Competence mapping in the Czech Republic: Questionnaire survey analysis

Best Practice Guide

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Introduction

The National Competence Centre (NCC) is the reference and the single point of contact and coordination in the Czech Republic for high-performance computing (HPC) and data analysis (HPDA). Its mission is to analyse, implement, and coordinate all necessary activities and offer its services to end users to meet their needs: from access to supercomputers and technology consulting to providing training for industry, public administration, and academia.

In the Czech Republic, the National Competence Centre in HPC, represented by IT4Innovations, aims to gather the necessary expertise to create a trans-European network of national coordination centres on topics related to HPC. The centre was created under the auspices of the EuroCC project, which the European High-Performance Computing Joint Undertaking approved, and is funded by the European Union's Horizon 2020 research and innovation programme and the Czech Republic.

Competence mapping on existing HPC, HPDA and AI competencies in the Czech Republic was one of the tasks of the NCC. For the purpose of this mapping, a survey targeting a broader group of stakeholders from industry and academia was created and broadcasted among various communities. The outcomes of this survey are presented in this document.

The survey was divided into several sections to guide respondents through it and avoid asking them questions irrelevant to their target group (For example, a question about the size of the company is not relevant for academic users). In this survey, which was conducted in the whole year of 2022, 40 respondents participated.

Section 1: common questions

In this section, respondents answered questions about whether they were coming from the industry, academia, or public administration sectors. We were also interested to know how experienced they are in HPC, HPDA and AI and, last but not least, their experience with preparing and submitting national or international grants.

As can be seen in figure 1, the majority of respondents come from academia. This is an expected outcome considering that most of the Czech Republic's HPC users come from this community.

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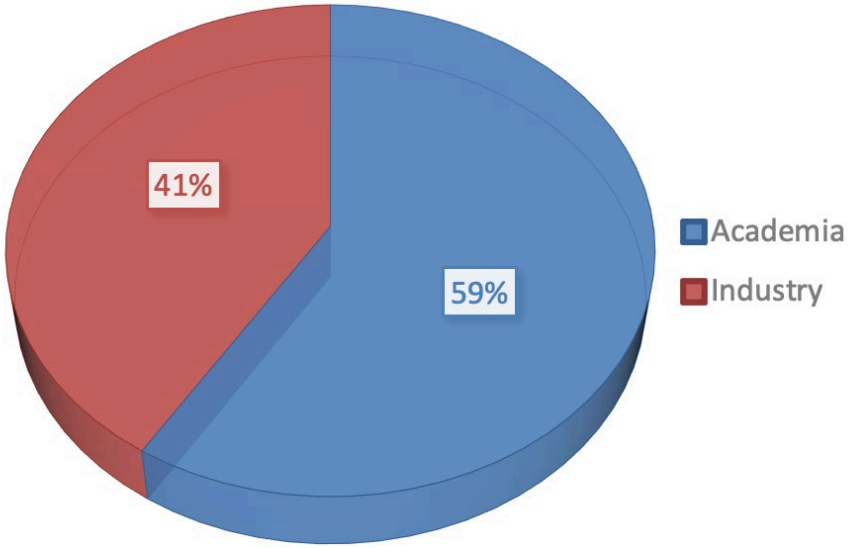

Figure 1 – respondents by sector

In terms of experience (figure 2), users with no experience or basic knowledge of HPC participated in the survey. Most of the users have up to three years of experience in HPC.

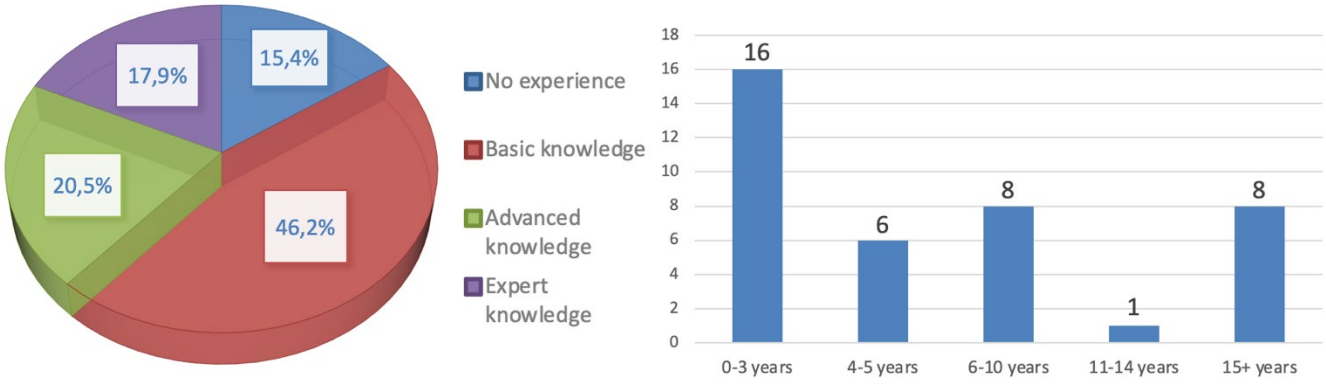

Figure 2 – Experience in HPC/HPDA/AI: level of experience (left) length of experience (right)

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On the other hand, most of the users have advanced to expert knowledge in software development (figure 3) which is very important information for our future plans of engagement with our stakeholders.

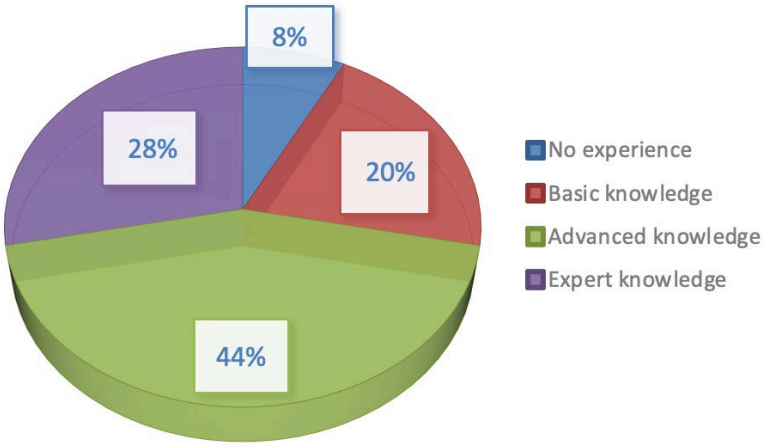

Figure 3 - Experience with software development

Another very important finding is about the experience with the preparation of international and national grants (figure 4). Based on this survey, we will explore the possibility of providing competence to our stakeholders in grant writing since the vast majority have basic or no experience in this area.

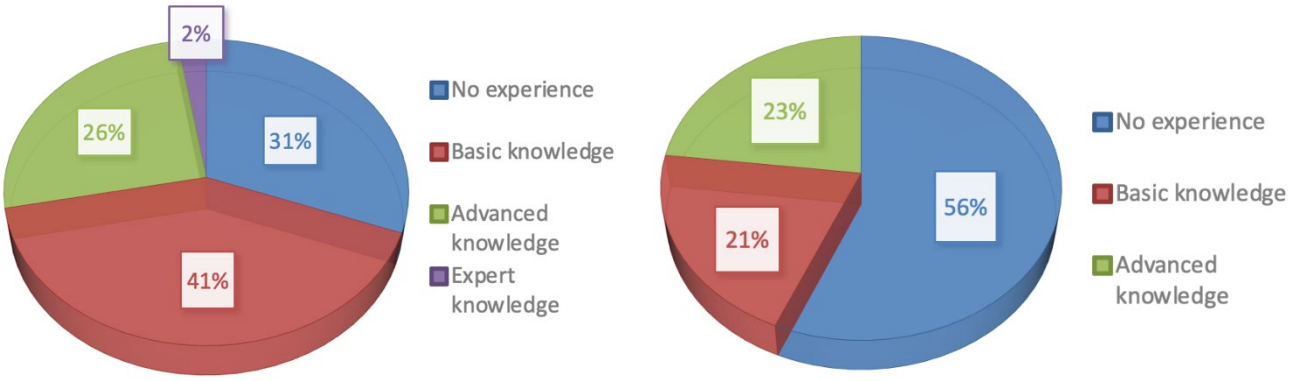

Figure 4 - Experience in submitting national grants (left) and international grants (right)

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Participants in this survey collaborate on both national and international levels (figure 5) and conduct both applied and basic research (figure 6).

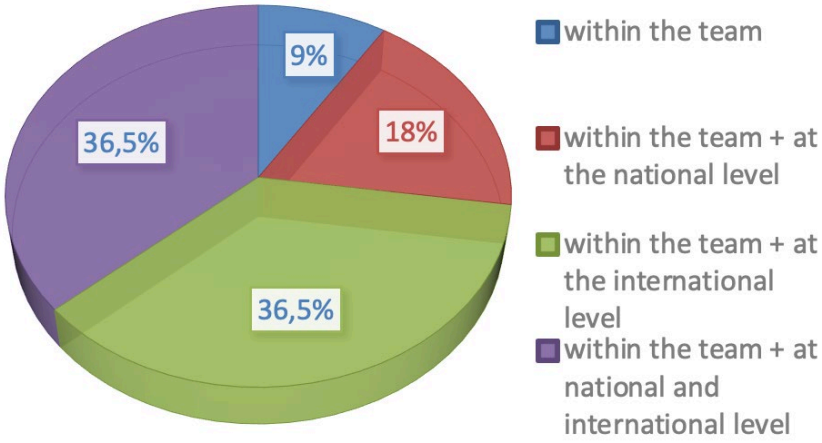

Figure 5 - Research cooperation

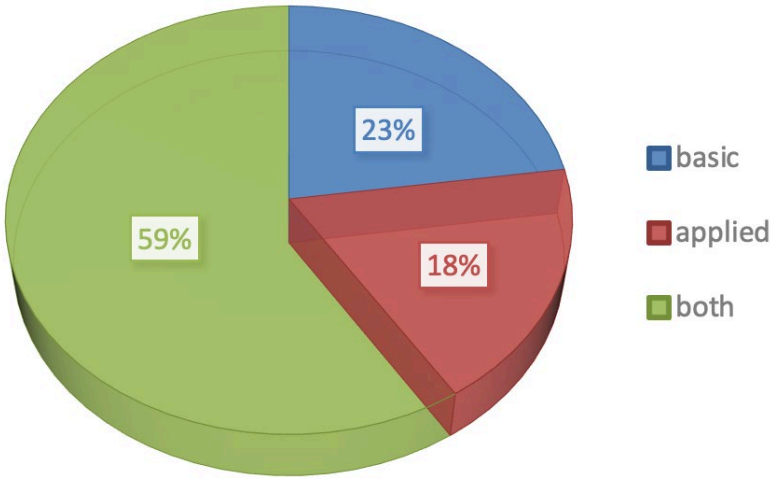

Figure 6 - Type of research

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It is only natural that the majority of respondents conduct research in HPC, Mathematics and ICT (figure 9) and that they could apply the results of their research in the IT and HPC systems industrial sectors (figure 8).

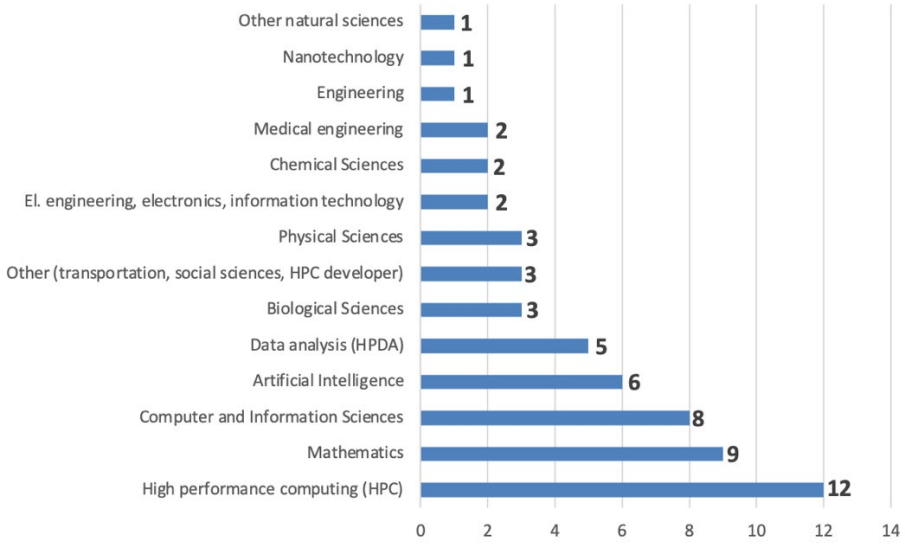

Figure 7 - Research area

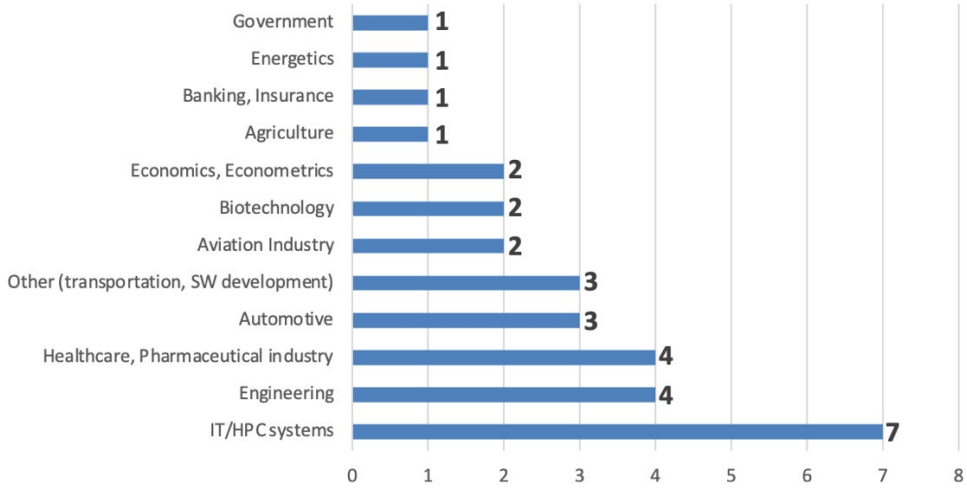

Figure 8 - Industry in which respondents apply their research results

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Section 2: Industry

In this section analysis of the survey section related to the industry is presented. Figure 9 shows that the majority of the companies participating in the survey are Small and Medium Enterprises (SMEs) and that they conduct their own R&D activities and collaborate with the universities (figure 10)

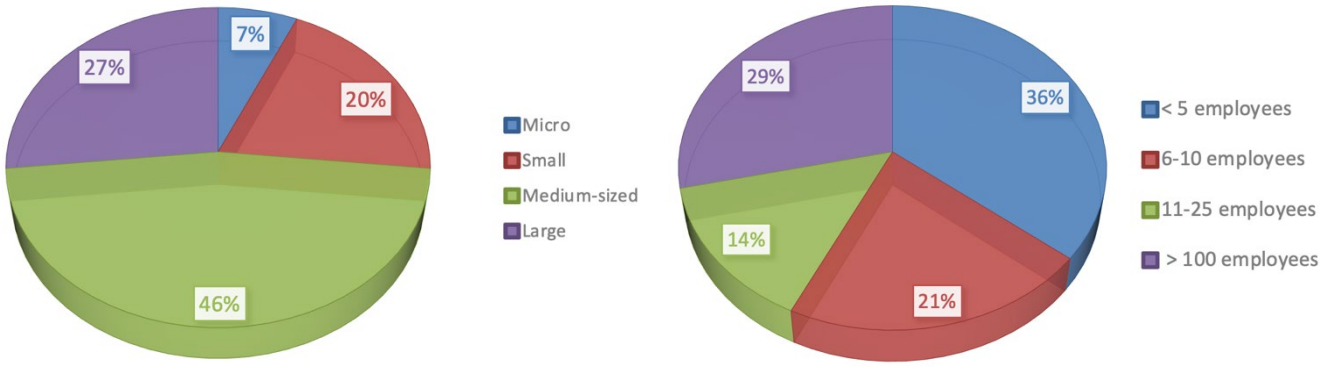

Figure 9 - Size of the enterprise (left) number of employees (right)

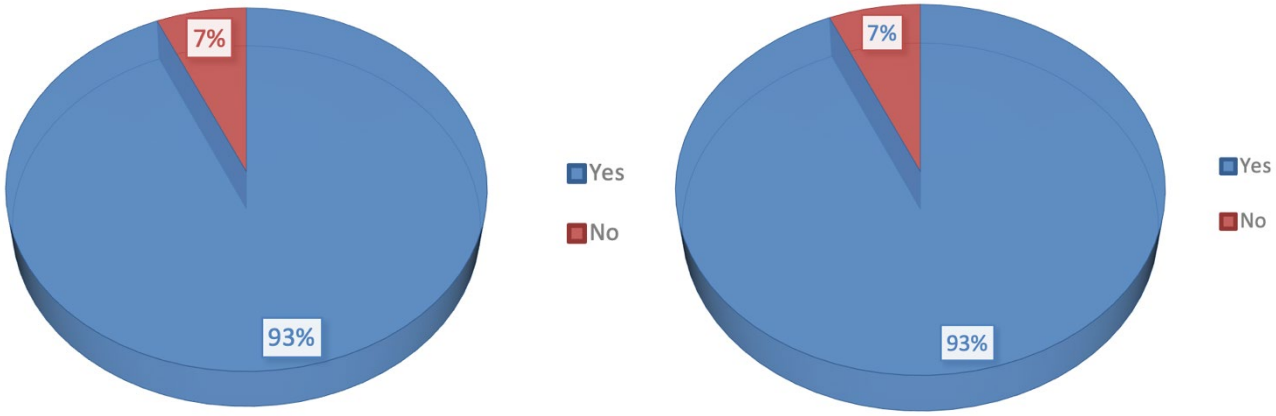

Figure 10 - Own R&D activities (left) collaboration with universities (right)

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Section 3: Codes and software developed/used

In the following section, we were interested in what kind of codes or libraries our users use or develop for their research. In terms of licenses (figure 11), it's open-source codes, software or libraries.

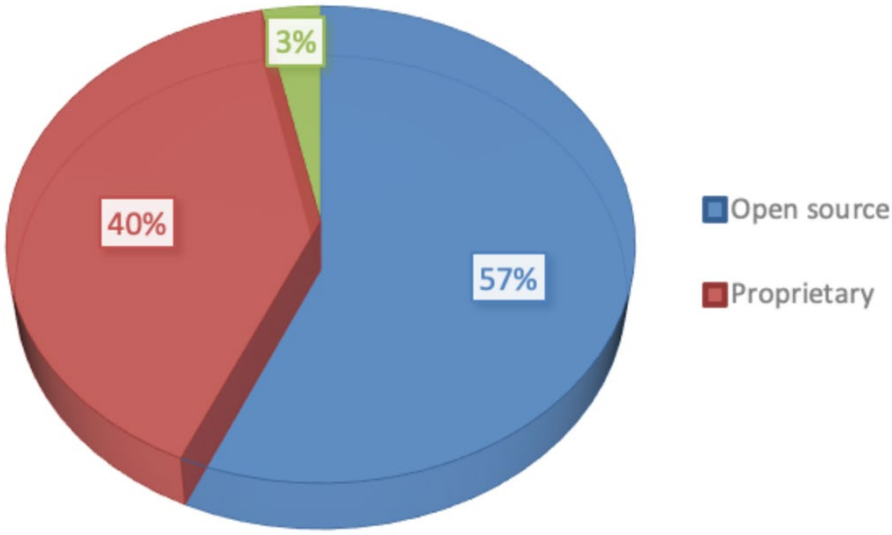

Figure 11 – Type of licence

Figure 12 shows that C/C++ and Python are the most commonly used programming languages solution developers.

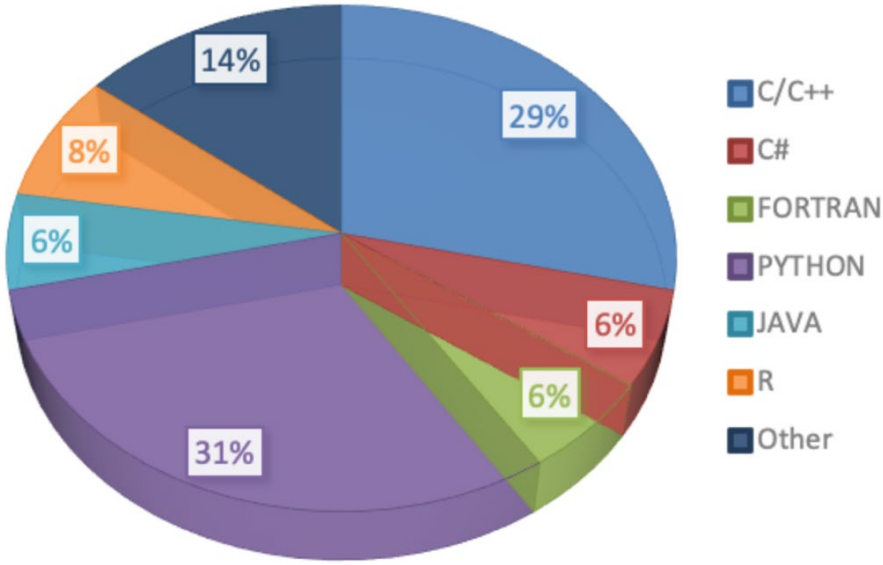

Figure 12 – Programming language used

When it comes to parallelization, only a third of the codes are sequential (figure 13), whereby the majority are parallel. Either for multiple CPUs, compute nodes or accelerated.

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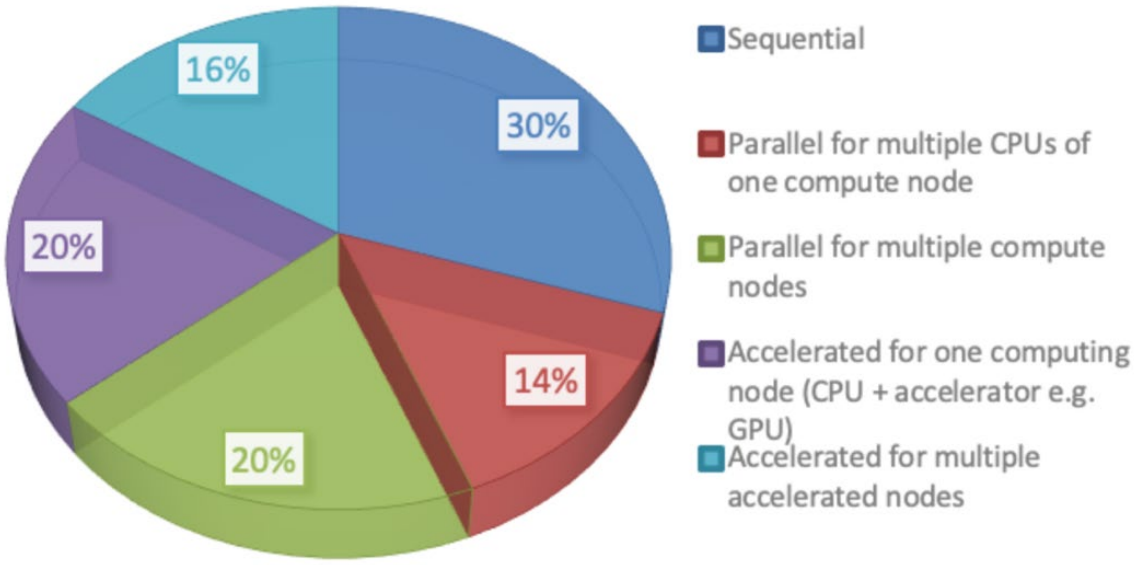

Figure 13 – The codes/libraries you develop are:

Figure 14 shows that the vast majority of the codes are GPU accelerated.

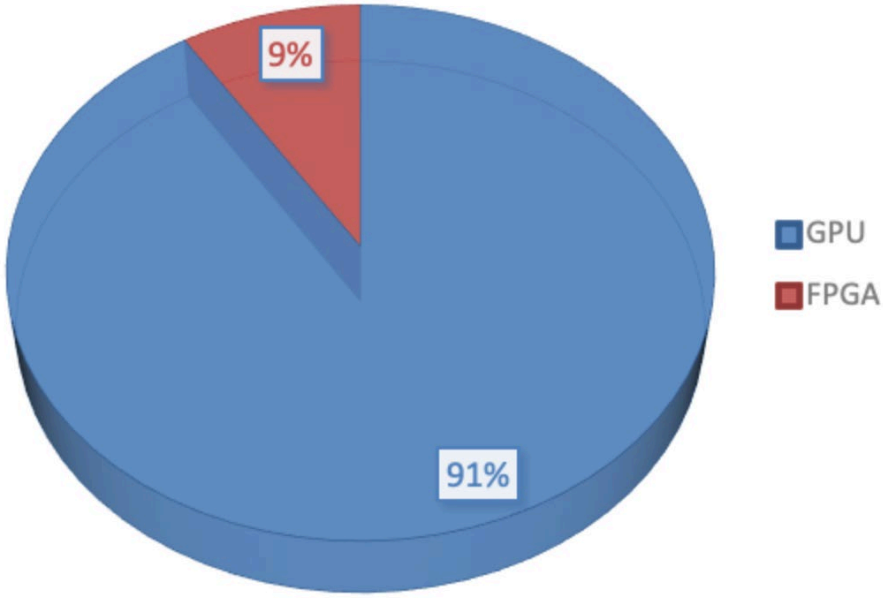

Figure 14 – Accelerated codes

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Section 4: Use of HPC infrastructure

The next section is dedicated to the use of HPC infrastructure. More than 60% of respondents answered that they use HPC infrastructure (figure 15). They use mainly small or medium size clusters which is mainly their own (figure 16) .

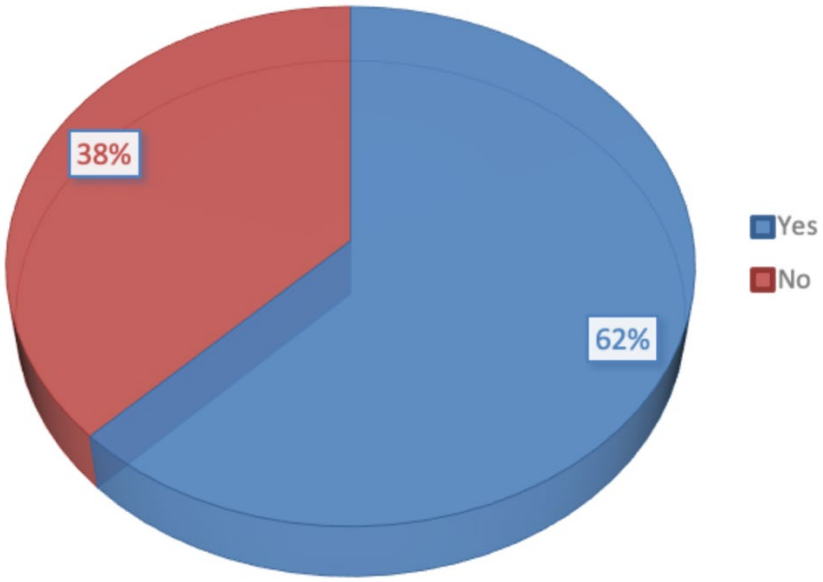

Figure 15 – Use of HPC Infrastructure

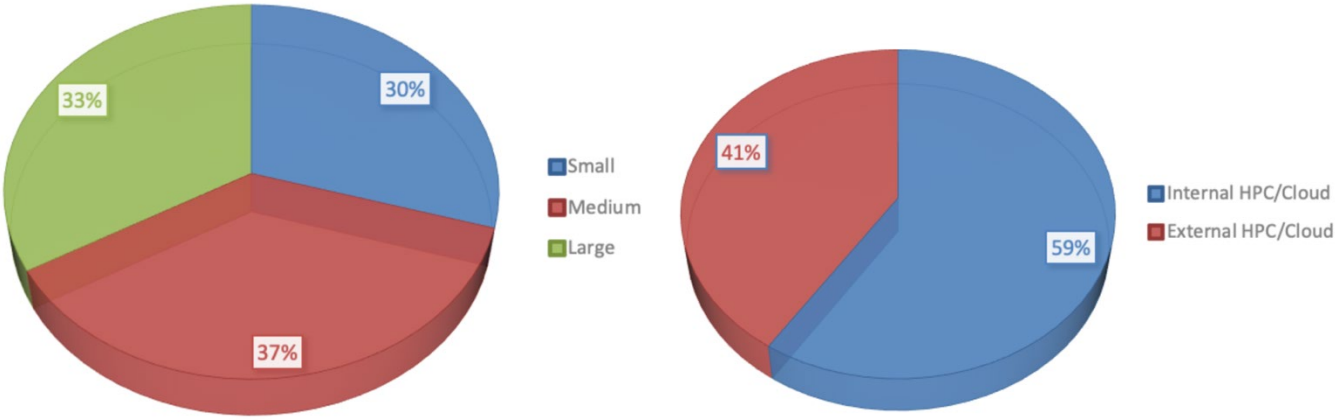

Figure 16 – Size of clusters normally used (left) type of HPC infrastructure (right)

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Section 5: User needs

The next section focuses on user needs and competencies they expect NCC will provide. Figure 17 an 18 gives a good picture of user needs and expected competences. Covering optimisation of user codes, improved scalability and porting to GPUs, and training on how to use HPC remotely. Which is also one of the services in high demand (figure 19).

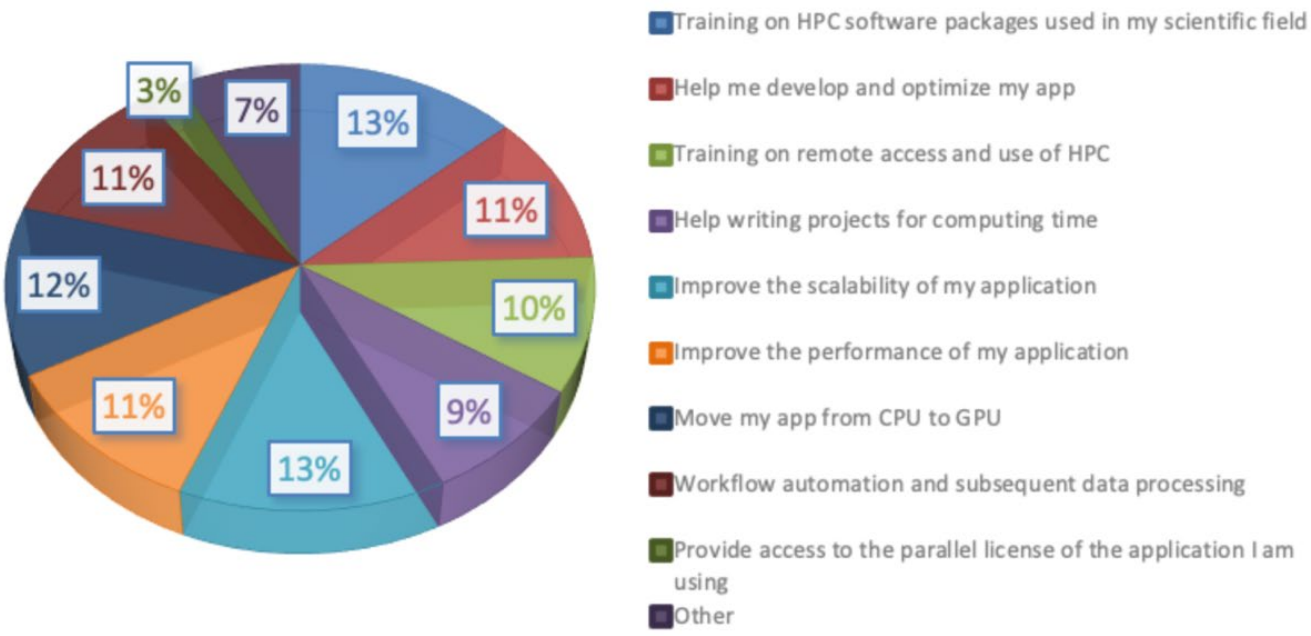

Figure 17 – To make more use of HPC resources, respondents need

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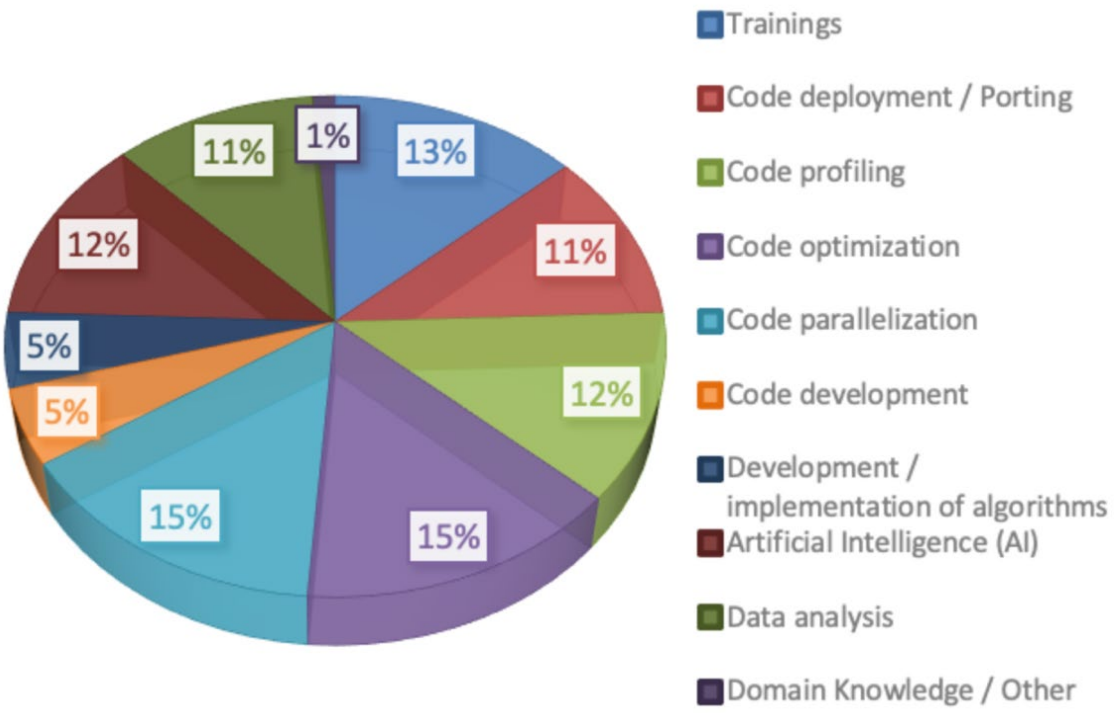

Figure 19 – Competencies that respondents would welcome

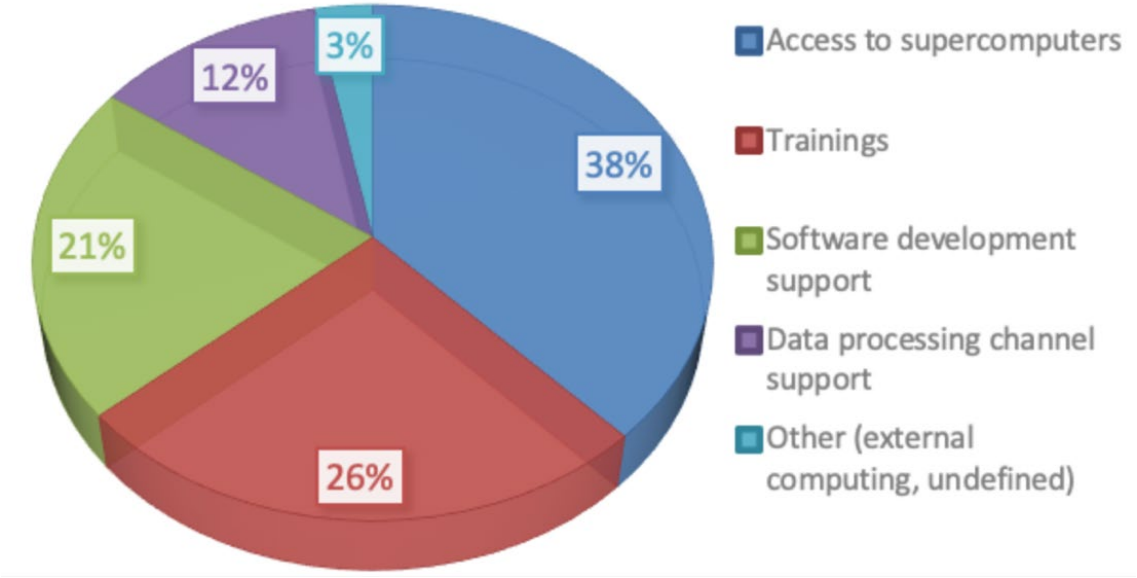

Figure 19 – Types of services offered by the NCC for HPC that respondents would be interested in

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Conclusion

The results of the questionnaire survey among stakeholders within the Czech Republic gave us a good overview of their needs and will enable the NCC to plan future activities to meet these needs and requirements.

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