

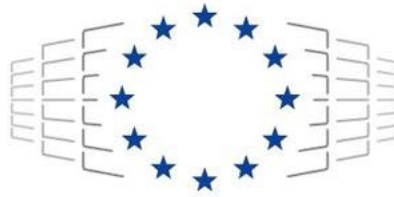
DIGITAL-EUROHPC-JU-2022-NCC-01



**Coordination & Support
for National Competence Centres on a European Level Phase 2**

Project Number: 101102047

**D3.1
Report on Training, Twinning, Mentoring and Mobility
Activities in the First Year**



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List of abbreviations

AI	Artificial Intelligence
BoF	Birds of a Feather
BSCW	A web-based groupware tool for efficient collaboration
C2ISS	CASTIEL 2 Information Sharing System
CoE	Centre of Excellence
EU	European Union
EuroHPC JU	The European High Performance Computing Joint Undertaking
EESSI	European Environment for Scientific Software Installations
GA	Grant Agreement
HPC	High-Performance Computing
HPDA	High-Performance Data Analytics
ISC	ISC High Performance 2023, an international conference and exhibition
MOOC	Massive Open Online Courses
NCC	National Competence Centre
PMT	Project Management Team
WP	Work Package

Executive Summary

CASTIEL 2 started in January 2023 and it will continue the mission of the CASTIEL H2020 project [1] to coordinate and support the initiative of National Competence Centres (NCCs) and in addition coordinate and support the Centres of Excellence (CoEs) in High-Performance Computing (HPC) and related technologies.

Training, twinning, mentoring and mobility are topics of Work Package 3 (WP3) in CASTIEL 2. **The main objectives of this work package in the second phase are:**

- Promoting outreach and pan-European visibility of HPC training opportunities to NCCs, industry, the public sector and academia and foster integration and inclusion of CoEs.
- Organising twinning, mentoring and mobility to support the interactions among NCCs as well as between NCCs and CoEs on training and other areas of interest, e.g., collaboration with industry, collaboration with academia and public sector and other areas of interest to transfer knowledge and information.
- Supporting training activities and exchange of training best practices across NCCs and CoEs. This includes the support of the conceptualisation of a training certification scheme in conjunction with different entities of the EuroHPC ecosystem.
- Supporting the design and implementation of the information sharing system and the evolved EuroCC Access portal [2] with training related information.

Section 1 of this deliverable reports on activities related to training, twinning, mentoring, mobility and the contribution to the EuroCC Access portal as well as the marketplace including the evolution of the training best practice guides during the first year of CASTIEL 2.

Section 2 of this deliverable provides details about the training activities in the first year of the project, namely the status of the central access point to HPC expertise, training activities and materials the training-related activities organised by CASTIEL 2 WP3 and examples of support of exchange of training best practices and training-related collaborations. This section also shows results from the initial training survey, and it summarises the events organised with hardware and software vendors during the first year of the project.

Finally, Section 3 of this deliverable describes planning and evolution of the mentoring, twinning and mobility programme and it provides examples of mentoring and twinning interactions.

Major achievements and concluding remarks are presented in Section 4.

The main achievements during the first year of this project, funded by the European High-Performance Computing Joint Undertaking (JU) [3], could be summarized as follows:

- Incorporation of Training champions from the CoEs and deputies into the Training Working Group. WP3, similar to all CASTIEL2 WPs, engages with NCCs and CoEs by training "champions" and their deputies. These individuals, nominated by each NCC/CoE, serve as the primary contact points facilitating communication between CASTIEL2 and the respective NCCs/CoEs. They are responsible for reporting about the activities of CASTIEL2 WPs within their NCC/CoE.
- Creation of opportunities for training-related collaborations within the NCCs and between NCCs and CoEs as well as the involvement in some of them.
- Organisation of two workshops and one presentation with some hardware and software companies as part of the knowledge transfer.

- Development of collaborations with new European hardware and software companies.
- Continuous work on the development of the definition of the EuroCC HPC training baseline and assessment of various options for the HPC training certification.
- Consultation on the initial NCC/CoE perspective on the current platforms – HPC in Europe portal [4] and the EuroCC Access portal – and on the future central point of access CASTIEL 2 Information Sharing System (C2ISS).

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1 Introduction

CASTIEL 2 started in January 2023 and will continue the mission of the CASTIEL H2020 project [1] to coordinate and support the initiative of National Competence Centres (NCCs) and in addition coordinate and support the Centres of Excellence (CoEs) for High-Performance Computing (HPC).

During the second phase, the tasks of WP3 have been categorized into four distinct assignments:

1. T3.1 Facilitate Access to Training Opportunities and Offers within the European HPC Ecosystem

The goal of this task is to facilitate access to training offered at the national and the European levels to interested NCCs, CoEs and other potential users (from industry, academia or the public sector) through a centralised training portal of training opportunities in Europe.

A common certification scheme and an HPC training baseline for industry, SMEs and academia/research/public sector is also being addressed via the setup of a task force and cooperation with other European initiatives in the area of training in HPC.

2. T3.2 Assist the Evolution of NCCs and CoEs through the Mentoring, Twinning and Mobility Programme

The goal of this task is to assist the development of NCCs/CoEs training through an effective mentoring, twinning and mobility programme with suitable instruments that serve the needs of NCCs and CoEs.

Mentoring events, such as workshops, hackathons and advanced trainings with a focus on collaboration and coordination aspects across NCCs or CoEs, are co-organised.

Further, this task will enable mobility of HPC specialists between communities, academia, public and industry through the mentoring, twinning and mobility programme.

3. T3.3 Support Exchange of Training Best Practices and Training Related Collaborations across NCCs and CoEs.

This task supports the exchange of training related best practices, available resources, knowledge and information within and between NCCs and CoEs and those resulting from the activities in Task 3.1 and Task 3.2. The task also supports training related collaborations of NCCs and CoEs by encouraging joint activities.

Furthermore, this task is connecting NCCs and CoEs to the network of different hardware and software suppliers based in Europe in order to enable information exchange between them.

4. T3.4 Contribution to the Information Sharing System and the Marketplace Design and Implementation from the Training Perspective.

The Grant Agreement of CASTIEL2 includes the creation of a separate information system for services, the now called LinkHPC platform (referred to as “Marketplace”). This task collects from NCCs, CoEs and other interest groups specific requirements, expectations and needs related to training aspects that shall be shown on the information sharing system and the marketplace and share this information with WP5. It also collects feedback from NCCs and CoEs on the usability and effectiveness of the (C2ISS) and the marketplace, once it is designed on behalf of their end-users. Moreover, this task contributes to the development of easy access to the information sharing system and the marketplace via the EuroCC Access. The activities

are being conducted in close collaboration with WP2 (focusing on NCC/CoE needs as provider, competences and service offerings; academic/governmental user needs), WP4 (covering the industrial end-users and related aspects) and WP5 (evolution of the EuroCC Access portal).

2 Training Activities

2.1 Facilitation of Access to Training Activities and Contribution to the Information Sharing System

CASTIEL 2 strengthens the collective impact of the CoEs and NCCs by:

- fostering networking and interaction and identifying synergies,
- balancing differences in HPC expertise/experience between countries,
- putting NCC and CoE activities onto a sustainable footing,
- creating a single reference point (starting from the current EuroCC Access portal from CASTIEL) for all parties interested in European HPC activities, codes, training materials and events, and services.

This evolved EuroCC Access portal will be open to other European HPC activities funded by the EC or EuroHPC JU [3] to register their offers, but generally to all interested parties, who either can gain from its usage or provide value to it.

The central point of access to information about the EU funded HPC+ (HPC+ stands for HPC and related technologies such as Artificial Intelligence – AI and High Performance Data Analytics – HPDA) will be through the CASTIEL 2 C2ISS, which is to be developed in CASTIEL 2 WP5 in close collaboration with the other WPs. The HPC in Europe portal [4] that has been used in CASTIEL 1 for showcasing the training activities of NCCs, was chosen to serve as initial basis for the C2ISS. All NCCs have already been using it for promotion of their training activities and they were encouraged to continue to use it in the first year of CASTIEL 2. CoEs were invited to create their accounts in Spring 2023 and to start to promote their training activities. More details about the design and development of the C2ISS can be found in deliverable *D5.2 Design strategy of the C2ISS and the evolved EuroCC Access Portal*. The training part will be developed in cooperation with the activities of the HPC SPECTRA project, coordinated by University of Galway, where BSC leads the development of the new EuroHPC training platform, expected to start in January 2024.

In order to know more about the NCC/CoE perspective on the current platforms – the HPC in Europe portal and the EuroCC Access portal – and on the future C2ISS, a survey was conducted in the Training Working Group in July 2023. 22 replies were received – 17 from NCCs and five from CoEs. The survey questions related to training can be found in Annex 1. The answers to these questions follow in the next sub-section.

I. NCC answers

Q.: Which of these features are important to have on the C2ISS? (closed question with three-step scale)

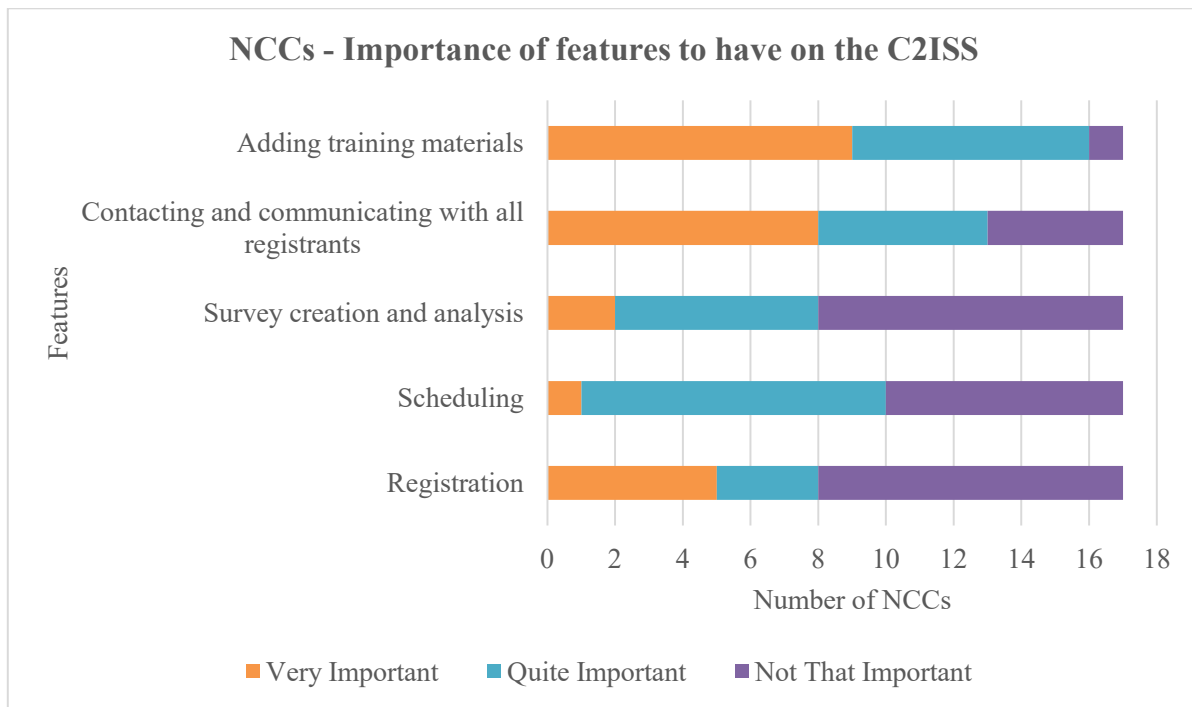


Figure 1: Rated importance of features on C2ISS by NCCs.

According to the questionnaire, the most important features required for the C2ISS are:

- In the first place: Adding training materials was considered as Very or Quite important by 94% of the sample.
- In the second place, 76% of the sample also considered Contacting and communicating with all registrants as Very or Quite important.
- In the third place, registration is Very important.

For the remaining features of Scheduling and Survey creation there is no consensus, having almost the same number of answers. Nevertheless, most of them stated they were not that important.

Q.: What other training-related functionalities would you expect? (open question)

- A pool of experts from the NCCs to take part in training organised by other NCCs. This way collaboration can be encouraged.
- Award training certificate at the end of the workshop/course.
- Roadmaps for users to be guided in learning paths, identifying the training material they should follow, to learn about specific subject.
- Customer being able to suggest or request training currently not provided.
- Specialized training for industry/public sector/academia.
- General course material for industry/public sector/academia.
- Initial courses, advanced, MOOC...with subject, price, learning language...
- Clear visual map of competencies and material.
- Approaching people for the first time (for example, how AI works or how people can use our systems, learning access to supercomputers).
- More advertising for public administration.
- IT security - part of the introductory course - Highlight we are experts in IT security.
- Disseminate our training to the general public - social media campaign.

- Management of invoices etc. connected to registrations.
- More informal things.
- Depends on how C2ISS works with the future EuroHPC training portal.

The responses to this survey item inform the team of expected future training opportunities. These ideas serve as guidelines for future development of training opportunities.

Q.: What training-related information would your NCC want to have/show on the C2ISS?
(multiple choice from 6 options)

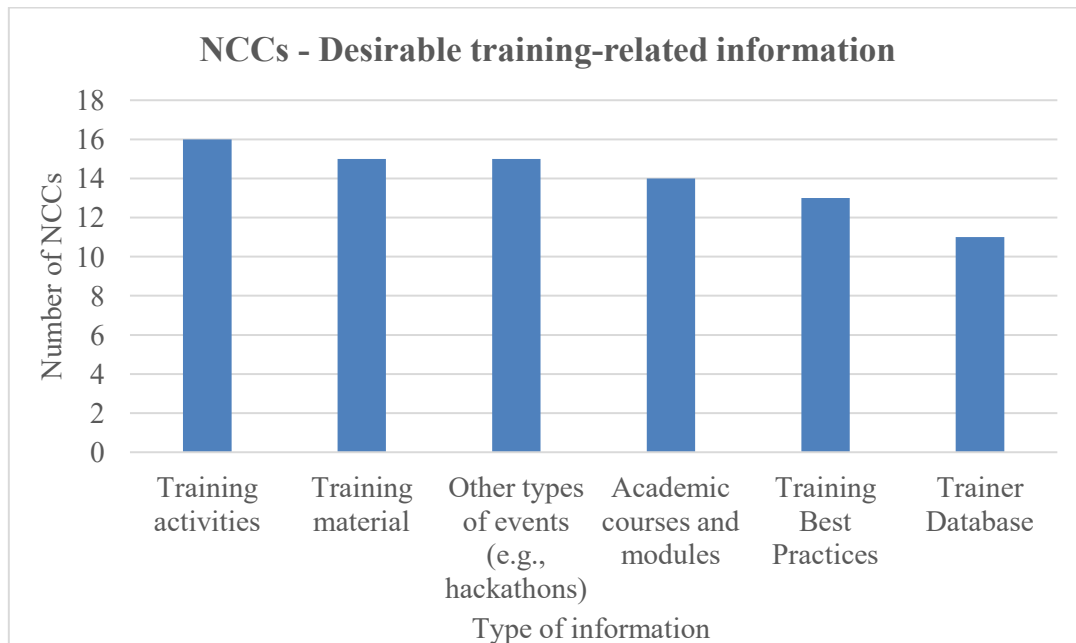


Figure 2: Training-related information wanted on the C2ISS by NCCs.

When analysing the desirable or preferred activities to have on the C2ISS according to the NCCs survey responses, we can conclude that even though there was not a significant difference among all the activities, the most popular answers were: Training activities, Training material and Other types of events (e.g., hackathons).

I. CoEs answers

Q.: Which of these features are important to have on the C2ISS? (closed question with three-step scale)

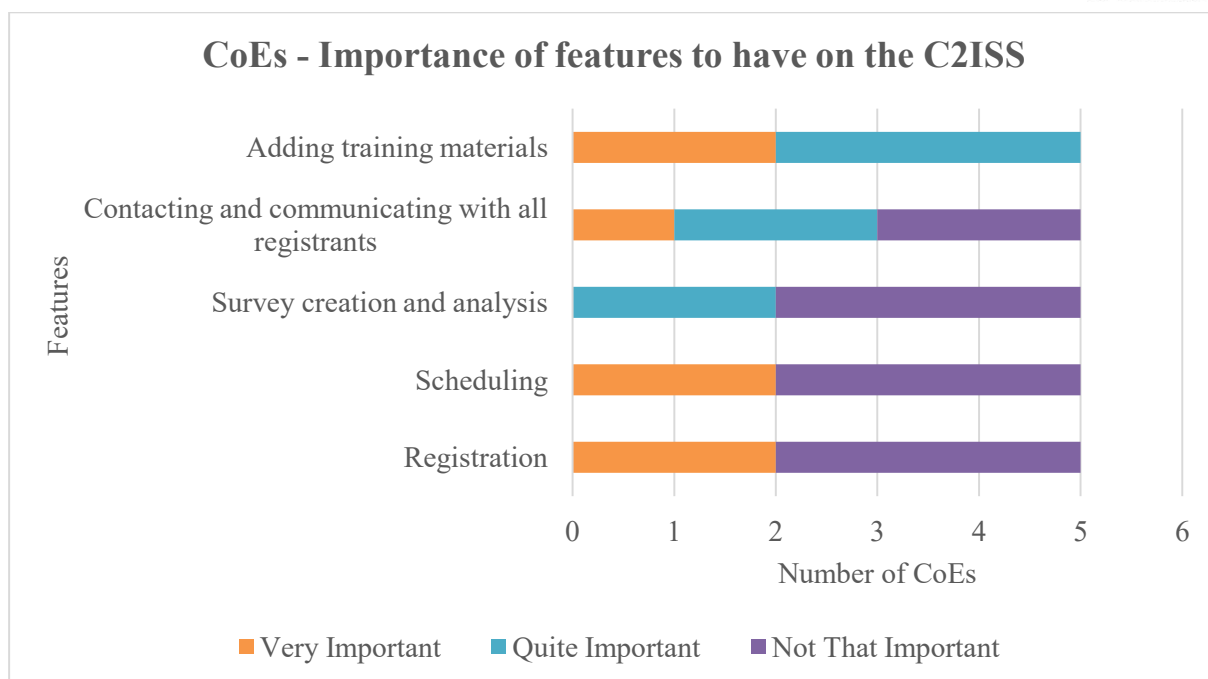


Figure 3: Rated importance of features on C2ISS by CoEs.

According to the CoEs answers, the only clearly accepted important feature to have on the C2ISS is Adding training materials, since all participants considered it to be Very or Quite important.

For the cases of Registration, Scheduling and Contacting and communicating with all registrants there is no consensus, having similar opinions with not a clear majority among them.

For the Survey creation and analysis feature, none of the participants considered it as Very important and 75% of them considered it Not that important.

Q.: What other training-related functionalities would you expect? (open question)

- Single entry point for course registration.
- Course registration infrastructure does not have to be connected to the main page, that is an internal service. Displaying training materials has an external component, but gathering that information is a service (that should really be separated to the main site).
- Process to avoid duplications of CoE websites.
- A very detailed course agenda, links to trainings on the hosting site, clear costs, accommodation facilities and CVs of professors.

Q.: What training-related information would your CoE want to have/show on the C2ISS? (multiple choice from 6 options)

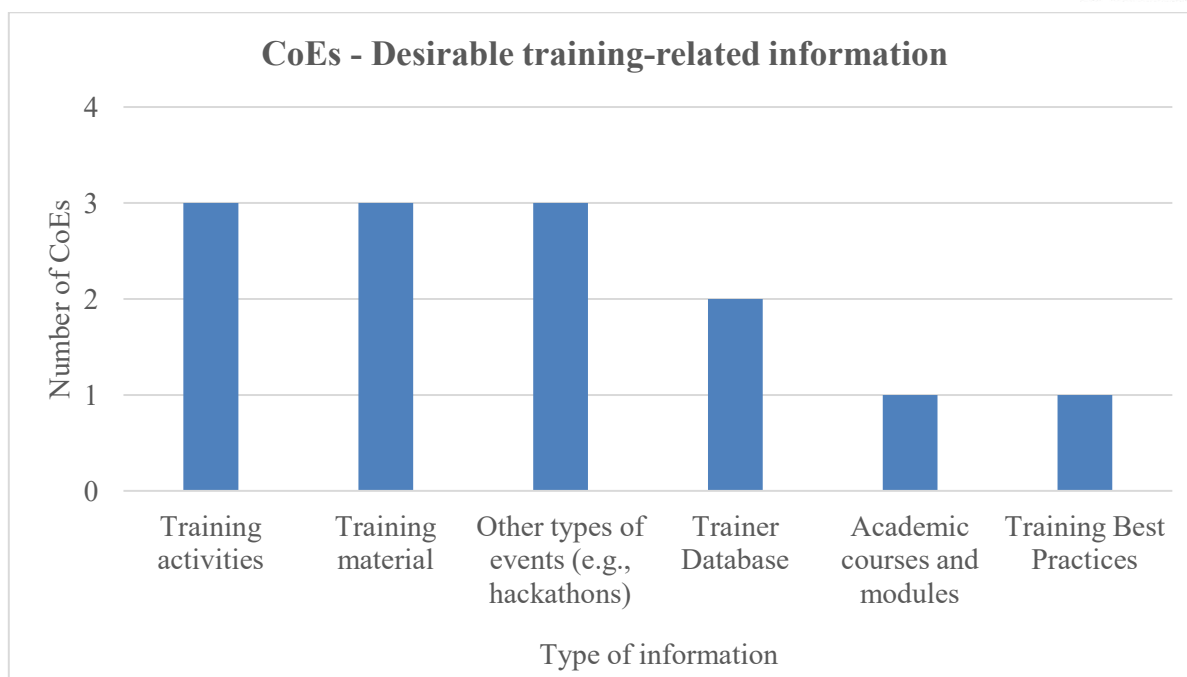


Figure 4: Training-related information wanted on the C2ISS by CoEs.

When analysing the desirable or preferred activities to have on the C2ISS according to the CoEs answers, even though it is a small sample, the most popular were: Training activities, Training material and Other types of events (e.g., hackathons) with 60% of the sample while for Academic courses and modules and Training Best Practices only one (20%) of the sample wants to have/ show these features on the C2ISS.

2.2 Training-Related Activities Organised by CASTIEL 2 WP3

CASTIEL 2 WP3 organised the following activities in the first year of the project:

1. Training Working Group Session at the EuroCC 2 & CASTIEL 2 Kick-Off Meeting in Stuttgart, 7 – 9 February 2023

At this session, the CASTIEL 2 WP3 partners were introduced, as well as the concept of the Training Working Group, which now includes NCC and CoEs. It was followed by a brief introduction of the current status of CoEs and their training. In the last part of the session, several NCCs presented the status of the training in their respective NCC and plans for the future.

2. CASTIEL 2-EuroCC 2 Working Group on Training Meeting in Stuttgart and Online, 10 February 2023

The one-day meeting was the first in-person meeting of the NCC Training champions and it was also streamed online. 21 people attended in-person and six people online. The meeting took place at HLRS, Stuttgart, Germany, just after the official Kick-off meeting.

The meeting started with *Session 1: CASTIEL & EuroCC Reflections and Lessons Learned*. The participants were divided into small groups and talked about their experience related to what worked well and what was less efficient in phase 1 of CASTIEL and EuroCC regarding training, twinning and mentoring. Afterwards, each group shared the main discussion points

with the whole group and made suggestions for CASTIEL 2. The following session – *Session 2: CASTIEL 2 & EuroCC 2 Outlook* – presented the goals, tasks and outlook of CASTIEL 2 WP3. The meeting continued with a third session focused on planning – all participants were divided into small groups and each of the groups discussed one of the following topics:

1. HPC training baseline and certification.
2. Mentoring, twinning and mobility programme.
3. Portal to show training courses.
4. Interaction with CoEs.
5. Collaboration on training. Exchange of training best practices, training materials across NCCs and CoEs.
6. HPC industrial course co-created by NCCs.

The main ideas and suggestions for the future direction of each topic were then shared with the remaining groups. The meeting was closed with an open discussion. The main conclusions and suggestions served as a basis for planning of the work in WP3 of CASTIEL 2.

3. Online Training Working Group Meeting on 6 April 2023

The aim of this meeting was to get to know all people involved in training in NCCs as well as to introduce the partners of CASTIEL 2 WP3 and to introduce the next action steps. The meeting was attended by 36 NCC Training champions and deputies. The goals and tasks of CASTIEL2 WP3 were briefly introduced again as well as the Training Working Group concept so that everyone from NCCs was informed.

It was decided to work on the six topics that were discussed at the in-person meeting in Stuttgart (planning session in the afternoon) in which small groups of Training champions volunteered to help develop the necessary concepts and action plans in order to take advantage of the experience and knowledge that is available in the EuroCC network.

All training champions and deputies were invited to join one or more task force of their interest. Two types of task force groups were introduced:

- Temporary task force – once the proposal is prepared or feedback is collected, the task force fulfilled its obligations.
- On-going – those task forces will continue over time as more work is expected.

The following plan was introduced at the meeting:

A. To create three task force on the following topics:

1. EuroCC HPC Training baseline and certification
 - a. EuroCC HPC Training baseline (on-going) – (planned collaboration with the EUMaster4HPC project [5])
 - b. HPC Training certification (on-going) – (planned collaboration with 3rd parties, CoEs, HPC Certification Forum [6], certification agencies, etc.)
2. Mentoring, twinning and mobility (temporary)
3. NCCs/CoEs training-related collaborations and exchange of training materials (temporary)

B. Working groups to explore the following topics at a later point:

1. Training-related interactions with CoEs – this topic was discussed in the task force group 3 and in other joint meetings and discussions with or without NCCs.

2. HPC industrial course co-created by NCCs [7] – NCC Greece is leading a task force created in CASTIEL 1-EuroCC 1.
3. Access to training offerings through centralised training portal – this task force will be created once the new project HPC SPECTRA, mentioned previously, has started.

Four task force groups were created and the first meetings took place in May 2023. Since then, the task forces on the EuroCC HPC Training baseline and certification had several additional meetings throughout 2023, the NCCs/CoEs training-related collaborations and exchange of training materials group also met and the Mentoring, twinning and mobility group is in contact about further meetings.

4. Break-out room on training, twinning and mentoring on 19 April 2023 at the NCCs and CoEs meeting

The NCCs and CoEs meeting organised by CASTIEL 2 WP2 took place online on 18-19 April 2023. CASTIEL 2 WP3, apart from presenting the tasks of the WP, the Training working group and training-related opportunities for collaboration between NCCs and CoEs, was in charge of the break-out room on training, twinning and mentoring. In the break-out room the discussed topics were the following: training-related opportunities for collaboration between NCCs and CoEs where several CoEs asked for help with organising joint training activities, further the task force groups were introduced and participants were invited to join them, discussion about available collaborations and opportunities for joint events followed then. The COEs have all joined meetings with NCCs and this is leading to a first major joint event, a training programme with a specific timetable (the CoE/EuroCC Spring Training Event) in early 2024.

5. Online Training Working Group Meeting on 26 June 2023

The meeting was attended by 37 NCC Training champions and deputies. The main goal was to present an amended mentoring and twinning programme from CASTIEL 1 offering mentoring and twinning in clusters based on the maturity levels instead of individual interactions and to gather feedback so that the feasibility of the new concept could be assessed. There was no clear consensus as there were NCCs who supported the original programme from CASTIEL 1, and some preferred the updated version. The feedback served as a basis for further discussions and work on the mentoring and twinning programme that is explained in more detail in Section 3.

2.3 EuroCC HPC Training Baseline and Certification

These two concepts that started in CASTIEL 1, namely the EuroCC HPC training baseline and certification were covered in the deliverable *D3.4 Implementation and Adoption of the Training Framework* due on 30 June 2023. Section 3 *EuroCC HPC Training Baseline and Certification in CASTIEL 2* described in detail the work done until May 2023 and the start of the task force groups on these two concepts. Further details about the work done since then will be written in the next deliverable *D3.5 – First Update of the Implementation and Adoption of the Training Framework* that will be due on 30 June 2024.

EuroCC HPC Training baseline and certification task forces are planned to meet regularly during the duration of the project to continue the initiated work.

2.4 Initial Training-Related Survey

In April 2023, a survey was conducted among the NCC Training champions to get more input on the topics of knowledge sharing, interest in hardware and software suppliers and other topics. The total number of responses was 31 (28 NCCs provided answers to the survey, three NCCs provided more than one answer). The results are presented in Figure 5:

1. Interest to share knowledge & experience related to training, twinning, mentoring and mobility at one of the future workshops

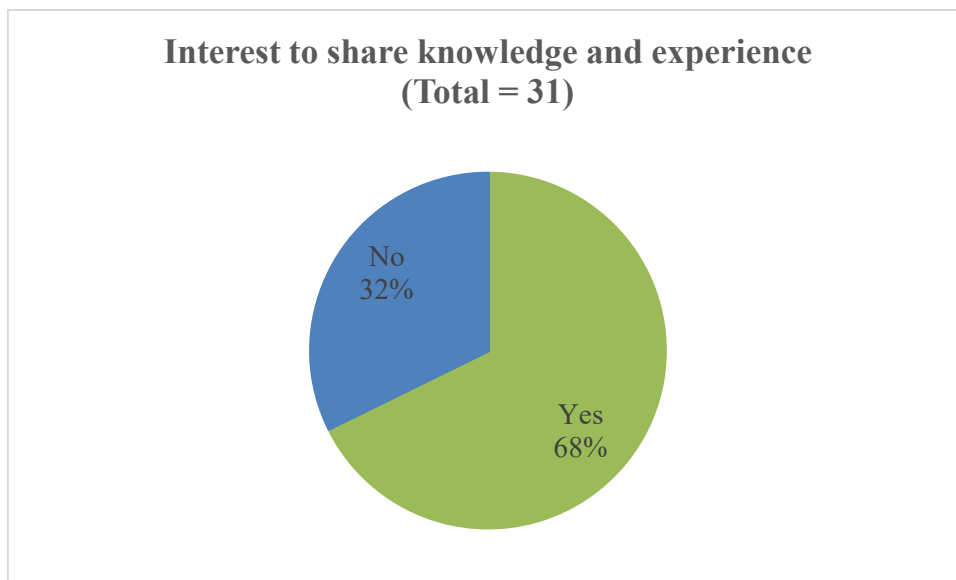


Figure 5: Interest to share knowledge and experience.

68 % of NCCs would like to share their knowledge and experience related to training, twinning, mentoring and mobility with others at future workshops.

2. Topics/ areas for knowledge and experience transfer

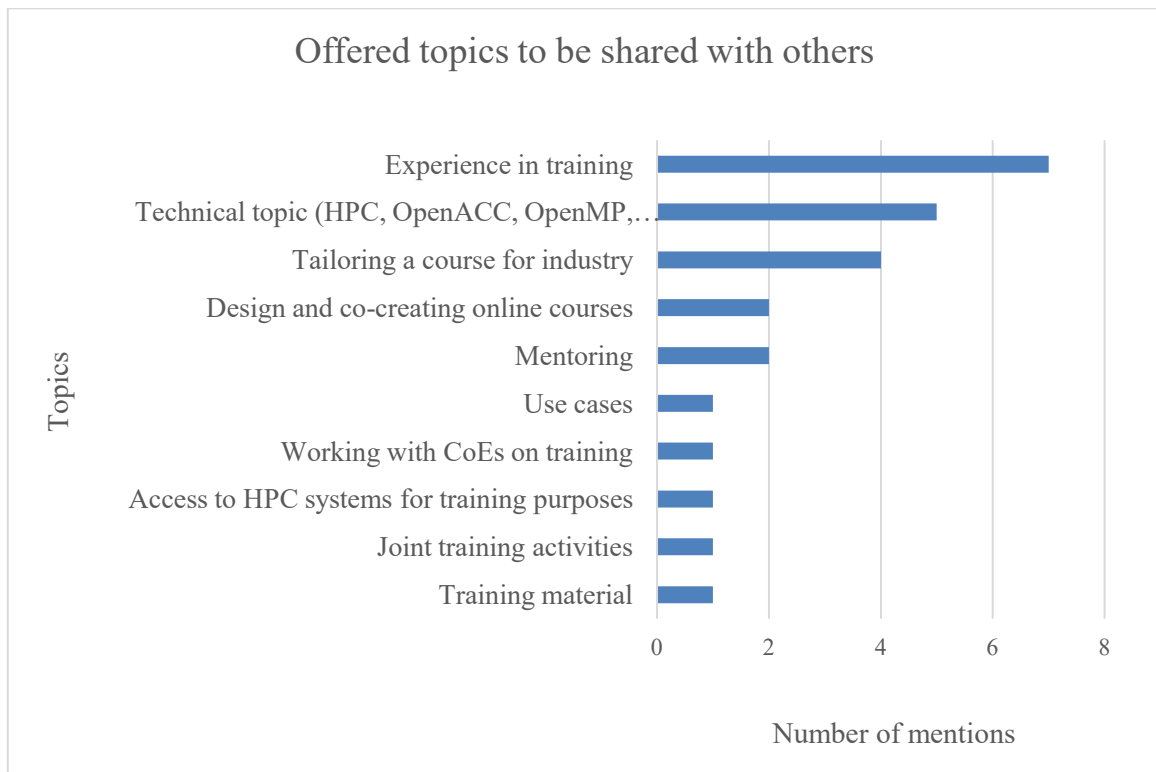


Figure 6: Topics for knowledge and experience transfer.

The majority of NCCs are open to sharing their experience in training and to also give a training on topics such as HPC, OpenACC, CUDA, parallel programming and other topics. Other topics are presented in Figure 6.

3. Which European hardware and software providers/suppliers/companies to invite on behalf of CASTIEL 2-EuroCC2

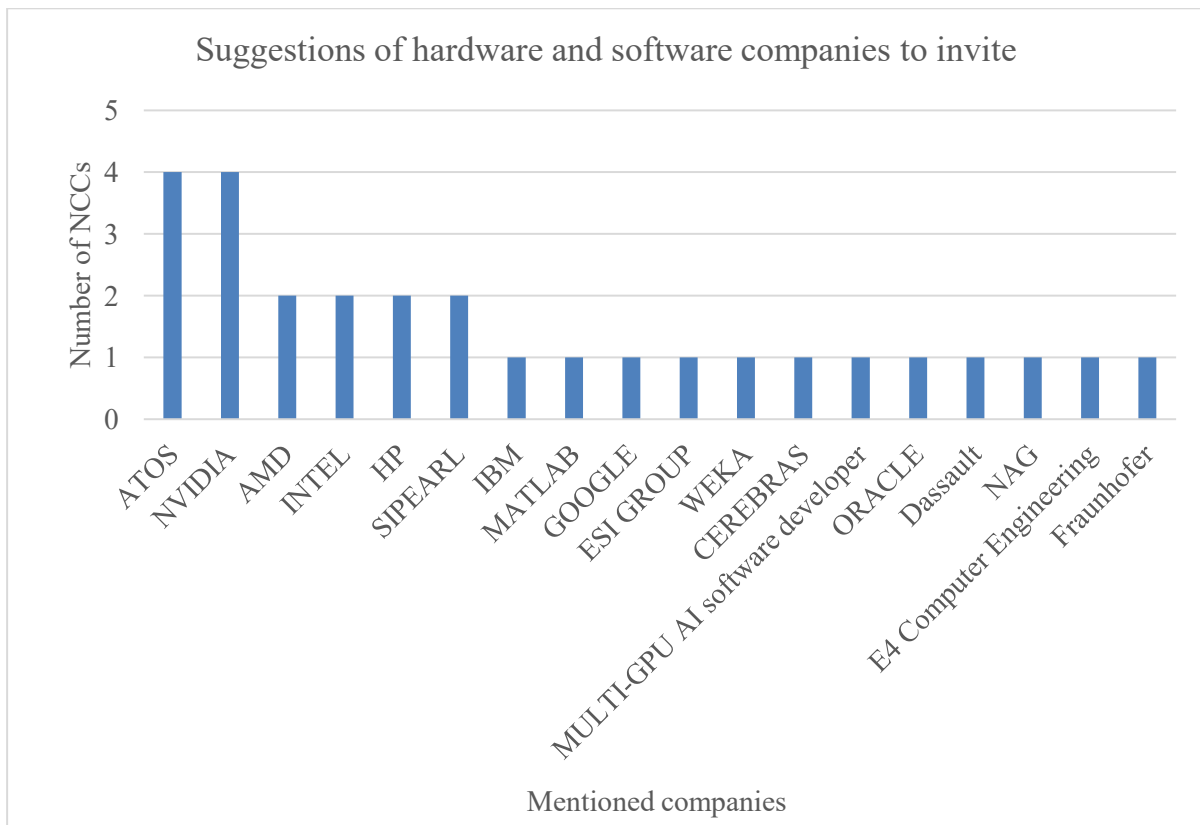


Figure 7: Suggestions of hardware and software companies to invite.

Ten NCCs provided their answer to this question and Figure 7. Two of those ten NCCs stated that they would welcome any company without providing specific suggestion. The remaining NCCs did not provide further suggestions.

4. Presentation topics from the hardware and software companies

The NCCs would mainly like the invited hardware and software companies to present mainly their training offers and recent developments in the field. Further topics can be seen in Figure 8.

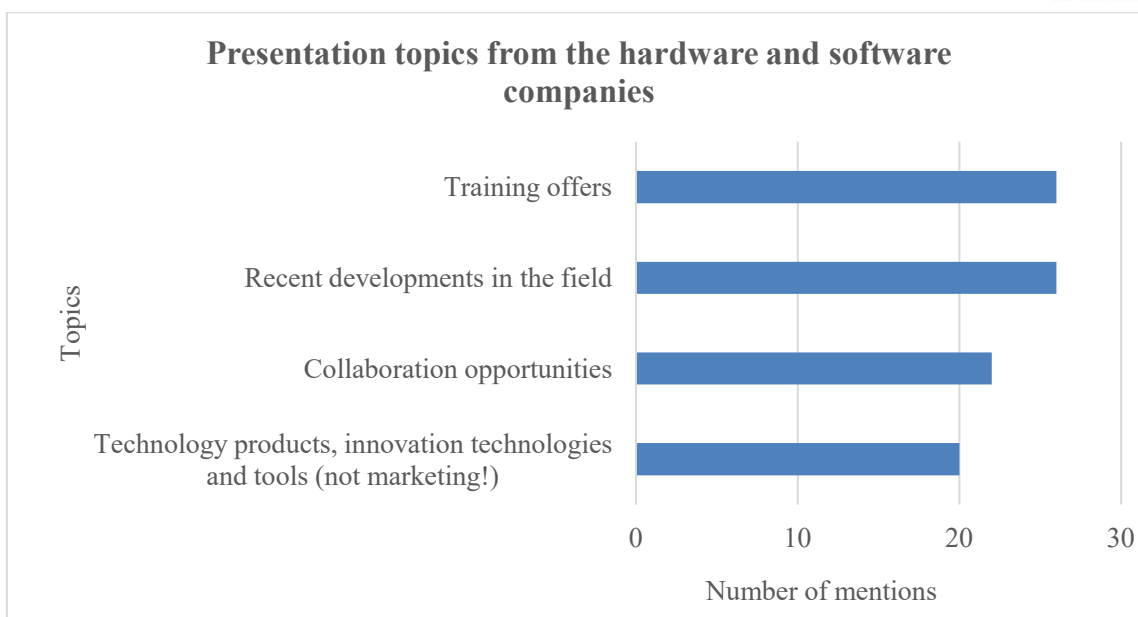


Figure 8: Presentation topics from the hardware and software companies.

5. What support would NCCs like from CASTIEL 2 WP3 related to training, twinning, mentoring and mobility planning, activities and/or evaluation?

Support areas from CASTIEL 2 WP3	Number of mentions
Opportunities for collaborations and creating a community (joint events, co-creation of courses/materials, etc.)	10
Knowledge transfers/Best practices (events, workshops, guides, etc.)	6
Support for mentoring and twinning	5
Funding of activities	4
Creating databases/repositories (trainers, courses, material, etc.)	3
Clear guidelines, rules easily accessible	3
Insight on latest training trends, user training needs	1
New digital technologies for training	1

Table 1: Areas of support wanted by NCCs from CASTIEL 2 WP3.

Creating opportunities for building collaborations such as joint events, co-creation of courses or materials and opportunities for sharing knowledge and best practices would be most welcome by NCCs as a support service from CASTIEL 2 WP3. Further support areas can be seen in Table 1.

6. Suggestions of topics for the Training Coffee Breaks

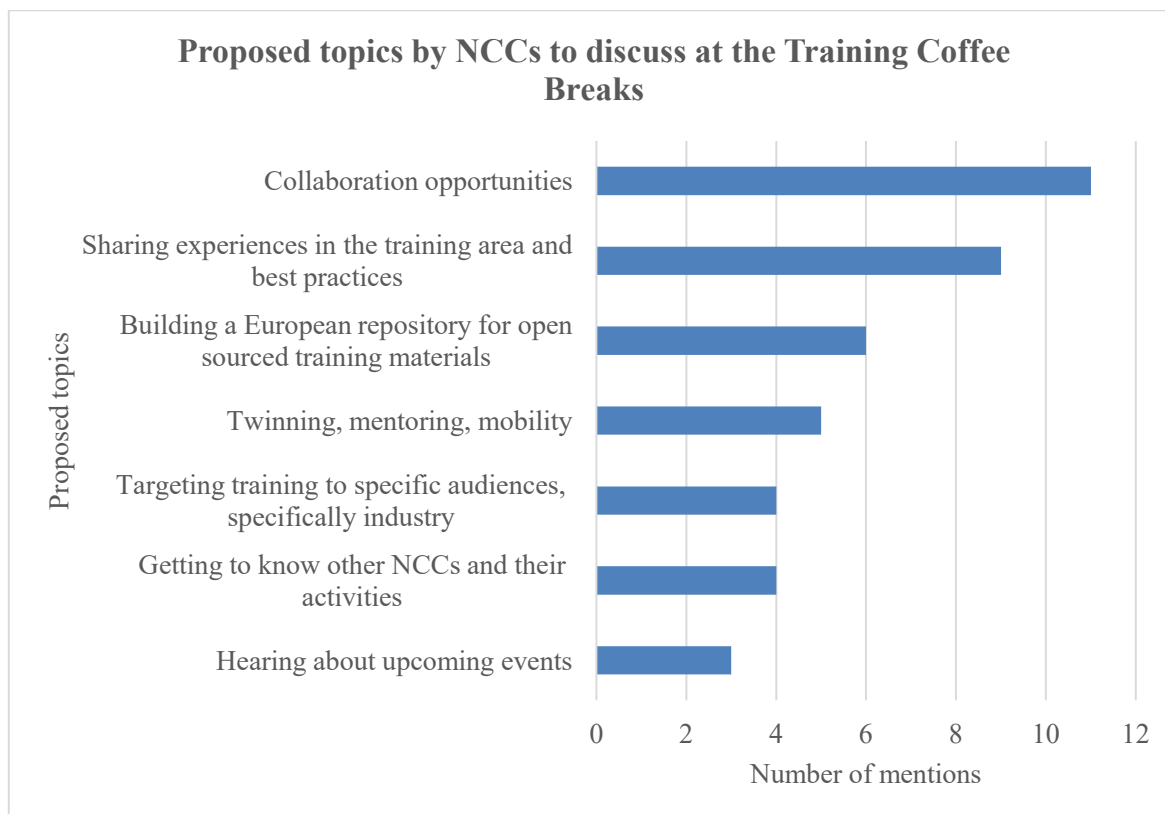


Figure 9: Proposed topics by NCCs to discuss at the Training Coffee Breaks.

The majority of NCCs would like to discuss opportunities for collaboration and to share best practices and training experiences. Other topics of interest can be found in Figure 9.

2.5 Examples of Support of Exchange of Training Best Practices and Training-Related Collaborations

The following sections provide examples of exchanging training-related best practices, available resources, knowledge and information within and between NCCs and CoEs and of training-related collaborations among NCCs and CoEs.

2.5.1 Collection of Best Practice Guides on Training

CASTIEL 2 WP3 focused on encouraging the exchange of training-related best practices, available resources, knowledge and information within and between NCCs and CoEs in the first year of the project. Discussions were held about an appropriate tool to store all these materials and resources and the plan is to use the C2ISS for storing the best practice guides.

Between January and June 2023, one NCC best practice guide related to training was created.

Further best practice guides will be collected from NCCs and shared by CASTIEL 2 WP3 in the second and third year of the project.

2.5.2 An Example of Exchange of Training Best Practices

The following paragraph provides information about how a workshop for sharing best practices in HPC training in a train-the-trainer workshop might look like.

Workshop Best Practices in HPC Training

This workshop took place online on 28-29 September 2023 and was co-organised by NCC Sweden and NCC Lithuania in collaboration with CASTIEL 2 WP3. The workshop was open to anyone interested in joining and it was attended by 44 participants from 21 countries, out of which 30 participants were from NCCs and one participant from a CoE, representing in total 17 countries.

The instructor for training material focused on helping competent practitioners and experts teach their knowledge to others in an interactive way. The workshop discussed the following core topics:

- Acquisition of Skill
- Lesson Design
- Good Interactive Teaching Practices
- Teaching Mechanics
- Collaborative Lesson Development
- Practice Teaching and Giving Feedback

All teaching material is accessible via Github [8].

A collaborative online document was used during the workshop for questions and answers, as well as collective note taking and for the discussion sessions [9].

2.5.3 Examples of Collaborations of CASTIEL 2 WP3 and NCCs/CoEs

1. **Training Coffee Breaks**

To provide space to NCCs and CoEs to better get to know each other, talk about training-related topics and collaborations, to present their training activities, ask questions and to share their experiences and resources, it was decided to organise regular monthly informal meetings called Training Coffee Break starting in May 2023. The agenda has usually been created by NCCs and CoEs depending on their needs, challenges and wishes and as seen from the initial training-related survey in Section 2.4, NCCs suggested several topics that they wanted to discuss in these meetings. CASTIEL 2 WP3 moderates the discussions and brings topics to discuss in the case of open discussions. Moreover, three Training champions and deputies from CoEs took this opportunity to present the training actions in their CoE and future plans.

2. **Task force on NCCs/CoEs training-related collaborations and exchange of training materials**

This task force group met twice, the first time in May 2023 and the second time in July 2023, with the aim of getting more input on the following topics:

- NCC-CoE collaboration – how to encourage more interactions, what are the needs of CoEs, how could NCCs assist, and what is the role of CASTIEL 2 as-facilitator.

From the discussion it was clear that CoEs would welcome help from NCCs with their contacts to broaden the audience (e.g., industry) and to disseminate their activities. On the other hand,

NCCs want CASTIEL 2 to be a contact point for information and a mediator between NCCs and CoEs.

- Collaboration on joint training and training material and exchange of materials – how to support it, where to store all material

NCCs and CoEs were interested in the train the trainer workshops, in providing space for discussions between both networks and in creating a public space for storing training materials. The tool created in CASTIEL 1 for storing training-related materials, the Training Matrix, and its potential use until the C2ISS is operational and running were discussed. At the moment, the collection of training-related materials has been put on hold until the C2ISS becomes available.

The aim of this task force has been fulfilled and if considered necessary, this group will meet again in the future.

3. Birds of a Feather (BoF) at the ISC23 in Hamburg: Future of HPC Training: Where Are We Going?

In October 2022, representatives from CASTIEL 1 WP3, NCC Sweden, Slovenia and the United Kingdom decided to organise a BoF session at the ISC High Performance 2023 [10] (ISC23)¹ in Hamburg in May 2023 with the aim to collect feedback and opinions on the following topics:

1. How does energy efficiency fit into HPC training? - Michael Ott, Senior researcher in the Future Computing group at Leibniz Supercomputing Centre leading the research activities on energy efficiency.
2. What kind of training certification do different user communities need? - Maria-Ribera Sancho Samsó, Professor at Universitat Politècnica de Catalunya and Manager of Education & Training at the Barcelona Supercomputing Centre.
3. How can we engage emerging HPC user communities in training activities? - Thor Wikfeldt, Director and training coordinator of ENCCS, the Swedish HPC competence centre in the EuroCC network.

The BoF with a title “Future of HPC Training: Where Are We Going?” was submitted on 24 January 2023 and it was accepted by the BoF chair. The session took place on Tuesday 23 May 2023 at the ISC conference centre.

An introductory talk on each topic was followed by a series of questions asked via a tool called Mentimeter [11]. The results were shown in real time to engage all attendees into answering the questions. Afterwards, a discussion was initiated to get more input from the attendees. The Mentimeter was open until 2 June 2023 so that the general public people who were not present at the BoF could also provide answers.

Further details about training certification from the survey will be written in the following deliverable *D3.5 – First Update of the Implementation and Adoption of the Training Framework* that is due on 30 June 2024.

The following topics were presented at the BoF:

How does energy efficiency fit into HPC training? introduced the topic and invited participants to share examples, experiences and ideas about this emerging focus area.

¹ An international conference and exhibition

How can we engage emerging HPC user communities in training activities? discussed the emerging need to develop attractive and relevant training for new user groups from the public sector, industry and digital humanities.

The overview of the Mentimeter results of the survey are presented in Annex 2.

2.5.4 Examples of NCC Collaborations

NCCs report their training-related collaborations in their Technical Progress Reports (TPRs) within the EuroCC 2 activities and these are shared with CASTIEL2's WP3. The NCC collaborations are related to e.g.: co-organising joint events, collaboration on developing course-material, training material exchange, speaking at workshops/trainings of other NCCs, providing access to supercomputing facilities and hands-on exercises during HPC training and other areas. The majority of NCCs is involved in such collaborations with other NCCs and in some cases with CoEs.

Selected examples shall be given below. Selected examples of NCCs teaming up to organise training events of multi-lateral interest are given below. NCCs have teamed up to organise training events of multi-lateral interest.

The main common reasons for collaborative training events reported were:

- Covering a subject of broad interest to several NCCs.
- Requirement of the training provider to overcome a certain minimum number of participants.
- Organisational ease due to established routines by the training provider concerning event planning and realisation.
- Positive rating of similar training events held by the training provider in the past.

Example 1 — NVIDIA Bootcamp “AI for Science”

Collaborating NCCs: Germany (LRZ, HLRS, JSC, EuroCC2), Austria (VSC/TUW, EuroCC2)

Date: 17-18 April 2023

Participants: 150

Specifics: NVIDIA provided cluster access, teaching materials and assigned a lead instructor. Zoom and slack were used throughout the event and all parties worked together to organise and advertise the bootcamp. Collaborating HPC centres had to provide teaching assistants always overseeing subgroups of 10 participants.

Example 2 — NVIDIA Bootcamp “N Ways to GPU Programming”

Collaborating NCCs: Germany (LRZ, HLRS, JSC, EuroCC2), Austria (VSC/TUW, EuroCC2)

Date: 15-16 May 2023

Participants: 119

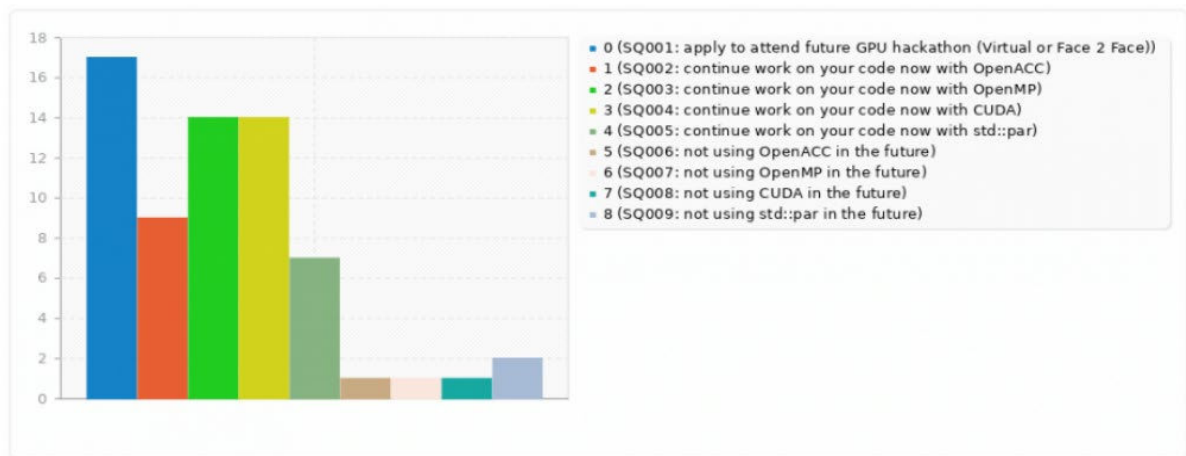
Specifics: Similar setup as in the bootcamp “AI for Science”.

Lessons Learned and Outlook

- *Experience*

A survey of 26 respondents resulted in the following overall assessment. Most of the users surveyed are motivated to take part in future bootcamps. OpenMP and CUDA were named as the most important target paradigms for GPU programming.

Given this bootcamp are you likely to:



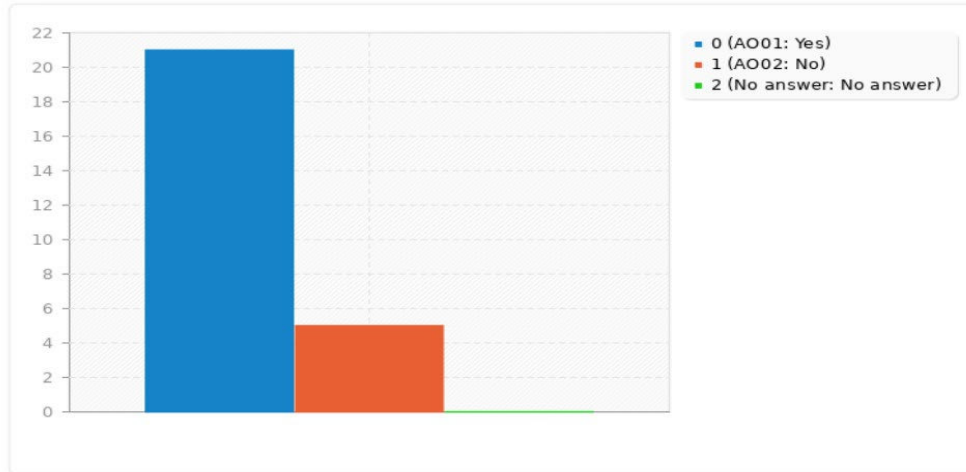
© LRZ, EuroCC Germany

Figure 10: Lessons learned from the NVIDIA bootcamp – experience.

- *Reason for having joined this bootcamp*

From the same survey with 26 replies, the main motivation for participation in this bootcamp appeared to be future code porting ambitions to GPUs.

Do you have a code you are planning to accelerate on GPUs?



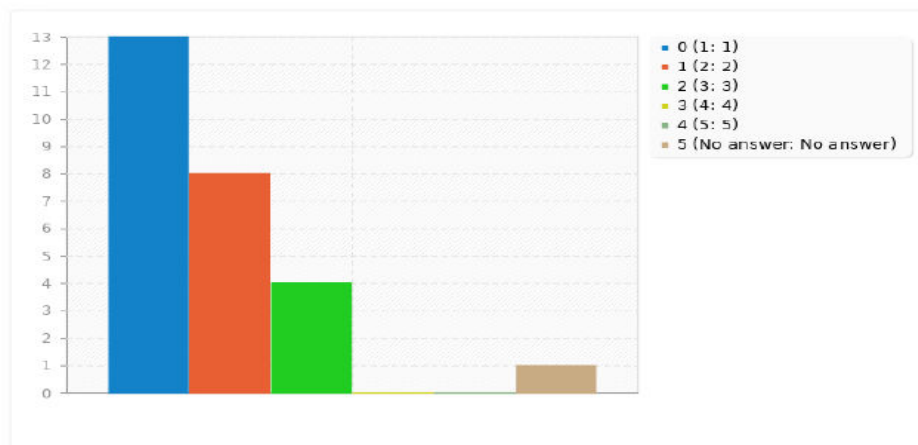
© LRZ, EuroCC Germany,

Figure 11: Lessons learned from the NVIDIA bootcamp – reason for joining the bootcamp.

- *Experience with GPU programming at bootcamp entry*

Most users came to this bootcamp without prior knowledge of GPU programming.

How much experience did you have with GPU programming before coming to the event (1 = Beginner, 5 = Expert) ?



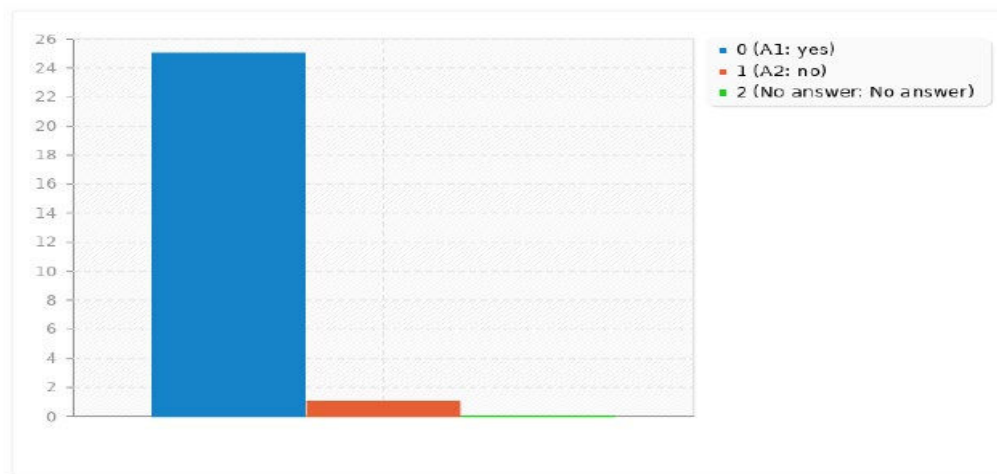
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Figure 12: Lessons learned from the NVIDIA bootcamp – previous experience with GPU programming.

- *Recommendation likeliness*

The majority of participants would recommend this bootcamp to potential other users.

Would you recommend this training event to others?



© LRZ, EuroCC Germany

Figure 13: Lessons learned from the NVIDIA bootcamp – recommendation likeliness.

2.5.5 An Example of Joint NCC Events

There were regional joint events where common trends and current problems were discussed and individual opinions exchanged (not primarily dedicated to training in an exclusive manner.). The given example can just be considered a sample case of more such events taking place in the EuroCC2 network.

Training-Related Exchange of Ideas at the ASHPC23 (Austrian-Slovenian HPC) 2023 Meeting in Maribor

Satellite Meeting: EuroCC2 Central European NCCs Workgroup Meeting

Collaborating NCCs:

- Slovenia (IZUM, ARNES, EuroCC2)
- Austria (VSC/TUW, EuroCC2)
- Czech Republic
- Slovakia
- Croatia
- Poland
- Belgium (online)
- Hungary (online)
- Latvia (online)
- Montenegro (online)
- Romania (online)
- Sweden (online)

Date: 12 June 2023

Participants: 45 (22 in-person, 23 online)

Specifics: The Austrian-Slovenian HPC Meeting (ASHPC) series of conferences are annual meetings held for initially solely the Austrian HPC user community, however, nowadays jointly held for both the Slovenian and the Austrian HPC user community.

This year's edition took place in Maribor, Slovenia, and had included an extra satellite day dedicated to discussions about EuroCC2/CASTIEL2 topics. The interest in this regional event was remarkably strong with 12 NCCs sending their representatives (in particular many Training champions). A second separate session was dedicated to the topic of EuroCC2 training.

Major topics discussed were are as follows:

1. Working training formats.
2. Attracting SMEs to training events.
3. Initiatives to organise joint training events.
4. General limitations and planning of forthcoming similar events.

2.5.6 Examples of Joint Events between NCCs and CoEs

The following section provides examples of collaboration between NCCs and CoEs that resulted from discussions during the Training Coffee Break.

Streaming optimised scientific software: an introduction to European Environment for Scientific Software Installations (EESSI)

Organiser: MultiXScale project

Date: 5 December 2023

Audience: NCCs, their networks and end users

Abstract: Have you ever wished that all the scientific software you use was available on all the resources you had access to without having to go through the pain of getting them installed the way you want/need? The European Environment for Scientific Software Installations (EESSI) is a common stack of architecture-optimised scientific software installations for HPC systems and beyond, including laptops, personal workstations and cloud infrastructure.

In this tutorial, it'll be explained what EESSI is, how it is being designed, how to get access to it, and how to use it.

A number of demonstrations will be given, as well as access to a resource where participants can try EESSI out by themselves.

BioExcel workshop on GROMACS and HADDOCK

Organiser: BioExcel

Date: October 18 – 19, 2023

Audience: NCCs and their networks

Abstract: National Competence Centres for HPC in Slovakia, Austria, Czechia and Hungary, together with BioExcel – Centre of Excellence in HPC are organising a 1,5-day workshop focused on GROMACS software package. Focus will be on basic usage and deployment on

GPU-accelerated HPC systems, the agenda will also cover more of the core modules for GROMACS developed by BioExcel (Haddock or PMX).

Other collaborations and joint events happened as a result of an initiative of a particular NCC or CoE like for instance joint workshops of NCC Sweden and MAX CoE and Plasma-PEPSC. More joint events are co-organised between NCCs and CoEs and they are reported in the Technical Progress Reports (TPRs) of NCCs.

2.6 Hardware and Software Suppliers Presentations

To continue practices established in the first phase of the project, CASTIEL 2 WP3 sustained to connect NCCs (and CoEs) to different hardware and software suppliers based in Europe in order to enable information exchange.

In the first year of the project, the following activities were organised by WP3:

Activity	Date and time	Audience	
[Online] EuroCC-AMD Workshop: Developing HPC Applications with AMD GPUs	2-5 May 2023 1pm – 5pm CEST	NCCs, CoEs – 65 attendees, 22 countries	Workshop on developing HPC applications for AMD GPUs. The workshop started with a developer's view of the AMD system GPUS and associated hardware. Then it covered a few different programming options including HIP and OpenMP. There were some presentations on obtaining the best performance for participants' applications. The workshop then introduced some of the available AMD profiling and debugging tools. The content was about 30% Beginner /40% Intermediate /30% Advanced.
[Hybrid] EuroCC-SambaNova Webinar: SambaNova Systems AI Platform	22 May 2023 3pm – 4pm CEST	NCCs, CoEs and the HPC ecosystem – 4 in-person and 21 online, 16 countries	SambaNova Systems developed a novel approach to process neural-network like artificial intelligence challenges of nearly arbitrary size and at low latency. This session introduced the participants to the company, the SambaNova “Reconfigurable Dataflow Architecture” and all components making up the platform. It also explained example scientific use cases and examples from real-life customers.
[Online] NVIDIA	25 October	NCCs,	This event provided valuable

Developer EuroCC	Day	for	2023 2pm -6pm CEST	CoEs – 65 attendees, 24 countries	insights into the latest advancements in GPU technology and how they can be applied to accelerate scientific research and innovation.
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Table 2: Overview of the activities with hardware and software suppliers in M1-M12.

The video recordings and slides from these events can be found in the Video library on the EuroCC Access website [13].

1. Other companies

Further collaborations and presentations are planned with other HPC providers, with a special focus on European companies.

In the first year of the project, initial discussions started with the following companies:

- Eviden/ATOS.
- Megware.
- SiloAI.
- HPE.
- SiPearl.

Events with these companies are being planned in the next year.

Further companies will also be approached during the second and third year of the project.

3 Assisting the Evolution through Twinning, Mentoring and Mobility Activities

3.1 Planning and Evolution of the Mentoring, Twinning and Mobility Programme

According to the Grant Agreement (GA), this WP will assist the development of NCCs through an effective mentoring, twinning and mobility programme with suitable instruments that serve the needs of NCCs and CoEs. CASTIEL 2 WP3 ensure that the NCCs in need of evolution get the necessary support and guidance by more experienced/mature NCCs and CoEs. Mentoring events, such as workshops, hackathons and advanced training courses with a focus on collaboration and coordination aspects across NCCs or CoEs, is co-organised. Further, mobility of HPC specialists between communities, academia, public and private sectors will be enabled through the mentoring, twinning and mobility programme.

In CASTIEL 1, NCCs could apply for funding for training, twinning and mentoring events. Since travel costs or personnel costs cannot be covered in phase 2 of the project, this concept is likely to change.

Mobility is a new concept in CASTIEL 2 and it was proposed that in order to enable flow of expertise among the NCCs, it should cover travel costs / compensations for external experts (people not involved in EuroCC, or people from the institutions forming the NCCs, or people from CoEs that have no budget for training). An amendment was proposed by the project coordinator and the final statement from the EuroHPC JU will be made soon.

Task force on Mentoring, twinning and mobility

In Spring 2023, a task force group from NCCs was created on this topic at the beginning of CASTIEL 2 to gather feedback from CASTIEL 1, what worked well or not so well and to get suggestions on how to improve the mentoring and twinning programme. The discussion about mentoring and twinning in small groups in Stuttgart (see more details in Section 2.2) and the results from the final survey conducted towards the end of CASTIEL 1 (described in Section 5 of the deliverable *D3.3 Final Report on Training, Twinning and Mentoring Activities [12]*) also provided answers to these questions. All feedback was taken into account at the meeting of the task force on Mentoring, twinning and mobility – 5 May 2023. No further meetings were organised within this task force but could be organised once the financing aspects are resolved and the mobility concept can be implemented.

Further feedback was asked to gather ideas on how to propose an effective mentoring, twinning and mobility programme for NCCs and CoEs, what to offer to more developed NCCs and how to approach the novel component of mobility. All members agreed that:

- The application process needs to be simplified
- It would be good to cover the travel and accommodation costs again
- Less reporting would be welcome
- CASTIEL 2 WP3 should continue with the mentoring workshops that were organised in CASTIEL 1 on various topics of interest.

With regard to mapping out the available knowledge and expertise in NCCs and CoEs, the participants suggested to have a questionnaire at the beginning and then have periodic checks to capture the development of NCCs and CoEs. It could be in form of an online document with broad topics that NCCs and CoEs can update and the Training Coffee Break might provide opportunities to update that information, too.

WP3, prepared and introduced a concept of clustering NCCs and CoEs according to their knowledge as a mechanism to support matching suitable partners for mentoring and twinning, and amended mentoring and twinning programme. It was presented to NCCs at the Training Working Group meeting (see details in Section 2.2) with the aim to receive feedback from the Training champions and deputies and to see the feasibility of the concept.

After a consideration of the received feedback, time and personnel restrictions, WP2 and WP3 has decided to collaborate with CASTIEL 2 WP2 and to use the upgraded competence map for potential mentoring and twinning matching once the upgrade is completed. In the meantime, NCCs and CoEs can get involved in individual mentoring and/or twinning interactions by themselves without financial support from CASTIEL 2.

3.2 Examples of Mentoring and Twinning Activities

NCCs report all initiated and finalised mentoring and twinning activities every quarter in their Technical Progress Reports (TPRs). Table 4 and Table 3 show examples of initiated mentoring and twinning collaborations during quarter 1 and 2.

Collaborating NCCs	Subject of Mentoring
2 NCCs	Projects / Collaboration with industry
2 NCCs	Training related info, collaboration on joint workshops / trainings,

	Projects / Collaboration with industry
1 NCC and 1 CoE	HPC centre, HPC usage, HPC services, Communication, dissemination, marketing
1 NCC and 1 CoE	HPC system usage, training
2 NCCs	Projects / Collaboration with industry, PoC, working on a code

Table 3: Examples of initiated mentoring interactions.

Collaborating NCCs	Subject of Twinning
5 NCCs	Training, collaboration on joint workshops/trainings, Industrial collaboration, Running of the HPC centre and other topics of interest
4 NCCs	Collaboration on joint training

Table 4: Examples of initiated twinning interactions.

4 Main Achievements and Concluding Remarks

All WP3 activities have started and are on track.

The main achievements of WP3 in the first year of CASTIEL 2 are summarised as follows:

- Incorporation of CoEs Training champions and deputies into the Training Working Group.
- Creation of opportunities for training-related collaborations between NCCs and NCCs with CoEs
- Organisation of two workshops and one presentation with hardware and software companies as part of the knowledge transfer and development of collaborations with new European hardware and software companies.
- Work initiated on the development of the definition of the EuroCC HPC training baseline and evaluation of various options for the HPC training certification.
- Initial NCC/CoE perspective on the current platforms – HPC in Europe portal and the EuroCC Access portal – and on the future central point of access, C2ISS.

The outlook for the next year is to continue working on the activities presented in this deliverable and introduce further activities (like the CoE/EuroCC Spring Training Event and our participation at ISC 2024 Birds of a Feather) that will enhance current-knowledge through specific events, joint collaborations and the mentoring, twinning and mobility programme.

5 References and Applicable Documents

- [1] CASTIEL and EuroCC projects, HYPERLINK / <https://www.eurocc-access.eu/about-us/the-projects>
- [2] EuroCC Access website, <https://www.eurocc-access.eu/>
- [3] EuroHPC Joint Undertaking, https://eurohpc-ju.europa.eu/index_en.
- [4] HPC in Europe portal, <https://hpc-portal.eu/>.

- [5] EUMaster4HPC, <https://eumaster4hpc.uni.lu/>.
- [6] HPC Certification Forum, <https://www.hpc-certification.org/>.
- [7] HPC industrial course co-created by NCCs, <https://mssg.ipta.demokritos.gr/tng4hpc4ind/>.
- [8] Github page of the Best Practices in HPC Training workshop, <https://enccs.github.io/instructor-training/>.
- [9] A collaborative online document of the Best Practices in HPC Training workshop, <https://hackmd.io/@enccs/instructor-training-sept2023>.
- [10] ISC High Performance 2023, <https://www.isc-hpc.com/agenda-2023.html>.
- [11] Mentimeter, <https://www.mentimeter.com/>.
- [12] The deliverable D3.3 *The Final Report on Training, Twinning and Mentoring Activities*, https://www.eurocc-access.eu/wp-content/uploads/2023/01/CASTIEL_D3.3_Final-Report-on-Training-Twinning-and-Mentoring.pdf.
- [13] Video library, EuroCC ACCESS, <https://www.eurocc-access.eu/services/video-library/>.

Annex 1 – C2ISS Survey for NCCs and CoEs – Training-Related Questions

Which of these features are important to have on the C2ISS? *

	Very important	Quite important	Not that important
registration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
scheduling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
survey creation and anal...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
contacting and commun...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
adding training materials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Zeile 6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What other training related functionalities would you expect?

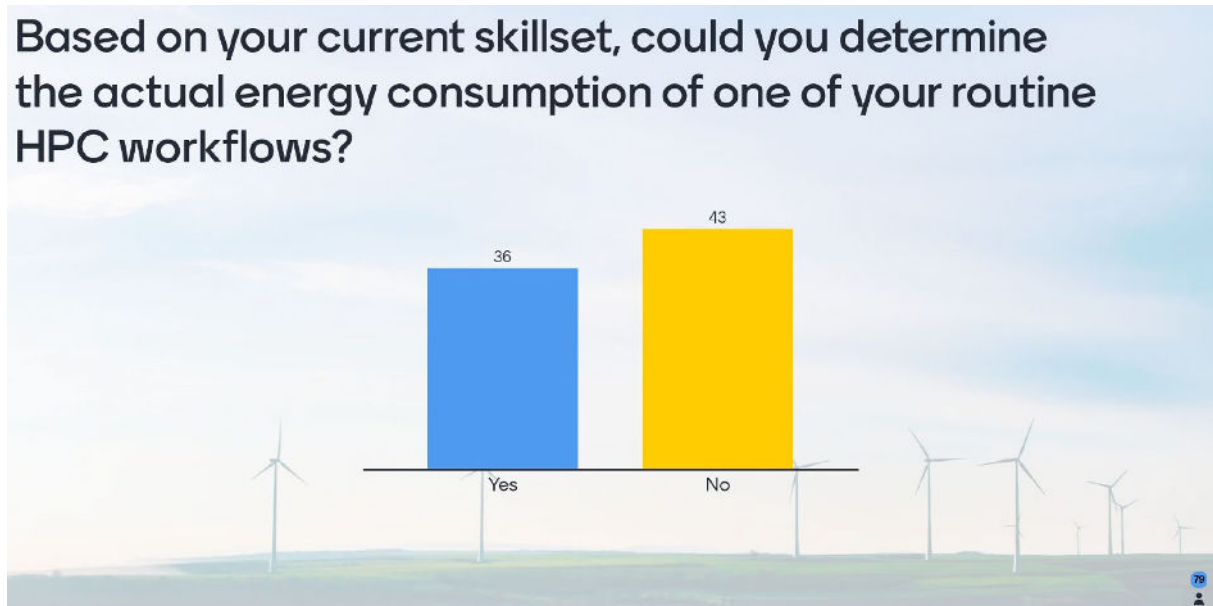
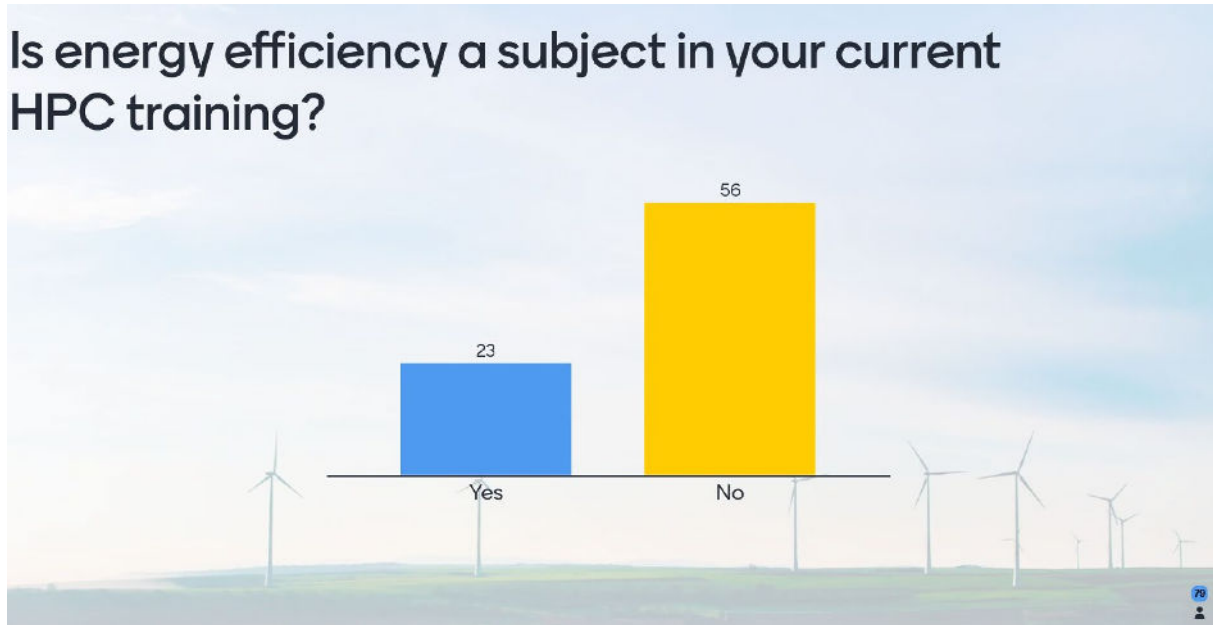
Langantwort-Text

What training-related information would your NCC want to have/show on the C2ISS? (multiple) *

- Training activities
- Academic courses and modules
- Training Material
- Training Best Practices
- Other types of events (e.g. hackathons)
- Trainier Database
- Weitere...

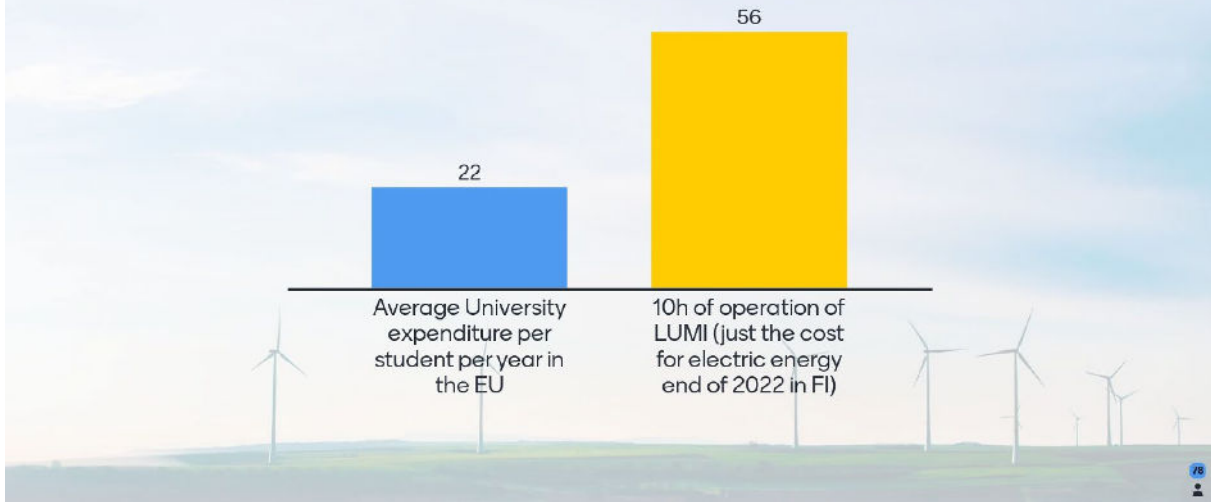
Annex 2 – Mentimeter Results from the BoF² Session on Energy Efficiency and User Engagement Parts

A. How does energy efficiency fit into HPC training?



² Birds of Feather

What is more expensive?



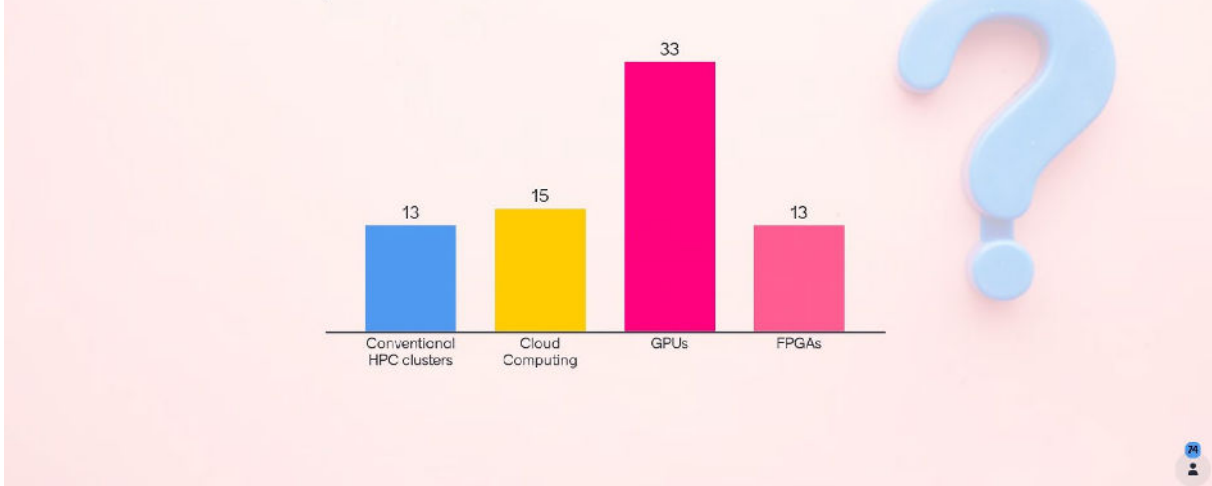
Would you be willing to make some efforts in reducing your electric energy footprint of your current HPC activity?



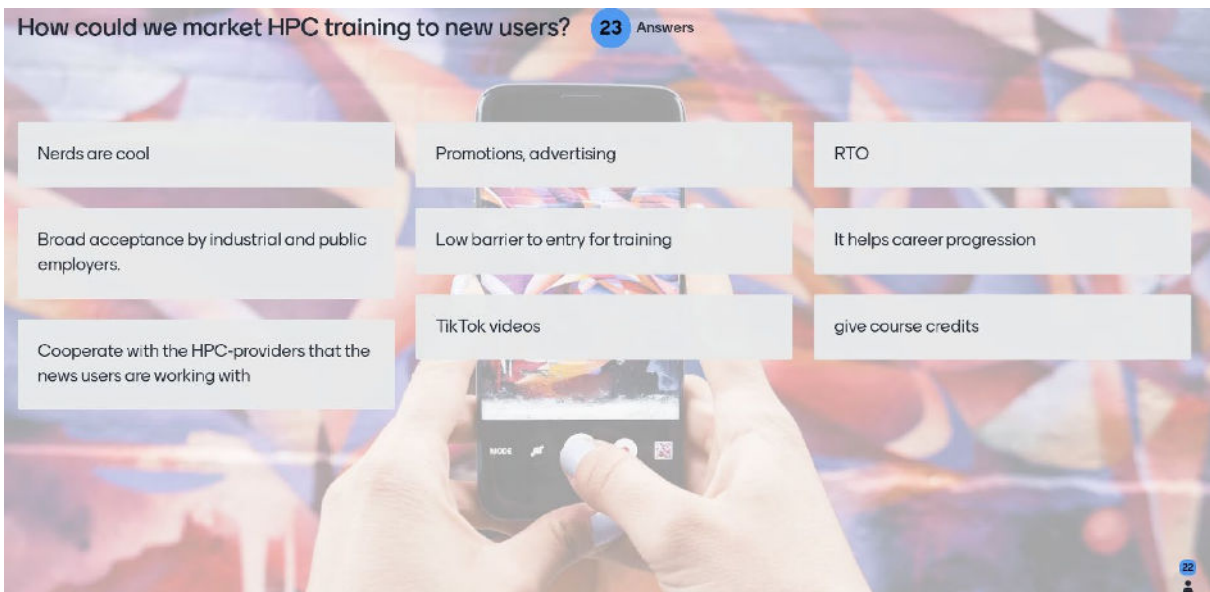
Why is it unattractive to spend time on energy efficiency in HPC ?



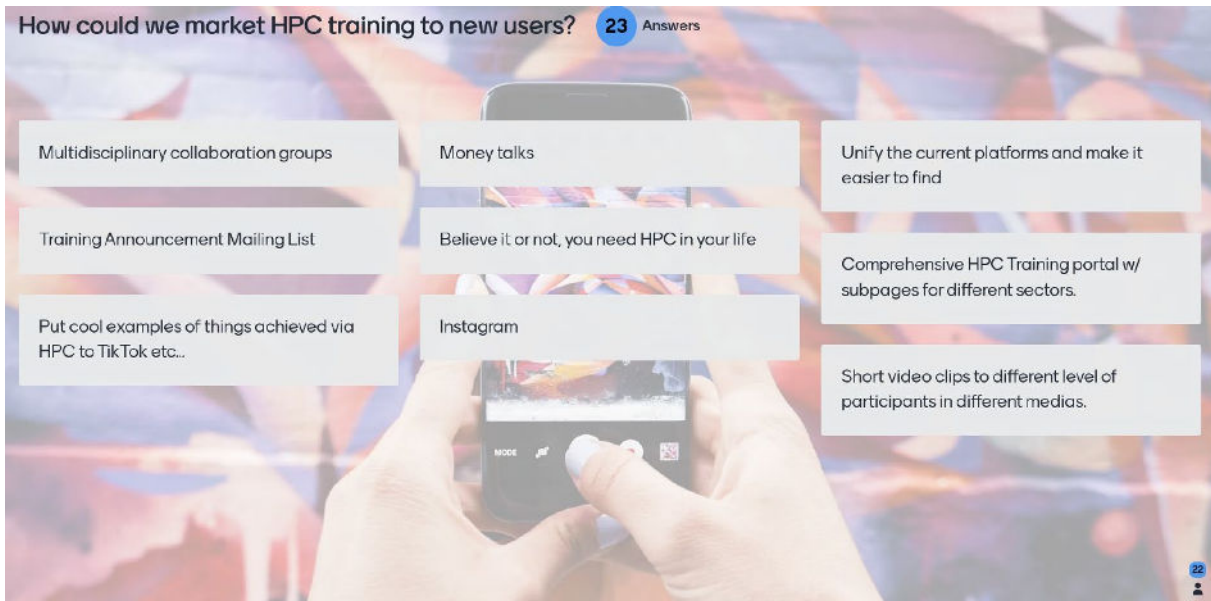
What would you consider the most energy efficient HPC platform?



B. How can we engage emerging HPC user communities in training activities?



How could we market HPC training to new users? **23** Answers



Multidisciplinary collaboration groups

Money talks

Unify the current platforms and make it easier to find

Training Announcement Mailing List

Believe it or not, you need HPC in your life

Comprehensive HPC Training portal w/ subpages for different sectors.

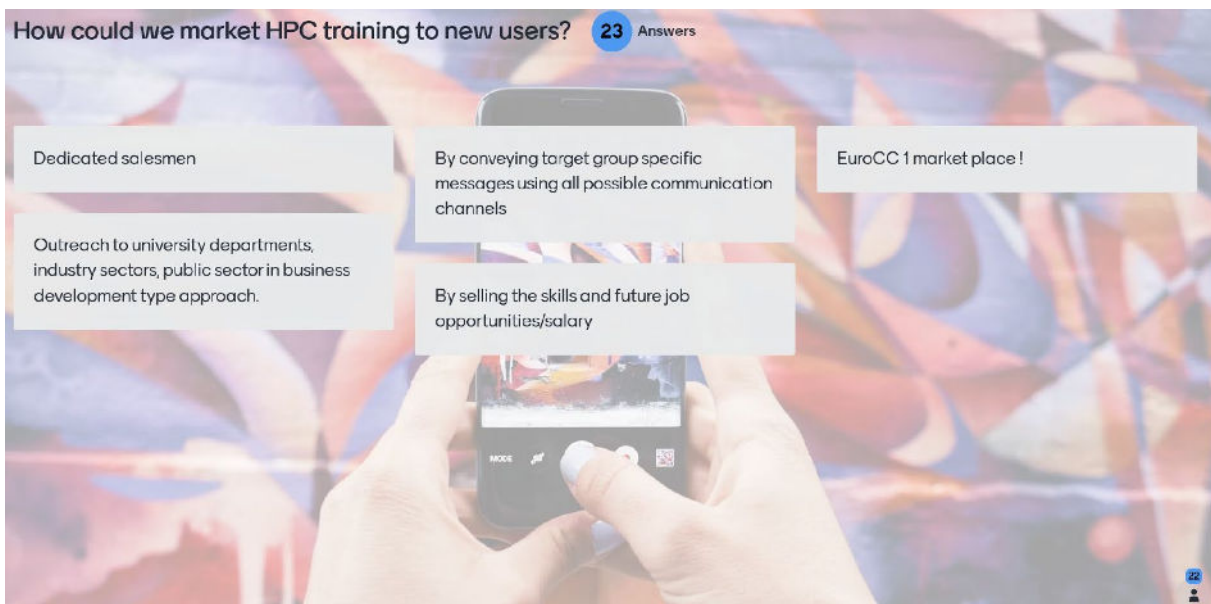
Put cool examples of things achieved via HPC to TikTok etc...

Instagram

Short video clips to different level of participants in different medias.

22

How could we market HPC training to new users? **23** Answers



Dedicated salesmen

By conveying target group specific messages using all possible communication channels

EuroCC 1 market place!

Outreach to university departments, industry sectors, public sector in business development type approach.

By selling the skills and future job opportunities/salary

22

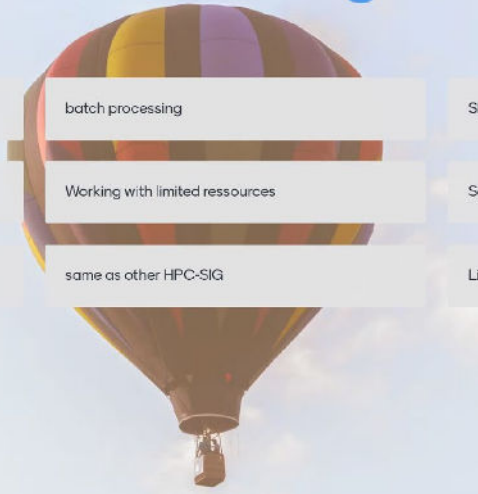
Do we need "packaged" training for specific job roles?



Do we need post-training support? If yes, then how?



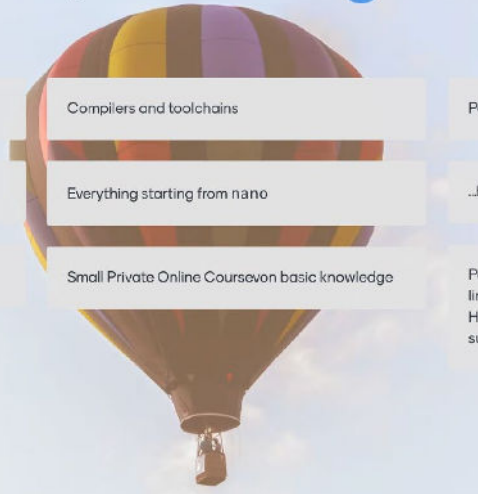
What training do cloud users need to get started with HPC? 18 Answers



Cloud fundamentals	batch processing	SLURM
migration, scheduler, running containers on HPC	Working with limited resources	Security
A lot	same as other HPC-SIG	Linux essentials

18

What training do cloud users need to get started with HPC? 18 Answers



Performance analysis	Compilers and toolchains	Parallel programming
Practical, hands-on training on getting started	Everything starting from nano	..how to use HPC?
Basic HPC training	Small Private Online Course on basic knowledge	Potential differences from a GUI to a command line interface. Batch scheduling type workloads. How to migrate containers onto HPC systems, if supported.

18

Should we consider new training formats for industry users with a tight schedule?



30

How do we find out the needs of emerging HPC user communities? 23 Answers

Survey	Mentis surveys :)	Personal communication
Hi mom!	Better advertising for HPC contact points/information points for non-experts	system monitoring
Ask them directly, talk to people	Ask them	Surveys

20

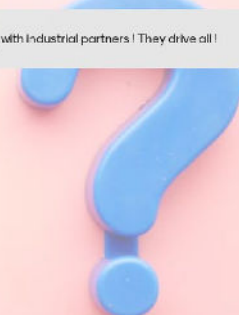
How do we find out the needs of emerging HPC user communities? 23 Answers



We need to walk the walk - attend their meetings and conferences, establish liaisons	Getting their needs on their working area	Through building collaborations
Find out who's batch job slows down the system	conversations with those communities	Surveys and interviews
Join their conferences and meetings to learn about their subject	Trainings held by providers: what hurdles do trainees face during the training?	Find potential domain champions. Nothing is more convincing than satisfied colleagues who make great new things using HPC

20

How do we find out the needs of emerging HPC user communities? 23 Answers



Give periodic open mic	Close contacts with various research communities and industrial clusters and associations	By talking with industrial partners ! They drive all !
A lot of one-to-one discussions with user community groups/representatives across the different sectors (academia and industry).	By talking directly to them or via a carefully designed questionnaire when we know what do we want to know from the answers (random questions without a clear purpose are useless to everyone)	

20