High-Performance **E**dge **A**nd **C**loud Computing

Koen De Bosschere
HiPEAC coordinator

30 January, 2023

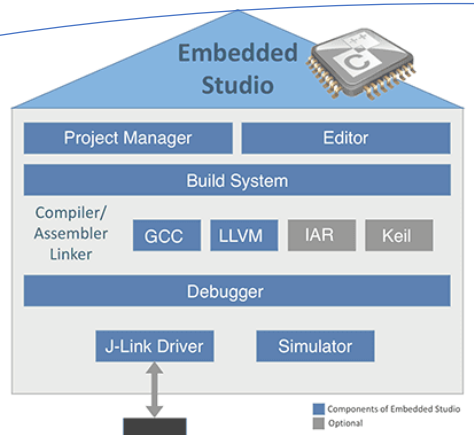
The HiPEAC project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 871174

What is the HiPEAC community?

Applications

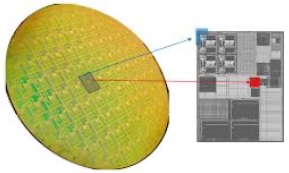
Industry Energy Mobility Health Digital Society Agrifood ....

HiPEAC



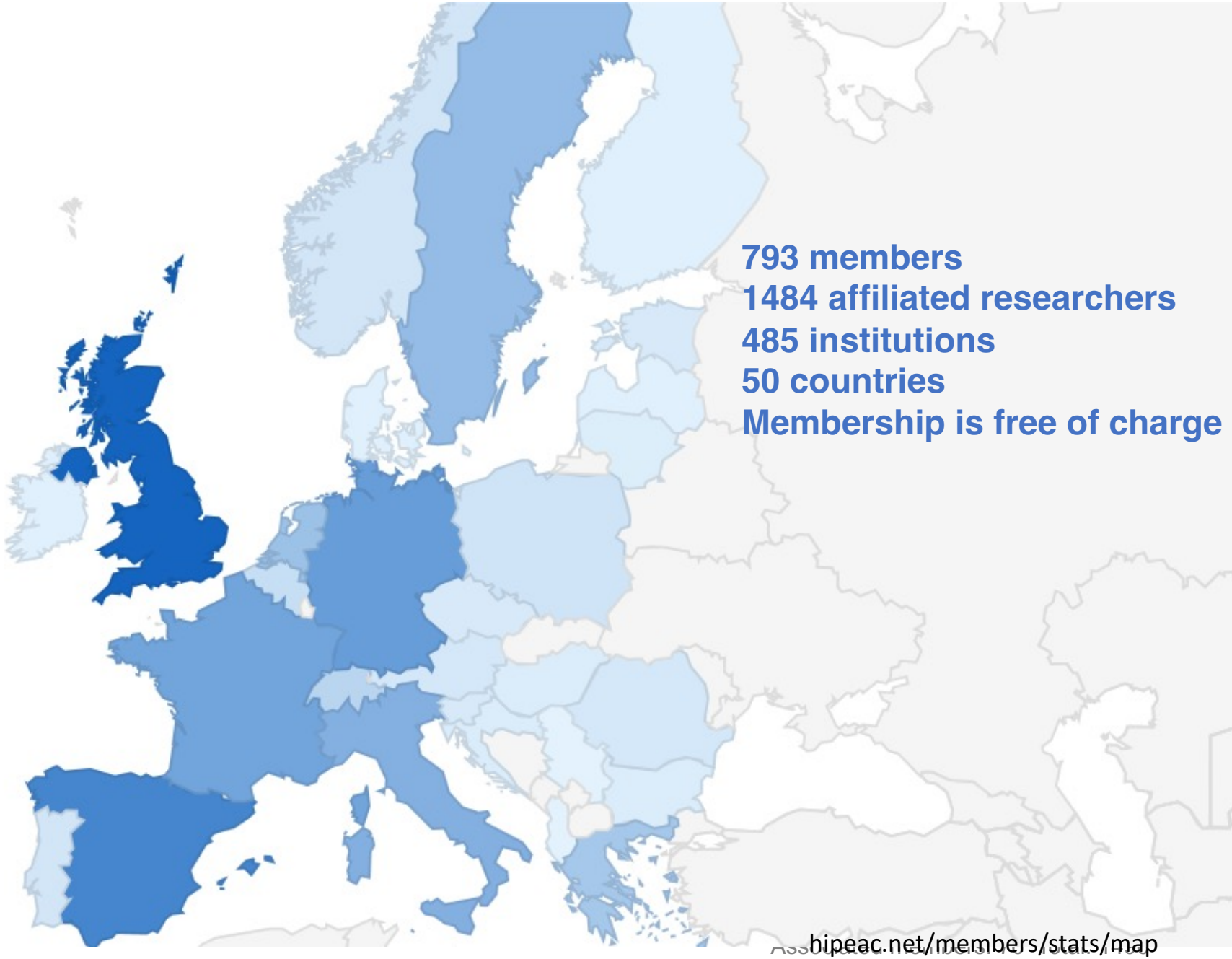
European Processor Initiative

Technology



Process Technologies
Equipment, Materials and Manufacturing

Membership



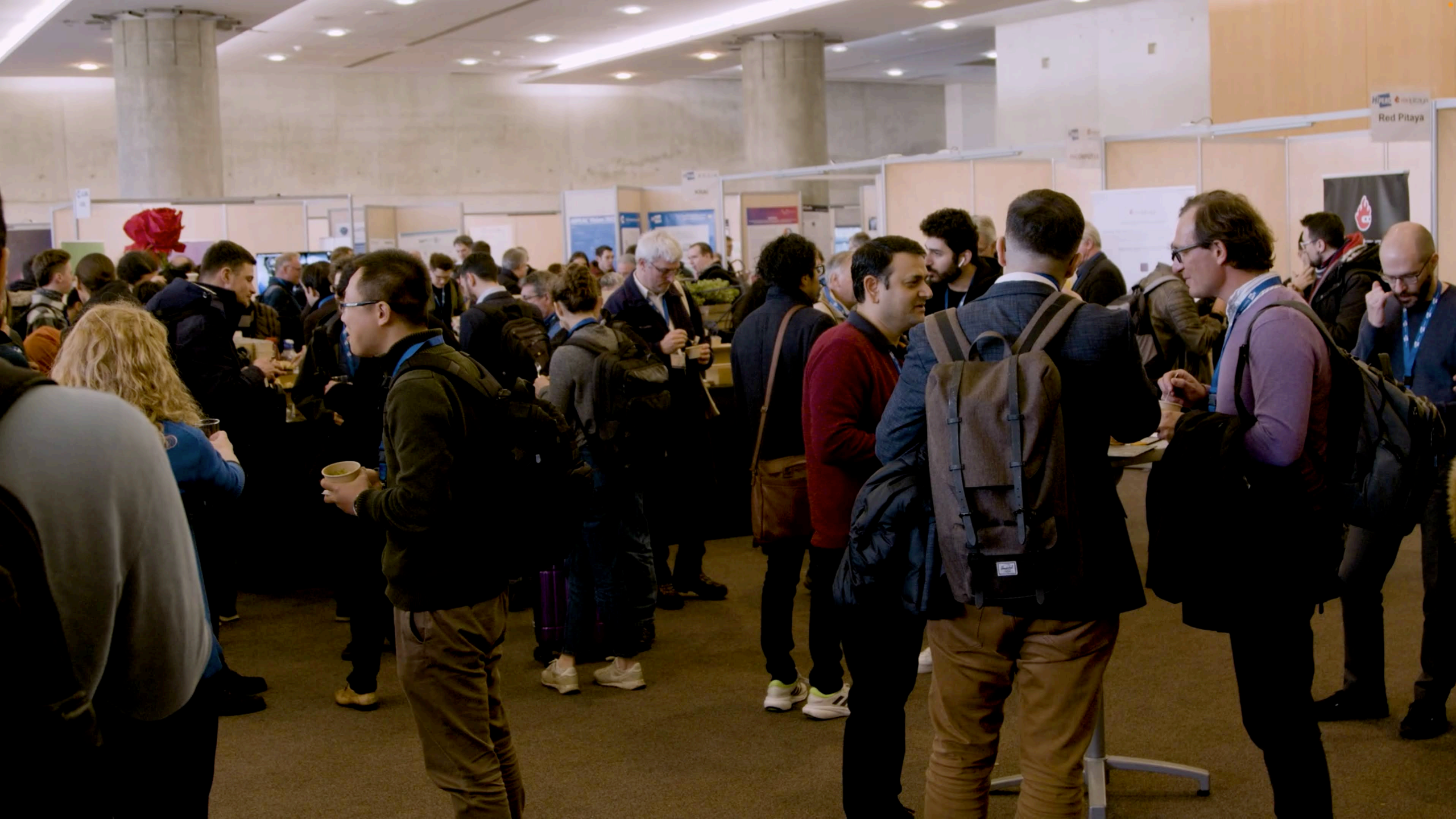
793 members
1484 affiliated researchers
485 institutions
50 countries
Membership is free of charge

hipeac.net/members/stats/map

Objectives

- Ecosystem building through networking
- Advancing research through roadmapping
- Stimulating innovation through value network creation
- Collaboration through partnership coordination
- Policy development
- Effective Dissemination

HiPEAC conference


Red Pitaya

July 10 - 16, 2022 12 courses

18th International Summer School on Advanced Computer Architecture and Compilation for High-performance Embedded Systems

Computer performance has increased by over 1,000-fold in the past three decades. This astonishing growth has fuelled major innovations across all aspects of society. New advances in drug discovery and diagnosis, product design and manufacturing, transportation and energy, scientific and environmental modelling, social networking and entertainment, financial analysis, all depend on continued increases in computer system performance. Computing systems are so fundamental to today's society that they represent a basic resource, and form a strategic foundation for many of our most powerful and

CHAIR

Koen De Bosschere
Ghent University, Belgium

STEERING COMMITTEE

Ad Ten Berg
Inside Industry Association, Netherlands

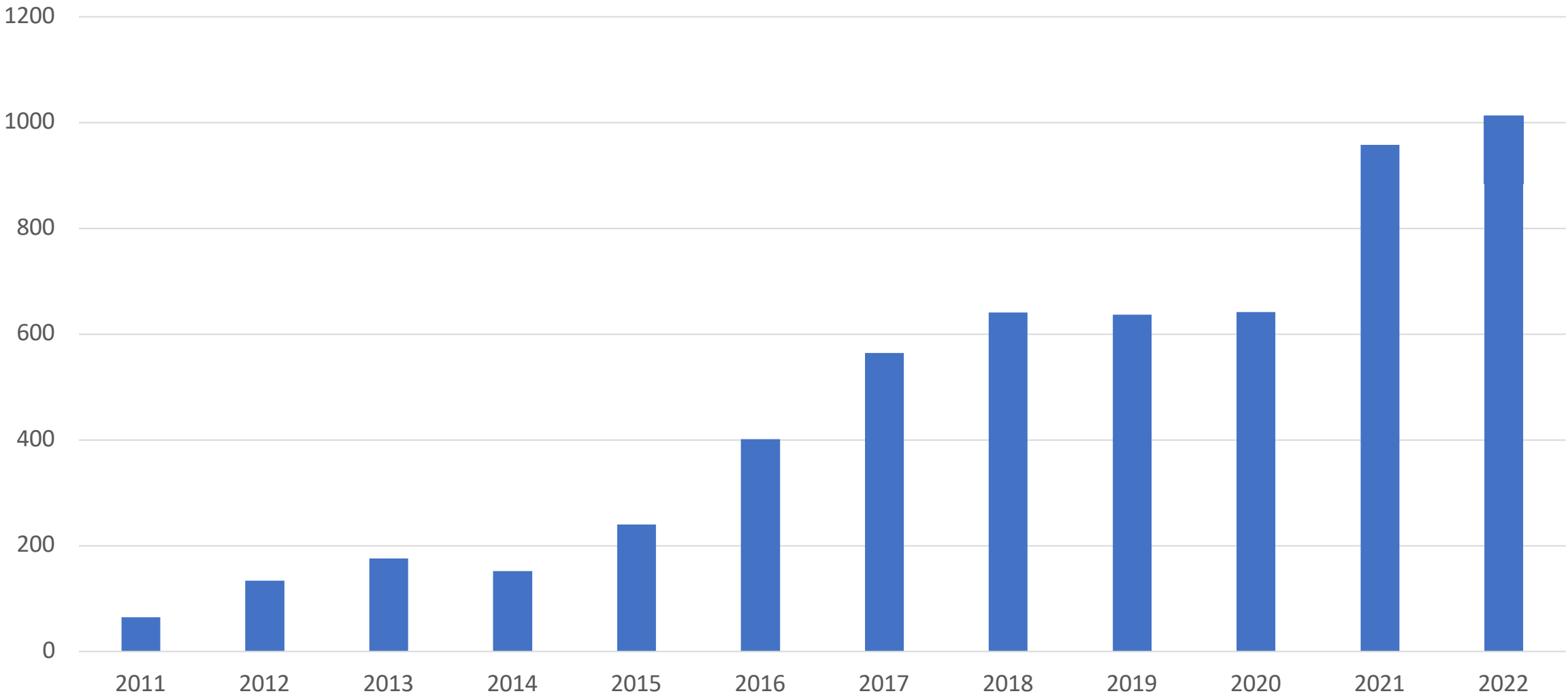
Andrea Kells
Arm, United Kingdom

Angelos Bilas
Foundation for Research & Technology - Hellas, Greece

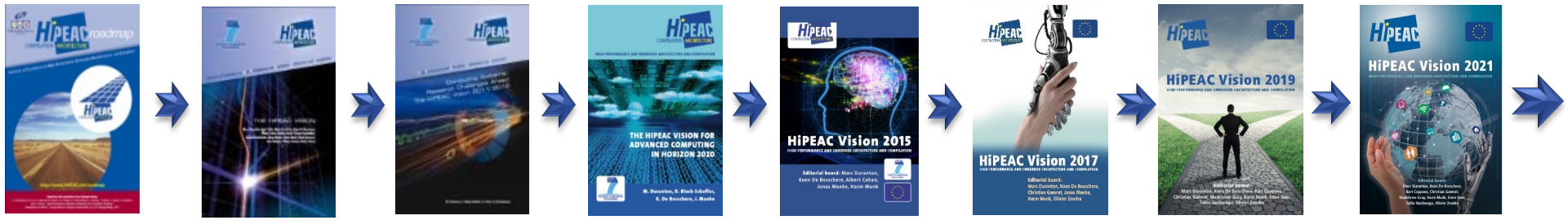
Charles Robinson
Thales Research and Technology, France


HiPEAC jobs
The online job portal for high-performance and embedded computing opportunities in Europe

HiPEAC Jobs


1200
1000
800
600
400
200
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

The ***HiPEAC Vision*** shows the trends, technology evolutions and limitations and position of Europe in the domain of computing (hardware and software) and provides recommendations to the HiPEAC community-at-large



2008 2009 2011 2013 2015 2017 2019 2021

2023

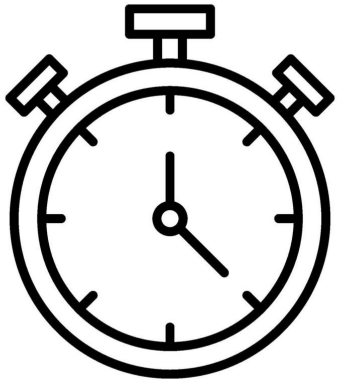
January 2023 version is available at:

http://hipeac.net/vision

HiPEAC Vision 2023

The general theme of the vision 2023 is that we are in races

- **Against time**
  - Because of external constraints – e.g. global warming
  - Because evolution of technology is very fast (e.g. AI)
- **Against the rest of the world**
  - On multiple aspects (economy, reducing dependances, ethics, …)



Collaboration between the European Commission and the US NSF

Fundamental advancements in programming, coordination, and intelligence across the computing continuum

Collaboration between European Commission and US NSF on fundamental research on new concepts for distributed computing and swarm intelligence

Themes: Cross-Atlantic Research Perspectives | 1. Next-Generation IoT, Research and Cross-Atlantic Cooperation

What: Keynote

When: 5:15 PM, Tuesday 21 Jun 2022 (1 hour 15 minutes)

Where: Croke Park Conference Centre - Hogan Mezzanine 1

How: You must be logged in to see the requirements for this session. Log In

Max Lemke
Moderator
European Commission
Head of Unit for Internet of Things in Directorate General CONNECT

Marc Duranton
Speaker
CEA (French Alternative Energies and Atomic Energy Commission)
International Expert

Gurdip Singh
Speaker
National Science Foundation
Division Director for Computer and Network Systems in the CISE Directorate

Jason Hallstrom
Speaker
Florida Atlantic University'
Executive Director of the Institute for Sensing and Embedded Network Systems Engineering (I-SENSE)

My Schedule

Add to My Schedule as Favorite

Send feedback

0 0

Send feedback to the event organizer

US-EU Workshop
14-15 November, 2022

Objective: The European Commission and the U.S. National Science Foundation seek to **catalyze long-term research collaborations** that draw upon **complementary expertise from the European and American computer and network systems research communities** to enable robust systems that operate across the computing continuum.

- **Day 1: Technical Directions:** *Monday, November 14th*
  5:00pm-8:00pm CET

- **Day 2: Collaboration Planning:** *Wednesday, November 16*
  5:00pm-8:00pm CET

The next computing paradigm will emerge from the convergence of computing across the continuum, systems working for both the cyber and physical world, "natural" programming and orchestration, and Everything-as-a-Service. To enable this paradigm, we need high-level programming and reasoning abstractions; mechanisms for discovering properties, services, and devices; and interoperability among them, all united by self-organizing and trustworthy orchestration mechanisms. The European Union and the United States will play important roles in addressing these challenges, and an active research collaboration will boost the effectiveness, and drive the convergence, of solutions.

EU/US White Paper on the Continuum of Computing

By TULLIO VARDANEGA, MARC DURANTON, JASON O. HALLSTROM, KOEN DE BOSSCHERE

Page 63-66 HiPEAC Vision
DOI: zenodo.org/record/7461800

A strategic research collaboration between the EU and the US is starting to enable seamless convergence across the computing continuum, spanning both the physical and cyber worlds. The collaboration represents a new expedition to tame the growing heterogeneity of computing platforms and services across the computing continuum, giving rise to a new computing paradigm.

The web has changed forever the ways in which applications are built and used. Applications are no longer a single piece of executable code deployed on a local computing device. Many modern applications are composed of multiple services published by different providers and executed over highly heterogeneous

This exciting vision of massively distributed cooperative computing across heterogeneous devices and networks is the foremost goal of this emerging collaboration between the EU and the US.

Key recommendations

- Sustain the EU-US joint collaboration in a manner that facilitates research initiatives to address the challenges of robust computing across the continuum.
- Promote the definition and demonstration of unifying specification and programming abstractions for heterogeneous computing across the continuum, capable of addressing functional and non-functional concerns, including performance, privacy, security, energy and emissions.
- Investigate ways to take artificial intelligence (AI) to the edge so that AI engines can assist service provisioning, migration, orchestration and multi-objective optimization of personalized compute services across the continuum.

Possible directions presented at the workshop

- Unifying specification and programming language abstractions for heterogeneous systems operating across the compute continuum, including support for both functional and non-functional concerns (e.g., declarative privacy constraints).
- Operating system, middleware, and runtime services for executing across the compute continuum.
- Resource disaggregation, federation, and scheduling across the compute continuum, including compute, memory, network, sensors, actuators.
- Collective perception of aggregate performance, resource utilization, and operating environment (e.g., differential energy costs).
- Specification-based, resource-aware service discovery, provisioning, migration, and orchestration across the compute continuum.
- AI-assisted service provisioning, migration, and orchestration based on multi-objective optimization (e.g., performance, privacy, security, energy, emissions) – i.e., autonomous infrastructure and service management.
- Ensuring trust across the compute continuum, including novel attack models and corresponding security and privacy patterns – in the presence of dynamic provisioning and migration.

Thank you

Koen.DeBosschere@ugent.be

@hipeac

hipeac.net/linkedin

www.hipeac.net