InnoHPC project
High-performance Computing for Effective Innovation in the Danube Region

Output 3.2. Database of HPC providers and industrial beneficiaries

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Abstract

This document presents a catalogue of needs and competences for enterprises and HPC providers/competence centres. The catalogue is equipped with basic comments to the status of HPC development and availability along with usage across the Danube region. The second part of the catalogue is in form of a database. This database provides the thorough insight into the needs for HPC of enterprises, especially SMEs who are TIER I and II subcontractors. Additionally, it also catalogues HPC providers and differentiates them based on their institutional capacity and competences.

The tool can be used as a basis for enhancement of transnational cooperation between HPC providers and & industrial beneficiaries.

Introduction

High performance computing (HPC) is an emerging general-purpose technology. It can improve framework conditions for innovations by drastically increasing effectiveness of innovations and reducing product development time. According to the Action Plan of the EC on European HPC strategy[1], HPC has excellent returns-on-investment (ROI) in Europe: for projects with financial returns, each euro invested in HPC on average returned €867 in increased revenue/income and €69 in profits.

However, while most advanced HPC infrastructure and knowledge are located in well-off western parts of the Danube region, enterprises – especially SMEs – from its eastern parts have limited access and competencies. Transnational cooperation in the region is limited, which is further hindering innovation. According to the benchmark conducted within InnoHPC project, the Danube region countries are grouped by the level of development of HPC in the following manner:

Subgroup of enterprises	Counties
HPC non-developed (n=23)	Bulgaria, Croatia, Moldova, Montenegro, Romania
HPC semi-developed (n=27)	Austria, BiH, Czech Republic, Hungary, Slovakia, Slovenia
HPC developed (n=29)	Austria, Germany
Non-opinionated (n=15)	Serbia

This catalogue along with the database directly addresses the topic of improving framework conditions for innovations in the Danube region by offering a tool for connecting HPC providers, business and innovation support organizations, along higher education and research institutions. The database is at this point valuable since it holds the information on the needs, competences and contact information for anyone to freely contact them upon the assessment of potential business opportunity.

The need for enabling the business opportunities in the fields of automotive and electronics industry shows to be one of the highest within the companies included in

[1] Action Plan for the European High-Performance Computing strategy, Brussels, 2016

benchmark conducted within InnoHPC project. The need to find partners was assessed with 3.5 (on the scale from 1-5).

Additionally, according to the same benchmark, 15.8 % enterprises report that if they would have access to more freely available HPC infrastructure (e.i. having sort of public funding) they would work with larger/more complex data or models, 6.3 % of companies said no, 34.7 % said maybe, 43.2 % of companies are undecided.

When it comes to cooperation, 70.5 % of enterprises believe that cooperation with science/industry could foster the HPC usage and their organisation development.

Collaboration and especially transnational collaboration is relatively week. The majority of the companies in our database has not been involved in international projects related to HPC (67.2 %). The one that were involved report mainly private projects (10.3 %), followed by EU projects such as PRACE, SESAME, FORTISSIMO, IoT and Big Data related projects and some others. Moreover, only small proportion of companies does take part in any cluster or network related to HPC (n=7). 38.7 % of enterprises report that they are aware that also other companies in the field use HPC, 21.5 % believe this is not the case, while 39.8 % does not have relevant information to believe so.

Catalogued needs of HPC of enterprises

The database consists of total 94 companies across the Danube region:

13.8 % of the companies come from Slovakia,
12.8 % were from Romania and Bulgaria,
11.7 % were from Slovenia,
10.6 % from Serbia,
9.6 % from Montenegro, and Bosnia and Herzegovina.

Less than half of participating enterprises are using HPC solutions to meet their business requirements.

Main reasons for the decision on using HPC solutions in the daily work. Here are the main reasons:

To solve problems that couldn't be addressed through other means (26.6 %);
To address problems more efficiently, faster, at the lower cost (24.5 %);
To develop new products or services (22.3 %);
To improve business innovation process (10.6 %);
To optimise supply chain (5.3 %);
Due to an external request from a customer or due to the legislation (5.3 %);
For research, testing (3.2 %);
Due to tax incentives (2.1 %).

Needs that were catalogued and included in the database are the following:

Needs dealing with the existence of R&D activities of the enterprise and of HPC usage

using HPC solutions to meet your business requirements.
what software applications and infrastructure enterprises use, what operating system enterprises use
use of HPC resources over a grid or a network
reasons for not using HPC, does enterprise intends to use it in the next 12months

Company's needs

Assessment on:
Availability of free HPC infrastructure (e.g. having sort of public funding)
Availability of commercial HPC infrastructure (where you have to pay for using it)

Availability of skilled human resources
Degree to which universities equip students with the necessary knowledge to work in HPC
Availability of competitive public funding (e.g. direct public funding, grants, awards, baseline funding)
Availability of private funding for R&D related to HPC
Degree of awareness about HPC benefits
Degree of science-industry cooperation related to HPC
Degree of industry- public authorities' cooperation related to HPC
Degree of science-public authorities' cooperation related to HPC
HPC prioritisation in legislative documents and strategies
Securing funding for HPC
Finding partners from business sector to collaborate with
Finding partners from academia and research centres to collaborate
Finding well trained human resources
Access to infrastructure
Awareness & knowledge about possible applications and the potential of HPC technologies
HPC training courses/ services for companies about possible applications of HPC technologies in their sector of activity
Training for the employees in the field of HPC
Regulatory and tax environment to improve conditions for investment in HPC
Getting help with modelling for developing a product or service that require HPC
Need of HPC usage to solve existing important computational problems

Company's HPC competencies

Which technical skills the personnel working with HPC in your organisation is equipped with, do they have the demand in additional training?
size of company's largest technical computer?
Existence of any HPC infrastructure and/or equipment that can be used by other companies?

Catalogued needs of HPC providers

The database consists of total 74 HPC providers across the Danube region:

Main characteristics of the database for Danube region:

in the database, there are 80.9 % public centres, 12.8 % private centres and 6.4 % of the organisations constitutes a private centre in a non-profit organisation

within the organisations, in general, only one department or part of the whole organisation deals with HPC (83.0 %)

the majority of organisations have been working on HPC solutions for more than 5 years (some even from the 90's) (61.7 %) on daily (48.9 %), weekly (12.8 %), monthly (10.6 %) basis

providers mostly rely on open source (33.0 %), developed in-house (28.3 %) or bought (24.5 %) software applications and infrastructure related to HPC
they focus on parallel computing (42.9 %), supercomputers (28.6 %), grid computing (23.1 %)

they serve engineering (30.4 %), research and education (16.5 %)[2], electronics (13.9 %), automotive (11.4 %), Aerospatiale industry (7.6 %)
46.8 % of organisations has 10 or less employees from the academic and technical staff working on HPC

Needs that were catalogued and included in the database are the following:

Need for R&D activities and of HPC use

Legal status of provider, level of involvement in HPC, years of experience with HPC,
what software applications and infrastructure provider uses,
HPC areas provider focuses on,
Collaboration with industry,
Number of academic and technical staff working on HPC,

[2] Research and education is not an industry itself, but due to a prevalent response among option other, we included it as a category itself.

Providers' needs

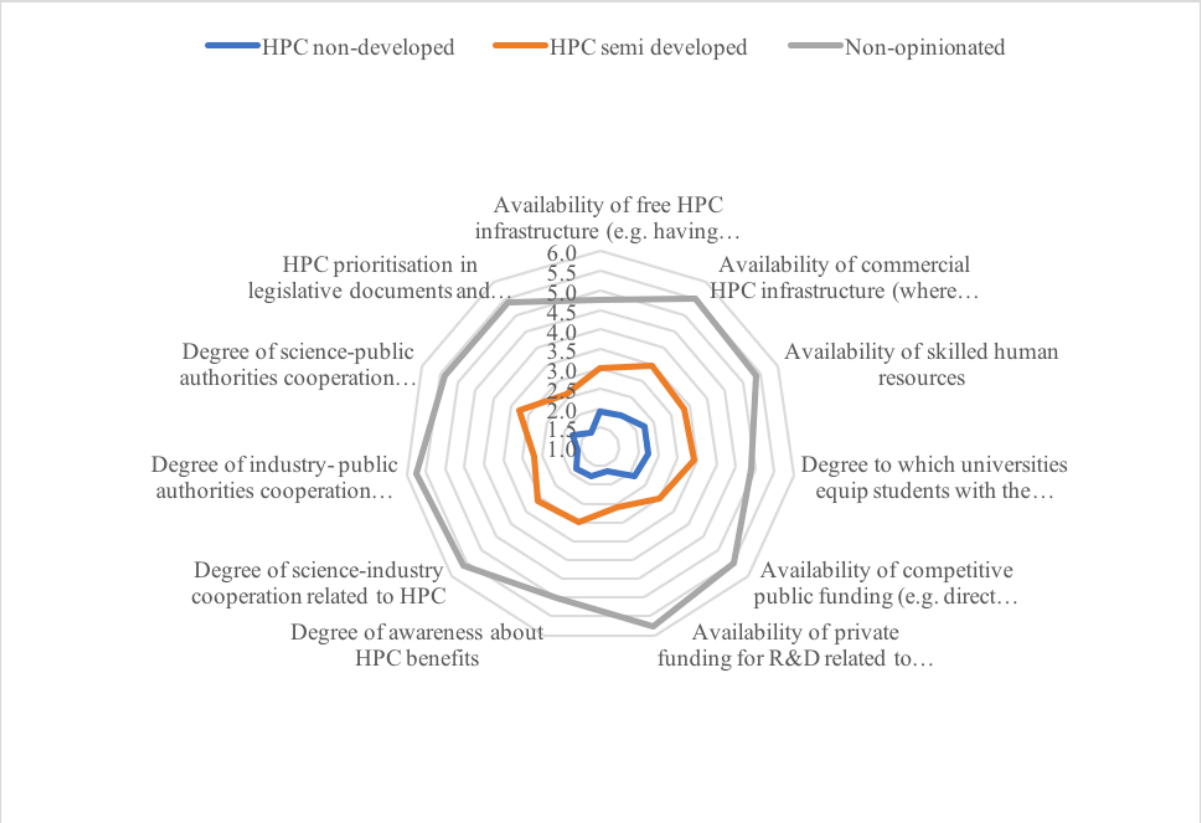
Availability of free HPC infrastructure (e.g. having sort of public funding)
Availability of commercial HPC infrastructure (where you have to pay for using it)
Availability of skilled human resources
Degree to which universities equip students with the necessary knowledge to work in HPC
Availability of competitive public funding (e.g. direct public funding, grants, awards, baseline funding)
Availability of private funding for R&D related to HPC
Degree of awareness about HPC benefits
Degree of science-industry cooperation related to HPC
Degree of industry- public authorities' cooperation related to HPC
Degree of science-public authorities' cooperation related to HPC
HPC prioritisation in legislative documents and strategies
Securing funding for HPC
Finding partners from business sector to collaborate with
Finding partners from academia and research centres to collaborate
Finding well trained human resources
Access to infrastructure
Awareness & knowledge about possible applications and the potential of HPC technologies
HPC training courses/ services for companies about possible applications of HPC technologies in their sector of activity
Training for the employees in the field of HPC
Regulatory and tax environment to improve conditions for investment in HPC
Getting help with modelling for developing a product or service that require HPC
Need of HPC usage to solve existing important computational problems
Need for themed course dedicated to the staff/ researchers of the provider

Providers' competencies

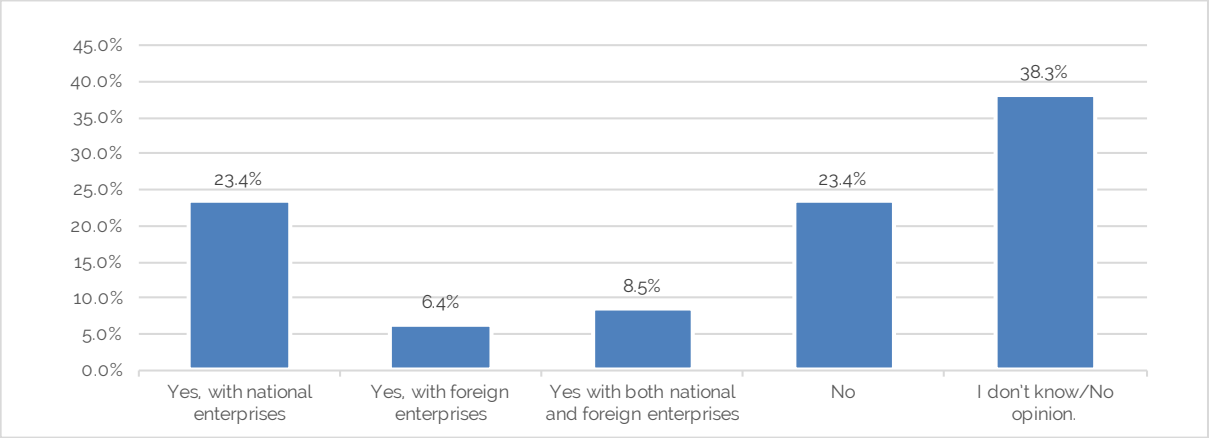
Which technical skills the personnel working with HPC in your organisation is equipped with, do they have the demand in additional training?
Availability of technical HPC infrastructure, which services provider hosts
Size of largest technical computer
Involvement in international projects related to HPC
Cooperation with industry in HPC related aspects, cooperation with other research centres
Appreciation of cooperation with industry/enterprises, possibilities to help enterprises to meet their needs
Availability of HPC to enterprises/industry

HPC Development in Danube region

The differences between subgroups of providers of HPC infrastructure are quite evident. Subgroups of providers manly coincide also with a specific country where the enterprise is located. In most of the cases, providers have a very similar view about the degree of the HPC development of their county, while others do not have such a harmonized opinion. This can refer also to the question of visibility of HPC providers and consequently also to the ability to use the services. The database makes its contribution also in this field aiming to increase the visibility and consequently increases the possibility to enhance cooperation among enterprises and HPC providers.



Potential for cooperation between HPC and enterprises – state of the art



Among HPC providers:

23.4 % cooperate with national enterprises,
6.4 % cooperate with foreign enterprises,
8.5 % cooperate with national and foreign enterprises,
23.4 % do not cooperate with industry in HPC related aspects,
while 38.3 % did not provide an opinion on the issue

Providers could help enterprises to meet their needs through HPC by:

help them to carry out **simulations and/or modelling** of complex processes
help them to **analyse or develop large datasets,**
help them to **conduct large-scale research projects,**
help them to **store large amounts of data** for future analysis,
help to **develop new products or to redesign products.**

Annex: Database of HPC providers and industrial beneficiaries