



Applications roadmap towards Exascale

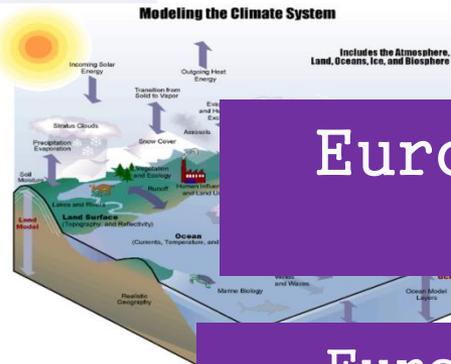
Stéphane Requena
(PRACE/GENCI)

1st European HPC Summit Week

May, 9 2016



Applications are THE meaning of HPC and Big Data



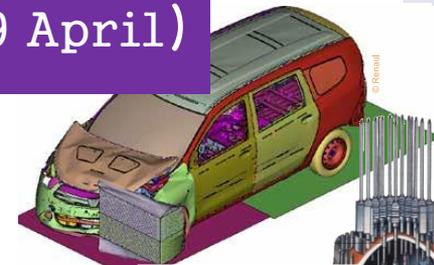
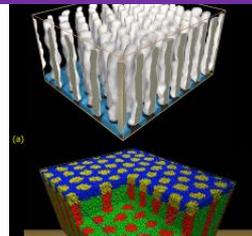
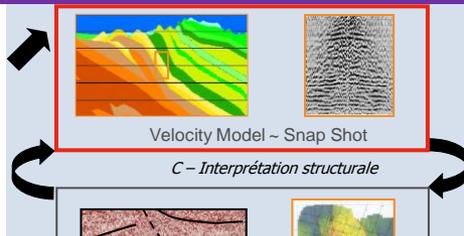
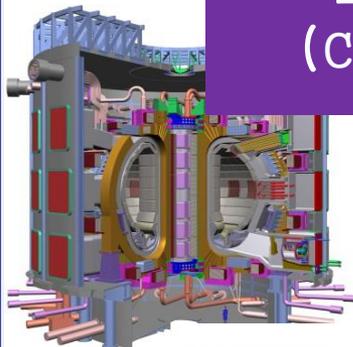
Memory Requirements

Particles (0.1-100x memory)
Reaction-Diffusion (0.1, 100x memory)
Data Cell Integration (100x memory)
Vasculature (0.1x memory)

Cellular Human Brain
O(1,000x Rat Brain)

Europe owns a lot of applications
(70% in chemistry)

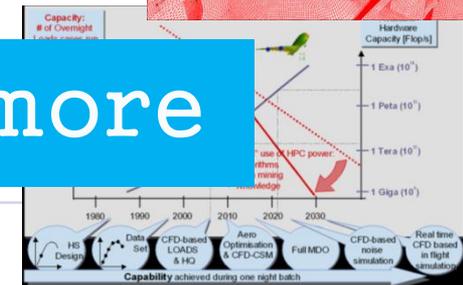
Europe is the biggest generator of data
(C. Moedas, Eu Open Science Cloud conf., 19 April)



Callista, Flockhart_0002
Detection & Localization

EXASCALE on critical path

But BIG DATA even more



- Objectives
 - Provide updated roadmaps of needs and expectations of scientific applications
 - Provide inputs to the update the PRACE Scientific Case in order to support PRACE in the deployment of its (Pre)Exascale pan European HPC research infrastructure
- Initiative to create an update of the Scientific Case and capture the current and expected future needs of the scientific communities
 - Weather, Climatology and solid Earth Sciences
 - Astrophysics, HEP and Plasma Physics
 - Materials Science, Chemistry and Nanoscience
 - Life Sciences and Medicine
 - Engineering Sciences and Industrial Applications



- **PRACE Scientific Case**
- Issued end of 2012 by the PRACE Scientific Steering Committee
- Needs and roadmaps from different scientific and industrial communities
- Key recommendations :
 - Persistent Pan EU HPC infrastructure
 - Development of algorithms and system tools
 - Integrated compute & data
 - Education & Training
 - Thematic centers (aka CoE)...

The EESI2 reports and recommendations

- Issued mid 2014 and mid 2015
- 5 Applications working groups
- 43 experts from 10 countries, academia & industry
- 3 specific reports on applications published
- Active participation on EESI2 global recommendations inc.:
 - Parallelisation in Time with examples on applications
 - Extreme scale solvers
 - Uncertainty Quantification in massively parallel codes
 - In-situ Data Processing in Extreme Simulations
 - Data Centric Approach in turbulent flows
 - Efficient Couplers for Extreme Computing
 - Urgent computing



**FET HPC 2 call
open on April'17**



- 4 working groups of around 30+ experts

- Industrial and engineering applications

EDF : Yvan Fournier, University of Aachen : Heinz Pitsch

- Weather, Climatology and Solid Earth Sciences

Univ. Salento/CMCC : Giovanni Aloisio,
JCA Consultance: Jean-Claude Andre



- Fundamental Sciences

CEA : A. Sacha Brun, JSC: Stefan Krieg

- Life Science & Health

BioExcel CoE / KTH : R. Apostolov,
CompBioMED / UCL : P. Coveney



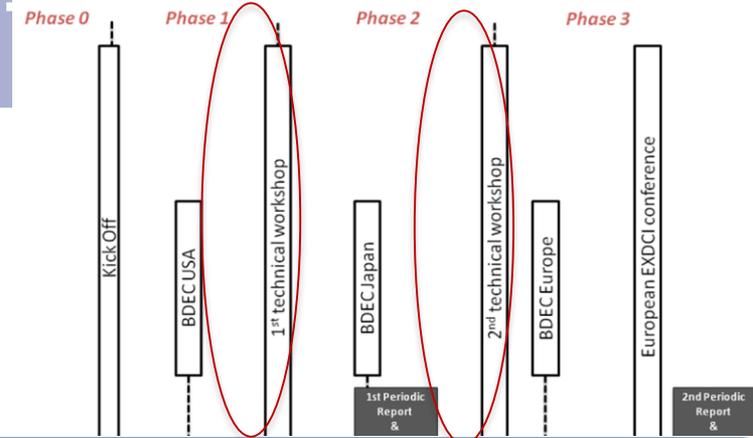
- Coordination, consolidation of application roadmaps and inputs to the update of the PRACE Scientific Case

PRACE : S. Requena and the PRACE SSC



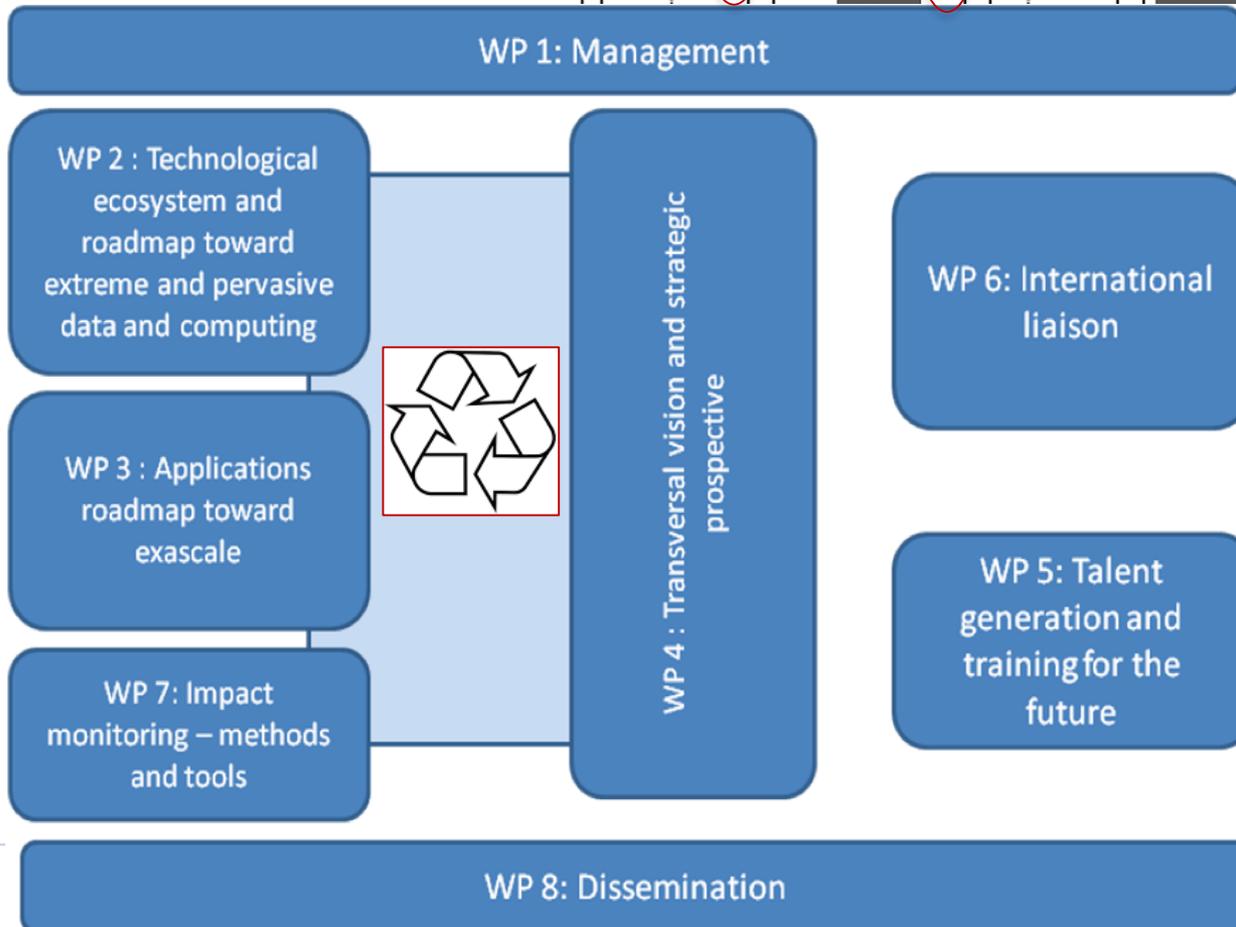
Applications roadmap towards Exascale: organisation of the activities (2/3)

Internal collaboration within EXDCI



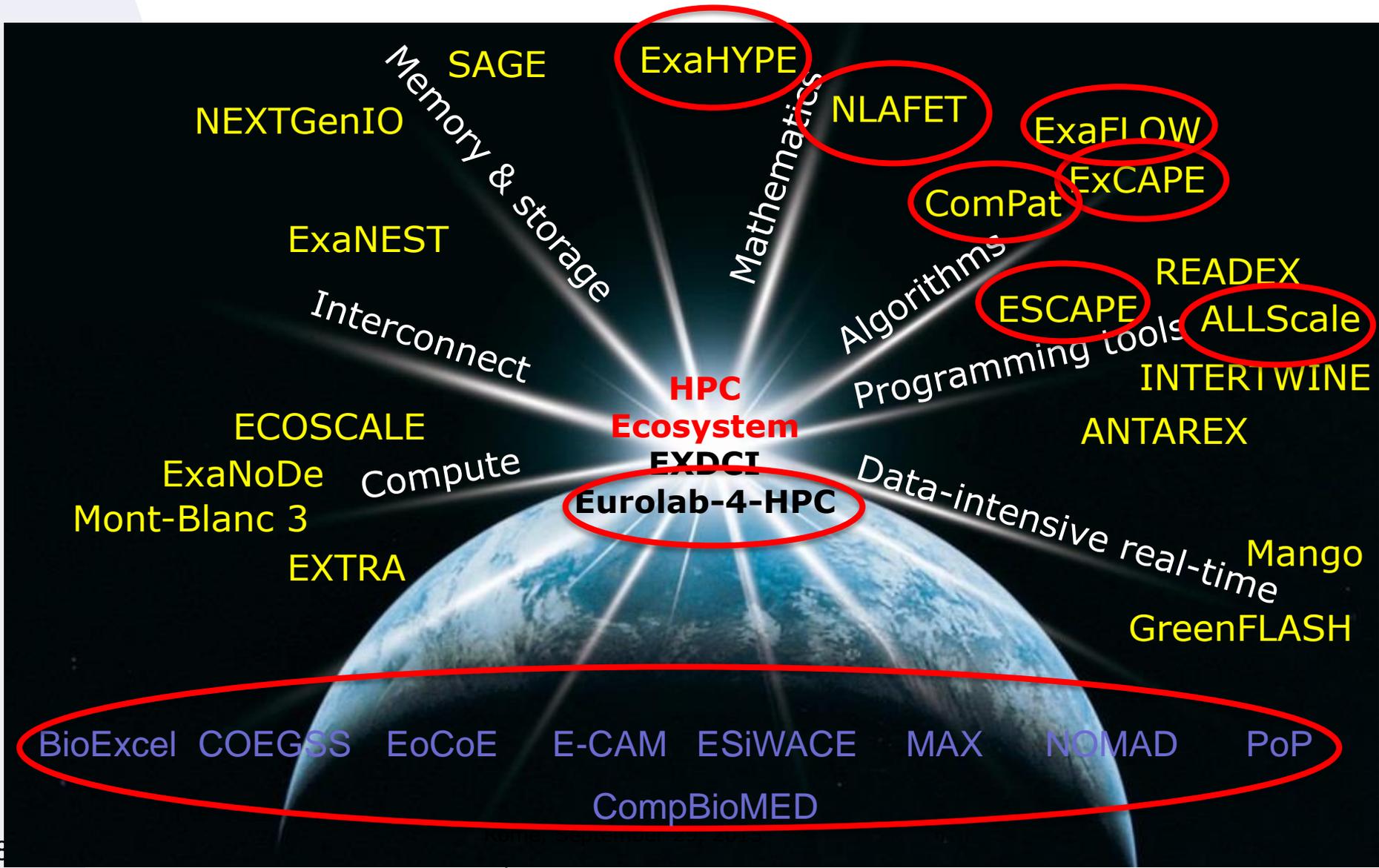
A mandatory virtuous cycle with technology and transversal vision

Synchronised by 2 technical meetings



Applications roadmap towards Exascale: organisation of the activities (3/3)

External collaboration with EU HPC ecosystem and beyond





- Participation in BDEC conference - June 16 & 17
- First interlock meeting with technology and transverse vision (21-22 September 2016, Barcelona)
- First set of reports and recommendations toward applications (November 2016)
- Third version of the PRACE SSC Scientific Case – a full bottom-up new version of PRACE SSC Scientific Case, following the last one published in 2012 (November 2017)

