**H2020-INFRAEDI-2018-2020**


**Concerted action for the European HPC CoEs**

**Project Number: 823964**

# D2.4 – Report on Propositions for a Sustainable HPC CoE Council

WP2 – The HPC CoE Council

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# List of abbreviations

*AISBL* ..... *Association Internationale Sans But Lucratif,*
*BDVA*..... *Big Data Value Association*
*CoE*..... *Centre of Excellence*
*CSA*..... *Coordination & Support Action*
*DAIRO*..... *Data, AI and Robotics (new name of BDVA)*
*DoA*..... *Description of Action*
*EC*..... *European Commission*
*ETP4HPC*..... *European Technology Platform for High-Performance Computing*
*EuroHPC JU* ..... *European High Performance Computing Joint Undertaking*
*HPC*..... *High Performance Computing*
*NCC*..... *National Competence Centre*
*PRACE* ..... *Partnership for Advanced Computing in Europe*
*ToR* ..... *Term of Reference*
*WP* ..... *Work package*

# Executive Summary

The HPC CoE Council (referred to as HPC3 in the following) was set up as an informal, non-contractual association involving the active CoE projects and their CSA (FocusCoE). Rules and responsibilities are endorsed by consensus and expressed in a Terms of Reference (ToR) document agreed to by all active CoEs. The member projects pledge best-effort contributions over their lifetime, enabling HPC3 governance and operations to work.

In internal discussions, three options for putting HPC3 onto a sustainable footing (not depending on CoE project terms) were identified: continue as is (non-contractual association), with newly funded CoEs replacing the ones which reach the end of their term; a CSA funded by EuroHPC JU taking over the operations; and a stand-alone legal organisation funded primarily by membership fees. Potential changes in membership rules and commitments were also identified, and additional potential services of a sustainable HPC3 were drafted.

A comprehensive survey was conducted involving all 14 active CoEs and the one CoE that terminated in 2021, asking what they believed any extended ambitions of HPC3 should be. Responses to this question clearly indicate a preference of the current HPC3 constituency to follow one the first two options. Additional response data indicates that a modest extension of membership is seen as beneficial, and that support of impactful co-design carries a high priority.

The two sustainability options are then described in detail, with the required steps and the opportunities to cast a wider membership net or increase ambition.

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# 1 Introduction

To investigate possibilities and propose options to place HPC3 (the HPC CoE Council) [1] on a sustainable footing, Task 2.4 was included in the FocusCoE workplan. HPC3 was established by the project as a platform for all CoEs to interact at a primarily strategic level and to provide a vehicle for the set of CoEs to promote their position and interests within the European HPC ecosystem. This is explained further in the description of WP2 in Part A of the DoA:

> *The scope of HPC3 as an entity structuring the application pillar of the EU HPC Ecosystem should extend beyond the FocusCoE project. Therefore, we will be planning for the establishment of HPC3 beyond the scope of the FocusCoE CSA. HPC3, in close collaboration with the EC and ETP4HPC will propose different options in order to turn itself into a long lasting entity well anchored in the European HPC landscape. The inclusion of EU13 organisations within the application pillar of the EU HPC Ecosystem and within the sustainability plans for HPC3 will be of particular importance.*

The relevance of Task 2.4 relates to the corresponding objective concerning HPC3 included in the FocusCoE DoA[1]:

> *The [HPC CoE Council] will be the mechanism by which coordination of activities and service offerings for the set of CoE projects is achieved. This coordination is based on the **collaborative** definition of an overall (cross-CoE) strategy and the identification of joint activities for either all CoEs or sub-groups of CoEs (depending on the themes and relevance for the parts of the user communities addressed). The common strategy will ensure that the CoEs can more effectively take up their role as the 3rd pillar of the EU HPC Ecosystem and that the use of HPC, by key application communities, is adequately represented in the EuroHPC initiative.*

It is immediately obvious that HPC3 can only play the role envisaged for it above if it can operate effectively independently of the project terms of FocusCoE and of the individual CoEs, so *sustainability in time* is absolutely necessary. The second tranche of CoEs [2] will come to an end in 2021 or early 2022, including those who have sought an extension. FocusCoE [2] is amongst them – the third tranche of CoEs will continue, and new EuroHPC JU calls for proposals for a new tranche of CoEs have been delayed, leading to an inevitable, significant gap between many of the current operational CoEs ending and the "class of 2022" beginning.

Three other sustainability elements are of course the availability of funding or in-kind resources to carry out HPC3 activities, the form of organisation that HPC3 will use, and the circle of organisations being members or supporters of HPC3. The express goal to include the EU13 countries (Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia) in the sustainability plans will require an extension of the current set of members or participants.

The Deliverable is structured as follows:

- Section 1 discusses the current modus operandi of HPC3, which can continue with minimal changes up to the end of the extended FocusCoE term (end of March 2022).

[1] Noting that in that text, and in the original project proposal, what we now refer to as HPC3 was referred to as the HPC CoE General Assembly; hereinafter we will only use the HPC3 abbreviation.
[2] These are funded under the H2020-INFRAEDI-2018-2020 call.

- Section 2 presents three options for sustaining and expanding HPC3 activities, which were discussed and developed through discussions (via meetings and bi-lateral communications) initially within FocusCoE WP2, then within the HPC3 Office – comprising of the appointed HPC3 officers and WP2 representatives - and finally with all HPC3 representatives[3].
- Section 3 provides an analysis of the results of a survey amongst all HPC3 participants (with the exception of FocusCoE) about their views, preferences and ideas for alternatives relating to the sustainability options.

Section 4 presents two approaches on sustaining HPC3 and extending its reach and scope, both of which have received favourable responses from the HPC3 CoE community in the survey. The section also discusses factors outside of the control of the CoEs which would need to be addressed to achieve a truly sustainable HPC3 which fulfils its role in the European HPC application pillar.

[3] In addition, interactions between the CoEs and NCCs (managed by FocusCoE and coordinated through HPC3) and the involvement of FocusCoE members within ETP4HPC and PRACE provided valuable input and insights.

# 2 HPC3 Status and Modus Operandi

Currently, HPC3 operates as an informal body based on an agreement between the coordinating organisations of the CoE projects[4] funded in the first two calls to meet regularly, to develop and agree on a shared, strategic position and to organise working groups for cross-CoE activities. To be more specific, the CoE coordinators (including the FocusCoE coordinator) agreed to become HPC3 members, they elected the officers of the HPC3 Office (tasked with operational and representational activities) and agreed to adhere to a set of operational procedures defined in the Terms of Reference (ToR) document. Promotion of the HPC3 strategic position within the EuroHPC ecosystem – specifically to the EuroHPC management and EuroHPC advisory groups – is part of the HPC3 mission and something that the HPC3 Office is acting upon.

Specific activities foreseen in the ToR include

- Coordinating activities that develop and convey the CoEs shared interests
- Managing the collaborative definition of an overall (cross-CoE) strategy and the identification of joint activities for all CoEs or sub-groups of CoEs
- Managing a common strategy to ensure that the CoEs can more effectively take up their role as the 3rd pillar of the EU HPC Ecosystem and that the use of HPC, by key application communities, is adequately represented in the EuroHPC JU initiative

The HPC3 members meet in monthly virtual HPC3 council meetings to track ongoing activities and actions required, present results and agree on new activities for future months. The interaction and collaboration with key European HPC initiatives is an important activity for HPC3, coordinated by the HPC3 Office.

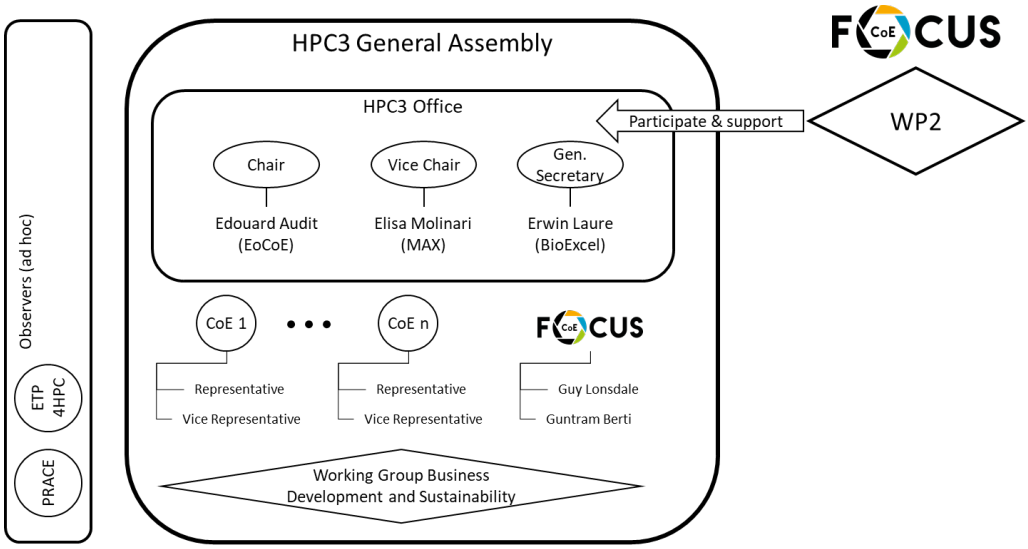


Figure 1 illustrates the HPC3 structure: each CoE member has two representatives, which participate in the general assembly, the highest decision body. Three HPC3 officers were elected, and they, together with assistance from FocusCoE WP2, coordinate the HPC3 activities. HPC3 has a circle of observers, which can be invited ad-hoc to meetings and discussions – PRACE and the ETP4HPC are examples. Finally, HPC3 runs the working group on Business Development and Sustainability.

[4] These are, in alphabetical order: BioExcel, ChEESE, CoEC, CompBioMed, E-CAM, EoCoE, ESiWACE, EXCELLERAT, FocusCoE, HiDALGO, MaX, NOMAD, PerMedCoe, POP, RAISE, TREX

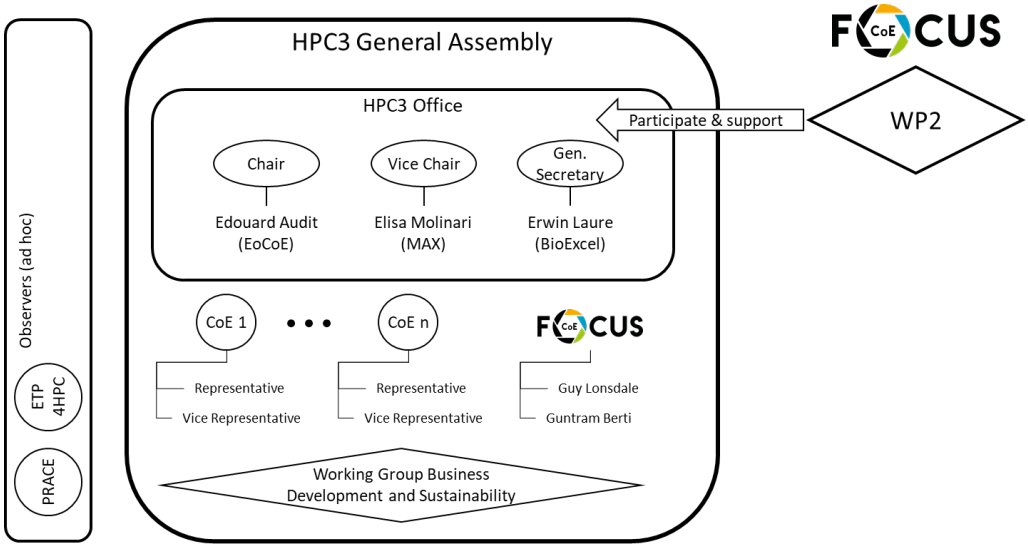


**Figure 1: HPC3 Structure**

Such interactions have taken place with the key European HPC initiatives, primarily, but not only, those linked directly to the EuroHPC JU and its programme. The interaction with EuroHPC JU itself was managed by the HPC3 Office and built on an online meeting held with the Director, Anders Jensen, and complemented by interactions with the RIAG and participation by a EuroHPC representative in the FocusCoE/HPC3 workshop held at the (virtual) EuroHPC Summit Week in 2021. Meetings and discussions were organised with the coordinating organisations of both the EuroHPC Petascale system consortia as well as the pre-Exascale system consortia. Coordinated by a collaboration between the FocusCoE and CASTIEL CSA [3]management teams, a set of specific-theme workshops was organised with representatives from both the CoEs and the national HPC competence centres (NCCs) [3]. FocusCoE also introduced the activities of the CoEs at an online conference for CASTIEL-EuroCC participants. Furthermore, both ETP4HPC [4] and PRACE [5] representatives took part in HPC3 meetings to present and discuss areas of common relevance and interest, for example the application contributions to the ETP4HPC SRA, which is one of the sources of information being fed into the EuroHPC RIAG strategic planning process and R&D&I agenda.

Two important aspects concerning the operation HPC3 need to be mentioned: budget and management. Any costs occurring in the HPC3 activities, such as hours worked by CoE experts, or travel expenses and event participation fees, are reimbursed by the CoEs responsible for the persons or travel/event activities. HPC3 has no budget of its own, and no authority over the member CoEs' budgets. While WP2 of the FocusCoE project plays a key role in facilitating HPC3 activities and participating in them, the FocusCoE project does not control or manage HPC3. All and any HPC3 governance is exclusively handled by HPC3 bodies.

From the point of view of sustainability, the regulatory and operational structure of HPC3 does have significant disadvantages:

- The circle of active participants in HPC3 varies over time, with CoEs ending and dropping out, and new ones starting up. The agreed ToR actually excludes (full) membership of CoEs which have reached the end of their contractual period, with the exception of those CoEs in an interim between contracts (i.e. when a follow-up contract is in preparation, but not yet in place). Even assuming that clause of the ToR would be changed, it is not clear how a CoE after the end of its contractual period could participate as a single entity: representation in HPC3 would need to be carried by the organisations previously involved in the CoE.

- Participation in HPC3 for the CoE members is on a best effort basis and is inherently linked to resourcing possibilities, and limitations on the availability of key staff dictated by the commitments of each CoE as determined by their individual grant agreement. It is important to realise that the continued provision of HPC3 results on the Web will require resources after the project terms of FocusCoE and the CoEs end.
- The ToR was drafted and agreed to by the then active CoEs at the start of HPC3 in May 2019. While it is obviously possible for the dynamically changing set of HPC3 members to agree on adaptations to the ToR, there is potentially an obstacle for new CoEs to join, for example if one or more of their beneficiaries insists on radical changes to meet the expectations of their legal departments.

HPC3 was aware of the above challenges and drove interaction between FocusCoE Task 2.4 and the HPC3 Office to evaluate and discuss options for HPC3 sustainability. This complemented the interactions between the CoEs and FocusCoE (notably the training events organised by FocusCoE WP4) addressing sustainability of the CoEs themselves, for instance within the HPC3 working group on Business Development and Sustainability[5]. The next section summarizes the findings.

[5] The main focus of this working group was on sustainability and business development for the CoEs themselves.

# 3 HPC3 Sustainability Options

Summarising aspects raised in the discussion above, HPC3 differs from other, established associations[6] in the field of HPC technology and science in that

- It is not a legal entity.
- Its membership consists of projects with a defined, finite term, which themselves are not legal entities.
- It has no budget to undertake actions itself, but relies entirely on in-kind contributions from organisations participating in the member projects (including the FocusCoE CSA).
- Its existence and membership circle are dependent on the existence of projects funded by the European Commission or EuroHPC JU, and currently restricted to a subset of these (the CoEs).

As discussed in Section 2 above, these idiosyncrasies pose significant challenges with regards to sustaining HPC3 and ensuring that the organisation can live up to the objectives expressed in the FocusCoE DoA. Therefore, all considerations about how to best sustain HPC3 revolved around adapting to some or all of the above constraints.

As an outcome of frequent discussions within FocusCoE WP2 and extensions of those discussions with the HPC3 office, and also taking into account the possibilities identified by individual CoEs for their sustainability options (explained and discussed in the context of the workshops and training organised by FocusCoE WP4 and discussed in the context of the HPC3 working group on business development and sustainability), three possibilities were identified to ensure that HPC3 evolves into a sustainable and impactful organisation. These are:

- Continuing as an informal organisation (a non-contractual association) with core members from active European Commission or EuroHPC JU funded projects, which dedicate in-kind resources to the HPC3 operation. Extending the membership beyond the CoEs to cover all such projects, and maybe even to cover non-project members would also be possible.
- Starting an HPC3 CSA action which would be funded by the European Commission or the EuroHPC JU, consisting of a core circle of funded beneficiaries who would facilitate collaboration with a larger circle of HPC-related projects or organisations to achieve the original HPC3 objectives.
- Create a stand-alone not for profit legal organisation (such as an AISBL[7]), which would solicit paid membership from HPC-related organisations or individuals, with the mission to support shared interests aligned with the original HPC3 mission and achieve the original HPC3 objectives. Governance and membership rules of such a legal entity would be critical to ensure its continued alignment with European HPC priorities, and ways would need to be found to include running projects (which in themselves are not legal entities).

Each of these three possible ways forward are discussed in more detail in the subsections below.

[6] Such as the ETP4HPC, PRACE, HPC Advisory Council, and vendor user groups

[7] This form of non-profit organisation is used by PRACE and Gaia-X; the legal framework is referenced in [6].

## 3.1 Continue as a Non-contractual Association

HPC3 could in principle continue as is, using the existing ToR as a charter and admitting any newly funded CoE projects as members (which would need to sign the ToR). Conversely, membership of all current CoE projects would automatically lapse at the end of their funding term. As long as there remained at least one CoE member, HPC3 could be said to exist.

Of course, the number and extent of activities HPC3 can perform and the potential impact of these correlate with the number of members, with every member devoting a certain amount of in-kind contributions to HPC3, at their sole discretion. In addition, keeping up the governance of HPC3 requires a minimum number of CoE members, and an orderly transition of the governance functions foreseen in the ToR needs to be organized when CoE members start to drop out.

A number of changes to the way a future HPC3 would operate are possible, while staying within the realm of an informal association:

- The ToR could be modified to require either a prescribed amount of in-kind contributions (measured, for example, as person months of effort) from each member, or, require new members to specify the amount of such contributions to HPC3 they see fit to provide as a binding commitment to HPC3. Both would simplify the mid/long-term planning of activities of HPC3, and could go a long way to increase results and impact, since HPC governance could rely on a prescribed participation of the member projects.
- Membership could be opened up to other HPC-related projects funded by the European Commission and/or EuroHPC JU, such as combined hardware and software development activities, which would broaden the base of HPC3, facilitate co-design activities carried out by HPC3, and provide additional effort and potentially budget for HPC3 to maximize its impact on the European HPC scene.

These two modifications of the ToR could be implemented by the HPC3 office, subject to agreement by the existing project members, and would then automatically apply to any new members.

A variant of the first bullet – naturally only feasible with the support of the funding body - would see future calls for CoEs and the resulting grant agreements sequestering a certain percentage of the project budgets for activities within HPC3, as was done in the past with “concertation” activities for the European Commission-funded Grid computing projects (in Framework Programme 5).

One of the challenges of continuing the “informal association” approach is that new CoEs or other European HPC projects would be asked to adhere to a pre-existing ToR framework, in the definition of which they did not have any part. This could lead to requests for renegotiation of the ToR, which might turn out to be difficult and protracted, since all HPC3 members would need to agree.

## 3.2 Implement an HPC3 CSA

Under the assumption that a future HPC funding programme would include a call for a CSA or part of a CSA linked to HPC Centres of Excellence, then setting up a CSA project (for example, in the framework of the next round of EuroHPC calls) which takes over the functions of HPC3 would provide a stable set of funding and of experts working for HPC3 and funding over the term of that CSA (referred to as “HPC3-CSA” in the remainder of this document). In turn, this would enable proper planning and resourcing of HPC3 activities, at least for governance and organisation, dissemination and outreach.

The number of beneficiaries of a HPC3-CSA could be significantly lower than the number of CoEs and the HPC3 beneficiaries would be an even smaller subset of the CoE beneficiaries. A key task of the HPC3-CSA would be to establish a close collaboration with all CoEs (and other members, if so desired), and include key expertise from them in the HPC3-CSA activities. While this is structurally similar to the request of the current HPC3 for CoEs to contribute, a HPC3-CSA would not ask for substantial effort to be expended – rather, it would offer the CoEs to bring in their scientific domain knowledge, experience and results to influence the HPC3-CSA actions, and offer services to them.

This collaboration with CoEs (or other parties) could take the form of one or several project advisory bodies which CoE experts would be invited into, and of day-to-day interaction for specific actions.

An HPC3-CSA could also be interested to broaden the scope of parties it collaborates with and supports. A primary area of collaboration would be with the national HPC Competence Centres (NCCs), which would expand on the current CoE-NCC interactions organized by FocusCoE and CASTIEL. Another natural step could be to open collaboration to include other-related R&I projects funded by the EC commission or the EuroHPC JU. This could be of particular benefit for activities which extend beyond the application space, such as HW/SW co-design or access to early prototype systems.

The above approach would address the sustainability of HPC3 for the CSA project term (3 or 4 years); at the end of which term, a follow-up CSA project could take over, or other ways to continue would need to be found. It is conceivable that a HPC3-CSA could make better progress in devising a scheme to sustain the beneficial actions and impact of HPC3 without the need for ever-continuing funding.

## *3.3 Found a Sustainable, Legal HPC3 Organisation*

In the above two approaches, HPC3 will continue to be an ephemeral effort without itself being a legal body or organisation, carried by mutual agreement of limited-term projects or by a research grant. Creating and operating a legal organisation for HPC3 (referred to as "HPC3++" in the remainder of this document) would bring a number of advantages with regards to sustainability:

- It would decouple the lifetime of HPC3++ from that of any constituent projects or research grants and avoid efforts to transition between different incarnations.
- A suitable legal organisation would be eligible to join project consortia and acquire funding for its activities from the EC commission, EuroHPC JU or member state agencies; it could also charge for membership, opening up an additional funding stream.
- A stable, long-lasting HPC3++ organization could have significantly enhanced impact in disseminating (building a powerful "European HPC Application" brand image) and supporting the European HPC application pillar, as shown by the success of PRACE for the scientific HPC infrastructure, and the ETP4HPC for industry involvement.
- If so desired, membership could be open to both academic and commercial entities, and also to technology providers and end-users. This would facilitate collaboration with industry as a whole, and create opportunities for advancing industrial use and co-design. The new set of national competency centres (NCCs) could also be very important and impactful for the members.

The legal form for HPC3++ would need to be chosen carefully – it is clear that HPC3++ would not be striving for profits from its operation, and so a non-for-profit association as for example an AISBL looks like an attractive option.

A downside of an HPC3++ organisation is the need for at least a basic level of funding to support operations. Membership fees can provide such a support, and for example the ETP4HPC is funded through such fees. It is understood that academic entities might be hard pressed to pay such dues, and the details would need to be carefully evaluated. It might be possible to combine approaches, found a non-for-profit HPC3++ organisation from within a HPC3-CSA and support it for a relatively short time while members are acquired, thus keeping the per-member fees reasonably low.

Regarding formal membership of Horizon Europe projects, the challenge is that such projects are not legal entities of their own; one way around this could be to have the coordinator (or a few key beneficiaries) formally join and represent the project(s).

# 4 HPC3 Sustainability Survey

## 4.1 Survey Text and Questions

The survey was implemented as a Microsoft Word document with multiple choice buttons and text fields for participants to fill in; since project reporting in most CoEs was done using Microsoft Word, this was seen as the easiest way to make progress[8] for a relatively small circle of participants without excluding any of these.

The full questionnaire is included below; to set it apart from the rest of the Deliverable, it is printed on a light blue background.

# HPC3 Sustainability Questionnaire

Addressing all HPC CoEs

## 1 Purpose

This questionnaire was prepared by FocusCoE WP2 after an initial analysis of the options for ensuring sustainability of the HPC CoE Council (HPC3) after the term of the participating H2020/EuroHPC funded projects ends. The findings of this analysis were presented at the HPC3 meeting on June 16, 2021, and it was decided in that meeting to collect the HPC CoE opinions regarding HPC3 sustainability via a questionnaire – this document.

We ask each CoE to read the questionnaire carefully, and fill in the CoE information plus answers to the questions the CoE has a position on. FocusCoE WP2 will collect and collate the answers, and the findings will again be discussed in a future HPC3 meeting. Any findings that are used within the related FocusCoE WP2 deliverable on the topic of HPC3 sustainability will be anonymised. The general purpose of the discussion on sustainability of HPC3 is to identify an interest/requirement for HPC3 itself to take steps to create a sustainable form or perhaps to be able to formulate a recommendation to the EuroHPC JU on how it might assist with making HPC3 sustainable.

## 2 Participating COE Information

Please identify the CoE responding: Name of CoE

Please identify yourself: Your first & last names

Date of response: Date of response

## 3 Questions

### 3.1 HPC3 Sustainability Relevance

A fundamental question is of course: how significant is a continuation of HPC3 and its current services for your CoE? Please rate the importance of the current HPC3 services to your CoE by selecting a number between 1 and 9, with 1 indicating highest importance:

- Formulating and representing common interests of the CoE community vis-à-vis EuroHPC, other relevant funding bodies, and industry Select a rank.
- Support in building CoE brand(s) and dissemination/exploitation Select a rank.

[8] Compared to, for instance, creating a PDF form or setting up a survey website.

- Support for reaching out to actual and potential industrial users of HPC Select a rank.
- Support for putting (the core activities of) CoEs on a sustainable basis (such as business development) Select a rank.
- Influence on EuroHPC (RIAG) to shape R&I&D priorities and influence coming calls Select a rank.

Please name any additional services a continued HPC3 should provide to your CoE? Please also add a rank between 1 and 9:

| Additional HPC3 services which should be continued. |
|---|

## 3.2 HPC3 Sustainability Approach

Please rank the approaches for sustaining HPC3 from the point of view of your CoE –select a number for each, with 1 indicating highest rank and 9 indicating lowest rank:

1. Continue HPC3 as voluntary collaboration of the individually funded CoEs, governed by Terms of Reference: Select a rank.
2. Continue HPC3 as a funded support action (**HPC3-CSA**) for the individually funded CoEs: Select a rank.
3. Evolve HPC3 into a legal organisation (**HPC3++**), who's operation would require income generation, noting that it could be eligible for funding from EuroHPC: Select a rank.
4. Does your CoE see approaches for HPC3 sustainability in addition to 1 – 3 above? Please enter a short description of these below, and rank these between themselves and wrt. 1 – 3 above (by entering a number between 1 and 9):

| Enter other HPC3 sustainability approaches here. |
|---|

A continuation of HPC3 will require funding – please enter your organisation's/your CoE's response to the following questions:

- Would your organisation be willing to pay membership fees to an HPC3++ legal entity? Enter Yes/No
- How would you estimate the willingness of your CoE's participant organisations to pay membership fees to an HPC3++ legal entity? Enter a number between 1 and 9 (1 = highly likely, 9 = very unlikely) Select a rank.
- Would your CoE be able and willing to assign funding (provide in-kind contributions) to a continued HPC3? Enter Yes/No

## 3.3 HPC3 Sustainability Scope

For any form of continued HPC3/HPC3-CSA/HPC3++ activity, it is important to define the scope in terms of the circle of members (or supported organisations/projects), and in terms of the domains and applications represented by them.

For the HPC3++ approach, please answer these questions

- What shall be the requirement for an organisation (such as an HPC centre, a university or a company) to be eligible for membership in HPC3++? Please check all that apply
  - Beneficiaries of (previous or ongoing) HPC CoE s☐

  - Associated partners of (previous or ongoing) HPC CoEs ☐
  - Partners of CSAs for HPC CoEs ☐
  - Organisation has to be incorporated in the EU[9] ☐
  - Organisation is active in the development of HPC applications ☐
  - Organisation is active in the development **or use** of HPC applications
  - Organisation operates HPC resources ☐
- Would your CoE support an option for personal memberships?
  - As the only membership scheme for HPC3++ ☐
  - As an addition to organisational membership ☐

For the HPC3-CSA approach, please answer these questions

- Should the circle of supported projects be restricted to the running HPC CoEs? Enter Yes/No
- Should the circle of supported projects include any running EuroHPC projects (CoEs, technology development, deployments)? Enter Yes/No

For the HPC3 approach, please answer these questions

- The circle of members in HPC3 should stay as is, that is include ongoing HPC CoEs and their CSAs? Enter Yes/No
- Should we strive to enlarge the number of members in HPC3, for instance by
  - Including former HPC CoEs and their CSAs? ☐
  - Including former or ongoing EuroHPC R&I projects? ☐
  - Including organisations active in HPC application development outside of the circle of EuroHPC funding ☐

The former and current HPC CoEs define the application domains which HPC3 focuses on. For a continued effort, if additional partners are admitted, how would you propose to ensure that the key CoE application areas are covered?

Proposed mechanisms to keep focus on key CoE application areas.

For the HPC3++ approach, we could consider including commercial organisations which conduct HPC application development (ISVs, large commercial HPC users, technology providers). Would your CoE support admitting as members

- ISVs (independent software vendors) working on HPC applications ☐
- Larger commercial companies with in-house HPC development activities ☐
- HPC HW or SW technology providers active in HPC application development ☐

A sustainable HPC3/HPC3-CSA/HPC3++ activity could decide to increase its ambition and scope – please rank the items below (number between 1 and 9, where 1 = high priority)

- Represent academic & industrial interests and provide targeted means to address academic, governmental, and industrial end-users and promote the uptake of HPC in these areas. Select a rank.

[9] or be eligible for funding in EuroHPC R&I activities.

- Address and promote the uptake of HPC in commercial/industrial areas and with small-and-medium enterprises. Select a rank.
- Achieve the sole representation of HPC applications (industrial or external to CoE) applications to EuroHPC and/or the European Commission. Select a rank.
- Support the creation of joint, impactful co-design activities with EuroHPC R&I projects and/or with HPC technology providers. Select a rank.

What specific added value could a HPC3++ activity provide to members outside of the circle of organisations active in CoEs?

| HPC3++ membership benefits. |
|---|

### 3.4 Work with Other Relevant Organisations

Within Europe and on a global scale, there is no shortage of organisations active in HPC technology and software. Which of the following organisations would your CoE see as a key collaboration target for a continued HPC3/HPC3-CSA/HPC3++ activity? Please add a rank between 1 and 9 to the entries below (where 1 = high priority).

- PRACE Select a rank.
- ETP4HPC Select a rank.
- EuroCC/CASTIEL/NCCs Select a rank.
- HiPEAC Select a rank.
- HPC user fora organised by technology providers Select a rank.

Please enter any other external organisation which your CoE would see as an important target for collaboration, again adding a rank between 1 and 9:

| Additional international organisations to be collaborated with. |
|---|

## 4.2 Survey Results and Conclusions

The survey was sent out by Email to the HPC3 representatives of all 14 active CoEs plus E-CAM at the end of July, 2021. The organisations addressed were asked to answer in the name of their CoE, taking suitable measures to ensure that the answers given reflect the opinion of the CoE's participants. A full set of responses was received by mid-September, and some respondents exercised the right to not answer questions which were not seen as relevant for their CoE.

The survey did use a numerical scale of 1 to 9 to express the importance of, satisfaction with or need for a service, or the agreement or disagreement to a question. Consistently, an answer of "1" indicates an extremely high value/agreement, and "9" signifies extremely low value or total disagreement. The results are shown below as "box plots" indicating minimum and maximum response, the quartiles, and the average across all responses. A median of 3 or less is interpreted as significant agreement or a significant high value.

In the questionnaire presented in Section 4.1 above, the term "voluntary collaboration" was used for what we referred to as non-contractual association in Section 3.1. In order to be consistent with the figures statistics on the results of the survey, included in the next subsections, we will maintain the use of that description.

### 4.2.1 Relevance of Sustaining HPC3 Services

Figure 2 shows the responses to the question of importance/relevance of the current HPC3 services to the CoEs. The "representation of common interests", "CoE brand and dissemination" and "influence on EuroHPC/RIAG" services were all see as highly important (median <=3). The other two services ("reaching out to industrial end users" and "support for sustainability") were in summary seen as weakly important (median 4), and the high spread of answers clearly indicates concrete differences of opinion between the CoEs.

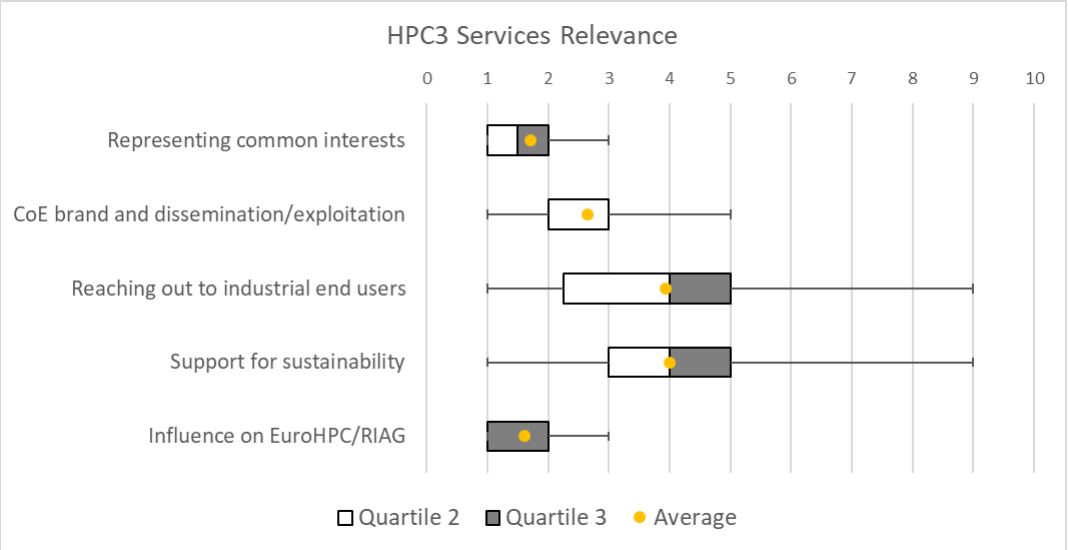


**Figure 2: Relevance of current HPC3 services.**

### 4.2.2 Options for Sustaining HPC3

Figure 3 indicates the level of agreement with the three HPC3 sustainability approaches presented in Section 3; The "voluntary collaboration" and "HPC3-CSA" approaches both receive strong agreement, while the "legal organisation" approach is only weakly accepted. A logical consequence of adopting a legal organisation is the charging of membership fees, which was strongly rejected (median of 7).

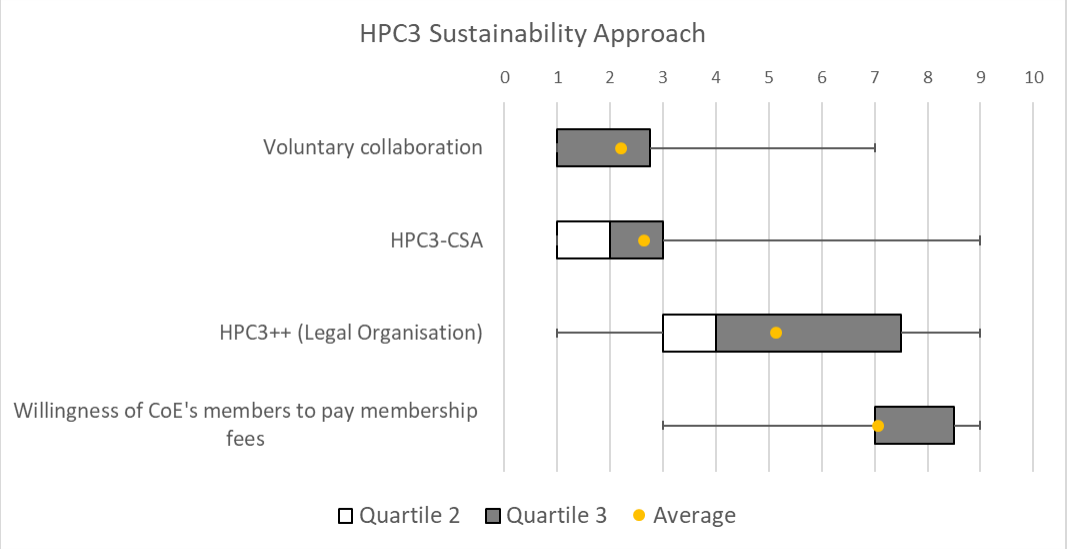


**Figure 3: Agreement to HPC3 sustainability options.**

Of the participating CoE coordinators, only 14% would agree to pay membership fees; on the other hand, 83% of the respondents agreed to assign funding/in-kind contributions to a future voluntary HPC3 (non-contractual association).

### 4.2.3 Membership in a Sustained HPC3 Activity

For the voluntary HPC3 sustainability option, Figure 4 shows the responses. The numbers indicate a desire to keep at least former CoEs as members, and a much weaker agreement to include other EuroHPC JU funded HPC R&I projects or HPC application developers outside the EuroHPC programme.

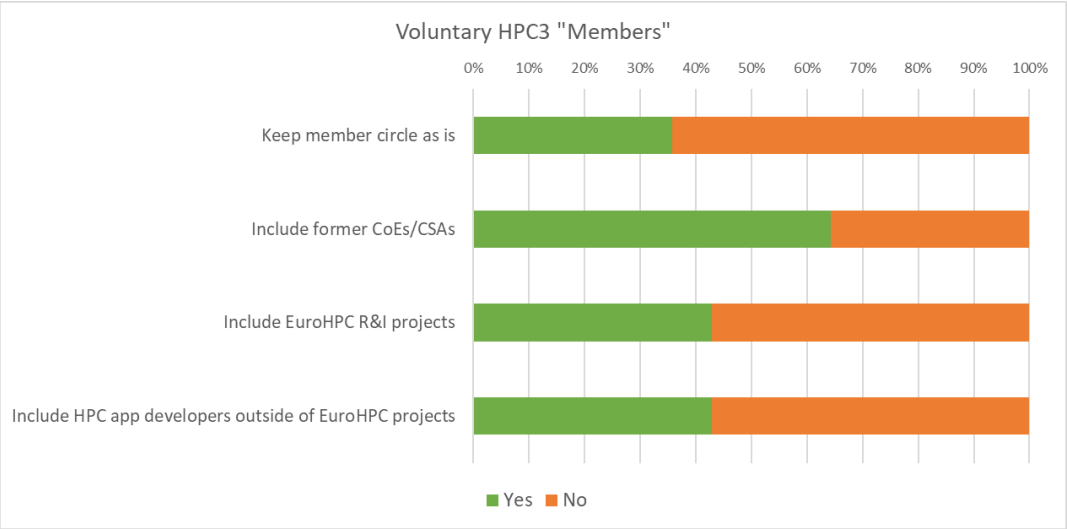


**Figure 4: Membership scope for a future, voluntary HPC3.**

For the HPC3-CSA option, a clear majority of respondents (69%) voted for including all EC and/or EuroHPC JU funded HPC projects in the circle of supported projects.

Finally, for the HPC3++ option, Figure 4 shows the tally; besides CoE beneficiaries and their associated partners, agreement was voiced to include parties which perform application development, as long as they are not independent software vendors (ISVs). developers/providers of HPC technology would also be welcome, and only about 30% would make incorporation in the EU a condition for membership. HPC3++ was only weakly accepted, and these results are included for completeness.

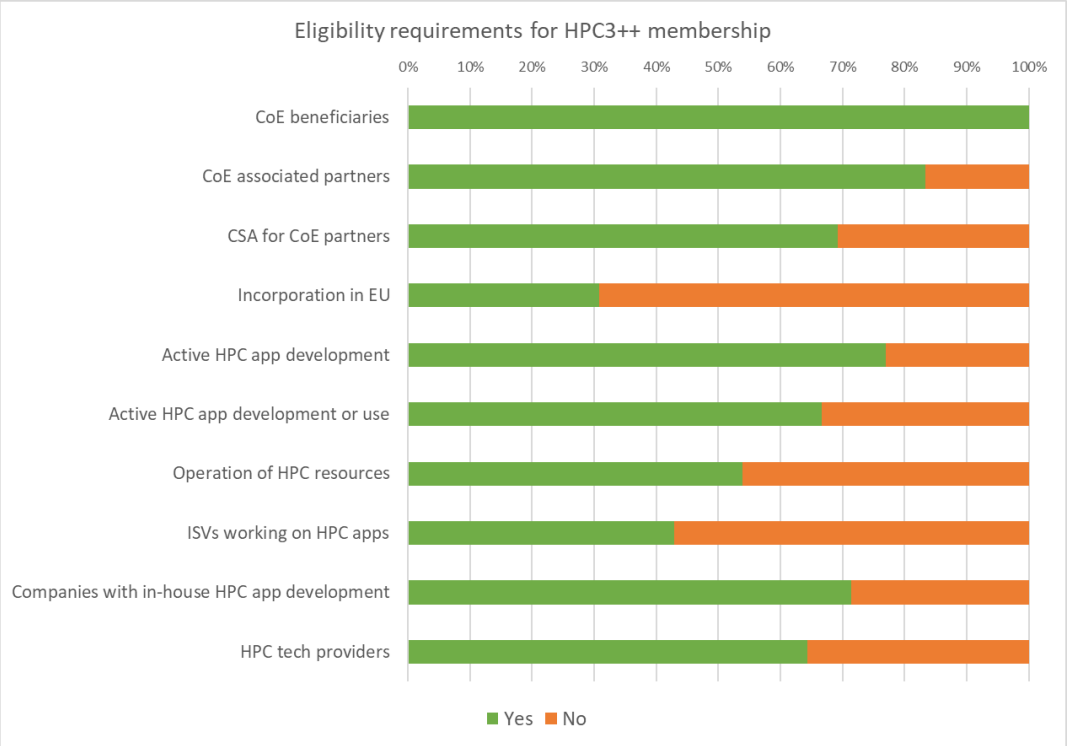


**Figure 5: Membership scope for a sustained HPC3++ organisation.**

### 4.2.4 Increased Ambitions of a Sustainable HPC3

Figure 6 depicts the answers concerning the relevance of additional services of a sustained HPC3, which would increase the ambition. The 'support for co-design activities" is seen as extremely relevant (median of 1), while the "representation of academic and industrial interests" and the "promotion of industrial HPC uptake" are both seen as significantly important. Amongst the respondents, there does not seem to be a desire for HPC3 to aspire to become the sole European representation for HPC applications.

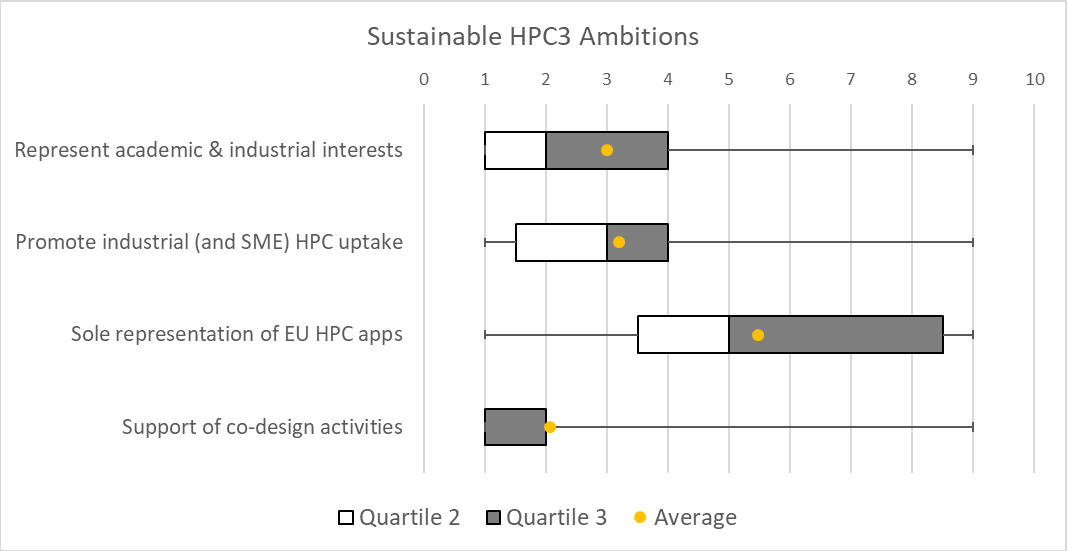


**Figure 6: Relevancy of additional HPC3 services.**

### 4.2.5 Other Relevant Organisations

Figure 7 presents the results relating to the organisations with which a sustained HPC3 should work. PRACE, ETP4HPC and the EuroCC/CASTIEL/NCC combination [3] receive strong

approval; HiPEAC [7] receives a median of 3, yet a large spread in answers, and other (mainly industry) HPC fora only received limited support.

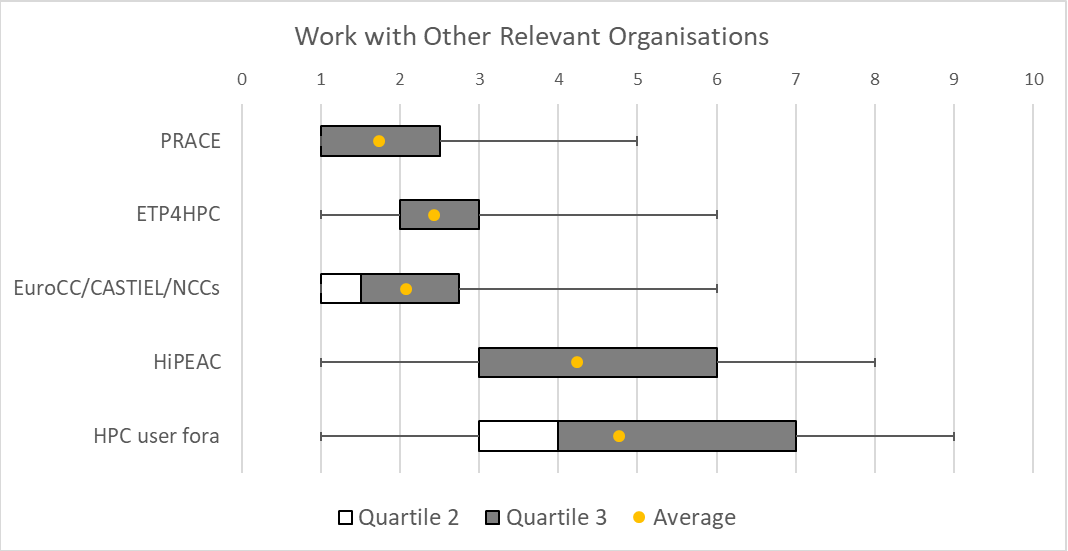


**Figure 7: Organisations relevant for a sustained HPC3 activity.**

The "Data, AI and Robotics" association DAIRO [8] (formerly BDVA) was proposed two times in the free-text responses.

# 5 Proposed Sustainability Options and Conclusion

From the survey results, it became clear that the current CoE constituency of HPC3 do not consistently support the creation of a stand-alone, legal entity, and much less the introduction of a paid membership scheme, which would be required for this approach.

This does leave two options for sustaining the HPC3 effort – one being the continuation as a non-contractual association (in Section 4, the voluntary collaboration option), and the other being a CSA funded by the European Commission or the EuroHPC JU. The survey results do slightly favour the former, yet the latter also receives significant approval.

The following two subsections detail these two options and the measures which are seen to be required to ensure both longevity/sustainability of an evolved HPC3 effort, and achievement of the objectives as specified in the FocusCoE DoA. They also factor in the remaining results of the survey.

## *5.1 Sustainable HPC3 as Informal Association*

The charter of the existing association of CoEs called HPC3 are the Terms of Reference (ToR), which were agreed by all running CoEs when HPC3 was founded, and accepted by the new CoEs who have joined afterwards. As detailed in 3.1, sustaining the association requires

- Effective mechanisms for transitioning the governance functions and all ongoing/planned efforts and tasks of HPC3 in case of members (CoEs at this point) and their beneficiaries are leaving the association; this is of particular importance for the HPC3 office functions., and for the support activities provided by WP2 of FocusCoE.
- A minimum number of members at each point such that the execution of the above tasks can be guaranteed, and that the promised results and impact can be delivered
- Reliable “pledges” of in-kind contributions (personnel effort, dissemination & travel support, support for keeping up Web presence and document repositories) from members; the response to the related, qualitative question (see 4.2.2) indicates that the vast majority of CoEs are open to this.
- A “membership” drive addressing newly-funded CoEs, with the objective to win as many as possible for HPC3; this might need to include a mechanism to negotiate and maybe accommodate requests for changes in the ToR.

Judging by the membership scope results reported in 4.2.3, the rules in the ToR affecting CoEs whose term has expired (and basically forcing the projects and their beneficiaries to drop out; the latter can stay if they are also funded in other CoEs), could be relaxed, keeping the beneficiaries of such CoEs in the HPC3 fold. This would help in smoothing out the transition periods between a “generation” of CoEs terminating and a new generation starting up. However, since no funding is available to the beneficiaries after a CoE ends, the amount of resources beneficiaries can put into a continued participation in HPC3 is unclear. To implement this, an amendment of the ToR needs to be created and approved by the current HPC3 members.

In addition, there is weak approval to also offer membership in an HPC3 association to other HPC-related projects funded by the EC or EuroHPC JU. If a convincing benefit for such non-CoE projects could be found, such a broadening of the membership base could bring in significant additional expertise and contributions, which in turn would support additional efforts and the output and impact of a sustained HPC3. A particularly relevant case of such an extension would be to offer membership to EuroCC/Castiel and the NCCs across the

EuroHPC countries. As in the paragraph above, the ToR would need to be suitable amended, and the current members would need to agree.

The existing mechanism to admit observers to certain HPC3 meetings could also be useful to extend the HPC3 scope, although it is more applicable to parties which can provide ad-hoc input to HPC3 in certain topics, or to target important external parties for dissemination purposes.

Including organisations active in HPC application development outside or European funded R&D projects was also weakly approved; the question of defining benefits for such parties to join the HPC3 organisation (and to pledge actual contributions) is unclear at this point, and we would expect that such partners would also require more changes to the ToR than those who are active in the European public-funded HPC area.

The EC and EuroHPC might – and naturally at their sole discretion - include specific conditions or motivations for future R&I projects to participate in a sustained HPC3. Going beyond a mere recommendation, this might extend to a collaboration requirement and potentially setting a minimum contribution to the HPC3 activities (i.e. a percentage of their funding to be devoted to such). This would put the HPC3 association onto a much more solid footing, since an “ in kind budget” would in effect become available.

A non-contractual HPC3 association could, if sufficient contributions are available, take on the additional services as discussed in 4.2.4; an effective support for co-design activities will likely require the inclusion of all European-funded R&I initiatives and their technology development beneficiaries.

Furthermore, such an HPC3 association would be able to liaise with and, dependent on available contributions, also collaborate with the external organisations listed in 4.2.5.

Most of the currently active CoEs have asked for moderate extensions of their term, to help bridge the gap before a new generation of CoEs included in the announced, yet not yet released EuroHPC call for projects can start. FocusCoE will continue until end of March 2022, and other CoEs with terms expiring around the end of 2021 might run until May 2022. Since a “HPC3-CSA” first needs to be included in a EuroHPC call for proposals, it is unlikely that a seamless transition to such a CSA is realistic.

Unless a different way to bridge the gap and continue effective support for HPC3 is found, the decisions mentioned above have to be taken in the first quarter of 2022, with ToR amendments produced an accepted in due time.

## *5.2 Sustainable HPC3 as a CSA*

Trivially, a continuation of HPC3 as a CSA would first require a corresponding call for proposals by EuroHPC JU or the EC, and the acceptance of one proposal under that call. It does not seem to make sense to have multiple CSA projects sharing the tasks of continuing HPC3.

To perform a transition from the current form of HPC3 to HPC3-CSA, a number of measures and steps are required; to ensure a smooth changeover, it would be important that the funding agencies consult with the current HPC3 on which requirements to put into a call for an HPC3-CSA. The steps as seen right now include

- The HPC3-CSA to define the role of “supported” projects and their beneficiaries in the governance and execution of the HPC3-CSA. This could take the form of advisory bodies guiding HPC3-CSA scientific/technical, dissemination and potentially co-design priorities within the limits of the HPC3-CSA DoA, and of joint activities where

such projects would bring in their unique expertise and HPC3-CSA would perform the actual work.

- The HPC3-CSA to define an operational framework governing the collaboration with supported projects, which could replace the ToR and govern rights and responsibilities between HPC3-CSA and a supported project or its beneficiaries, and also the rights and obligations between supported projects and their beneficiaries.
- The members of the existing HPC3 association then being offered the possibility to join the circle of HPC3-CSA supported entities. For new projects, the EC or EuroHPC JU could actually require collaboration with the HPC3-CSA.
- As far as possible within the legal context of its Grant Agreement, the HPC3-CSA would continue any ongoing activities of the HPC3 associations, in particular the Web presence and document repositories, with the option of "re-branding" such over time.
- As reported in Section 4.2.3, a clear majority of the current HPC3 members do favour an HPC3-CSA supporting additional European funded HPC-related projects (instead of just the CoEs); since this would also facilitate the support of effective co-design activities, a HPC3-CSA should be setup to cover the relevant EC and EuroHPC JU HPC-related projects. It is hard to see how, given the legal conditions of the Horizon Europe framework[10], a HPC3-CSA could also offer support to projects or entities operating outside these frameworks, and so no corresponding question was asked in the survey.

An HPC3-CSA project could, if included in its DoA, take on the additional services as discussed in Section 4.2.4; an effective support for co-design activities will be possible, if the relevant European-funded HPC R&I projects would be within the scope of the CSA. Since a CSA would have an assured budget to take on these activities, proper planning and execution would be possible, maximizing the achieved results and impact.

The EuroHPC JU has clearly expressed the objective of increasing participation of EU-13 countries in HPC-related projects, and of supporting take-up of HPC in general and EuroHPC-funded results in particular with industry across the EuroHPC countries. Finding a way to include EuroCC/Castile and, in particular, the individual NCCs in the circle of projects supported by a HPC3-CSA would support this specific objective and therefore should be pursued.

## *5.3 Ending HPC3*

There is, of course, an option which ahs not yet been discussed in any detail: what would happen if HPC3 would come to an end, after FocusCoE and most of the current member CoEs have finished. Clearly, even an informal association discussed in 5.2 requires a minimum number of members contributing resources to its operation to keep it viable, and it is not clear how long the hiatus will be after termination of most of the current CoEs and start-up of the new generation later in 2022.

With the end of HPC3, the "surviving" CoEs and the new generation of CoEs will lose the established way of collaborating between all projects, of representing common interests towards EuroHPC, PRACE, the ETP4HPC and other players in the European HPC ecosystem, and of creating a "CoE brand" which amplifies the impact of individual projects, and implements the role of driving the "Application Pillar". HPC3 has also been instrumental in bundling individual training offers by CoEs and making these accessible from the PRASCE

[10] which the EuroHPC JU uses for their funding activities

training repository, and it has made good headway in establishing a working collaboration with EuroCC and the NCCs.

## 5.4 Conclusion

In this deliverable, we have analysed the current modus operandi of HPC3 and detailed three approaches for putting the HPC3 organisation (and more importantly, its services) onto a sustainable footing. This presentation drew heavily on the actual experience of running HPC3, and on the results of FocusCoE sustainability workshops. A survey of all CoEs (active ones and the already terminated E-CAM) was conducted, asking about their opinion on the HPC3 services, the sustainability approaches, membership rules and future ambitions. The results indicate that two of the sustainability options are actually seen as acceptable and realistic – continuing as a non-contractual association, with potentially varying membership and best-effort contributions from members, and transitioning to a CSA. For both options, we describe the steps required and additions to or improvements which would substantially extend the stability and potential outcomes of a sustainable HPC3.

Both options have the drawback that they are directly or indirectly dependent on project funding cycles: a HPC3-CSA will exist for its term, and while potentially there could be a successor project, this is uncertain. The non-contractual association option depends on the membership of limited-term projects and on (voluntary) contributions from these to support operational and functional tasks of HPC3.

From a stability perspective, forming a legal organisation initially supported by membership dues looks most attractive – such an organisation can acquire other sources of funding (such as EC or EuroHPC JU R&I funding), extend its membership circle, or in theory even involve in limited commercial activity, as permissible by a not-for-profit organisation. The current round of CoEs are not supportive of an approach which foresees membership fees, which is not surprising. Yet, ultimately, funding has to be found to enable HPC activities, and the two other sources are meaningful & reliable resource pledges by the CoEs or funding from the EC or EuroHPC JU.

# 6 References

[1] HPC3 website: https://www.hpccoe.eu/
[2] FocusCoE project website: https://www.focus-coe.eu/
[3] EuroCC/CASTIEL website, including map of NCCs: https://www.eurocc-access.eu/
[4] ETP4HPC website: https://www.etp4hpc.eu/
[5] PRACE website: https://prace-ri.eu/
[6] Regulations for a Belgian AISBL: AISBL: https://justice.belgium.be/fr/themes_et_dossiers/societes_associations_et_fondations/associations/aisbl
[7] HiPEAC website: https://www.hipeac.net/
[8] DAIRO/BDVA website: https://www.bdva.eu/