Update on European HPC Eco-system

ETP4HPC

cPPP

EXDCI

ETP

H2020

WG

SRA

CoE

FETHPC

By the end of this talk you should know:

- ETP4HPC Objectives & the European HPC Eco-system
- ETP4HPC Strategic Research Agenda (SRA1) and its update (SRA 2)
- Contractual Public-Private Partnership for HPC and European Extreme Data and Computing Initiative (EXDCI)
- ET4HPC Organisation, Working Groups and Membership

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Key EU developments HPC

European Commission

Communication from the EC "High-Performance Computing: Europe's place in a global race" (2012)

Council Conclusions on High-Performance Computing (Competitiveness Council – 2013)

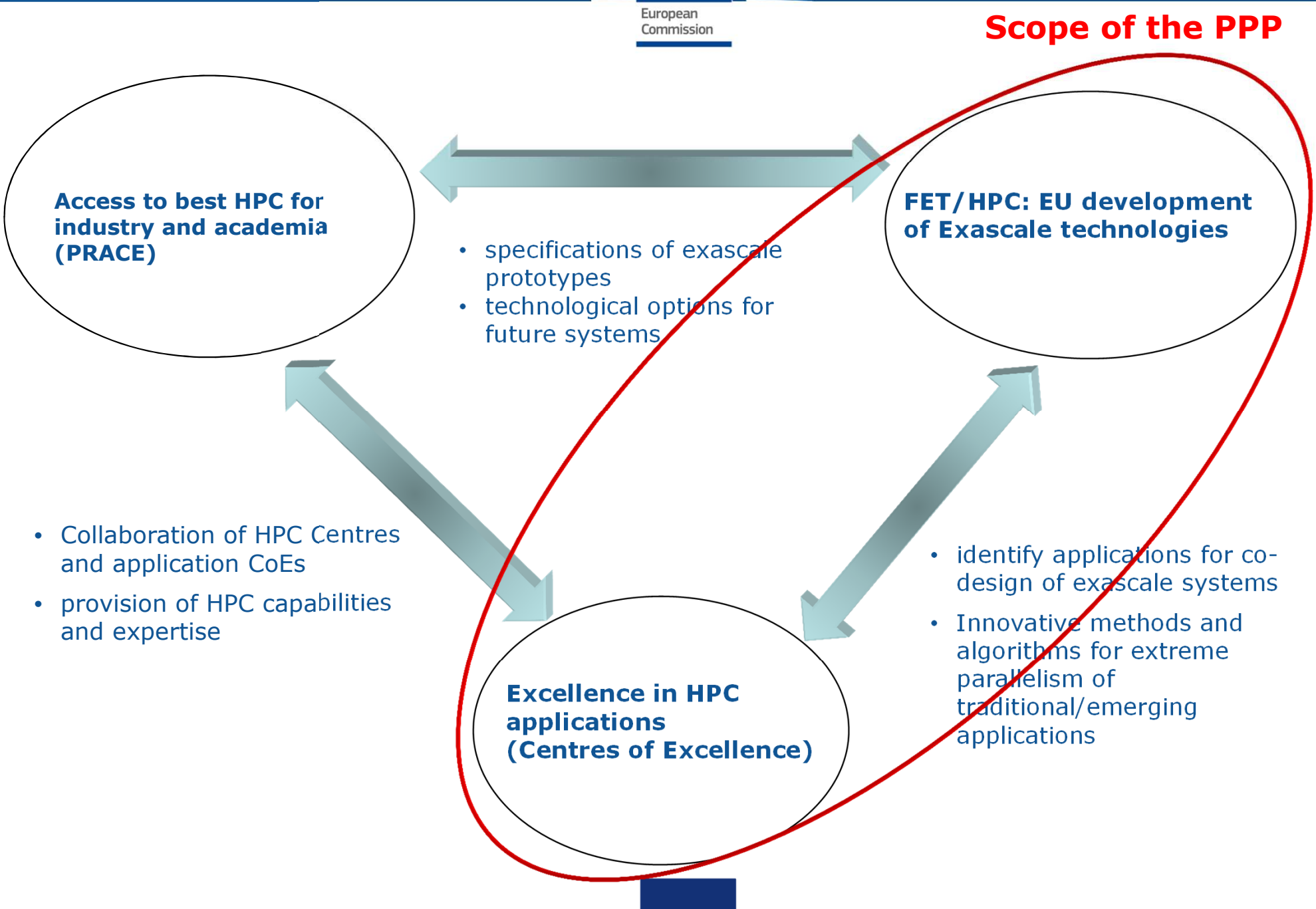
Establishment of the European Technology Platform on High-Performance Computing (ETP4HPC - 2012) and Strategic Research Agenda on HPC (2013)

Horizon 2020 programme including HPC Calls adopted (end of 2013)

Public-Private Partnership with ETP4HPC (1st January 2014)

Interrelation between the three elements

"Excellent Science" part of H2020



Why the technology pillar ?

- Leadership in HPC required
  - vision of the technologies evolution
  - expertise in future technologies

- Large opportunities
  - extreme parallelism, energy efficiency
  - co-designed

The Objective of ETP4HPC

To build a European world-class HPC technology value chain that is globally competitive

allinea
ARM
BSC
BULL
SILKAN
Embedded simulation for a safer world
Micron
elixir Data for Life
eXact
solutions for your productivity
cea
CINECA
EUROTECH
Imagine. Build. Succeed.
Fraunhofer
SICOS
KTH
VETENSKAP OCH KONST
UNIVERSITAT POLITÈCNICA DE VALÈNCIA
Bright Computing
IBM
intel
JÜLICH
FORSCHUNGSZENTRUM
lrz
ARCTUR
universe
CIMNE
DataDirect
NETWORKS
HPC
WALES · CYMRU
PARTEC
CLUSTER COMPETENCE CENTER
Seagate
MAXELER
Technologies
MAXIMUM PERFORMANCE COMPUTING
INFN
Istituto Nazionale di Fisica Nucleare
E4
COMPUTER ENGINEERING
ENGINSOFT
CSC
CRAY
THE SUPERCOMPUTER COMPANY
epcc
numascale
Inria
INVENTEURS DU MONDE NUMÉRIQUE
Ter@tec
FUJITSU
SYSFERA
Queen's University Belfast
ECMWF
ROGUE WAVE
SOFTWARE
KALRAY
HLRS
NVIDIA
Instituto Universitario de Investigación Biocomputación y Física de Sistemas Complejos
Universidad Zaragoza
SURF SARA
National Centre for Nuclear Research
Świerk
WIGNER
FINMECCANICA
clustervision
produban
HUAWEI
FORTH
Institute of Computer Science
ICHEC
Irish Centre for High-End Computing
Appentra
Science & Technology Facilities Council
MEGWARE
SUPERCOMPUTING · TECHNOLOGY
NICE
transtec
lenovo
FOR THOSE WHO DO
grnet
hp
JOHANNES GUTENBERG UNIVERSITÄT MAINZ
scilab enterprises
DISTENE
UNIVERSITÉ DE REIMS CHAMPAGNE-ARDENNE
ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA
LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY
LIST
UNIVERSITÉ DE VERSAILLES SAINT-QUENTIN-EN-YVELINES

Main activities

- cPPP implementation
  - FET HPC call : 83 submissions for R&D research projects and 19 selected projects
  - eInfra 5 CoE call : 23 proposals for Center of Excellence and 8 CoEs selected
- Inputs for Work Programme 2016-2017
  - Very active working group
- Preparation of a support action European eXtreme Data and Computing Initiative
  - Key element for the animation of HPC ecosystem in Europe
- Development of our relationship
  - Other organizations : Big Data Value, SKA,…
  - International contacts

Our actions in 2015

- Strengthening our ecosystem
  - More members with opening ETP4HPC to advanced users
  - EXCDI start
- Start of the projects
  - Coordination and development of a global vision
- Centers of Excellence
  - Cooperation in cPPP and co-design
- Update of the Strategic Research Agenda
- Election of a new Steering Board
  - General Assembly in September 2015

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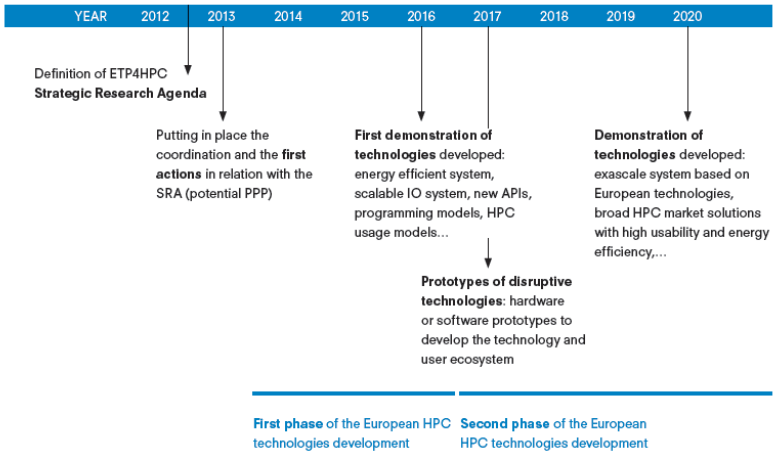
Strategic Research Agenda (SRA)

- **Purpose:** R&D roadmap to develop HPC technology in Europe within **Horizon 2020**

5.3.6
Milestones

Deadline	Milestones
2014	**M-PROG-API-1:** Develop benchmarks and mini-apps for new programming models/languages
2015	**M-PROG-API-2:** APIs and annotations for legacy codes[3]
	M-PROG-API-3: Advancements of MPI+X approaches (beyond current realisations)
	M-PROG-DC-1: Data race detection tools with user support for problem resolution
	M-PROG-LIB-1: Self-/auto-tuning libraries and components
	M-PROG-PT-1: Scalable trace collection and storage: sampling and folding
	M-PROG-RT-1: Runtime and compiler support for auto-tuning and self-adapting systems
	M-PROG-RT-2: Management and monitoring of runtime systems in dynamic environments
	M-PROG-RT-3: Runtime support for communication optimization: data-locality management, caching, and pre-fetching
2016	**M-PROG-API-4:** APIs for auto-tuning performance or energy
	M-PROG-LIB-2: Components/library interoperability APIs



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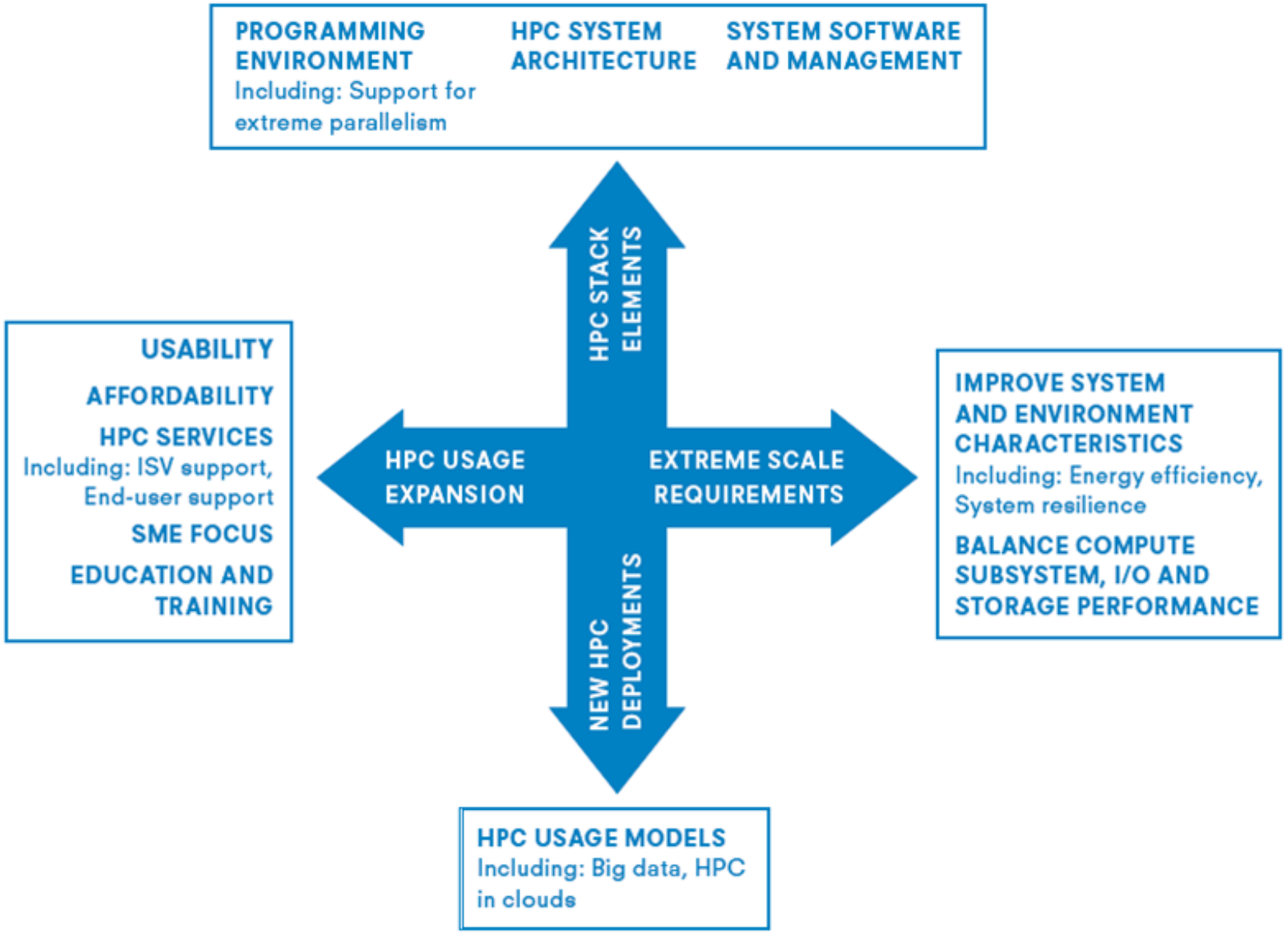
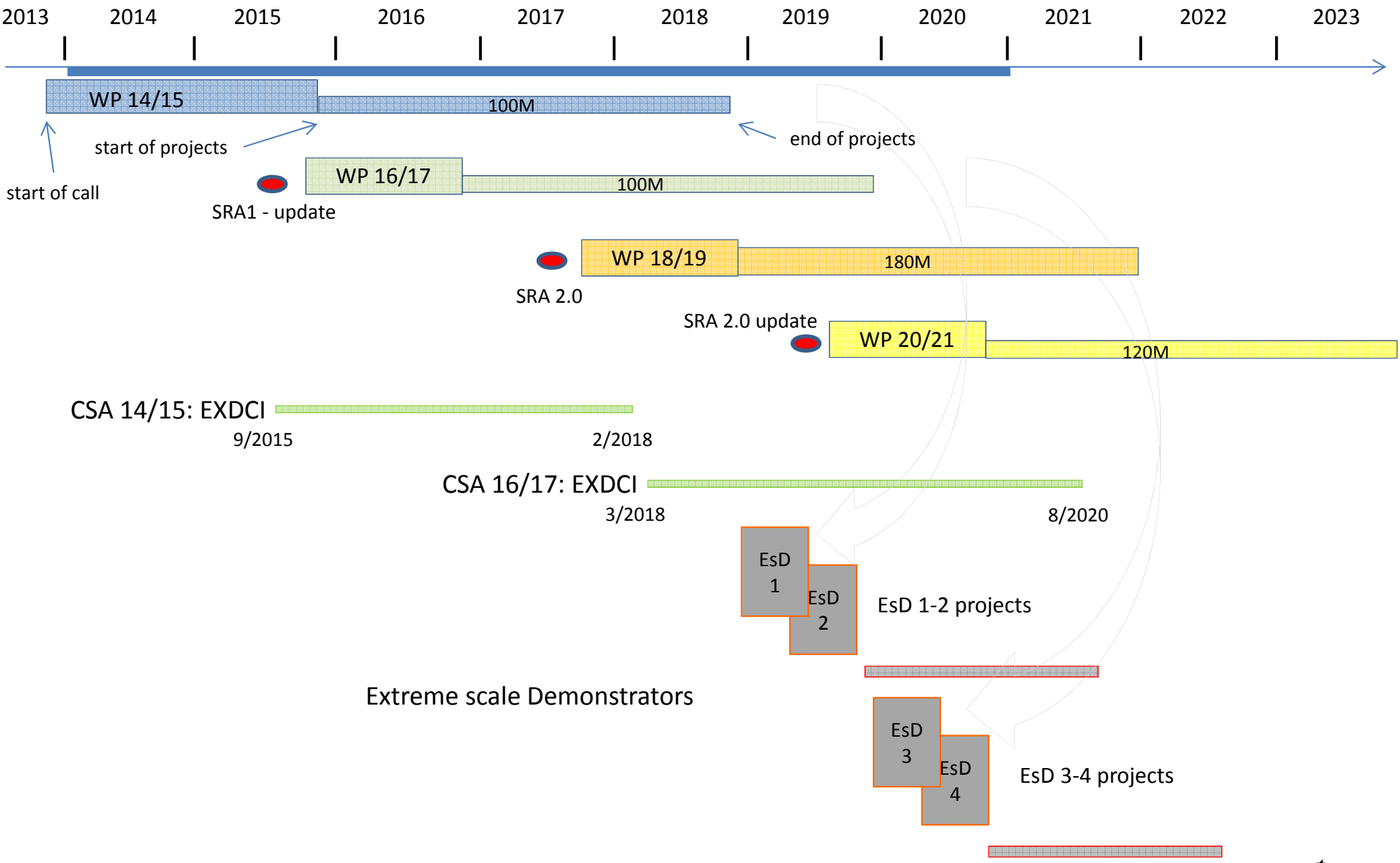
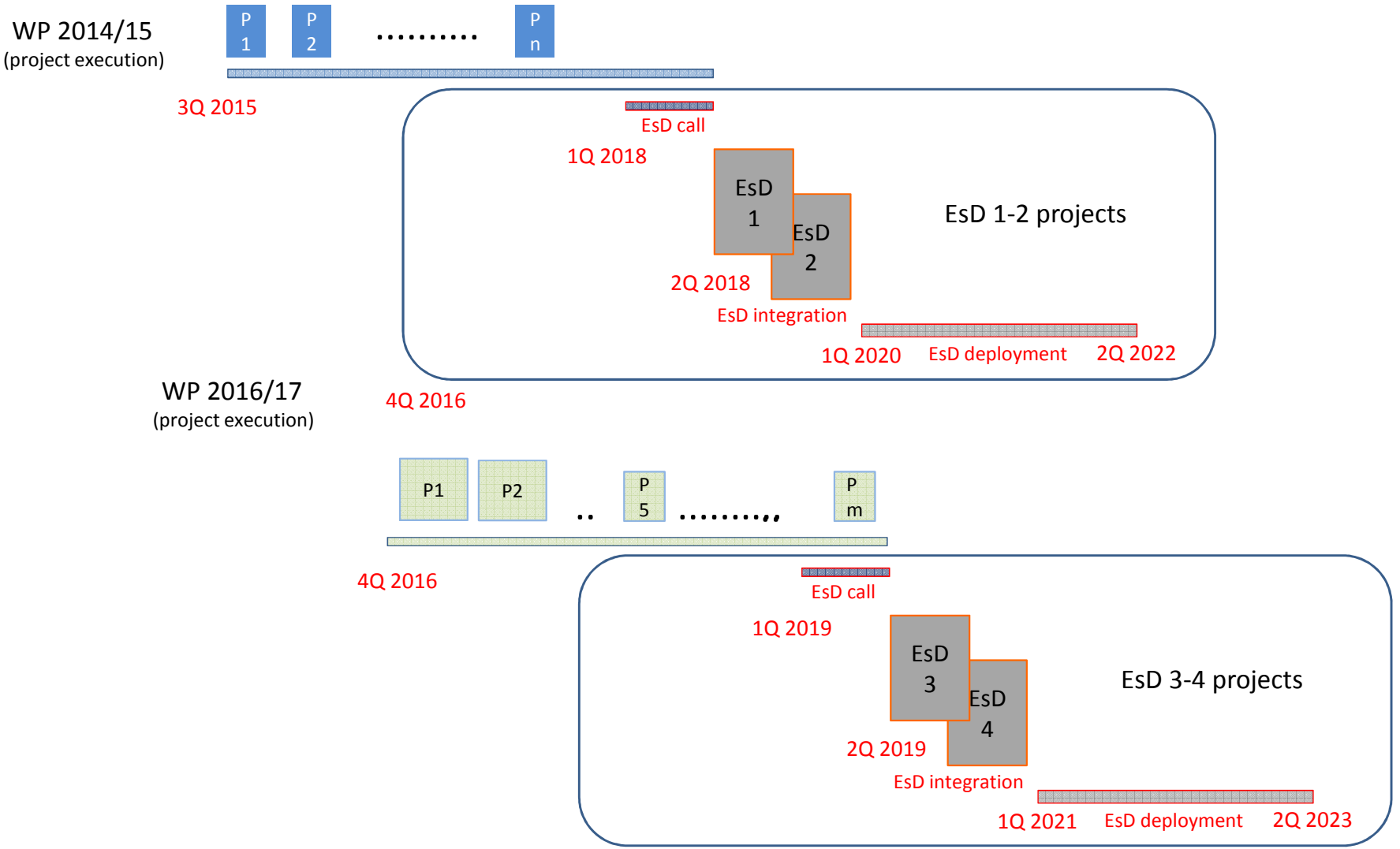

PROGRAMMING ENVIRONMENT
Including: Support for extreme parallelism
HPC SYSTEM ARCHITECTURE
SYSTEM SOFTWARE AND MANAGEMENT
HPC STACK ELEMENTS
USABILITY
AFFORDABILITY
HPC SERVICES
Including: ISV support, End-user support
SME FOCUS
EDUCATION AND TRAINING
HPC USAGE EXPANSION
EXTREME SCALE REQUIREMENTS
IMPROVE SYSTEM AND ENVIRONMENT CHARACTERISTICS
Including: Energy efficiency, System resilience
BALANCE COMPUTE SUBSYSTEM, I/O AND STORAGE PERFORMANCE
NEW HPC DEPLOYMENTS
HPC USAGE MODELS
Including: Big data, HPC in clouds

HPC-Horizon 2020 roadmap



Extreme scale Demonstrators call-integration-deployment schedule



Workprogramme 2016/2017 status

- ETP4HPCs proposal (version from Febr. 9th) sent to EC on Febr. 11th
- No further modifications expected
- EC generates its own version based on ETP4HPCs proposal:
  - FETHPC1: HPC Co-design of HPC systems and applications
  - FETHPC 2: Transition to Exascale Computing
    - High productivity programming environments for Exascale
    - Exascale system software and management
    - Exascale I/O and storage in the presence of multiple tiers of storage
    - Supercomputing for Extreme Data and emerging HPC modes
    - Mathematics and algorithms for extreme scale HPC systems and applications working with extreme data
  - FETHPC 3: HPC ecosystem development and international collaboration (CSA)
- Next step: review and approval by EU member states
- Expected call start November 2015

SRA – update: the starting point

- We committed to provide a “fresh SRA” every 2 years, prior to the start of a new call
- Next target date is October 31st 2015
- This cycle we need to provide a “delta update” on top of SRA 1 (only)
- For 2017, it will be a full document update including the general parts
- Technical focus areas:
  - HPC System Architecture and Components
  - Energy and Resiliency
  - Programming Environment
  - System Software and Management
  - Balance Compute, I/O and Storage Performance
  - Big Data and HPC usage Models
  - NEW :Mathematics and algorithms for extreme scale HPC systems
  - NEW: Extreme scale Demonstrators

Every member is invited to contribute by providing deep technical expertise, time and resources!

SRA – update : mapping technical focus areas

SRA 1

- HPC System Architecture and Components
- Energy and Resiliency
- Programming Environment
- System Software and Management
- Balance Compute, I/O and Storage Perf.
- Big Data and HPC usage Models

Added to ETP4HPC scope:

New:

SRA 1-update for 4Q 2015 :

FETHPC1:

- HPC – Co-design of HPC systems and applications

FETHPC2:

- High Productivity programming environments for Exascale
- Exascale system software and management
- Exascale I/O and storage in the presence of multiple tiers of storage
- Supercomputing for Extreme Data and emerging HPC modes
- Mathematics and algorithms for extreme scale HPC systems and applications working with extreme data

Beyond 2017:

- Scoping of Extreme Scale Demonstrators

SRA – update : the actions in 2015

- 25.2.2015 Kickoff-meeting session (IBM Research Rueschlikon)
- March 2015 Start workgroups
- May 2015 Levelset with EESI, BDV …..(f2f worksession)
- 22.6.2015 User / ISV session (Teratec Forum, Paris)
- July 2015 First rough draft
- Sept. 2015 Second version, f2f meeting SRA technical leads
- Oct. 2015 Reviews, conf. calls
- Oct. 31st 2015 Send out final version

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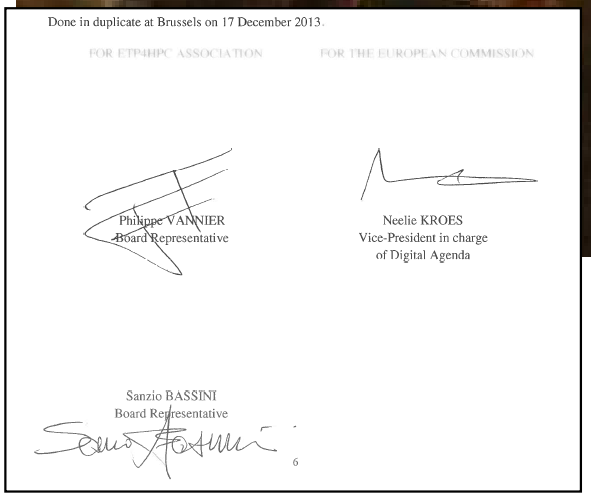
Partnership for European leardership in HPC

cPPP

Contractual Public-Private Partnership



Done in duplicate at Brussels on 17 December 2013.

FOR ETP4HPC ASSOCIATION

Philippe VANNIER
Board Representative

FOR THE EUROPEAN COMMISSION

Neelie KROES
Vice-President in charge
of Digital Agenda

Sanzio BASSINI
Board Representative

6

EUROPEAN COMMISSION

PRESS RELEASE

Brussels, 17 December 2013

EU industrial leadership gets boost through eight new research partnerships

The European Commission today launched eight contractual Public Private Partnerships (cPPPs) of strategic importance for European industry. The partnerships will leverage more than €6 billion of investments to be allocated through calls for proposals under Horizon 2020, the new EU programme for research and innovation. Each euro of public funding is expected to trigger additional investments of between three and 10 euro to develop new technologies, products and services which will give European industry a leading position on world markets (MEMO/13/1150).

European Commissioner for Research, Innovation and Science Máire Geoghegan-Quinn said: *"Europe needs industry to innovate to create income and jobs. New technologies and products, such as green cars, energy efficient buildings and cleaner manufacturing processes, are essential to address societal challenges such as climate change, energy and resource efficiency. We want these contractual PPPs to have a substantial impact on the competitiveness of the EU industry, on sustainable economic growth and the creation of new high-skilled jobs in Europe."*

Vice President Neelie Kroes, Commissioner responsible for the Digital Agenda, said: *"This is a great opportunity for Europe. These PPPs will maintain our global lead in robotics, photonics, high performance computing, telecoms and give us a head start in smart cities, intelligent transport, education, entertainment, media and other promising markets. Combined with a comprehensive industrial strategy, the PPPs will ensure vigorous European leadership and a better future for all."*

The eight contractual Public-Private Partnerships are:

- **Factories of the Future (FoF)**, to support the manufacturing industry through the development of sustainable production technologies and systems (Link to factsheet)
- **Energy-efficient Buildings (EeB)**, to increase the competitiveness and energy efficiency of the construction industry (Link to factsheet)
- **European Green Vehicles Initiative (EGVI)**, to develop a competitive and resource efficient transport system with significantly less CO2 emissions (Link to factsheet)
- **Sustainable Process Industry (SPIRE)**, to make the process industry more resource- and energy-efficient (Link to factsheet)
- **Photonics,** one of the key enabling technologies for our future prosperity and an essential element of many sectors, from energy and health, to everyday products like DVD players and mobile phones (Link to factsheet)
- **Robotics,** a key driver of industrial competitiveness and essential to address key societal challenges in areas such as demographic change, health and well-being, food production, transport and security (Link to factsheet)
- **High Performance Computing (HPC),** which plays a pivotal role in stimulating Europe's economic growth and advancing European science (Link to factsheet)
- **Advanced 5G networks for the Future Internet (5G),** to stimulate the development of network internet infrastructure to ensure advanced ICT services for all sectors and users (Link to factsheet)

The contracts setting up the PPPs were signed today by the Commission and chairpersons of specially-created industrial research and innovation associations, representing more than 1,000 large and small enterprises across Europe.

700 M€ committed by EC to implement application and technology development

HPC cPPP at a Glance

CONTRACTUAL ARRANGEMENT

SETTING UP A PUBLIC-PRIVATE PARTNERSHIP IN THE AREA OF HIGH PERFORMANCE COMPUTING

BETWEEN

THE ASSOCIATION ETP4HPC

AND

THE EUROPEAN UNION

Contract between EC and ETP4HPC

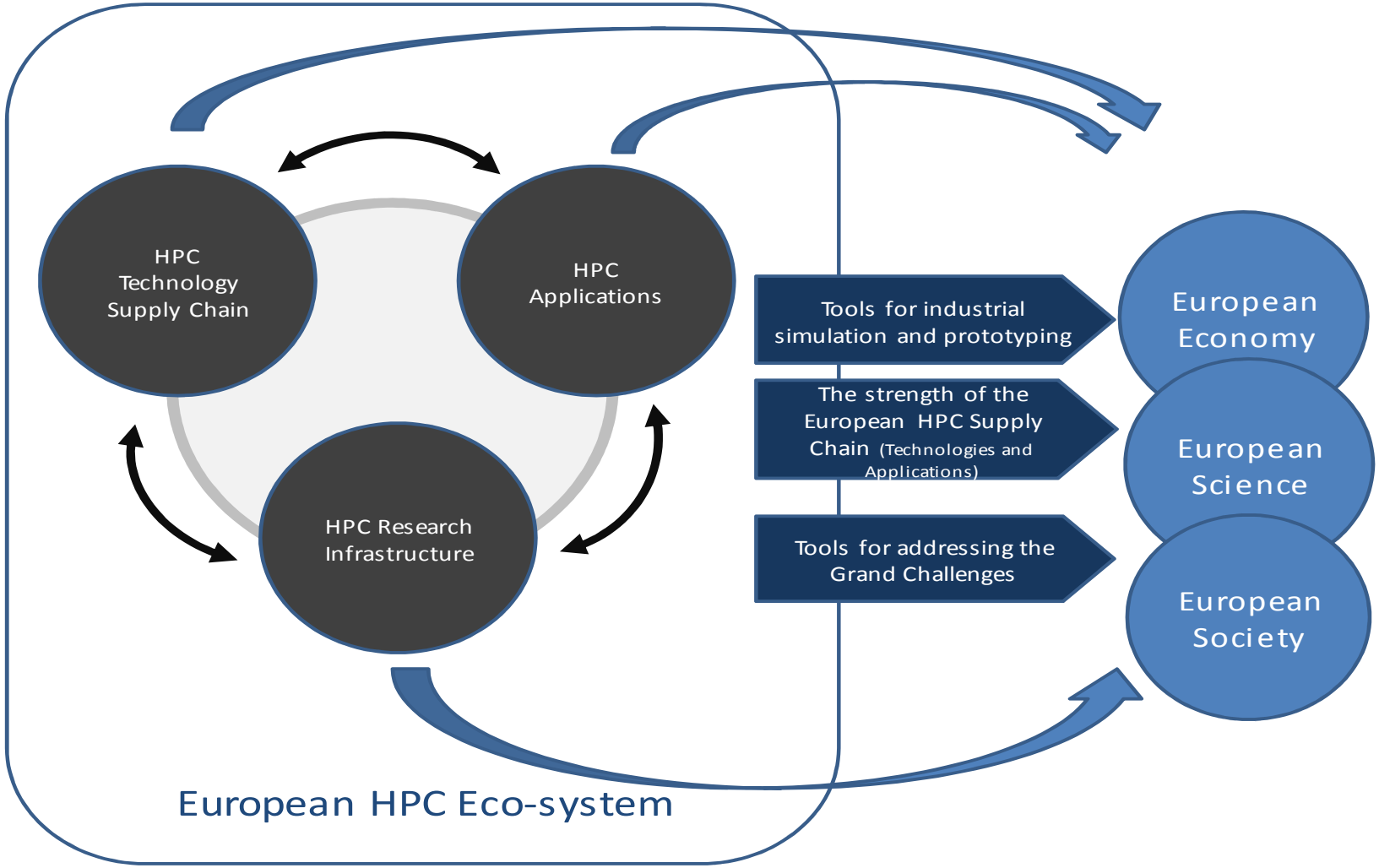
Main Objective: HPC Technologies Development

- To build a European world-class HPC technology value chain that will be globally competitive, fostering synergy between the three pillars of the HPC ecosystem (technology development, applications and computing infrastructure);

700M Euro in H2020

The Commission intends to allocate from the Union budget an indicative financial envelope of EUR 700 million for the period of 2014-2020 for those research and innovation activities (from DG Communications Networks, Content and Technology).

HPC cPPP – Building a European HPC Ecosystem



cPPP Partnership Board meetings

- 4 meetings
  - One informal in Paris April 3rd 2014
  - Three ones in Brussels on June 13th, November 12th 2014 and

- Main topics covered
  - Organization of the Partnership Board
  - KPIs
  - Work programme 2016-2017
  - International cooperation
  - Communication
  - Work groups inputs : Education and Training, Intellectual Property Rights

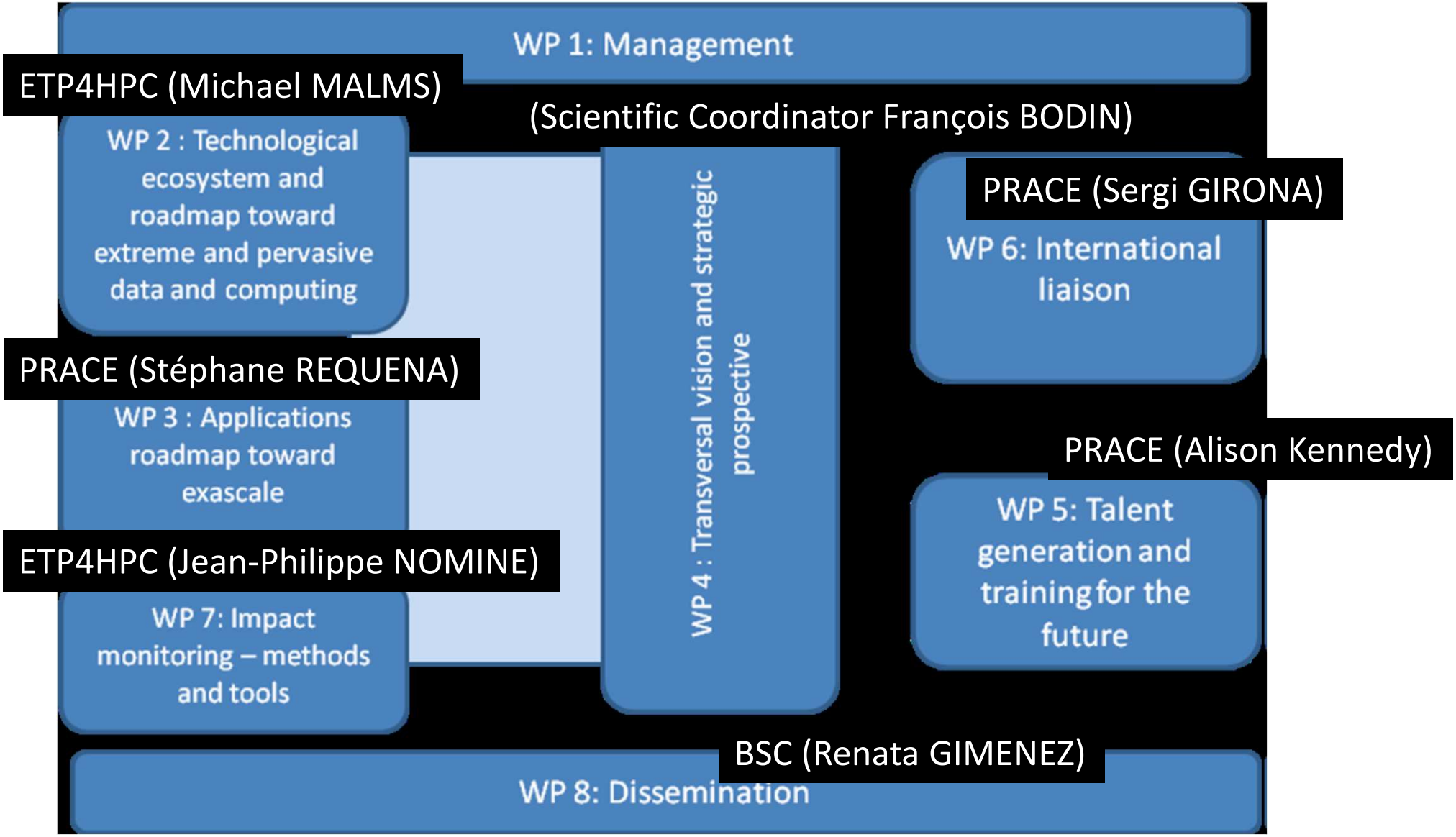
KPIs and monitoring

- KPIs
  - Industrial competitiveness and economical impacts
    - Global share of European HPC, HPC investments, Jobs, SMEs
  - Operation of the programme
    - Quality of projects, Contribution to new HPC solutions, People, HPC use, Software ecosystem
  - Management of the programme
    - Openness of the programme, dissemination
- Monitoring
  - Annual cPPP report
  - Collection of data with a survey

EXDCI

- Objective: **Coordination of HPC Strategy**
- A Coordination and Support Action – budget – 4M together with Part B
- Bid sumbitted by PRACE (leader) and ETP4HPC – with a number of subcontacting agreements (e.g. the expertise of EESI)

EXDCI - Structure



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How do we work?

- Incorporated as a Dutch association
- Open membership for organisations having R&D based in Europe
- Managed by a Steering board with 15 members representing:
  - Research centres (5)
  - European SMEs (3)
  - European controlled corporations (5)
  - International companies with R&D in Europe (2)
- Steering Board organization
  - Chairman
  - 2 Vice chairmen for PRACE coordination and HPC development
  - Secretary-Administrator, Treasurer
- Virtual office
  - BSC, CEA, Cineca+Eurotech, IBM

ETP4HPC Working Groups

- **FETHPC2 – HPC Strategy Coordination**
- **Education and Training**
- **Monitoring and KPIs**
- **Exploitation and IPR**
- **Centres of Excellence**
- **SME**
- **Co-desing and Prototyping**
- **Ecosystem**

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THANK YOU!

For more information visit

www.etp4hpc.eu

contact: office@etp4hpc.eu

ETP 4 HPC
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FOR HIGH PERFORMANCE COMPUTING