Digital Single Market

Pooling resources to build a world-class supercomputing infrastructure and ecosystem in Europe

EuroHPC
Joint Undertaking

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EuroHPC: the Joint Undertaking on High Performance Computing

is a **legal** and **funding instrument** enabling the EU to become a world leader in supercomputing, and focuses on:

Acquiring and deploying in the EU a world-class pan-European supercomputing infrastructure that will multiply Europe's current supercomputing capabilities by a factor of 5-10.

- By the end of 2020 acquire and install 8 supercomputers, with a joint investment of € 840 million between the EU and participating states:
  - 3 high-range (pre-exascale) supercomputers in the global top 10 in Kajaani (Finland), Barcelona (Spain), and Bologna (Italy)
  - 5 mid-to-high range (petascale) supercomputers in the global top 40/50 in Bissen (Luxembourg), Braga (Portugal), Ostrava (Czech Republic), Maribor (Slovenia), and Sofia (Bulgaria)
- 2022-2024: acquire further mid-to-high-range supercomputers, and at least 2 very high-range (exascale) supercomputers in the global top 5 (with at least 1 based on European technology)
- 2025+: acquire a super high-range (post-exascale) supercomputer that could be a combination of classical and quantum supercomputing.

These supercomputers will be interconnected via networks with terabit/sec capacity and made available throughout Europe to public and private users for research and innovation activities and use in more than 800 scientific and industrial application fields.

Ensuring the EU's **strategic digital autonomy in supercomputing technologies** by supporting an innovative supercomputing ecosystem, and stimulating a European technology supply industry, covering the full value chain from hardware and software to applications.

- The European Processor Initiative (EPI) started in December 2018 and is one of the EU's major initiatives for developing a low-power processor and accelerator needed for building exascale supercomputers
- Research and innovation calls for proposals will be launched in 2019-2020, with more than €300 million of funding from the current EU budget
- More research and innovation calls will be planned when the next EU budget is agreed.

Maintaining Europe's world leadership in supercomputing applications by:

- Stimulating the innovation potential of science, businesses and industry users to develop applications using the available computational power
- Developing a network of national supercomputing Competence Centres that will serve a large number of users, provide knowledge and new digital skills via training programmes, and promote targeted actions for SMEs.

Established in November 2018, EuroHPC will be operational until 2026 with the support of the current EU budget

Continued financial support is expected from the next EU budget.

EuroHPC is composed of public members (representatives of the EU and of participating European countries) and private members (representatives from supercomputing and big data stakeholders, including academia and industry).

EuroHPC has a budget of around €1 billion, of which 50% comes from the EU and 50% from the participating countries. Private entities will provide additional resources, of an estimated value of about €400 million.

EuroHPC is establishing agreements with national supercomputer centres for the acquisition, hosting and operation of the EuroHPC supercomputers. It also provides support for research and innovation activities.

WHAT IS SUPERCOMPUTING, ALSO KNOWN AS HIGH-PERFORMANCE COMPUTING (HPC)?

HPC involves thousands of processors working in parallel to analyse billions of pieces of data in real time, performing calculations thousands of times faster than a normal computer.

10^{18} The next step in high-performance computing is exascale performance: machines able to perform 10^{18} (a billion billion) operations per second, a technology which is expected to be reached by top global players by 2021.

WHY IS IT IMPORTANT TO JOIN FORCES AT EU LEVEL AND CO-INVEST IN WORLD-CLASS SUPERCOMPUTING INFRASTRUCTURES AND ECOSYSTEM?

Supercomputing technologies have an enormous potential to be leveraged in the broader ICT market, estimated at more than **€1 trillion**. They represent a huge prospective market for innovative applications for businesses, especially SMEs.

Better technology supply and availability of supercomputing resources will enable European researchers and companies to process their data in the EU, ensuring high levels of **data protection**.

EuroHPC will acquire, build and deploy an integrated **world-class** supercomputing infrastructure ranking among the world's top three.

The European Commission's proposed **Digital Europe programme** for 2021-2027 includes a projected additional €2.7 billion of funding for building supercomputing capabilities.

HPC BENEFITS

Citizens
Addressing major challenges faced by modern society (e.g. healthcare, public service efficiency, cybersecurity, safer and greener transport).

Researchers and scientists
Underpinning innovation in almost all scientific disciplines, and providing deeper insights into highly complex unexplored systems (e.g. astrophysics and deep space research).

Business and industry
Helping manufacturers and small and medium-sized enterprises be more innovative and save money, time and resources.

HPC CAN BE USED TO SOLVE SCIENTIFIC, INDUSTRIAL AND SOCIETAL CHALLENGES, INCLUDING:

Health
- Development of personalised and precision medicine to make treatments more effective.
- Saving money and time in the development of new drugs, from the initial concept to the final phase of reaching the market.
- Saving lives and money, through early detection of diseases and quicker diagnoses.

Climate change and weather forecasting
- 33% of the world's GDP is affected by the weather.
- Weather variations in Europe have an economic impact of around €400 billion annually.
- Severe weather resulted in high costs for Europe between 1970 and 2012:
  - 150,000 lives lost
  - €270 billion in economic damage.
- Using HPC technology, climate scientists can predict the size and paths of storms and floods more accurately, meaning that people can be alerted and evacuated faster, saving lives.

Industry
- Reducing development time, minimising costs, optimising decision processes and producing higher quality goods and services.
- HPC has helped the car industry save more than €40 billion by, for example, reducing new vehicle development cycles from 60 months to 24 months.

Cybersecurity
- It is estimated that between 2015 and 2021 the global costs of damage from cybercrime will double and reach $6 trillion per year.
- Combined with artificial intelligence, HPC helps to detect:
  - strange systems behaviour
  - insider threats and electronic fraud
  - cyberattack patterns.
- → This can shorten response times to hours instead of days, and even before a cyberattack happens.

Energy
- HPC provides critical tools for:
  - designing renewable energy parks
  - designing high-performance photovoltaic materials
  - optimising turbines for electricity production.
- HPC expenditure in the energy sector is projected to grow by 5% in the next few years.