



64th HPC User Forum

HPC & Quantum Technologies in Europe

Dr Gustav Kalbe

**Head of Unit – High Performance Computing & Quantum Technologies
DG CONNECT, European Commission**



European HPC Strategy & Support

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"*

27 October 2015

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]



- **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



- **Tighter coordination of national strategies for upgrading computing, data and network infrastructures including:**
 - EU-wide access to federated computing and data resources
 - Pooling of investments (EU, national) to reach critical mass needed for accelerating the move to exascale
 - Building on achievements in PRACE-2 and GEANT
- **Establishing as quickly as possible a partnership with industry and Member States to offer:**
 - HPC as a service to a wide range of data and compute intensive applications in key sectors (health, industrie 4.0, finance, agriculture, etc.)
 - Build up HPC industrial strengths in Europe across the technology chain
 - Build on progress in IPCEI
- **Challenge → make the two tracks converge and ensure "co-design" as early as possible**

HPC/EDI – Funding needs

[COM(2016) 178 of 19/4/2016]

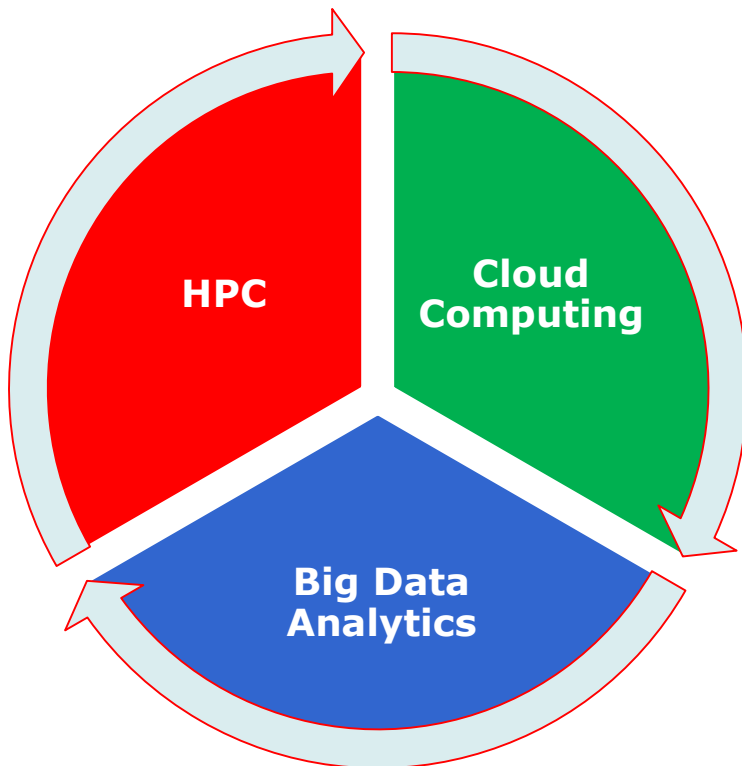


- **1.5 B€** for 2 pre-exascale and 2 exascale machines
- **1.7 B€** for the interconnection and federation of supercomputing infrastructures
- **0.5 B€** for processor and for wider access to HPC facilities for SMEs
- **1.0-1.5 B€** for demo and testing of industrial applications

Total: 4.7 – 5.2 B€

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/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

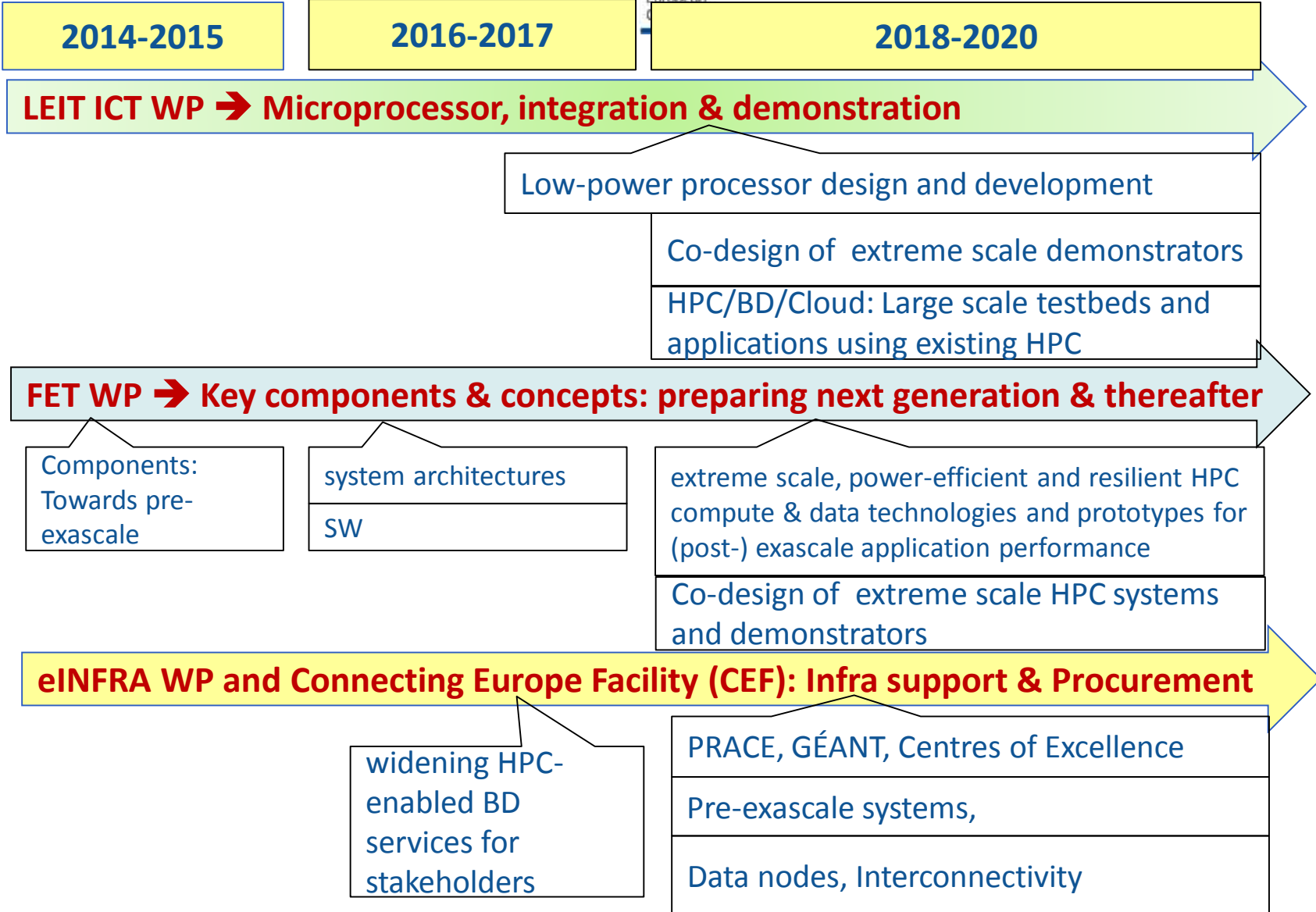
Two exascale

Infrastructure/CEF calls

- Procurement and services for EDI/HPC infrastructures (exascale, big data nodes, interconnection)

HPC/EDI in Horizon 2020

Work Programs





Flagship on Quantum Technology

Why now?



- Keep EU scientific leadership while preparing for exploitation and future industrial take-up
- QT maturing
- Build on strong interest from Member States
 - **ERANET Cofund with 24 MSs (QUANTERA)**
 - **National initiatives : NL, UK, others in preparation (DE, DK, IT, ES, PT, ...)**
- Increasing interest from European industry
 - **Bosch, Thales, ASML, Safran, Airbus, ATOS/Bull...**
 - **SMEs : VLC Photonics, E2V, MuQuans, IDQuantique...**
- Global competition very active
 - **US, Canada, China, ...**
 - **Industry engaged: MS, Google, Intel, IBM, Lockheed Martin, Toshiba...**



- EC Communication ECI – Staff Working Document (April 2016)
- Quantum Manifesto (April 2016)
- EU Council Conclusions (May 2016)



"Action: The European Commission will start the preparatory steps for the flagship...with the aim to launch the ramp up phase in 2018."



- **Turning science into industrial success**
 - "valorisation de la recherche"
 - Technology transfer
- Maintain research excellence in EU
- Expand to engineering
- Stimulate innovation
- Stimulate industrial involvement

A European endeavour



- No single EU country can do it alone
- A truly shared European political priority
- From established industries (Bosch, Thales, Atos, Airbus, ...) to **start-ups**

Ressources?

Expertise

Engage with industry, funders & investors

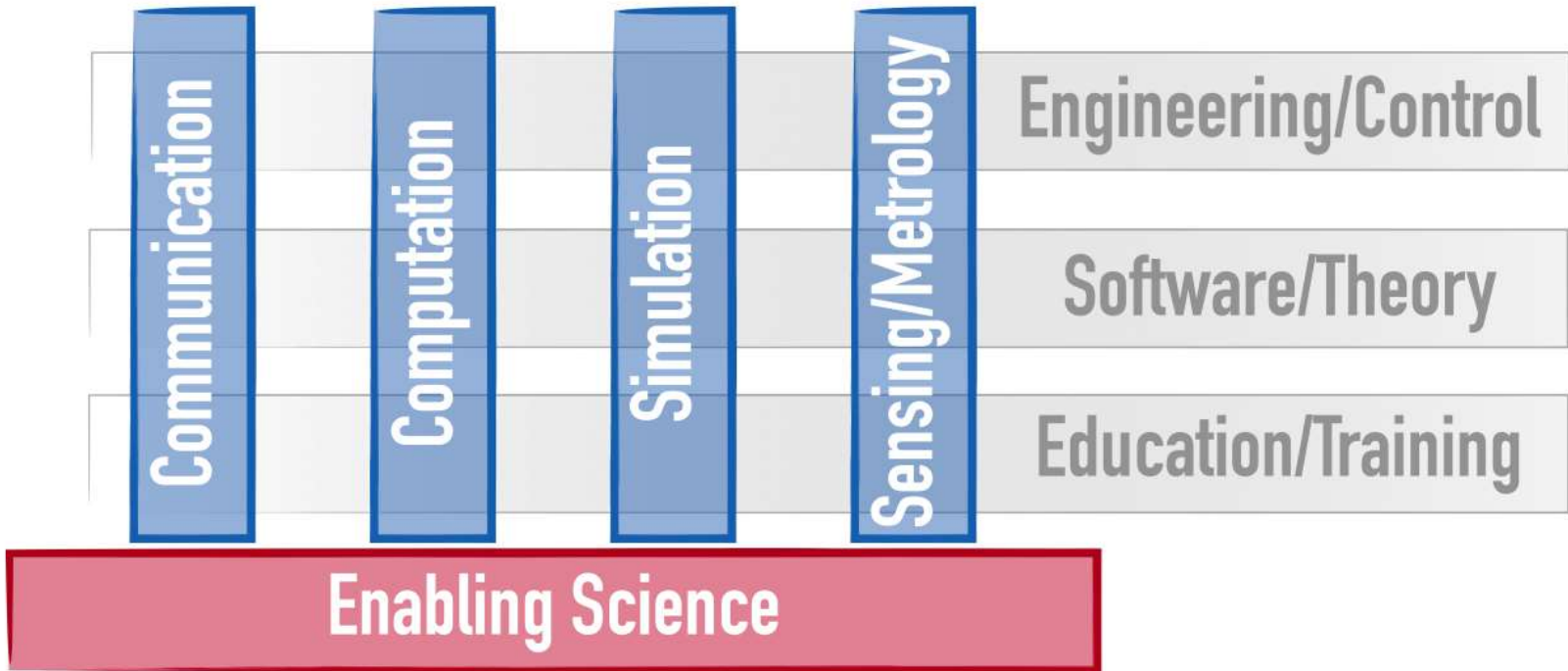
Joint agenda going beyond research

Join forces and coordinate at EU level

=> The Quantum Technology Flagship Initiative

WP 2018-2020

Key features



=> Starting point for WP
=> ramp-up coverage?



Big "complementary" projects, higher TRL,
addressing cross-cutting aspects

- **Quantum Communications**
Focus on networks & network components
- **Quantum Computing**
Integration of key building-blocks / co-design
- **Quantum Simulation**
Applications/simulator co-design
- **Quantum Metrology and Sensing**
Exploiting quantum properties in industrial relevant environments

Smaller projects, lower TRLs, horizontal topics

- **Fundamental/enabling science**



HPC – Quantum Technologies: Commonalities



Industrial Policy

Strategic technology for EU

Long term investment

Joint EU / MS initiative

Roadmap based

QT Computing / Simulation = HPC complements?



THANK YOU!