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# EuroHPC

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# Motivation

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- US, China, Japan have big plans to build the exascale SuperComputers in the next 5 years
- Top 500 list, 1<sup>st</sup> ten:
  - 2 in CN (~90 PFlops)
  - 1 in CH (~20PFlops)
  - 3 in JP (~19PFlops)
  - 4 in US (~17PFlops)
- EU lagging a bit behind
  - National projects cannot compete with large scale evolution and funding, largest 7.5PFlops

# The EuroHPC project

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- Effort at the EU level, in addition to national level HPCs
- EU states with large HPC centers:
  - Germany, Italy, Spain, UK, France (and Switzerland)
  - smaller centers in Scandinavia (NO, FI, SE), Netherlands, Czech Republic, Poland, ...
- Join the funding efforts to build competitive centers and infrastructure around it including Centers of Excellence and Competence Centers.

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- Effort started early 2017 at the EU level
  - Plan:
    - ➔ Funding of ~1.5B euro in 2018-2020, more after
    - ➔ Build 2 pre-exascale machines by 2020(21) - ~100-200 PFlops
    - ➔ Build 2 exascale machines by 2024(25) - ~1EFlops

# 16 Member States

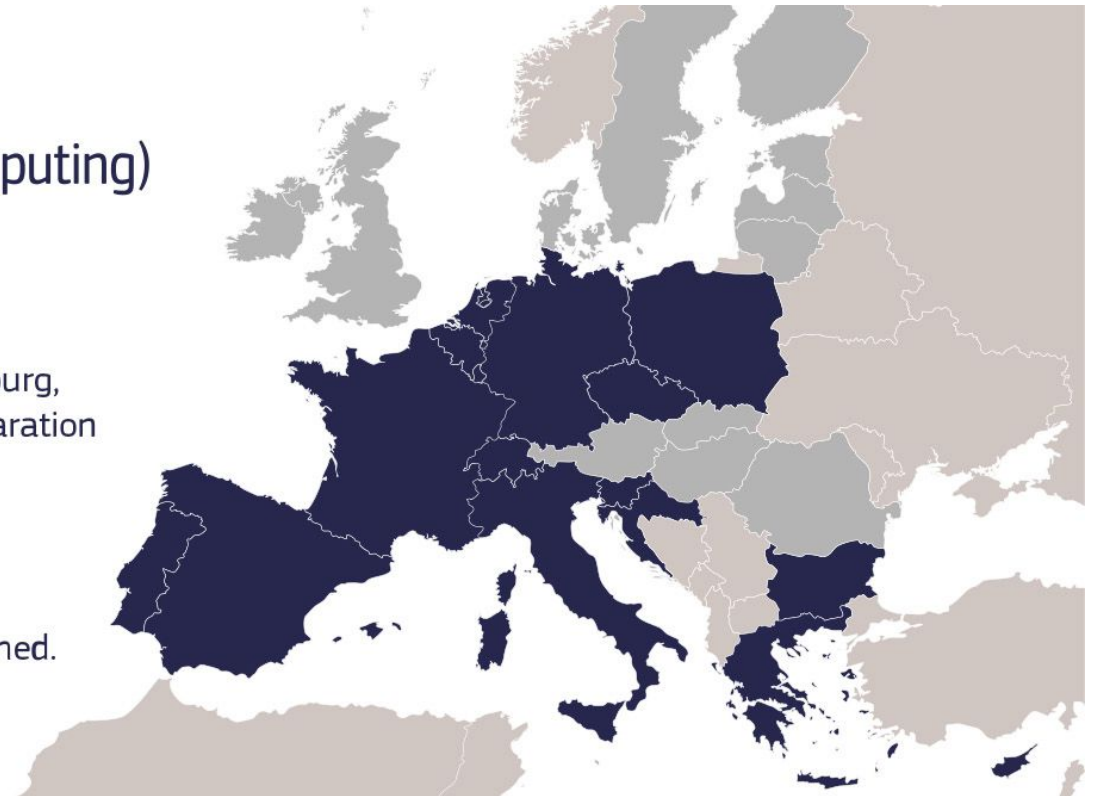
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## **#EuroHPC (High Performance Computing) Declaration**

*Signatory European countries*

Seven countries – France, Germany, Italy, Luxembourg, Netherlands, Portugal and Spain – signed the declaration in March 2017.

Since then, another nine countries – Belgium, Slovenia, Bulgaria, Switzerland, Greece, Croatia, Czech Republic, Cyprus and Poland – have also signed.



# Organizational Structure

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- Joint Undertaking (JU)
- Member States (Participating States)
- Hosting Entity: country or consortium of states hosting the center
- Working groups
  - Hosting and Procurement
  - User requirements
- Funding resources for pre-exascale
  - ~500M EU funding
  - ~500M MS funding
  - ~400M “private” funding, operational costs...

# Timeline

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- By autumn 2018
  - ➔ Agree on organizational structure
  - ➔ Elaborate the funding contributions
  - ➔ Working group reports and documents
- Early 2019:
  - ➔ Establish the Joint undertaking organization
- Mid 2019:
  - ➔ Selection of Hosting Entities
  - ➔ Start with the pre-exascale procurement
- 2020-21: Pre-exascale
- 2023-26: Exascale

# Resource distribution

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- JU owner of the resources till depreciation
- EU funded JU share (50%) – likely to be distributed in a similar way as in PRACE model
  - Peer reviewed access
  - User support and training
  - Dissemination and outreach
- Hosting entity share (50%)
  - Member state share proportional to direct funding or in-kind contribution



# Relation to PRACE and other communities

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- PRACE plans PRACE3 after 2020
- Relation to EuroHPC not quite clear yet but:
  - ➔ Likely adoption of PRACE model for access
  - ➔ Level of cooperation and integration with JU under discussion
- Centers of Excellence
  - ➔ PPI4HPC, POP, CompBioMed, ESiWACE,...

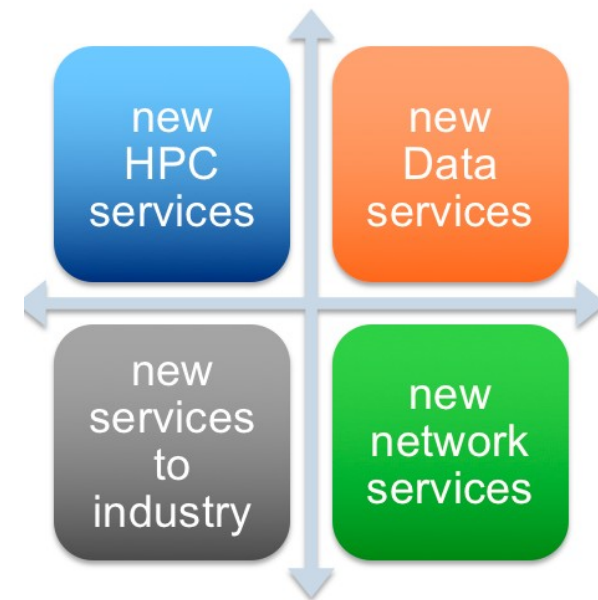
# EDI & PRACE

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- Offer a variety of system architectures to enable traditional scientific simulations
  - General purpose HPC centers and topical centers
- Addressing the convergence of HPC, HTC, HPDA and AI
  - FENIX and EUDAT projects - data management
- How to handle the large volume of data generated
  - Generated centrally at large RIs or distributed (e.g. sensor networks)
  - Rethink data movement (from edge to the data center) :
    - Local (at data source) processing facilities for data reduction
    - Central or distributed storage
    - How to support end to end workflows
- How to provide HPC/HTC capacity to large scale scientific instruments
- Need for an even tighter coordination of national infrastructure procurements in EU

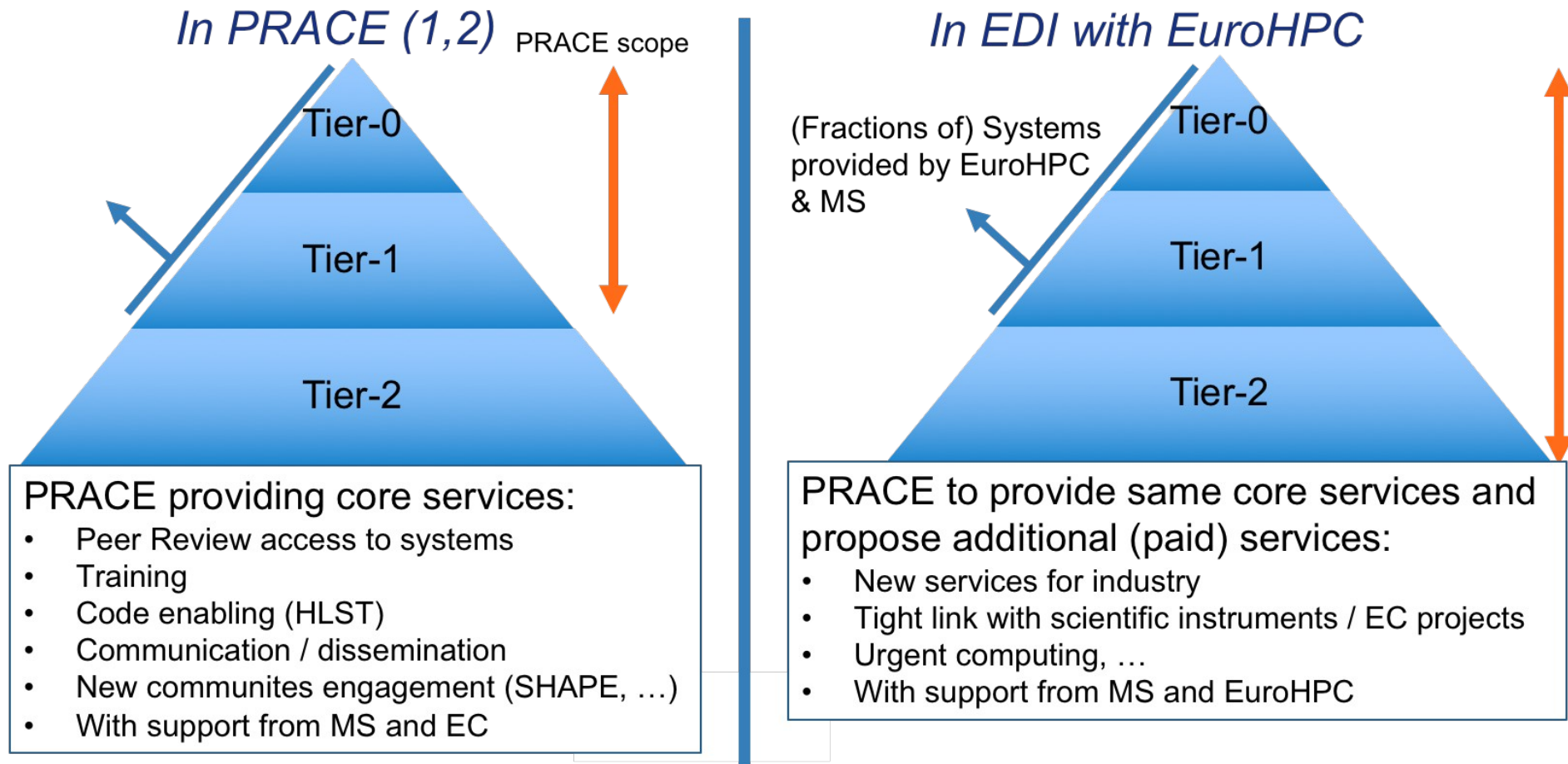
# Extend current PRACE activities to EDI

- PRACE as main contributor to EDI with GÉANT
- Access to JU- & Tier-0-infra provided by HMs for Open R&D for science & industry
- Offer **training**, code enabling, communication, **Tier-1 for Tier-0** services provided by PRACE partners & AISBL office
- Extend services towards **industry** (SHAPE-Fortissimo), and to the **public sector**
- **Local** support to Tier-2 services across Europe



- New **extended** services provided by partners
- **EDI** as a **one-stop-shop** for all EU project/infra on HPC and data
- **EOSC** as potential vehicle to offer services to industry and public

# PRACE, EDI, EuroHPC landscape



# Procurement

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- Two pre-exascale systems:
  - ➔ Italy and Spain expressed interest
- Peta-Scale systems, joint to pre-exascale:
  - ➔ Several Member States have plans
- Exascale systems:
  - ➔ Germany and France expressed interest

# New paradigm

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- Extend to support all aspects of scientific and industry demands:
  - ➔ Traditional HPC, simulation oriented
  - ➔ Data intensive application (EDI, GEANT)
    - Support for large data volumes and transfers
    - Scientific instruments with large data collection
  - ➔ BigData
    - Support for massively vectorizable applications (GPU)

# Conclusions

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- Much more funding will go to large sites supporting cpu and data intensive applications in the next 6-7 years
- Various scientific fields need to adapt to a new way of doing the computing, data storage and preservation
  - Big centers plan to evolve to cover wider spectrum of computing needs
- Disclaimer: EuroHPC project still under heavy discussion, everything might change