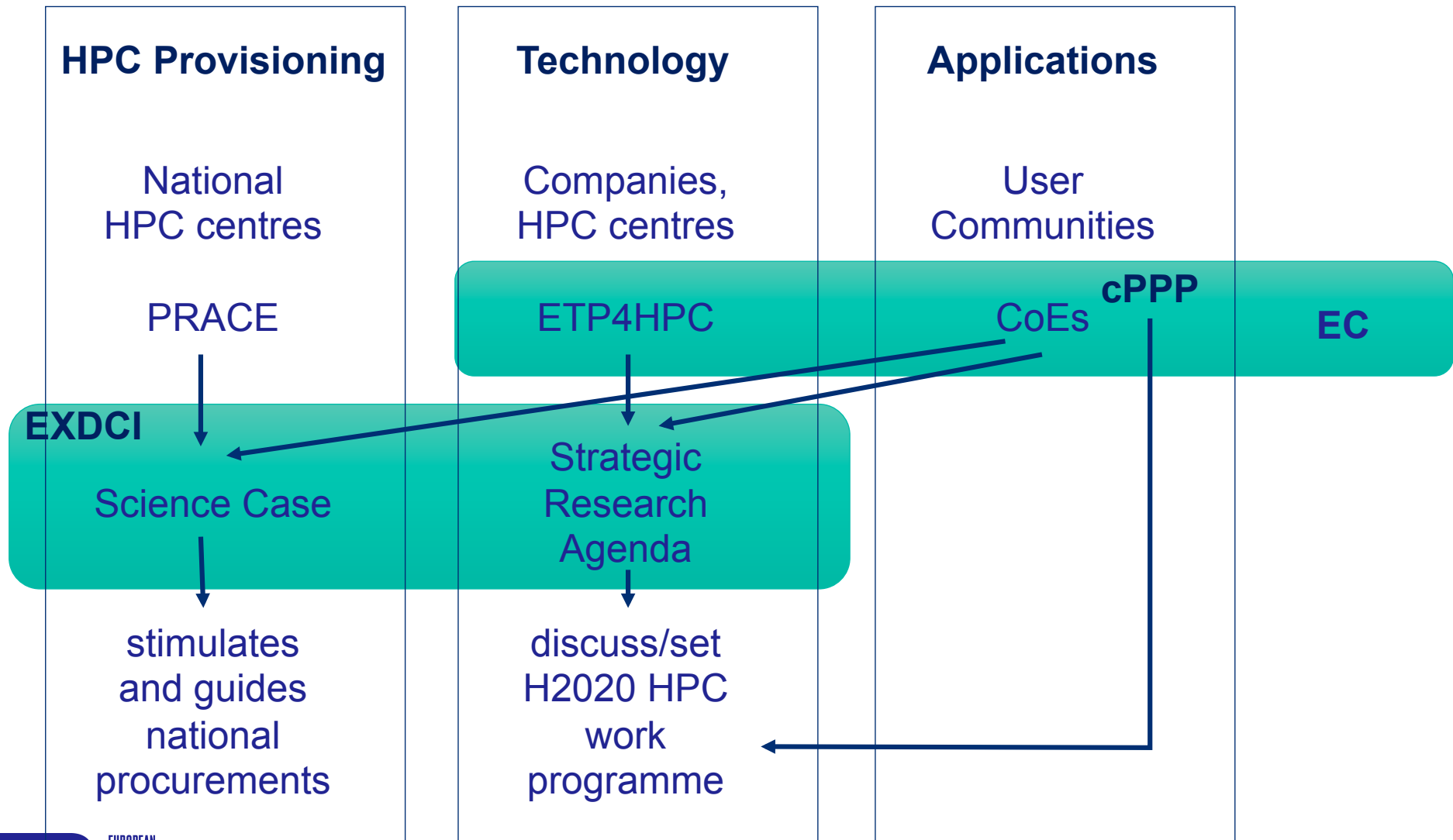# EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

ETP 4 HPC

An Update of the ETP4HPC
and
Extreme Scale Demonstrators

Th.Eickermann, Juelich Supercomputing Centre
most ETP Slides from Michael Malms

www.etp4hpc.eu • office@etp4hpc.eu

EUROPEAN HPC ACRONYM LANDSCAPE (SMALL EXCERPT)

HPC Provisioning	Technology	Applications
National HPC centres	Companies, HPC centres	User Communities
PRACE	ETP4HPC	CoEs

cPPP

EC

EXDCI

Science Case

Strategic Research Agenda

stimulates and guides national procurements

discuss/set H2020 HPC work programme

ETP 4 HPC

EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING
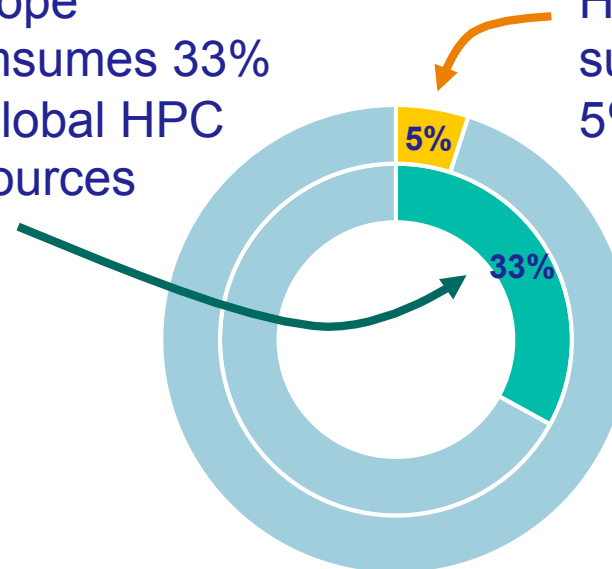
KEY DOCUMENT:
2012 EC COMMUNICATION

EU needs independent access to HPC technologies, systems and services

=> ETP4HPC created end of 2012 to contribute to this objective

Europe comsumes 33% of global HPC resources

However, supplies less than 5% of them

5%

33%

EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

SETTING UP THE HPC cPPP

- cPPP signed Dec. 2013 with ETP4HPC (Public-Private Partnership)

  Entry in force Jan. 2014

- Centres of Excellence joined in 2015

  ('private' side = ETP4HPC + CoEs)

- Partnership Boards twice a year

- Private side provides input to define H2020 HPC programmes

  which are funded and operated by the EC

- Collaboration with PRACE, BDVA/Big Data PPP

  HiPEAC, Eurolab4HPC…

EUROPEAN
TECHNOLOGY
PLATFORM
FOR HIGH
PERFORMANCE
COMPUTING

OUR ASSOCIATION (DEC. 2017 SNAPSHOT)

Recent members

2CRSI

ICEOTOPE TECHNOLOGIES LIMITED

PRO DESIGN ELECTRONIC GMBH

HPCNOW!

FACULTY OF ELECTRICAL ENGINEERING AND COMPUTING UNIVERSITY OF ZAGREB

ASPERITAS
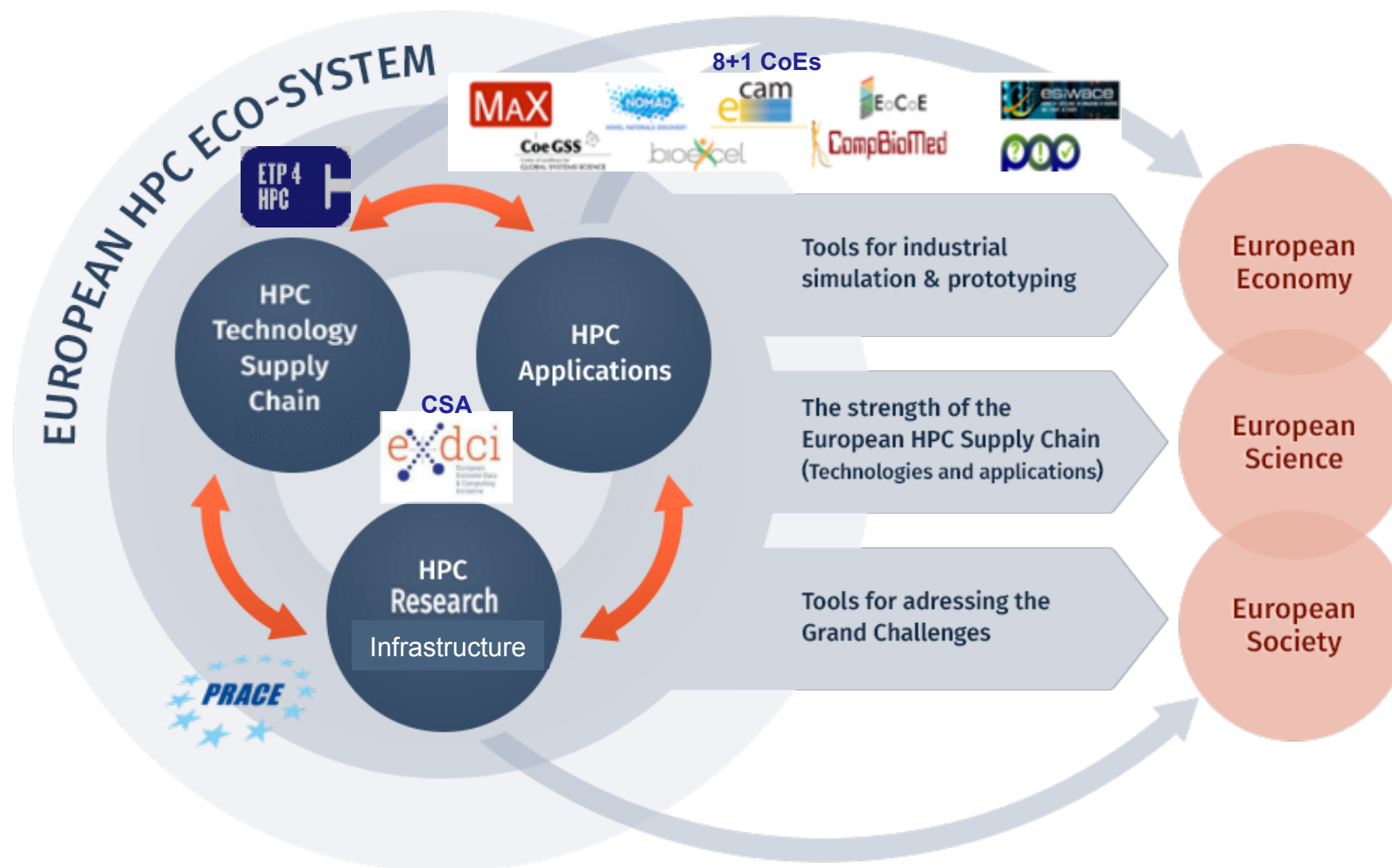
NEC

ESI Group

VERNE GLOBAL

HEIDELBERG UNIVERSITY COMPUTING CENTRE

IFP ENERGIES NOUVELLES (IFPEN)

EUROPEAN HPC ECOSYSTEM

ETP4HPC Key Activities

- Foster growth of HPC technology Research and Development in Europe

- Advise EC through cPPP

- Define Strategic Research Agenda (SRA)

- Propose H2020 Work Program contents

- Monitor ecosystem development

ACTIVITIES: SRA3 IN 2017

STRATEGIC RESEARCH AGENDA 2017

European Multi-annual HPC Technology Roadmap

ETP4HPC — EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

CONTENTS

http://www.etp4hpc.eu/sra.html

ETP 4 HPC — EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

CURRENT PORTFOLIO
PROJECTS FUNDED IN 2015-2017

http://www.etp4hpc.eu/en/european-hpc-handbook.html

CENTRES OF EXCELLENCE:
● MaX | ● NOMAD | ● E-CAM | ● EoCoE |
● ESiWACE | ● CoeGSS | ● BioExcel |
● CompBioMed | ● POP

DEEP-EST

EuroExa

● SAGE
● NEXTGenIO
● ExaNeSt
DEEP/
DEEPER
● ECOSCALE
● ExaNoDe
● Mont-Blanc 3
● EXTRA
MONT-BLANC
NLAFET
● NLAFET
● ExaHyPE   NUMEXAS

Interconnect   Mathematics

HPC ECOSYSTEM
EXDCI, EuroLab-4-HPC
COST Networking,
NESUS

Memory &
Storage

Algorithms

Compute

Programming
Tools

Data Intensive
Real-Time

ExaHyPE
NLAFET
CRESTA
ExaFLOW ●
ExCAPE ●
ComPAT ●
EXA2CT
ESCAPE ●
READEX ●
ALLScale ●
INTERTWinE ●
ANTAREX ●
NLAFET
MANGO ●
Green Flash ●
EPiGRAM

The size of the circle =
Project size e.g. 10M Euro

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EUROPEAN
HIGH-PERFORMANCE
COMPUTING
—
HANDBOOK 2017

ETP 4 HPC EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING   exdci

2017 EUROPEAN HPC HANDBOOK

Our 2017 European HPC Handbook is available. This professional publication details the HPC Technology and Applications Projects within the European HPC ecosystem. It will be distributed at our Supercomputing 2017 Birds-of-a-Feather Session in Denver (14th Nov 2017, 5.15pm).

If you wish to receive a hard copy, please contact the Office.

Funding WP 14-20
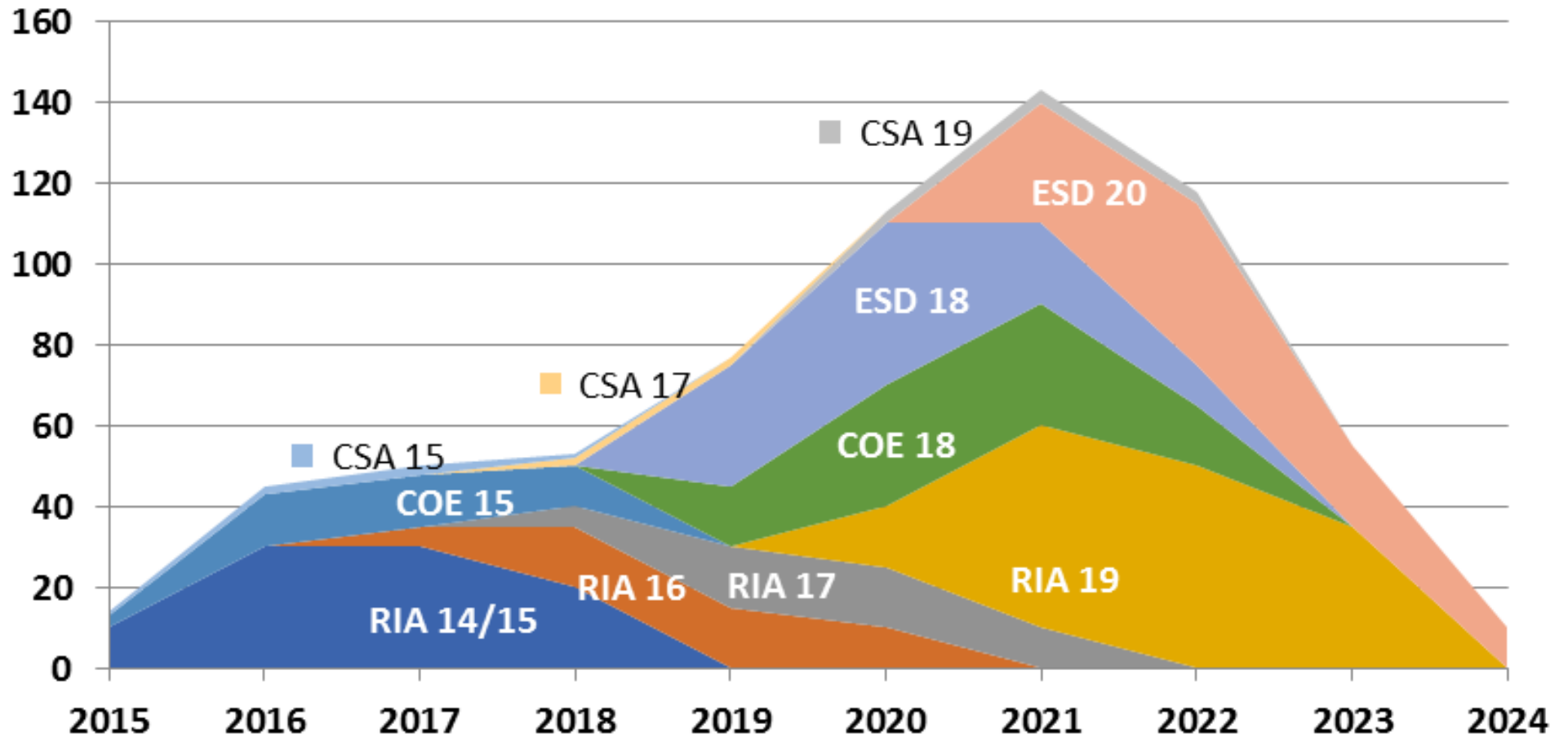
COMES EUROHPC

EUROPEAN COMMISSION
Press Release Database

European Commission > Press releases database > Press Release details

European Commission - Press release

Commission proposes to invest EUR 1 billion in world-class European supercomputers

Brussels, 11 January 2018

The European Commission unveiled today its plans to invest jointly with the Member States in building a world-class European supercomputers infrastructure.

Supercomputers are needed to process ever larger amounts of data and bring benefits tothe society in many areas from health care and renewable energy to car safety and cybersecurity.

ETP 4 HPC — EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

EUROHPC MEETING

- A large part of the HPC projects under the current **cPPP** will be **transferred to EuroHPC** together with their budget

- DG-CNECT will redirect **486M€** originally earmarked for Work Programme 2019-20 to be managed by EuroHPC (including 10M€ for administration costs). 386M€ coming from the FET, LEIT-ICT and INFRA R&I programmes and an additional 100M€ coming from CEF.

- The **Member States** should contribute to the same amount (**another 486M€**)

- The WP 2019-20 will be updated, dates and some R&I call amounts may be slightly adjusted. Only minor adjustment, no major changes will be possible. The **R&D calls** management will be delegated to **EuroHPC**

- The R&D calls will follow the same rules as currently except that EuroHPC will organize them, not the EC anymore

- Transition period, EuroHPC to take over gradually. E.g. for the European microprocessor FPA, SGA1 (2018) will be handled under current cPPP, SGA2 (2020) by the EuroHPC JU.

- The R&D calls must prepare for **exascale** systems which will be acquired by EuroHPC (call ~2022). This effort encompass Technology, Applications (e.g. the CoEs), skills development and training.

FROM CPPP → EUROHPC
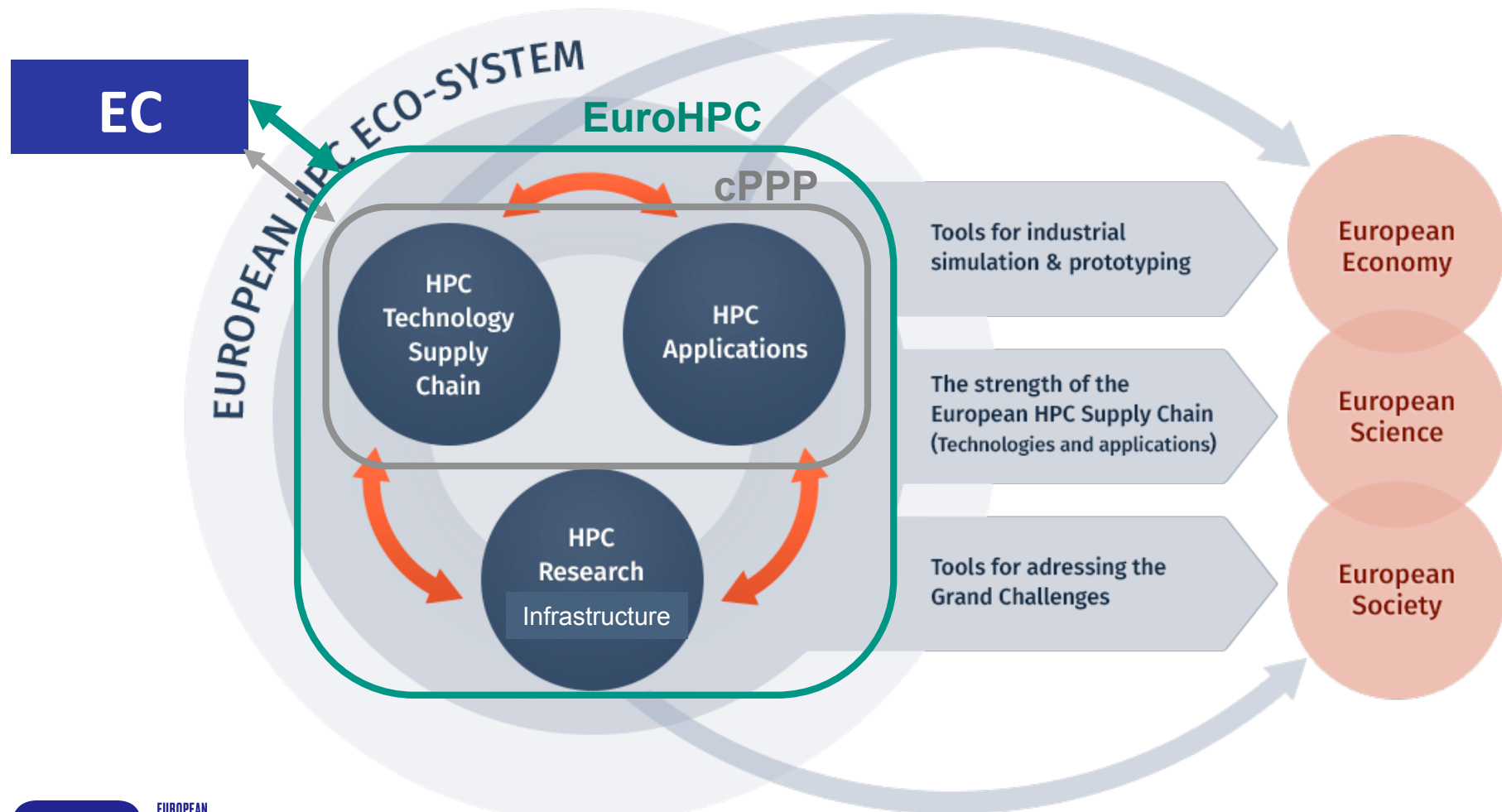
EuroHPC: a new collaboration framework for HPC

- EuroHPC is still in definition

- EuroHPC Joint Undertaking is a complex tool

however

- ETP4HPC welcome the EuroHPC initiative

- ETP4HPC role is hardwired into EuroHPC

- EuroHPC opens up some good opportunities

- better coordination and leverage between the different HPC projects

- linking developments (R&I, CoEs) to the exascale (and post-exascale) European infrastructures

- should be flexible enough to grow into new areas

ETP 4 HPC — EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

IoT / CPS / Edge /…

HPC "in the loop"

BD Analytics @Edge

Storage & Curation @Cloud

BD Analytics @Cloud

ETP 4 HPC

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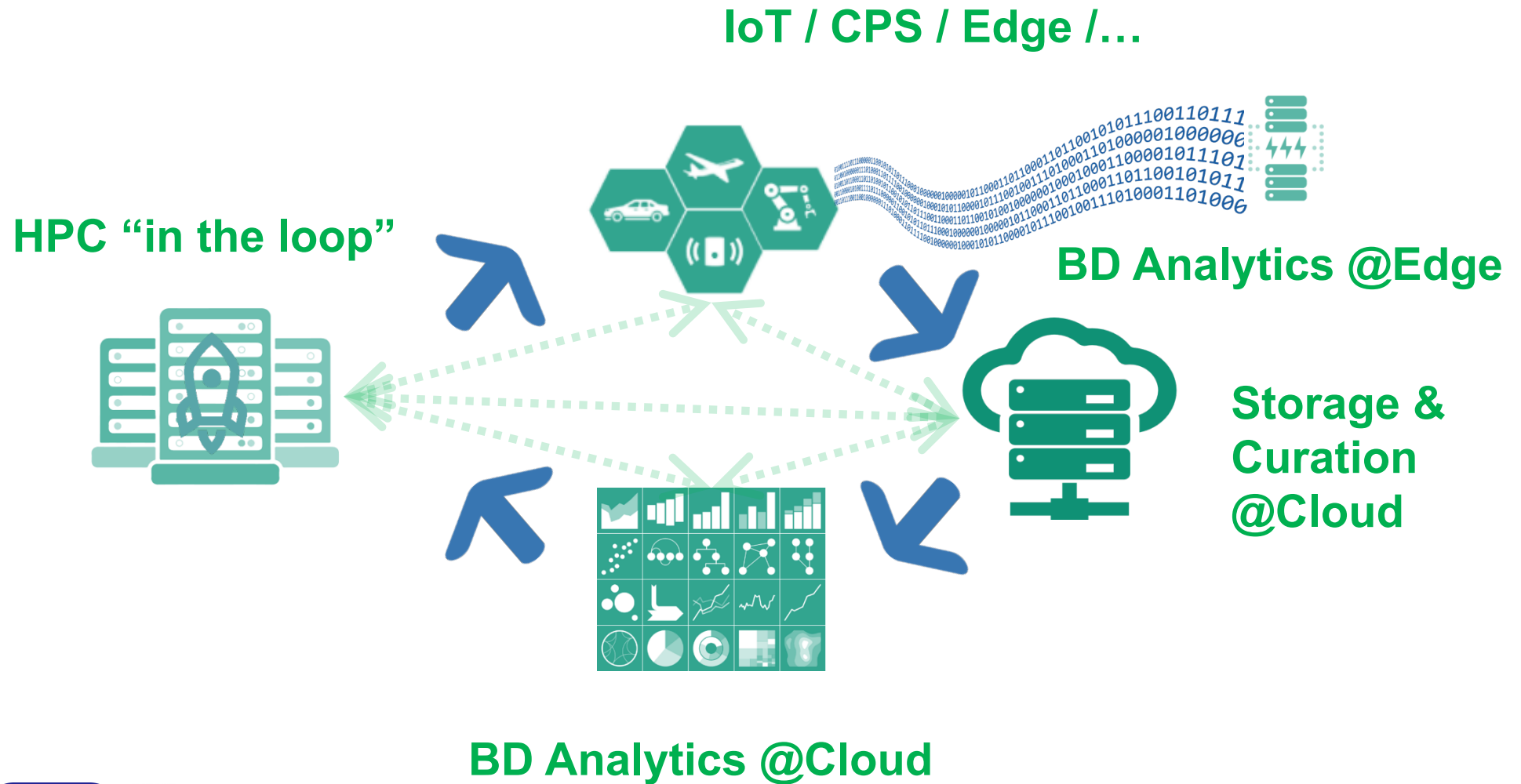
An Update on
Extreme scale Demonstrators

5th ENES HPC Workshop on HPC for
high-resolution climate and weather modelling
Lecce, May 18th 2018

Thomas Eickermann

including slides from Marc Duranton

ETP 4 HPC

May 18, 2018

Outline

- Extreme scale Demonstrators in a nutshell

- Preparation – community involvement

- ICT-14-2019 – the call for proposals

- What's next

EsDs in a Nutshell: Concept   (#1/3)

- Extreme scale Demonstrators – objectives

  - Integrate results of R&D projects into fully integrated systems prototypes

  - Establish proof-points for the readiness, usability and scalability of the technologies

- EsD will fill critical gaps in the HPC H2020 programme:

  - Bring technologies from FET-HPC closer to commercialisation (TRL 7)

  - Combine results from targeted R&D efforts into a complete system (European HPC technology ecosystem)

  - Provide the missing link between the 3 HPC pillars: Technology providers, infrastructure providers, user communities (co-design)

Technology providers

- Technology integration
- System architects
- Testing and quality/performance assurance (phase A)
- Maintenance and service (phase B)

EsD Expectations

- Design point 500-1000 PF
- Power efficiency: 35 kW/PF
- Density: 1 PF/rack
- I/O balanced design
- TRL 7

EsDs

Application owners / CoEs

- Application requirements and key challenges (phase A)
- Port, optimize application(s), use them productively (phase

HPC Centres

- Participate in co-design
- Manage system deployment (phase A)
- System operation, validation (phase B)

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EsDs in a Nutshell: Call for Proposals (#3/3)

TOPIC : Co-designing Extreme Scale Demonstrators (EsD)

Topic identifier:	ICT-14-2019
Publication date:	27 October 2017

Types of action:	RIA Research and Innovation action		
DeadlineModel:	single-stage		
Planned opening date:	26 July 2018	**Deadline:**	14 November 2018 17:00:00

Time Zone : (Brussels time)

- ## EsD project structure
  - Phase A (~24 months): Development, Integration and Testing
    - Little or no basic technology research
    - Substantial R&D focus geared towards integrating components and sub-systems developed in the preceding R&D projects
  - Phase B (~24 months): Deployment, Benchmarking and Use
    - Operated by a hosting center
    - EsD made available to application owners for code porting and development … and close-to-production usage
    - Characterization and EsD validation, benchmarking based on real use-cases.

exdci

European
Extreme Data
& Computing
Initiative

EsD History

- ETP4HPC created EsD Workgroup in Dec 2014 (after discussions with EC)

- Broad discussion on EsDs in several Workshops:

  (slides and results available at http://www.etp4hpc.eu/en/esds.html)
  - EXDCI Workshop '15, Rome: Kick-Off
  - ETP4HPC's SRA2 Nov. '15: introduces EsD
  - HPC Summit '16, Prague: Discuss EsD concept in community and with EC:
    - Technical system characteristics, budget, procurement model, consortia, use cases
  - ISC '16, Frankfurt:
    - focus: from Use Cases to System Specs

  - EXDCI Workshop '16, Barcelona:
    - focus: system integrators & Application Communities
    - gathered input on expectations, interests, constraints, …
  - cPPP Board meeting, Nov. '16 + EsD Workshop with EC, Dec. 5th '16, Brussels
    - Discussion of EsD details

EsD History (cont.)

- … Broad discussion on EsDs in several Workshops:

  - HPC Summit Week, May 18th '17, Barcelona
    - EsD Roundtable: final exchange before WP is published & call is opened
  - ISC '17, Frankfurt:
    - Gather input from industrial users
  - Spring / Summer '17
    - Working group drafted EsD chapter for SRA3

  - ETP4HPC's SRA3 public release, Nov '17

  - H2020 Work Programme 2018-2020 release, Oct. 27th, 2017

  - EsD Networking
    - A list of entities indicating their interest in contributing to an EsD consortium: technology providers, HPC-Centres, FETHPC-Projects, CoEs, …

      http://www.etp4hpc.eu/esd-networking017.html

Input from CoEs

- General Requirements

  - EsDs need to be stable enough to allow production runs

  - Clear view on programming models and software stack developments
    - As much as possible, commonly used tools need to be supported (compilers, MPI, OpenMP, numerical libraries, etc.)
    - Novel technologies should provide standard interfaces where possible

  - Applications need to be part of EsD design from the beginning
    - Needs significant engagement from the EsD projects for application porting and optimization

- Open Questions
  - Support for extreme FLOP AND extreme scale data (analytics)
  - How sustainable will novel technologies be (and thus the effort to port)?
  - How will application porting and optimization be funded?
  - Support for ensembles/workflows

extracted from presentation by E.Laure at EsD Roundtable, May '17

Input from ESiWACE (extracted from a CoE survey)

What are the key scientific challenges and what does it take to achieve them (structured along SRA3 Research Priority topics) ?

- **Architecture:** High bandwidth memory, networks, NVRAM

- **System Software:** Dynamic scheduling, compilers

- **Programming Environment:** Fast standardisation, DSL

- **Energy and resliency:** Energy aware algorithms

- **Balance Compute, I/O and storage performance:** post-procssing on the fly, multi-tier software

- **Big Data and HPC usage models:** Recomputing, data analytics

- **Mathematics and algorithms for extreme scale computing:** disruptive numerical methods (discretisation), data placement
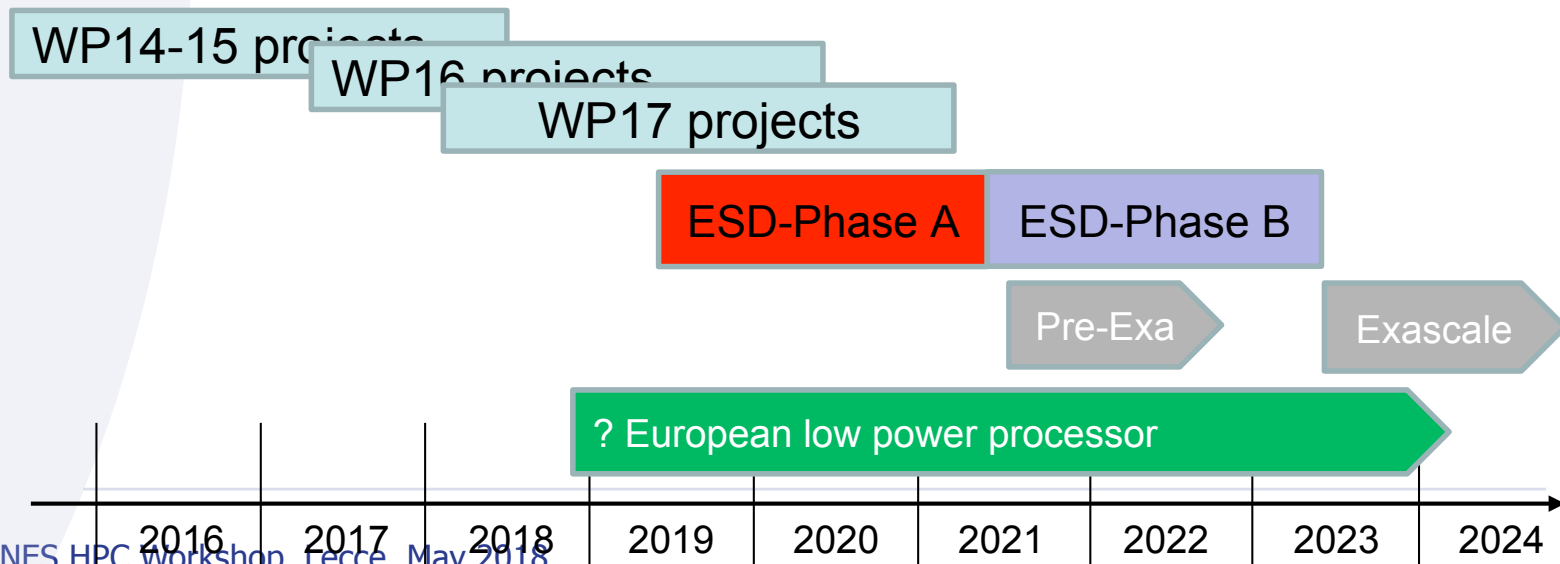
ICT-14-2018 Co-Designing EsDs

- Call facts
  - Planned timing: 26 July 2018 – 14 November 2018
  - Project start: 1H2019
  - Foreseen funding: 80 Mio. €
  - Anticipated project size: 20 … 40 Mio. € + national co-funding welcome
- Specific Challenge
  - To demonstrate in operational environments the successful integration of technology building blocks developed in previous R&I actions into world-class Extreme Scale Demonstrators. The challenges of power efficiency, resiliency and scalability of these systems require a strong co-design approach driven by ambitious applications involving technology suppliers, system integrators, supercomputing infrastructure providers and user communities, as well as ambitious HPC and extreme-data application owners or providers.

    … scalability up to exascale-class levels with specific design points and performance/power targets (e.g., 500 Petaflops to 1 Exaflop).

ICT-14-2018 Co-Designing EsDs cont.

- Further EC expectations expressed in the call text
  - New operational environments and capacity available for users with extreme-data application requirements
  - integrate technologies developed in FP7, Horizon 2020 or other R&D actions in Europe, e.g. FETHPC, LEIT-ICT low-power microprocessor technologies
  - Proof-of-principle for pre-exascale machines addressing strategic HPC and Big-Data applications
  - EC reserves right to block transfer of results to outside EU
- Timeline dependencies

WP14-15 projects

WP16 projects

WP17 projects

ESD-Phase A   ESD-Phase B

Pre-Exa   Exascale

? European low power processor

2016 2017 2018 2019 2020 2021 2022 2023 2024

exdci

European Extreme Data & Computing Initiative

What's Next

- Challenges for the upcoming EsD projects

  - Balance innovation (based on EU R&D) and stability/usability

  - Timing – how to provide useful input to the Pre-Exascale systems?

  - Manage interests in consortia (integrators, centres, users)

  - Ensure resulting system is no dead-end or one-of system

  - Achieve ambitious goals with a tight budget and schedule

  - Balance budget shares for Technology R&D, Hardware costs, operational costs, application and porting and optimisation

- EsD Working Group mission completed ?

  - Yes, but: ETP4HPC proposed a continuous effort with initially 2 calls

  - … restart targeting FP9 ?

Thank you for your Attention !

Questions ?

Backup Slides

European HPC Strategy in Horizon 2020

ETP4HPC

Developing the next generation of HPC technologies, applications and systems towards exascale

PRACE

Providing access to the best supercomputing facilities and services for both industry including SMEs and academia

CoEs

Achieving excellence in HPC application delivery and use

3 Pillars working in Synergy