

**H2020-JTI-EuroHPC-2019-2**



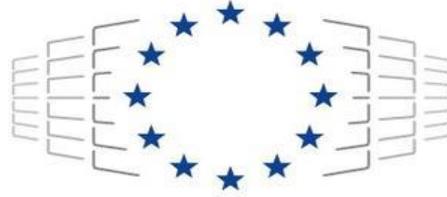
**CASTIEL – Coordination & Support  
for National Competence Centres on a European Level**

**Project Number: 951740**

**D2.1**

**The initial version of the Competence Map**

Deliverable D2.1 V1.0 is currently under review by the European funding agency and is therefore subject to change. The current version V3.0 already contains amendments.



**EuroHPC**  
Joint Undertaking

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## **List of abbreviations**

AI	Artificial intelligence
CoE	Centres of Excellence
HPC	High-performance computing
HR	Human Resources
BD	Big Data
NCC	National Competence Centre
WP	Work package
ICM	Initial Competence Map
KPI	Key Performance Indicator

## Executive Summary

The Coordination and Support Action CASTIEL is aimed at facilitating and accelerating the EuroCC project's results throughout the 33 National Competence Centres (NCCs) across Europe.

The objectives of CASTIEL WP2 are:

1. To produce an initial competence map by categorizing and clustering the competences of all the national Competence Centres.
2. To maintain the competence map during the project lifetime.
3. To identify topics of interests for focused events and to organize and execute those events.
4. To identify further mechanisms of networking.

As per the objective 1 above, we developed a questionnaire to collect elements for the Initial Competence Map (ICM).

The questionnaire was proposed to the NCCs' representatives and reviewed according to the inputs received. The questionnaire resulted from this exercise has been sent out to the NCC Competence Champions (the representatives of every NCC responsible for the topic of competence mapping) to gather the information and data.

By the deadline for the presentation of the current Deliverable, it was possible to analyse the answers to the ICM provided by 47 legal entities out of 108 participating to the EuroCC project.

Results of this partial survey are provided in the document, including the composition of the sample.

Based on answers received, useful elements can be retrieved for the roadmap definition, including but not limited to twinning and clustering activities among the different NCCs to share and reinforce competences or to retrieve best practices in the collaboration and service provisioning to specific user sectors.

Some important results can be also derived in terms of how to evolve the ICM in a further version in the next months. This results will be valuable input for the definition of the updated version of the competence map to be defined in collaboration with the NCC Competence Champions in the next months.

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## 1. Introduction

The Coordination and Support Action CASTIEL is aimed at facilitating and accelerating the EuroCC project's results throughout the 33 NCCs across Europe. This activity is performed in close collaboration among the three WPs: WP2 focuses on the competences available in the EuroCC network, WP3 focuses on training, WP4 focuses on collaboration with industry.

The objectives of CASTIEL WP2 are:

1. To produce an initial competence map (ICM) by categorizing and clustering the competences of all National Competence Centres (NCCs).
2. To maintain the competence map during the project lifetime.
3. To identify topics of interests for focused events and to organize and execute those events.
4. To identify further mechanisms of networking.

To do so, the state of play on competences is a fundamental piece of information to set the scene, for both projects (EuroCC and CASTIEL), to support cooperation and sharing of experience, knowledge, and information among NCCs.

The sharing of competences and the cooperation among NCCs is relevant to boost their achievements at the national level. Mapping specific competences initially and throughout the project allows NCCs to get to know each other better, to know how they can leverage each other's experience, competence and information, in order to achieve their project goals at the national level.

Therefore, we developed a questionnaire to collect elements for the Initial Competence Map (ICM).

The questionnaire was proposed to the NCCs' representatives and reviewed according to the inputs received. The questionnaire resulted from this exercise has been sent out to the NCC Competence Champions to gather the information and data.

Section 2 describes our strategy and our approach toward the competence maps.

Section 3 describes how the data has been collected, and in Section 4 we illustrate the results.

Section 5 provides the next steps concerning the competence mapping activities.

## 2. Competence map strategy

Ideally, the competence mapping exercise shall help NCCs to understand which competences are available within the network, how these competences can help to achieve their goals and finally which areas can be used for competence improvement.

In the frame of the CASTIEL project, the term competences mean any element of value, tangible or intangible, that can support the users in the research, adoption, and exploitation of HPC, Big Data and Artificial Intelligence (AI) technologies. The term also includes skills, capabilities, assets, and resources.

Through the competence mapping exercise each NCC (in most cases) shall find out at least one or two corners of improvement. That done, the NCC should include such improvements and how to achieve them in the NCC roadmap. In some situations, the means to achieve the competence improvement could be achieved in twinning and clustering with other NCCs – the ones that, based on the competence mapping, can express the competences required.

If this valuable mechanism is not activated, the ICM will only reach the goal of tracing a state of play that could be of use for external stakeholders and for the general public – which is a valuable result by itself.

To this end, the competence map strategy is conceived as an evolving survey at increasing levels of detail throughout the project duration –this increasing level of detail reached via a step by step, bottom-up like approach. Each NCC competence Champion is invited to suggest additional pieces of information, or dimensions on which to drill down the competence gathering. Clearly, such an approach will produce good results only if a collaborative, and constructive approach is contributed by NCCs and by NCC Competence Champions.

The final structure of the ICM agreed on among NCCs, can also be used to map competences at the national level involving other legal entities complementing and fostering the NCC. The detailed structure of the ICM is reported in Annex 1.1.

The ICM is conceived to collect data and information at the level of each single legal entity being involved in an NCC.

This allows:

- On the one side, an appropriate period to build the competence map at the national level.
- On the other side, to retrieve information at a granularity level which is affordable to collect for NCCs.

### 2.1 Considerations on the structure of the NCCs and the typology of legal entities

For some legal entities it is difficult to distinguish which competences (both assets, and human resources) are part of the NCC in comparison to the ones being outside of the NCC. This especially applies to those entities such as general-purpose centres of research and universities, private companies, and public entities not specifically created for HPC, Big Data and AI research and projects.

This is an additional reason why setting the ICM retrieval basis at the legal entity level has been deemed a good trade-off by the WP2 and the WP2 champions participating in the discussion: not to put too much burden on the side of the respondents, also considering the challenging deadline to meet the M3 due date for the present Deliverable 2.1.

Nonetheless, such a retrieval basis puts some level of complexity on the side of the WP2 team because a synthesis of the information gathered shall anyway be performed at some point in time. The synthesis at the NCC level will be performed after the release of the current Deliverable, following the discussion with the Competence Champions on the data visualization (contents, visualization tools, level of granularity).

For some of the data gathered, the synthesis at the NCC level is easy, for others, it is in fact necessary to make a choice: such choices shall be shared choices among the project participants.

Another relevant consideration is needed to address those legal entities which are associations (or any different type of regrouping of legal entities on a continuing basis) bringing together academia and / or research centres, public legal entities, private legal entities or a combination of those categories. Associations often do not express competences at the grouping level, but they express competences at the single associate / member level. That said, the ICM does not do them justice, but a better balance will be achieved for the updated competence map due by M12 and M24, respectively in D2.2 and D2.3, when the whole respective national level of competences will be mapped in each participating country of the EuroCC project.

## 2.2 Competence mapping objectives

### 1) Inform:

The first overall result of the initial competence mapping is to inform stakeholders who are not within the EuroCC and CASTIEL projects about the competences that are available within NCCs.

The above-mentioned stakeholders are not limited to the general public, but they also include legal entities belonging to academia, the public sector and private sector being interested in accessing HPC, Big Data and AI competences, best practices and facilities or in being involved in the respective NCC.

### 2) Awareness creation of the competences available within the network:

The awareness of the competences available within the network is one of the most important results of the competence mapping exercise. This awareness helps NCCs understand competences relevant to reach their goals and define their roadmap. Every NCC can start from a self-awareness step, and based on that, create the roadmap to evolve in the short and long-term.

### 3) Establish cooperation:

Once the NCC has built one's own relative positioning, the NCC can plan the actions in order to achieve its goals based on the competences that the NCC and the network can express. The principal tools in this respect are twinning, clustering and mentoring activities among NCCs. Specific topics not covered elsewhere can be also analysed in specific networking sessions.

### 4) Feed the NCC roadmap

The main aspects resulting from steps 3 and 4 will serve as raw material to feed the NCC's roadmap throughout the duration of the project.

Objective	Synthetic description
<b>Inform</b>	Inform stakeholders not involved in the EuroCC project.

<b>Awareness of network competences</b>	Understand competences relevant to reach the NCC goals and define roadmap.
<b>Establish cooperation</b>	Connecting with other NCCs and start twinning, clustering, and mentoring activities.
<b>Feed the NCC Roadmap</b>	Plan actions in the roadmap, both in terms of cooperation with other NCCs and in terms of autonomous actions to reinforce competences.

**Table 1: Synthetic view of the objectives of the Competence Map.**

## 2.3 The Initial Competence map structure

The Initial Competence Map is divided into six sections plus an initial Section 0. The content of each section is described below, and the detailed structure of the ICM is provided in Annex 1.

<b>Section #</b>	<b>Content</b>
<b>Section 0</b>	Is dedicated to collect basic identification and contact information on the legal entity.
<b>Section 1</b>	Includes technical and technological assets, as well as specialized skills of the human resources (HR) of the legal entity, meaning skills on Big Data, AI and HPC.
<b>Section 2</b>	Contains one question, dedicated to the availability of HR competence evaluation tools within the legal entity. Such tools may be of different typologies but they are useful to understand what is the state of play in terms of internal skills and to define KPIs to measure, for instance, the impact of internal trainings or hiring campaigns.
<b>Section 3</b>	Groups some high level questions on training courses being delivered by the legal entity.
<b>Section 4</b>	Includes questions on both self-assessed excellent competencies, on the one hand, and needs in competencies, on the other hand.
<b>Section 5</b>	Meant to describe the breadth and depth of the project portfolio of the legal entity.
<b>Section 6</b>	Aims at describing the network of the legal entities in terms of relationships with the HPC, Big Data and AI European ecosystem.

**Table 2: Initial Competence Map Structure.**

## 2.4 The data retrieval methodology

For the collection of the ICM, contributions were collected by providing to each legal entity an excel sheet to fill in, the one enclosed in Annex 1. To guide the completion step and to facilitate the data processing, where possible the fields were provided with a drop-down menu of possible values. Domains were provided with the value: “other” to accommodate options that could not be captured in a fixed and limited domain of choices.

## **2.5 The methodology for defining the questions of the questionnaire**

A rich list of questions useful to assess competences on a quantitative basis and to also cover the aspects related to collaboration with industry was proposed to the NCCs representatives and agreed on within CASTIEL's WP2. The list of questions originates from the experience achieved in years of activity and of collaboration with industry in the specific sector of HPC.

This questionnaire, available in Annex 1.2, was presented and distributed to NCCs representatives and feedback was collected both through written feedback and an open discussion. Some positive and constructive feedback was gathered: some feedback was, for instance, directed at the too high complexity of the questionnaire.

After this initial step, together with the CASTIEL partners it was agreed to simplify the questionnaire, retaining as much as possible of its structure, to facilitate a bottom-up approach and the teamwork with the NCC Competence Champions. At the same time, it was agreed to carry out separate questionnaires on training and collaboration with industry. These questionnaires were sent out to the NCC representatives for feedback and were considered feasible (please refer to Annex 1.1).

## 3. Data

### 3.1 Analysis of responses

The ICM was proposed by the CASTIEL WP2 and discussed with the NCC Competence Champions during two calls before issuing it in its final format on October 23<sup>rd</sup>. The NCC Competence Champions were provided with a two-weeks' timeframe to provide the filled-in survey. Due to this short deadline, of a total of 108 legal entities participating in EuroCC, 47 responses were submitted until November 9th, 2020 (roughly 44% of the total), distributed across 18 NCCs (WPs of EuroCC).

In some cases, only a part of the legal entities constituting the NCC provided their inputs in time for the present Deliverable 2.1. Provided that the number of respondents is not sufficient for a comprehensive mapping of the NCCs, the analysis in the present document is only provided on absolute figures. Missing contributions received long after the deadline will be included in the visualization of the results of the ICM and in the updates of this deliverable (at M12 and M24), and will be available through the EuroCC/CASTIEL gate.

One respondent asked to keep a portion of answers private. These answers will be considered only statistically, and not processed in association with the identity of the respondent.

### 3.2 Considerations on data quality

Provided that the ICM is high-level and focused on qualitative answers, it is impossible to have counter-proof questions, thus the quality of answers cannot be easily checked a priori.

However, certain congruency checks can still be performed. Answers in sections where the first answer is “no” (i.e.: First question is “does the legal entity have competencies on Big Data? “) have been ignored, or “no” has been changed into “yes” depending on the specific sections (the same approach was adopted for all respondents of the given section).

In those situations, where the answers in the questionnaire were indicated outside of the given categories (e.g., the answer was “25” but the category was 1-50, as in thresholds of people being skilled in a specific competence; or: yeah/nope changed to yes/no), answers have been recorded to fit the categories that had been previously defined.

Collecting data on resources allows to understand competences on specific hardware knowledge and programming on an objective basis, improving the quality of the data.

An analysis of outliers will be performed once a more complete set of answers is available, surely before publishing a visualization map.

## 4. Results of the Initial Competence Map

In this section, we present the data collected via this first initial survey. Since data is not representative of the whole NCC network, we will illustrate results, without an in-depth quantitative analysis, and without deriving conclusions.

However, an initial analysis allowed to draw some preliminary considerations that are provided, after the correspondent figures, in the next paragraphs.

### 4.1 Section 0 – Description of the legal entity

All 47 respondents have a website, 36 have a LinkedIn page and 31 a Twitter account.

41 respondents are public entities, 6 are private.

Among the 41 public entities: 24 are Universities, 12 are Research Centres, 3 are Associations, 1 is in Industry and 1 is another type of Legal Entity (higher education).

Among the 6 private entities: 3 are in Industry / Private Companies, 1 is an Association, 1 is a University and 1 is a Research Centre.

Grouped by type of organisation, respondents are:

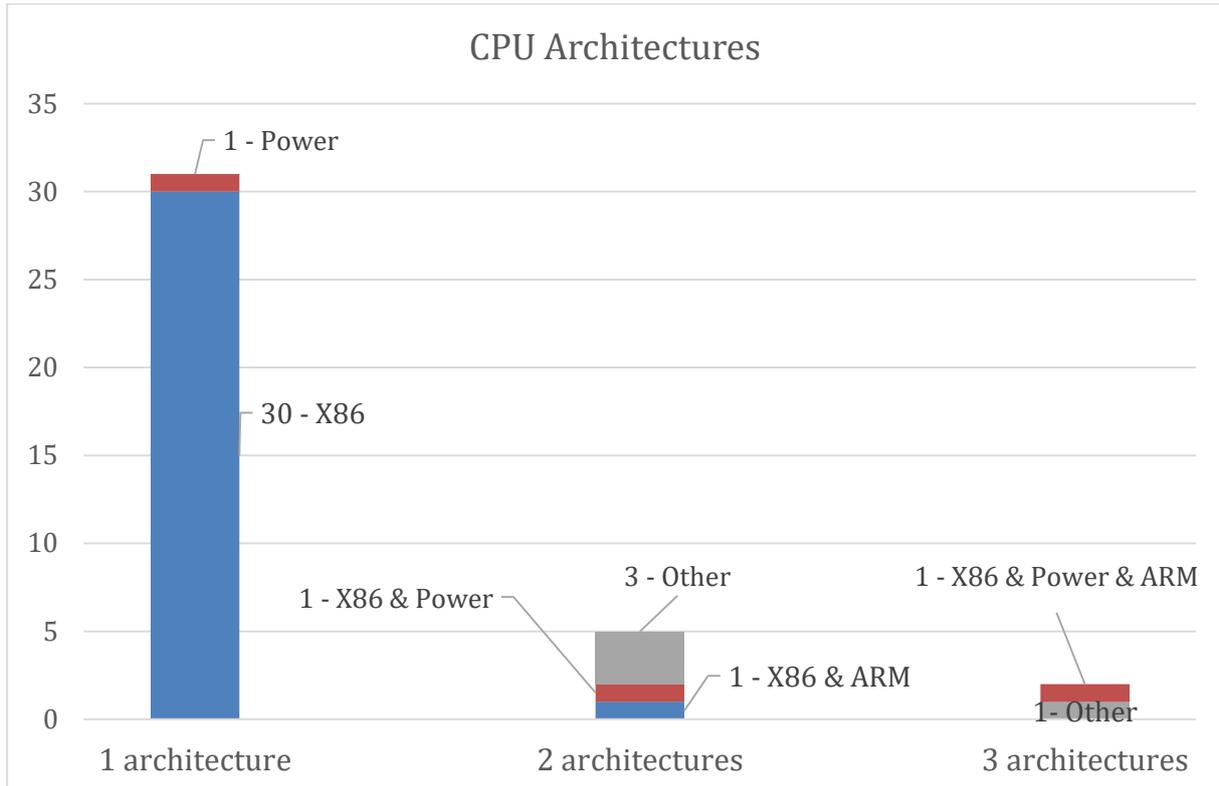
- 25 Universities
- 13 Research Centres
- 4 Associations
- 4 Industry / Private Companies
- 1 is of other typology.

### 4.2 Section 1 – Technical skills, assets, and resources

38 respondents out of 47 own a HPC infrastructure; 15 of these HPC centres are classified in the Top500 list.

32 out of 38 HPC infrastructures are based on a single CPU architecture, 4 on 2 different ones, and 2 on 3 different architectures.

More detailed information on the type of CPU architectures available in combination is provided in Figure 1.

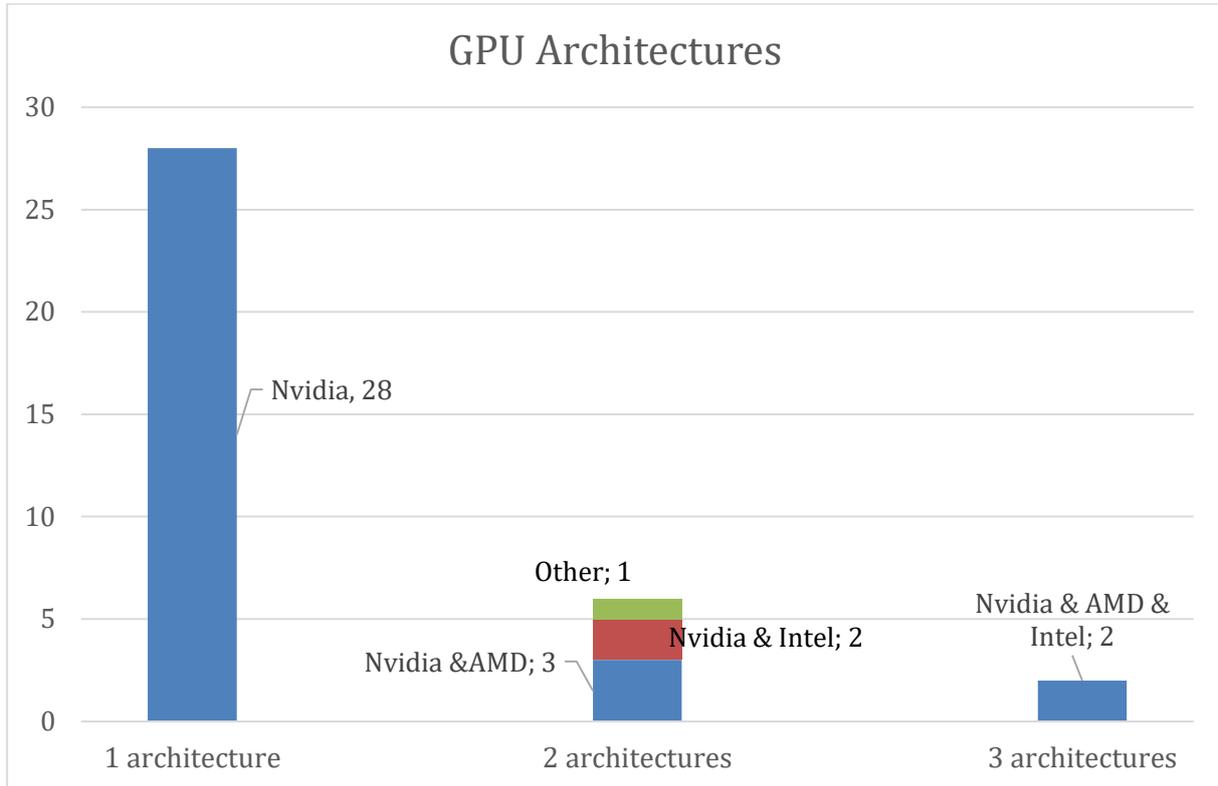


**Figure 1: Number of different CPU architectures per single HPC data centre.**

35 out of 38 HPC infrastructures also have GPUs:

- 28 have a single GPU architecture
- 6 have two different GPU architectures
- 1 has three different GPU architectures

More detailed information on the type of CPU architectures available in combination is provided in Figure 2.



**Figure 2: Number of different GPU architectures per single HPC data centre.**

7 out of 38 HPC infrastructures also have FPGAs:

- 3 have Intel.
- 1 has Xilinx.
- 1 has Intel & Xilinx.
- 2 have other combinations of architecture.

2 out of 38 legal entities running an HPC infrastructure, provide access to quantum computing resources.

29 out of 38 legal entities running an HPC infrastructure, have a cloud infrastructure as well. Among these, 11 have a private, 3 have a public and 15 have both private and public cloud infrastructures.

36 respondents manage their own data centres and 34 out of those run a control access system. Accesses to locals of the computing centre are restricted in all cases, as well anti intrusion safeguards are in place in all HPC centres directly managed.

As a preliminary consideration, we can see from this initial analysis that, collecting the availability of specific hardware, highlights specific competences available in the network. This gives the possibility to have a technology watch, at the EuroCC network level, relevant for the NCCs and their end users, and especially those who buy HPC technology and need to assess them.

This mapping can be extended together with the WP2 Champions to other elements of the available and future infrastructures in order to build a complete and updated map of the available technologies, and thus competences, across the EuroCC network.

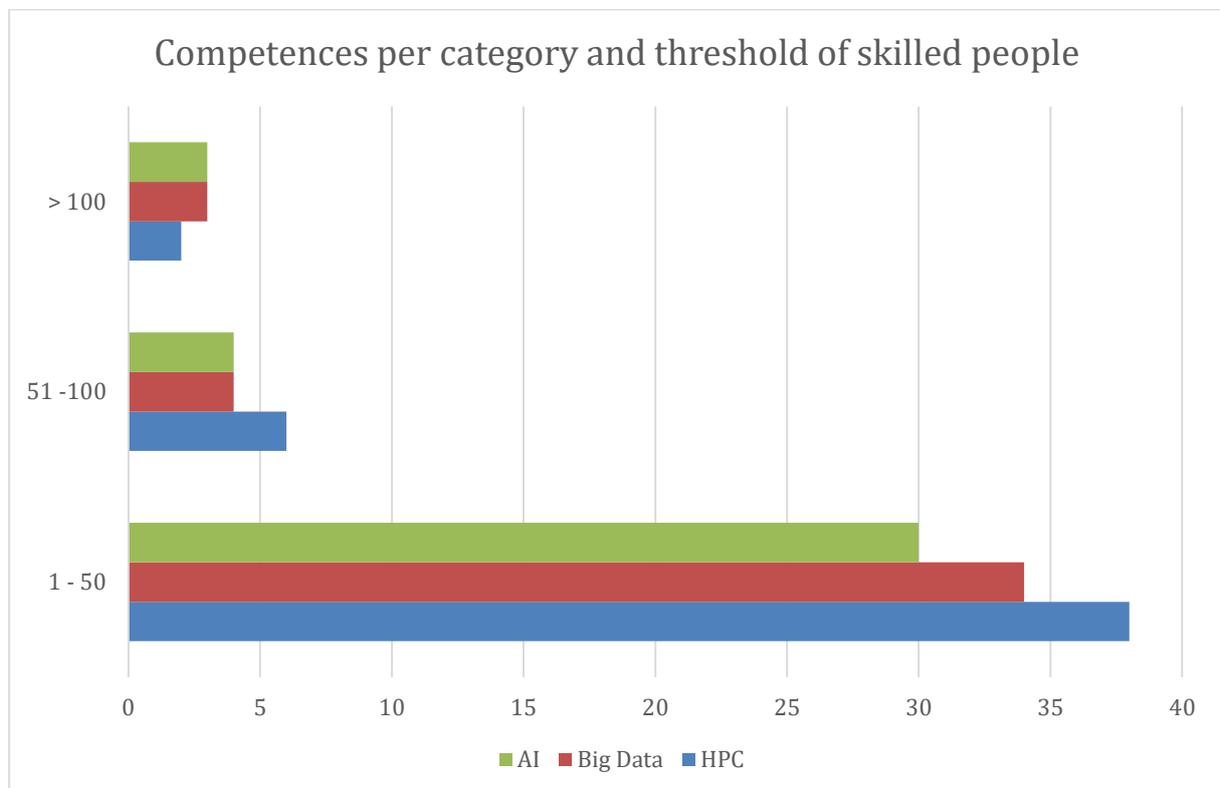
In terms of skills the ICM asks similar questions around the 3 competence areas covered by the project: HPC, Big Data, and AI.

As far as HPC skills are concerned, 46 respondents out of 47 declared to have such competencies internally.

Big Data skills are present in 41 out of 47 legal entities.

As far as AI competencies are concerned, 37 respondents out of 47 declared to have such competencies within their organisation.

Figure 3 represents the distribution of skills in the legal entities with respect to the competence categories (HPC, Big data and AI) and with respect to the threshold of skilled people.

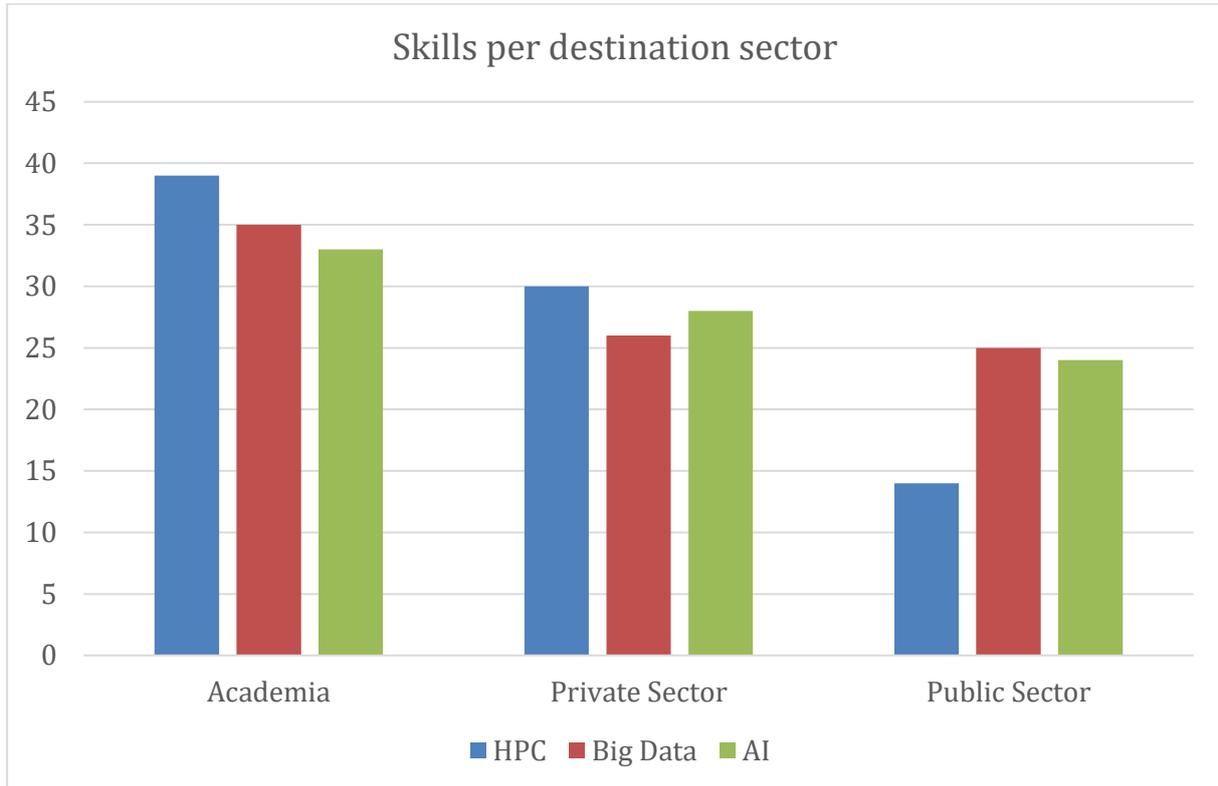


**Figure 3: Competences grouped per competence category and per number of skilled people.**

**Ranges are: 1- 50 people; 51- 100 people; more than 100 people.**

As a preliminary consideration, we can observe that collecting data about the number of people having competences in a specific field (HPC, HPDA, AI) provides us with information on the size of the NCCs. This element, once correlated with the information on the volume of activities of the different NCCs, could help each NCC to position itself with respect to the network. From this positioning analysis, each NCC could gain quantitative indicators on how much they need to grow to reach their objectives.

Figure 4 represents how the legal entities address the internal skills in terms of final user sector (academia, private sector or public sector).



**Figure 4: Distribution of skills per sector of destination.**

In addition, collecting information on the different target user (academia, public sector, private sector) shows that most respondents target all the sectors. Having such a piece of information across all the network of NCCs could allow us to understand whether one of the target sectors dominates over the others.

Detailed information on the collaboration with industry and the different industrial sectors currently served by the NCCs will be collected by CASTIEL WP4 and is an input of this competence map of the EuroCC network.

### **4.3 Section 2 - Basic organisational competencies**

18 legal entities out of 47 have an internal HR methodology to map skills and competencies.

### **4.4 Section 3 - Training**

Out of a total number of 47 respondents:

- 33 have a training program or training courses on HPC
- 29 have a training program or training courses on Big Data
- 30 have a training program or training courses on AI.

#### 4.5 Section 4.1 - Excellent Competencies

The ICM here asks to mention a maximum of three competencies for which the legal entity is considered excellent, for each of the competence category: HPC, Big Data and AI.

The following table represents the most frequent combinations of excellent competences expressed by the respondents. The complete set of combinations is reported in Annex 3.

To read the map:

A = academia

Pu = public sector

Pr = private sector

O = other

The table shall be read as follows:

AAA means that the legal entities expressed three excellent competencies, all three in academia. For instance, 2 at the crossroad between first row (AAA) and first column (HPC) of the table means exactly that 2 legal entities expressed that they excel in three HPC competencies, all three being academia end-users.

To make another example, 2 at the crossroad between the row (A) and last column (AI) means that two legal entities expressed that they excel in only one AI competence, in academia.

Combination of excellent competences	HPC	Big Data	AI
<b>APuPr</b>	9	9	9
<b>A</b>	5	4	2
<b>AAA</b>	2	0	5
<b>AA</b>	1	2	4
<b>Pr</b>	2	3	2

**Table 3: Most frequent combination of excellent competences provided by the respondents.**

This means that most frequently, NCCs' excellent competences address both HPC, Big Data and AI, towards both academia, public sector and private sector.

After the most frequent combination, NCC's excellent competences are polarized towards academia, both within the HPC and AI types of competences.

#### 4.6 Section 4.2 - Needed competencies

The ICM asks to mention a maximum of three competences for which the legal entity feels the need to improve its services and / or activities. The section is divided in two sub-sections, to allow the respondent to indicate which needs in competences are to be covered through new hiring and which can be covered by re-training existing staff. For each need in competence, the

legal entity is asked to provide the competence category: HPC, Big Data and AI and eventually the user sector to which this competence shall be specialized (academia, public sector, private sector).

Hereinafter follows the distribution of responses with respect to the most frequent combinations expressed, given that some respondents did not provide the user sector of specialization (or if they stated “other” to indicate mainly all user sectors) and some other stated different kinds of competences (in such cases the competences that were given as answers are not included in the synthesis below).

**Since a significant number of respondents included a note to describe the competence needed on a greater level of detail than the one specified in the survey, this aspect shall be analysed in more depth in the next edition of the competence map.**

Needs in competences are grouped by modality of need fulfilment, that is: hiring new personnel versus re-training existing staff.

Table 4 shows the number of answers received per category plus the user sector of specialization in brackets, where:

A = academia

Pu = public sector

Pr = private sector

\* = any user sector or other (including all user sectors).

For instance, HPC(A) means competence on HPC, specialized to serve the academia.

Competence (user sector)	Means to fill the competence gap		Total hits in training needs
	New hiring	Re-training existing staff	
HPC (*)	8	11	19
AI (*)	13	6	19
AI (Pr)	13	6	19
HPC (Pu)	12	6	18
AI (A)	2	15	17
BD (*)	10	7	17

**Table 4: Most frequent hit combinations of needs in competences.**

#### 4.7 Section 5 - Project portfolio

18 out of 47 respondents have ongoing global projects:

- 43 respondents have ongoing European projects
- 43 respondents have ongoing national projects
- 38 legal entities have ongoing projects with the private sector / industry.
- 22 respondents have ongoing mobility projects.

#### **4.8 Section 6 - Relations with the ecosystem**

The last section of the ICM is dedicated to the description of the network of the legal entity with respect to the HPC, Big Data and AI European ecosystem.

26 out of 47 legal entities indicated at least one EU centre of excellence (CoE) or Association with which the legal entity itself is involved.

The three CoEs or Associations which are most linked to the respondent legal entities are:

1. PRACE (15 respondents)
2. ETP4HPC (11 respondents)
3. BDVA (8 respondents).

## 5. Next steps

The main objective for the next months is to define the next release of the competence map, in order to best serve the needs of the NCCs and EuroCC network.

In particular, this will be implemented through the following actions:

- 1) Discussion with Competence Champions whether to complete the initial mapping exercise with the missing contributions.
- 2) Collect input for the next competence map sampling (M12), still via a bottom-up approach, involving the WP2 champions to ensure completeness of the exercise.
- 3) Select data gathering, data storage and data visualization tools to be operational for the M12 sampling and to visualize the complete results of the ICM, including late contributions.

This strategy has been presented and discussed with the NCCs during the EuroCC and CASTIEL Joint Conference held September 28<sup>th</sup> and 29<sup>th</sup> 2020.

## 6. Conclusions

The competence map is a valuable tool to set the state of play and support the awareness of competences available within the network, the needs of the NCCs and their definition of the roadmap and strategy along the project. It can also support the definition of KPIs to measure the impact of short-term actions carried out in the roadmap and mid to long-term actions to enforce building of infrastructure and competences.

The objectives of CASTIEL WP2 are:

1. To produce an Initial Competence Map by categorizing and clustering the competences of all the national Competence Centres.
2. To maintain the competence map during the project lifetime.
3. To identify topics of interests for focused events and to organize and execute those events.
4. To identify further mechanisms of networking.

Regarding the first objective, we drafted the structure of the ICM and proposed it to the NCCs' representatives. Adjustments were made to make the ICM easier to complete for the NCCs.

Data and information were retrieved at the legal entity basis, provided that the legal entities are the ones participating in the EuroCC project. We were able to collect only partial results, due to missing contributions. For this reason, we were not able to draw any conclusion, nor to make any in depth analysis, though some preliminary considerations could still be drawn based on our initial analysis.

Pursuing the competence mapping at the national level, based on specific parameters agreed on with the WP2 champions, can provide us with a more complete overview of the real European network of institutions working together and allow us to set the ground for further collaboration and exchange.

Open answers on the excellent competences that each NCC can express and is willing to share, can set the ground for fruitful collaboration activities. Open questions on needs can set the ground for twinning, mentoring and identify specific networking needs.

The results give evidence which is quite useful to enhance the competence map for the future, namely: NCCs are more comfortable to disclose excellent competences, and there is a will to go to a finer level of granularity than what was possible to do within this first ICM. Pursuing the collection of information in this direction will set the ground to increase the awareness of the potential of networking in terms of collaboration and support to better address user needs.

The structure, including the level of detail as well as the domains along which to classify competences, will evolve in time and will be defined based on the outcomes of previous steps and based on the inputs from the NCCs' competence champions.

Starting from this Initial Competence Map, CASTIEL WP2 will put effort into collecting input from the NCCs and in evolving the competence map and its visualization to optimally serve the EuroCC and CASTIEL objectives.



# Annex 1 – The ICM as delivered to the NCC Competence Champions

## Annex 1.1 Excel file used to collect data and information for the ICM

Screenshot of the Excel spreadsheet: *Initial Competence map*

Figures and info required at source		On going picture
Competence	Description	
<b>0. DESCRIPTION OF THE LEGAL ENTITY</b>		
	Name of the legal entity	
	Address of the legal entity	
	Contact point (e-mail contact)	
	Website of the legal entity	
	LinkedIn page (if available)	
	Twitter account (if available)	
	Public or private entity?	
	What type of organization is the legal entity?	
	Which NCC	
<b>1. TECHNICAL AND TECHNOLOGICAL ASSETS</b>		
<b>1.1 HPC infrastructure available</b>		
	<b>Does the legal entity own a HPC infrastructure?</b>	
	Website describing the HPC infrastructure	
	Is the HPC infrastructure classified in the Top500 list?	
<b>Performance</b>	Peak performance	Tflops
	Linpack performance	Tflops
<b>Available processor architectures</b>	# different processor (CPU) architectures (X86/ Power /Arm)	Qty
	Type of Available processor (CPU) architecture	
<b>Available devices</b>	# different GPU architectures (Nvidia/AMD/Intel)	Qty
	Type of GPU	
	# different FPGA architectures (Intel/Xilinx)	Qty
	Type FPGA	
<b>Cloud infrastructure</b>	Is the legal entity providing access to Quantum computing resources?	
	Does the legal entity own a cloud infrastructure	
	Private / public / both	
<b>1.2 Data center management</b>		
	<b>Does the legal entity manage its own data center?</b>	
<b>Physical security</b>	Does the legal entity run a control access system?	
	Are accesses to locals of the computing center restricted?	
	Are there anti intrusion safeguards?	

<b>1.3 Access to the HPC infrastructure</b>		
	<b>Does the legal entity have competences on HPC?</b>	
	How many people have competences on HPC?	Qty
	Does the legal entity provide HPC services to the academia?	
	Does the legal entity provide HPC services to the public sector?	
	Does the legal entity provide HPC services to the private sector?	
<b>1.4 Big data</b>		
	<b>Does the legal entity have competences on big data?</b>	
	How many people have competences on big data?	Qty
	Does the legal entity provide big data services to the academia?	
	Does the legal entity provide big data services to the public sector?	
	Does the legal entity provide big data services to the private sector?	
<b>1.5 Artificial Intelligence</b>		
	<b>Does the legal entity have competences on AI?</b>	
	How many people have competences on AI?	Qty
	Does the legal entity provide AI services to the academia?	
	Does the legal entity provide AI services to the public sector?	
	Does the legal entity provide AI services to the private sector?	
<b>2. BASIC ORGANIZATIONAL COMPETENCIES</b>		
	Does the the legal entity have an internal HR methodology to map skills and competences ?	
<b>3. TRAINING PROGRAM</b>		
	Does the legal entity provide a training program on HPC?	
	Does the legal entity provide a training program on big data?	
	Does the legal entity provide a training program on AI?	
<b>4.1 EXCELLENT COMPETENCES (SELF ASSESSMENT)</b>		
	<b>Mention max 3 HPC competencies for which the legal entity is considered excellent</b>	1° Public sector
		2°
		3°
		1° Competence
	For each competence mentioned in the previous box, provide the most successful project in which the competence was useful	2° Competence



4.1 Excellent competences		3° Competence	
	Mention max 3 big data competencies for which the legal entity is considered excellent	1°	
		2°	
		3°	
	For each competence mentioned in the previous box, provide the most successful project in which the competence was useful	1° Competence	
		2° Competence	
		3° Competence	
	Mention max 3 AI competencies for which the legal entity is considered excellent	1°	
		2°	
		3°	
For each competence mentioned in the previous box, provide the most successful project in which the competence was useful	1° Competence		
	2° Competence		
	3° Competence		
<b>4.2 NEEDED COMPETENCES (SELF ASSESSMENT)</b>			
4.2 Needs in		1° Competence	
	Mention max 3 competences for which the legal entity feels the need to improve its services and / or activities ( <b>obtainment through new hiring</b> ) - Please specify the type of competence if it is not present in the drop down menu.	2° Competence	
		3° Competence	



competences		1° Competence	AI
			Private sector
	Mention max 3 competences for which the legal entity feels the need to improve its services and / or activities ( <b>obtainment through training on existing staff</b> ) - Please specify the type of competence if it is not in present in the drop down menu.	2° Competence	
		3° Competence	
<b>5. PROJECT PORTFOLIO</b>			
5.1 Project experience	Does the legal entity have on going global (not EU funded and at least one partner outside the EU) projects?		
	Does the legal entity have on going EU projects?		
	Does the legal entity have on going national projects?		
	Does the legal entity have on going projects with the private sector/ industry?		
	Does the legal entity have on going mobility projects (i.e.: HPC Europe)?		
<b>6. RELATIONS WITH THE ECOSYSTEMS</b>			
6.1 Relations with the HPC ecosystem	Is the legal entity involved in any EU centre of excellence / association? If yes, which ones?		
	BioExcel-2		
	ChEESE		
	CompBioMed2		
	EoCoE-II		
	EsiWACE2		
	E-CAM		
	EXCELLERAT		
	HiDALGO		
	MaX 2		
	POP2		
	PerMedCoE		
	T-REX		
	NOMAD-2		
	CoEC		
	FocusCoE		
	Prace AISBL		
	BDVA		
	EGI		
	ELIXIR		
	ETP4HPC		

Screenshot of the Excel Spreadsheet: *Foreword and Instructions*

Data will be retrieved on each single legal entity (one form per legal entity being part of the EUROCC project, partners and third parties)
Data on the national level will be retrieved at a subsequent step (second version of the competence mapping, due in M12), not now as the initial competence mapping
Frequency of data retrieval is yearly after the initial mapping (in time for deliverables to be produced by M3, M12 and M24 respectively)
The mapping will be delivered in excel format for the initial mapping, different formats will be agreed with the competence champions and the CASTIEL management team for the second version of the competence mapping, due in M12 (i.e.: web interface).
Fill-in will be conditional for many sections - that is, only if the legal entity owns a HPC centre, data related to the description of the HPC centre are meant to be provided
Ideally, the results of this initial mapping will be visualized in a way similar to the one you can find here: <a href="https://i4ms.eu/dihs/map">https://i4ms.eu/dihs/map</a> . Other suggestions of results visualizations are welcome and will be part of the activities for the second version of the competence mapping, due in M12
COMPETENCE: a skill or an ability to do something well, within the scope of the activities of a HPC competence center
EXCELLENT : extremely good, outstanding. A legal entity is considered excellent for a specific competence when it is widely recognised that the legal entity owns an outstanding level of that competence and this arises for instance from projects, training activities, request of CPU time, etc
AISBL (PRACE AISBL) stands for <i>Association internationale sans but lucratif</i> (International Non-Profit Organization)
The mapping can be used at national level to map competences being available in companies or other legal entities in the Country. These data, though useful for the task x.5 in EuroCC project of the single Competence Center, will not enter the initial competence mapping exercise, limited to legal entities being part of EuroCC project as stated in row 1 of this sheet
Instructions to fill-in rows 22 to 27 on CPU, GPU and FPGA architectures: once you indicate the number of different architectures present in your HPC infrastructure (rows 22, 24 and 26 for CPU, GPU and FPGA architectures respectively), the drop-down menu of the subsequent question shows you the available combinations (rows 23, 25 and 27 respectively). For example, if you have both X86 and Arm CPUs in your HPC centre, you should indicate "two" in row 22. This way, the drop-down menu of the next question (type of available CPU architectures) lists the possible combinations, including the combination "X86 and Arm". The value "other" accomodates in any case the situation in which the architecture available is not present in the list provided.
CPU: with X86 we include either X86 or AMD64 (X86-64)
INTEL GPUs are expected by 2021 (commercial name: Intel Xe), we included this option in the view of the next mapping, not to forget to enhance the field domain.
INTEL Phi fits in GPU category (though it could fit also in the CPU one), in this case please select Intel as GPU type
If you have other types of CPU, GPU, FPGA, please select other. For the initial mapping further specifications are not required in this case.
If you feel that the answers to a give wuestion shall not go public, please inform me (luisa.monti@associazionebigdata.it) or Cinzia Zannoni (c.zannoni@cineca.it) or the management team, specifying the question, thank you
If you feel that the answers to a certain questions have to be included for next sampling of the competences, please send them to me (luisa.monti@associazionebigdata.it ) or Cinzia Zannoni (c.zannoni@cineca.it ), providing the question or the list of questions.
Row 55 of the map asks if the legal entity has an "internal HR methodology to map skills and competences". With this, we mean having a tool that allows to map skills and competences, eventually through evaluation processes. Such tool can be employed for different purposes, for example, strategies for career path developments of employees or, another example, personnel resource reallocation strategies for optimal use within the legal entity.



**Annex 1.2 preliminary Excel file shared with the Competence Champions to collect inputs for structuring the Excel file used to collect data and information for the ICM**

Screenshot of Excel spreadsheet: *Competences*

Competence	figures and info required at source	to be collected for 2017, 2018 and 2019	on the HPC centre, to be collected also separated by stable contractors	to be collected the overall legal entities extensively considered (beyond	to be collected by experience: junior (<3), level (3-10), senior (>10)	to be collected totally and by gender	to be collected totally and divided by national and international level	to be collected separated by academia, public sector, private sector
<b>0. OVERALL METRICS AND DIMENSIONS</b>								
	# legal entities composing the NCC							
	# public legal entities							
	# private legal entities							
	name and website of each legal entity forming the NCC							
	name and website address of the NCC							
	# people of the NCC	yes	yes	yes	yes	yes		
	Overall available budget ^^^	yes						
<b>1. TECHNICAL AND TECHNOLOGICAL ASSETS</b>								
<b>1.1 Infrastructure</b>								
cloud infrastructure	private/public	yes						
private cloud	#physical servers & server peak performance	yes						
intracluster network bandwidth (Gbit/s)		yes						
public cloud	Virtual CPU, RAM, storage consumed/year	yes						
local cloud storage (PB)		yes						
HPC infrastructure (Flops - Peak Performance or Linpack Performance )		yes						
Total Available core hours		yes						
intracluster network bandwidth (Gbit/s)		yes						
local HPC storage (PB)		yes						
archive storage (PB)		yes						
data center shared storage (PB)		yes						
<b>Available processor architectures</b>		yes						
Available devices	X86/Power/Arm	yes						
Available Quantum computing resources	GPU (Nvidia/AMD/Intel) FPGA (Intel/Maxeller)	yes						
PROPRIETARY ALGORITHMS (ML, AI)	Quantum volume	yes						
PATENTS	# proprietary algos (including co-owned)	yes		yes				
	# Patents (including co-owned)	yes		yes				
<b>1.2 Indispensable infrastructures /organizational safeguards</b>								
<i>Physical security</i>	Control of accesses to the building	yes	yes	yes	yes			
	External people are never left alone	yes	yes	yes	yes			
	Restricted accesses to locals of the computing center	yes	yes	yes	yes			
	anti intrusion safeguards	yes	yes	yes	yes			
<i>Logical security</i>	Firewalls	yes		yes				
	encryption	yes		yes				
	dedicated lines	yes		yes				
	other?							
<i>Business continuity</i>	yes / no, if yes recovery times and recovery points (RTO and RPO)	yes		yes				
<i>Disaster recovery plan</i>	yes/ no , if no building no people no service scenarios are all addressed	yes		yes				
<i>Data protection</i>	is there a DPO	yes	yes	yes	yes			

	are there procedures for the processing of personal data including genetic and biometric?	yes		yes		
<i>Non compete, non disclosure competences</i>	are there procedures in place to ensure the respect of non competition and non disclosure clauses	yes		yes		
<i>Other compliance competences</i>	is there a compliance officer/ unit	yes	yes	yes	yes	
<b>1.3 infrastructure- based Provided Services</b>						
National HPC Resource Allocation program for scientific research		yes		yes		yes
PRACE center		yes		yes		yes
Other European HPC resource allocation program		yes		yes		yes
HPC Computing services (core/hours)		yes		yes		yes
Data center services - 5. Vertical, technical competences (infrastruttura)		yes		yes		yes
<b>Services on big data and AI (to be expanded)</b>						
<b>2. BASIC ORGANIZATIONAL COMPETENCIES</b>						
<b>2.1 Talent management</b>	Having an internal methodology to map HR skills and competences	yes		yes		
	Having an internal methodology / process for competence evaluation and enhancement	yes		yes		
	Having an internal methodology to map the fit between competences and role, professional paths and job rotation mechanisms	yes		yes		
	Mean # weeks necessary to cover an open position in junior and senior levels	yes		yes		
<b>3. PEOPLE COMPETENCES</b>						
<b>3.1 Transversal / horizontal</b>						
Help desk		yes	yes	yes	yes	yes
High Level support		yes	yes	yes	yes	yes
How many people working in industrial projects or services		yes	yes	yes	yes	yes
Project management		yes	yes	yes	yes	yes
Certified project managers (PMP or other)		yes	yes	yes	yes	yes
<b>3.2 HPC specific</b>	<b>total people (no double counting)</b>	yes	yes	yes	yes	yes
Scientific Domain - Computational Engineering etc		yes	yes	yes	yes	yes
HPC Technology (nodo, rete, storage)		yes	yes	yes	yes	yes
HPC System management		yes	yes	yes	yes	yes
HPC and AI SW optimization and engineering		yes	yes	yes	yes	yes
Scientific Application development		yes	yes	yes	yes	yes
HPC SW Community contribution		yes	yes	yes	yes	yes
AI Technology and Algorithm development		yes	yes	yes	yes	yes
High Performance Data Analytics		yes	yes	yes	yes	yes
Quantum Computing		yes	yes	yes	yes	yes
Collaboration in open source projects (parallell SW stack) in the domains bel	<b>total people (no double counting)</b>	yes	yes	yes	yes	yes
Programming Languages		yes	yes	yes	yes	yes
Parallelism Programming		yes	yes	yes	yes	yes
Devices Programming		yes	yes	yes	yes	yes
Scientific libraries		yes	yes	yes	yes	yes
Scientific domains courses		yes	yes	yes	yes	yes
Debugging and Optimization		yes	yes	yes	yes	yes
<b>3.3 data management and big data specific</b>	<b>total people (no double counting)</b>	yes	yes	yes	yes	yes
<b>Data management</b>		yes	yes	yes	yes	yes
Data Intensive Computing		yes	yes	yes	yes	yes
Data management		yes	yes	yes	yes	yes
<b>Big data and Machine learning</b>		yes	yes	yes	yes	yes
Data Mining and data visualisation		yes	yes	yes	yes	yes
Big Data Analytics		yes	yes	yes	yes	yes
Machine Learning		yes	yes	yes	yes	yes
<b>3.4 Artificial Intelligence</b>	<b>total people (no double counting)</b>	yes	yes	yes	yes	yes
Cognitive Neural Networks		yes	yes	yes	yes	yes
<b>3.5 People competence - based services</b>						
<b>Servizi basati sulle competenzaza</b>						
Training	do you offer training services yes/ no? if yes please refer to the			yes		
SW Porting / optimization		yes		yes		
Application development / engineering (simulazione, scientific		yes		yes		
Project management		yes		yes		
Technological assessment (PoC and projects)		yes		yes		
HPC infrastructures management (systems and storage)		yes		yes		
Set up management of cloud infrastructures		yes		yes		
Data analytics, Machine Learning e Artificial Intelligence application		yes		yes		
Workflow development and management		yes		yes		
<b>Others on big data and AI?</b>						
<b>4.1 Excellent competences (self assessment)</b>						
<b>4.1.1 Excellent asset-type competences</b>	Mention the competences belonging to group 1 for which: the CC is recognised as unique or indispensable for given kind of projects					
	for each competence mentioned in the previous box, provide the biggest successful project and related overall budget - successful mean that the project was successfully concluded in the relevant year					
	for each competence mentioned in the previous box, provide the number of total successful projects that leveraged that competence, concluded in the relevant year					
	for each competence mentioned in the previous box, provide the total financed amount of the successful projects that leveraged that competence, concluded in the relevant year			yes		
<b>4.1.2 Excellent skill-type competences</b>	Mention the competences belonging to group 3.1: the CC is recognised as unique or indispensable for a given kind of projects					
	for each competence mentioned in the previous box, provide the biggest successful project and related overall budget - successful mean that the project was successfully concluded in the relevant year			yes		

for each competence mentioned in the previous box, provide the number of total successful projects that leveraged that competence, concluded in the relevant year

for each competence mentioned in the previous box, provide the total financed amount of the successful projects that leveraged that competence, concluded in the relevant year

4.2 Needed competences (self assessment)		
4.2.1 Needs in asset-type competences	Mention the competences belonging to group 1 for which the CC feels the need for asset enhancement or flexibility in terms of temporary resources available	
4.2.2 Needs in skill-type competences	Mention the competences belonging to group 3 for which the CC feels the need for skill level improvement/ number of employees/ or flexibility in terms of temporary resources available	
5. PROJECT PORTFOLIO		
		to be collected
5.1 EU projects (excluding EuroHPC innovation support initiatives & Centres of Excellence)	# ongoing EU projects divided by project category (IA, RIA, CSA, training like MSCA / Erasmus)	yes
	# new EU projects in the relevant year divided by project category (ERIC)	yes
	# EU projects in the relevant year for which the NCC (or one of the legal entity on behalf of the NCC) is leading party divided by project category (ERIC)	yes
	maximum financing per EU project among the ones kicked off in the relevant year (total project financing)	yes
	total financing from EU projects referred to the relevant year (EU projects kicked off in any year, still open in the relevant year; financing referred to the 12 month period of the relevant year)	yes
	# EU projects for which the NCC (or one of the legal entity on behalf of the NCC) is leading party	yes
	# EU projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved at least one corporate as contributor	yes
	# EU projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved one SME as contributor	yes
	# EU projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved one startup as contributor	yes
	# EU projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved an academic party	yes
5.2 Participating / being coordinator of projects promoted by the centres	<a href="#">BioExcel - Centre of Excellence for Biomolecular Research - project website</a>	yes
	<a href="#">COEGSS - Center of Excellence for Global Systems Science - project website</a>	yes
	<a href="#">CompBioMed - A Centre of Excellence in Computational Biomedicine - project website</a>	yes
	<a href="#">E-CAM - An e-infrastructure for software, training and consultancy in simulation and modelling - project website</a>	yes
	<a href="#">EoCoE - Energy oriented Centre of Excellence for computer applications - project website</a>	yes
	<a href="#">ESWACE - Excellence in Simulation of Weather and Climate in Europe - project website</a>	yes
	<a href="#">MaX - Materials design at the eXascale - project website</a>	yes
	<a href="#">NoMaD - The Novel Materials Discovery Laboratory - project website</a>	yes
5.3 H2020/EuroHPC innovation support initiatives (PoC)	<a href="#">POP - Performance Optimisation and Productivity - project website</a>	yes
	# Fortissimo projects	yes
	# Prace shape projects	yes
	# IAMS/SAE cascade funding projects	yes
	Others	yes
5.4 National or local projects (except National innovation support initiatives)	# ongoing national or regional projects	yes
	# new national or regional projects in the relevant year	yes
	# national or regional projects in the relevant year for which the NCC (or one of the legal entity on behalf of the NCC) is leading party	yes
	maximum financing per national or regional project among the ones kicked off in the relevant year (total project financing)	yes
	total financing from national or regional projects referred to the relevant year (national or regional projects kicked off in any year, still open in the relevant year; financing referred to the 12 month period of the relevant year)	yes
	# national or regional projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved one corporate as contributor	yes
	# national or regional projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved one SME	yes
	# national or regional projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved one startup as contributor	yes
	# national or regional projects in which the NCC (or one of the legal entity on behalf of the NCC) has involved an academic party	yes
	# projects by initiative (name of the initiative shall be collected as well)	yes
5.5 National innovation support initiatives (PoC)		yes
5.6 Projects funded (for more than 75% of overall costs) by private legal entities	# ongoing projects in the relevant year	yes
	# new projects in the relevant year	yes
6. RELATIONS WITH THE ECOSYSTEMS		
6.1 HPC ecosystem management	Belonging to one of the following Centres of Excellence in computing	yes
	<a href="#">BioExcel - Centre of Excellence for Biomolecular Research - project website</a>	yes
	<a href="#">COEGSS - Center of Excellence for Global Systems Science - project website</a>	yes
	<a href="#">CompBioMed - A Centre of Excellence in Computational Biomedicine - project website</a>	yes
	<a href="#">E-CAM - An e-infrastructure for software, training and consultancy in simulation and modelling - project website</a>	yes
	<a href="#">EoCoE - Energy oriented Centre of Excellence for computer applications - project website</a>	yes
	<a href="#">ESWACE - Excellence in Simulation of Weather and Climate in Europe - project website</a>	yes
	<a href="#">MaX - Materials design at the eXascale - project website</a>	yes
	<a href="#">NoMaD - The Novel Materials Discovery Laboratory - project website</a>	yes
	<a href="#">POP - Performance Optimisation and Productivity - project website</a>	yes

	Belonging to European Associations (Prace AISBL, BDVA, ETP4HPCetc)	yes		yes	
	Being part of the European Mobility projects (HPC Europa)	yes		yes	
	# exchanged professionals within the project in the relevant year	yes		yes	
<b>6.2 extra HPC ecosystem management (€)</b>	partners or potential partners	yes		yes	yes
<i>(€) the global level shall be collected beyond the national and the european</i>	academic bodies, research centers, other kind of competence centers	yes		yes	yes
	excellent competence providers	yes		yes	yes
	private companies and private companies associations	yes		yes	yes
	institutions and policy makers	yes		yes	yes
<b>7. Overall external performance (Communication skills)</b>					
<b>7.1 How the company is positioned publicly</b>	social presence if available, # followers, social traffic and reach,	yes		yes	
	sentiment analysis if available	yes		yes	
	web site if available, # visits	yes		yes	
	# yearly posts / new news	yes		yes	
	# academic publications	yes		yes	
	# press releases	yes		yes	
	# articles on specialistic magazines	yes		yes	
<b>7.2 Organizational aspects</b>	existence of a communication manager or social media manager	yes	yes	yes	yes

Screenshot of the Excel spreadsheet: *Talent Management Map*

		to be collected for 2017, 2018 and 2019	on the HPC competence centre, to be collected also separated by stable contractors and other type of contractors *	to be collected included the overall legal entities extensively considered (beyond the boundaries of the NCC)	to be collected by years experience: junior (<3), senior (3-10)	to be collected totally and by gender	to be collected totally and divided by national and international level - global level when it applies (€)	to be collected separated by academia, public sector, private sector
<b>3. Horizontal skills</b>								
<b>3.2 Business competencies and skills</b>	# people with Business competencies. Actual and trend. Per single business competency (i.e.: business analysis)	yes	yes	yes	yes	yes		
Business analysis	For each of the business skill and skill groups below:	yes	yes	yes	yes	yes		
Project management	# employees with junior level competences	yes	yes	yes	yes	yes		
Business development /business consultancy	# employees with level level competences	yes	yes	yes	yes	yes		
Incremental innovation on products, services, projects	# employees with senior level competences	yes	yes	yes	yes	yes		
Training and knowledge transfer (external training)	#, actual and trend	yes	yes	yes	yes	yes		
	# people with business competencies and with technical competencies	yes	yes	yes	yes	yes		
<b>3.3 Soft skills</b>	# people with Soft competencies. Actual and trend. Per single business competency (i.e.: team working)	yes	yes	yes	yes	yes		
team working	# people with Soft competencies and with specialistic skills	yes	yes	yes	yes	yes		
time management	# people with Soft competencies and with business skills	yes	yes	yes	yes	yes		
	# people with soft, business and specialistic skills	yes	yes	yes	yes	yes		
coaching	For each of the soft skill and skill groups :	yes	yes	yes	yes	yes		
communication & public speaking	# employees with junior level competences	yes	yes	yes	yes	yes		
	# employees with level level competences	yes	yes	yes	yes	yes		
	# employees with senior level competences	yes	yes	yes	yes	yes		
<b>Strategic competences</b>								
Vision	Existence of a 3 o 5 yr plan for the strategic development of the competences, alliances and projects of the CC	yes		yes			yes	yes
Discontinuous Innovation promotion on any layer: Products, methodology, technology, organization and processes	Existence of an organizational tool for the individuation, promotion and decision for disruptive innovation initiatives	yes		yes			yes	yes
External relations	Existence of functions/people dedicated to relationship management (€)	yes		yes			yes	yes
<b>Other organizational competences</b>								
Training and knowledge transfer (internal training)	#people participating to specialist skills courses (as training receiver)	yes		yes				
	#people participating to business skills courses (as training receiver) - actual and trend	yes		yes				
	#people participating to soft skills courses (as training receiver) - actual and trend	yes		yes				
	having the knowledge transfer being part of the job description and of the MBO (if any) of coordinators and managers	yes		yes				

## Annex 2 – List of legal entities per EuroCC WP and Country

There are 108 legal entities participating in the project, distributed across 33 NCCs (WPs).

LEGAL ENTITIES	WP#	COUNTRY
1 – USTUTT	WP2	Germany
· SICOS	WP2	Germany
2 – GCS	WP2	Germany
· JSC	WP2	Germany
· LRZ	WP2	Germany
3 – IICT	WP3	Bulgaria
· SU	WP3	Bulgaria
· UNWE	WP3	Bulgaria
4 – UNIVIE	WP4	Austria
· TUG	WP4	Austria
· BOKU	WP4	Austria
· TUW	WP4	Austria
· UIBK	WP4	Austria
· INITS	WP4	Austria
5 – SRCE	WP5	Croatia
· FERIT	WP5	Croatia
· FESB	WP5	Croatia
· RBI	WP5	Croatia
· UNIRI	WP5	Croatia
· UNIZG-FER	WP5	Croatia
· RITEH	WP5	Croatia
6 – CaSToRC	WP6	Cyprus
7 - IT4I	WP7	Czech Republic
8 – DTU	WP8	Denmark
· SDU	WP8	Denmark
· RUC	WP8	Denmark

LEGAL ENTITIES	WP#	COUNTRY
· ITU	WP8	Denmark
· AU	WP8	Denmark
· CBS	WP8	Denmark
· KU	WP8	Denmark
· AAU	WP8	Denmark
9 - UTARTU	WP9	Estonia
· TALTECH	WP9	Estonia
· KBFI	WP9	Estonia
· HITSА	WP9	Estonia
10 - CSC	WP10	Finland
11 - GRNET	WP11	Greece
· FORTH	WP11	Greece
· NCSR-D	WP11	Greece
· ICCS	WP11	Greece
· AUTH	WP11	Greece
12 - KIFŰ	WP12	Hungary
13 - ICHEC	WP13	Ireland
14 - CINECA	WP14	Italy
· LEONARDO	WP14	Italy
· DOMPE	WP14	Italy
· BIREX	WP14	Italy
· ABD	WP14	Italy
15 - LitGrid	WP15	Lithuania
16 - RTU	WP16	Latvia
· LU	WP16	Latvia
17 - SIGMA2	WP17	Norway
18 - NORCE	WP17	Norway
19 - SINTEF	WP17	Norway
20 - CYFRONET	WP18	Poland
· NCBJ	WP18	Poland

<b>LEGAL ENTITIES</b>	<b>WP#</b>	<b>COUNTRY</b>
· ICM	WP18	Poland
· PSNC	WP18	Poland
· CI TASK	WP18	Poland
· WCSS	WP18	Poland
21 – FCT	WP19	Portugal
· ULISBOA	WP19	Portugal
· LIP	WP19	Portugal
· UCOIMBRA	WP19	Portugal
· UPORTO	WP19	Portugal
· UMINHO	WP19	Portugal
· UEVORA	WP19	Portugal
22 – ICI	WP20	Romania
23 - ARNES	WP21	Slovenia
· UL	WP21	Slovenia
· UNG	WP21	Slovenia
· NIC	WP21	Slovenia
· UM	WP21	Slovenia
· SI-MPA	WP21	Slovenia
· JSI	WP21	Slovenia
· ARCTUR	WP21	Slovenia
· IZUM	WP21	Slovenia
· FIS	WP21	Slovenia
24 – BSC	WP22	Spain
· UNICAN	WP22	Spain
· IAC	WP22	Spain
· CESGA	WP22	Spain
· UNIZAR	WP22	Spain
· SCAYLE	WP22	Spain
· CENITS	WP22	Spain
· CSUC	WP22	Spain

LEGAL ENTITIES	WP#	COUNTRY
25 – UU	WP23	Sweden
· RISE	WP23	Sweden
26 - ETH Zürich	WP24	Switzerland
27 - TUBITAK	WP25	Turkey
· SU	WP25	Turkey
· METU	WP25	Turkey
28 - UEDIN	WP26	United Kingdom
· STFC	WP26	United Kingdom
29 - TERATEC	WP27	France
· GENCI	WP26	France
· CERFACS	WP26	France
30 - SURFSARA	WP29	Netherlands
31 - CENAERO	WP30	Belgium
32 - LUXINNOVATION	WP28	Luxembourg
· Uni.lu	WP28	Luxembourg
· LuxProvide	WP28	Luxembourg
33 - CCSAS	WP31	Slovakia
34 - UKIM	WP32	Macedonia
· NMBA	WP32	Macedonia
· IS	WP32	Macedonia
35 – UoI	WP33	Iceland
36 – UDG	WP34	Montenegro

**Table 5: Legal Entities per EuroCC WP and country.**

## Annex 3 – Complementary Tables

### Annex 3.1 Combinations of CPU architectures being present in the 38 HPC data centres

This is the distribution of respondents with respect to the combinations, taking into account that some respondents provided only one or two excellent competences.

Table 6 shall be read as follows:

A = academia

Pu = public sector

Pr = private sector

O = Other

AAA means that the legal entities expressed three excellent competencies, all three within academia. For instance, 2 at the crossroad between first row (AAA) and first column (HPC) of the table means that exactly two legal entities expressed that they excel in three HPC competencies, all for academia.

To make another example, 2 at the crossroad between last row (A) and last column (AI) means that two legal entities expressed that they excel in only one AI competence, in academia.

Combination of excellent competences	HPC	Big Data	AI
AAA	2		5
AAPu	2		1
AAPr	3		1
APuPu	1		
APuPr	9	9	9
APrPr	1	1	
APrO	1	1	1
PuPuPu		2	1
AA	1	2	4
APu		2	1
Apr	2	2	2
AO	1	1	1
PuPr			1
Pr	2	3	2
A	5	4	2

**Table 6: Combination of excellent competences provided by the respondents.**

### Annex 3.2 Needs in competence expressed by the respondents

Hereinafter is the complete distribution of respondents with respect to the combinations of competence needs expressed.

Needs in competences are grouped by modality of fulfilment, that is: hiring new personnel vs. re-training existing staff.

The table shows the number of answers received per category plus the user sector of specialization in brackets, where:

A = academia

Pu = public sector

Pr = private sector

\* = any user sector or other (including all user sectors).

For instance, HPC(A) means competence in HPC, specialized to serve academia.

Competence (user sector)	Means to fill the competence gap		Total hits in competence needs
	New hiring	Re-training existing staff	
HPC (*)	8	11	19
AI (*)	13	6	19
AI(Pr)	13	6	19
HPC(Pu)	12	6	18
AI(A)	2	15	17
BD (*)	10	7	17
HPC(A)	8	6	14
BD(A)	1	13	14
BD(Pr)	10	4	14
BD(Pu)	4	6	10
AI(Pu)	3	6	9
HPC(Pr)	3	4	7
<b>TOTAL HPC</b>	31	27	<b>58</b>
<b>TOTAL BD</b>	25	30	<b>55</b>
<b>TOTAL AI</b>	31	33	<b>64</b>

**Table 7: Complete distribution of combinations of needs in competences.**