RESOLUTION

Accelerating HPC adoption in the EU

Adopted at the 12th YEPP Congress in Athens, 03.11.2018

Acknowledging that:

- High-Performance Computers (HPC) play an important role in the field of computational science and are used for a wide range of computationally intensive tasks in various fields, including quantum mechanics, oil and gas exploration, molecular modelling, as well as in physical and nuclear simulations. Super-computers already have a great impact on numerous sectors, such as healthcare, clean energy, agriculture and cybersecurity. In medicine data processing technologies have made better and personalised treatments at lower cost possible.
- Reports show demand for supercomputing is rapidly increasing in key sectors of the European economy.[1]
- EU has already created the EuroHPC Joint Undertaking - a legal entity form established at a European level by the European Council. Meanwhile, 25 countries have committed to join the EuroHPC JU. The advantage of this Joint Undertaking is that it combines both research and industry components[2].
- Scientists use HPC's computing power to study climate change and weather prediction. They can predict the path and the effects of devastating storms and can save lives and limit the economic consequences.
- None of the top 10 supercomputers in the world is located in EU.

Recognizing that:

- The EuroHPC JU plans to pool European and national resources to establish a world-class high-performance computing and data infrastructure, and a competitive HPC ecosystem, by acquiring and operating world-class high-performance computers and also by building

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[1] http://www.eib.org/attachments/pj/financing_the_future_of_supercomputing_en.pdf
[2] http://primeurmagazine.com/flash/AE-PF-09-18-7.html

key technology blocks (from low power processor up to systems architecture) in Europe, together with software tools and applications. The aim is to put Europe in the HPC world top three by 2022-2023.

- The need for supercomputing for industrial and commercial applications in Europe has grown rapidly in recent years. In fact, EU creates only 5% of the world HPC input and consumes 30% of it.[3]

- HPC is also essential to national security and defence - in developing complex encryption technologies, in tracking and responding to cyber-attacks and in deploying efficient forensics. HPC is being increasingly used in the fight against terrorism and crime, such as face recognition or detection of suspicious behaviour in cluttered public spaces. In cybersecurity, HPC, in combination with Artificial Intelligence and Machine Learning techniques, is used to detect strange systems behaviour, insider threats and electronic fraud, very early cyber-attack patterns (in a matter of few hours, instead of a few days), or potential misuse of systems and it can take automatic and immediate actions in order to prevent hostile actions. For example, the European Union Agency for Network and Information (ENISA) report states that there are multiple threats coming from countries, such as China, which was defined as "the top attacking country" when it comes to DoS (denial of service attacks) that paralyze target systems by flooding them with data[4].

- Europe's super-computing landscape is facing interconnected challenges:

    o Europe has clearly been underinvesting in HPC with a funding gap of EUR 500-750 million per year compared to its competitors. Whereas other countries (e.g. China and the US) have invested heavily in supercomputing infrastructure and capacity, Europe has been lagging behind.

    o No single country in Europe has the capacity to sustainably set up and maintain an exascale[5] HPC ecosystem in competitive time-frames by itself.

- There is large fragmentation of HPC programmes and efforts in Europe, leading to non-coordinated activities, which are due to the lack of a common procurement framework. The result is a waste of precious resources. In spite of the EC-supported pan-European PRACE programme (Partnership for Advanced Computing in Europe), which connects public HPC centres across Europe, the majority of HPC centres tend to be standalone organisations with a close link to a local academic institution or are embedded in a research cluster. Most of these centres are funded by national or at times, even regional budgets.

- EU's supercomputing capabilities depend on non-EU suppliers for critical technologies and systems - according to the 'targeted stakeholder consultation' on the Common European initiative on High-Performance Computing (HPC) that was held from the 3rd August till the 5th of September 2017[6].

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[3] Mariya Gabriel before "Shaping Europe's Digital Future – Bulgarian Presidency event on High Performance Computing"
[4] https://europa.eu/european-union/about-eu/agencies/enisa_en
[5] Capable of performing 1 billion billion calculations per second
[6] https://ec.europa.eu/digital-single-market/en/news/synopsis-report-and-contributions-eurohpc-targeted-consultation

- HPCcentres
Europe has a strong academic HPC provider infrastructure, mainly financed by public research grants. However, private and commercially-oriented HPC providers are less common in Europe. The strong competition, particularly from US-based companies, such as Amazon Web Services, Google and Microsoft, has left a relatively small landscape of European players offering HPC capacities on a commercial basis.

Independent Software Vendors (ISVs) develop and sell software for HPC applications. A considerable number of European ISVs are industry leaders in highly specialised niche segments. They are facing growing global competition in their niche markets from larger and less specialised providers expanding their presence into these new segments.

HPC intermediaries play a critical role in connecting users of HPC services and HPC centres. Many companies lack technical knowledge about HPC and are therefore finding it hard to make use of the HPC services. Without support from experts and a good understanding of the exact business case for the use of HPC applications, companies, in particular, SMEs, frequently do not realise the possible economic gains that can be derived from the use of HPC services.

HPC customers in Europe are mainly composed of public entities, both research and academia. This is reflected in the usage rates of Europe's highest performing HPC systems, where up to 94% of operating time is allocated to research tasks. The commercial users are mainly large corporations that apply HPC to reduce research and development costs. HPC uptake among SMEs is still very limited, due to the lack of awareness of the HPC capacity and barriers to accessing adequate financing to acquire it.

YEPP calls for:

- Creating a wide HPC community in Europe, which is among EuroHPC's most important goals. This way the development of smaller, petascale, and pre-exascale systems in research supercomputing centres across the Union can be facilitated. This can also be a vital step towards the creation of the Digital Single Market.
- Instead of putting an additional strain on the European taxpayers, when it comes to the HPC financing, a more market-oriented approach needs to be undertaken.
- As the European commissioner on Digital Economy and Society Mariya Gabriel mentioned there is going to be a need of a wide range of solutions such as dedicated financial instruments and public-private partnerships to mobilise the significant investments and new ways of financing that are necessary."[7]

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[7] http://www.eib.org/attachments/pj/financing_the_future_of_supercomputing_en.pdf

- In order to attract higher private capital, there need to be tax reliefs for the private sector representatives that participate in the HPC financing.
- To tackle the identified problems such as the limited interaction between academia and industry, the large fragmentation of HPC programmes in Europe, and the European dependence on non-EU suppliers, the EU needs to create new financial instruments.
- Ensuring direct contact with the interested small and medium enterprises that could benefit from HPC via direct channels and introducing them to the various ways they can benefit from the use of HPC. The Joint Undertaking will provide the European industry, in particular, small and medium-sized enterprises, with better access to supercomputers to develop innovative products. There are several key players in the HPC ecosystem, whose roles in this ecosystem are closely intertwined and who are facing complex issues. The EU's priority should be to facilitate their interactions as much as possible in order to achieve greater and faster results.
- Introducing a larger number of supercomputers within the borders of the EU - besides the already listed benefits, they will also lead to the creation of more jobs. Both among technically-skilled individuals as well as practically-skilled individuals who will be needed to build the necessary infrastructure in the European Union and will further prevent the 'brain drain' from the continent.
- Popularizing HPC-related B2B summits and conferences, such as ISC High Performance[8] - a specialized HPC event taking place in Frankfurt, Germany.
- With reference to the recent intelligence operation[9] of the PRC aiming at nearly 30 U.S. companies, including a major bank, we call for cautious partnerships with the Chinese companies and

[8] https://www.isc-hpc.com/diversity.html
[9] https://www.bloomberg.com/news/features/2018-10-04/the-big-hack-how-china-used-a-tiny-chip-to-infiltrate-america-s-top-companies