



High Performance Computing Research in Europe

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European Commission President Jean-Claude Juncker

"Our ambition is for Europe to become one of the top 3 world leaders in high-performance computing by 2020"

Paris, 27 October 2015

Vice-President Andrus Ansip

"I encourage even more EU countries to engage in this ambitious endeavour"

Ministers from seven MS (France, Germany, Italy, Luxembourg, Netherlands, Portugal and Spain) sign a declaration to support the next generation of computing and data infrastructures



Digital Day Rome, 23 March 2017



- *The **US** CORAL projects provide financial contributions for developing two streams of home-grown processors and exascale machines*
- ***China** is developing its home-grown technology including a processor for the TaihuLight supercomputer, world-leader at the moment in the Top500 supercomputers.*
- ***Japan** is developing the post-K machine with home-grown processor and exascale machine*

The Political Priorities



European Cloud Initiative [COM(2016) 178 of 19/4/2016]

■ **European Open Science Cloud (EOSC)**

- Integration and consolidation of e-infrastructures
- Federation of existing research infrastructures and scientific clouds
- Development of cloud-based services for Open Science
- Connection of ESFRIs to the EOSC

■ **European Data Infrastructure (EDI)**

- Development and deployment of large-scale European HPC, data and network infrastructures

■ **Widening access**

- SMEs, Industry at large, Government

"Building a European Data Economy" [COM in Jan 2017]

HPC/EDI Objectives (1)



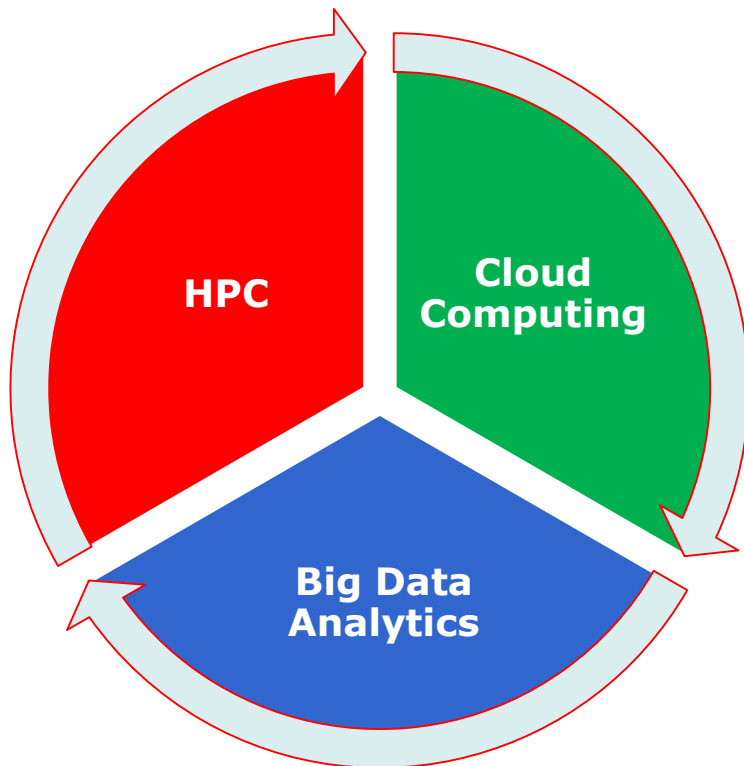
- **Acquisition** (in 2020-2021) of 2 operational **pre-exascale** and (in 2022-2023) two full **exascale** machines (of which one based on European technology)
- **Interconnection and federation** of national and European HPC resources and creation of an HPC and Big Data service infrastructure facility
- **Demonstrating and testing** technology performance towards exascale through scientific & industrial compute-intensive applications

HPC/EDI Objectives (2)



Build a world-class European High Performance Computing (HPC), Big Data and Cloud Ecosystem

Enabled by the Convergence of 3 big technologies



- Major investments so far both at MS and EU level [FP7, H2020]
- Numerous research players (academia and industry)
- HPC and Big Data PPPs, PRACE, GEANT, etc.

HPC R&D: H2020 current landscape



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HPC/EDI: The Logic of EU investments



FET & LEIT Calls: technology development, integration, pilot test-beds and applications

- Technology development (low-power processor, SW, applications)
- Integrating and co-designing extreme scale systems

**HPC – Cloud – BDA
Ecosystem development**

Two pre-exascale

Two exascale

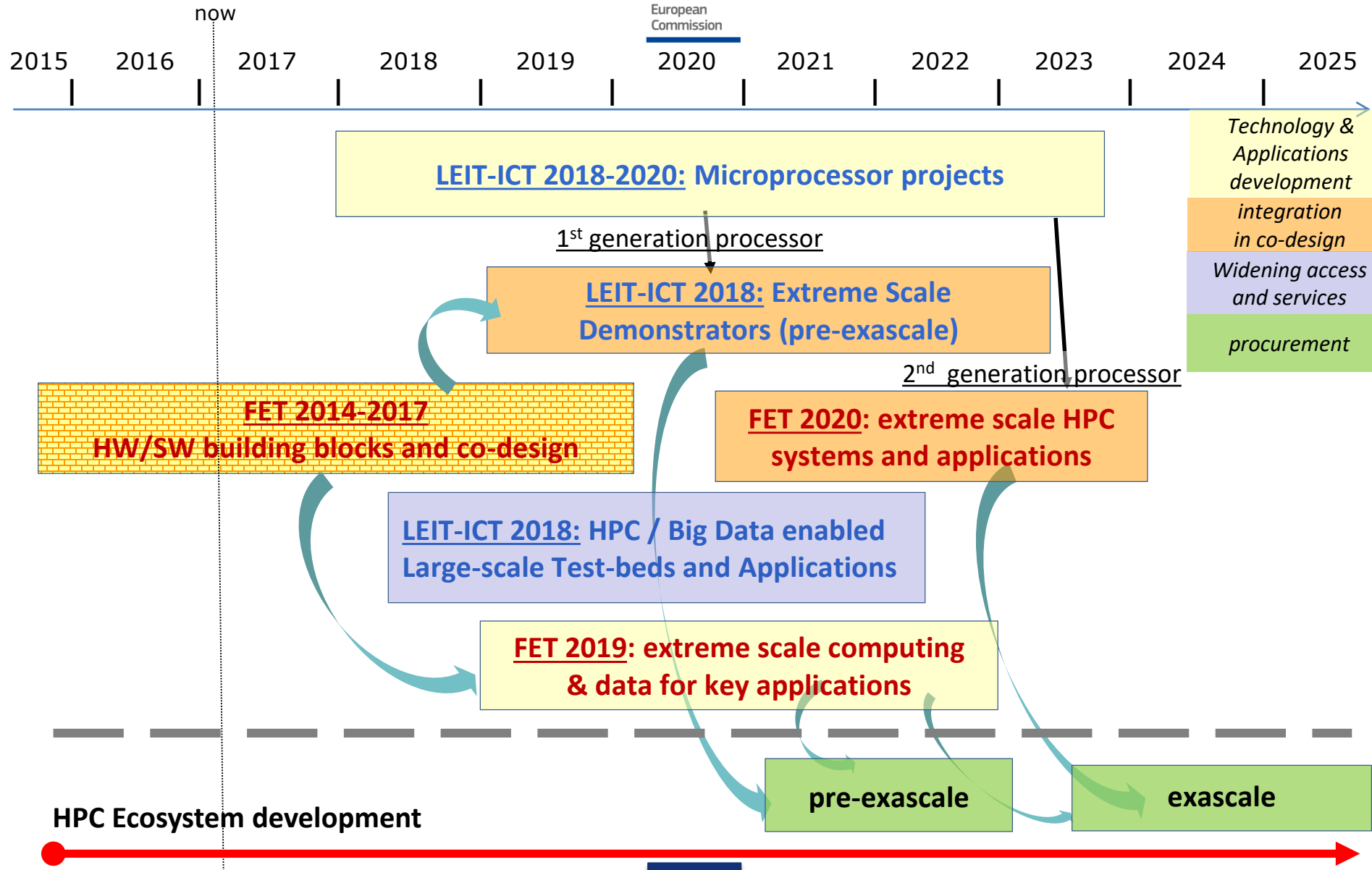
Infrastructure/CEF calls

- Centres of Excellence, Ecosystem development
- Procurement and services for EDI/HPC infrastructures (exascale, big data nodes, interconnection) and use widening

HPC timeline LEIT/FET (indicative)



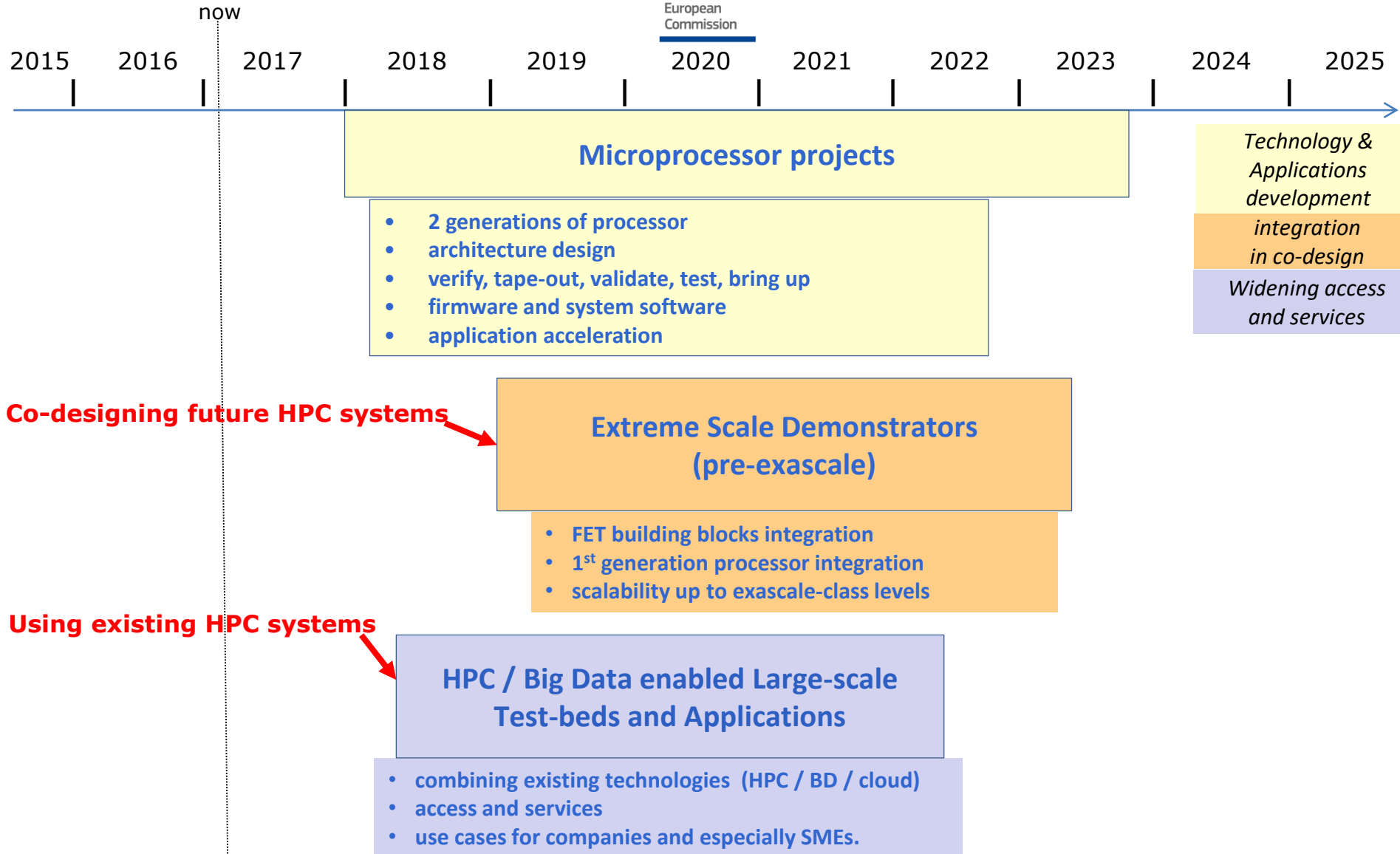
**DRAFT – under discussion
with the H2020 Programme
Committees**



HPC in LEIT 2018-2020 (indicative)



**DRAFT – under discussion
with the H2020 Programme
Committees**



HPC in FET 2018-2020 (indicative)

**DRAFT – under discussion
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*Technology &
Applications
development
integration
in co-design*

FET 2020: extreme scale HPC systems and applications

- innovative and ground-breaking system architectures
- integrate leading edge technology including 2nd generation processor
- co-design driven by ambitious applications

FET 2014-2017

HW/SW building blocks and co-design

FET 2019: extreme scale computing & data for key applications

- System software and management
- Programming environments
- I/O and storage
- Data-intensive HPC – emerging se modes
- Mathematical methods/algorithms

HPC Ecosystem development



HPC timeline eINFRA (indicative)

**DRAFT – under discussion
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eINFRA 2014 and 2018: Centres of Excellence (CoEs)

- Consolidating important areas (including Big Data)
- Opening to new CoE in other domains

eINFRA 2014-20: Support to PRACE and GEANT

eINFRA 2020: PPI for pre-exascale

Applications

*Widening access
and services*

procurement

Making Europe one of the top world leaders in HPC



- **Clear roadmap** and timeline implementing the political priorities
- **Coordinated actions** using all mechanisms of H2020
- Covering the **full HPC ecosystem**
 - Technology development
 - Co-design and integration
 - Applications and test-beds
 - HPC infrastructure development
 - Widening use of HPC
- **EUROHPC declaration** and further **strong cooperation with Member States**

High Performance Computing: a strategic area for the future of Europe's science and industrial competitiveness



European
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THANK YOU!