

H2020-JTI-EuroHPC-2019-2

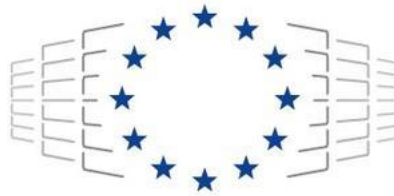


Coordination and Support for National Competence Centres on a European Level

Project Number: 951740

D3.3
Final Report on Training, Twinning and Mentoring
Activities

Deliverable D3.3 V1.0 is currently under review by the European funding agency and is therefore subject to change.



EuroHPC
 Joint Undertaking

This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 951740. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Germany, Italy, Spain, France, Belgium

Work package:	WP3	Training, Twinning, Mentoring
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Dissemination Level	Public	

Date	Author	Comments	Version	Status
2022-11-24	Martina Blazkova, Maria Ribera Sancho, Siegfried Hoefinger, Lorenzo Zanon, Tobias Haas	Initial draft	V0.0	Draft
2022-12-07	Martina Blazkova	Amended final draft sent to Competence Centre Management	V0.1	Draft
2022-12-16	Martina Blazkova	Final version for submission	V1.0	Final

List of Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
BPG	Best Practice Guides
BSC	Barcelona Supercomputing Centre
BSCW	A web-based groupware tool for efficient collaboration
CC	Competence Centre
CFD	Contract for Differences
CoE	Centre of Excellence
CPU	Central Processing Unit
DoA	Description of Action
EU	European Union
EuroHPC JU	The European High Performance Computing Joint Undertaking
FocusCoE	Focus Centres of Excellence
FPGA	Field Programmable Gate Array
GA	Grant Agreement
GDPR	General Data Protection Regulation
GPU	Graphics Processing Unit
HPC	High-Performance Computing
HPDA	High-Performance Data Analytics
M	Month
MoU	Memorandum of Understanding
NCC	National Competence Centre
NDA	Non-Disclosure Agreement
NLP	Neuro-linguistic Programming
PMT	Project Management Team
PoC	Proof of Concept
PRACE	Partnership for Advanced Computing in Europe
SME	Small and Medium Enterprise
TMTF	Training Mapping Task Force
TTM	Training, Twinning and Mentoring
WP	Work Package
WGT	Working Group on Training

Executive Summary

The first deliverable of CASTIEL WP3 D3.1 *Initial Training, Twinning and Mentoring Opportunities and the Needs of NCCs* [1], submitted by 31 January 2021, provided the initial overview of available training competences in the NCCs, initial training, twinning and mentoring (TTM) opportunities, and a first identification of the TTM needs of individual NCCs. The deliverable D3.2 *Training, Twinning and Mentoring Plans and Achievements* [2] presented the evolution of training, twinning and mentoring plans as well as the respective activities done by CASTIEL WP3 within the first year of the project. This deliverable is an update of D3.2 with the activities and findings in the second year of CASTIEL.

During the second year, Task 3.1 *Working Group on Training* organised discussions and workshops on training-related topics with the Training champions and workshops and presentations with several HPC providers, e.g., NVIDIA and Intel, that provided further follow-up workshops on topics such as Quantum and Machine Learning. Two companies were introduced to the NCCs – ConstelCom [27] and Weka [28]. In response to the project reviewers' comments from the reviews in October 2021 and April 2022, further improvements of the HPC in Europe Portal [3] and the EuroCC Access Training page [5] have been made. To formalise previous and future collaboration among CASTIEL, FocusCoE [6] and PRACE-6IP [7] on adapting and expanding the HPC in Europe Portal, a Memorandum of Understanding (MoU) was signed among these parties in March 2022.

Task 3.2 *Development and Execution of Training Plans* focused on the second wave of the training mapping and the detailed analysis of the training activities of NCCs, this time using information inserted directly by NCCs into the HPC in Europe portal. The summaries from the analysis were compared with those produced in April 2021 to assess the evolution of training activities across NCCs. Further, this task focused on the definition of the EuroCC HPC Training Baseline, on the creation of best practice guides on training-related topics and on summary reports of workshops and presentations. Collaboration between NCCs has been continuously stimulated by this task, including providing support to the HPC training course for industrial users co-created by NCCs.

Within Task 3.3 *Development and Execution of Mentoring and Twinning Plans*, further improvements and amendments were made in the mentoring and twinning programme and all related documents to address the feedback from NCCs. CASTIEL WP3 further focused on fostering mentoring and twinning interactions as well as other training-related collaborations among NCCs. This task also supported the planning and execution of all mentoring workshops on the following topics:

- Outreach and collaboration with industry and public sector.
- HPC disruptive technologies for industries.
- Programming best practice and industrial software development.
- Quantum computing.
- HPC, HPDA and AI applied to industrial use cases.

Further, this task tracked information about mentoring/twinning and workshop collaborations and connected 25 NCCs to discuss mentoring or twinning opportunities.

A final progress and evaluation survey was sent to the Training champions before the end of the project to get both updated information about the progress and the situation of the training area in their NCCs, and opinions about the work of CASTIEL WP3. This information will be used in CASTIEL 2 to support the planning of CASTIEL WP3 activities.

Overall, NCCs have experienced progress in the training area over the last two years, they were keen on collaborating with each other, on sharing their experiences and knowledge, on learning and closing knowledge gaps. This created a strong base for future collaborations. The results of the final survey have also shown that on average 84% of NCCs found the work of CASTIEL WP3 useful and helpful, recognising as main benefits the mentoring and twinning programme and various workshops and events, which enabled to establish new collaborations during the project duration.

The main achievements and contributions to the overall work of CASTIEL presented in this deliverable can be summarised as follows:

- CASTIEL WP3 enabled many opportunities for NCC collaborations and interactions, including knowledge transfers among NCCs.
- CASTIEL WP3 gathered further insight on individual NCCs' training profiles.
- CASTIEL WP3 forwarded continued development of the EuroCC ACCESS Training page and the HPC in Europe portal, including the signed MoU among CASTIEL, FocusCoE, and PRACE.
- CASTIEL WP3 contributed to the training offering of NCCs, e.g.:
 - Proposal of the EuroCC HPC training baseline for academia, big industry and SMEs.
 - Support to the creation of the HPC training course for industrial users.
- CASTIEL WP3 triggered and supported mentoring and twinning interactions through 5 mentoring paths and the initial workshops in each of them (15 NCCs as mentors).

Table of Contents

1	Introduction	9
2	Training-Related Activities in M13 – M28.....	10
2.1	Update on the Training-Related Activities	10
2.2	Meetings of the WGT Related to Training	11
2.3	The Second Wave of the NCCs’ Training Mapping	13
2.4	Further Detailed Analysis of NCCs’ Training Activities	14
2.4.1	Methodological Remarks	14
2.4.2	Key Findings of the Analysis of Individual NCCs Training Profiles in 2022 ...	15
2.5	Further Improvements of Portals to Show Training Activities of NCCs	15
2.5.1	HPC in Europe Portal.....	15
2.5.2	EuroCC ACCESS – Training Section	20
2.6	Maintenance of the Training Matrix.....	21
2.7	EuroCC HPC Training Baseline Proposal.....	22
2.7.1	Aim of the Proposal.....	23
2.8	Collection of Best Practice Guides on Training	24
2.9	Collaborations among NCCs in the Second Year	24
2.9.1	Examples of Collaborations among NCCs in the Second Year	25
2.9.2	Knowledge Sharing among Training Champions	26
2.9.3	HPC Industrial Course Co-Created by NCCs	27
3	Mentoring and Twinning-Related Activities in M13 – M28	29
3.1	Mentoring and Twinning Plan Update	29
3.2	Meetings of the WGT Related to Mentoring and Twinning	30
3.3	Triggering and Support of the Mentoring and Twinning Interactions	31
3.3.1	Identification of Potential Mentors, Mentees and Interactions	31
3.3.2	Examples of Ways of Stimulating the Mentoring and Twinning Interactions...	33
3.4	Mentoring Paths Supported by CASTIEL WP3 in the Second Year	34
3.5	Reporting of Mentoring and Twinning Activities	35
4	Technology Providers’ Presentations and Workshops Series in M13 – M28.....	37
5	Results from the Final Training Survey	38
5.1	Methodology.....	38
5.2	Status of the Training Area across NCCs.....	39
5.3	Evaluation of CASTIEL WP3	49
6	Major Achievements	54
7	Concluding Remarks	55
8	References and Applicable Documents.....	56
	Annex 1 – Examples of Profile Usage in the Training Analysis	57
	Annex 2 – HPC in Europe Portal and Example of Some Features	60
	Annex 3 – CASTIEL WP3 Support of Collaborations among NCCs and Reporting.....	62
	Annex 4 – Amended Mentoring and Twinning Template Documents	64
	Annex 5 – Budget Application in the NCC-restricted Area on EuroCC ACCESS	66
	Annex 6 – Summary of Events with Technology Providers.....	67
	Annex 7 – CASTIEL WP3 Final Survey Questionnaire for NCCs	69
	Annex 8 – List of Reported Key National Training Providers in HPC, HPDA and AI.....	77

List of Figures

Figure 1: HPC in Europe portal – Homepage with the “Training and Events” section.....	16
Figure 2: HPC in Europe portal – Menu of available displays for training events.....	17
Figure 3: HPC in Europe portal – Filters and a selection of the upcoming short courses (on 21 Nov 2022).....	18
Figure 4: EuroCC ACCESS – Filters and current display of training courses (embedding of the HPC in Europe portal) – 15 December 2022.	21
Figure 5: Overview of all supportive mentoring and twinning documents on BSCW.	32
Figure 6: Number of all courses organised by NCCs during the project duration.....	39
Figure 7: Number of EuroCC courses organised by NCCs during the project duration.....	40
Figure 8: Comparison of the number of all vs. EuroCC courses during the project duration..	40
Figure 9: Internal trainers in NCCs between Sep 2021 - Aug 2022.	41
Figure 10: External trainers in NCCs between Sep 2021 - Aug 2022.	41
Figure 11: Total participants in NCCs courses between Sep 2021-Aug 2022.....	42
Figure 12: Industry participants in NCCs courses between Sep 2021-Aug 2022.....	42
Figure 13: Average % of female participants in NCCs courses between Sep 2021-Aug 2022.	43
Figure 14: Comparison of training-related constraints mentioned by NCCs in 2020 and 2022.	44
Figure 15: Comparison of training-related needs mentioned by NCCs in 2020 and 2022.	45
Figure 16: % of NCCs wishing for support from more experienced NCCs.	45
Figure 17: % of NCCs where the trainers receive a specific training education.	46
Figure 18: % of NCCs having their own space for training.	47
Figure 19: % of NCCs having a specific training IT infrastructure.	47
Figure 20: Variation (% number of NCCs) of positive answers compared to the initial survey for four areas.	48
Figure 21: Promotional channels used by NCCs at the end of the project and their increment compared to the initial survey.	48
Figure 22: Number of mentioned HPC, HPDA and AI training providers in a country at the start and at the end of the project.	49
Figure 23: NCCs evaluation of all activities initiated by CASTIEL WP3.....	50
Figure 24: % of NCCs wishing for more support from CASTIEL WP3.	51
Figure 25: Example profiles in category “Format” for two different NCCs.....	57
Figure 26: Distribution of weights in most recent evaluations (a) when compared to previous analysis (b).	58
Figure 27: NCC-C profiles for category “Audience” computed in May 2022 (a) or late 2020 (b).	58
Figure 28: Detecting NCC-X with strongest focus on beginners (a) reaching up to 80% as detailed in (b).	59
Figure 29: Finding a complementary partner NCC for twinning in the category “Difficulty Level”.	59
Figure 30: HPC in Europe portal – Map of upcoming short courses.....	60
Figure 31: HPC in Europe portal – Map of the HPC, HPDA and AI training providers.....	61
Figure 32: HPC in Europe portal – Calendar of HPC, HPDA and AI academic programmes.....	61
Figure 33: EuroCC ACCESS – Budget application (after the web relaunch).	66

List of Tables

Table 1: Overview of all meetings of the WGT related to training in M1-M28.....	13
Table 2: Overview of all documents uploaded to the Training matrix in M1-M28.....	22
Table 3: Examples of NCC training-related collaborations during M13-M21.....	26
Table 4: Organised training activities for Training champions during M13-M28.....	26
Table 5: Overview of all meetings of the WGT related to mentoring and twinning in M1-M28.	31
Table 6: Overview of all mentoring first workshops in M1-M28.....	35
Table 7: Overview of areas for mentoring and twinning during M8-M28.	36
Table 8: Overview of all presentations and workshops with technology and solution providers in M1-M28.	37
Table 9: Main NCCs training progress and achievements during M1-M28.....	39
Table 10: Current NCCs constraints related to training.	43
Table 11: Current NCCs needs related to training.	44
Table 12: Overview of mentioned NCCs benefits from CASTIEL WP3.....	49
Table 13: Mentioned barriers to having more mentoring/twinning interactions with other NCCs.	52
Table 14: What was effective in the mentoring/twinning programme.....	52
Table 15: What was less effective in the mentoring/twinning programme.....	53
Table 16: What could be improved in the mentoring/twinning programme.....	53
Table 17: Overview of all presentations and workshops with technology and solution providers in M1-M28.	68

1 Introduction

The first deliverable of CASTIEL WP3 D3.1 *Initial Training, Twinning and Mentoring Opportunities and the Needs of NCCs* (submitted by 31 January 2021) provided the initial overview of available training competences of NCCs, initial training, twinning and mentoring (TTM) opportunities, and a first identification of the needs for TTM of NCCs [1]. The next deliverable D3.2 *Training, Twinning and Mentoring Plans and Achievements* (submitted by 30 September 2021, amended and resubmitted by 31 January 2022) presented the evolution of training, twinning and mentoring plans and the respective activities within the first year of CASTIEL [2]. This deliverable D3.3 *The Final Report on Training, Twinning and Mentoring Activities* is an update of D3.2 with the activities and findings in the second year of CASTIEL until December 2022 (Months M13 – M28).

Section 2 in this deliverable focuses on training-related activities, specifically Section 2.1 provides an update on the training-related activities in M13 – M28. Section 2.2. describes the content of the meetings of the Working Group on Training (WGT) on various training-related topics in the period of September 2021 to December 2022. Section 2.3 introduces the second wave of the training mapping, which took place in 2022, and Section 2.4 describes the second detailed analysis of the training activities of NCCs. Section 2.5 describes the changes and improvements made to the HPC in Europe portal and EuroCC ACCESS Training. Section 2.6 looks at the Training Matrix, mainly the new documents uploaded into it. Section 2.7 introduces the work done on the EuroCC HPC Training Baseline proposal and Section 2.8 introduces the Best Practice Guides (BPG) related to training in M13 – M28. Section 2.9 provides examples of collaborations among NCCs in the second year with a focus on the training workshops for the Training champions and the HPC industrial course co-created by NCCs.

Section 3 is dedicated to mentoring and twinning and Section 3.1 provides an update about the mentoring and twinning plan and all related changes during M13 – M28. Section 3.2 introduces the meetings organised with the WGT in which the mentoring and twinning topics were discussed. Section 3.3. describes various ways of triggering and supporting the mentoring and twinning interactions between NCCs by CASTIEL WP3, including the support with identification of potential mentors and mentees. An update on the mentoring paths initiated by CASTIEL WP3 with all activities in M13 – M28 can be found in Section 3.4. Section 3.5 reports on the mentoring and twinning interactions among NCCs during the second year of the project.

The presentations and workshops organised in collaboration with technology and solutions providers are presented in Section 4.

Section 5 presents results of a final training survey that was sent to the Training champions before the end of the project with the aim of receiving an update on the status of training in all NCCs and an evaluation of the work done by CASTIEL WP3.

Major achievements are summarised in Section 6 and concluding remarks are given in Section 7.

References can be found in Section 8 and Annexes 1-8 conclude this document.

2 Training-Related Activities in M13 – M28

2.1 Update on the Training-Related Activities

As described in Section 2 of D3.2, the first training assessment (training mapping survey) among all NCCs was carried out in October – November 2020 and during spring 2021. Afterwards, the detailed analysis of the training activities was conducted by CASTIEL WP3 with the objective of comparing individual training profiles and identifying strengths and weaknesses with the overall goal of developing a training plan in which twinning and mentoring are integral components. Feedback was collected on the training mapping document and the information collection and an improved way of data collection was proposed and implemented (see Section 2.3 for more information).

CASTIEL WP3 worked on tracking of the training development of NCCs during the second year of the project. This was done by new summaries that were prepared by CASTIEL WP3 using training activities information inserted by NCCs into the HPC in Europe portal [3] during the second year of the project. The summaries of the analysis were compared with those produced in April 2021 to assess the evolution of the training offering of NCCs (see Section 2.4 for more information).

The work package (WP) focused on the HPC in Europe portal and its improvements as well as on including a visual representation of the training activities on a geographical map. The HPC in Europe portal is the basis for displaying the training activities on EuroCC ACCESS [4] and it also served as basis for the next wave of the training mapping survey. Further improvements to the HPC in Europe portal and the EuroCC ACCESS Training page [5], which also experienced a major redesign, were made in response to the reviewers' comments from the reviews in October 2021 and April 2022. Section 2.5.1 and 2.5.2 provide more details on the changes.

Meetings with other projects and initiatives, such as FocusCoE [6] and PRACE-6IP [7], took place in October 2021 and February 2022 and the aim was to discuss the way forward and collaboration with regard to the HPC in Europe portal. To formalise previous and future collaboration between these initiatives on adapting and expanding the HPC in Europe portal, a Memorandum of Understanding (MoU) was signed by these parties in March 2022. See Section 2.5.1 for more details.

CASTIEL WP3 also worked on the maintenance and addition of new links related to training materials, resources and best practices to the Training Matrix, which was created in the first year. Section 2.6 provides updated information about the Training Matrix.

Based on the project reviewers' feedback from October 2021, work started on the EuroCC HPC training baseline definition for NCCs. Separate baselines were suggested by CASTIEL WP3 in collaboration with the Training champions for big industry, SMEs and academia/research. More details are provided in Section 2.7.

During the second year of the project, BPG and summary reports from the training events, providers' presentations and mentoring workshops were created by CASTIEL WP3 and they were uploaded to the EuroCC ACCESS, the Training Matrix and BSCW, an internal web-based groupware tool for efficient collaboration (see Section 2.8 for more details).

The focus during the second year of the project continued to monitor various types of collaborations among NCCs, e.g., speakers' exchange, collaboration on workshops, information exchange and other types of collaboration (more information can be found in

Section 2.9). CASTIEL WP3 also held discussions and workshops on training-related topics of interest to NCCs with the Training champions. Examples of these training workshops and discussions are given in Section 2.9.2. Further, CASTIEL WP3 supported the NCCs involved in the creation of the HPC industrial course called “*What is HPC & How It Can Help Your Business*” aimed at industry users by contacting all Training champions via email and encouraging them to contribute to the modules development by sending their success stories and overview of NCC. Section 2.9.3 describes the course in detail.

2.2 Meetings of the WGT Related to Training

In M13 – M28, further online meetings of the WGT took place with the aim of discussing training-related topics, present new ideas and collect feedback and support further collaborations among NCCs. The following meetings were organised:

1) 17 November 2021 – Discussion about training-related topics

A meeting was organised with the Training champions to provide them space to discuss any training-related topic of their interest. Every participant expressed their expectations and topics of interest at the beginning of the meeting and the most mentioned topics – Train the trainer (TTT) and Attracting SMEs – were discussed during the meeting. In the second part of the meeting, NCC Greece introduced a proposal of a collaborative training activity with the aim to design an HPC industrial course targeting SMEs, big industry and other users. 6 NCCs expressed interest to become part of the core team. More information about the course can be seen in Section 2.9.3. The meeting was closed with an agreement to meet again.

2) 19 January 2022 – How to enter training events in the HPC Portal

As further changes to improve the user-friendliness, layout and display were made to the internal and external interfaces of the HPC in Europe portal and the EuroCC ACCESS Training page between M13 – M16 (please refer to Section 2.5.1 and 2.5.2 for more details), a meeting was organised to introduce the changes and to go through the new entry form for short courses so that the Training champions could start to enter the training activities of their NCCs again. University courses and study modules have separate forms from the short courses (typically several hours up to several days) and new links to the entry forms as well as the guide document were introduced. The participants then could see the fields of the new form to enter short courses. This talk was recorded for internal purpose and it was shared with those who were not present at the meeting.

3) 13 April 2022 – Meeting of the core team of the HPC Industrial Training Course and CASTIEL WP3

CASTIEL WP3 joined the meeting of the core team to learn about the status of the training course design and to see what support is needed from CASTIEL. Update on each module was provided and action points were agreed to move further with the course design. CASTIEL WP3 agreed to support the course creation by contacting all Training champions via email and encouraging them to contribute to the modules development. Several emails were sent after this meeting.

4) 20 April 2022 – Discussion about the EuroCC HPC Training Baseline Proposal

As mentioned in Section 2.1, CASTIEL WP3 was working on guidelines on what should be the baseline of the training offering across EuroCC. The initial draft was first reviewed by selected Training champions and their feedback was implemented. After that, CASTIEL WP3 organised this meeting to hear opinions and feedback from all Training champions. All Training

champions received the proposal in advance before the meeting, on 7 April 2022. The meeting started with the introduction of the proposed EuroCC HPC Training Baseline for big industry, SMEs and academia/research/infrastructure services and the public sector, highlighting the aim and challenges. For each baseline, a flexible structure was proposed, with a suggested core set of course areas that can be extended further to address specific targets and applications depending on the link to various industries. Very useful feedback and comments on the whole proposal were received from the participants. The meeting was closed with the outline of next steps – feedback revision and implementation by CASTIEL WP3 and re-consideration of next steps which would be communicated to all Training champions in due course.

5) 8 June 2022 – Training Speed Dating Session

A training-related “speed dating” format session was organised for interested NCCs to provide more space for collaboration and connections among NCCs. After the welcome, the format of the speed dating session was introduced to explain the objective and the way of moving within the breakout rooms. Two NCCs did not join the session therefore the total number was 12 participating NCCs. The original schedule was kept and NCCs got the opportunity to speak to other NCCs in 7 rounds, each round lasting 6 minutes.

After the time for breakout discussions was over, all participants came back to the main room and provided feedback and impressions from the event. Participating NCCs found the opportunity to talk to other Training champions/deputies very useful as it allowed them to initiate new collaborations and to learn about other NCCs.

6) 7 September 2022 – In-Person meeting of the WGT in Montenegro

The WGT and other participants met in person for the first time at the Joint EuroCC-CASTIEL Conference in Montenegro in September 2022. The work on various tasks done by CASTIEL WP3 in the period of October 2021 until August 2022 was presented to the participants, followed by the introduction of CASTIEL WP3 next steps for months M25 – M28. The CASTIEL 2 WP3 proposal was introduced next, presenting the objectives, tasks and partners. After the presentations questions were answered and the meeting finished with an open discussion on topics of interest of the Training champions.

7) 20 October 2022 - Introduction of HPC Certification

The aim of the organised meeting was for NCCs to learn about the HPC Certification Forum [8], the HPC certification program and to discuss the opportunities for collaboration between the HPC Certification Forum and EuroCC. The invitation was sent to the Training champions and everyone interested could join this meeting. The presentation started with introduction of the HPC Certification Forum, its role and activities, status and strategies for long-term sustainability. It was followed by the introduction of the HPC certification strategy, namely the certification process, the examinations, the design of the question pool, the current status and the outlook. The introduction finished with a presentation of what the HPC Certification Forum needs, how contributions could be made. Then there was space for questions from the participants and for discussion about opportunities for collaboration. NCCs were encouraged to collaborate and further discussions will take place in CASTIEL 2 from January 2023. The video and slides from the presentation are available in the Video library in the Resources section of the EuroCC ACCESS website [9].

The Table 1 summarises all meetings of the WGT that were related to training topics throughout the project duration, M1 – M28.

Date	Meeting
11 December 2020	Introduction and presentation of results from the questionnaire
2 February 2021	Presentation of results from the training mapping survey – generic section
30 March 2021	Discussion with the Training Mapping Task Force (TMTF) about the next wave of the training mapping
16 April 2021	Presentation of the detailed analysis of the training activities section of the training mapping survey
20 – 30 April 2021	Discussions with NCCs about the status of the training area
17 November 2021	Discussion about training-related topics
19 January 2022	How to enter training events in the HPC Portal
13 April 2022	Meeting of the core team of the HPC Industrial Training Course and CASTIEL WP3
20 April 2022	Discussion about the EuroCC HPC Training Baseline Proposal
8 June 2022	Training Speed Dating Session
7 September 2022	In-Person meeting of the WGT in Montenegro
20 October 2022	Introduction of HPC Certification

Table 1: Overview of all meetings of the WGT related to training in M1-M28.

2.3 The Second Wave of the NCCs’ Training Mapping

In D3.1, the initial mapping introduced in November 2020 was described in detail. In D3.2, several ideas and plans were mentioned to set up a new, improved mapping. CASTIEL WP3 started to internally discuss proposed changes and improvements in spring 2021. At the same time, the Training Mapping Task Force (TMTF) was established with the aim of getting more feedback on the existing training mapping document and input on the information collection for the next wave. A meeting was organised with CASTIEL WP3 and the TMTF in March 2021, where extensive feedback was collected. Further input from various sources was implemented during autumn 2021.

After these preparatory steps, the training mapping has been repeated in the final months of the project in order to evaluate the evolution of the EuroCC training portfolio and the impact of CASTIEL.

Concerning the procedure to gather the data, they have been extracted directly from the Training section of the HPC in Europe portal. This had the significant advantage of eliminating the overhead for the NCCs to fill in some specific form or table. As detailed already in Section 2.4.1 of D3.2, the HPC in Europe portal is the single gateway for training in the EuroCC community. Hence, NCCs have been keeping their training portfolio up to date on the portal, providing CASTIEL a reliable and vast dataset for the second mapping.

Secondly, the analysed data correspond to the fields required to enter an event in the HPC in Europe portal. The catalogue of questions in the initial 2020 mapping was thoroughly discussed with the TMTF (see D3.2), but also with PRACE and FocusCoE, to achieve the final set of fields in the HPC in Europe portal (see Section 2.5.1).

A summary of the aggregated results of the analysis are presented in Section 2.4. The NCCs have been given access to their individual results and to the complete aggregated results via BSCW.

A set of non-course-specific “generic questions” were additionally part of the initial mapping in 2020. Those aimed to evaluate the general status of each NCC in training and to provide CASTIEL with a comprehensive picture. These aspects have been included in the Final Training Survey that is introduced and analysed in Section 5. The generic questions investigate among others the number of internal and external trainers, the amount of female and industry participants, the availability of training IT infrastructure, the dissemination channels for training, among others.

2.4 Further Detailed Analysis of NCCs’ Training Activities

The first detailed analysis of the training activities of NCCs was carried out in spring 2021. CASTIEL WP3 wanted to continue capturing the diversity of approaches to training across NCCs, therefore a second round of NCCs’ training program assessment was carried out in spring 2022 to analyse the progress made within NCCs’ training profiles. The assessment took into account recommendations of the Training champions and discussions with the WGT and other training representatives of individual NCCs. Results reported below summarize the outcome of this evaluation, where detailed reference data can be downloaded from BSCW.

2.4.1 Methodological Remarks

In May 2022, all entries present in the Training section (course start date from 14 January 2021 until 20 May 2022) have been extracted, summing up to 377 analysed short courses, 70 study modules and 47 academic programmes. Among them, 161 courses have been labelled as EuroCC/CASTIEL.

All 33 NCCs were evaluated in 5 categories reflecting the filters available at the EuroCC ACCESS Training page and considering 2 further categories, i.e. “Technical Domain” and “Scientific Domain”. In contrast to the initial survey, none of the underlying data had to be provided manually by any NCC as everything was auto-derived from the HPC in Europe portal as described in Section 2.3. Summary evaluations are available under the aforementioned BSCW to offer each individual NCC a tool for comparison and self-assessment of where they stand with regard to the rest of the EU-wide training activities.

Profiles were used as described previously (see Annex 1 in D3.2). Since training events had been recommended by the Training champions to be regrouped into (i) Academic Programmes, (ii) Study Modules and (iii) Short Courses, it is difficult to compare the current analysis with earlier results in a 1:1 fashion. Here we specifically focus on group (iii) Short Courses as it provides the largest sample size and comes closest to our previous data set (only limited contextual change in some of the classes of all the 5 categories considered).

Five illustrative examples are given in Annex 1 to showcase appropriate profile usage to address frequently occurring enquiries.

2.4.2 Key Findings of the Analysis of Individual NCCs Training Profiles in 2022

The late project stage detailed analysis also provided a comprehensive and informative overview of training profiles of individual NCCs identifying their strengths and weaknesses. The individual NCC's training profiles may be summarised as follows:

- 22 NCCs have a well-equilibrated training program targeting all domains, research & academia, industry and the public sector, 5 NCCs neglect the public sector and rather focus on research & academia and industry. 1 NCC is exclusively targeting research & academia while 5 NCCs prefer not to provide explicit answers.
- 21 NCCs dedicate their training activities to all instruction levels: beginners, intermediate and advanced users with 9 NCCs having a strong focus on beginners and 2 NCCs on intermediate users. 8 NCCs focus either on two or one category, usually emphasizing beginners and intermediate level. 8 NCCs also focus on level “Other”. 4 NCCs preferred not to provide any answer (those that were also missing out on data when characterising the target audience).
- 5 NCCs offer training activities with no particular distinction with respect to the scientific domain. Rather frequently we see a preference for “Computer Science, Computer Engineering, Electrical Engineering, Telecommunications” together with “Engineering” (11 NCCs), occasionally a more-than-average-focus on a particular domain (7 NCCs).
- 25 NCCs partially provide training activities covering technical domains HPC, HPDA and AI. 20 NCCs have a rather diversified focus on a whole range of technical domains while 6 NCCs specifically focus on a single or 2 technical domains.
- The majority of training activities takes place preferentially in “online” formats (22 NCCs) with only 14 NCCs being involved in “in-person” formats and just 9 NCCs reporting a significant share in “mixed” formats.

2.5 Further Improvements of Portals to Show Training Activities of NCCs

2.5.1 HPC in Europe Portal

The DoA for Task 3.1 *Working Group on Training* foresees the creation of a “comprehensive catalogue of training opportunities” in the EuroCC landscape and of a “training activities map”. These goals have been achieved in the “Training and Events” section of the HPC in Europe portal (Figure 1), which is at the moment the central place for the collection and display of all training activities offered by NCCs in EuroCC. Along with the course catalogue, the HPC in Europe portal also contains two sub-sections to visualise both activities and their providers on a geographical map.

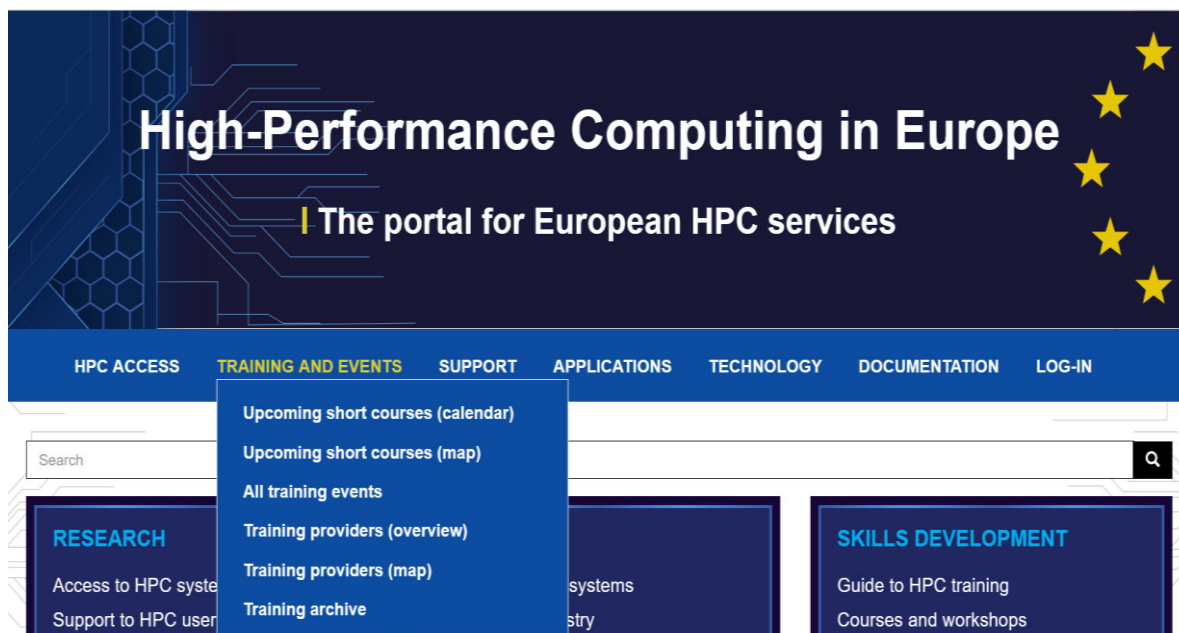


Figure 1: HPC in Europe portal – Homepage with the “Training and Events” section.

The technical implementation and maintenance of the HPC in Europe portal have been carried out by the consortium partner Barcelona Supercomputing Centre (BSC) personnel within the PRACE-6IP project since 2019 (refer to D3.2 Section 2.4.1 for more information), without relying on any external services. While the portal was initially designed to be a “neutral” catalogue for a variety of European HPC services, it served as a basis for CASTIEL to specifically develop a registry of NCC training events. Therefore, from the start of the project, CASTIEL WP3 joined PRACE-6IP in the conceptual and technical development of the Training section of the HPC in Europe Portal. Finally, also FocusCoE (on behalf of the Centres of Excellence) became a further stakeholder to collaborate on the portal development. On 21 October 2021, a meeting with PRACE-6IP and FocusCoE took place to discuss the way forward with regard to the HPC in Europe portal. Later on, on 10 March 2022, CASTIEL, FocusCoE and PRACE signed a Memorandum of Understanding (MoU) and formalised in it their close previous and future collaboration on adapting and expanding the HPC in Europe portal, avoiding fragmentation and duplication of efforts.

Compared to D3.2, the Training section of the portal has been significantly enriched in the second year of the project, both concerning the display and the interface to enter and edit content (after login). The menu of available displays is publicly accessible and contains the training calendars, including a geographical map of courses, and training providers’ information, also including a map (refer to Figure 2).



Figure 2: HPC in Europe portal – Menu of available displays for training events.

The training calendars have been split as follows:

1. Upcoming, ongoing, “all” short courses (compact courses in blocks of a few days or weeks, e.g., on a specific topic or with a zero-to-hero approach).
2. University courses with significant HPC/HPDA/AI content are displayed separately as recurrent academic programmes or study modules (typically over a semester).

Several filters have been added in those calendars to facilitate users in finding relevant courses. (please refer to Figure 3).


Upcoming Short Courses

Select any combination of filters and click on **"Apply"** to see results.
 You can select multiple values for most filters (using comma separation for predictive fields and CTRL+CLICK for lists).
 Reloading the page will reset the filters.

FORMAT	<input type="text" value="In person"/> <input type="text" value="Online"/> <input type="text" value="Mixed"/>	LEVEL	<input type="text" value="Beginner"/> <input type="text" value="Intermediate"/> <input type="text" value="Advanced"/> <input type="text" value="Other"/>	SECTOR	<input type="text" value="- Any -"/>			
COUNTRY	<input type="text"/>	LANGUAGE	<input type="text"/>					
TECHNICAL DOMAIN	<input type="text" value="- Any -"/>							
SCIENTIFIC DOMAIN	<input type="text" value="- Any -"/>							
SUPPORTING PROJECT(S)	<input type="text" value="EuroCC/CASTIEL"/> <input type="text" value="PRACE"/> <input type="text" value="BioExcel-2"/> <input type="text" value="ChEESI"/> <input type="text" value="CoEC"/> <input type="text" value="CompBioMed"/> <input type="text" value="E-CAM"/> <input type="text" value="EoCoE-II"/>				SEARCH FOR KEYWORDS	<input type="text"/>	ITEMS PER PAGE	<input type="text" value="20"/>


Apply

Modern C++ Software Design (Advanced)




Event/Course Format
Online
Event/Course Start
Tue, 22/11/2022 - 08:30 CET
Event/Course End
Fri, 25/11/2022 - 16:30 CET
Organiser
HLRS
Country: Germany
[Read more](#)

Advanced HPC Workshop for MPG and NOMAD




Event/Course Format
Mixed
Event/Course Start
Tue, 22/11/2022 - 09:00 CET
Event/Course End
Thu, 24/11/2022 - 17:00 CET
Organiser
NOMAD
Country: Germany
[Read more](#)

Parallelization with MPI




Event/Course Format
Mixed
Event/Course Start
Tue, 22/11/2022 - 09:00 CET
Event/Course End
Fri, 25/11/2022 - 13:30 CET
Organiser
VSC Research Center, TU Wien
Country: Austria
[Read more](#)

R Statistics: Data Analysis and Visualization




Event/Course Format
Online
Event/Course Start
Wed, 23/11/2022 - 08:00 CET
Event/Course End
Thu, 24/11/2022 - 16:00 CET
Organiser

Programming heterogeneous environments with Intel oneAPI



Event/Course Format
Mixed
Event/Course Start
Thu, 24/11/2022 - 09:00 CET
Event/Course End
Thu, 26/01/2023 - 16:30 CET
Organiser
IT4Innovations National Supercomputing Center
Country: Czech Republic

ARCHER2 for Package Users



Event/Course Format
Online
Event/Course Start
Thu, 24/11/2022 - 11:00 CET
Event/Course End
Tue, 22/11/2022 - 17:00 CET
Organiser

Figure 3: HPC in Europe portal – Filters and a selection of the upcoming short courses (on 21 Nov 2022).

As mentioned, geographical maps of both upcoming short courses and HPC, HPDA and AI training providers are also part of the main training menu. These maps have been realised through geolocation metadata with an OpenStreetMap plugin: the results can be seen in Figure 30 and Figure 31 in Annex 2.

The editing interface for training events requires a login by NCCs. A coherent set of metadata has been set-up jointly by CASTIEL, FocusCoE and PRACE in order to specifically characterise training events (and not a generic HPC Service, as at the time of writing D3.2). The resulting metadata are a heterogeneous mix of fields that require input as free text, multiple selection from a list of options, addresses and geolocation information, or an image file. The

set of metadata can be roughly split into three groups as shown below (cf. also FocusCoE *D4.2: Final Training Report* [10]).

Events details include the following fields:

- Title.
- Primary Event/Course URL.
- Event/Course start.
- Event/Course end.
- Event/Course Format.
- Online learning mode.
- Venue Details Link.
- Location.
- Languages.
- Event/Course Description + Summary.
- Image.

As an example of an improvement over the first iteration of the HPC in Europe portal, the course format (“Presence: In-person, Online”) has been renamed as “Format” and extended to include the option “Mixed”. An additional field allows to specify the “Online learning mode: Live (synchronous), Self-paced (asynchronous), Blended (mixture of live and self-paced)”.

Metadata in addition to the core event details include:

- Sector of the Target Audience.
- HPC profile of Target Audience.
- Country.
- Organisers.
- Supporting Project(s).

The target audience fields allow to specify whether courses are targeted at a specific sector (e.g., academia, industry) or at a particular cohort of HPC users (e.g., application users, developers, system administrators). “Organisers” are not entered as free text but are selected from a dynamic and extendable list of HPC providers. CASTIEL regularly invites the NCCs to keep their national providers’ information up-to-date in such a database. The list of “Supporting Projects” include EuroCC/CASTIEL, PRACE, and the CoEs/FocusCoE. This field is especially important to filter events when embedding custom views of the registry.

Finally, the following fields help to define the scope of the training events that may be filtered by users:

- Scientific domain.
- Technical Domain.
- Level of Instruction.

While the complete list above applies to short courses, the set of fields has been adjusted to allow NCCs to additionally enter their HPC/HPDA/AI university courses as academic programs or study modules. In the display, university courses belong to a calendar separate from the short courses, see Figure 32 in Annex 2.

Such a major refurbishment is not compatible with the pre-existing content schemes as mentioned in D3.2. For this reason, events entered mostly by CASTIEL WP3 during the first year of the project have been moved to a separate Archive section [11]. The current version of the HPC in Europe portal has been presented to the NCCs on 19 January 2022 (see Section 2.2).

During this meeting, NCCs were provided with a walkthrough of using and entering information into the HPC in Europe portal. The NCCs have been invited to enter all their upcoming events and, whenever possible, some relevant past events. To facilitate entering information, in addition to built-in compilation instructions, the link to a short guide has been provided to the NCCs via email. The procedure to embed the training calendar in each project's own webpage is also covered in this short guide.

A few of the long-term adaptations indicated in D3.2 have not been realised in the second year of the project. Firstly, to create a tool for registration and feedback collection would have exceeded the available effort in T3.1. At the same time, most NCCs have already access to their own tools for this purpose, for example PRACE-Indico [12]. Further, an automatic porting of events entered especially by the CoEs in the Timely database [13] has not been necessary, since the CoEs themselves transitioned to the HPC in Europe Portal at the beginning of 2022. The FocusCoE platform itself currently exclusively embeds the HPC in Europe portal in their training section [14].

To conclude, and quoting FocusCoE D4.2, it is important to note that the HPC in Europe portal has only basic functions at present and will require continuous funding and effort to further develop and maintain this infrastructure in a stable manner.

2.5.2 EuroCC ACCESS – Training Section

As described in D3.1, EuroCC ACCESS presents “a competence map of the NCCs and their HPC-related activities along with a place for an exchange with other stakeholders”. The EuroCC ACCESS was continuously adapted and enriched during the second year of the project taking into account the comments from the project reviews. For example, a section collecting all necessary information to apply for budget for training-related workshops or twinning and mentoring was changed and improved in the NCC Area, which is only available for logged-in NCC members. Two modified web forms have been integrated in this section that allow NCCs to easily apply online for budget.

In the publicly accessible Training Section the listing of upcoming training events has undergone major improvements. The data of the HPC in Europe portal are now displayed by including a simple script. This has several advantages over the old approach:

- The layout and design could be improved, modernised and adapted to the colour scheme of the existing pages of EuroCC ACCESS.
- An event feed (ics) can be provided.
- It is much more configurable. For instance, an NCC can use it and only display its own events or choose to use only a subset of filters or change the colour scheme.

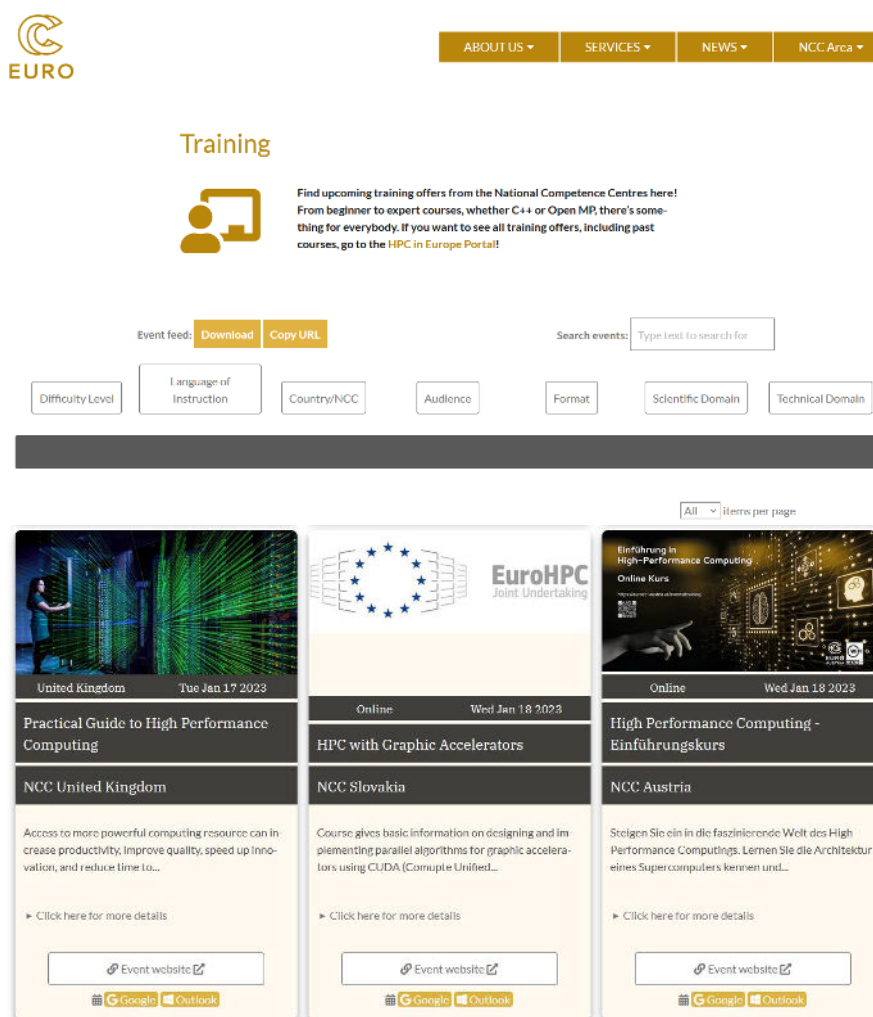
The appreciated feedback of the project reviewers was also considered. The relation to the HPC in Europe portal was clarified and pointed out that on that portal more, and in particular also past, events can be found, whilst the EuroCC ACCESS website focuses on upcoming events. The filters on EuroCC ACCESS and the HPC in Europe portal have been unified and at present comprise of

- Level.
- Language.
- Country.
- Audience.
- Format.

- Scientific domain.
- Technical domain.
- Initiative (not needed on EuroCC ACCESS).

Changes in the internal and external training interfaces were needed for those improvements, and many NCCs, irrespective of their maturity level, show their training offers.

See **Figure 4: EuroCC ACCESS – Filters and current display of training courses (embedding of the HPC**



in Europe portal) – 15 December 2022. Figure 4 for details on the filters and on the design in general.

Figure 4: EuroCC ACCESS – Filters and current display of training courses (embedding of the HPC in Europe portal) – 15 December 2022.

2.6 Maintenance of the Training Matrix

As described in D3.2 Section 2.5 about the Training Matrix, it has been available to NCCs since 17 May 2021 and it enables the NCCs to collect and share best practices, available resources, and mechanisms for training.

The Training Matrix continues to consist of two parts:

1. The Training Matrix on EuroCC ACCESS in the NCC Area, which is a collection of meta-data.
2. A directory called NCC Exchange on the shared workspace system BSCW containing training best practices and files.

The Training Matrix was in full production mode in the second year of the project. Only maintenance and minor changes (e.g., renaming descriptions for clarification) were done. New links related to training materials, resources and BPG were continuously added to the Training Matrix during the period M13-M28 and made available to the Training champions.

Table 2 summarises all documents uploaded to the Training Matrix per category during the project duration.

Category	Number of documents
Training Best Practice Guides by CASTIEL WP3	4
Training Best Practice examples by NCCs	7
Best Practice documents by CASTIEL WP4 and WP5	2
Carpentry Best practices for in-person and online teaching	1
NCC Material (exercises/hands-on/training)	9
Other Material (exercises/hands-on/training)	5
Mentoring and twinning reports from NCCs	46
Summary reports from CASTIEL WP3 mentoring activities	3
TOTAL	77

Table 2: Overview of all documents uploaded to the Training matrix in M1-M28.

As it can be seen in Table 2 above, various types of documents were added to the Training Matrix during the project duration: training BPG from CASTIEL WP3 and NCCs, NCC training-related material, mentoring and twinning reports from NCCs and training material from other sources, e.g. HPC Carpentry [15], PRACE and HiDALGO Training [16]. In total, 77 documents were uploaded to the Training Matrix during the project duration.

2.7 EuroCC HPC Training Baseline Proposal

One of the reviewers' recommendations at the review in October 2021 was to suggest guidelines about what should be the training baseline across EuroCC. Therefore, CASTIEL WP3 was working on such guidelines in February-March 2022 and then asked for feedback from selected Training champions, which was then implemented. In April 2022, CASTIEL WP3 organised a meeting (as described in Section 2.2) to hear opinions and feedback from all Training champions on the first proposal draft. Further feedback was collected and implemented in the proposal draft in autumn 2022. The following section provides more details about the aim of the proposal and challenges that need to be taken into account when designing the proposal.

2.7.1 Aim of the Proposal

The intent has been to propose the EuroCC HPC Training Baseline in collaboration with the NCCs across Europe with the objective of adopting this baseline among NCCs.

A research of similar work was done before drafting the proposal and various sources of information, e.g., PRACE and ETP4HPC [17], have been identified. Several challenges were identified during the research phase:

- When considering the HPC training, ETP4HPC recognizes in their document Education and Training in the area of HPC [18] that industry, research and data centres need to hire people into 4 main categories, which can serve as a basis to define the curricula:
 - Computer infrastructure designers, Complex HPC and HPDA installations administrators, HPC Software specialists and Data analysts, scientists, engineers in many application areas, trained in HPC.
- When addressing SMEs, it is important to keep in mind that they need training offerings tuned to their specific needs.
 - While big industry can afford large teams of specialised personnel, SMEs require ‘adaptable’ personnel, able to learn and apply new technologies to create competitive products and solutions.
 - On the other hand, SMEs, specifically startups, use more innovative technology than some big industry companies.
 - In general, there may not be a difference between big enterprises or SMEs, but rather the scope may differ. The time and money available for training can also vary.
- It is important to provide deeper understanding and skills in parallel programming, computing and HPC for students while taking into account the needs of industry. The first pan-European Master of Science (MSc) programme in High Performance Computing (HPC) - EUMaster4HPC [19], funded by the EuroHPC Joint Undertaking [20], aims to offer courses to a first cohort of 50 students since September 2022. The MSc programme links academic excellence to the current and future challenges of European businesses, industry and the public sector in the multidisciplinary field of HPC. Therefore, all training baseline efforts by CASTIEL WP3 need proper coordination with similar tasks carried out in the EUMaster4HPC project.
- Initial HPC training is important to ensure good technical foundations – with regular updates to prepare for a lifelong career. Continuous training of the workforce is needed.
- Courses may be tagged with the attributes listed in the proposed HPC Training Baselines – tags can then be used to identify and bridge gaps.
- Initial baselines need to be re-evaluated on a regular basis taking into account user experience and general expectations.

The idea was not to propose a detailed, specific plan, but rather to provide a **framework**, for the development of such a plan. It was clear that a large number of options were possible, and one framework could not address all of them. Therefore, a flexible structure has been proposed, with a suggested core set of course areas that can be extended further to address specific fields of specialisation (including industrial needs).

The following draft of guidelines has been suggested:

- Baseline for Big Industry.
- Baseline for SMEs.

- Baseline for Academia, Research, Infrastructures and Services and the Public Sector.

Various user profiles, levels and career stages has been recommended to be taken into account when preparing the set of courses for each baseline. Also career paths (see ARCHER2 Training Courses [21]) could provide systematic guidance.

The work on the baseline for each target audience will continue in CASTIEL 2, starting with a synchronisation meeting with EUMaster4HPC workforce and a survey among big industry, SMEs, academia and other target groups. The results will then be used when defining the final EuroCC HPC Training Baseline to be adopted and implemented by NCCs. Thus collaboration with the EUMaster4HPC project will be fundamental and further interactions will be needed to coordinate work going on in both projects.

2.8 Collection of Best Practice Guides on Training

In the first year, CASTIEL WP3 started to collect training-related material, including the BPG on training in the Training Matrix. In the second year of the project, CASTIEL WP3 has continued collecting BPG from NCCs and moreover, it created several BPG from events that CASTIEL WP3 organised.

The following events were organised:

- The CASTIEL Train the Trainer workshop.
- The Training Best Practices Seminar.
- Sharing Circle: “Best Practices for In-Person and Online Courses”.

More information about these training activities can be found later in Section 2.9.2. CASTIEL WP3 provided summaries with questions and answers from those events and compiled four BPG with key findings:

- Best Practice Guide: Train the Trainer.
- Best Practice Guide: How to Organise an HPC Event.
- Best Practice Guide: How to Find New Attendees for a Training Course.
- Best Practice Guide: Sharing Circle - Best Practices for In-Person and Online Courses.

All those guides are available in the Training Matrix, BSCW folder for Training champions and publicly in the Document library of the EuroCC ACCESS Resources section [22].

Additionally, 7 NCCs uploaded BPG on other or more specific areas, for instance focusing more on national aspects and experiences, on the creation of a training course, development of new training materials or organisation of events. Those are also accessible to all members of EuroCC via the Training Matrix and BSCW.

2.9 Collaborations among NCCs in the Second Year

In the second year, CASTIEL WP3 continued to encourage NCCs to approach CASTIEL WP3 in case of needed support. NCCs reached out to ask for support and CASTIEL WP3 has been providing support and advice when necessary. Support or advice were related to the mentoring and twinning procedures, searching for a suitable partner, or to the training activities and recommendation for trainers, among other topics.

CASTIEL WP3 also encouraged more collaborations among NCCs in the second year of the project, for instance by emailing all Training champions regularly and reminding them of all resources, processes, material and opportunities for collaboration, by providing information and

advising the NCCs with respect to the training, twinning and mentoring. CASTIEL WP3 created a document called *CASTIEL WP3 Support of Collaborations among NCCs and Reporting*, which was distributed to the Training champions on 30 November 2021. The aim of this document was to demonstrate to the NCCs how CASTIEL would trigger and support collaborations, mentoring and twinning activities between and among NCCs. The document can be found in Annex 3.

After the first project review in October 2021, it was decided that information about all interactions and collaborations should be reported by NCCs in their Technical Progress Reports (TPR) every quarter and necessary changes were introduced to the report templates. These reports were monitored by CASTIEL WP3 and the PMT. Later on, an automated way to extract the answers from the reports was implemented.

In the new TPRs, NCCs report on the following:

- *Collaboration/interaction with other NCCs – Training, twinning and mentoring, joint events* (Collaboration: e.g., training, twinning, mentoring, joint event etc., Interaction: e.g., phone calls, one-on-one meetings).
- *Collaboration/interaction with other NCCs – Other type of collaboration/interaction* (Collaboration: e.g., joint proposal, knowledge exchange on topics NOT related to training, twinning and mentoring, etc.).

NCCs provide information such as names of involved NCCs, the type of collaboration/interaction, the subject of the collaboration and expected benefits for involved NCCs and the time period of the collaboration.

In the second year of the project, NCCs continued collaborations on joint workshops/trainings, trainer exchanges and other interactions with other NCCs with or without any support from CASTIEL. For communication of such collaboration requests, the Slack channel as well as the mailing list continued to be used by the Training champions and CASTIEL WP3. Examples of various types of collaborations taking place in the second year are provided in the next sections.

2.9.1 Examples of Collaborations among NCCs in the Second Year

In the second year of the project, NCCs again collaborated on joint conferences, workshops or courses, they shared information about training events and/or invited other NCCs to participate in HPC, HPDA and AI related events. Further, NCCs asked for speakers, other NCCs offered to speak at events of other NCCs or NCCs asked for sharing experiences from other NCCs on training-related topics. Access to supercomputing facilities was provided by some NCCs to other NCCs organising training. Table 3 below shows examples of NCC collaborations related to training that were recorded by the NCCs in the TPRs in the period September 2021 – May 2022.

Collaboration type	Number of mentions
Joint workshops, webinars, training	95
Speaking at workshops/training of other NCCs	35
Providing participant places at training activities to other NCCs	30
Access to supercomputing facilities and hands-on exercises during HPC training	9
Training material exchange	9

Collaboration on course material	4
Other	10

Table 3: Examples of NCC training-related collaborations during M13-M21.

2.9.2 Knowledge Sharing among Training Champions

Some Training champions expressed concerns in discussions taking place in the first year that lack of trainers in general or for specific topics in particular was a constraint to their NCCs. To address this issue, the CASTIEL Train the Trainer Workshop was organised in December 2021 and mentoring and twinning interactions, as well as joint training events were encouraged by CASTIEL WP3. Training champions also expressed interest to share their experiences and best practices with in-person and online courses, organising HPC events and attracting new attendees. Activities addressing these topics were also organised in the second year of the project and BPG were produced afterwards (see Section 2.8 for more details). Table 4 below shows the organised activities for the Training champions in M13-M28.

Activity	Date	Number of participants – Training champions/ deputies
CASTIEL Train the Trainer workshop <i>Speakers: NCC Czech Republic, NCC Germany, NCC Austria, NCC Finland, NCC Belgium</i>	16 December 2021	57
Training Best Practices Seminar <i>Speakers: NCC Slovakia, NCC Turkey, NCC Montenegro, NCC UK, NCC Germany</i>	20 January 2022	49
Sharing Circle on Best Practices for In-Person and Online Courses <i>Speakers: NCC Turkey, NCC Sweden, NCC UK, NCC Iceland, NCC Germany</i>	4 February 2022	43

Table 4: Organised training activities for Training champions during M13-M28.

These events provided space for the Training champions to share their knowledge and experiences on training-related topics of interest. NCCs with experience in a particular topic were approached to give a short presentation (between 10 – 30 minutes) with ample time for questions from the audience. This way, those with less experience could learn from more experienced ones or simply attend the event and learn about common practices.

The first workshop addressed the problem that there are not many sufficiently qualified trainers available for many topics in the areas of HPC, AI or HPDA and presented ways to increase the numbers of qualified trainers.

The second workshop focused on how different kinds of HPC training events can be organised and how to attract (new) attendees to training events.

Finally, in the third workshop experiences and challenges with online or in-person courses were discussed.

All these events were perceived as very useful from both speakers and participants and apart from the knowledge transfer they contributed to getting to know the Training champions better and helped initiating additional collaborations among them.

2.9.3 HPC Industrial Course Co-Created by NCCs

NCC Greece initiated a collaborative effort of NCCs to create an industrial course on HPC addressing the early needs of industry in Europe and worldwide. The idea was first introduced at a meeting with the Training champions on 17 November 2021 (see Section 2.2 for more details about the meeting). 6 NCCs expressed interest to join the core team and they met on 6 December 2021 to discuss further steps. CASTIEL WP3 joined the following meeting on 13 April 2022 where the status of the course and updates were presented. CASTIEL WP3 agreed to further facilitate the course creation and contacted all Training champions via email and encouraged them to contribute to the modules development by sending their success stories and NCCs overview. Many NCCs joined the co-creation by sending the requested material. CASTIEL WP3 also announced the call for interest to join the task force to work on the module on adopting an “HPC-oriented” approach. The course has its own webpage [23] and it encompasses the knowledge and the success stories of multiple NCCs covering a wide variety of industrial domains. It is envisioned to provide a continuously updated HPC training hub for the industry, that is open and co-created. When all modules will be developed in CASTIEL 2, it will be accessible from EuroCC ACCESS.

2.9.3.1 Overview of the HPC Industrial Course

Course Description

The course is called “*What is HPC & How It Can Help Your Business*”. This modular course aims to provide a short introduction to HPC for industrial users (start-ups, SMEs, etc).

The idea has been for all NCCs to co-create a short modular HPC course for the industrial community. This course can serve as the basis upon which each NCC can subsequently build its own additional modules.

Course Objectives

- To provide a short, concrete overview of HPC.
- To demonstrate the potential of HPC and its industrial impact.
- To offer an overview of the different ways that HPC can help industrial users.
- To provide practical industrial best practices across different domains from all NCCs.
- To explain how an industrial user can adopt HPC.
- To create a link with the local NCC.

Basic Information

- Type: Online course.
- Form: A ‘modular approach’ that can be extended by EuroCC/CASTIEL as well as by individual NCCs. Three modules, self-paced course.
- Format: short presentations.
- Target audience: SMEs, start-ups, entrepreneurs, large companies.

- Availability: Freely available (under the Creative Commons license).
- Prerequisites: None.

Modules Overview

Module 1. What is HPC & Why it is important

1. What HPC is.
2. Why HPC is important (market perspective).
3. The impact of HPC in Europe.
4. How HPC can provide solutions for your business needs.
5. The financial aspects of HPC.

Module 1 has been created in collaboration with other initiatives (e.g., Elements of Supercomputing online course from Finland [24], PRACE RI [25] and Digital EU [26]).

Module 2. HPC Best Practices Success Stories

1. Domain X: Success Story from Country 1 (NCC1).
2.
3. Domain X: Success Story from Country 33 (NCC33).

Module 3. Getting Started

1. Adopting an “HPC-oriented” approach (using HPC practices in your current practices).
 - a. HPC BENEFITS (Benefit Analysis).
 - i. Efficiency / Optimisation.
 - ii. Cost-Benefits.
 - b. HPC COST (Cost Analysis).
 - i. Assess cost of Infrastructure.
 - ii. Assess cost of personnel.
 - c. IMPLEMENTATION GUIDELINE.
 - i. Practical hints (CPU vs GPU, compilers, distribution in workers, etc.).
2. Get in touch with your local NCC.
 - NCC1 overview.
 -
 - NCC33 overview.

Status on 15 December 2022:

- Core team of 7 NCCs, involvement of remaining NCCs.
- Module 2 – 40 success stories collected from 22 NCCs. 17 fields of application:
 - Time series analysis: 1.
 - Transport: 6.
 - Materials science: 3.
 - Marketing: 3.
 - Social Science: 1.
 - NLP: 3.
 - Manufacturing: 3.
 - Safety: 1.
 - Infrastructure design: 2.
 - Health: 3.
 - Real estate: 1.
 - Energy: 3.
 - IoT: 1.

- Software engineering: 1.
- Process: 5.
- Bioinformatics: 1.
- Earth Science: 2.
- Module 3.1 – Task force has been initiated and it works on the module development.
- Module 3.2 – 7 NCCs overviews.

NCCs involvement is needed for all modules, e.g., more success stories, fields of application, NCCs overviews and designing the Module 3.1. The work on the modules development will continue in CASTIEL 2.

3 Mentoring and Twinning-Related Activities in M13 – M28

The following sections describe all actions and activities related to mentoring and twinning that happened during M13-M28:

- Mentoring and twinning plan implementation and amendments of the process and the necessary documents – Section 3.1.
- Meetings of the WGT related to mentoring and twinning – Section 3.2.
- Continuous triggering and support of the mentoring and twinning interactions by CASTIEL WP3. Twinning initiated by CASTIEL WP3, irrespective of the NCCs maturity based on a proposal of twinning matches – Section 3.3.
- Mentoring initiated by CASTIEL WP3: Organisation of mentoring workshops – collaborations between more mature and less mature NCCs, support and guidance from more experienced/mature NCCs – Section 3.4.
- CASTIEL WP3 continuous monitoring of the mentoring and twinning interactions and NCCs reporting: The final twinning and mentoring reports available to other NCCs in the Training Matrix – Section 3.5.

3.1 Mentoring and Twinning Plan Update

The mentoring and twinning programme has been running since 21 April 2021 and it will run until the end of this project – originally August 2022, after the official project extension December 2022.

As described in Section 3.1 in D3.2, financial guidelines on applying for the workshop, mentoring and twinning budget were created jointly by the CASTIEL Project Management Team (PMT) and CASTIEL WP3 to support the mentoring and twinning activities and to address doubts of the Training champions about the use of the available budget and other financial aspects. Further, the application form and the necessary document templates were created and uploaded in the NCC restricted area of the EuroCC ACCESS website, Administration – Budget. Two types of templates were created:

1. A short description of the planned mentoring or twinning activity – to be used with the application before any mentoring or twinning activity.
2. A short report on the mentoring or twinning activity – to be used after the mentoring or twinning activity has terminated.

Since the launch, the financial guidelines were amended twice (first amendment – July 2021, second amendment – July 2022) to incorporate the feedback received from NCCs and the

reviewers on how to make certain processes easier and for clarifying some of the terms. The first amendment cancelled the submission dates for applications giving NCCs the possibility to submit an application whenever a suitable mentoring or twinning activity is agreed. The second amendment introduced several significant changes, such as separation of mentoring and twinning and creation of two respective sections (that meant separating the template documents too and introducing some small changes to the templates – the templates can be found in Annex 4), provision of examples of budgets for in-person and online mentoring and twinning, enabling more than one mentor or mentee from any NCC participating in a mentoring and twinning activity. The mentoring and twinning without applying for financial support was formalised and the process is described in the latest version of the financial guideline, which is available to everyone on BSCW. The budget application form on EuroCC ACCESS NCC area has also been amended during the second year of the project to make it more user-friendly (see Figure 33 in Annex 5).

CASTIEL PMT and CASTIEL WP3 have been responsible for the approval of all applications and they also receive the required documentation and reports.

As the mentoring and twinning programme started relatively close to the end of the first year, more interactions were expected in the second year of the project. Eight applications for mentoring or twinning budget and four applications for workshop budget were received in the second year, however, many mentoring and twinning interactions and joint workshop organisations were initiated by NCCs themselves without any financial support from CASTIEL. Continuous support and encouragement have been provided to NCCs in the second year of the project to initiate more mentoring and twinning interactions (refer to Section 3.3 for more details). The evaluation of the mentoring and twinning programme was included in the final training survey and the results can be found in Section 5.

The output document *The CASTIEL WP3 T3.3 Final Report: Mentoring and Twinning Plan* from Task 3.3 *Design and Execution of Mentoring and Twinning Plans* was produced by CASTIEL WP3 in October 2022. The document's main objective is to describe the CASTIEL mentoring and twinning plan and programme, its development, implementation and impact. It is a summary of all the work done around mentoring and twinning since the beginning of the project until the end of September 2022 as well as overview of all documents produced. The document is confidential and available to the Training champions via the BSCW folder for Training champions.

All received final mentoring and twinning reports were analysed and more details can be found in Section 3.5.

3.2 Meetings of the WGT Related to Mentoring and Twinning

One meeting was organised during M13 – M28 and more details are provided further.

1) 14 February 2022 - Discussion about mentoring and twinning-related topics

To support the mentoring and twinning, CASTIEL WP3 decided to organise a meeting with the Training champions with the aim of clarifying the mentoring and twinning processes and the requirements for budget applications. The Training champions had called for this event because of questions related to formal procedures inherent in mentoring and twinning.

The meeting started with the explanation of the latest content of the financial guidelines and the mentoring and twinning processes. Training champions were then encouraged to ask questions, which were answered by CASTIEL WP3 with support from the PMT. After that, an open

discussion was initiated for NCCs to share their experience on how to provide a successful mentoring and twinning experience, what is required from a mentor and other topics related to mentoring and twinning. The Training champions were also reminded of all the documents that were created to support mentoring and twinning. Reporting through the final mentoring/twinning reports was also mentioned. The meeting was finished with a wrap-up and an outline of the next steps, one of them being an amendment of the financial guidelines to provide more clarity with explicit examples for budget.

Table 5 summarises all meetings of the WGT throughout the project duration, that were related to mentoring and twinning.

Date	Meeting
5 February 2021	Presentation of the mentoring and twinning proposal
12 February 2021	Discussion about the questionnaire for mentoring and twinning
14 February 2022	Discussion about mentoring and twinning-related topics

Table 5: Overview of all meetings of the WGT related to mentoring and twinning in M1-M28.

3.3 Triggering and Support of the Mentoring and Twinning Interactions

3.3.1 Identification of Potential Mentors, Mentees and Interactions

As mentioned in Section 3.1 in D3.2 about the design and implementation of the mentoring and twinning plan, CASTIEL WP3 produced various documents after the launch of the mentoring and twinning programme to facilitate the identification and search for potential mentors and/or mentees or to find a match between NCC mentors and NCC mentees. All documents were saved on BSCW in a specific folder that can be accessed by the Training champions and EuroCC WP leaders. These documents were used in the second year of the project. The folder also contains important documents related to the mentoring and twinning – a document explaining the mentoring and twinning processes in general and also a document explaining steps for NCCs to take after the mentoring paths were initiated.

In the second year of the project, several new documents were added to the folder, e.g., the outcomes of the second detailed analysis, as described in Section 2.4 in this document, and the amended financial guidelines. Figure 5 below shows the current status of the folder with all the documents (on 25 November 2022).

2021_03_29_mentoring_twinning_survey_results	
	Nombre
<input type="checkbox"/>	Twinning combinations by country
<input type="checkbox"/>	20210416_scientific domain_AB [0.1]
<input type="checkbox"/>	20210416_target audience_V [0.1]
<input type="checkbox"/>	20210416_target audience_W [0.1]
<input type="checkbox"/>	20210416_target audience_X [0.1]
<input type="checkbox"/>	20210416_target audience_Z [0.1]
<input type="checkbox"/>	20210416_teaching methodology_J [0.1]
<input type="checkbox"/>	20210416_technical domain_AC [0.1]
<input type="checkbox"/>	20210421_CASTIEL_Mentoring_Twinning_Processes [0.1] <small>Tratamiento (DC): PowerPoint-Präsentation</small>
<input type="checkbox"/>	20210505_CASTIEL Mentoring process details [0.1]
<input type="checkbox"/>	20210707_CASTIEL_Mentoring_Twinning_process_updated [0.1] <small>Tratamiento (DC): PowerPoint-Präsentation</small>
<input type="checkbox"/>	20210707_Financial Guideline_Workshop_Mentoring_Twinning_update [0.1]
<input type="checkbox"/>	20210707_Mentoring with the Support from CASTIEL updated [0.1]
<input type="checkbox"/>	20220707_2update_Guideline_Workshop-Mentoring-Twinning-Budget.pdf [0.1]
<input type="checkbox"/>	2022May_audience2022.pdf [0.1]
<input type="checkbox"/>	2022May_difficulty_level2022.pdf [0.1]
<input type="checkbox"/>	2022May_format2022.pdf [0.1]
<input type="checkbox"/>	2022May_scientific_domain2022.pdf [0.1]
<input type="checkbox"/>	2022May_technical_domain2022.pdf [0.1]
<input type="checkbox"/>	Financial_Guideline_Workshop_Mentoring_Twinning [0.1]
<input type="checkbox"/>	20210415_mentoring_twinning by country V1 [0.1]
<input type="checkbox"/>	20210415_mentoring_twinning by topic V1 [0.1]

Figure 5: Overview of all supportive mentoring and twinning documents on BSCW.

The NCCs have been encouraged by CASTIEL WP3 to use the following supportive documents to facilitate the identification and search for potential mentors and mentees:

- **Twinning combinations by country** – every country can find recommendations for possible twinning partners on any topic based on the replies from the mentoring and twinning questionnaire (which was described in D3.2, Section 3.1 and 3.3) – matches have been found only between those countries that could support each other in terms of needed and offered topics.
- **Documents having “20210416” and “2022May” in the title** – to look for a **partner for some of the training topics**, seven category overviews from the analysis of the training activities section can be used – the scientific domain, the technical domain, teaching methodology, target audience in general, academia - skill level, industry - size, existing vs. future users, all compared to the NCCs baseline. These overviews were created from information provided by NCCs in November 2020 and March 2021. In May 2022, five new overviews were created based on the information available at that point.

- **Mentoring/twinning by country** – for every country it is clearly presented in an Excel document in which topic they have or lack experience and it is easy to see what every country can offer and where they need support. The information is based on the results from the mentoring and twinning questionnaire.
- **Mentoring/twinning by topics** – NCCs can check an Excel document sorted by topics. For every topic from the questionnaire it is clearly presented which NCCs can offer mentoring/twinning in that topic. The information is based on the results from the mentoring and twinning questionnaire.

3.3.2 Examples of Ways of Stimulating the Mentoring and Twinning Interactions

After the launch of the CASTIEL mentoring and twinning programme all NCCs were encouraged to use this opportunity to exchange information, to collaborate with other NCCs, and in the case of the less experienced NCCs, to learn from the more experienced ones.

Due to the pandemic over the last two years, all exchanges among NCCs happened online and this tendency has also been visible in the second year of the project with the majority of the interactions happening online. However, whenever possible, in-person interactions also took place.

During the second year of the project, many NCCs initiated mentoring and/or twinning interactions with one another without any support from CASTIEL. To encourage further mentoring and twinning interactions, CASTIEL WP3 proactively supported NCCs by various means since the launch of the mentoring and twinning programme in April 2021 and particularly in the second year of the project.

Examples of the main ways of triggering and supporting the interactions can be summarised as follows:

1. Providing access to supportive mentoring and twinning documents explained in Section 3.3.1 – Several reminders of these documents were sent to the Training champions during the second year of the project.
2. Putting in contact those NCCs that represent an ideal match according to the analysis of the training activities (as explained in Section 2.2 *Detailed Analysis of NCCs' Training Activities* in D3.2), irrespective of the NCCs maturity – see Twinning initiated by CASTIEL WP3 below.
3. Emailing all Training champions from time to time throughout the year and reminding them of all available resources and the mentoring and twinning procedure, and encouraging NCCs to engage in the mentoring and twinning interactions.
4. Connecting NCCs throughout the whole project time when they were looking for a mentor/a mentee.
5. Continuous support to the mentoring paths on five topics that were initiated in May 2021 – CASTIEL WP3 provided support to every group with the organisation of the first workshop until August 2022 – see Section 3.4 for more details.
6. CASTIEL WP3 created a document called *CASTIEL WP3 Support of Collaborations among NCCs and Reporting* (as seen in Annex 3) which was distributed to the Training champions on 30 November 2021. The aim of this document was to demonstrate to the NCCs how CASTIEL would trigger and support collaborations, mentoring and twinning activities between and among NCCs.

Twinning initiated by CASTIEL WP3

- Potential NCCs suitable for collaboration (with a special focus on interactions between more mature and less mature NCCs) were put into contact to encourage collaborations between NCCs and to start a twinning activity on mutual topics of interest – an email invitation was sent out on 8 November 2021 (25 suggestions made).
- NCCs got access to documents showing benefits of twinning between each country and all other countries one by one.
- Connecting NCCs when looking for a mentor/a mentee or a twinning partner.

All this support was appreciated by those NCCs asking for guidance, as it can be seen from the final survey in Section 5.

3.4 Mentoring Paths Supported by CASTIEL WP3 in the Second Year

As described in the deliverable D3.2, Section 3.4 about the initiation of the mentoring paths, CASTIEL WP3 initiated mentoring groups on five topics with NCC contributors-mentors who had experience and could provide mentoring on them in May 2021. Until September 2021, several meetings with the NCC mentors took place in respective groups with the objective of planning the first workshops and two of the workshops were already scheduled by that time.

In the second year of the project, CASTIEL WP3 supported the organisation of the first workshops of every mentoring group to ensure their successful completion.

All meetings with NCC-mentors in the respective groups since May 2021 until April 2022 are provided next:

- *Group 1 – Outreach and collaboration with industries and public sector* - 12/05/2021, 15/06/2021, 23/06/2021, 23/09/2021, 19/10/2021.
- *Group 2 – HPC disruptive technologies for industry* - 18/05/2021, 10/01/2022, communication via emails in-between.
- *Group 3 – Programming best practice and industrial software development* - 20/05/2021, 25/10/2021, 24/11/2021, 12/01/2022, 02/02/2022.
- *Group 4 – Quantum computing* - 25/05/2021, 13/07/2021, 06/09/2021, 04/10/2021, 05/11/2021, follow-up workshop planning - 03/12/2021, 28/01/2022, 14/03/2022.
- *Group 5 – HPC, HPDA and AI applied to industrial use cases* - 27/05/2021, 13/07/2021, 29/10/2021.

The following table shows more details about the organised initial mentoring workshops where more experienced/mature NCCs shared their experience and knowledge with participants. The Quantum computing group also organised a follow-up workshop using the feedback gained at the end of the first workshop (see Table 6 below for more details).

Mentoring Group	Workshop Date	Number of participants from EuroCC/CASTIEL
G1 – Outreach and collaboration with industries and public sector <i>NCC-mentors – Finland, Germany, Ireland, Italy, Sweden, UK</i>	28 October 2021	98 (23 NCCs)
G2 – HPC disruptive technologies for industries <i>NCC-mentors – Denmark, Italy, Slovenia, Switzerland</i>	7 March 2022	82 (28 NCCs)
G3 – Programming best practice and industrial software development <i>NCC-mentors – Bulgaria, Czechia, Denmark, UK + 1 external guest</i>	11 February 2022	82 (26 NCCs)
G4 - Quantum computing <i>NCC-mentors – Denmark, Germany, Iceland, Ireland, Italy, Netherlands</i>	9 November 2021	106 (NA)
G5 – HPC, HPDA and AI applied to industrial use cases <i>NCC-mentors – Austria, Bulgaria, Portugal, UK</i>	25 November 2021	95 (24 NCCs)
G4 - Quantum computing – Follow up Full day workshop – Diving into Quantum Computing <i>NCC-mentors – Denmark, Germany, Iceland, Ireland, Italy, Netherlands</i>	4 April 2022	87 (NA)

Table 6: Overview of all mentoring first workshops in M1-M28.

Recording and slides from the workshops were uploaded to the BSCW and the NCC Area on EuroCC ACCESS. A document with key take-aways was published from the mentoring workshop of the Outreach and collaboration with industries and public sector group in collaboration with CASTIEL WP4 *Industrial Interaction and Business Development*. Summary reports were created by CASTIEL WP3 and the leading NCC from the workshops of the mentoring groups Quantum computing (NCC Italy) and HPC, HPDA and AI applied to industrial use cases (NCC UK). All documents are publicly available on EuroCC ACCESS in the Document library in the Resources section.

The feedback received from the participants of all workshops was very positive and they found the workshops extremely useful in learning more about the presenting NCCs, the topics and cases which triggered further collaborations and mentoring & twinning interactions.

3.5 Reporting of Mentoring and Twinning Activities

As described in Section 3.5 *Mentoring and Twinning Interactions among NCCs* in D3.2, an email was sent to the Training champions in July 2021 explaining how to report the planned or initiated mentoring and twinning interactions in the first year of the project – from April 2021 (alternatively from the beginning of the project) until August 2021.

To keep track of the finished mentoring and twinning interactions, a short report on the mentoring or twinning activity was introduced when the mentoring and twinning programme

was launched, to be jointly completed and sent by the participating NCCs at the end of each activity.

In the second year, CASTIEL WP3 continuously monitored the mentoring and twinning activities via the NCCs TPRs (as explained in Section 2.9) and email communication. The main reporting tool has been the final mentoring and twinning report sent by NCCs after every interaction. CASTIEL WP3 received 46 reports (mentoring = 16, twinning = 30) during the duration of the mentoring and twinning programme (April 2021 – 16 December 2022). The reports are not only from the mentoring and twinning interactions for which NCCs applied for the CASTIEL budget, but also from mentoring and twinning organised between NCCs without any financial support from CASTIEL. All submitted reports are available to all NCCs in the Training Matrix so that NCCs can see the areas of mentoring and twinning and approach those NCCs, if of interest. It is important to note that some NCCs interacted between each other without reporting it as they did not consider it as mentoring or twinning.

The received reports have been analysed to receive more information about the finished mentoring and twinning interactions. Table 7 below Table 7: Overview of areas for mentoring and twinning during M8-M28.shows all areas of support that were discussed when NCCs engaged in the mentoring or twinning interactions during the project duration.

Areas for mentoring or twinning	Number of interactions
Training-related info, collaboration on joint workshops/trainings	24
Projects with industry, collaboration with industry	14
HPC centre, HPC usage, HPC services	11
Communication, dissemination, marketing	5
Learning about new tool(s)	4
Other (legal, PoC, edge computing, big data, academic users, change management)	9

Table 7: Overview of areas for mentoring and twinning during M8-M28.

It can be seen that the majority of NCCs shared experiences about various topics during the mentoring and twinning activities, mainly they were exchanging information about training-related topics, they engaged in organising joint events or they talked about their experiences with projects and collaboration with industry. Some NCCs also shared knowledge about HPC centres, HPC usage and HPC services, communication and dissemination, new tools and other topics, e.g., legal aspects, proof of concept (PoC), academic users. During the twinning interactions, the NCCs usually discussed more than one topic, whereas during the mentoring activities the focus was usually on one specific subject.

The mentoring and twinning activities lasted on average 2 days (mentoring) and 15 days (twinning), some of them lasting several months. During these longer interactions, both NCCs were addressing several topics and sometimes they also planned a joint workshop as a result of the twinning.

The average budget spent was around 1500 Euros for those activities that were supported by the CASTIEL budget (8 applications). The remaining activities happened without an official request for budget. The majority of the interactions were online due to the pandemic situation

in 2020-2022, however the majority of the activities that were financially supported by CASTIEL were in-person.

The participating NCCs mentioned as benefits from engaging in the mentoring and twinning activities that they got to know the other NCCs and the people better, they learned about the way how the other NCCs do things, they learned new information, insights and the activities were the basis for further collaborations.

4 Technology Providers' Presentations and Workshops Series in M13 – M28

In the second year of the project, the presentations and workshops from technology and solutions providers continued to be organised and offered to the EuroCC network. The collaboration with Intel continued during the second year with a full day- and a two-day workshop and with NVIDIA through a half-day workshop. New contacts were developed with companies such as Huawei, ConstelCom [27] and Weka [28]. Discussions with AMD and SambaNova have been taking place in the last months of the project about their forthcoming events in 2023.

Table 8 below shows the presentations and workshops that took place online over the entire project duration. Details about the content can be found in Annex 6.

Activity	Date	Number of participants from EuroCC and CASTIEL
Presentation of the NVIDIA Deep Learning Institute	19 January 2021	51
AMD-EuroCC Half-Day Workshop CPU/GPU	8 June 2021	More than 100
Presentation of Intel to EuroCC	14 September 2021	55
Presentation of Huawei to EuroCC	30 November 2021	54 <i>21 NCCs</i>
Presentation of ConstelCom to EuroCC	18 January 2022	46 <i>21 NCCs</i>
Intel/EuroCC Joint Workshop: Introduction to the Intel oneAPI Development Environment	16 – 17 February 2022	93 and 81 <i>23 NCCs</i>
Presentation of Weka to EuroCC	22 February 2022	48
Online EuroCC Quantum Workshop by NVIDIA	27 September 2022	65 <i>21 NCCs</i>
Intel/EuroCC Joint Workshop: Accelerated Machine Learning with Intel AI Software Tools	25 October 2022	39 <i>19 NCCs</i>

Table 8: Overview of all presentations and workshops with technology and solution providers in M1-M28.

The participants found these presentations and workshops useful and insightful. CASTIEL WP3 created summary reports from the joint workshop with Intel on oneAPI, from the presentation of ConstelCom and Weka and all these reports are publicly available in the Document library of the Resources section of the EuroCC ACCESS website. Videos and slides

are also publicly available from both workshops with Intel in the Video library of the Resources section.

Further collaboration is also planned with AMD for 2023 when AMD will offer a workshop over four half-days to EuroCC 2 in 2023. Intel and NVIDIA will also continue to collaborate during CASTIEL 2. New companies, known as well as less known, will be contacted to provide a presentation and/or a workshop to EuroCC 2 during the next years.

5 Results from the Final Training Survey

5.1 Methodology

CASTIEL WP3 decided to send a survey to the Training champions before the end of the project to get an updated information about the progress and situation of the training area in their NCCs and opinions about CASTIEL WP3 efforts in general. The link to the online questionnaire was distributed to the Training champions by email on 28 September 2022 with a two-week deadline set to 12 October 2022.

The survey had two parts:

- PART I. Current status of the training area in NCC and generic questions.
- PART II. Evaluation of CASTIEL WP3 - Training, Twinning and Mentoring.

The Training champions were asked to complete both parts answering all questions thoroughly to provide the view of their NCC, consulting the answers with the Training deputy and any other person working with them in the training area. They were also informed that the information from Part I would be analysed and compared with the information collected in November 2020, that Part II would also be analysed and the work of CASTIEL WP3 would be evaluated and that generalised results without any sensitive information, i.e. not mentioning the specific output of an NCC, would be included in this deliverable and in the presentation for the final project review. It was also mentioned that a final and confidential report would be produced from the results of both sections and would be distributed to all Training champions. The results from Part II will be used in CASTIEL 2 when planning activities and actions of this WP.

The questions of the final training survey can be found in Annex 7. The following type of questions was used in the survey:

- Closed questions where one answer could be selected (Q1, 3, 4, 5, 6, 7, 8, 9, 13, 16, 18, 20, 26, 27).
- Multiple choice closed question (Q22).
- Open-ended questions where Training champions could freely write their opinions (Q2, 10, 11, 12, 14, 15, 17, 19, 21, 23, 24, 25, 28, 29, 30, 31, 32, 33).

The open-ended questions were analysed in a way to provide more quantitative point of view searching for common keywords or phrases.

The next sections show the summary results for the questions asked in both parts of the survey.

5.2 Status of the Training Area across NCCs

Q1. Please select the country you represent:

The survey was answered by 32 NCCs out of 33.

Q2. What has been the progress of the training area in your NCC since September 2020? Please provide a brief summary and also mention the main achievements in the training area in your NCC:

Table 9 shows the key common areas of progress and achievements of the training area in NCCs since the beginning of the project as identified from the open-ended question.

Main progress and achievements	Number of mentions
More support for industries and SMEs	15
Additional events	10
More support for academia	9
Initiated new collaborations	9
New course developments	7
Organized workshops	6
Organized hackathons	3

Table 9: Main NCCs training progress and achievements during M1-M28.

Q3. Number of all training activities (not only EuroCC) organised by your NCC during the project duration (Sep 2020 to Dec 2022, including planned activities until Dec 2022):

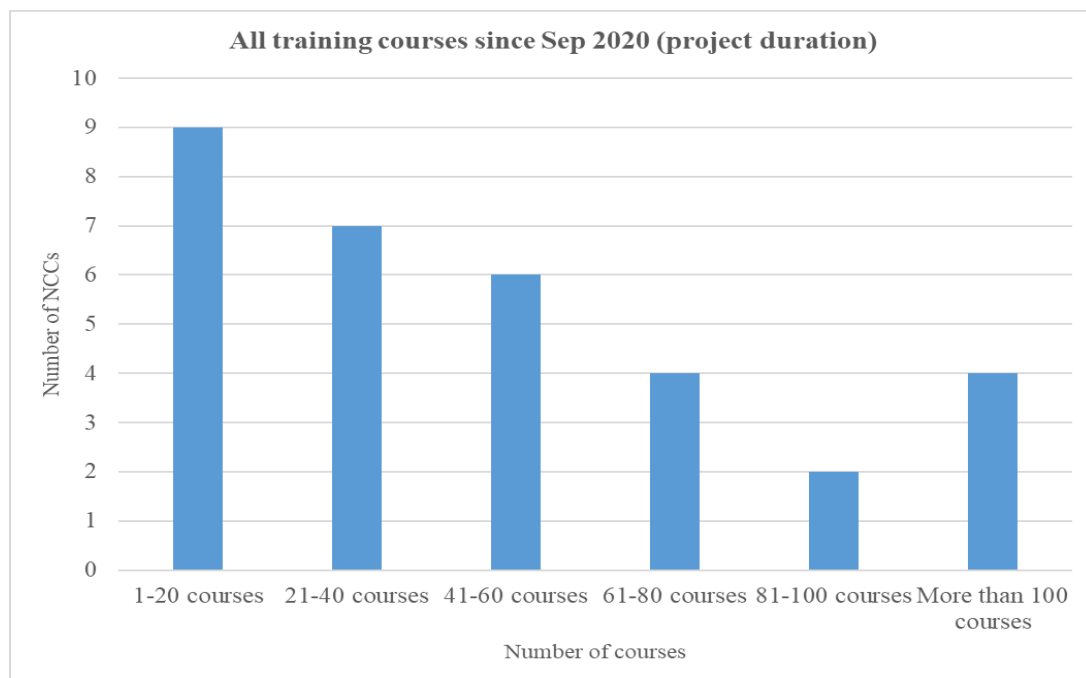


Figure 6: Number of all courses organised by NCCs during the project duration.

Q4. Number of training activities organised under the EuroCC brand during the project duration (Sep 2020 to Dec 2022, including planned activities until December 2022):

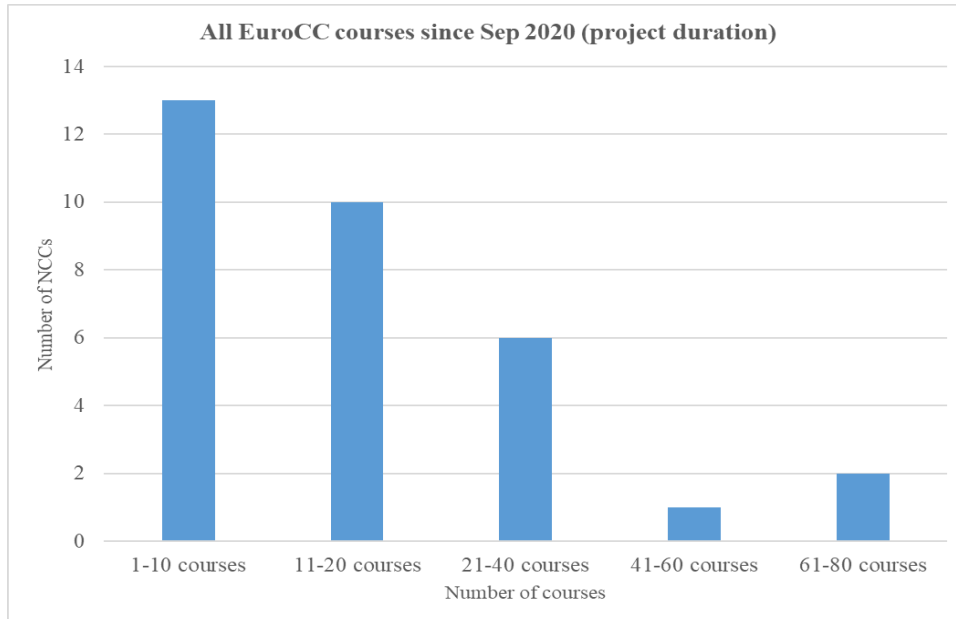


Figure 7: Number of EuroCC courses organised by NCCs during the project duration.

Figure 8 provides comparison of the number of all training courses and the EuroCC courses organised by NCCs during the project duration.

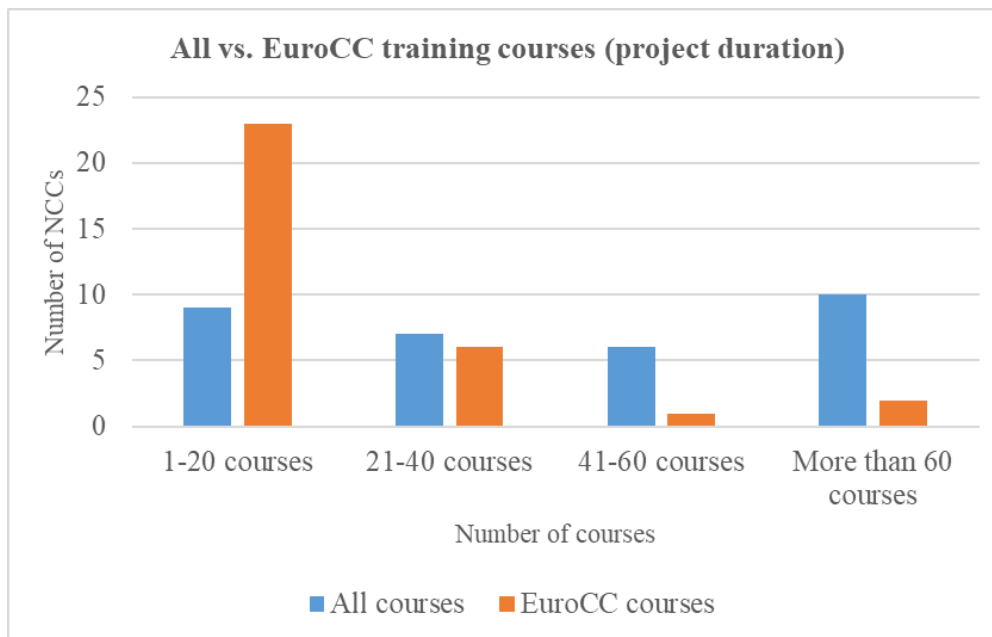


Figure 8: Comparison of the number of all vs. EuroCC courses during the project duration.

Q5. Number of internal trainers in your NCC in the period of September 2021 - August 2022 (instructors providing a course at your NCC and working at your NCC, possibly doing a different function, e.g. research):

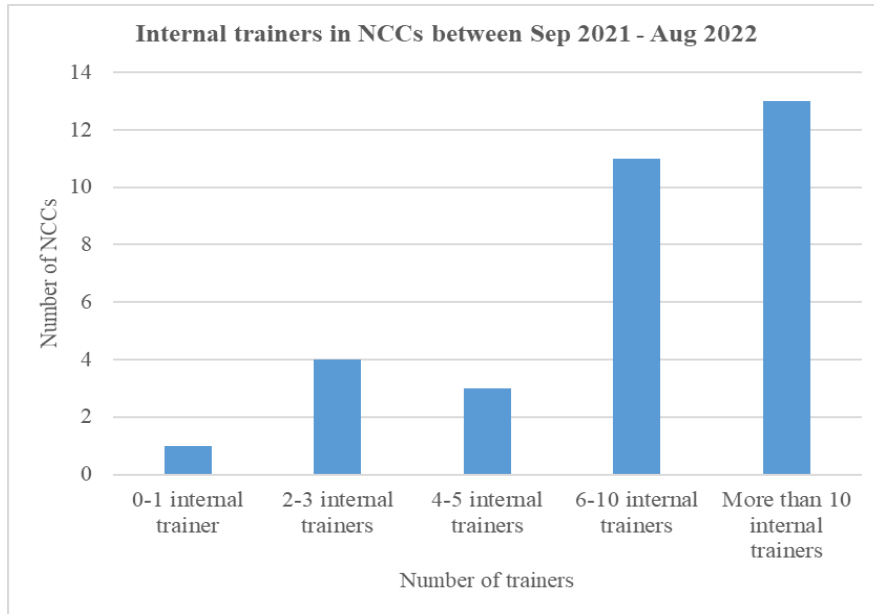


Figure 9: Internal trainers in NCCs between Sep 2021 - Aug 2022.

Q6. Number of external trainers in your NCC in the period of September 2021 - August 2022 (instructors providing a course at your NCC but not working at your NCC):

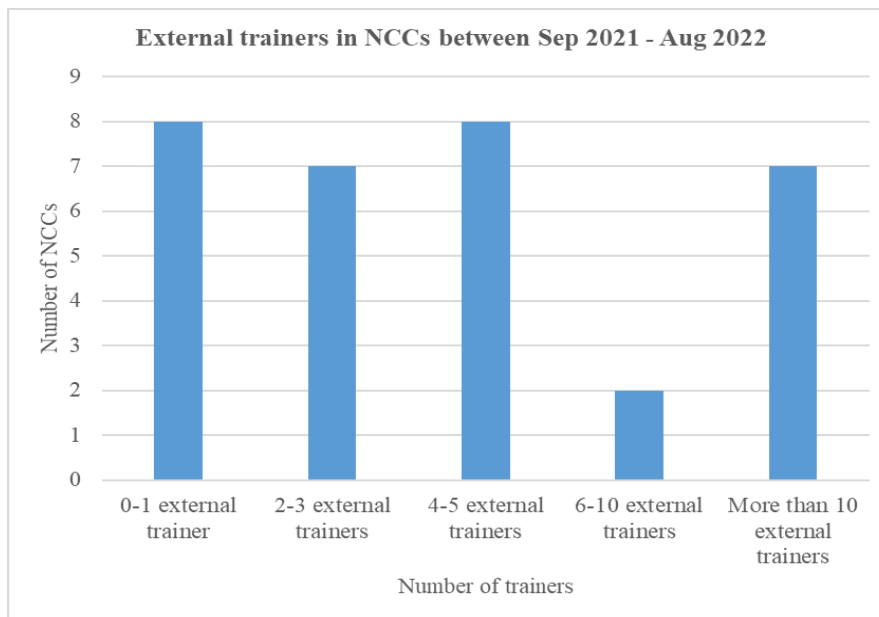


Figure 10: External trainers in NCCs between Sep 2021 - Aug 2022.

Q7. Number of all attendees in all training activities organised by your NCC in the period of September 2021 - August 2022:

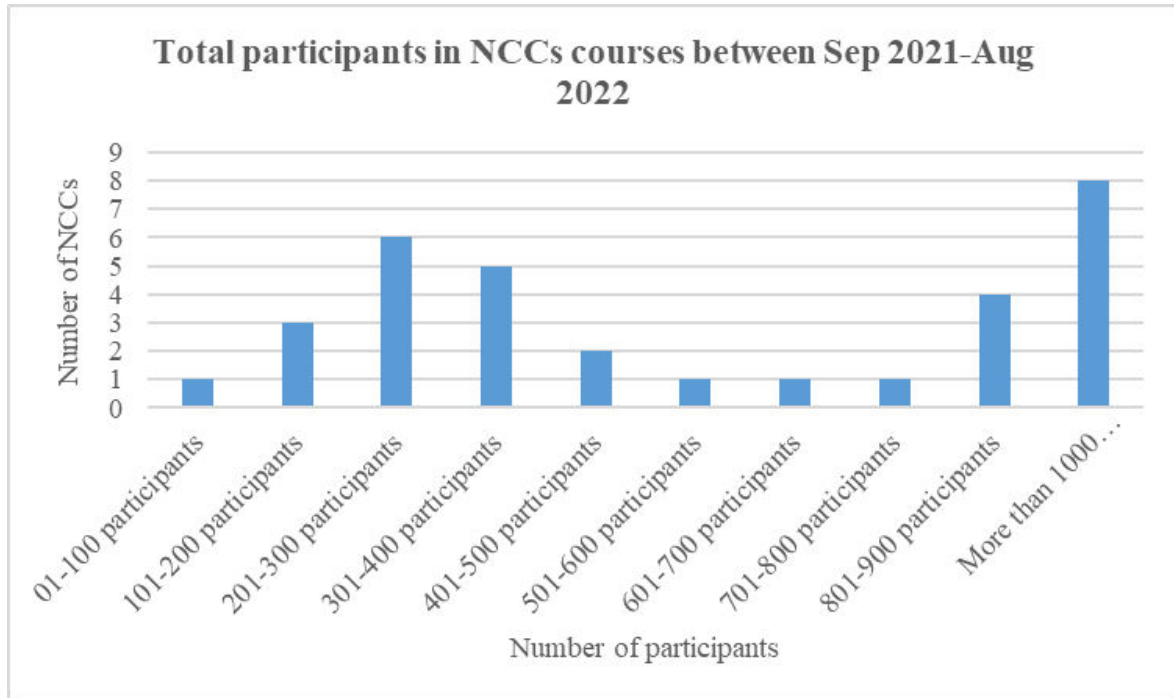


Figure 11: Total participants in NCCs courses between Sep 2021-Aug 2022.

Q8. Number of attendees from industry in all training activities organised by your NCC in the period of September 2021 - August 2022:

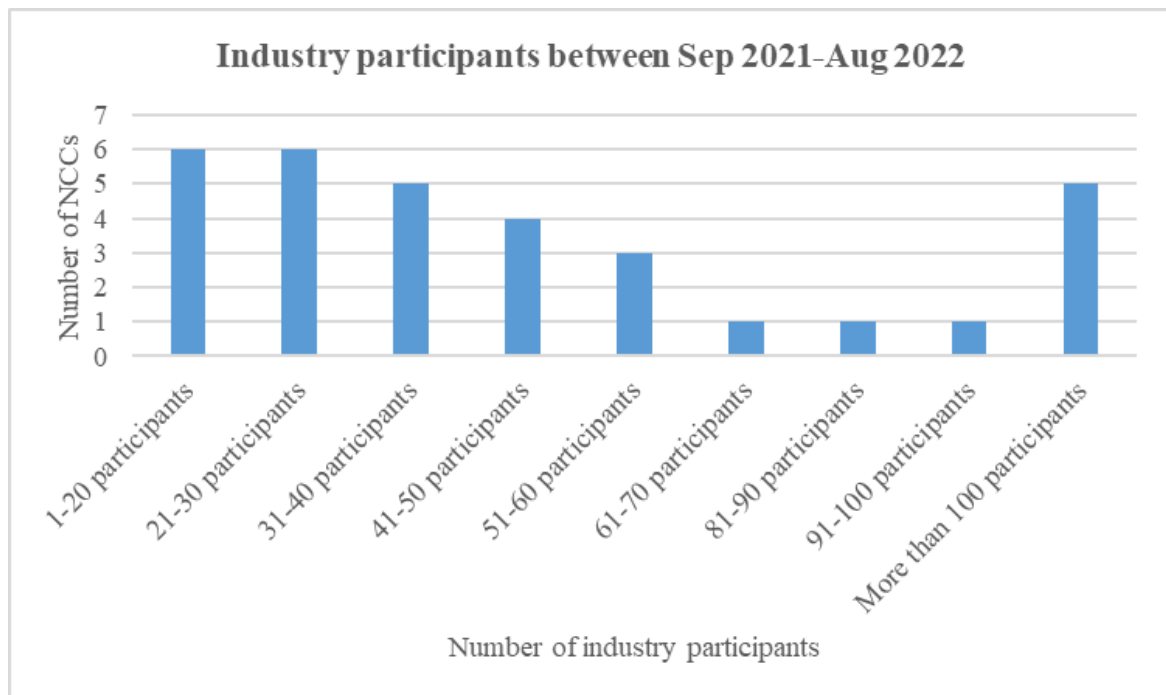


Figure 12: Industry participants in NCCs courses between Sep 2021-Aug 2022.

Q9. Average percentage of women as attendees in the period of September 2021 - August 2022:

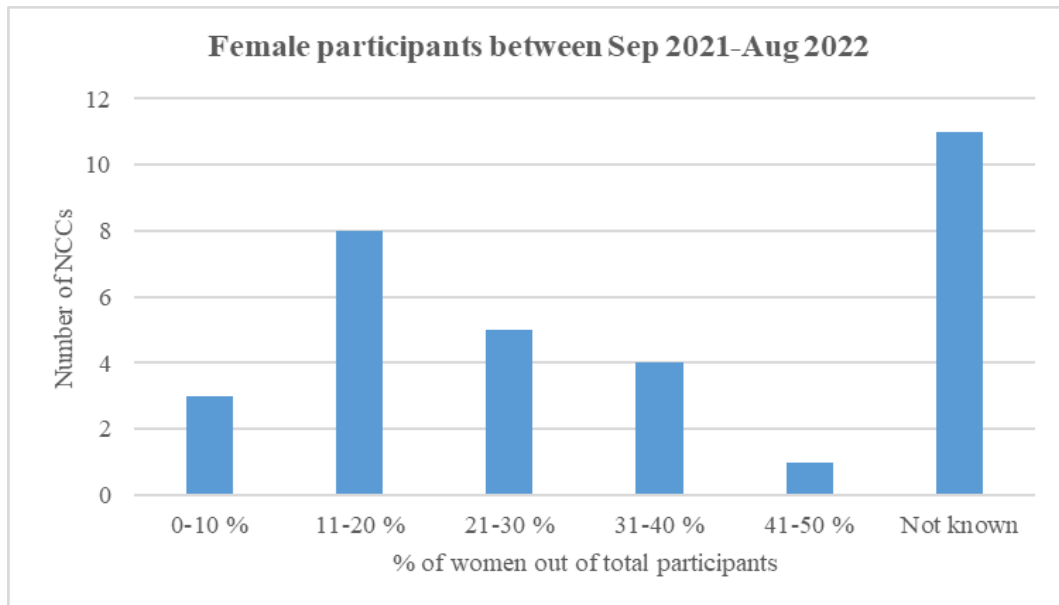


Figure 13: Average % of female participants in NCCs courses between Sep 2021-Aug 2022.

Q10. What constraints or obstacles related to the training offers/activities does your NCC currently have? Please explain in detail.

Constraints related to training activities/offer	Number of mentions
Limited number of trainers/lecturers/staff	16
Getting industries and SMEs involved	14
Pandemic-related hurdles, e.g. online preference	5
Limited number of attendees	
Infrastructure	4
Time constraints	3
Competencies	3
Outreach efforts	3
Struggle with coordination	2
Administrational limits	2
Budget constraints	2

Table 10: Current NCCs constraints related to training.

Figure 14 shows comparison of NCCs constraints related to training activities that were reported in 2020 and in the final survey. Limited number of trainers was also mentioned as one of the key constraints in 2020, however, the involvement with industry was mentioned by 3 NCCs in 2020 compared to 14 NCCs in 2022.

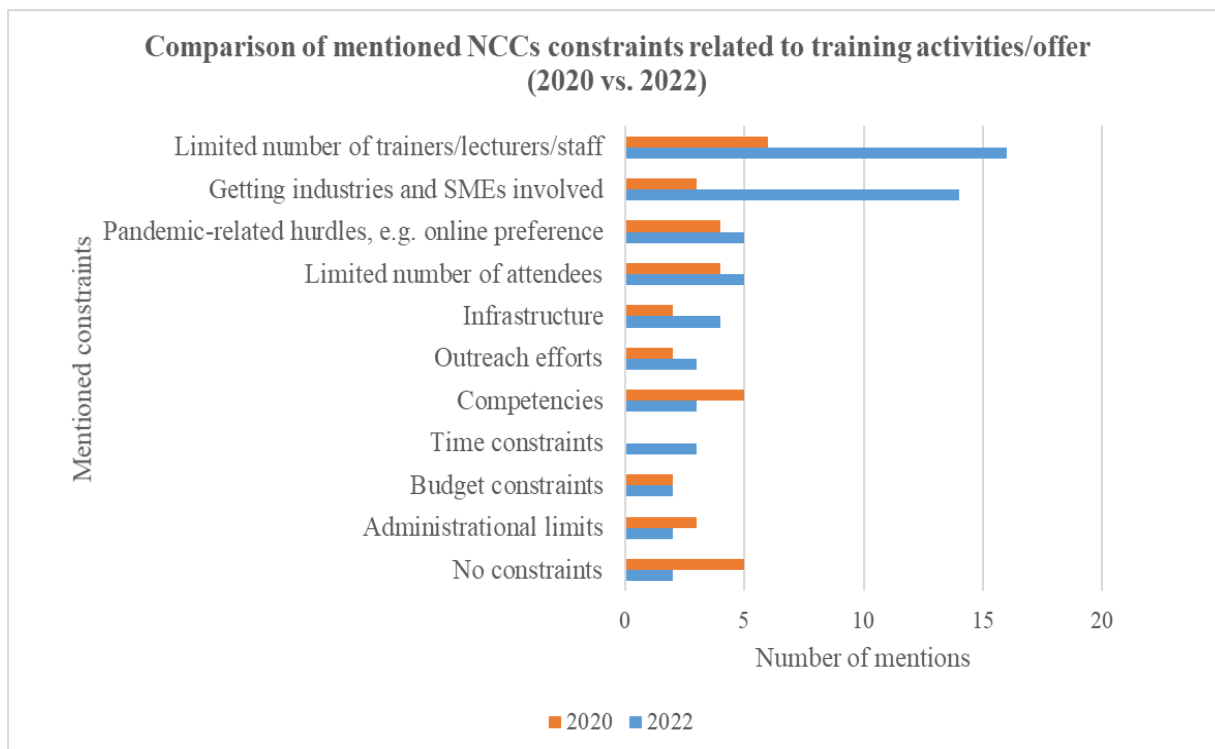


Figure 14: Comparison of training-related constraints mentioned by NCCs in 2020 and 2022.

Q11. What needs does your NCC currently have in connection with the training offers/activities? Please explain in detail.

Training activities needs	Number of mentions
Trainers/teachers/personnel/staff	10
Specifically targeting industries and SMEs	7
Dedicated infrastructure	4
New dedicated online or on-site courses	4
Time commitment	3
New materials	3
Better organization	2
Budget	2
No specific needs noted	5

Table 11: Current NCCs needs related to training.

Figure 15 shows the comparison of NCCs needs related to training mentioned in 2020 and in the final survey 2022. Several new needs have emerged during the project duration, e.g., new dedicated online or on-site courses, whereas the need for the Train the Trainer activities has not been mentioned anymore as it was addressed by CASTIEL WP3 and NCCs during the project duration.

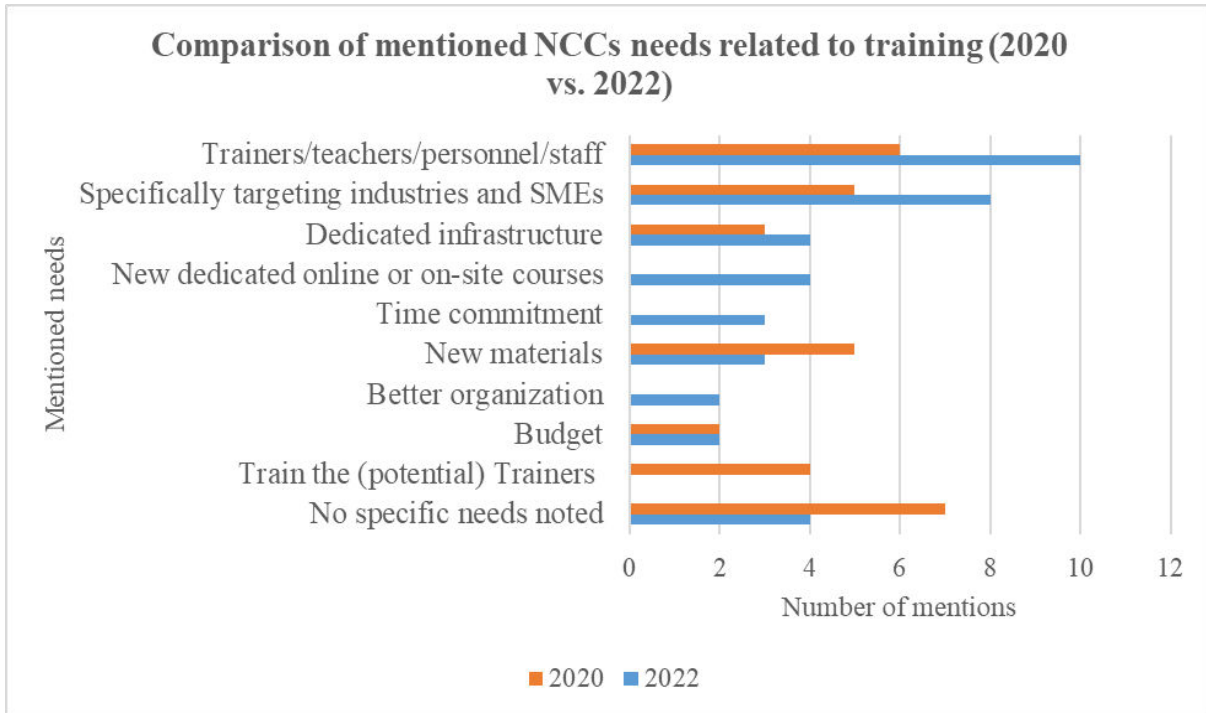


Figure 15: Comparison of training-related needs mentioned by NCCs in 2020 and 2022.

Q12. What else would you like to mention about the current status of the training area in your NCC?

This question was answered only by 12 NCCs and the main answers were related to the following:

- Satisfied with the current status
- Planned future collaborations/cooperation with NCCs
- Future industry/SME outreach
- Planned courses on data science

Q13. At this stage, would your NCC welcome support and/or guidance in the area of training from more experienced/mature organizations?

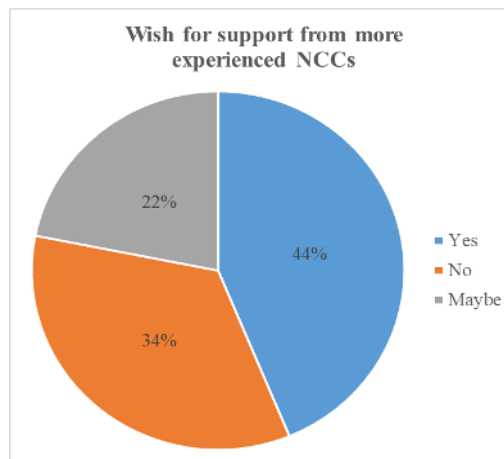


Figure 16: % of NCCs wishing for support from more experienced NCCs.

Q14. If YES – Please mention what kind of support and/or guidance you would welcome.

Those NCCs that answered YES in Q13, mentioned the needed support:

- Finding domain-specific (e.g., in emerging HPC topics) expert trainers also for knowledge transfer (train the trainer) at a certain level.
- Sharing training and certification activities for industries/SMEs.
- Access to (multi-GPU) training clusters.
- Direct and formal matching of training/education offers and needs between NCCs.
- Sharing experiences and best practices in organising and conducting trainings (learning pathways).
- Developing course materials and a training curriculum, organising and teaching.
- Developing university HPC courses.

Q15. You mentioned "Maybe". Please provide more details:

Those NCCs that answered Maybe in Q13, mentioned the needed support:

- Open discussion on training within the network (smaller quarterly or bi-yearly workshops).
- Offer joint training activities.
- Providing tools for training in areas of interest in the NCC.
- Improving competences and providing further interesting topics.

Q16. Do your internal trainers receive a specific education on creating and running training activities?

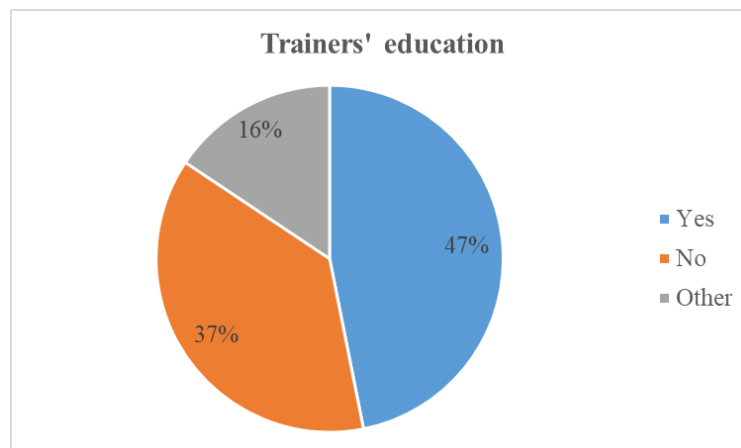


Figure 17: % of NCCs where the trainers receive a specific training education.

Those who mentioned Other referred to education on demand or to education that is offered and it is not mandatory to attend.

Q18. Does your NCC have its own space for hosting your training activities?

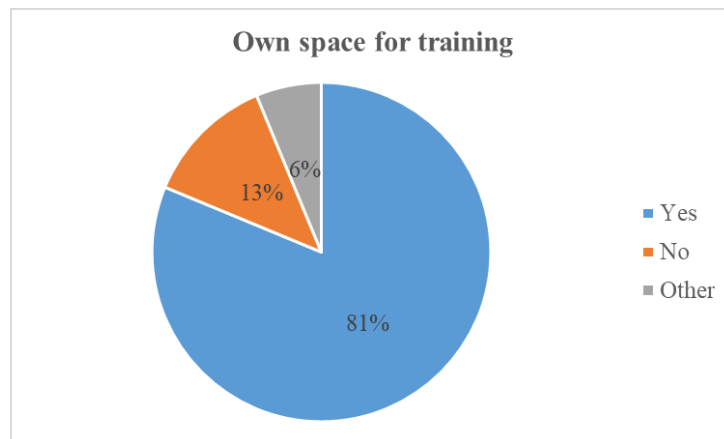


Figure 18: % of NCCs having their own space for training.

NCCs answering Other in this question specified that their training courses are online.

Q20. Does your NCC have a specific training IT infrastructure?

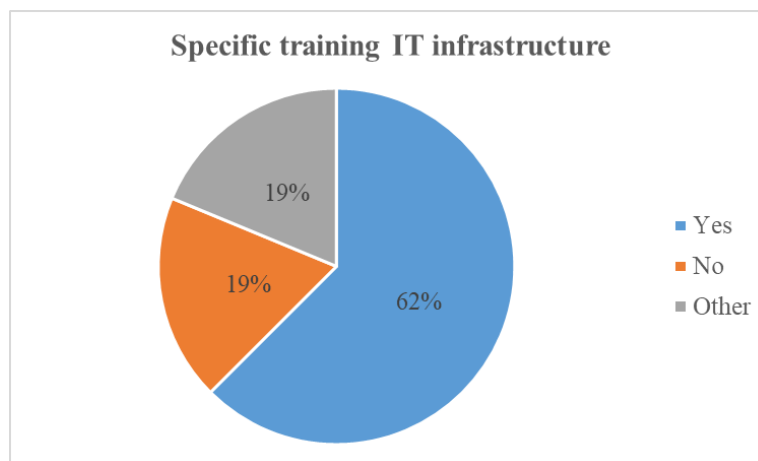


Figure 19: % of NCCs having a specific training IT infrastructure.

NCCs answering Other use infrastructure of other institutions.

Comparison in Four Areas with Survey in 2020

The variation of positive answers in four areas (support needed from other NCCs, trainers' education, own space for training and specific training IT infrastructure) compared to the initial survey in 2020 can be observed (as % of NCCs) in Figure 20. Different number of answers was obtained in 2020 and 2022 (33 vs. 32).

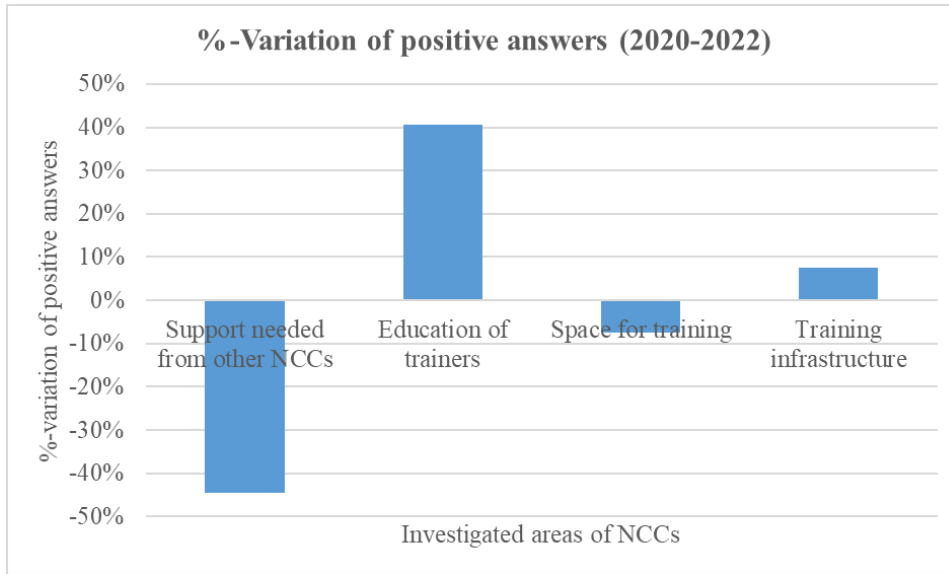


Figure 20: Variation (% number of NCCs) of positive answers compared to the initial survey for four areas.

As significant changes (more than 40%), we can notice that less NCCs need support from other NCCs, while more NCCs offer education to trainers.

Q22. What are the advertising/promotional channels for your training activities? (Please select all that apply)

A comparison with answers from 2020 regarding the promotional channels used by NCCs to promote their training activities can be seen in Figure 21.

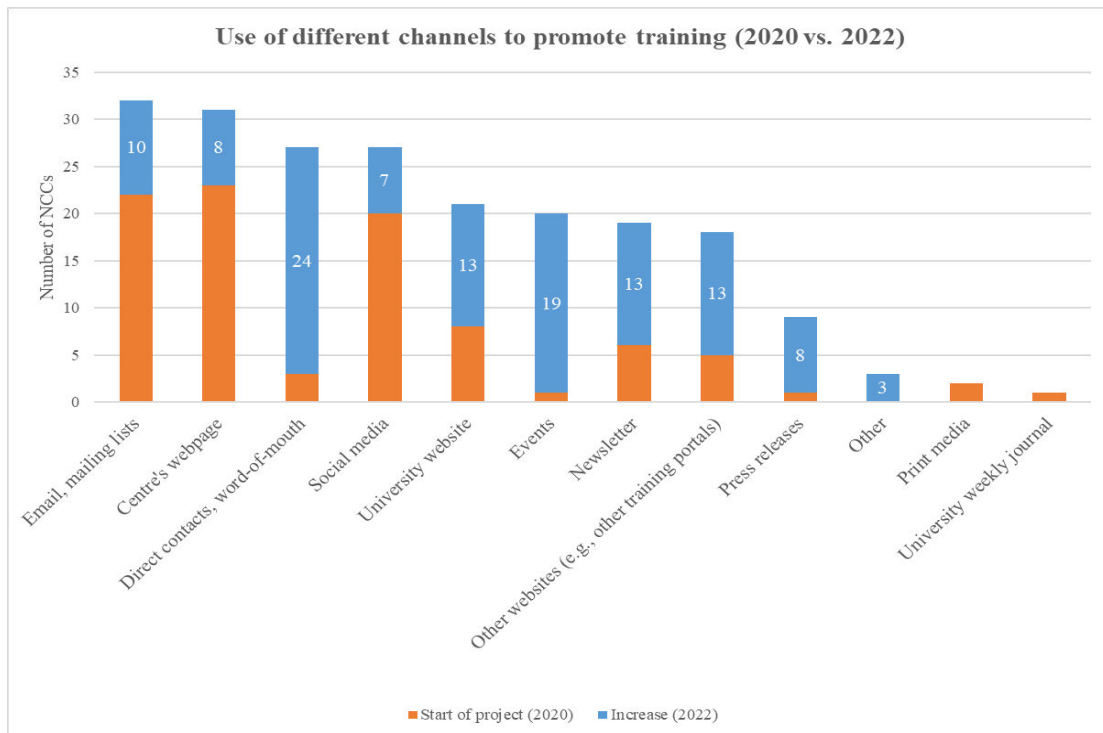


Figure 21: Promotional channels used by NCCs at the end of the project and their increment compared to the initial survey.

A striking increase can be witnessed in promoting NCCs’ training activities at events (20 NCCs in 2022, only 1 in 2020), through direct contacts (27 NCCs in 2022, only 3 in 2020) and with press releases (9 NCCs in 2022, only 1 in 2020).

Q24. Who are the national/local key training providers in the areas of HPC, HPDA and AI in your country? Please write the names of all national/local key training providers:

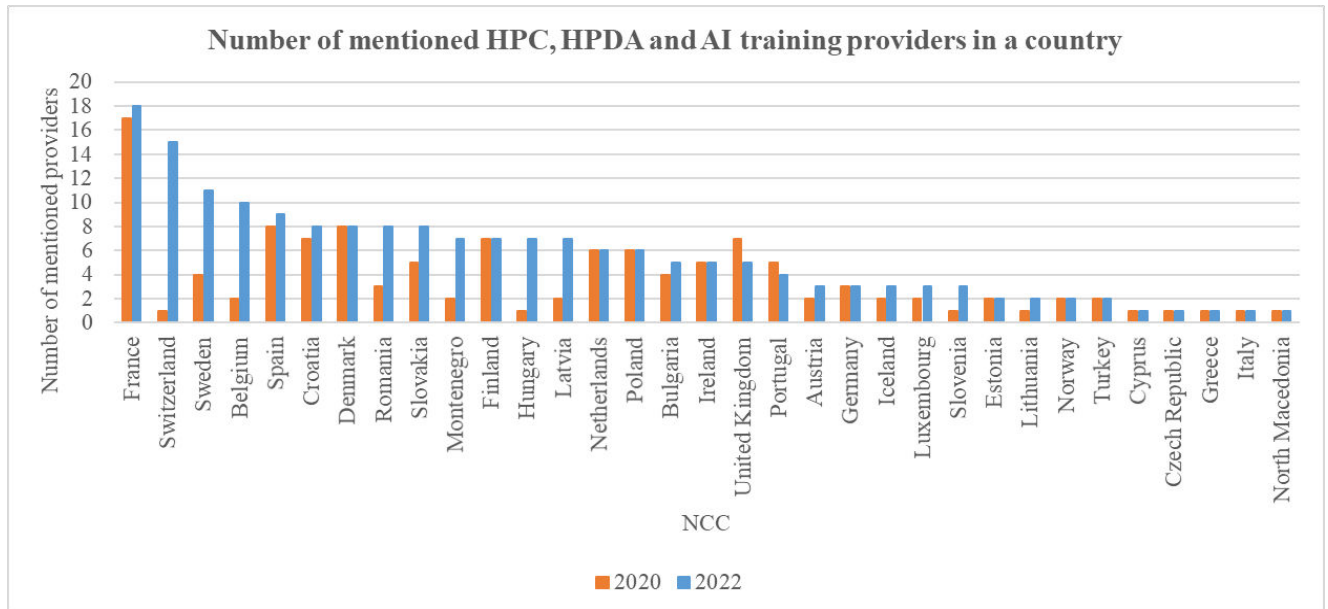


Figure 22: Number of mentioned HPC, HPDA and AI training providers in a country at the start and at the end of the project.

The list of all reported training providers in this survey can be found in Annex 8.

5.3 Evaluation of CASTIEL WP3

Q25. How did your NCC profit from CASTIEL WP3 – Training, Twinning and Mentoring? Please describe in detail:

NCCs gained the following from CASTIEL WP3	Number of mentions
Benefitted from twinning/mentoring	18
Established new collaborations	16
Participated in training activities, events and workshops	15
Exchanged knowledge and experiences	10
Received support	7
Connection to Training champions or other NCCs	5
Start/ Improvement of training programs or their quality	4
Possibility to support other NCCs	2
Other	5

Table 12: Overview of mentioned NCCs benefits from CASTIEL WP3.

Q26. What activities done/organised/offered by CASTIEL WP3 – Training, Twinning and Mentoring were helpful/useful and which ones were less helpful/useful and why?

Figure 23 shows the summary of NCCs’ evaluation of all activities initiated by CASTIEL WP3. The exact wording of each activity can be seen in the questionnaire in Annex 7.

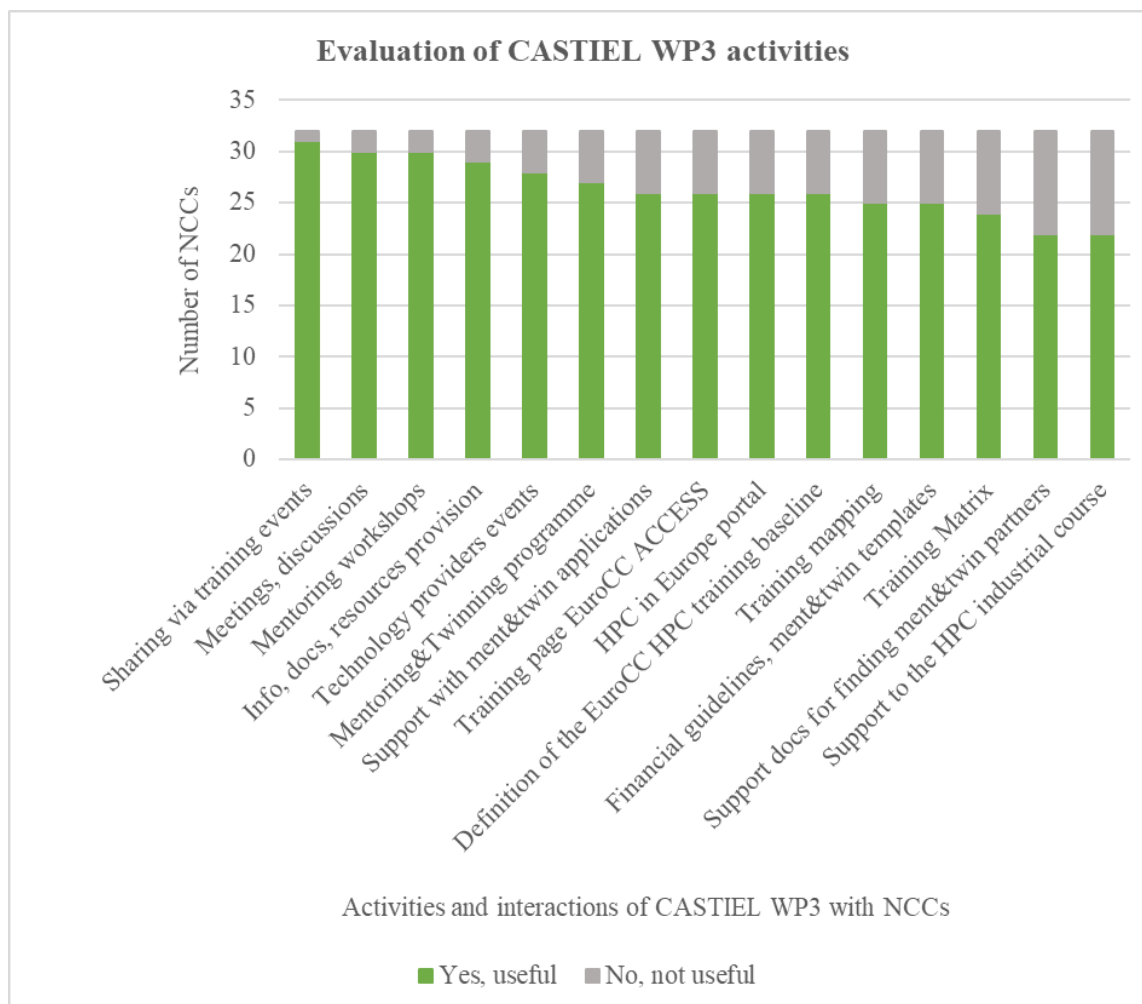


Figure 23: NCCs evaluation of all activities initiated by CASTIEL WP3.

97% of NCCs found sharing via events organised for Training champions useful and all meetings, discussions and mentoring workshops were useful to 94%. On the other hand, the support to the HPC industrial course and the supportive documents for mentoring and twinning were not considered useful by 31% of NCCs and the Training Matrix by 25%. The NCCs, that answered “No, not useful” for these activities and provided a reason, were not familiar with the HPC industrial course and in case of the supportive documents, NCCs did not use them as they preferred to use their existing contacts. With regard to the Training Matrix, either lack of access to the matrix or awareness were the main reasons for not being useful.

Q27. Did your NCC need or would your NCC have liked more support from CASTIEL WP3 during the project duration?

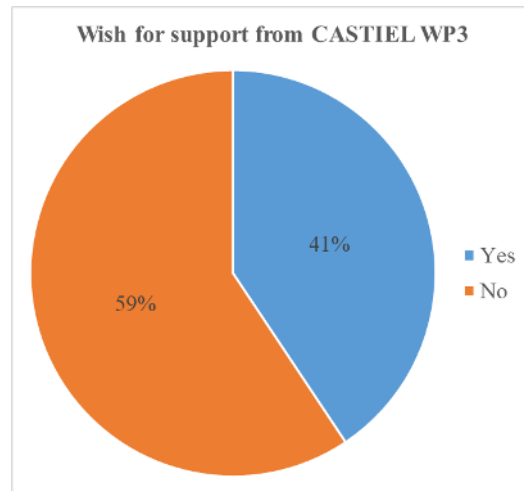


Figure 24: % of NCCs wishing for more support from CASTIEL WP3.

Q28. If YES – Please share with us what kind of support would your NCC have liked or needed from CASTIEL WP3 during the last two years?

Support already provided:

- Suggesting and coordinating areas and topics of interest in HPC, HPDA and AI.
- Connecting with technology providers.
- Creating of the Industry training course.
- Initiating and coordinating a twinning or mentoring with another NCC.
- Getting in contact with potential mentors.

Support needed:

- Help (the Training champions) with the documentation.
- More clarity about budget (what and how can be paid from CASTIEL).
- Setting up training and teaching visitor longer stays.
- Organizing meetings and interest groups e.g. on the training baseline, which can work/interact together to share expertise and deliver training.
- Defining quality measures about training.
- Providing a central course database for certified trainers of train the trainer programmes.
- Collecting training topics/materials in one place and offer access to them to the NCCs.

Q29. What has been stopping your NCC from having more mentoring and/or twinning interactions with other NCCs? Please explain in detail any barriers to mentoring/twinning that your NCC encountered:

Barriers to mentoring/twinning	Number of mentions
Lack of time	10
Lack of people to carry out/engage in these activities	6
Administrative procedures demanding, unclear	5
Travel ban during the pandemic	5
Lack of certain information about other NCCs	4
Financial incentive was not motivating enough	3
Focus on other activities	2
No need for more than what was already realised	2
Hard to agree the schedule with other NCCs	2
No need for mentoring/twinning	2
Interest in collaborating with more developed NCCs	1
No answer	1

Table 13: Mentioned barriers to having more mentoring/twinning interactions with other NCCs.

Q30. In your opinion, what was effective in the mentoring and twinning programme? Why?

What was effective	Number of mentions
Sharing of experiences, knowledge, information and technology	11
The activities between NCCs (meetings, discussions, workshops and speed dating)	10
Sharing training methodologies, materials, learning about other teaching styles	6
Effective organization and structure, support from CASTIEL WP3	6
Receiving financial support	2
Other	2
No answer	4

Table 14: What was effective in the mentoring/twinning programme.

Q31. In your opinion, what was less effective in the mentoring and twinning programme? Why?

What was less effective	Number of mentions
Difficult organisation, high requirements	7
Unclear procedure and financial guidelines changing over time	4
Lengthy surveys and questionnaires	2
Lack of time	2
Challenging for more established centres to identify how they would benefit from the mentoring process	1
Financial support not motivating enough	1
Other	6
Nothing to mention	8

Table 15: What was less effective in the mentoring/twinning programme.

Q32. How could the mentoring and twinning programme be improved?

Suggested improvements	Number of mentions
Clear and simplified procedure and financial guidelines	8
Monthly meetings with small groups in order to connect them to share and collaborate	6
Face-to-face meetings	3
Longer stays, spreading the activities over time	2
Higher financial incentives	2
Rethink the concepts of mentor and mentee, not separating strictly mentoring and twinning.	2
Train the trainers events organized by CASTIEL WP3	2
Other	9
Nothing to mention	5

Table 16: What could be improved in the mentoring/twinning programme.

Q33. What else would you like to say about our work, activities, support or anything else in general?

This question was answered by 8 NCCs. 7 NCCs acknowledged the work of CASTIEL WP3 and 3 NCCs repeated some of the suggestions for improvement in general.

6 Major Achievements

The main achievements and contributions to the overall work of CASTIEL presented in this deliverable can be summarised as follows:

- CASTIEL WP3 enabled many opportunities for NCC collaborations and interactions, including knowledge transfers among NCCs, e.g.:
 - 4 organised training activities, e.g., Train the Trainer, Training Speed Dating.
 - 4 CASTIEL WP3 best practice guides and 6 reports uploaded to EuroCC ACCESS.
 - 77 training and mentoring/twinning-related documents uploaded to the Training Matrix.
 - 3 presentations and 3 workshops from technology and solution providers.
- CASTIEL WP3 gathered further insight on individual NCCs' training profiles.
- CASTIEL WP3 forwarded continued development of the EuroCC ACCESS Training page and the HPC in Europe portal, including the signed MoU among CASTIEL, FocusCoE, and PRACE.
- CASTIEL WP3 contributed to the training offering of NCCs, e.g.:
 - Proposal of the EuroCC HPC training baseline for academia, big industry and SMEs.
 - Support to the creation of the HPC training course for industrial users.
- CASTIEL WP3 triggered and supported mentoring and twinning interactions, e.g.:
 - 5 mentoring paths initiated by CASTIEL WP3 with initial workshops in each of them (15 NCCs as mentors).
 - Face-to-face and online mentoring and twinning activities between NCCs.
 - 46 final reports on mentoring or twinning activities.

7 Concluding Remarks

This deliverable describes the training-related activities during the second year of the CASTIEL project, namely the training-related workshops, training mapping analysis, improvements of the HPC in Europe portal and the EuroCC ACCESS Training page, preparation of the EuroCC HPC Training Baseline, creation of Best Practice Guides on training and summary reports from mentoring workshops. Further, it provides an update on the mentoring and twinning plan, in particular the mentoring path activities and the ways of stimulating further mentoring and twinning interactions between NCCs. It also provides an overview of the activities organised in collaboration with the technology and solution providers. This deliverable finally provides a summary of the final training survey showing the current status of training in NCCs. The NCC evaluation of CASTIEL WP3 work and activities is also part of the survey summary.

The main activities of this WP in the second year of the project focused on stimulating the NCCs collaborations, knowledge and material sharing and on closing the knowledge gaps among NCCs. Further insights have been gained through the analysis of the NCCs' training profiles. In particular, CASTIEL WP3 had a prominent role in establishing the HPC in Europe portal as the single gateway for training in the EuroCC community.

Many mentoring and twinning collaborations and activities took place in the second year of the project. CASTIEL WP3 focused on supporting the mentoring groups with the organisation of the initial mentoring workshops. Effort has been made to support and trigger the mentoring and twinning interactions between NCCs in various ways and to report about all activities. Overall, NCCs were keen on collaborating with each other, on sharing their experiences and knowledge, on learning and closing the knowledge gaps. This created a strong base for future collaborations.

Further collaborations between CASTIEL WP3, NCCs and few technology providers, such as Intel, NVIDIA and AMD, were established throughout the project duration as well as new contacts were initiated, namely with ConstelCom and Weka. There is an interest on both sides to pursue such collaborations in CASTIEL 2.

The results of the final survey show that NCCs found the activities and actions of CASTIEL WP3 useful, especially in supporting the mentoring and twinning and organising a variety of workshops and events.

8 References and Applicable Documents

- [1] D3.1: The CASTIEL Report: Initial Training, Twinning and Mentoring Opportunities and the Needs of NCCs, EuroCC ACCESS, https://www.eurocc-access.eu/wp-content/uploads/2022/02/CASTIEL_WP3_D3.1.pdf.
- [2] D3.2: The CASTIEL Report: Training, Twinning and Mentoring Plans and Achievements, https://www.eurocc-access.eu/wp-content/uploads/2022/11/20220131_D3.2_Training_Twinning_Mentoring_Plans_Achievements_final_V1.2.pdf.
- [3] HPC in Europe portal - High-Performance Computing in Europe, <https://hpc-portal.eu/>.
- [4] EuroCC ACCESS, <https://www.eurocc-access.eu>.
- [5] Training section in EuroCC ACCESS, <https://www.eurocc-access.eu/services/training/>.
- [6] FocusCoE, <https://www.hpccoe.eu/about/>.
- [7] PRACE-6IP, <https://prace-ri.eu/about/ip-projects/>.
- [8] HPC Certification Forum, <https://www.hpc-certification.org/>.
- [9] Video library in the Resources section of the EuroCC ACCESS website, https://www.eurocc-access.eu/services/resources/#section_videos.
- [10] FocusCoE deliverable D4.2 Final Training Report, <https://www.hpccoe.eu/download/>.
- [11] Training archive in the HPC in Europe portal, <https://hpc-portal.eu/training-and-events/training-events?category=11>.
- [12] PRACE-Indico, <https://events.prace-ri.eu/>.
- [13] Timely event management online services, <https://time.ly/>.
- [14] CoE Training Registry on hpccoe.eu, <https://www.hpccoe.eu/coe-training-calendar/>.
- [15] HPC Carpentry, <https://www.hpc-carpentry.org/>.
- [16] HiDALGO Training, <https://moodle.hidalgo-project.eu/>.
- [17] ETP4HPC, <https://www.etp4hpc.eu/>.
- [18] ETP4HPC document Education and Training in the Area of HPC, <https://www.etp4hpc.eu/pujades/files/ETP4HPC%20E%26T%20input%20for%20EuroHPC-02Oct2020.pdf>
- [19] EUMaster4HPC, <https://eumaster4hpc.uni.lu/>.
- [20] EuroHPC Joint Undertaking, https://eurohpc-ju.europa.eu/index_en.
- [21] ARCHER2 Training Courses, <https://www.archer2.ac.uk/training/courses/>.
- [22] Document library in the Resources section of the EuroCC ACCESS website, https://www.eurocc-access.eu/services/resources/#section_library.
- [23] HPC Industrial course co-created by NCCs page, <https://eurocc-greece.gr/industrial-course/>.
- [24] Elements of Supercomputing online course, <https://edukamu.fi/elements-of-supercomputing>.
- [25] PRACE RI, <https://www.youtube.com/c/PRACERI>.
- [26] Digital EU, <https://www.youtube.com/c/DigitalEU>.
- [27] ConstelCom, <https://www.constelcom.com/>.
- [28] Weka, <https://www.weka.io/>.

Annex 1 – Examples of Profile Usage in the Training Analysis

Profiles were used in the detailed analysis of the training activities. Five illustrative examples are given here to showcase appropriate profile usage to address frequently occurring enquiries.

a) How to identify EU-level conformity or individual characteristics of a particular NCC training program:

A particular NCC would like to know how its training program is doing in a particular category, for example “Format”. Two potential scenarios are shown in Figure 25. Red bars in the profiles are indicating the percentage dedication of the entire training program to “In-person” training, “Online” training or “Mixed” forms. For direct reference, the EU-wide average is also included in the form of blue bars (baseline from weighted arithmetic means). As can be easily seen from Figure 25a, NCC-A delivers its training program in equal shares in all possible formats. This deviates significantly from the rest of the 33 training programs, where a clear preference for online formats is evident. Contrary to this, NCC-B (see Figure 25b) organizes its training program rather similar to the EU-wide average (minor differences between red and blue bars).

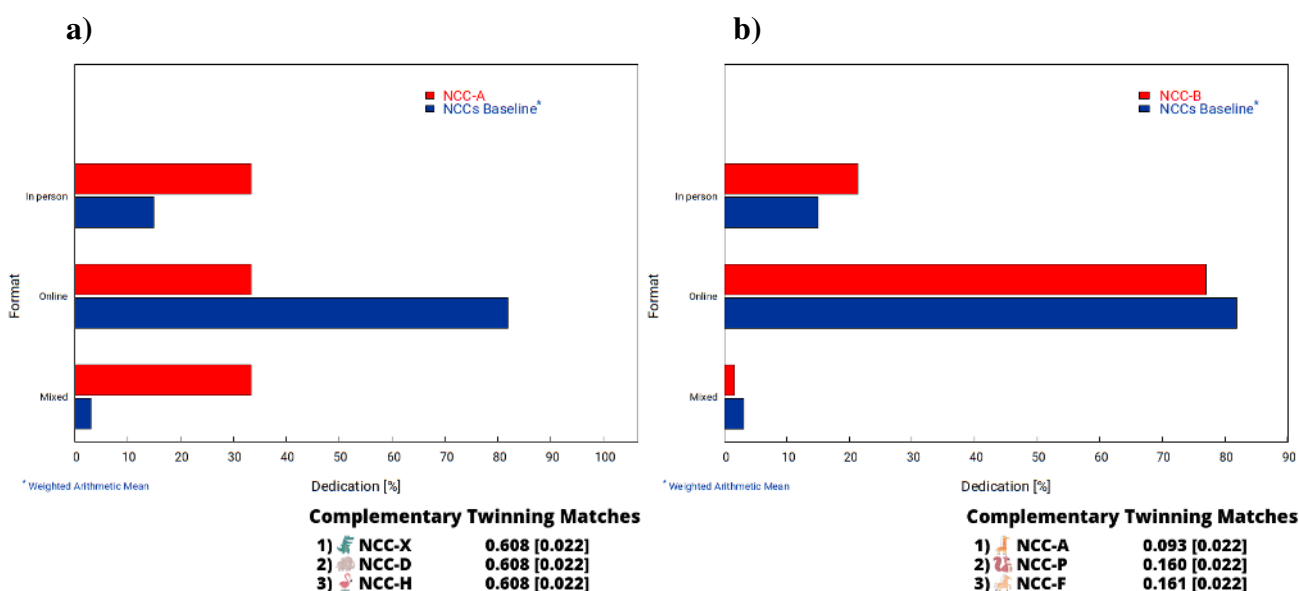


Figure 25: Example profiles in category “Format” for two different NCCs.

b) Change of weight distributions:

Computing EU-wide averages means accounting for different sizes of countries’ populations relative to the offerings present in individual training programs (i.e. weighted arithmetic means, see Annex 1 in D3.2). Hence, the underlying distributions of “weights” should therefore not show any obvious trend between previous and current evaluation. In Figure 26a, the current weight distribution is given and may be compared to the previous one (see Figure 26b), clearly demonstrating that the most recent analysis has become even less susceptible to any over-determination by a particular NCC – narrower distribution of weights in Figure 26a) versus Figure 26b), while still showing significant spread over a range of weights with multiple contributors.

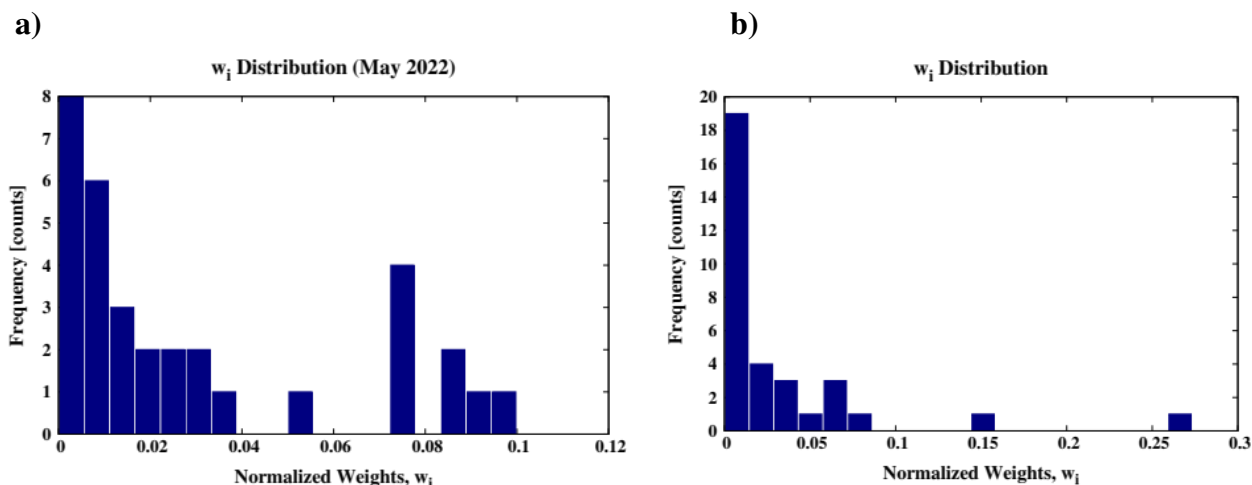
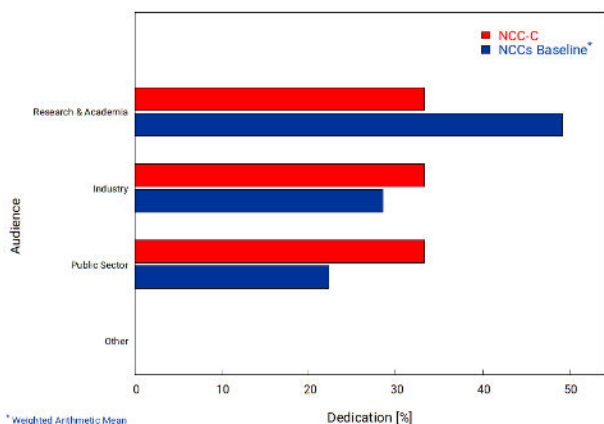


Figure 26: Distribution of weights in most recent evaluations (a) when compared to previous analysis (b).

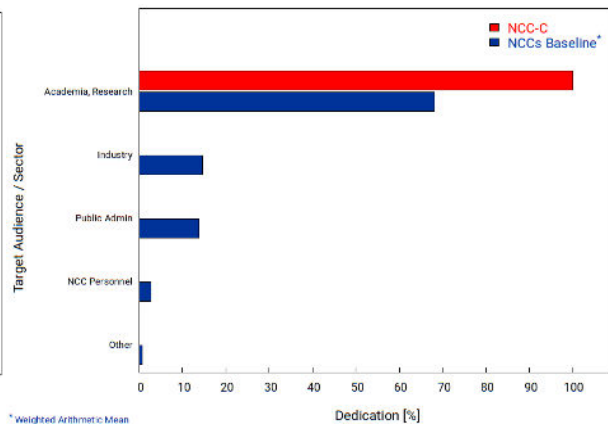
c) How to monitor progress in NCCs’ training programmes:

Profiles created at early/late stages of the CASTIEL project can be directly used to assess training programme evolution. A typical example is given in Figure 27, where NCC-C has clearly transformed its training offering from a previously exclusive focus on “Academia & Research” (Figure 27b) to nowadays equal focus on “Industry”, “Research & Academia” and “Public Sector” (Figure 27a).

a) May 2022



b) Nov 2020



Complementary Twinning Matches		
1)	NCC-X	0.153 [0.007]
2)	NCC-D	0.155 [0.007]
3)	NCC-H	0.224 [0.014]

Figure 27: NCC-C profiles for category “Audience” computed in May 2022 (a) or late 2020 (b).

d) Identifying the ultimate expert in a particular field (as occasionally requested in WGT meetings):

Profiles can also be used to identify NCCs with extra-experience in a particular field. For example, we want to identify/contact that NCC that has the strongest focus on HPC/HPDA/AI training most suitable for beginners. By simply scanning through the summary sheet of category “Difficulty Level” we quickly discover NCC-X to have the strongest focus on beginners’ level

in its training program (arrow in Figure 28a). In fact, 80% of the training program of NCC-X is targeting beginners (see Figure 28b), i.e., much more than the EU-wide average of 50%, hence compared to the rest of the 33 NCCs, NCC-X should clearly have some advantage when it comes to organizing training events for beginners. While interesting on its own – even for this somewhat hypothetical case – more significant such localizations may take place in categories “Scientific Domain” and “Technical Domain”.

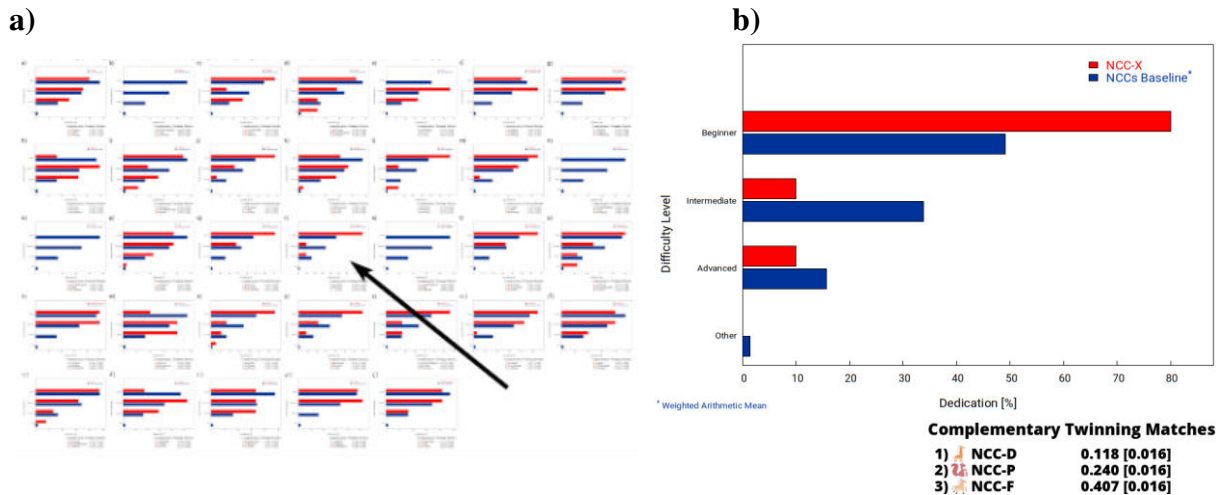


Figure 28: Detecting NCC-X with strongest focus on beginners (a) reaching up to 80% as detailed in (b).

e) Finding a Complementary NCC Partner for Twinning:

Another way of using profiles is to find a suitable complementary NCC for twinning. NCC-D, as seen in Figure 29a, provides training for intermediate and advanced users only, without any training for beginners. On the other hand, NCC-X, as seen in Figure 29b, has the strongest focus on beginners’ level in its training program. NCC-D would profit from a twinning partner with focus on beginners. The suggested complementary twinning matches for NCC-D are seen in Figure 29a on the right side at the bottom – NCC-X, NCC-F and NCC-H. The complementary twinning matches for NCC-X are seen in Figure 29b on the right side at the bottom – NCC-D, NCC-P and NCC-F. Therefore, NCC-D and NCC-X would profit from a twinning collaboration.

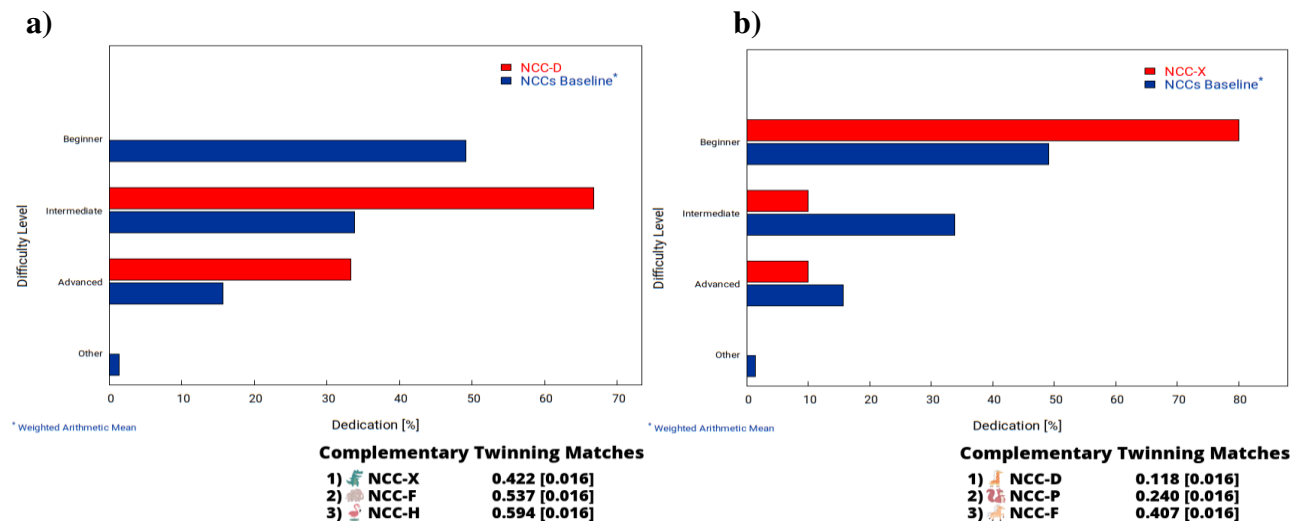


Figure 29: Finding a complementary partner NCC for twinning in the category “Difficulty Level”.

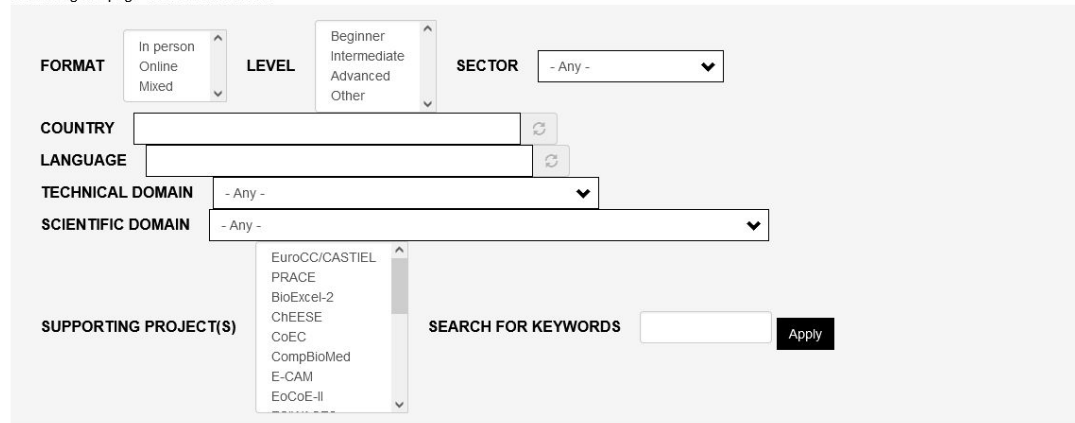
Annex 2 – HPC in Europe Portal and Example of Some Features

Map of Upcoming Short Courses

Select any combination of filters and click on "Apply" to see results.

You can select multiple values for most filters (using comma separation for predictive fields and CTRL+CLICK for lists).

Reloading the page will reset the filters.



The screenshot shows a filter interface with the following elements:

- FORMAT:** In person, Online, Mixed
- LEVEL:** Beginner, Intermediate, Advanced, Other
- SECTOR:** - Any -
- COUNTRY:** Text input field with a refresh icon
- LANGUAGE:** Text input field with a refresh icon
- TECHNICAL DOMAIN:** - Any -
- SCIENTIFIC DOMAIN:** - Any -
- SUPPORTING PROJECT(S):** EuroCC/CASTIEL, PRACE, BioExcel-2, ChEES, CoEC, CompBioMed, E-CAM, EoCoE-II
- SEARCH FOR KEYWORDS:** Text input field with an "Apply" button



The screenshot shows a map of Europe with several blue location pins. To the left of the map is a card for the "vienna AD-INITIO Simulation Package (VASP) Ecosystem" event. The card includes the following details:

- Event/Course Format:** Online
- Event/Course Start:** Wed, 14/12/2022 - 14:00 CET
- Event/Course End:** Thu, 15/12/2022 - 19:00 CET
- Organiser:** (HPC_UE) - High Performance Computing Center -

Figure 30: HPC in Europe portal – Map of upcoming short courses.

Map of HPC, HPDA and AI Training Providers

If you are a provider and are not listed please add yourself via [this link](#) (requires login).

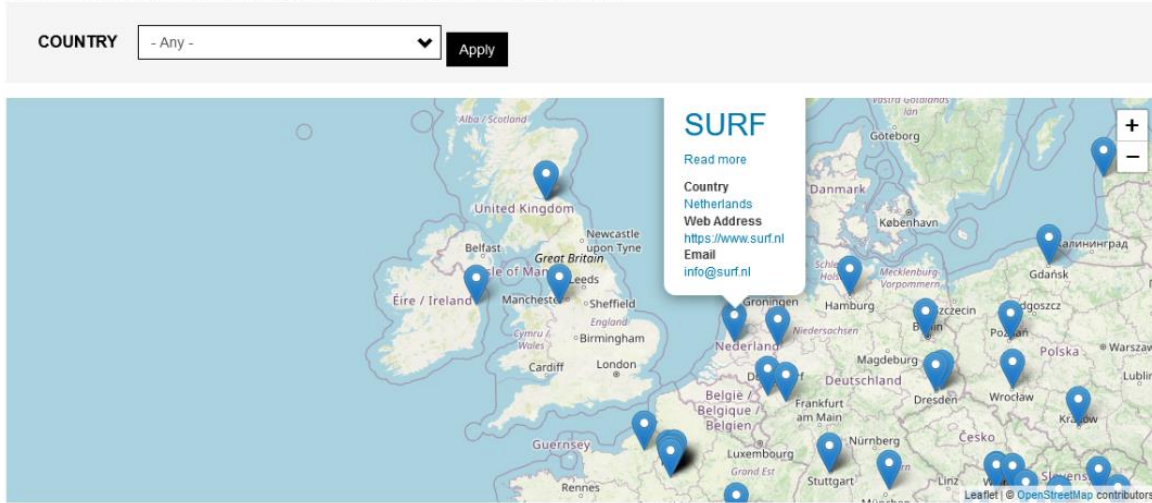


Figure 31: HPC in Europe portal – Map of the HPC, HPDA and AI training providers.

Academic Programmes

Select any combination of filters and click on "Apply" to see results.

You can select multiple values for most filters (using comma separation for predictive fields and CTRL+CLICK for lists).

Reloading the page will reset the filters.

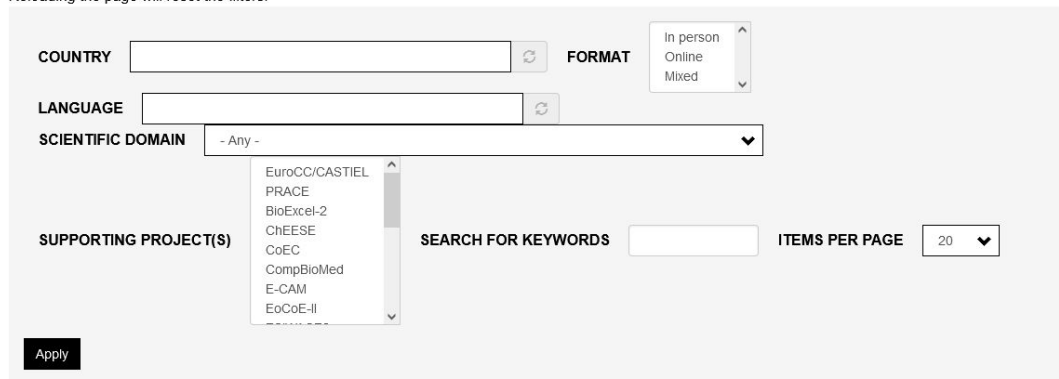


Figure 32: HPC in Europe portal – Calendar of HPC, HPDA and AI academic programmes.

Annex 3 – CASTIEL WP3 Support of Collaborations among NCCs and Reporting

Support and Trigger of Collaborations

As the mentoring and twinning programme started relatively close to summer, more interactions are expected during the second year of the project. Also, the focus of NCCs at the beginning of the project was more on competence and training mapping, therefore the mentoring and twinning will become focus in the second year of the project.

Due to the pandemic situation, all exchanges among NCCs happened online and it is expected that the majority of the interactions in the second year of the project will also happen online, which in a way facilitates the exchanges. Whenever possible, in-person interactions will take place too.

The following ways of support and trigger of collaborations were identified:

1. It is foreseen that the **NCCs will initiate** mentoring and/or twinning interactions with one another, collaborations on workshops/trainings, exchanges and other interactions without any support from CASTIEL. Information about such interactions and collaborations will be reported by the NCCs in their Technical progress reports (TPR) every quarter.
2. Possible means of proactive **support from CASTIEL WP3** in the second year of the project:
 - Putting in contact those NCCs that represent an ideal match according to the analysis of training activities.
 - Organising workshops and sharing circles for the Training champions where they will share their knowledge and experience on training-related topics. (expected frequency = once a month).
 - Supporting the 5 mentoring paths = the initial workshops, further detailed workshops, one-to-one mentoring.
 - Emailing all Training champions from time to time and reminding them of all resources, processes, material and opportunities for collaboration.
 - Providing information, being the central point for and advise the NCCs with respect to the training, twinning and mentoring.
3. Support in **collaboration with the PMT**:
 - Support of the mentoring and twinning programme – explaining the process, how to look for mentors and mentees, financial support, reporting – a meeting will be organised.
4. In addition, further support will be provided in **collaboration with CASTIEL WP2**, that identified various forms of networking preferences among NCCs:
 - Sharing specific competences, experiences and achievements mastered by a NCC.
 - Learning specific competences from other NCCs.
 - Networking (both learning and sharing) with other NCCs on a given topic.

CASTIEL WP2 collected 368 networking preferences around 66 different topics, training being one of the most often mentioned topics. WP2 has shared the results with WP3 as well as with WP4 to define the roadmap of actions to be implemented in the

second year of the project. Workshops and interactions on the identified topics will be organised in the second year of the project.

Reporting of NCC Collaborations

In order to report on all collaborations among NCCs in the deliverable D3.3 Final report on Training, Twinning and Mentoring Activities, the NCCs will provide related information in the Technical progress reports every quarter and CASTIEL WP3 will extract the necessary information from the reports.

NCCs will report on the following:

- Mentoring and twinning interactions
- Collaboration on training, workshops, other type of events
- Collaboration with regard to competences
- Collaboration/interaction regarding any topic related with industry
- Collaboration with regard to communication, dissemination and awareness
- Other - NCCs can provide information about other interactions, e.g., phone calls, one-on-one meetings.

Provided information – involved NCCs, the subject of the collaboration and expected benefits for involved NCCs and the time period of the collaboration.

Annex 4 – Amended Mentoring and Twinning Template Documents

1. A Short Description of the Planned Mentoring Activity

NCC-mentor(s) (*NCC and names of the involved people*):

NCC-mentee(s) (*NCC and names of the involved people*):

Planned dates of the mentoring activity:

Planned in-person visit: Yes / No

If YES – Planned length of the in-person visit (in days/weeks):

Section 1. Mentee(s) motivation – *Justification of the choice of the mentor(s), indication of what the mentee(s) expect to gain from this collaboration and what their motivation for the collaboration is.*

Section 2. Mentor(s) motivation - *The level of support granted by the proposed mentor(s), what the mentor(s) expects to gain from the collaboration and what their motivation for hosting the mentee(s) is.*

Section 3. Logistics - *Logistical matters such as where the visit will take place, whether accommodation is needed etc. (in case of F2F) or logistical matters in case of a virtual collaboration.*

Section 4. A detailed description of the areas of planned support (*e.g. training, outreach and collaboration with industry, academia, public sector, any other topic/area where you need support, and what the focus will be within each area; draft of the agenda if available or an outline of topics*).

2. A Short Description of the Planned Twinning Activity

NCC-A (*NCC and names of the involved people*):

NCC-B (*NCC and names of the involved people*):

Planned dates of the twinning activity:

Planned in-person visits: Yes / No

If YES – Planned length of the in-person visits (in days/weeks):

Section 1. NCC-A motivation - *Justification of the choice of NCC-B, the level of support granted by NCC-A as a mentor, indication of what NCC-A expects to gain from this collaboration and what their motivation for the collaboration is.*

Section 2. NCC-B motivation - *Justification of the choice of NCC-A, the level of support granted by NCC-B as a mentor, indication of what NCC-B expects to gain from this collaboration and what their motivation for the collaboration is.*

Section 3. Logistics - *Logistical matters such as where the visits will take place, whether accommodation is needed etc. (in case of F2F) or logistical matters in case of a virtual collaboration.*

Section 4. A detailed description of the areas of planned support *(e.g. training, outreach and collaboration with industry, academia, public sector, any other topic/area where you need support, and what the focus will be within each area; draft of the agendas if available or an outline of topics).*

3. A Short Report on the Mentoring Activity

The NCC-mentor(s) *(NCC and names of the involved people):*

The NCC-mentee(s) *(NCC and names of the involved people):*

Dates of your activity, including duration in hours/days/weeks:

A detailed description of the areas of provided support:

What were the impact and gained benefits on the side of the mentor(s)?:

What were the impact and gained benefits on the side of the mentee(s)?:

What worked well and why:

What was less effective and why:

Suggestions for improvement:

4. A Short Report on the Twinning Activity

NCC-A *(NCC and names of the involved people):*

NCC-B *(NCC and names of the involved people):*

Dates of your activity, including duration in hours/days/weeks:

A detailed description of the areas of provided support:

What were the impact and gained benefits on the side of NCC-A?:

What were the impact and gained benefits on the side of NCC-B?:

What worked well and why:

What was less effective and why:

Suggestions for improvement:

Annex 5 – Budget Application in the NCC-restricted Area on EuroCC ACCESS



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NCC Area ▾

Here you can find different forms for project specific, administrative tasks.

Download Document

The latest version of the financial guidelines for workshops, twinning and mentoring budget.

Files you will need (only for twinning and mentoring, not needed for Workshops)

Download Mentoring Document

A short description of the mentoring or twinning activity (template): Please fill out the template and upload it in the proposal form

Download Twinning Document

Download Mentoring Report Document

A short report on the mentoring or twinning activity (template): Please fill out the template after the mentoring or twinning and send it to castiel-budget@lists.projects.hirs.de and to Martina Blazkova (martina.blazkova@bsc.es)

Download Twinning Report Document

For Twinning or Mentoring

I'm applying for budget for:

Twinning

Mentoring

The Hosting/Mentoring NCC is:

Country, WP Number

The contact person at the Hosting NCC is:

The topic of mentoring/twinning activity is:

Please list all participating mentees:

Mentee 1: name, email; Mentee 2: name, email...

What is the period of the (virtual) stay?

From:

dd / mm / yyyy

Until:

dd / mm / yyyy

Please upload the budget draft as .pdf here:

Browse... No file selected.

Please upload your proposal as pdf here:

Browse... No file selected.

I agree that the data entered will be sent to the PMT of EuroCC and WP3 of CASTIEL, who will process the data in accordance with GDPR regulations.

Send

Figure 33: EuroCC ACCESS – Budget application (after the web relaunch).

Annex 6 – Summary of Events with Technology Providers

Activity	Date	Content
Presentation of the NVIDIA Deep Learning Institute	19 January 2021	NVIDIA presented the Deep Learning Institute offering, the Deep Learning Institute Ambassador programme and the NVIDIA GPU boot camps.
AMD-EuroCC Half-Day Workshop CPU/GPU	8 June 2021	CPU and GPU sessions were included. Each session covered architecture details, power and cooling considerations, software development environment and platform considerations. The last session included the next steps, where to find more material, how to engage companies like AMD in general (NDAs, timelines + roadmaps to sync with procurement timescales).
Presentation of Intel to EuroCC	14 September 2021	Intel presented its current software tools offering and strategy and its ecosystem of tools and software related training programs.
Presentation of Huawei to EuroCC	30 November 2021	The Huawei presentation focused on introducing all domain High-Performance Computing (HPC), all-scenario AI and High density and HPC storage solutions. Training and Education opportunities for Huawei's computing technologies were also mentioned.
Presentation of ConstelCom to EuroCC	18 January 2022	An online introductory presentation of the company with a presentation and a demo of its platform called Constellation®.
Intel/EuroCC Joint Workshop: Introduction to the Intel oneAPI Development Environment	16 – 17 February 2022	A follow up workshop of the introduction of Intel to EuroCC that took place in September 2021. The workshop intended to teach the participants about the latest and expanded features of the Intel oneAPI toolkits. The presenters showed the participants how to use the tools for shared and distributed computing on heterogeneous hardware platforms including Intel CPUs, Intel hardware accelerators and Intel discrete graphics solutions.

Presentation of Weka to EuroCC	22 February 2022	An online introductory presentation of the company and the Weka's data platform with a demo.
Online EuroCC Quantum Workshop by NVIDIA	27 September 2022	This afternoon workshop introduced participants to the NVIDIA solution for GPU-accelerated quantum circuit simulation, cuQuantum, embedded in three popular quantum circuit simulation frameworks. Specifically, the speakers presented a hands-on tutorial demonstrating performant classical simulation of quantum workflows, highlighting the functionality of cuQuantum's state vector and tensor network libraries, cuStateVec and cuTensorNet.
Intel/EuroCC Joint Workshop: Accelerated Machine Learning with Intel AI Software Tools	25 October 2022	In this full day workshop, the participants learned about the Intel AI Analytics toolkit and how to integrate the various optimized components into their workflow. The presenters showed how to use the tools for both classical machine learning and deep learning workflows.

Table 17: Overview of all presentations and workshops with technology and solution providers in M1-M28.

Annex 7 – CASTIEL WP3 Final Survey Questionnaire for NCCs

0%

Save a backup on your local computer (disable if you are using a public/shared computer)

CASTIEL WP3 Final Survey for NCCs

Fields marked with * are mandatory.

Disclaimer
The European Commission is not responsible for the content of questionnaires created using the EUSurvey service - it remains the sole responsibility of the form creator and manager. The use of EUSurvey service does not imply a recommendation or endorsement, by the European Commission, of the views expressed within them.

Pages: [Start](#) [Your NCC](#) [Part I.](#) [Part II.](#)

Dear Training champions,
as CASTIEL and EuroCC projects are coming to an end, we would like to get your feedback through the final survey.

The survey has two parts:
PART I. Current status of the training area in your NCC and generic questions.
PART II. Evaluation of CASTIEL WP3 - Training, Twinning and Mentoring.

Instructions on how to proceed:

- Please complete both parts answering all questions thoroughly to provide the view of your NCC. Consult the answers with the Training deputy and any other person working with you in the training area.
- It is possible to move freely between the sections even if not all questions are answered.
- It is possible to save draft (there is a button on the right side) and come back as many times as you need to.
- It is also possible to download the empty questionnaire as a PDF (see the right side) to see all questions in advance.
- In case you would like to share the survey with your colleague, please note that **only one person at a time can edit the draft**. Once you enter the information you want, save the questionnaire as a draft, choose to send the draft via email to your colleague and then close it.

How the information will be used:

- The information from Part I will be analysed and compared with the information collected in November 2020.
- Part II will be analysed and the work of CASTIEL WP3 will be evaluated.
- To validate the analysis conclusions, short discussions with every NCC will be organised.
- Afterwards, a final report will be produced from the results of both sections. This report will be confidential and will be distributed to all Training champions and deputies.
- Generalised results without any sensitive information, i.e. not mentioning the specific output of an NCC, will be included in the final deliverable D3.3 Final report on Training, Twinning and Mentoring Achievements and in the presentation for the final review.

We appreciate the time you spend with the survey and we thank you for your collaboration. The results are a valuable resource for further development of the WP3 in CASTIEL2.

Please submit the answers in 2 weeks – by 12 October 2022, EoB at the latest.

Thank you!
Don't hesitate to contact me if you have any questions.
Best regards
Martina on behalf of CASTIEL WP3

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Languages

English

Background Documents

[National Providers 2020](#)

Contact

martina.blazkova@bsc.es

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[Your NCC](#)

[Part I.](#)

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Your NCC

* 1 Please select the country you represent:

[Previous](#)

[Next](#)

PART I. Current status of the training area and generic questions

Please give us more information about the current status of the training area in your NCC:

* 2 What has been the progress of the training area in your NCC since September 2020? Please provide a brief summary and also mention the main achievements in the training area in your NCC:

* 3 Number of **all** training activities (not only EuroCC) organised by your NCC during the project duration (Sep 2020 to Dec 2022, including planned activities until December):

- 1-20 courses
- 21-40 courses
- 41-60 courses
- 61-80 courses
- 81-100 courses
- More than 100 courses

* 4 Number of training activities organised under the EuroCC brand during the project duration (Sep 2020 to Dec 2022, including planned activities until December):

- 0 courses
- 1-10 courses
- 11-20 courses
- 21-40 courses
- 41-60 courses
- 61-80 courses
- 81-100 courses
- More than 100 courses

* 5 Number of internal trainers in your NCC in the period of September 2021 - August 2022 (instructors providing a course at your NCC and working at your NCC, possibly doing a different function, e.g. research):

- 0-1 internal trainer
- 2-3 internal trainers
- 4-5 internal trainers
- 6-10 internal trainers
- More than 10 internal trainers

* 6 Number of external trainers in your NCC in the period of September 2021 - August 2022 (instructors providing a course at your NCC but not working at your NCC):

- 0-1 external trainer
- 2-3 external trainers
- 4-5 external trainers
- 6-10 external trainers
- More than 10 external trainers

* 7 Number of all attendees in all training activities organised by your NCC in the period of September 2021 - August 2022:

- 1-100 participants
- 101-200 participants
- 201-300 participants
- 301-400 participants
- 401-500 participants
- 501-600 participants
- 601-700 participants
- 701-800 participants
- 801-900 participants
- 901-1000 participants
- More than 1000 participants

* 8 Number of attendees from industry in all training activities organised by your NCC in the period of September 2021 - August 2022:

- 1-20 participants
- 21-30 participants
- 31-40 participants
- 41-50 participants
- 51-60 participants
- 61-70 participants
- 71-80 participants
- 81-90 participants
- 91-100 participants

* 9 Average percentage of women as attendees in the period of September 2021 - August 2022:

- 0-10 %
- 11-20 %
- 21-30 %
- 31-40 %
- 41-50 %
- 51-60 %
- 61-70 %
- 71-80 %
- 81-90 %
- 91-100 %
- Not known

* 10 What constraints or obstacles related to the training offers/activities does your NCC currently have? Please explain in detail.

* 11 What needs does your NCC currently have in connection with the training offers/activities? Please explain in detail.

12 What else would you like to mention about the current status of the training area in your NCC?

* 13 At this stage, would your NCC welcome support and/or guidance in the area of training from more experienced/mature organizations?

- Yes
- No
- Maybe

* 14 Please mention what kind of support and/or guidance you would welcome.

* 15 You mentioned "Maybe". Please provide more details:

* 16 Do your internal trainers receive a specific education on creating and running training activities?

- Yes
- No
- Other

* 17 You mentioned "Other". Please provide more details:

* 18 Does your NCC have its own space for hosting your training activities?

- Yes
- No
- Other

* 19 You mentioned "Other". Please provide more details:

* 20 Does your NCC have a specific training IT infrastructure?

- Yes
- No
- Other

* 21 You mentioned "Other". Please provide more details:

* 22 What are the advertising/promotional channels for your training activities? (Please select all that apply)

- Email, mailing lists
- Centre's webpage
- Social media (LinkedIn, Twitter, Facebook, YouTube)
- University(ies) website(s)
- Newsletter
- Other websites (PRACE training portal, other training portals)
- Direct contacts, word-of-mouth
- Print media
- University weekly journal
- Events
- Press releases
- Other

* 23 You mentioned "Other". Please provide more details:

* 24 Who are the national/local key training providers in the areas of HPC, HPDA and AI in your country?
You can check in the Background documents on the right side what key providers you mentioned last time.

Please write the names of all national/local key training providers:

That was all for Part I. Thank you for the information. Let's continue with Part II - Evaluation of CASTIEL WP3 and its activities.

Previous

Next

PART II. Evaluation of CASTIEL WP3 - Training, Twinning and Mentoring

* 25 How did your NCC profit from CASTIEL WP3 – Training, Twinning and Mentoring? Please describe in detail:

26 What activities done/organised/offered by CASTIEL WP3 – Training, Twinning and Mentoring were helpful/useful and which ones were less helpful/useful and why?

Please select "Yes" if the activity was helpful or "No" if it was less helpful and write the reason (only for less helpful activities).

We add links to BSCW where you can see more details about each point if you need.

Activities	Helpful/Useful	If not helpful - please state the reason(s)
Organising meetings, discussions, speed dating session with Training champions/deputies to present ideas, proposals, to get feedback, to start collaborations, to exchange experiences, etc. https://bscw.hlr.de/sec/bscw.cgi/241791	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Training mapping across NCCs and its analysis	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Designing the Mentoring and twinning programme and process, incl. the mentoring and twinning questionnaire. https://bscw.hlr.de/sec/bscw.cgi/376743	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Designing and distributing the Financial guidelines and mentoring and twinning document templates incl. the final reports. https://www.eurocc-access.eu/budget/	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Creating and distributing the supportive documents to find a mentor/mentee (twinning by country, mentoring and twinning by topic and country) https://bscw.hlr.de/sec/bscw.cgi/357078	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Support with mentoring and twinning (connecting with other NCCs, help with the application, with budget proposal, etc.)	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Enabling sharing of experiences among NCCs via events for Training champions/deputies (Train the trainer, Training best practice seminar, Sharing circle for in-person and online courses) https://bscw.hlr.de/sec/bscw.cgi/241791	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Providing information, best practices, summary reports and other relevant material, resources, training events available in other countries via email and shared on EuroCC ACCESS, BSCW, Training matrix. https://www.eurocc-access.eu/services/resources/ , https://www.eurocc-access.eu/training-matrix/ , https://bscw.hlr.de/sec/bscw.cgi/241791	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Creating, maintaining and improving the Training page on EuroCC ACCESS. https://www.eurocc-access.eu/services/training/	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Improving the Training section of the HPC in Europe portal. https://hpc-portal.eu	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Creating and maintaining the Training matrix. https://www.eurocc-access.eu/training-matrix/	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>
Giving support to the industrial HPC course co-created by NCCs	* <input type="radio"/> Yes <input type="radio"/> No	<div style="border: 1px solid black; height: 20px; width: 80px;"></div>



Designing the EuroCC Training Baseline proposal. https://bscw.hlr.de/sec/bscw.cgi/650406	* <input type="radio"/> Yes <input type="radio"/> No	<input type="text"/>
Organising presentations and workshops with technology providers. https://bscw.hlr.de/sec/bscw.cgi/413411	* <input type="radio"/> Yes <input type="radio"/> No	<input type="text"/>
Organising Mentoring workshops on 5 topics. https://bscw.hlr.de/sec/bscw.cgi/404512	* <input type="radio"/> Yes <input type="radio"/> No	<input type="text"/>
Anything else that we didn't mention and it was helpful/useful (Please let us know more details):	 <input type="radio"/> Yes <input type="radio"/> No	<input type="text"/>

* 27 Did your NCC need or would your NCC have liked more support from CASTIEL WP3 during the project duration?

- Yes
 No

* 28 Please share with us what kind of support would your NCC have liked or needed from CASTIEL WP3 during the last two years?

* 29 What has been stopping your NCC from having more mentoring and/or twinning interactions with other NCCs? Please explain in detail any barriers to mentoring/twinning that your NCC encountered:

* 30 In your opinion, what was effective in the mentoring and twinning programme? Why?

* 31 In your opinion, what was less effective in the mentoring and twinning programme? Why?

* 32 How could the mentoring and twinning programme be improved?

33 What else would you like to say about our work, activities, support or anything else in general?

You reached the end. Thank you very much for your participation. We really appreciate your time! We will inform you about the short discussions and the final report in due course. If there is still something that you would like to tell us, let us know via email: castiel-workpackage3@lists.projects.hlr.de.

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Annex 8 – List of Reported Key National Training Providers in HPC, HPDA and AI

Country	Who are the national/local key training providers in the areas of HPC, HPDA and AI in your country? Please write the names of all national/local key training providers:	Number of providers
Austria	VSC Research Center, TU Wien Know-Center GmbH, Graz Research Center High Performance Computing, Research Area Scientific Computing, University of Innsbruck	3
Belgium	HPC centres from all Belgian universities belonging to the VSC and CECI virtual organisations.	10
Bulgaria	Sofia University St. Kliment Ohridski (a LTP of the NCC BG) provides training in HPC/HPDA/AI IICT-BAS provides training in HPC University of National and World Economy provides training in HPDA Bourgas University Asen Zlatarov provides training in AI for the region at the Black Sea Russe University provides training in Big Data analytics for archeology	5
Croatia	University of Zagreb, Faculty of Electrical Engineering and Computing University of Zagreb, University Computing Centre J.J. Strossmayer University of Osijek, Faculty of Electrical Engineering, Computer Science and Information Technology Ruđer Bošković Institute University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture University of Rijeka, Faculty of Engineering University of Rijeka Croatian National Competence Center for HPC	8
Cyprus	The NCC is this entity for Cyprus. There are no real other training providers in these fields	1
Czech Republic	IT4Innovations, the NCC/CZ which is the national supercomputing centre and only provider of HPC related training services.	1
Denmark	DTU KU AAU RUC AU CBS SDU ITU	8

Estonia	University of Tartu TalTech	2
Finland	CSC - IT Center for Science Ltd. (NCC Finland) Certain universities and polytechnics Reaktor	7
France	Telecom Paris Tech/ENSTA Paris Tech Université de la Sorbonne Université de Bourgogne ISAE SupAéro Toulouse Université Aix Marseille et Centrale Marseille Université Fédérale de Toulouse : Université Toulouse III Paul Sabatier Institut Léonard de Vinci Université de Versailles Saint-Quentin Université de Reims Champagne-Ardenne Université Paris Saclay Institut Polytechnique de Paris Mines Paris Tech Inria CNRS CRIANN Université Grenoble Alpes Triscale Innov Cerfacs	18
Germany	Jülich Supercomputing Centre High Performance Computing Center Stuttgart Leibniz Supercomputing Centre	3
Greece	GRNET	1
Hungary	KIFÜ University of Debrecen University of Győr University of Pécs University of Miskolc BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS UNIVERSITY OF PANNONIA	7
Iceland	The Icelandic High-Performance Computing (IHPC) University of Iceland University of Reykjavik	3
Ireland	Irish Centre for High-End Computing (ICHEC) University of Galway Trinity College Dublin (TCD) University of Limerick (UL) University College Dublin (UCD)	5
Italy	CINECA	1

Latvia	The biggest universities, including Riga Technical University and University of Latvia- part of the NCC Latvia	7
Lithuania	NCC Lithuania Vilnius University	2
Luxembourg	Luxembourg University LuxProvide PwC (AI related courses)	3
Montenegro	Universities IT companies Other (Cluster, Association)	7
Netherlands	SURF (NCC) The ResearchData facility from the 4TU collaboration The Data Archiving facility from the Royal Dutch Academy of Sciences The Netherlands eScience Center The Dutch Techcentre for Life Sciences Universities and research centres in the Netherlands	6
North Macedonia	FCSE-UKIM	1
Norway	Sigma2 NORA - Norwegian Artificial Intelligence Research Consortium	2
Poland	Cyfronet, PSNC, Wrocław Centre for Networking and Supercomputing at Wrocław University of Science and Technology (WCSS) ICM UW, CI TASK, NCBJ	6
Portugal	High Performance Computing Centre, University of Evora - HPCUE Centre Advanced Computing Laboratory, University of Coimbra - UC-LCA National Infrastructure for Distributed Computing - INCD Minho Advanced Computing Centre - MACC	4
Romania	Cluster Power University Politehnica of Bucharest West University of Timisoara Technical University of Cluj-Napoca Babes Bolyai University Politehnica University of Timisoara Oracle Romania INCAS - The National Institute for Aerospace Research "Elie Carafoli"	8

Slovakia	Slovak Academy of Sciences Slovak University of Technology in Bratislava Comenius University in Bratislava Technical University of Košice University of Žilina Matej Bel University in Banská Bystrica IT Academy	8
Slovenia	University of Ljubljana University of Maribor JSI institute	3
Spain	BSC UPC UNICAN SCAYLE CSUC COMPUTAEX CESGA IAC-ULL Spanish Supercomputing Network (RES)	9
Sweden	SNIC - Swedish National Infrastructure of Computing, composed of 6 individual HPC centres: - HPC2N, Umeå - NSC, Linköping - UPPMAX, Uppsala - PDC, Stockholm - C3SE, Gothenburg - LUNARC, Lund RISE - Research Institutes Sweden SeRC - Swedish e-science Research Collaboration eSENCE - The e-science collaboration NBIS - National Bioinformatics Infrastructure Sweden CodeRefinery	11
Switzerland	CSCS (ETH Zurich), Swiss Universities Some of the members of The Swiss HPC Service Provider Community	15
Turkey	UHEM TRUBA.	2
United Kingdom	EPCC STFC-Hartree Centre Alan Turing Institute Centre for Scientific Computing, University of Cambridge (HPC Autumn Academy) University of Bristol, Advanced Computing Research Centre	5