



The European strategy for High Performance computing

***A collective effort at the service
of our society and economy***

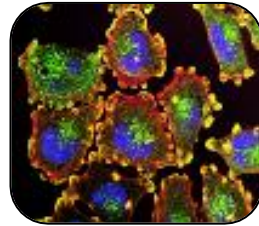
DG CONNECT, European Commission – June 2019

Why invest in HPC?

HPC is at the core of major advances and innovations in the digital age

Strategic value for science

Personalised health



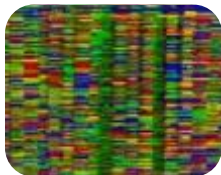
Cancer



Drug discovery



Drug design



Genomics



Climate

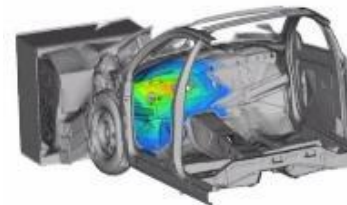
Strategic value for Industry



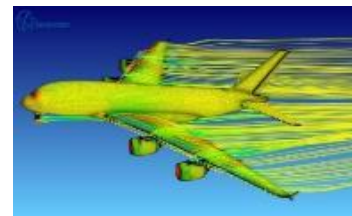
Wind plant modelling



Oil & Gas exploration



Crash simulations



Aerodynamics & structural analysis

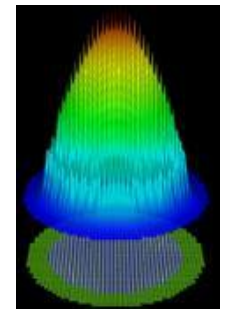


Pharmaceuticals

National security and defence



Cybersecurity



Nuclear reactor simulations



complex encryption technologies

Europe's scientific capabilities and industrial competitiveness critically depend on access to world-leading HPC computing and data infrastructures

HPC Applications

HPC is used in various **domains**, all **requiring a lot of computing power** to **solve problems**, or **run simulations**.



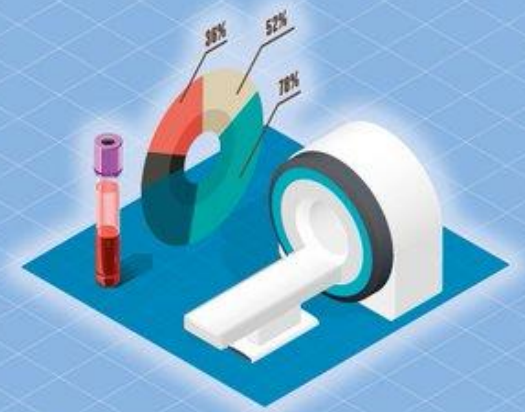
climate & weather
prediction simulations



geo-sciences like
seismic simulations



manufacturing &
material science



health & pharmaceutical
drug development,
cancer analysis

Digital twins

HPC helps to **reduce the time** it takes
to develop new vehicle platforms

from **60** to **24 months**

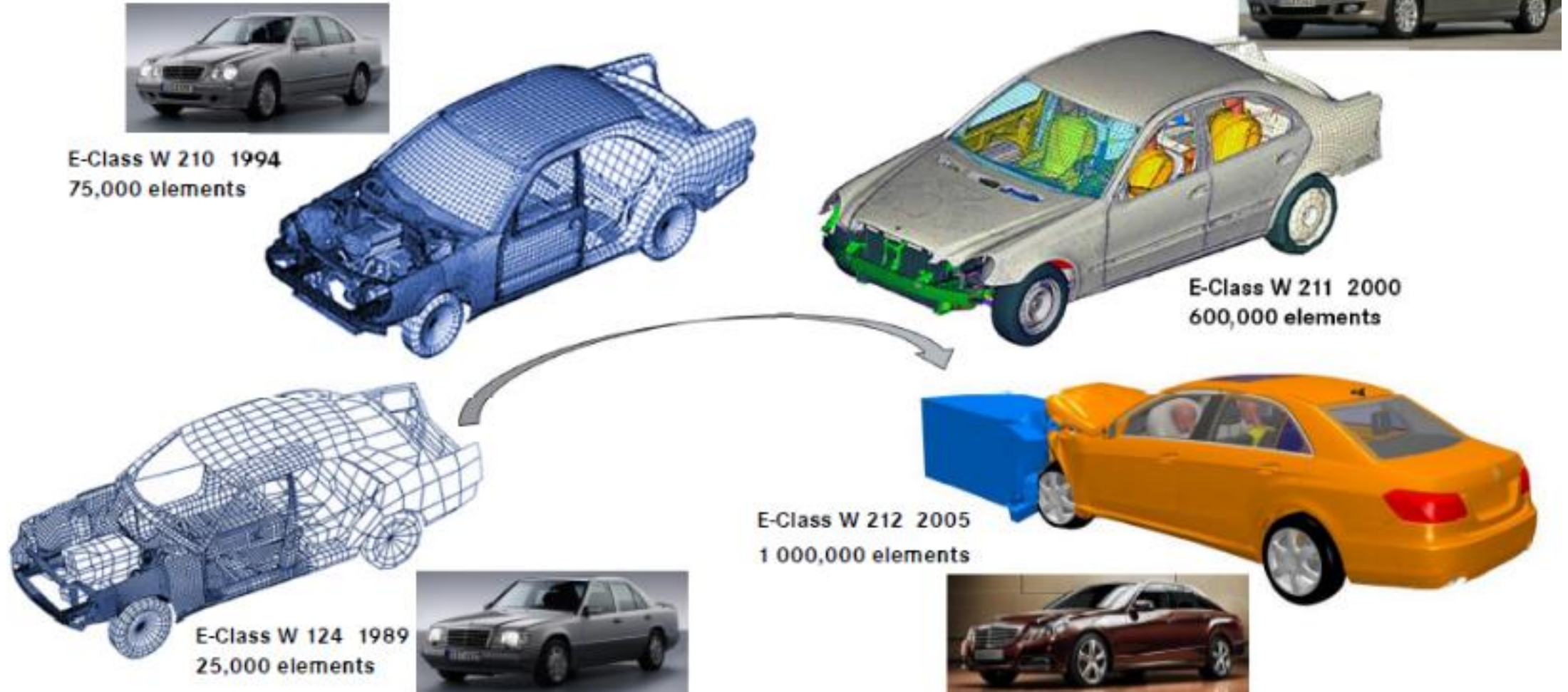


HPC helps to accelerate **bio-chemistry**
simulation to identify **new drug**

from **5000 years**
in a **standard PC**
to only **100 days** in
a **supercomputer**

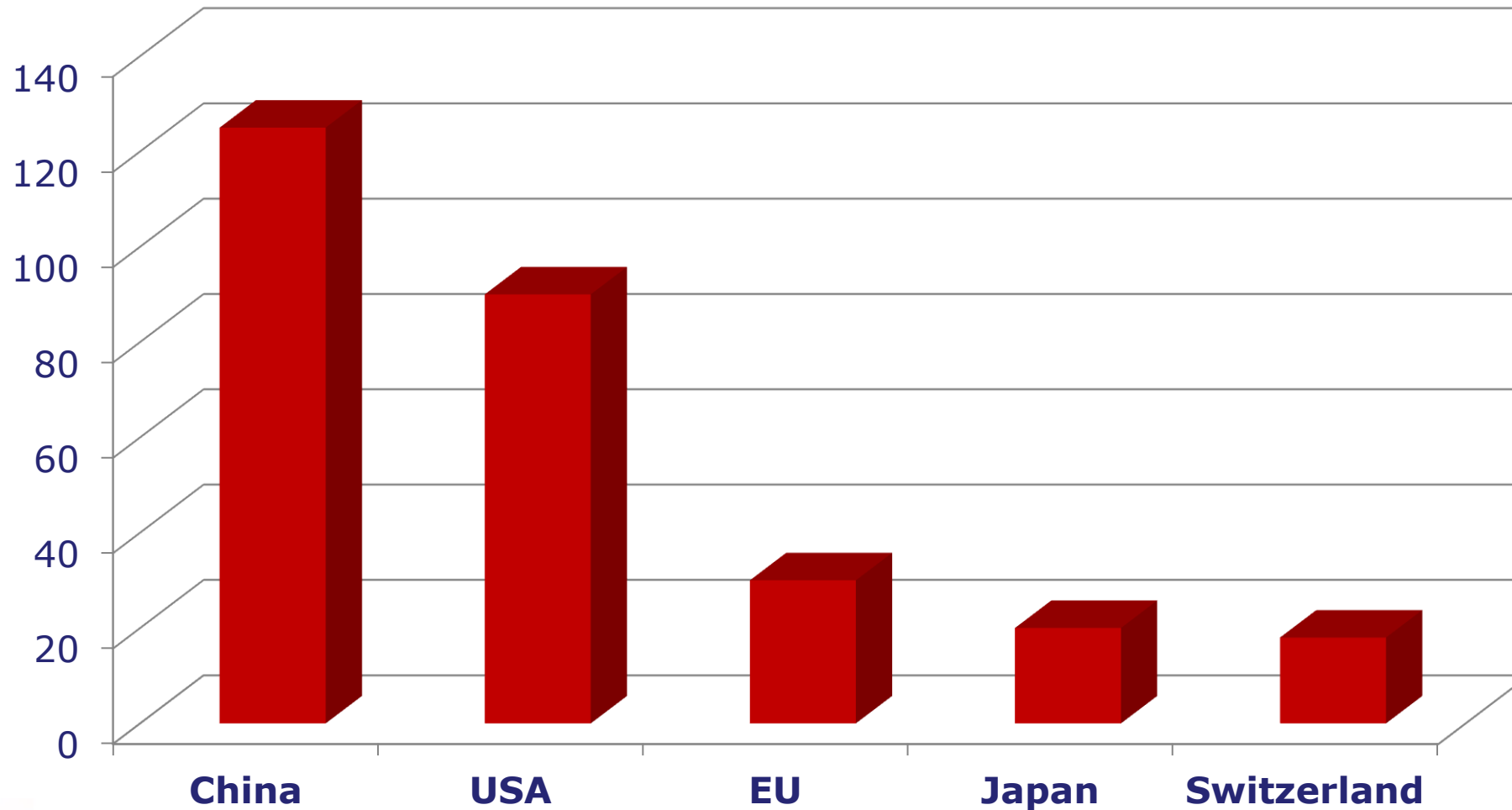


Evolution of crash models



Where does Europe stand?

HPC world Computing power in Petaflops, Top 20, 2017-18



The EuroHPC Joint Undertaking (EuroHPC JU)

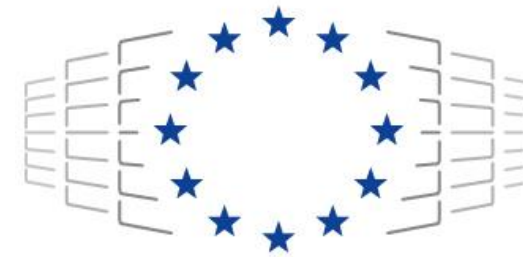


A legal and funding agency created by the Council

- 28 Participating States + EU
- Site: Luxembourg
- Budget (2019-2020): ~1 Billion Euros (half from EU)
- Operational: 11/2018 to 2026

Mission: Establish an integrated world-class supercomputing & data infrastructure and support a highly competitive and innovative HPC and Big Data ecosystem

The JU is already delivering!



EuroHPC
Joint Undertaking

<https://eurohpc-ju.europa.eu/>

EuroHPC JU
EuroHPC JU Participating Sta

EuroHPC JU Participating States

Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and Turkey.



The EuroHPC delivers a leading supercomputing infrastructure



High-range Supercomputers



3 sites for supercomputers selected
performance: 150-200 million billion operations per second



Investment: 650 million Euros
50% from EU and 50% from Consortium supporting the site

Sites and supporting Consortia

- Kajaani (FI) – FI, BE, CZ, DK, NO, PL, SE, CH, EE, NL
- Barcelona (ES) – ES, HR, PT, TR, IE
- Bologna (IT) – IT, SI

EuroHPC JU is the owner

Medium-to-high range Supercomputers



5 sites for supercomputers selected
performance: at least 4 million billion operations per second



Investment: ~180 million Euros
34 Million from EU

Sites and supporting Consortia

- Bissen (LU) – LU
- Minho (PT) – PT, ES
- Ostrava (CZ) – CZ
- Maribor (SI) – SI
- Sofia (BG) – BG

EuroHPC JU is co-owner

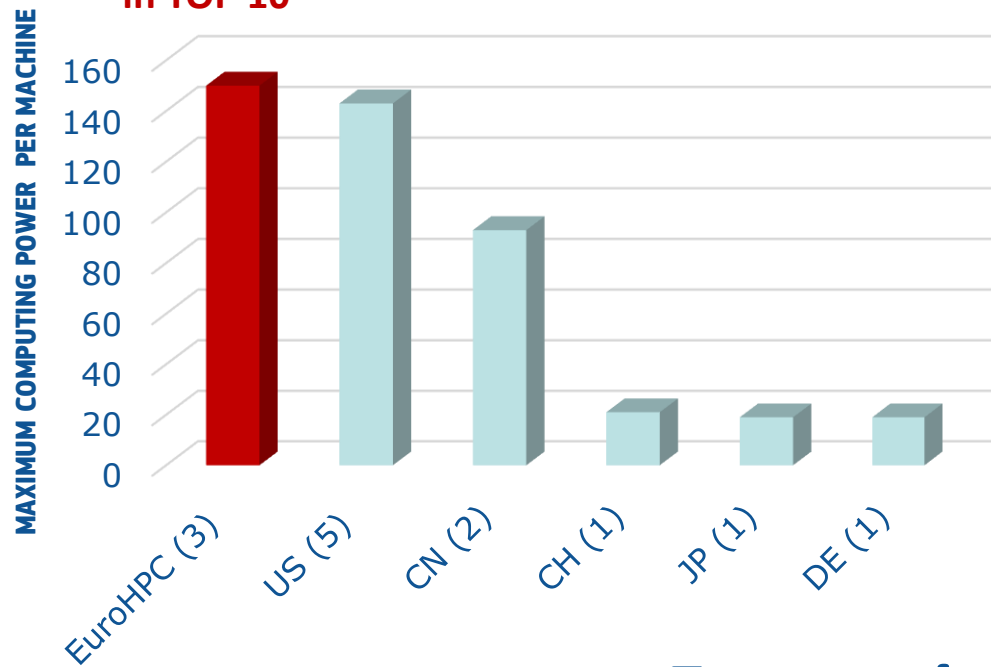
All supercomputers accessible to any user in Europe

The EuroHPC delivers a leading supercomputing infrastructure



**EuroHPC will have
3 machines
in TOP 10**

**Current TOP 10
World Supercomputers**



- **8 Sites and 19 Participating States**
- **The supercomputers operational in 2nd half of 2020**
- **Total joint investment: ~830 M€**
- **Over 800 leading applications for scientific and industrial users**

Europe in the world TOP 10!

***Challenge for next MFF: Prepare for the
next 2 super-machines and for Quantum Computers***

EuroHPC Supercomputer in the Top 10 ranking

Rank	Site	Country	Rmax [PFlop/s]*
	Cineca (EuroHPC)	Italy	150-180
	BSC (EuroHPC)	Spain	152
	CSC (EuroHPC)	Finland	150
1	DOE/SC/Oak Ridge National Laboratory	United States	143
2	DOE/NNSA/LLNL	United States	94
3	National Supercomputing Center in Wuxi	China	93
4	National Super Computer Center in Guangzhou	China	61
5	Swiss National Supercomputing Centre (CSCS)	Switzerland	21
6	DOE/NNSA/LANL/SNL	United States	20
7	National Institute of Advanced Industrial Science and Technology (AIST)	Japan	19
8	Leibniz Rechenzentrum	Germany	19
9	DOE/SC/Oak Ridge National Laboratory	United States	17
10	DOE/NNSA/LLNL	United States	17

EuroHPC Supercomputers will be within the top 10 in the world

Rank	Site	Country	Rmax [PFlop/s]*
30	HLRS - Höchstleistungsrechenzentrum Stuttgart	Germany	5,6
31	Max-Planck-Gesellschaft MPI/IPP	Germany	5,6
32	King Abdullah University of Science and Technology	Saudi Arabia	5,5
33	NASA/Ames Research Center/NAS	United States	5,4
34	Total Exploration Production	France	5,3
35	National Renewable Energy Laboratory	United States	4,9
36	National Center for Atmospheric Research (NCAR)	United States	4,8
37	Research Institute for Information Technology, Kyushu University	Japan	4,5
38	Sugon	China	4,3
39	DOE/NNSA/LLNL	United States	4,3
40	CEA/TGCC-GENCI	France	4,1
	PetaSC (EuroHPC)	Bulgaria	4,0
41	Petroleum Geo-Services	United States	4,0
42	ECMWF	United Kingdom	3,9
43	ECMWF	United Kingdom	3,9
44	Forschungszentrum Juelich (FZJ)	Germany	3,8
45	Indian Institute of Tropical Meteorology	India	3,8

PetaSC Bulgaria will be within the top 40 in the world

- *By joining effort, we build the world most powerful ecosystem for computing and data handling*
- *We are reinforcing our capacities & applying them for the benefits of our citizens and businesses*
- *Mastering advanced computing is essential to capture the benefits of Artificial Intelligence & Data.*
- *We are rebuilding the EU digital supply chain*
- *and preparing for the next generation: Exascale, Quantum Computing*