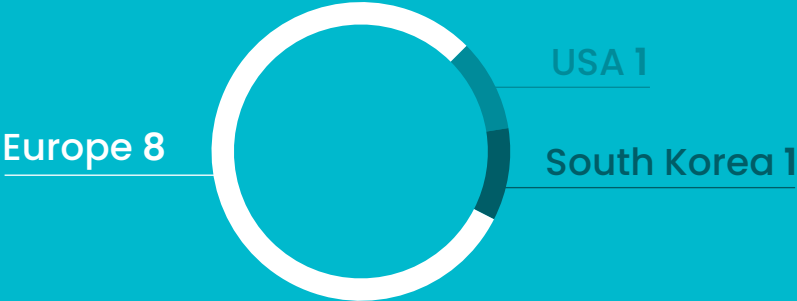
Energy consumption of supercomputers

a growing concern in Europe

A supercomputer consumes enormous amounts of electricity

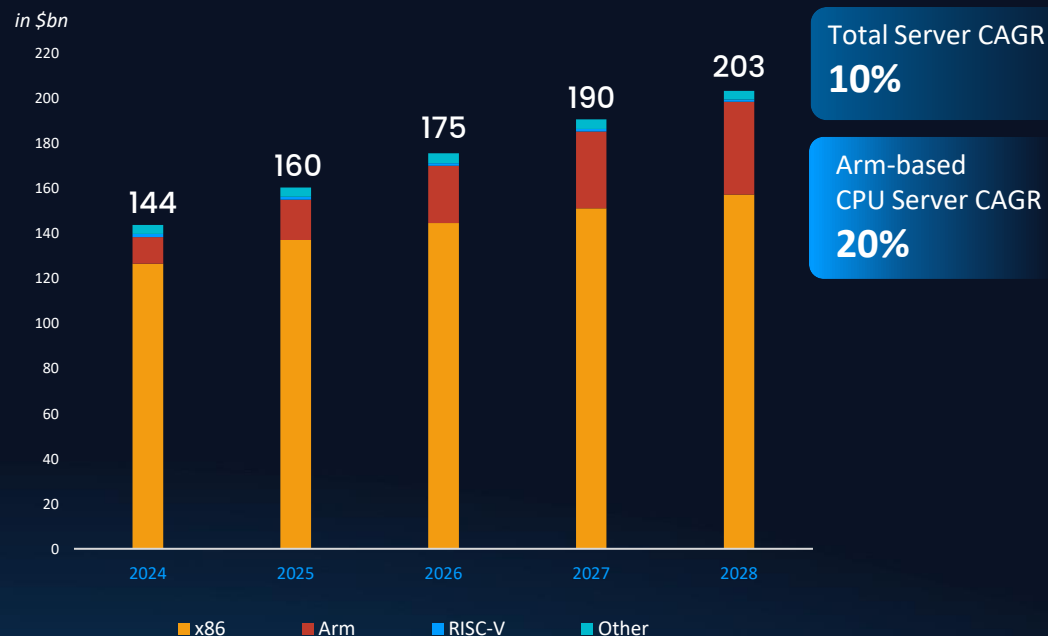


With 8 machines
in the Top10⁽¹⁾ Green500 supercomputers,
Europe is far more targeted in
energy-efficiency than the USA



FOCUS: Server, a booming market for Arm-based CPUs⁽¹⁾

Server revenue forecasts by CPU technology



arm

- Server revenues x 2.5 from \$12B in 2024 to \$41B in 2028,
- Server market share: from 8% in 2024 to 20% in 2028

x86

- Server market share: from 88% in 2024 to 77% by 2028.

Arm-based CPUs' key market players

Third-party CPU suppliers

Rising players



\$16.5m revenues in 2024
Sold for \$6.5bn in 2025



SIPEARL

Legacy players



For internal use only



Google Cloud



Microsoft Azure



EUROPEAN
TECHNOLOGY
PLATFORM
FOR HIGH
PERFORMANCE
COMPUTING

ETP4HPC webinar

SRA 6: Hardware Components

20/06/2025

Marc Duranton (CEA)
Denis Dutoit (CEA)
Craig Prunty (SiPearl)

INDUSTRY TRENDS IN HW COMPONENTS

Hardware Components for HPC face new challenges driven by advancements in technology and emerging workloads, particularly in the context of AI.

- Enhancing the “Byte per Flop” ratio
- The rise of Arm and RISC-V compute ISAs
- Accelerators and heterogeneous computing
- Interconnect technologies driving to higher bandwidth/lower latency
- AI and Variable Precision computing
- The slowing of Moore’s Law and high cost of Tape-Out in advanced nodes
- Advanced packaging; integration of compute, memories and interconnects within the same package
- Reliability – handling silent data corruptions, etc.

EXPONENTIAL INCREASE IN PERFORMANCE OVER 20 YEARS



BlueGene/L – 2005
280 TFlops/s (280×10^{12})

1.43 MW

→
x 6222



El Capitan — 2024
1742 PFlops/s (1742×10^{15})

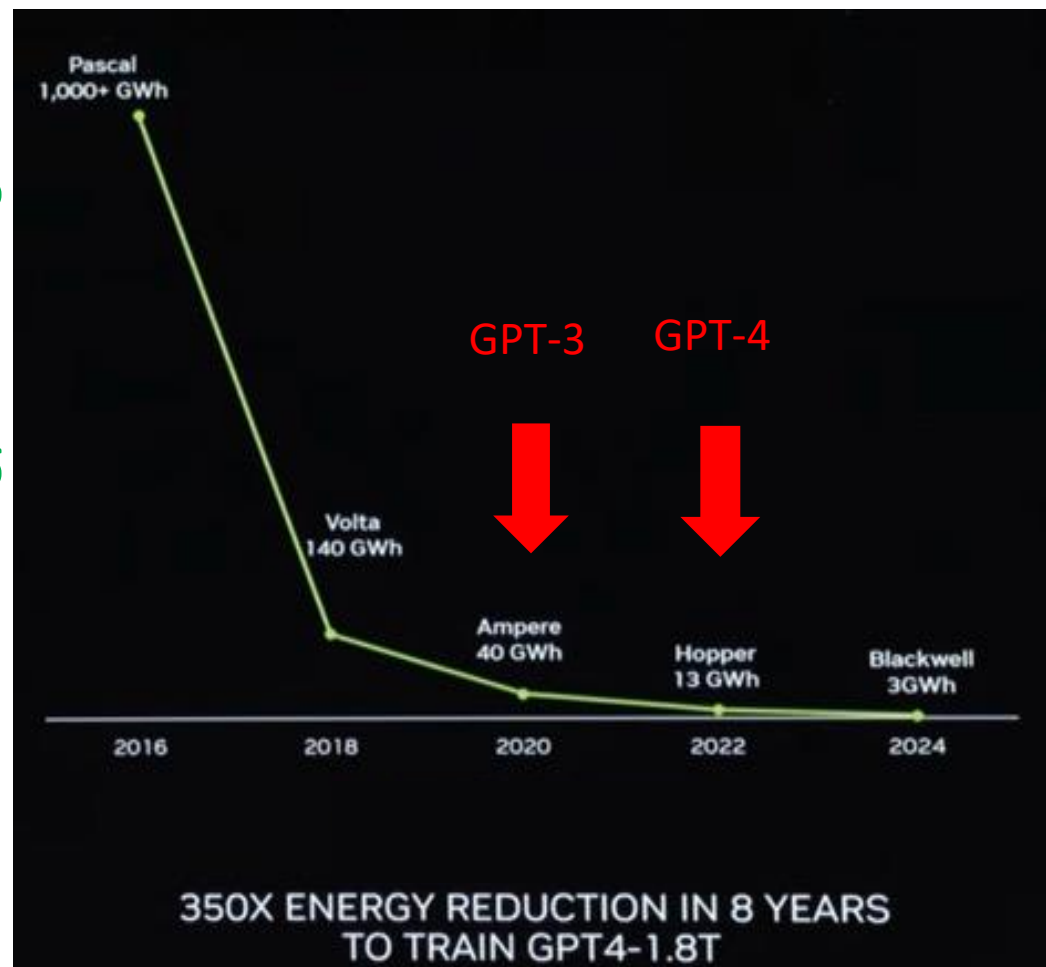
29.6 MW

→
x 21

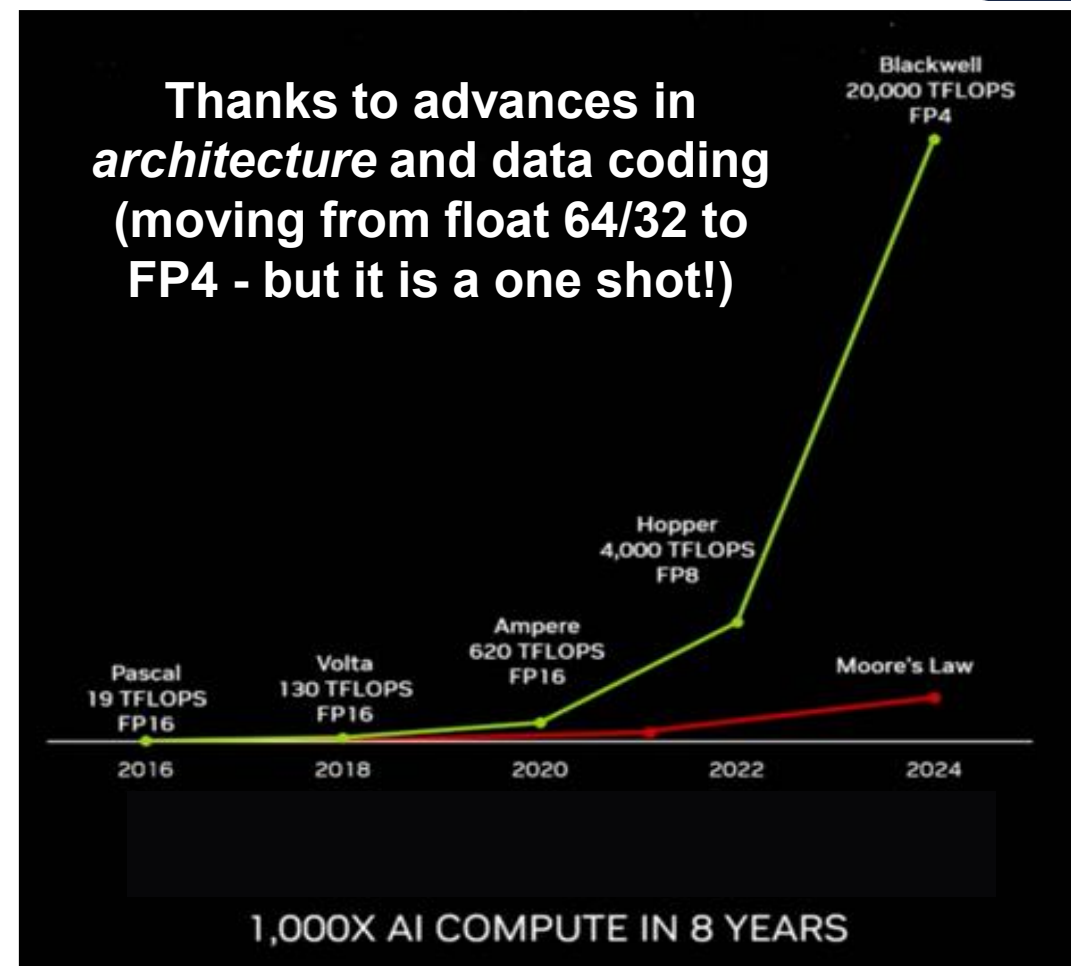
Energy efficiency x 300 in 20 years

EXPONENTIAL INCREASE IN AI PERFORMANCE

Cost of energy for training

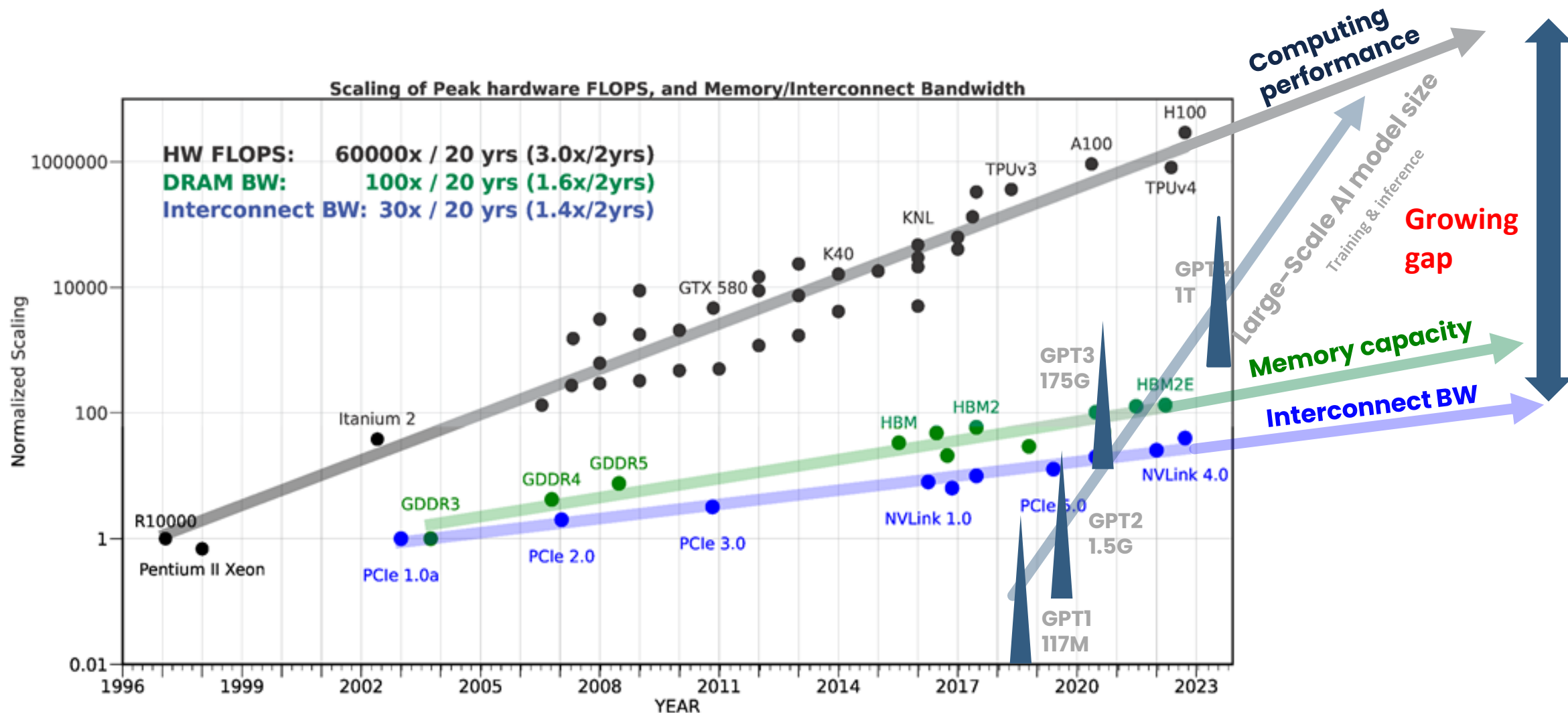


From Nvidia, Computex 2024

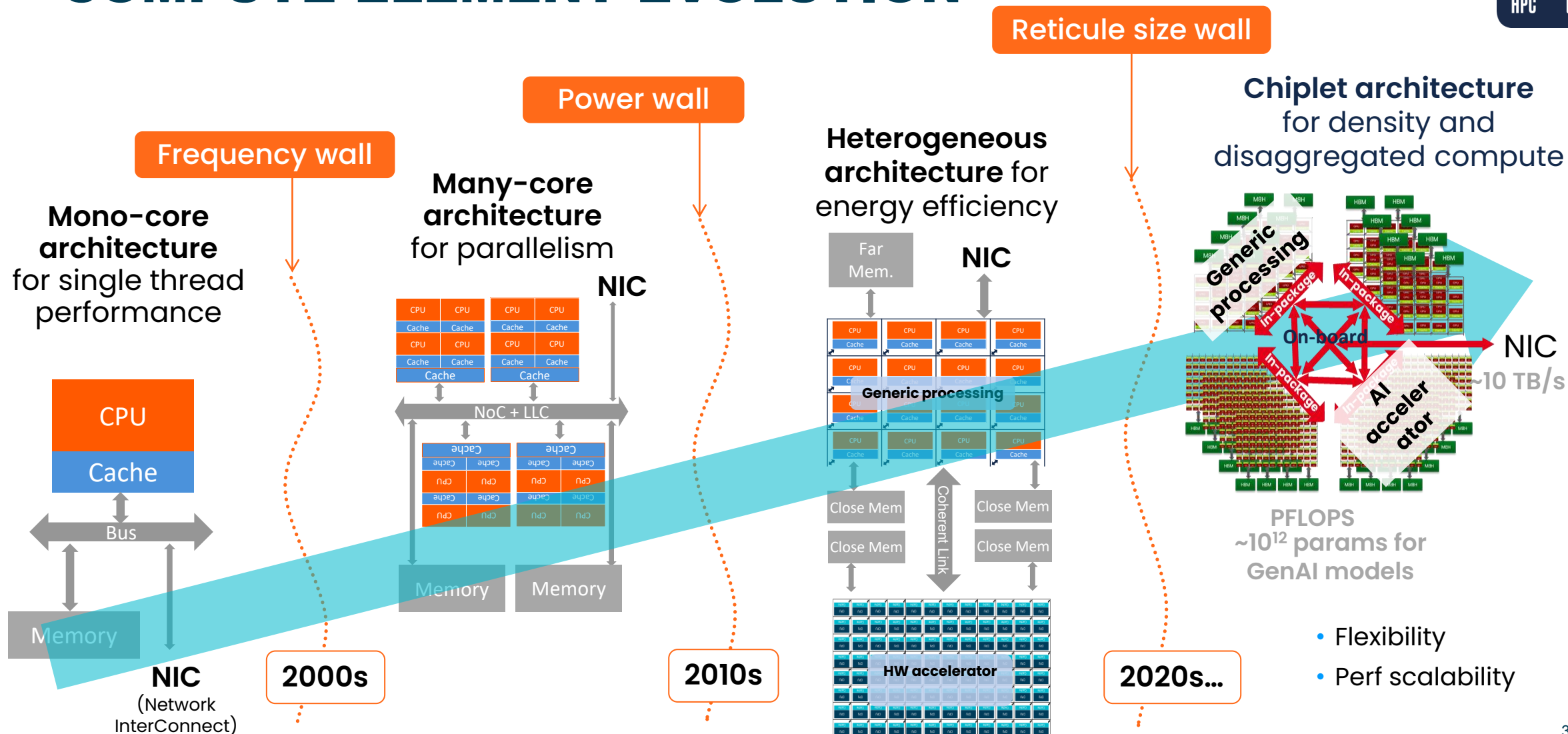


How to pursue this trend ?

LARGE-SCALE AI MODEL SIZE EVOLUTION



COMPUTE ELEMENT EVOLUTION



NEW PARADIGM

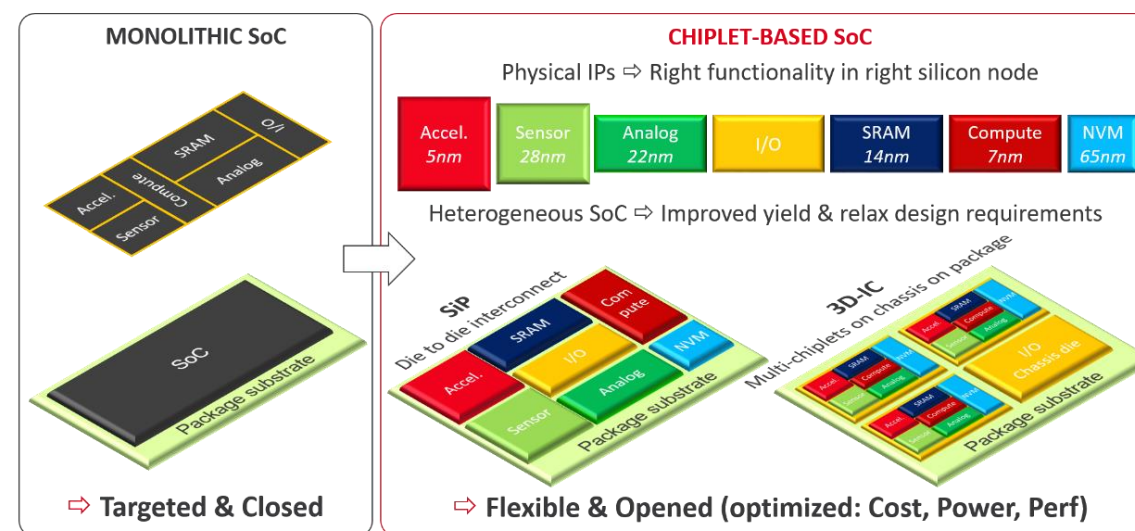
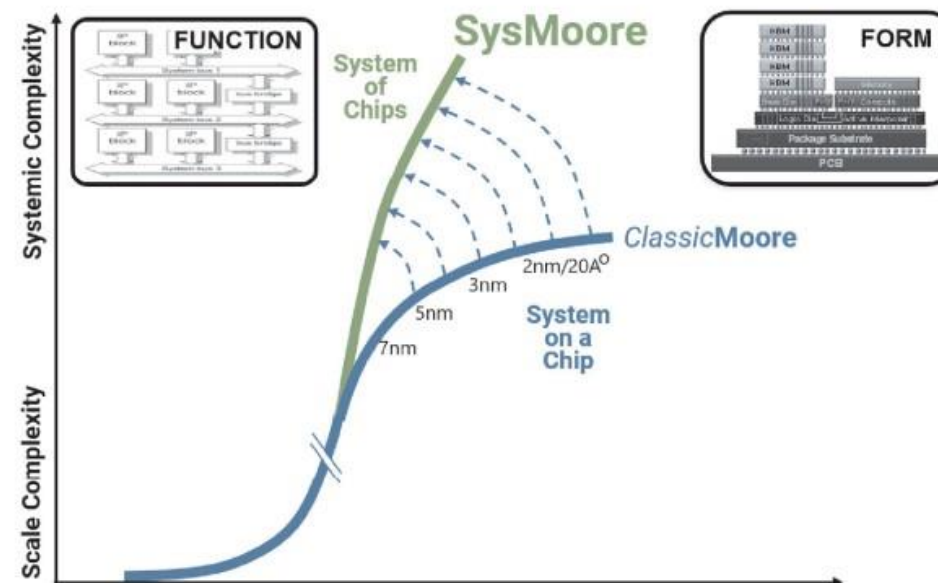
Moving towards system-of-chiplet

• Application trends

- ➔ More processing & data (AI, Security...)
- ➔ Reuse of legacy (ISA, IO interface...)
- ➔ More modularity & scalability (low to high end)

• System-of-chiplet enables Flexible, Faster and Cheaper designs with sovereignty.

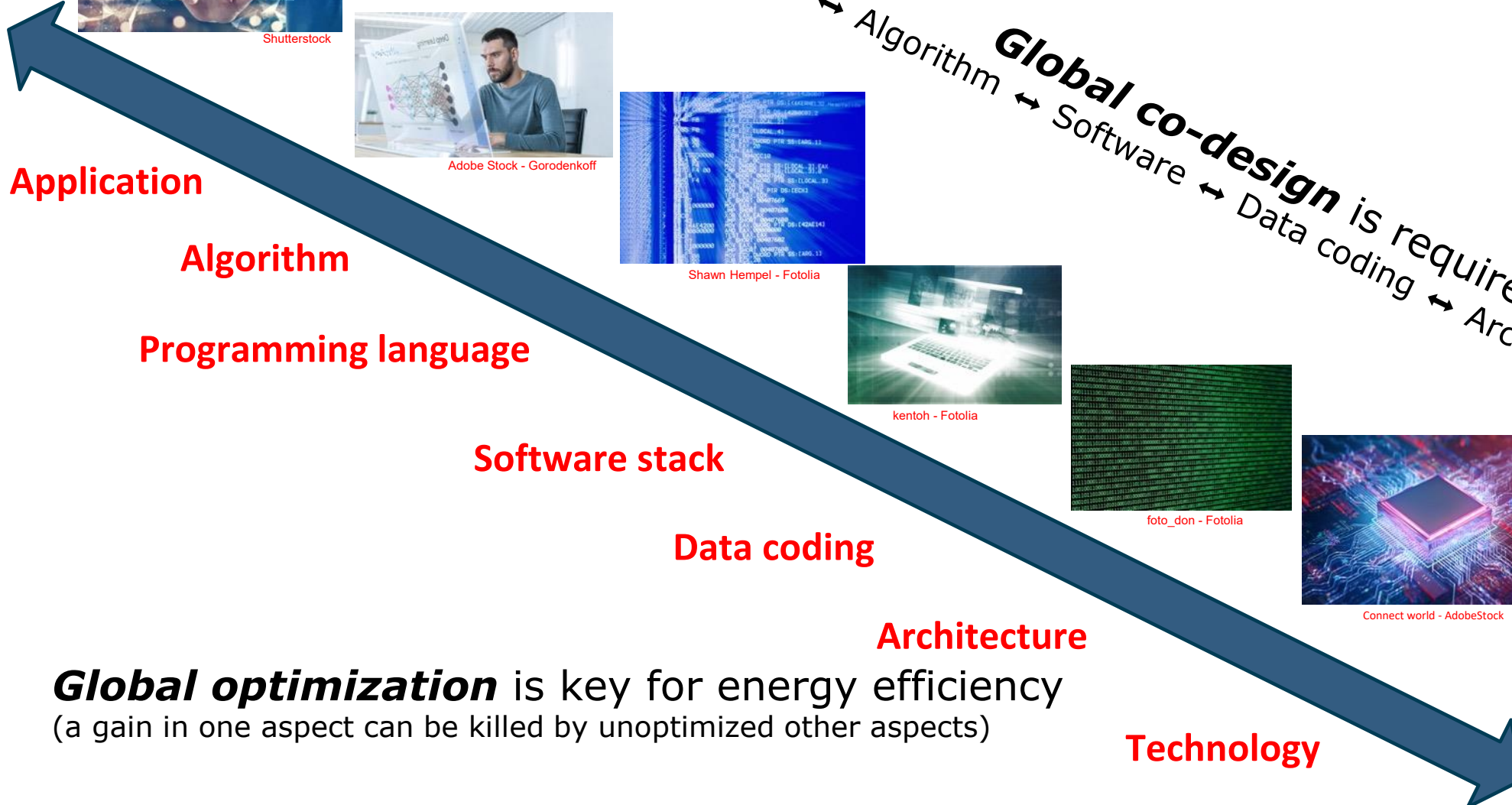
- ➔ Cost reduction (right silicon node per function)
- ➔ Enhanced customization (modularity)
- ➔ Enhanced integration of additional functionality (design & system scalability)
- ➔ Faster Time-to-Market (chiplet reuse)
- ➔ Reduced sourcing dependency



A HOLISTIC APPROACH IS NEEDED FOR EFFICIENCY

Application ↔ Algorithm ↔ Software ↔ Data coding ↔ Architecture ↔ Technology

Global co-design is required:



Shutterstock



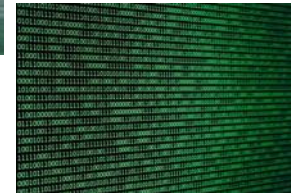
Adobe Stock - Gorodenkoff



Shawn Hempel - Fotolia



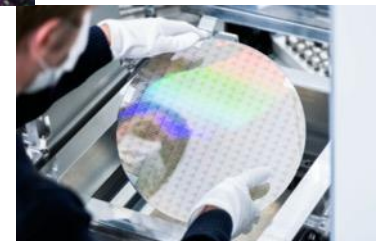
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Andréa AUBERT/CEA

Global optimization is key for energy efficiency
(a gain in one aspect can be killed by unoptimized other aspects)

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Thank You