HIPEAC
Benefits for Industry

Koen De Bosschere
HiPEAC coordinator

Ghent University

14 February, 2018

This project has received funding from the European Union's Horizon2020 research and innovation programme under grant agreement no. 687698

HiPEAC – 14 years of successful networking

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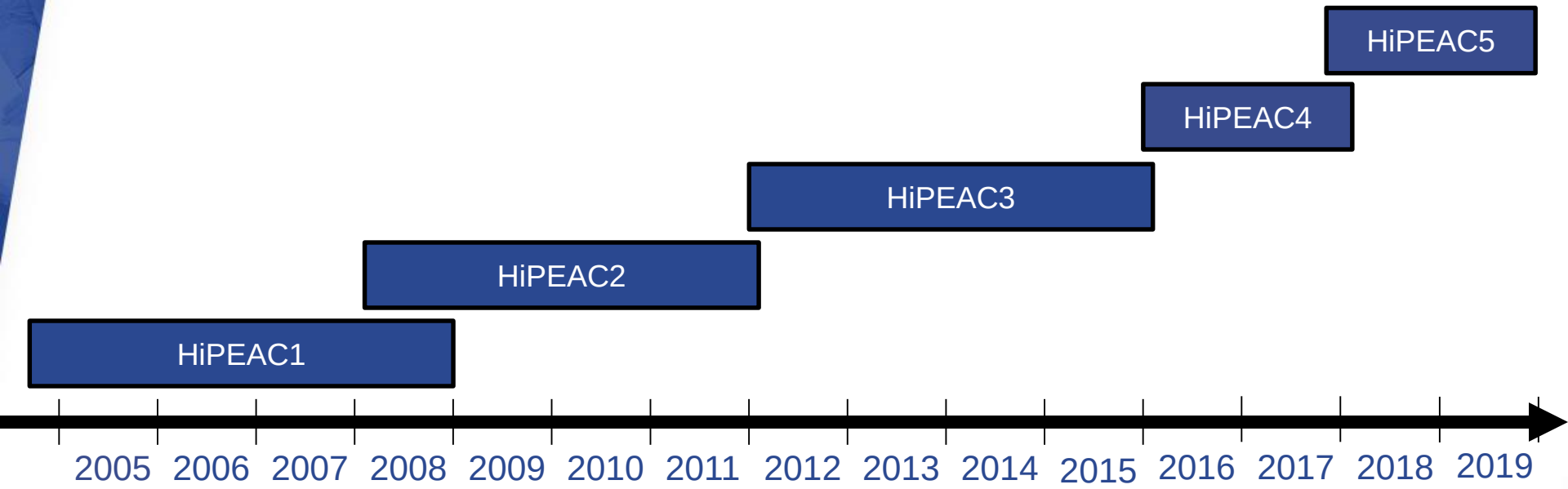
HiPEAC
=
High-**P**erformance and **E**mbedded **A**rchitecture and **C**ompilation

HiPEAC's mission is to steer and increase the European research in the area of high-performance and embedded computing systems,

and stimulate cooperation between
a) academia and industry and
b) computer architects and tool builders.

HiPEAC history



FORTH
INSTITUTE OF COMPUTER SCIENCE

informatiques mathématiques Inria

IN SUPREMÆ DIGNITATIS 1343
UNIVERSITÀ DI PISA

THE UNIVERSITY OF EDINBURGH

ARTEMIS

UNIVERSITEIT GENT

CHALMERS

BSC Barcelona Supercomputing Center
Centro Nacional de Supercomputación

RWTH AACHEN
RHEINISCH-WESTFÄLISCHE TECHNISCHE HOCHSCHULE AACHEN

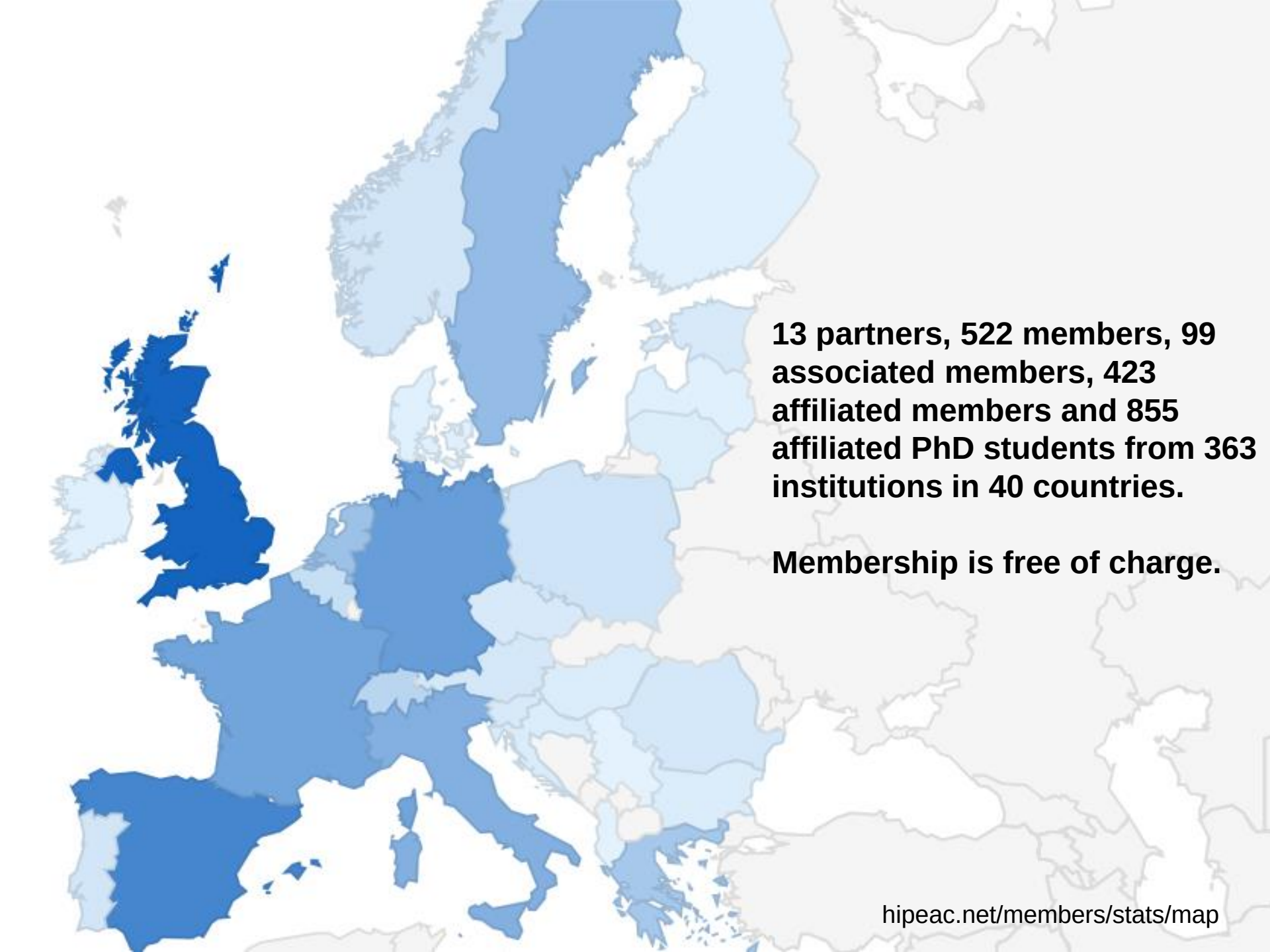
HiPEAC
COMPILATION ARCHITECTURE

FROM RESEARCH TO INDUSTRY
cea tech

THALES

ARM

innovalia ASSOCIATION

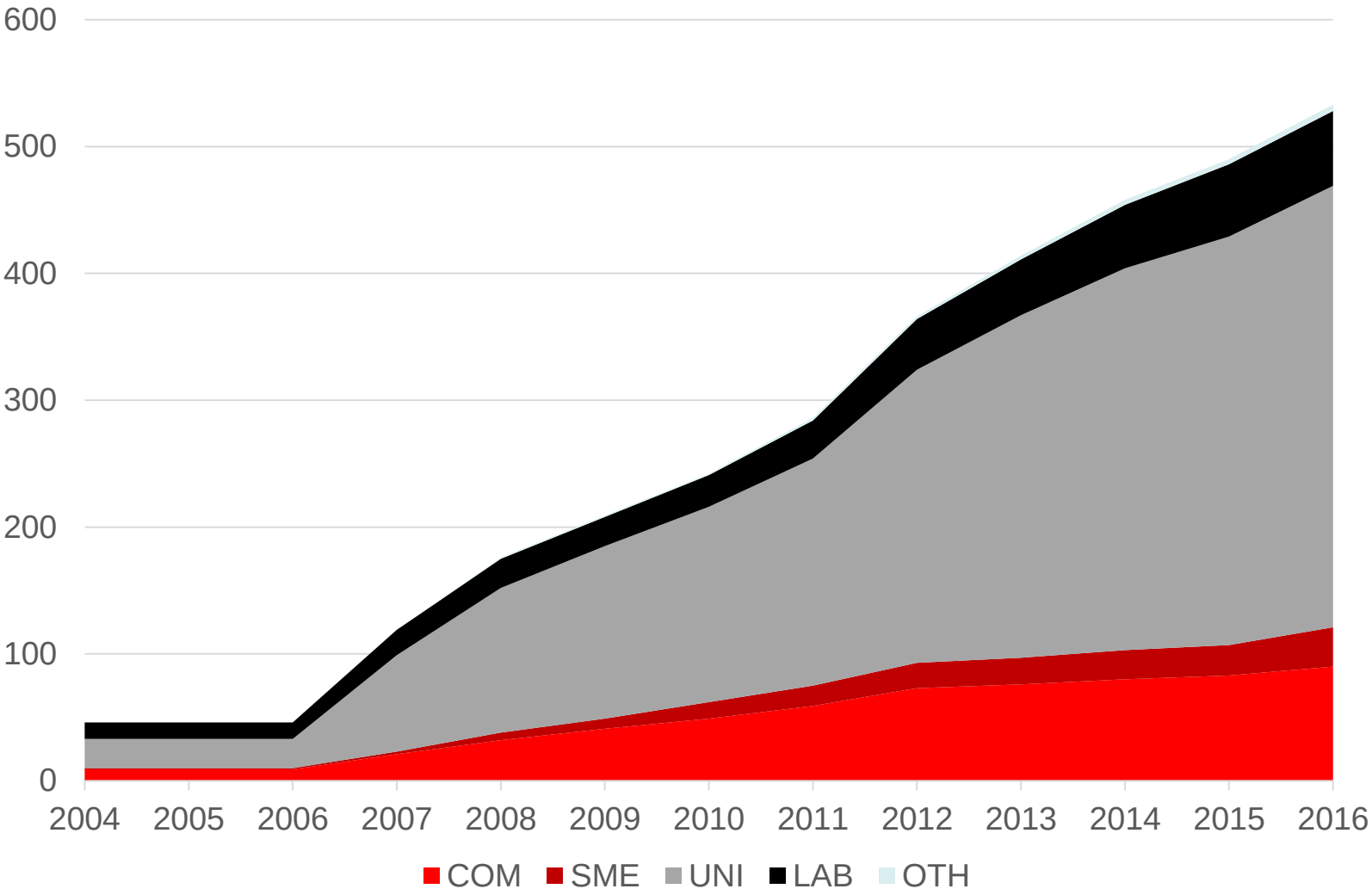


13 partners, 522 members, 99 associated members, 423 affiliated members and 855 affiliated PhD students from 363 institutions in 40 countries.

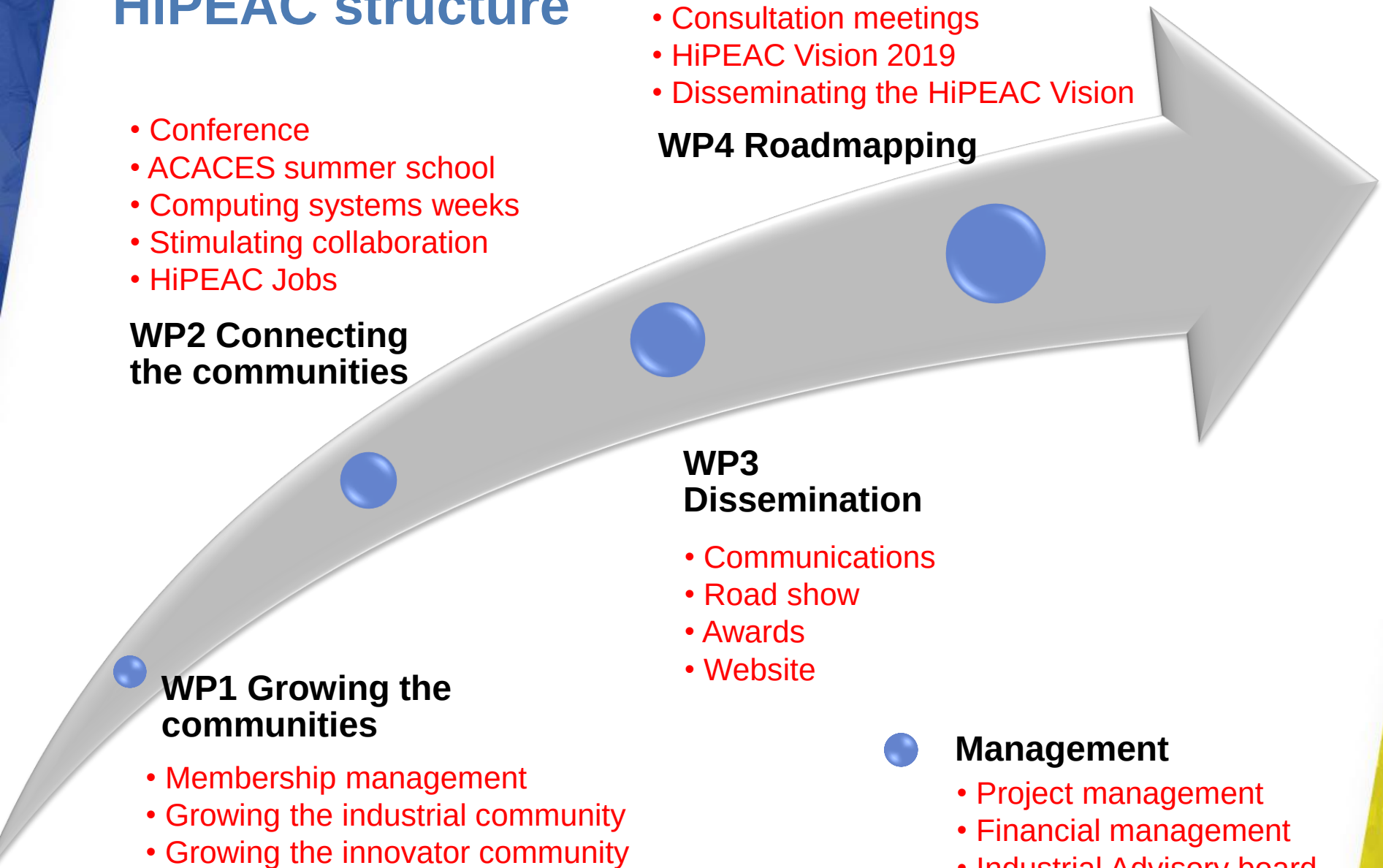
Membership is free of charge.

hipeac.net/members/stats/map

Membership evolution per type



HiPEAC structure



- Consultation meetings
- HiPEAC Vision 2019
- Disseminating the HiPEAC Vision

WP4 Roadmapping

- Conference
- ACACES summer school
- Computing systems weeks
- Stimulating collaboration
- HiPEAC Jobs

WP2 Connecting the communities

WP3 Dissemination

- Communications
- Road show
- Awards
- Website

WP1 Growing the communities

- Membership management
- Growing the industrial community
- Growing the innovator community
- Growing the stakeholder community
- Growing the new member states membership

Management

- Project management
- Financial management
- Industrial Advisory board

#HiPEAC18

January 22-24, 2018, Manchester, United Kingdom

Log in + JOIN

Programme | Paper track | Keynotes | Venue and travel | Recruitment | Sponsorship | Attendees | #HiPEAC18

arm DeepMind Google SAMSUNG AXIOM

Polly Labs Atos BARCO $\frac{d\vec{v}}{dt}$ Embedded Computing Specialists

KALEAO Springer SUNDANCE SYSGO EMBEDDING INNOVATIONS THALES

Think Silicon

motiv
PRODUCTIONS
CREW

KALEAO
WEB SCALE
TRUE CONVERGED
SOLUTIONS
Introducing the KMAX
Server and Appliances
Demonstrating 10x the compute
density at a quarter the power
at a fraction of the capex
commodity server solutio
Results: Server performance, Rich Wordpress Site
Wordpress throughput
SAMSUNG
KMAX

Digital Single Market
DSM mid-term review:
what are the priorities?
digital skills
digitising industry and services
High Performance Computing
artificial intelligence
modernising public serv
health and care

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

SUMMER SCHOOL ACACES 2017

Home | Program | Course info | General Info | Poster session | Industry | • Registration •

Thirteenth International Summer School on Advanced Computer Architecture and Compilation for High-Performance and Embedded Systems

9-15 July 2017, Fiuggi, Italy

Early registration deadline
March 31 2017

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 versatile tools and developments. Maintaining rapid growth in computing performance is key for tackling the societal challenges shaping Europe and assuring our global competitiveness in the future.

Slot 1

Moinuddin Qureshi
Advanced Topics in Memory Systems

Gernot Heiser
Operating systems for secure and safe embedded systems

Giacomo Indiveri
Neuromorphic Electronic Circuits for Compact Low-Power Real-Time Neural Processing Systems

Slot 2

Michael Hübner
Reconfigurable Hardware, Tools and Applications

Rosa Badia
Application programming on parallel/distributed computing platforms

Koen Bertels and Carmen G. Almudever
Quantum computing: from circuit to architecture

Slot 3

Tushar Krishna
High-Performance On-Chip Interconnects for Emerging SoCs

Mike Ferdman
Cloud Computing

Mohit Tiwari
Composable primitives for systems security

Slot 4

Jan Reineke
Design and Analysis of Time-Critical Systems

Fernando Pereira
Compilation

Colin Adams
Technology Innovation and Entrepreneurship

Computing Systems weeks

HiPEAC European Network on High Performance and Embedded Architecture and Compilation

kdbosche

Activities | Mobility | Research | Jobs | Industry | The Network | Publications | Press room

CSW Stuttgart, October 25-27, 2017

About | Programme | Venues & Accommodation | Attendees

Registrations are now open! Click here to register or update your registration.

HiPEAC COMPILATION ARCHITECTURE

HiPEAC Jobs

Find your ideal computing job in Europe. There are currently **145 open positions**!

+ ADD JOB / INTERNSHIP

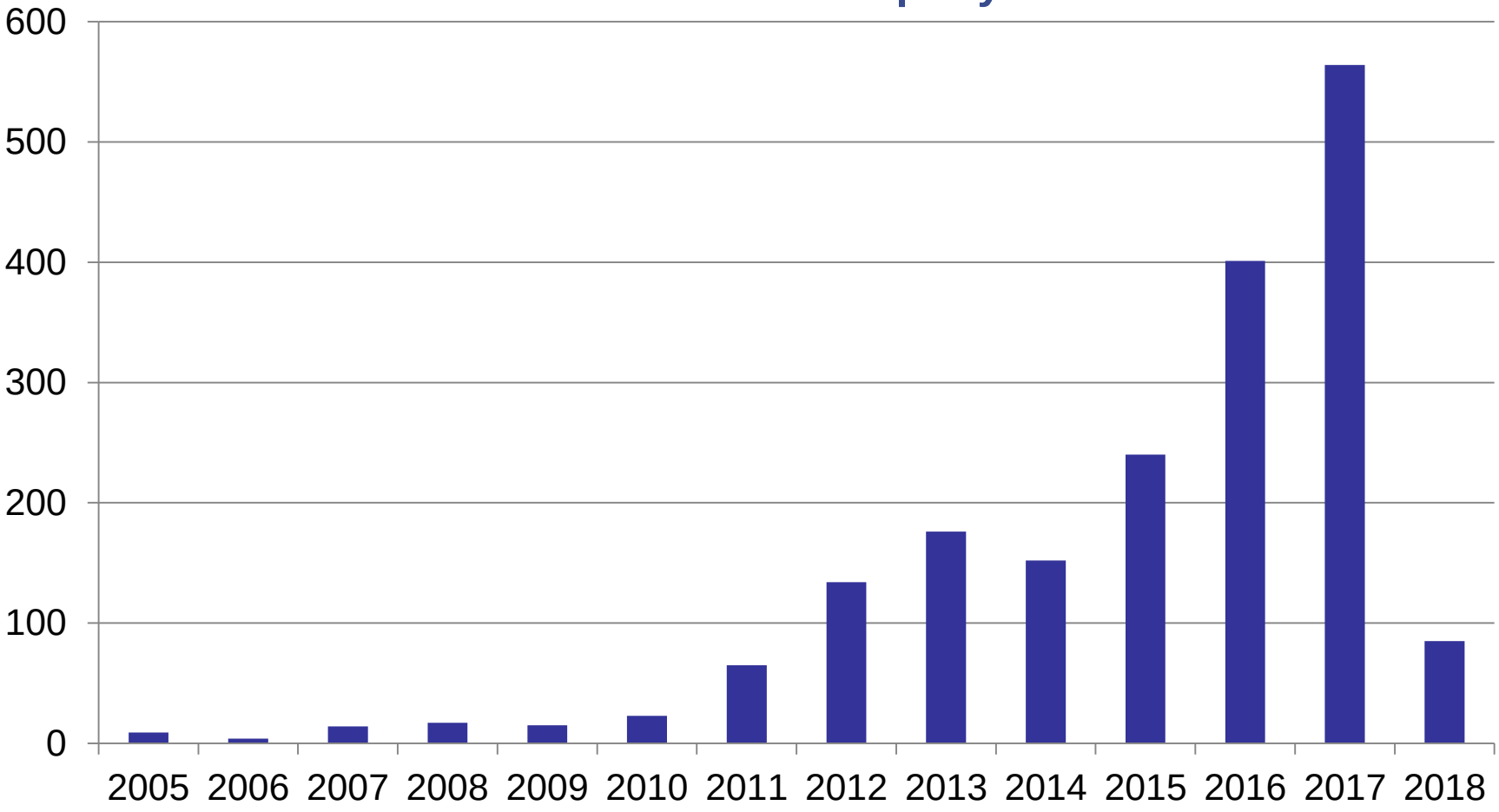
or manage **my job posts**

Job Country Career level Institution

Core skills

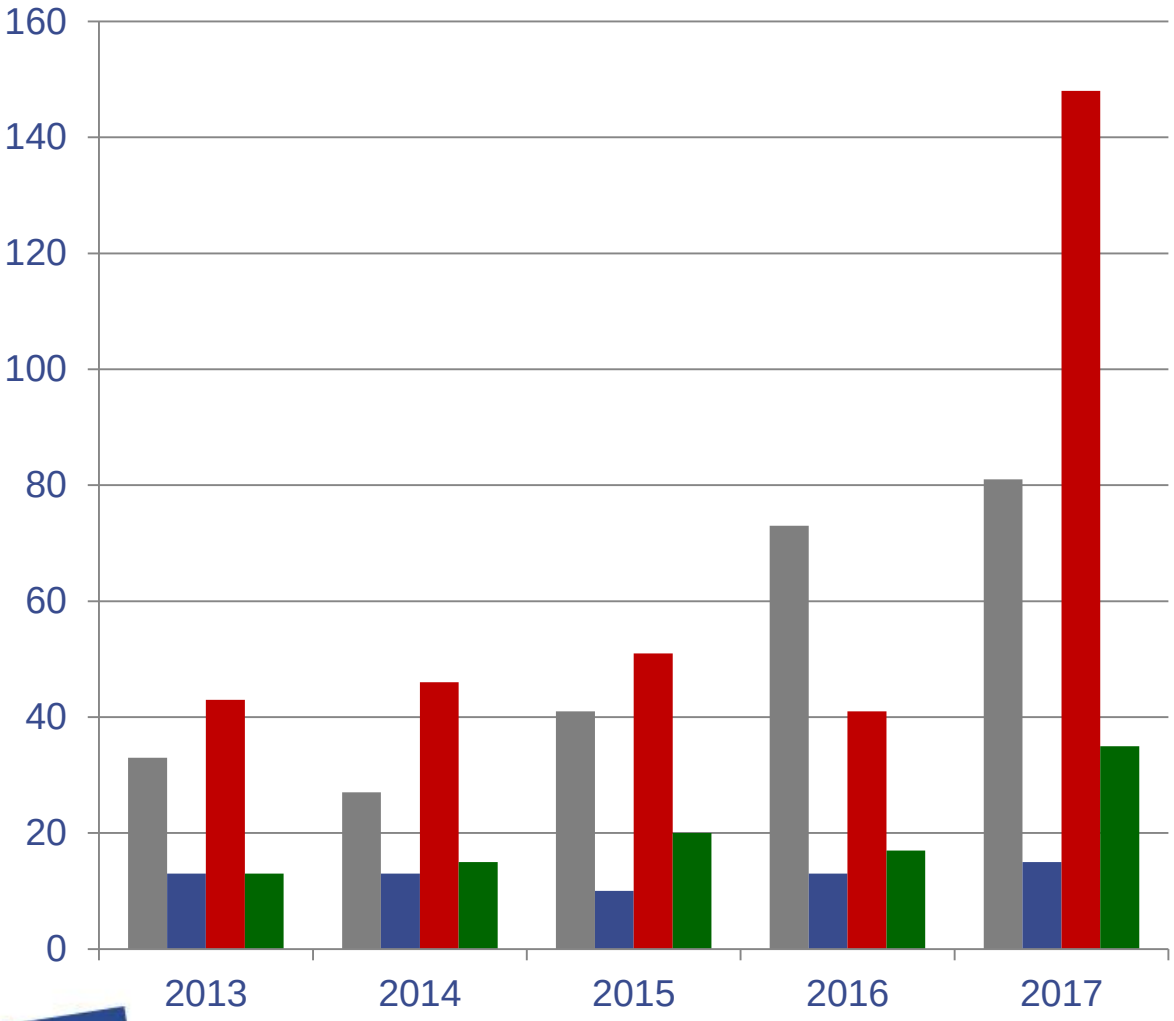
Approximate Computing | Architecture | Compilation | Design Space Exploration | Disruptive Technologies | Embedded / Cyber-Physical Systems | Energy Efficiency | GPUs / Heterogeneous Systems | HPC / Exascale | Machine Learning | Memory | Multicore / Manycore | Networking | Parallel Computing | Reconfigurable Computing | Runtime Performance | Safety and Security | Scheduling / Virtualization | Simulation | Systems Software | Other

Total Number of Jobs per year



Xavi Salazar, recruitment officer

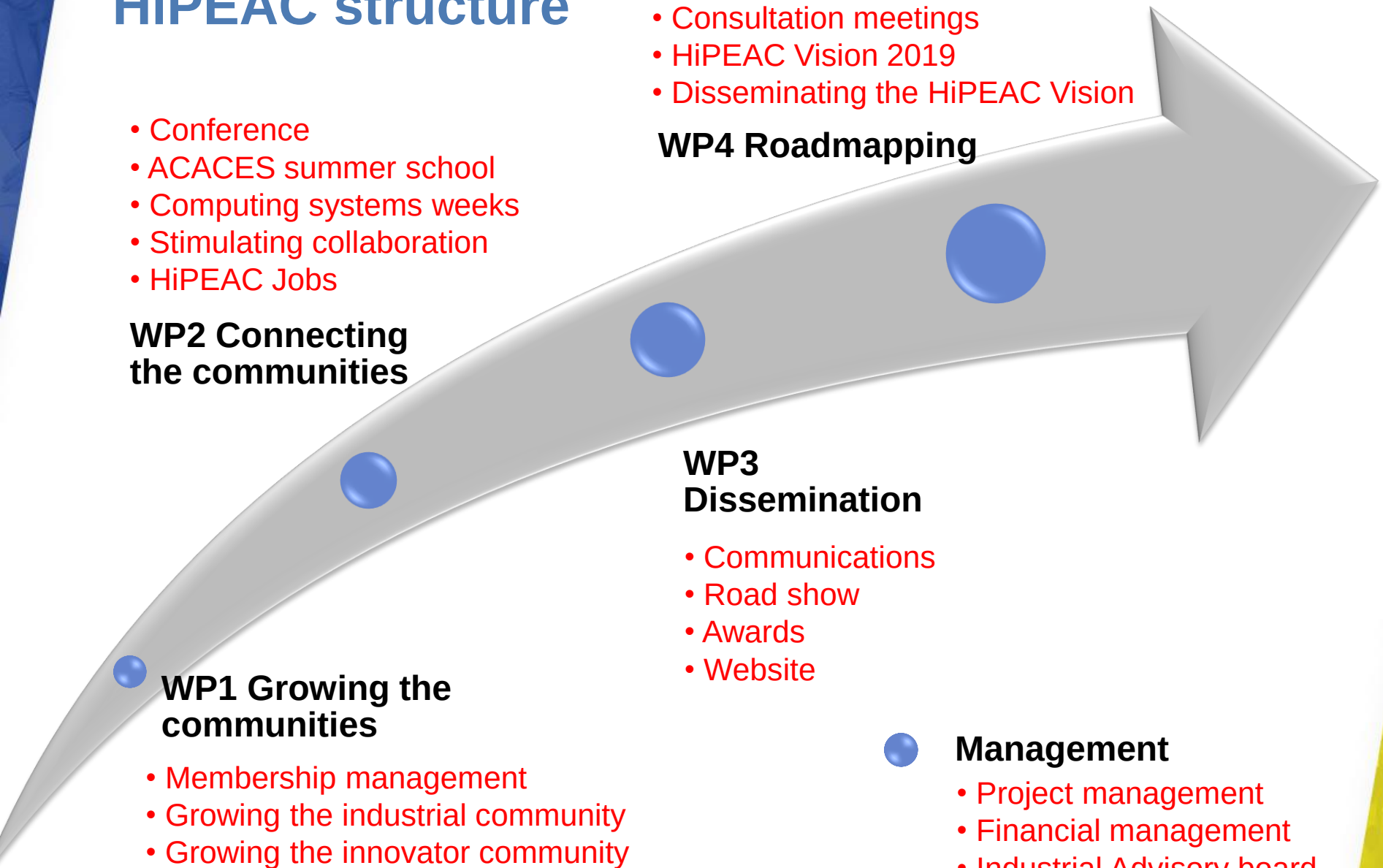
Industrial internships



Internship Grants

- Number of submitted positions
- Number of companies participating
- Number of applications
- Number of grantees

HiPEAC structure



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A single-board computer made in Europe

Cyber-physical systems meet supercomputing

In April, we saw another indicator of the booming popularity of the DIY electronics scene, when the Kickstarter campaign for the UDOO X86 board smashed its €100,000 target overnight. Thanks to the EU-funded AXIOM (www.axiom-project.eu) and Mont-Blanc (www.montblanc-project.eu) projects, a new and improved version of Barcelona Supercomputing Center's OmpSs parallel programming model can be run on a cluster of UDOO X86, allowing hobbyists and professionals to craft their own supercomputer. The AXIOM team aims to create a single-board computer – a complete computer comprising microprocessor(s), memory, input/output and other features on one circuit board – which is designed and manufactured in Europe.

HiPEAC caught up with UDOO co-founder Maurizio Caporali (MC) of the University of Siena and Xavier Martorell (XM) of Barcelona Supercomputing Center to find out more.

What's so special about this new board?

MC: UDOO X86 is a unique single-board computer: it's both the world's most powerful maker board and a fully fledged Arduino 101. As a computer, UDOO X86 is a quantum leap forward compared to regular single-board computers for makers, and its performance is comparable to most notebooks. It can drive up to three 4k screens – that is, screens with a horizontal resolution of around 4,000 pixels – simultaneously and runs Windows (including Windows 10), Android and Linux. It is 10 times more powerful than the Raspberry Pi 3. Despite this incredible power, its Intel Quad Core 14nm 64-bit processors consume as little as 5-6W in energy, depending on the UDOO X86 model.

UDOO X86 has the same pinout as an Arduino 101 and is 100% compatible with Arduino shields, sensors and actuators. It can even run the Arduino Integrated development environment directly from the main Intel quad core processor. The Arduino 101-compatible microcontroller is based on Intel Curie, which integrates 32-bit Quark SE system-on-chip, six-axis motion sensors and Bluetooth low energy. Last but not least, UDOO X86 is open source and open hardware.

UDOO X86: Vital statistics

- Processor up to 2.56GHz
- Up to 8GB of RAM
- Drives up to three 4K monitors simultaneously
- Completely Arduino 101 integrated
- Runs any X86 Linux distribution, Windows and Android
- Multiple options for mass storage
- Ability to start up processor through on-board microcontroller

Why are do-it-yourself (DIY) electronics so popular? What are the benefits of making things open source?

MC: Hardware is becoming less expensive year by year, and people have started realizing that they can build their own stuff instead of buying it. Recently there's also been more focus on STEAM (science, technology, engineering, arts and mathematics) fields. What we are witnessing is not just a bunch of hobbyists; it's a new industrial revolution, embodied by makers.

But there's an
it's a natural
have program
for those sam
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This is only p
thrives aroun
an open soun
way to get ma

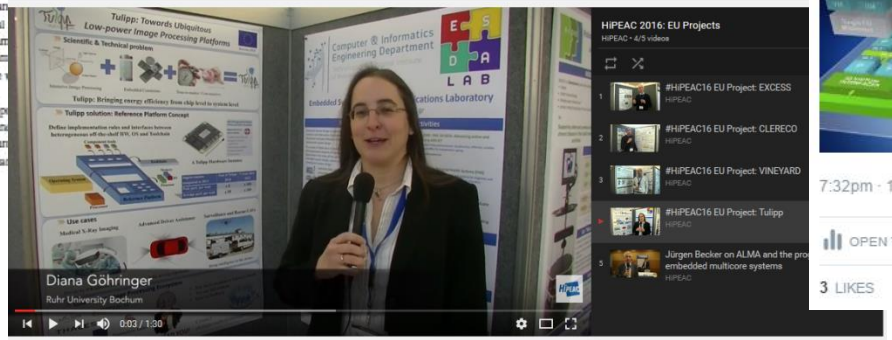
HiPEAC
@hipeac

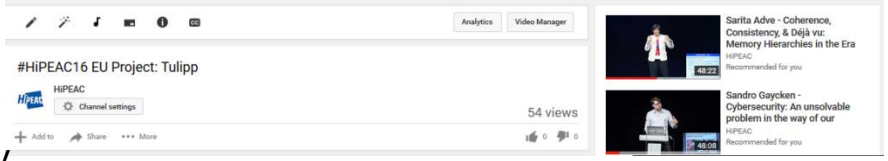
Take a look at EUROSERVER's film on 'Scale-out architecture for energy efficient servers & micro-servers' youtube.com/watch?v=2EnEKo…

7:32pm · 15 Feb 2017 · TweetDeck

OPEN TWITTER ANALYTICS

3 LIKES





Madeleine Gray

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Computing
Specialists
The expertise that secures
your project outcomes
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Video processing algorithms to boost edge and motion detection

August 08, 2016 // By Julien Happich 0 Comments

Researchers at the Czech Institute of Information Theory and Automation (UTIA) have demonstrated video processing algorithms for the Sundance EMC2 platform using the Xilinx system-on-chip (SDSoC) 2015.4 design environment.

Hardware accelerators used in the demonstration were found to achieve up to eight times faster edge detection and 50 times faster motion detection without a significant increase in power dissipation, hence significantly reducing energy consumption.

Three edge detection and three motion detection video processing designs were demonstrated on the Sundance EMC2 platform. The results for image processing will enhance embedded applications in security, medical imaging and unmanned vehicles.

HiPEAC COMPILATION ARCHITECTURE

HiPEAC news

Silexica reach German Entrepreneur Award finals

SILEXICA

Congratulations to Silexica, the RWTH Aachen University spin-off specializing in multicore software design automation, on being named one of three finalists for the German Entrepreneur Award 2017 in the StartUp category. At the time of going to press the winners had not been announced.

In April, the company released the latest version (2017.4) of its SLX Tool Suite. This release provides many new features to improve the efficiency of multicore programming and code distribution. These include:

- The SLX Parallelizer now has a powerful reconfigurable cache analyser that simulates cache behaviour and estimates usage statistics.
- The SLX Mapper has a new set of visualization capabilities providing deeper insights into application runtime behaviour of computed/simulated mappings.
- The SLX Generator now features added support for additional processor cores such as 32-bit ARMv7 and 64-bit ARMv8, as well as Linux-based Power-PC 32-bit and 64-bit processors.
- The SLX Automotive Development package is now available with the rest of the SLX tools.

silexica.com

Find out who was named German Entrepreneur 2017 on the awards website: www.deutscher-gruenderpreis.de/en

Silexica's Maximilian Odendahl and Johannes Emmerich

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Biting the hand that feeds IT

DATA CENTRE | SOFTWARE | SECURITY | TRANSFORMATION | DEVOPS | BUSINESS | PERSONAL TECH | SCIENCE | EMERGENT

Data Centre ▸ HPC

European Commission dangles €374m for low-power exascale research

Processors are going to be everywhere, so they shouldn't be energy hogs

14 Nov 2016 at 07:28, Richard Chirgwin

Europe is trying to plant a flag in future chip development, slinging money tow
low-power server silicon.

aboration, the European Commission p

oject, which looks to push more digitis
evelop better software development er

More like this

European Commis

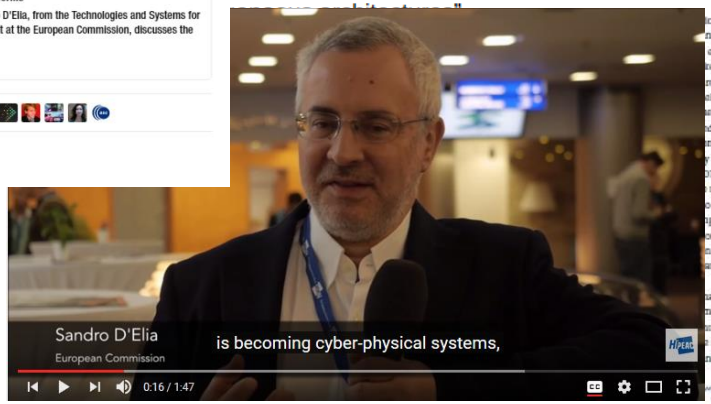
HiPEAC
@hipeac
Following

Video-What #digitalplatforms are needed to propel European industry into the future? @SandroDElia @DigIndEU explains

Sandro D'Elia on digital platforms
HiPEAC project officer Sandro D'Elia, from the Technologies and Systems for Digitising Industry department at the European Commission, discusses the digital ...
youtube.com

RETWEETS 5 LIKES 6

11:44 AM - 25 Jul 2016



Digitising Industry
@DigIndEU
Following

.@hipeac co-organizer of 2day event,is doing a great job in promoting #digitiseEU strategy and @DSMeu #dsm #digital

Policy Corner

The 2017 call for proposals is coming

The next call for proposals "ICT-05-2017: Customised and low energy computing" will open in December, with a new topic on processor hardware which will be of interest to the HiPEAC community.

A few words of introduction: the overall strategy of the European Commission is to support jobs, growth and investment through digital technologies. European companies are strong in industrial markets like avionics, health and automotive, and the relevant objective of the Horizon2020 Research and Innovation Programme is to develop the technologies that will be used in those sectors in the coming years.

...ical problem in these sectors is the ...nd complexity of software develop... especially because it is still difficult ...e efficient programs for recent sys... ...rchitectures (heterogeneous, highly ...el). For this reason, the first version ...e 2016-2017 Work Programme ...d only on software ("Programming ...nments and toolboxes for low ...y and highly parallel computing"). ...016 has seen a stronger policy focus ... technologies for digitizing industry, ...o it was possible to allocate extra ...g for hardware research: the EC will ...one project in the range of €6-10 ...n to start the development of next... ...ation high-performance processors.

...ain objective is to get a substantial ...measurable improvement over the ...e state of the art in energy/perfor... ...e ratio for high performance compu... ...nd server workloads. This is a step

towards the "exascale" performance of tomorrow's fastest supercomputers, but is also meant to support all the applications where high performance must be coupled with low energy consumption, and criteria like efficiency and space are relevant; in general, these are the requirements of many cyber-physical systems and of many applications requiring computing power also at the edge of the network.

The Work Programme text does not impose specific technical solutions: the only strict requirements are to improve significantly the energy/performance ratio compared to the state of the art, and to develop a design that can be manufactured in volume at a reasonable cost. We do not just want a computer design exercise, but something that will change the market in the coming years.

For this reason, the call text asks for a "working prototype". Developing and manufacturing an actual silicon chip is extremely expensive and the timescales are not compatible with those of an EU-funded project, so we do not specify what the prototype should be (actual chip, software simulator, hybrid hardware-software demonstrator or anything else): the important point is that the prototype should convince hardware experts that the objectives of the project have been achieved.

Here lies the challenge: the EU needs you to develop the computer chips of tomorrow. These are the chips which will drive your car, make your city's subway faster, monitor your health and maybe even foresee the exact time and location of the next earthquake before it strikes. If you are reading these lines in the HiPEAC Info newsletter, you are part of the community that can do it.

"Something that will change the market in the coming years"

MORE INFORMATION: bit.ly/ICT-05-2017

HiPEAC COMPILATION ARCHITECTURE

Tweets 2.446 | Volgend 598 | Volgers 1.254 | Vind-ik-leuks 527 | Lijsten 9 | Momenten 1

HiPEAC

@hipeac Volgt jou

European network bringing together the cream of the #HPC and #embedded architecture and compilation sector. CSA funded by #Horizon2020 / #H2020

Europe

hipeac.net

Geregistreerd in januari 2012

Tweeten naar | Bericht verz···

19 volgers die je kent

Tweets | Tweets en antwoorden | Media

Vastgemaakte Tweet

HiPEAC @hipeac · 16 aug.

Don't forget that you can get a free pass to #HiPEAC18 by posting a photo of your @hipeacjobs poster! More info: bit.ly/HiPEACJobs_pos...

ESIT @ESITatRUB

Excellent job offers @hipeacjobs with the link hipeac.net/jobs HiPEAC offers a #freepassHiPEAC18 for a visit of the summer school

Vertalen uit het Engels

1

HiPEAC @hipeac · 6 u

HiPEAC coordinator @kdbosche will be addressing the @exdci_eu final conference tomorrow at 11am hipeac.net/roadshow/event...

Wie te

Trends

#lavuelta

el tribuna

HiPEAC COMPILATION ARCHITECTURE

@hipeac

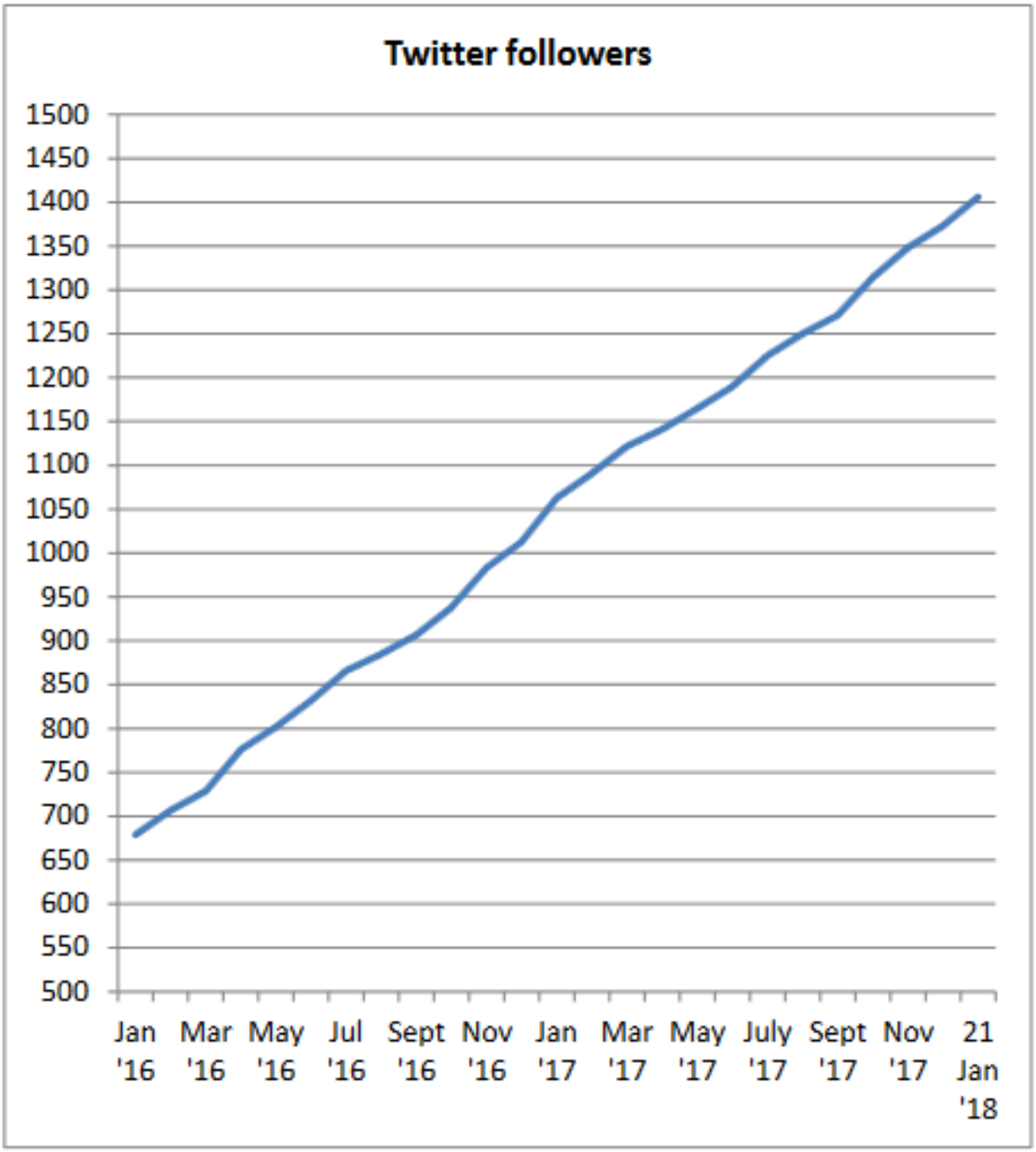
hipeac.net/linkedin

HiPEAC Retweeted

Digitising Industry @DigIndEU · Jan 29

Ahead of the upcoming #DigitiseEU Stakeholder Forum, @Alun_F shares @ECSEL_JU's views on the future of #industry40 & the need for EU collaboration: bit.ly/2DBHXgr #DEIforum

HiPEAC COMPILATION ARCHITECTURE



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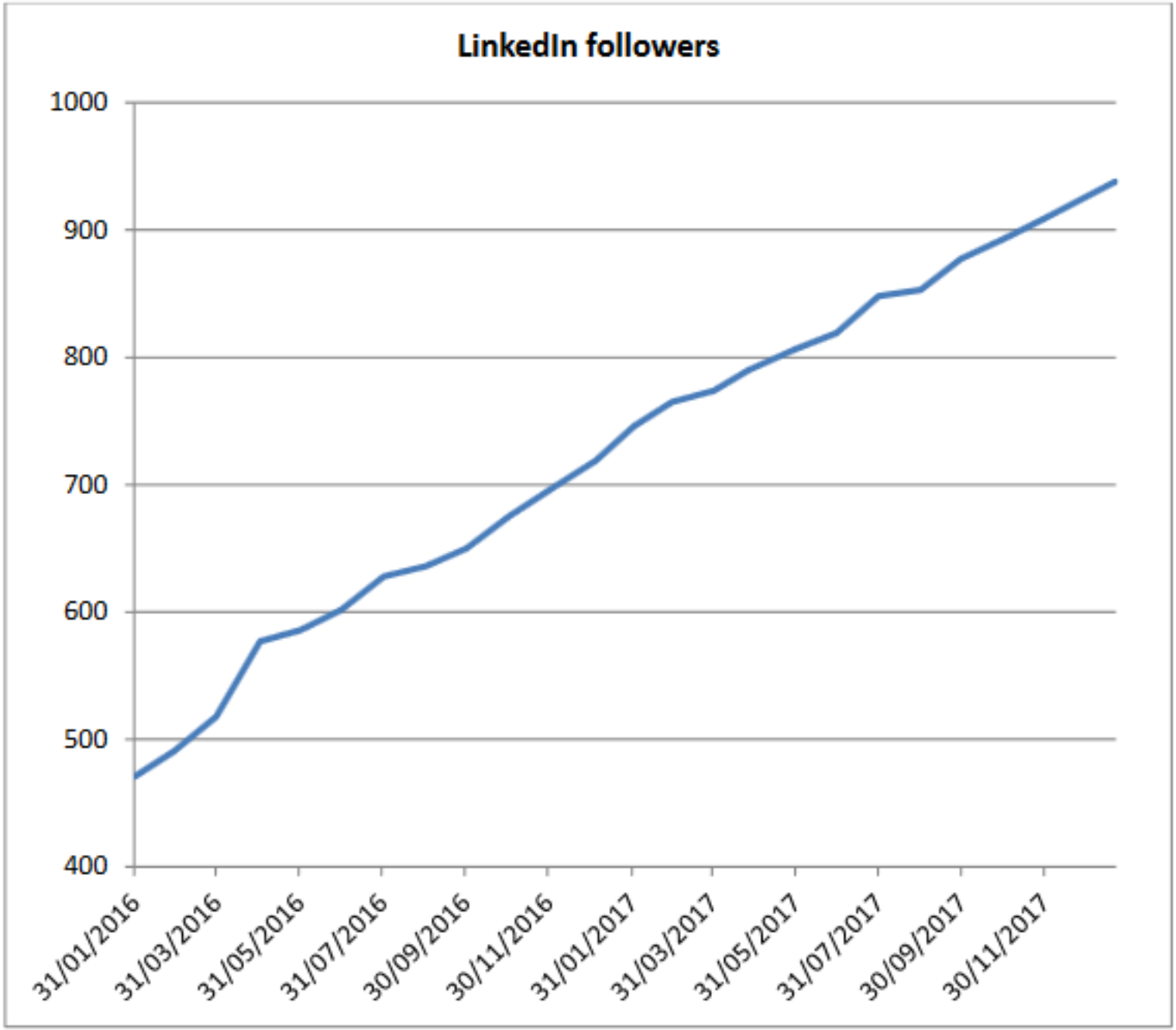
LinkedIn followers
1000
900
800
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31/01/2016
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30/09/2016
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31/01/2017
31/03/2017
31/05/2017
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30/09/2017
30/11/2017

The Steering Committee of the
HiPEAC Network of Excellence
has awarded a

HiPEAC Paper Award

for the paper

Clearing the Clouds: A Study of Emerging Workloads on Modern Hardware

by **M. Ferdman, A. Adileh, O. Kocberber, S. Volos, M. Alisafaee, D. Jevdjic, C. Kaynak, A.D. Popescu, A. Ailamaki and B. Falsafi**

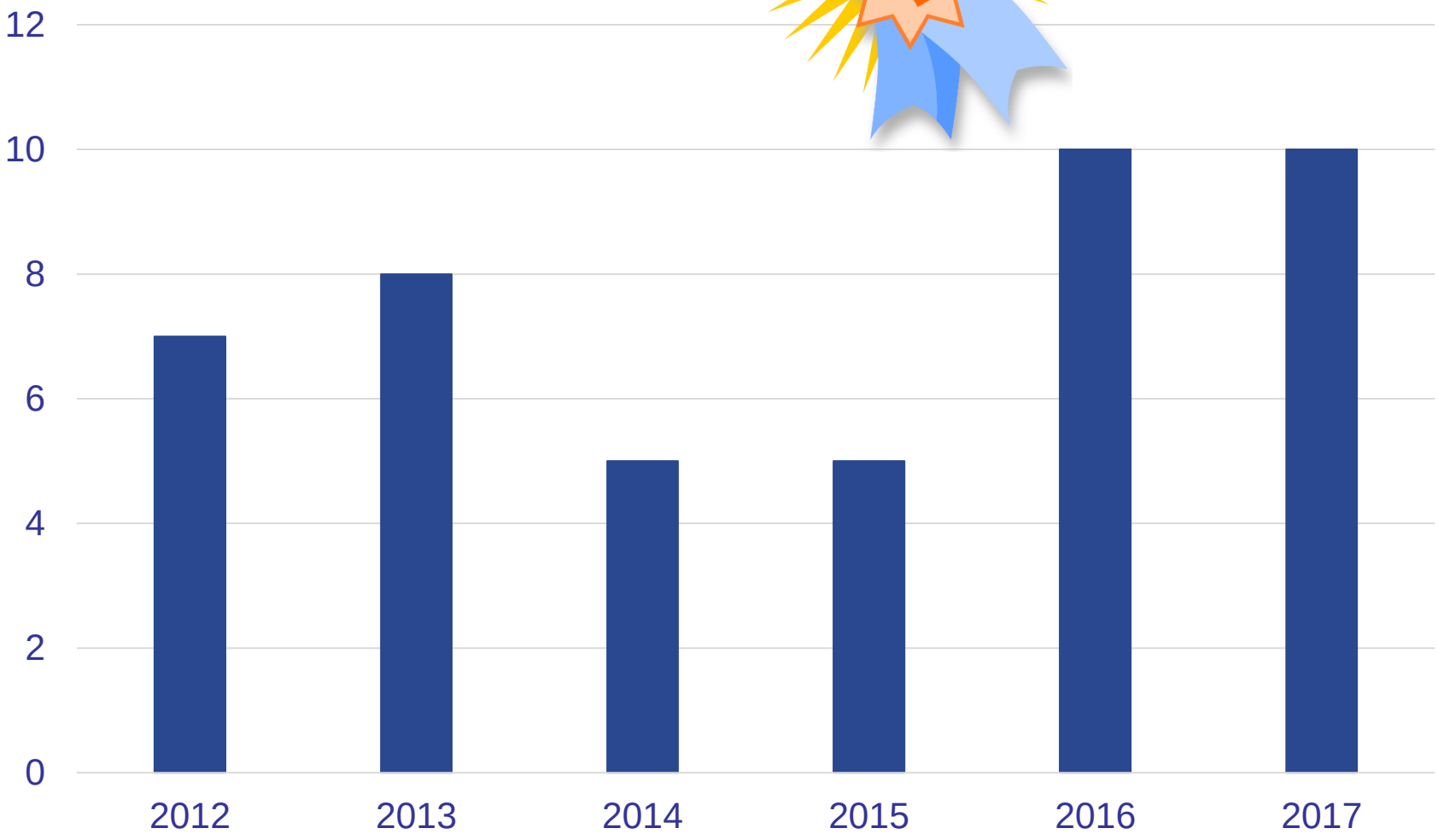
at **International Conference on Architectural Support for Programming Languages and Operating Systems**

The HiPEAC Award Coordinator

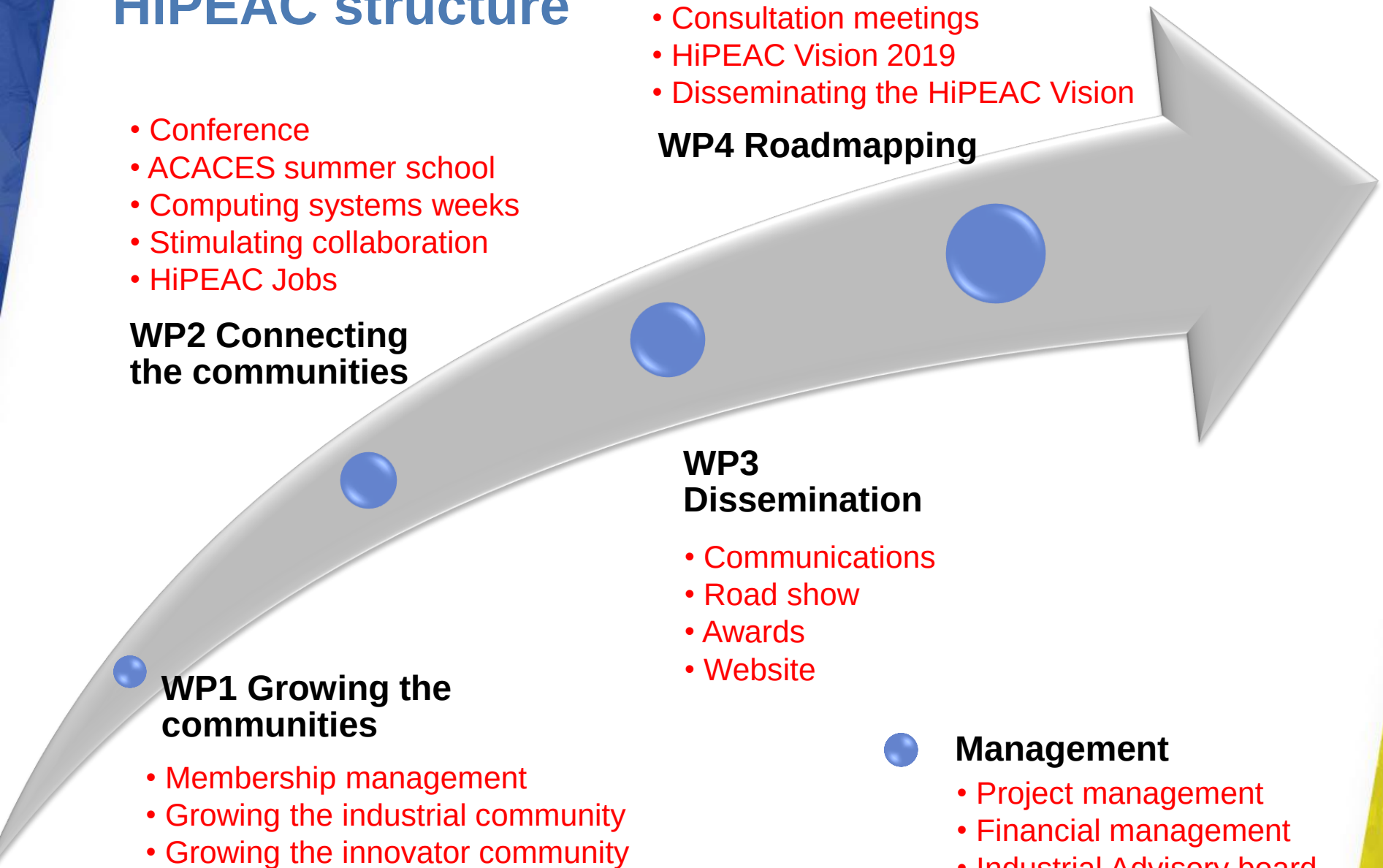
Prof. Koen De Bosschere

HiPEAC
COMPILATION ARCHITECTURE

TT Awards



HiPEAC structure



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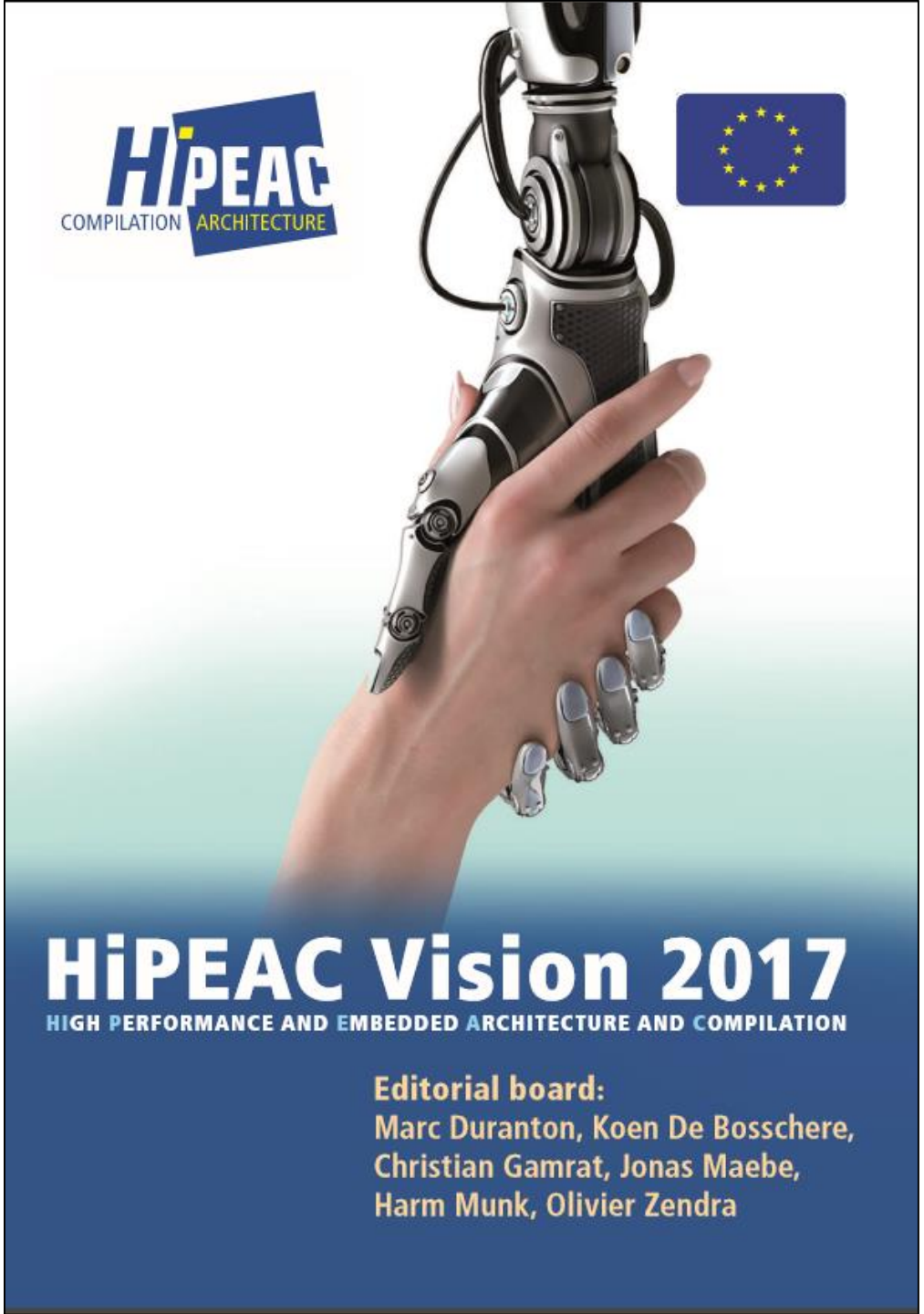
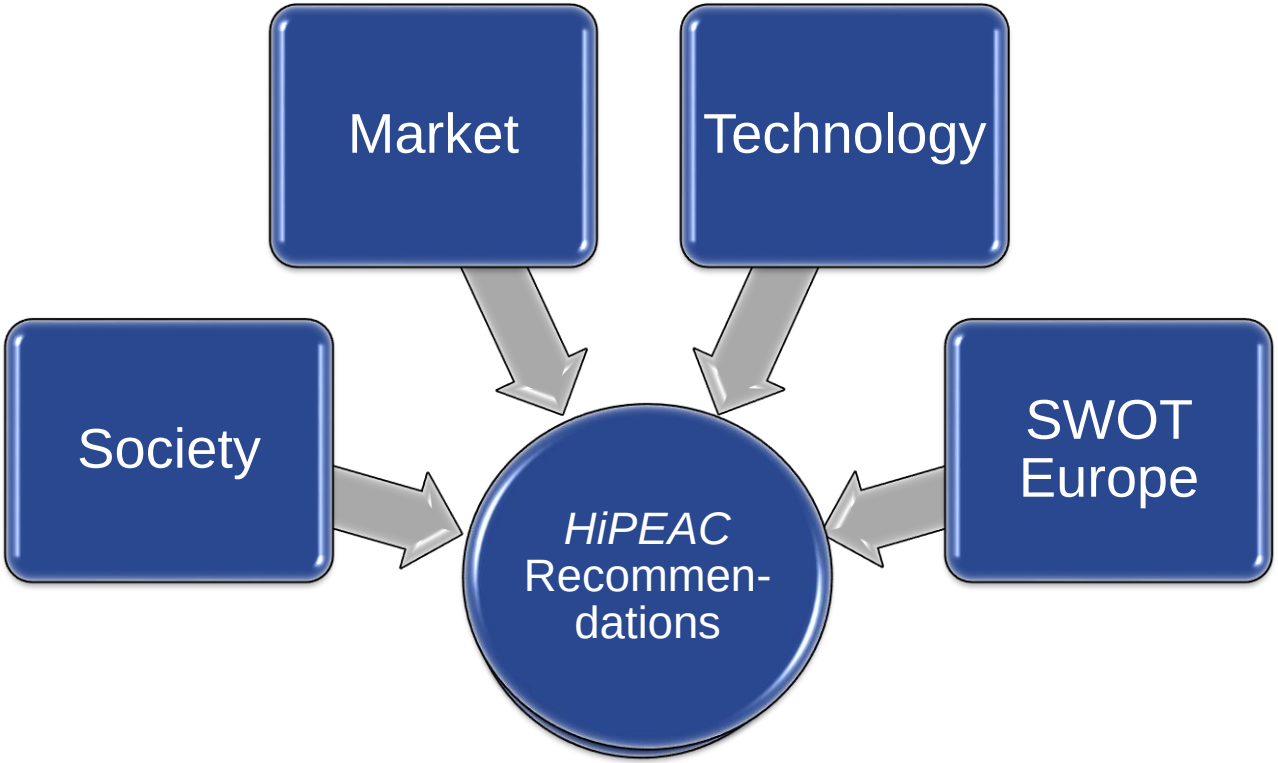


Marc Duranton

HiPEAC COMPILATION ARCHITECTURE

HiPEAC vision 2017



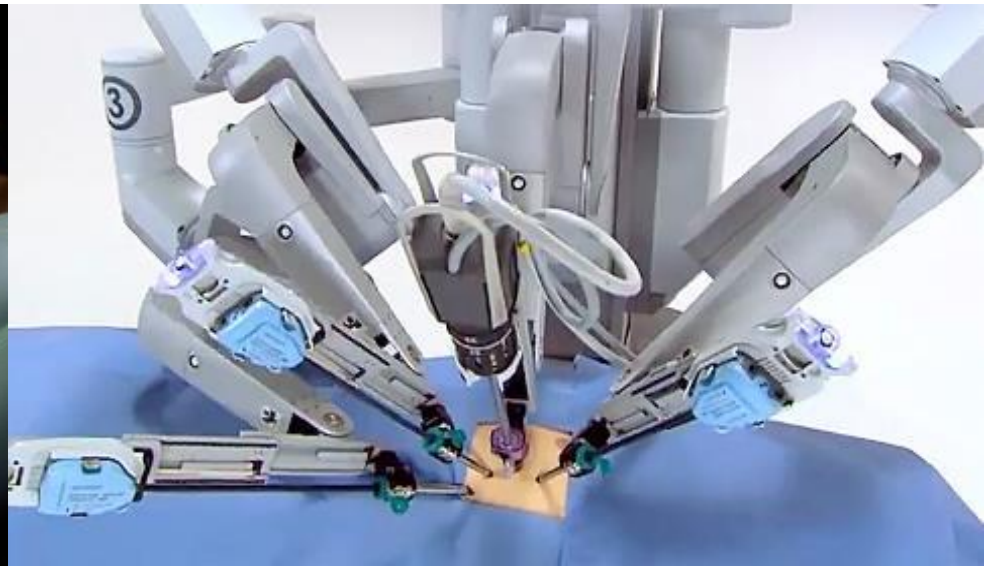
Evolution of society

(Narrow) Artificial Intelligence everywhere

- ***Artificial Intelligence*** is changing the man-machine interaction – natural interfaces, ”intelligent” behavior
- The new systems should make intelligent and ***trustable decisions***

IBM WATSON

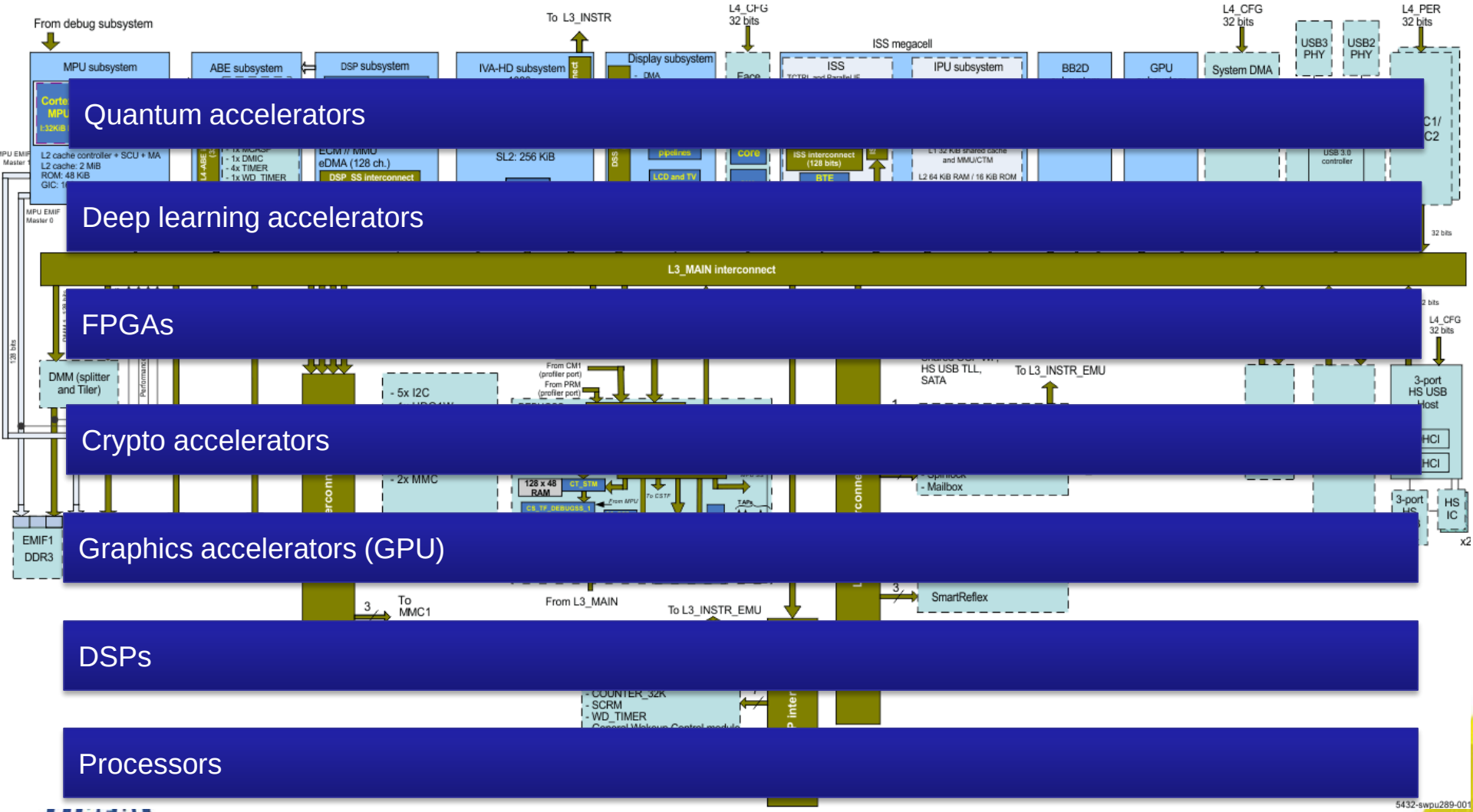
Trust is key for critical applications



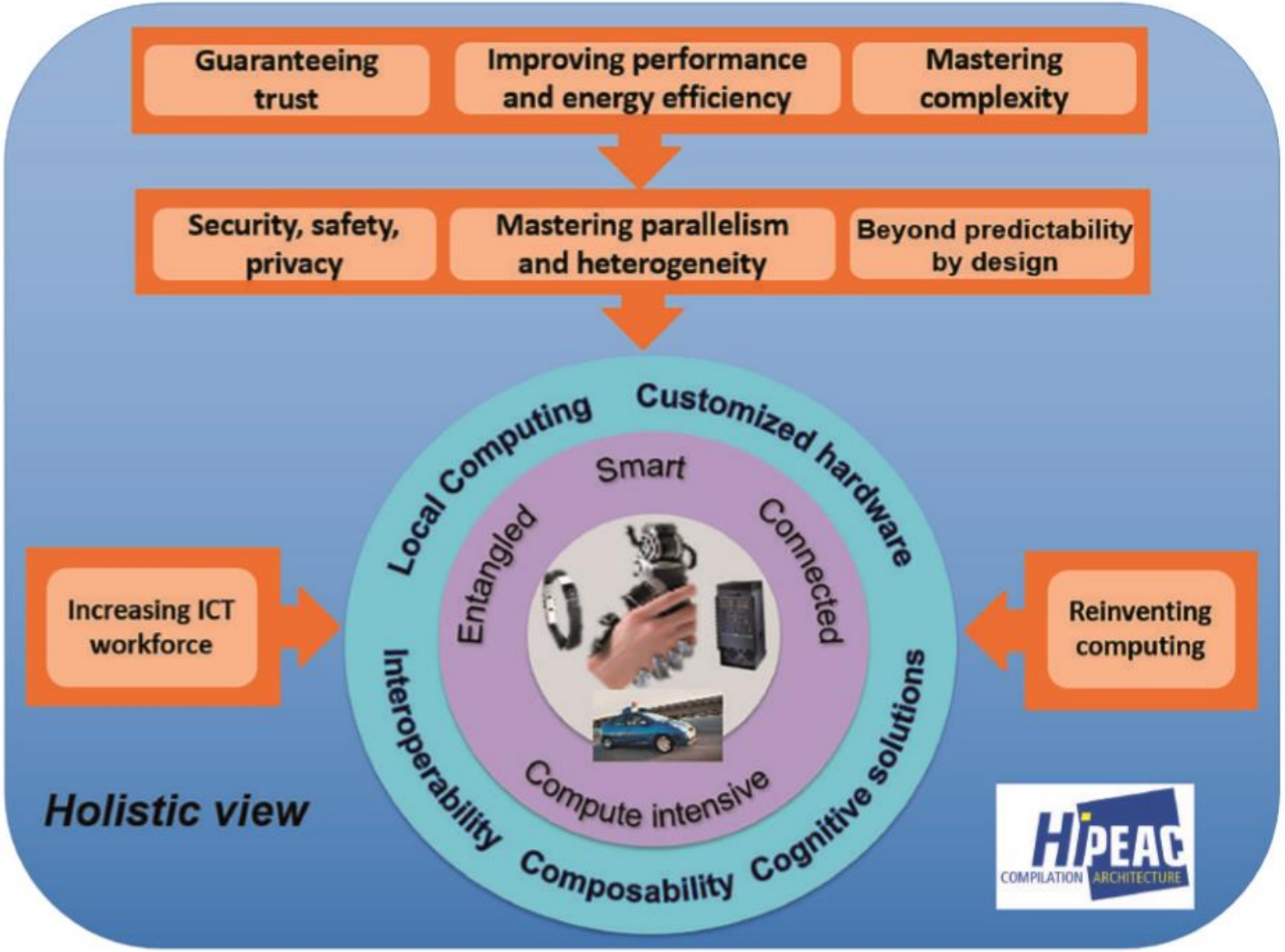
- **Beyond predictability by design** and beyond worst-case execution time (WCET)
- Capability to **build trustable systems from untrusted components**
- **Mastering trustability for complex distributed systems**, composed of black or grey boxes

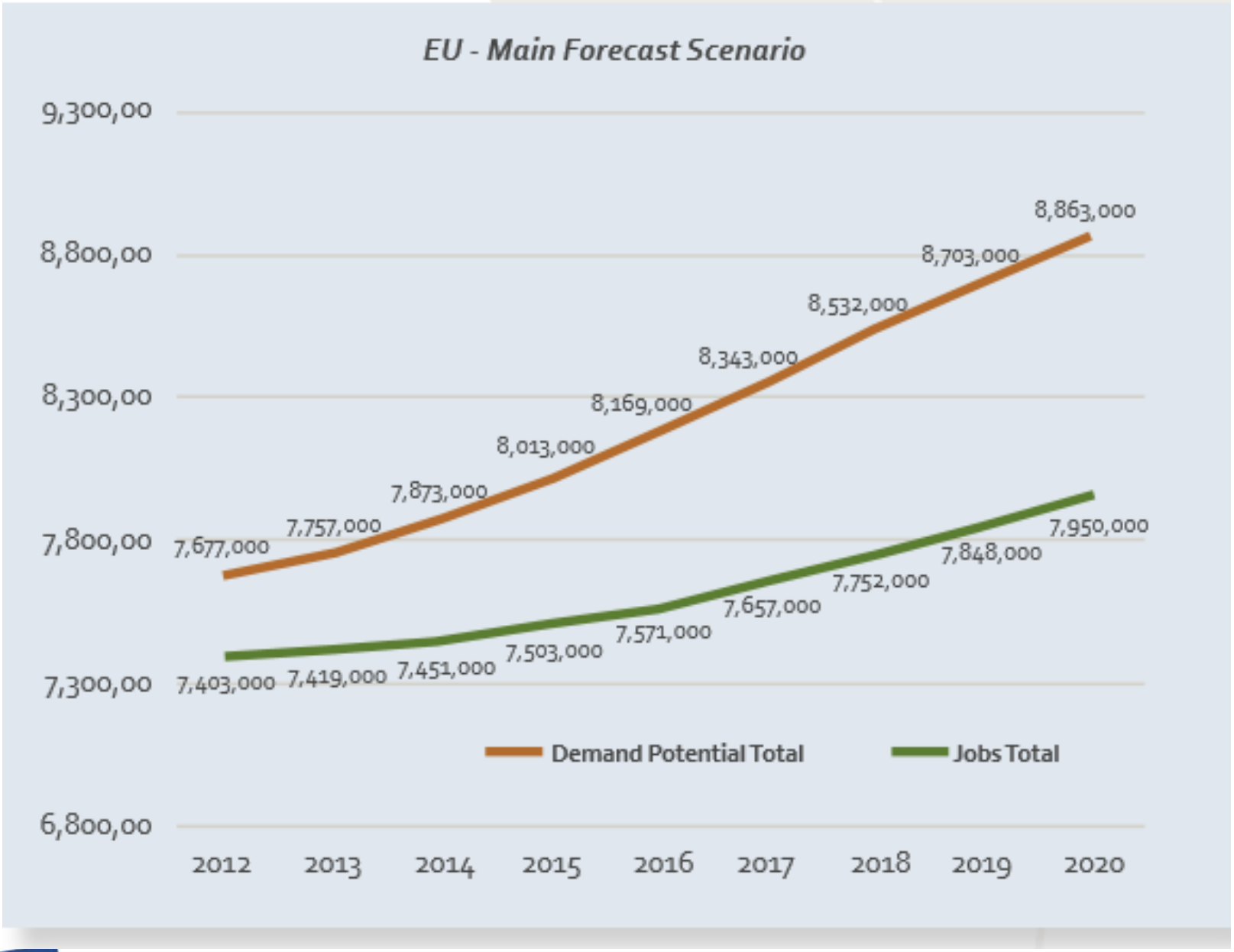
HiPEAC COMPILATION ARCHITECTURE

Growing complexity of software and hardware

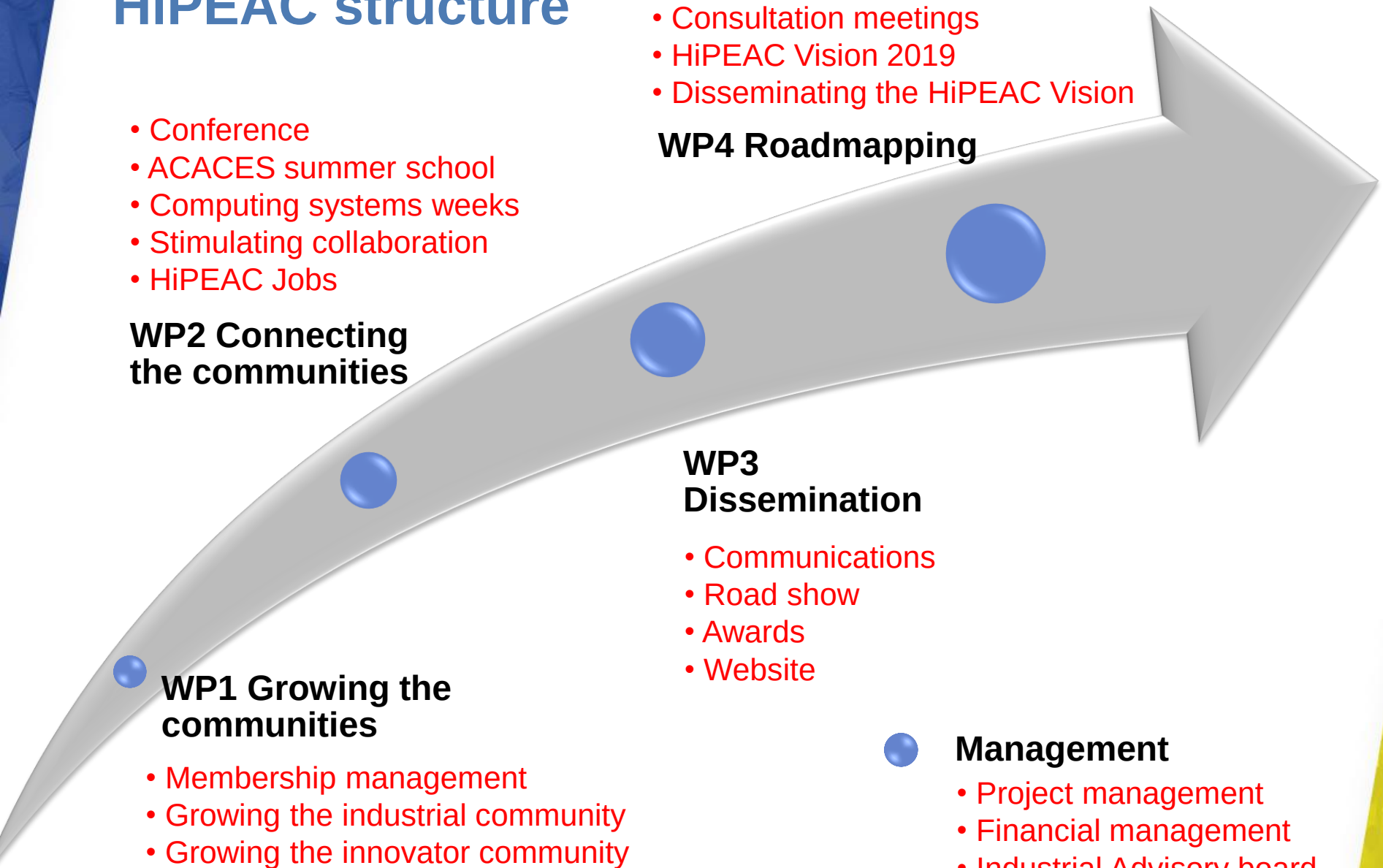


Functional diagram OMAP 5432 Multimedia Device


Guaranteeing trust
Improving performance and energy efficiency
Mastering complexity
Security, safety, privacy
Mastering parallelism and heterogeneity
Beyond predictability by design
Local Computing
Customized hardware
Smart
Entangled
Connected
Interoperability
Cognitive solutions
Compute intensive
Composability
Increasing ICT workforce
Reinventing computing
Holistic view
HiPEAC
COMPILATION ARCHITECTURE


EU - Main Forecast Scenario
9,300,00
8,800,00
8,300,00
7,800,00
7,300,00
6,800,00
7,677,000
7,757,000
7,873,000
8,013,000
8,169,000
8,343,000
8,532,000
8,703,000
8,863,000
7,403,000
7,419,000
7,451,000
7,503,000
7,571,000
7,657,000
7,752,000
7,848,000
7,950,000
Demand Potential Total
Jobs Total
2012
2013
2014
2015
2016
2017
2018
2019
2020

HiPEAC structure



- Consultation meetings
- HiPEAC Vision 2019
- Disseminating the HiPEAC Vision

WP4 Roadmapping

- Conference
- ACACES summer school
- Computing systems weeks
- Stimulating collaboration
- HiPEAC Jobs

WP2 Connecting the communities

WP3 Dissemination

- Communications
- Road show
- Awards
- Website

WP1 Growing the communities

- Membership management
- Growing the industrial community
- Growing the innovator community
- Growing the stakeholder community
- Growing the new member states membership

Management

- Project management
- Financial management
- Industrial Advisory board

https://www.hipeac.net/membership
https://www.hipeac.net/members

To join, simply email
membership@hipeac.net

Rainer Leupers

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