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**D2.3
Management Processes and Tools**

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List of Acronyms and Abbreviations

AISBL	Association International Sans But Lucratif (legal form of the PRACE-RI)
CPU	Central Processing Unit
DoA	Description of Action (formerly known as DoW)
EC	European Commission
ESFRI	European Strategy Forum on Research Infrastructures
GB	Giga (= 2^{30} ~ 10^9) Bytes (= 8 bits), also GByte
Gb/s	Giga (= 10^9) bits per second, also Gbit/s
GB/s	Giga (= 10^9) Bytes (= 8 bits) per second, also GByte/s
GFlop/s	Giga (= 10^9) Floating point operations (usually in 64-bit, i.e. DP) per second, also GF/s
GHz	Giga (= 10^9) Hertz, frequency = 10^9 periods or clock cycles per second
GPU	Graphic Processing Unit
HPC	High Performance Computing; Computing at a high performance level at any given time; often used synonym with Supercomputing
IP	Implementation Phase
ISC	International Supercomputing Conference; European equivalent to the US based SCxx conference. Held annually in Germany.
MB	Management Board (highest decision making body of the project)
MooC	Massively open online Course
MoU	Memorandum of Understanding.

NDA	Non-Disclosure Agreement. Typically signed between vendors and customers working together on products prior to their general availability or announcement.
PATC	PRACE Advanced Training Centres
PRACE	Partnership for Advanced Computing in Europe; Project Acronym
PRACE 2	The phase of the PRACE Research Infrastructure following the initial five-year period.
RI	Research Infrastructure
TB	Technical Board (group of Work Package leaders)
TB	Tera (= 10^{12}) Bytes (= 8 bits), also TByte
TFlop/s	Tera (= 10^{12}) Floating-point operations (usually in 64-bit, i.e. DP) per second, also TF/s
Tier-0	Denotes the apex of a conceptual pyramid of HPC systems. In this context the Supercomputing Research Infrastructure would host the Tier-0 systems; national or topical HPC centres would constitute Tier-1

List of Project Partner Acronyms

BSC	Barcelona Supercomputing Center - Centro Nacional de Supercomputacion, Spain
CaSToRC	Computation-based Science and Technology Research Center, Cyprus
CEA	Commissariat à l'Energie Atomique et aux Energies Alternatives, France (3 rd Party to GENCI)
CSC	CSC Scientific Computing Ltd., Finland
GENCI	Grand Equipement National de Calcul Intensiv, France
GRNET	Greek Research and Technology Network, Greece
JUELICH	Forschungszentrum Juelich GmbH, Germany
PRACE	Partnership for Advanced Computing in Europe aisbl, Belgium
UC-LCA	Universidade de Coimbra, Laboratório de Computação Avançada, Portugal

Executive Summary

The objective of this deliverable is to report on the support provided by PRACE-4IP Work Package 2 to the development of the PRACE Research Infrastructure (RI) during the timeframe of the PRACE-4IP project, based on the recommendations collected in D2.3 of the PRACE-3IP project [1].

The work has followed the recommendations of the Board of Directors of PRACE, to review and improve the following processes: peer review, project management, conflict of interests, mail management. The Board of Directors of PRACE also requested to further develop the impact assessment methodology, as a continuation of the efforts collected in D2.4 of PRACE-3IP project [2] and D2.4.1 of PRACE-3IP project [3]. This has resulted in the proposal of baseline and target values for PRACE-RI KPIs.

In addition to these topics, this deliverable collects the work done in relation to one of the EC recommendations of the PRACE-4IP mid-term evaluation, that is, to report on the impact assessment of the outcomes of the project itself, beyond that of the Research Infrastructure.

As a result of all these efforts, a number of improvements have been applied to PRACE AISBL procedures, notably to the Peer Review process. This includes an enhanced process for the selection of external reviewers for proposals to PRACE Calls, the simplification of the Preparatory Access instrument, as well as other recommendations to improve the information provided to PRACE applicants. In addition, the impact assessment methodology of PRACE has been further developed, with the operational implementation of the methodology described in D2.4.1 of PRACE-3IP project [3], the definition of baseline and target values for PRACE-RI KPIs, and the complete elaboration and reporting of PRACE-4IP KPIs.

1 Introduction

The objective of this deliverable is to report on the support provided to the development of the PRACE-RI during the timeframe of the PRACE-4IP project by Work Package 2. This work builds on top of the recommendations collected in D2.3 of the PRACE-3IP project [1], in order to assist the association on their implementation.

The work has been focused on the recommendations of the Board of Directors (BoD) of PRACE, who identified at the beginning of the project the following PRACE AISBL processes to be reviewed and possibly improved:

- Peer review of proposals,
- Project management,
- Conflict of interests,
- Mail management.

The PRACE BoD has also requested to further develop the impact assessment methodology, as a continuation of the efforts collected in D2.4 of PRACE-3IP project [2] and D2.4.1 of PRACE-3IP project [3].

In addition to these topics, this deliverable collects the work done in relation to one of the recommendations of the PRACE-4IP mid-term evaluation, that is to report in the impact assessment of the outcomes of the project itself, beyond that of the Research Infrastructure.

This deliverable describing the activity undertaken by Task 2.2 is structured as follows:

- Section 2 recalls the management structure of PRACE Research Infrastructure; reports on the process reviewed and issues recommendations for each one of them.
- Section 3 analyses the current impact assessment methodology for PRACE Research Infrastructure and recommends steps for their further development.
- Section 4 reports on the development of KPIs for the PRACE-4IP project.

2 Support to PRACE-RI management processes

The PRACE Research Infrastructure (PRACE-RI) has been operating since 2010. Its management has been based on the creation of a legal structure to manage the access to PRACE HPC resources, while the strategic management has taken place at Council level. In between these two bodies, the RADAR logic of the European Foundation for Quality Management Excellence model is completed in PRACE with the Strategy Working Group (SWG) of PRACE, in charge of the preparation of strategic proposals, and the Board of the Council, to evaluate the results and close the cycle (Figure 1).

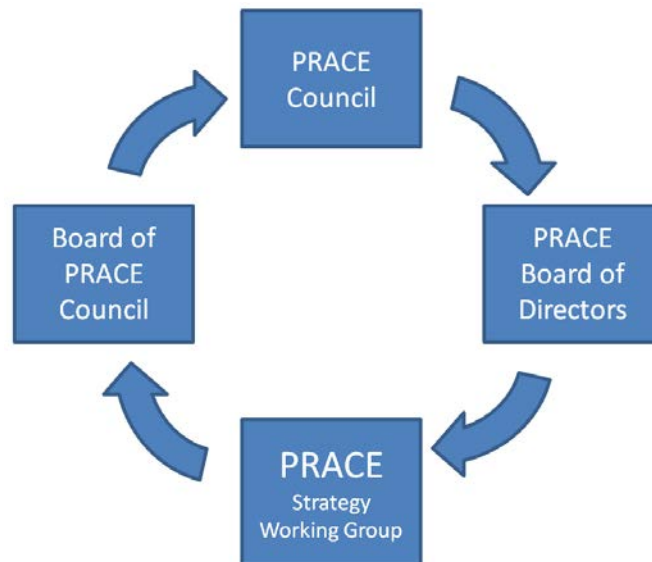


Figure 1: RADAR logic applied to PRACE governance

According to this structure, the Board of Directors (BoD) of PRACE and the PRACE SWG have been identified as the main interlocutors between PRACE-RI and the PRACE-4IP project. Throughout this project, it has proven useful that these two bodies have common members with this work package. This has ensured that the objectives of PRACE-RI are aligned with the work developed in general in the PRACE-4IP project, and specifically in WP2 and this task.

At the beginning of the project, the task leaders of WP2 had a meeting with the PRACE BoD to discuss the key processes of the association in need of further development, or that could be improved according to the lessons learned and other experience of PRACE-4IP consortium members. The following processes were identified as a result:

- Process for the peer review of PRACE Project Access proposals,
- Management of EU-funded projects,
- Process for mail management in PRACE AISBL.

In addition, the PRACE BoD requested two additional activities for this task, that is the elaboration of a Conflict of Interest policy for people working for or representing PRACE, and the continuation of the efforts carried out in PRACE-3IP towards the development of an impact assessment methodology for PRACE-RI.

During the development of the project, there have been regular interactions between the contributors to this task and PRACE BoD, in order to review the actions in progress. In addition, in October 2015 the leader of this WP (Oriol Pineda) and the Project Manager of PRACE-4IP (Florian Berberich) were appointed by the PRACE Council as members of the PRACE BoD. This has facilitated the work of this WP, by ensuring the complete alignment of the actions in progress with the objectives of PRACE-RI.

2.1 Peer Review

The management of the process for the review of PRACE Project Access proposals is one of the cornerstones of PRACE-RI. This is the major activity of the Peer Review area of PRACE AISBL, and as such it is regularly revisited, in order to confirm that the principles defined for PRACE Peer Review during PRACE Preparatory Phase project are maintained:

- Transparency
- Expert Assessment
- Confidentiality
- Prioritisation
- Right to Reply
- Managing Interests
- No Parallel Assessment
- Ensure Fairness to the Science Proposed.

The following figure summarises the major steps of this process:

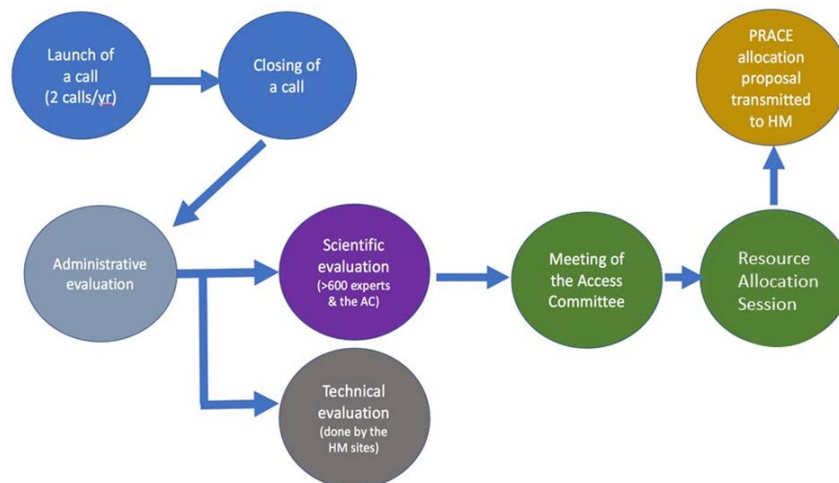


Figure 2: The PRACE Peer Review Process

Even though the structure of the process remains stable, the details of each step are periodically reviewed and improved per request of PRACE BoD according to the experience, lessons learned and inputs from the PRACE advisory committees. During the PRACE-4IP project, this process has been analysed on two occasions by WP2. The different elements analysed, the result of the review, recommendations, actions taken and future actions are indicated here.

2.1.1 Scientific Reviewer Selection

The scientific review step starts with the selection of external scientific reviewers for the proposals received. This has been identified by the PRACE SWG as one of the key elements of the process, as it has a great potential to influence the results of the whole process and distort the PRACE Peer Review principles.

As this is an element that requires strong scientific knowledge, this action was initially assigned to the PRACE Access Committee (AC). This committee of scientific experts, appointed by the PRACE Scientific Steering Committee (SSC) carried out the action until

Call 9. The experience during this period showed a number of incorrect or unsuitable selections, and not enough assessment of the potential conflicts of interest.

The first measure to improve this element has been to benefit from the recent increase in PRACE office manpower and assign this action to the Peer Review officers, in order to make it more transparent and impartial. Furthermore, this has allowed a better balance of workload for scientific reviewers, with a maximum of three applications to each individual, ensuring a higher diversity of reviewers, which can help in receiving detailed and carefully completed reviews. This improvement has also allowed an accurate check of potential conflicts of interest, and a better alignment with the timings of each PRACE Project Access Call.

After running this measure from Call 10 to Call 13, and coinciding with the extensive review of the Peer Review procedures requested by the PRACE Council on the occasion of the preparations for PRACE 2, this action has been reverted to an intermediate stage where the members of the PRACE Access Committee and the Peer Review officers collaborate in order to complete the selection of scientific reviewers. PRACE SWG, PRACE SS and PRACE-4IP WP2 members have participated in this review.

In detail, the Peer Review officers will have the responsibility to assign each proposal to two AC members based on both their scientific profile and workload balance, each of which has to propose at least three external scientific reviewers for each proposal. Then the Peer Review officers will check the availability and potential conflict of interests of the six individuals, and contacts three of them. This procedure combines the better of the two previous options, since the Peer Review officers retain the global overview of external scientific reviewers, which allows for an adequate balance of their workload, and thoroughly check for potential conflicts of interest, while the scientific expertise of the PRACE Access Committee members is adequately used. This process has been already effectively used in Call 14, recently finished. The process will be analysed by WP2 in PRACE-5IP after Call 15, to confirm the suitability or identify possible further modifications.

2.1.2 Peer Review Tool

The online tool to manage the whole Peer Review process has been reviewed by experts from other HPC national programmes, as well as by the members of the Access Committee. This has been reported internally to the PRACE Board of Directors. As a result of these reviews, a number of necessary developments have been identified, in order to add functionalities that would help the day-to-day work of the Peer Review officers, the interaction with PRACE applicants and users, and the work of the reviewers, including the PRACE Access Committee. Some of these developments include better user interfaces, global statistics and easy access to the information stored in the underlying database.

At this stage, the task has evolved into a wider initiative to define the complete requirements of the peer review tool for PRACE, and then use them to assess if the current peer review tool can be adjusted to meet them, or alternatively a new one is required, either developed by PRACE or adapting commercial solutions from Third Parties. This is involving many actors out of the PRACE-4IP project, and as a consequence this definition has not been completed on time to be reported in this deliverable. The PRACE Managing Director is currently leading a committee that includes the chairs of the PRACE SSC and PRACE AC, the chair of the PRACE User Forum, the peer review officers and representatives from WP2. This committee will aim to have a new tool ready and operational for Call 16, in October 2017.

2.1.3 *Potential Scientific Reviewer Expert Pool*

PRACE keeps a pool of the scientific reviewers that have collaborated in past PRACE Calls, including a black list of reviewers that have declared themselves not willing to review proposals for PRACE or that have submitted unacceptable reviews. This database is partly used as a guide for the assignment of reviewers in the next calls.

As a result of the review, it has been found that the pool is lacking a few scientific fields that would facilitate the selection of reviewers. In addition, the database includes only around 1500 entries, which can be limited to select the 300-400 reviewers required for each PRACE call. In the past, PRACE has suffered a high decline rate, ca. 60% of the scientific reviewers didn't answer or rejected the review. The recommendation of the review is to search and implement ways to increase the pool of potential scientific reviewers. This includes reaching agreements with other institutions and programmes, to incorporate their databases.

PRACE AISBL has implemented the additional fields in the database, and will consider exchanging the pool of reviewers with other related programmes. In fact, the database has been already shared with the Tier-1 DECI programme, and work is in progress to create a common database of reviewers for these two programmes. The requirements for this common database will be analysed by WP2 in PRACE-5IP during 2017.

2.1.4 *Peer Review Statistics*

Most of PRACE-RI key performance indicators derive from the information used in or collected through the Peer Review process. However, there is still an important amount of information that is currently not completely or properly used, in particular the details about PRACE Preparatory Access. This is important, since there is a high number of industrial users in this access modality that is not currently considered. In addition, the peer review database collects details on PRACE users that should be used for stratification, like geographical distribution of team members, professional position, academic degree, gender, among others. It is recommended to develop a new process with the aim to analyse all this data, and possible create new KPIs for PRACE-RI.

Peer Review statistics should also appear as complete as possible on the PRACE website. Possible measures include:

- Links to project publications derived from PRACE projects
- Final project made publicly available, upon consent of the author

This requires an analysis on the legal requirements, updated of consent forms and then technical requirements to carry out this recommendation. This will be done by the members of WP2 in PRACE-5IP during 2017.

2.1.5 *Preparatory Access*

After Project Access, the second, less-visible access mode of PRACE is Preparatory Access, where users can request a limited amount of resources, in order to carry out performance analysis of their codes, or prepare adaptations of them to PRACE systems. Currently, PRACE has the following four schemes in Preparatory Access:

- Type A: this scheme is intended to produce scalability plots of the performance of the codes on PRACE HPC systems, as well as other parameters that may be relevant to apply for PRACE calls for Project Access.

- Type B: the objective of this scheme is to undertake code development and optimisation. Applicants will need to describe the proposed work plan in detail, including the human resources and expertise available to implement the project.
- Type C: in this scheme, PRACE-4IP experts from WP7 are requested to provide the necessary support to undertake adaptations (development and optimisation) to the codes of PRACE users.
- Type D: this scheme allows PRACE users to start a code adaption and optimisation process on a PRACE Tier-1 system, with the support of PRACE-4IP experts from WP7. In addition to Tier-1 computing time, the PRACE user will also receive Tier-0 computing time towards the end of the project to test the scalability improvements.

Preparatory Access started as an open call with quarterly cut-offs for the evaluation of the proposals received. This was established for the convenience of working in batches. However, experience has shown that there is an average time-to-resources-access of three months. This offset is inconvenient for those small applications that only require a short allocation period to produce performance plots of their codes, prior to applying to PRACE Project Access.

As a result of this review, it is recommended that cut-offs for Type A and Type B schemes are removed, turning these two types into a continuous open call. With this change, a maximum time-to-resources of two weeks is expected. This recommendation does not include Type C and Type D, since these represent larger projects involving the technical support provided by WP7. PRACE-RI adopted this measure in October 2016, and since then 90% of the projects have been awarded resources in two weeks or less.

2.1.6 Peer Review Procedure Document

The recommendation of the analysis of WP2 is that a general document should be prepared and made available on the PRACE website and application tool. This document should include a description of the different steps of the PRACE Peer Review process. Such a document would be useful to conduct analysis of the PRACE Peer Review by external parties, as well as to the applicants, in order to better understand the process.

With the occasion of the preparations for PRACE 2, and the extensive review of the Peer Review process, this document has been produced by the PRACE Strategy Working Group, with collaborations from the participants of WP2. This document has been recently approved by the PRACE Council, and has been used as base to prepare the 15th Call for PRACE Project Access. This document, or an adapted version, will be soon available on PRACE web site.

2.1.7 Guideline for PRACE Applicants

The recommendation of the analysis of WP2 is that a new guide for applicants should be prepared. The current materials in the web page are rather old and do not consider the last updates on the Peer Review process. This document should provide a detailed description of the application form and summarise the requirements of a correct application. This document could be separated in two parts regarding Preparatory Access and Project Access. This document is currently being drafted by PRACE Peer Review officers, and after that will be reviewed by WP2 and made available on PRACE web site.

2.2 Conflicts of Interest

In order for PRACE to stay a respectable and trustworthy representative for the European HPC community, it must meet high ethical standards in order to merit the trust of its members, governments and the public. Because of this, it was felt that a policy on conflict of interest was necessary to ensure that persons and bodies of PRACE are committed to business in a manner that ensures members' judgment and undue personal interests do not influence decision-making.

Such a policy has been created by members of WP2 and reported in PRACE-4IP D2.1. The proposed policy can be found again in Annex 1 of this deliverable for convenience. It describes what a conflict of interest is, the types of conflict of interest which can surface, when a conflict of interest should be disclosed (and to whom) and also provides guidelines on how a conflict of interest can be managed. The conflict of interest policy is aimed for all persons and decision-making bodies who represent PRACE, its interests and activities.

After the submission of D2.1, this conflict of interest has been presented to PRACE BoD, who approved it with the sole modification of a clarification on the scope and applicability of the policy. It will be the responsibility of PRACE Managing Director to implement and enforce this new policy

2.3 Project Management

During the different implementation phases of the PRACE IP Projects, all partners have gained experience in the management of EC Projects. The interaction between them has allowed participating in a mutual learning process and improving their own internal processes. PRACE AISBL has also been part of this development and since it is getting more and more involved in EC projects, the implementation of a good project management process in PRACE AISBL is of outmost importance.

When it comes to Project Management there are different methods, which can be taken as a reference. Among the most well-known ones are the following:

2.3.1 *Project Cycle Management (PCM)*

The European Commission promotes the use of the Project Cycle Management (PCM) principles, for the identification, appraisal, implementation and evaluation of EU funded projects.

A core and fundamental tool within Project Cycle Management is the Logical Framework Approach (LFA). This step-by-step procedure supports the different stages of PCM and should provide an information base for completing the required PCM documents.

Project and programme cycle management guidance [6] proceeds on the fundamental principles governing the cycle of operations characterized by a five-stage cycle:

- programming, where the priorities are defined;
- identification, where the options for an intervention are considered;
- formulation or design, where the action is developed in detail on the basis of which funding is approved;
- implementation, where actions are carried out and monitored;
- evaluation where the achievements are assessed in depth and lessons learned.

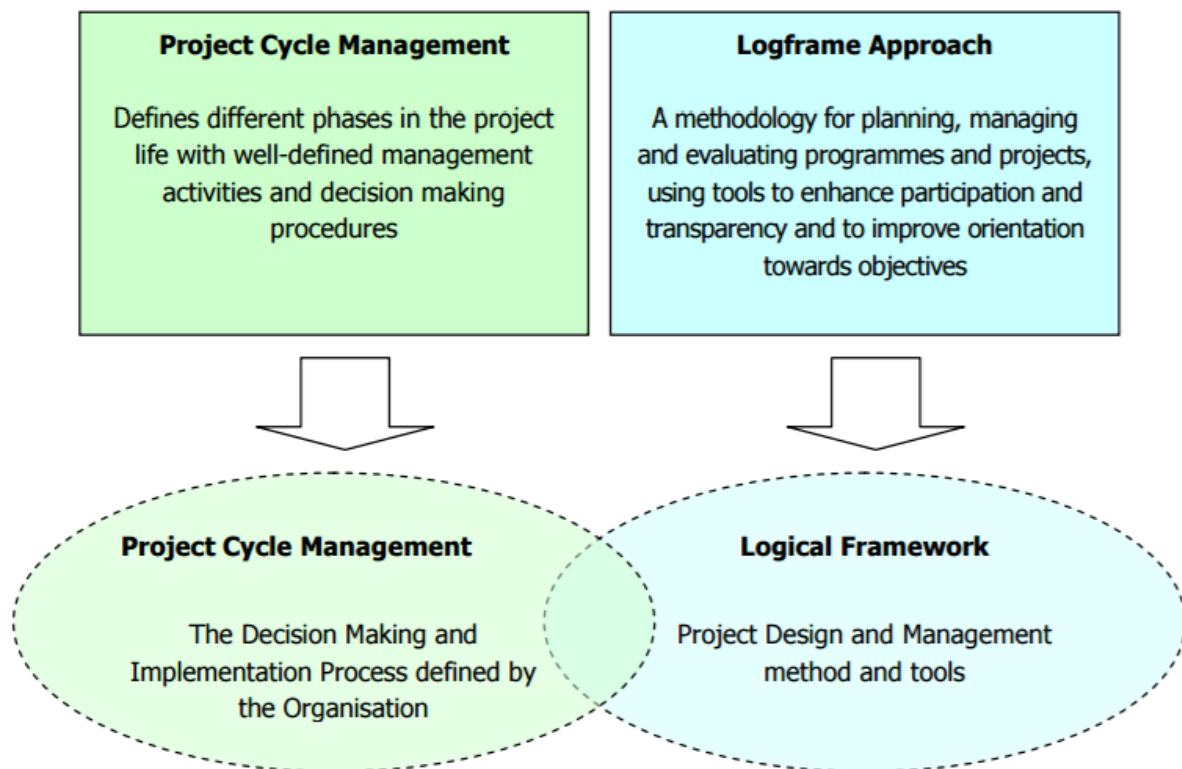


Figure 3: Project Cycle Management and Logical Framework Approach

This method allows managing a project efficiently throughout its phases, from planning through execution then completion and review to achieve pre-defined objectives or satisfying the project stakeholder by producing the right deliverable at the right time, cost and quality.

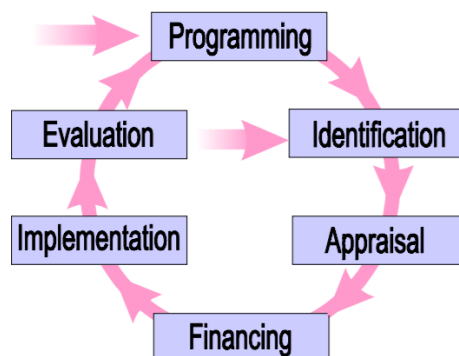


Figure 4: Project management phases

2.3.2 Prince2 Method

PRINCE2 [7] (an acronym for **PR**ojects **IN** Controlled **EN**vironments) is a de facto process-based method for effective project management. Used extensively by the UK Government, PRINCE2 is also widely recognised and used in the private sector, both in the UK and internationally. The PRINCE2 method is in the public domain, and offers non-proprietary best practice guidance on project management.

For organisations, PRINCE2's formal recognition of responsibilities within a project, together with its focus on what a project is to deliver (the why, when and for whom) provides:

- A common, consistent approach
- A controlled and organised start, middle and end
- Regular reviews of progress against plan
- Assurance that the project continues to have a business justification

This method adapts to different types of projects and it is based on proven principles, allowing organization to improve the quality of project management.

The PRINCE2 method addresses project management through the four integrated elements of principles, themes, processes and the project environment.

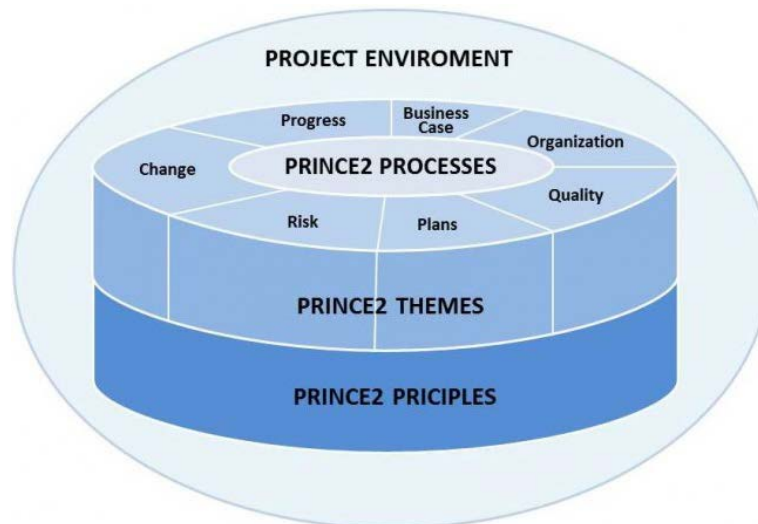


Figure 5: PRINCE2 distribution of Principles, Themes, Processes and Environment

The PRINCE2 principles are:

- Continued business justification – is there a justifiable reason for starting the project that will remain consistent throughout its duration?
- Learn from experience – project teams should continually seek and draw on lessons learned from previous work.
- Defined roles and responsibilities – projects should have a clear organizational structure and involve the right people in the right tasks.
- Manage by stages –projects should be planned, monitored and controlled on a stage-by-stage basis.
- Manage by exception- projects have defined tolerances for each project objective to establish limits of delegated authority.
- Focus on products - projects focus on the product definition, delivery and quality requirements.
- Tailor to suit the project environment – it is tailored to suit the project’s environment, size, complexity, importance, capability and risk

2.3.3 Agile Method

Agile project management [8] focuses on adaptability to changing situations and constant, regular feedback. Agile project management was developed for software projects and/or those with accelerated development schedules.

The agile manifesto [9], a "formal proclamation of four key values and 12 principles to guide an iterative and people-centric approach to software development," was published by 17 software developers. These developers gathered together to discuss lightweight development methods based on their combined experience.

Agile's four main values are the following:

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

The 12 Monkey principles that guide agile project management:

- i. Customer satisfaction is always the highest priority; achieved through rapid and continuous delivery.
- ii. Changing environments are embraced at any stage of the process to provide the customer with a competitive advantage.
- iii. A product or service is delivered with higher frequency.
- iv. Stakeholders and developers closely collaborate on a daily basis.
- v. All stakeholders and team members remain motivated for optimal project outcomes, while teams are provided with all the necessary tools and support, and trusted to accomplish project goals.
- vi. Face-to-face meetings are deemed the most efficient and effective format for project success.
- vii. A final working product is the ultimate measure of success.
- viii. Sustainable development is accomplished through agile processes whereby development teams and stakeholders are able to maintain a constant and on-going pace.
- ix. Agility is enhanced through a continuous focus on technical excellence and proper design.
- x. Simplicity is an essential element.
- xi. Self-organizing teams are most likely to develop the best architectures, designs and meet requirements.
- xii. Regular intervals are used by teams to improve efficiency through fining tuning behaviours. Regular intervals are used by teams to improve efficiency through fining tuning behaviours.

2.3.4 *PRiSM*

Projects integrating Sustainable Methods (PRiSM) [8] was developed as means of creating a methodology that took environmental factors into account while being a repeatable, efficient process that could easily be incorporated into various large-scale projects.



Figure 6: PRISM diagram

The six Principles of Sustainable Change Delivery governing this method derived from the UN Global Compact's Ten Principles, Earth Charter, and ISO:26000, Guidance on Corporate Social Responsibility [9].

- Commitment & Accountability
- Ethics & Decision Making
- Integrated & Transparent
- Principal & Values Based
- Social & Ecological Equity
- Economic Prosperity

From the analysis of the different methods presented above one can conclude that all of them have positive aspects, which could be taken into account. In addition they can provide a good basis in order to improve the current project management systems for PRACE Partners.

In the PRACE-5IP project, WP2 will work to identify the methods currently used by the different PRACE Partners, in order to discuss the advantages and disadvantages of all of them, and elaborate a proposal that can be used by PRACE AISBL.

2.4 Mail management

When dealing with a lot of incoming and outgoing documents it is important to have a methodology to handle it properly.

In this context PRACE AISBL has put in place a method to register and categorize mails. In this way, a set of guidelines has been developed in order to handle systematically relevant postal and electronic mail received and sent, and also to set up a system to access it. This method is based on a single point registry with the use of categories and specific references in order to:

- store properly the document
- identify and deliver it to the relevant department
- allow a quick search based on different parameters like sender, amount, topic. etc.
- keep track of the exchange of mail with external stakeholders.

This methodology has been already implemented, and has proven to be a very good tool in order to avoid losses of mails, promote transparency and improve internal coordination and efficiency.

One important aspect which still needs to be taken into account is the security of the files and usage policy. This is currently being addressed in collaboration with T2.1, including an analysis of the relevant legislation in data protection.

3 Development of PRACE-RI Key Performance Indicators

A performance indicator or key performance indicator (KPI) is a type of performance measurement [5]. KPIs evaluate the success of an organization or of a particular activity in which it engages. The work on Key Performance Indicators in the context of PRACE-RI started as early as the first implementation phase (PRACE-1IP) and continued to involve in the succeeding series of PRACE-IP projects until today. These KPIs are a reflection of the performance of the activities of PRACE-IP projects. Nevertheless, there are areas of the PRACE-IP projects not sufficiently represented in PRACE-RI KPIs, particularly the most innovative, or those areas not directly related with the services provided by PRACE-RI. Impact assessment of PRACE-4IP will be described in Section 4 of this deliverable.

The primary purpose in the early stages of this work was to devise methods; metrics and procedures that would help identify the impact assessment of PRACE-RI both in quantitative and qualitative terms. This initial work is reflected in a series of deliverables compiled during the course of PRACE-1IP and PRACE-3IP upon which the current deliverable builds.

Deliverable D2.4.1 in PRACE-1IP [6] described in detail all aspects regarding monitoring and reporting in PRACE-RI. The document also elaborated on the management cycle of PRACE AISBL (shown in Figure 7) resulting from the whole monitoring process. The report emphasised that the process should lead to adjustments of implementation of PRACE where necessary.

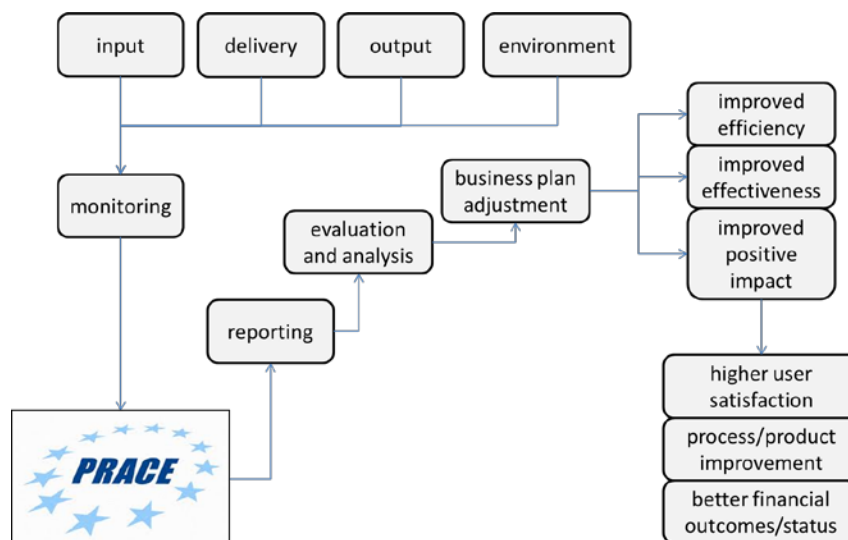


Figure 7: Management cycle of PRACE AISBL

Deliverable D2.4.2 in PRACE-1IP [7] further developed a theoretical framework and provided a classification of various impact-related variables. It was clearly identified that impact assessment for PRACE is necessary and possible, pointing out that it will require a significant amount of operational and organizational effort focusing on a well-established

methodology and clear procedures for the analysis of each type of information. Deliverable D2.4.3 in PRACE-1IP [8] provided a pilot assessment on some variables for which there was data available at that time. The results obtained in the PRACE-1IP project pilot were not conclusive given the early stage of implementation of PRACE-RI at that time. The analysis provided baseline numbers. The pilot was also useful for discarding data assessment mechanisms that were not sustainable because of the difficulty of obtaining or processing the data.

A significant step forward in the definition of PRACE-RI KPIs was the work carried within Task 2.4 of PRACE-3IP. In particular, the task focused on the qualitative assessment of the RI which incorporated the identification and the final selection of 11 variables. These variables were presented in detail and analysed within Deliverable D2.4 [8]. The document apart from describing the purpose and scope of these variables, offered an indicative procedure of data collection for these KPIs along with first initial analysis of the variables using baseline (mock-up) data from PRACE-1IP reports along with real data wherever they were available.

After a period of refinement and elaboration from the PRACE AISBL, a total of 15 variables were finally selected as official PRACE-RI KPIs and became publicly available on the official PRACE web site [11]. These KPIs rely on actual data that are periodically collected on yearly basis. They are updated at the beginning of every year with the results and findings of previous year. Currently the official PRACE-RI KPIs are:

PRACE's impact on evolving research

1. Total number of projects awarded
2. Total number of projects rejected
3. Ratio of Principle Investigator inter-Call recurrence

International Cooperation aspects of PRACE

4. Ratio of awarded 'foreign' projects
5. Ratio of resources awarded for 'foreign' projects
6. Ratio of awarded projects with National support
7. Ratio of awarded projects with EC support
8. Ratio of awarded projects with International support

Scientific production supported by PRACE

9. Number of Papers published
10. Number of Thesis completed
11. Number of Scientific talks delivered

PRACE's impact on growing know-how in Europe

12. Number of person-days registered PRACE Training days

PRACE's impact on attracting the industrial sector

13. Number of industrial attendees that made contact with PRACE in SC and ISC
14. Industrial participation (percentage) in PATCs training days
15. Number of industrial projects that were awarded access

The work on PRACE-RI KPIs continued in PRACE-4IP, with Task 2.2 focusing on three aspects of KPI development:

- KPI operational implementation
- Definition of specific targets and acceptable KPI value thresholds
- Improvement of public presentation of PRACE-RI KPIs

In the following sections, we present the work performed towards these directions.

3.1 Operational implementation

The last step of Task 2.4 of PRACE-3IP in the development of PRACE-RI KPIs was the elaboration of a framework for the operational implementation of the indicators here described. This framework consisted of a series of excel files that collect all the necessary data, process it adequately and produce graphical representations of the collection of KPIs. Deliverable 2.4.1 of PRACE-3IP [3] includes a description of this framework.

As part of Task 2.2 in PRACE-4IP, this framework has been presented to PRACE BoD, who decided to adopt it and include it in the regular tasks of the Communications area and Peer Review area.

For this objective, a few dedicated meetings have taken place between WP2 and PRACE AISBL officers, in order to effectively hand over the framework, and ensure the adequate use of it. In these meetings, the sources of information were analysed, and a few modifications were introduced in order to optimise the transfer of data and performance of the framework. The following table shows the sources of information for each PRACE-RI KPI.

KPI	Title	Source
1	Total number of projects awarded	Peer Review
2	Total number of projects rejected	Peer Review
3	Ratio of Principle Investigator inter-Call recurrence	Peer Review
4	Ratio of awarded 'foreign' projects	Peer Review
5	Ratio of resources awarded for 'foreign' projects	Peer Review
6	Ratio of awarded projects with National support	Peer Review
7	Ratio of awarded projects with EC support	Peer Review
8	Ratio of awarded projects with International support	Peer Review
9	Number of Papers published	Peer Review
10	Number of Thesis completed	Peer Review
11	Number of Scientific talks delivered	Peer Review
12	Number of person-days registered PRACE Training days	WP4 – Training
13	Number of industrial attendees that made contact with PRACE in SC and ISC	Communications
14	Industrial participation (percentage) in PATCs training days	WP4 – Training
15	Number of industrial projects that were awarded access	Peer Review

Table 1. PRACE-RI KPIs and sources of information

It is reasonable that most of the PRACE-RI KPIs are related to the PRACE Peer Review, since this is the area that centralises all the information related to PRACE Proposals and Awards. After the hand-over of the framework, this area has been in charge of updating the PRACE-RI KPIs on a year basis with the support of PRACE-4IP WP2 members. With the lessons learned, the future work in this direction will be to integrate the KPI framework into the PRACE Peer Review database, as part of the tasks of PRACE-5IP.

3.2 Public presentation

The PRACE KPI online description was a point for improvement made by the EC reviewers. Given the KPIs were created by WP2, this was also carried out by WP2 members towards the end of 2015 and the start of 2016. The effort focused on elaborating the rationale behind these KPIs, analysing the process used to collect and process them. The improved description also

further analysed the KPI evolution and how this reflects on the evolution of the RI. In most cases the argument was that either the RI is progressing positively towards the goals it has set, or in other cases that the KPIs are contributing to improvement of offered services.

After comments from all WP2 members and approval from PMO and BoD, the updated KPI description was publicized in the PRACE web [15].

Every January/February, each of the featured figures and statistics are updated to include the past year KPI results. These updates are then incorporated into PRACE Annual Report. The recommendations from WP2 can be found in Annex 2.

3.3 Targets and baselines

Since the beginning of PRACE, a strong effort has been dedicated to the definition, and implementation of a reliable impact assessment methodology, which has translated into the KPIs that can be found in PRACE-RI web site.

The next step in the development of an impact assessment methodology is to confer a meaning to the values of the KPIs; this is to set a baseline for them. For most of these KPIs, data has been collected back to the beginning of PRACE, and after 5 years of operation there is enough information to proceed and confer a meaning to most of these indicators.

The following tables show the data available for each KPI:

KPI	Early-Access Call	1st call	2nd Call	3rd Call	4th Call	5th Call	6th Call	7th Call	8th Call	9th Call	10th Call	11th Call
1	10	9	17	24	43	57	57	42	44	43	48	18
2	55	50	29	29	35	22	26	81	97	85	79	89
3	0%	47%	51%	47%	37%	33%	27%	32%	57%	51%	55%	57%
4	50%	78%	53%	66%	55%	57%	59%	49%	70%	64%	56%	70%
5	34%	78%	72%	81%	62%	52%	65%	49%	79%	60%	50%	49%
6	60%	78%	65%	58%	44%	42%	53%	43%	43%	30%	70%	56%
7	20%	33%	35%	13%	16%	21%	39%	24%	24%	39%	33%	33%
8	30%	11%	24%	13%	21%	14%	9%	5%	5%	2%	5%	8%
9	23	30	46	104	138	212	193	*				
10	11	8	17	32	54	68	85					
11	64	68	78	186	239	385	343					
15	0	0	0	1	2	4	5	4	4	2	3	2

Table 2. Values for PRACE-RI KPIs dependant on PRACE Calls. 1) Total number of projects awarded; 2) Total number of projects rejected; 3) Ratio of Principle Investigator inter-Call recurrence; 4) Ratio of awarded 'foreign' projects; 5) Ratio of resources awarded for 'foreign' projects; 6) Ratio of awarded projects with National support; 7) Ratio of awarded projects with EC support; 8) Ratio of awarded projects with International support; 9) Number of Papers published; 10) Number of Thesis completed; 11) Number of Scientific talks delivered; and 15) Number of industrial projects that were awarded access. In order to be representative, data on publications (KPIs 9, 10 and 11) is only collected 2 years after the end of the project.

KPI	2008	2009	2010	2011	2012	2013	2014	2015	2016
12	124	192	245	1296	4570	5216	6538	5267	5812
13	22	78	77	136	163	296	204	254	208
14	-	-	-	-	10%	11%	12%	16%	Not. Av.

Table 3. Values for PRACE-RI KPIs with year update. 12) Number of person-days registered PRACE Training days; 13) Number of industrial attendees that made contact with PRACE in SC and ISC; and 14) Industrial participation (percentage) in PATCs training days. Industrial seminars started only in 2012.

Most of these values show a typical ramp-up, as expected for an infrastructure of recent creation like PRACE. In order to obtain a reasonable baseline, it is necessary to select a representative period of time. For those KPIs related to training and events, the representative period starts with PRACE-3IP in 2012. For those KPIs based on the provision of resources, this period is related to the systems available in PRACE. The following table shows countries contributing to each PRACE Project Access call. The most representative period is that from the 5th Call to the 10th Call, where all the PRACE Hosting Members have been continuously contributing resources to PRACE. For the indicators on the scientific production supported by PRACE (9, 10 and 11) we have not enough data available, so the representative period will be assumed as 5th Call only.

Call	Allocation start	BSC	CINECA	GCS	GENCI
EAC	May 2010			√	
1	Nov 2010			√	
2	May 2011			√	
3	Nov 2011			√	√
4	May 2012		√	√	√
5	Nov 2012	√	√	√	√
6	Mar 2013	√	√	√	√
7	Sept 2013	√	√	√	√
8	Mar 2014	√	√	√	√
9	Sept 2014	√	√	√	√
10	Mar 2015	√	√	√	√
11	Sept 2015	√	√		
12	Mar 2016	√	√		
13	Sept 2016	√	√		

Table 4. Participation of PRACE Hosting Members in PRACE Calls.

Taking into account these representative periods of time, a first proposal for a baseline can come from the average values of each indicator. This represents a good starting point in order to find an appropriate baseline for each of them. The table below shows these average values, the final proposed baseline, and a comment on each of them.

KPI	Average value	Proposed baseline	Comments
1	49	50	The average value is an appropriate baseline
2	65	N/A	There is no meaning to set a baseline to projects rejected, since this is only depending on the total number of applications received
3	42 %	50 %	This indicator is highly unstable, and the average doesn't seem representative for a baseline.
4	59 %	60 %	The average value is an appropriate baseline
5	59 %	60 %	The average value is an appropriate baseline
6	47 %	50 %	The average value is an appropriate baseline
7	30 %	40 %	This indicator is highly unstable, and the average doesn't seem representative for a baseline.
8	7 %	15 %	This indicator is decreasing with time, which turns the average not representative
9	203	200	The average value is an appropriate baseline
10	77	75	The average value is an appropriate baseline

11	364	350	The average value is an appropriate baseline
12	4893	5000	The average value is an appropriate baseline
13	230	250	The average value is an appropriate baseline
14	10%	10%	The average value is an appropriate baseline
15	4	5	The average value is an appropriate baseline

Table 5. Average values for PRACE-RI KPIs and proposed baselines. 1) Total number of projects awarded; 2) Total number of projects rejected; 3) Ratio of Principle Investigator inter-Call recurrence; 4) Ratio of awarded 'foreign' projects; 5) Ratio of resources awarded for 'foreign' projects; 6) Ratio of awarded projects with National support; 7) Ratio of awarded projects with EC support; 8) Ratio of awarded projects with International support; 9) Number of Papers published; 10) Number of Thesis completed; 11) Number of Scientific talks delivered; 12) Number of person-days registered PRACE Training days; 13) Number of industrial attendees that made contact with PRACE in SC and ISC; 14) Industrial participation (percentage) in PATCs training days; and 15) Number of industrial projects that were awarded access.

The final objective for an impact assessment methodology is to define performance objectives for the organisation. This is done by setting future targets for each KPI. These targets may be used for the periodic review of the performance objectives of the organisation.

Setting targets for PRACE-RI is strategic discussion that is out of the scope of this deliverable. However, with the information available, the members of this task are comfortable suggesting the following targets for PRACE 2:

KPI	Target	Comments
1	50	The SSC has set as an objective for PRACE 2 that the resources are increased at least a 50% in relation to PRACE 1. Another objective is that the average size of allocations is increased, in order to support larger projects. Combined, these two objectives set a target equal to the past baseline.
2	N/A	In order to maintain a healthy competition that will help fostering scientific excellence, PRACE expects to receive 250 applications per year. According to KPI #1 this would imply 200 applications rejected. However, setting a target for rejection is not advisable.
3	50 %	The current baseline is already a reasonable target for the recurrence of PIs call after call.
4	80 %	This KPI shows the percentage of projects that are allocated to PIs not working in the country of allocation. A high target for this KPI is proposed, in order to foster the international scope of PRACE-RI
5	80 %	Same as KPI #4
6	50 %	In the interest of PRACE, a high number of allocations should be part of national, European and international grants.
7	50 %	
8	25 %	
9	250	The increase of resources in PRACE 2 should be accompanied by an increase of publications acknowledging usage of PRACE resources. 20-30% increases in relation to the baselines are proposed.
10	100	
11	400	
12	5000	The current baseline is already a reasonable target for this KPI
13	250	The current baseline is already a reasonable target for this KPI
14	15%	The objective of PRACE is to increase industrial participation
15	10%	The target for this KPI needs to be relative to #1. It is included in the mission of PRACE to enable industrial competitively; therefore a reasonable number of awarded projects should include industrial participation.

Table 6. Targets for PRACE-RI KPIs proposed by WP2. 1) Total number of projects awarded; 2) Total number of projects rejected; 3) Ratio of Principle Investigator inter-Call recurrence; 4) Ratio of awarded 'foreign' projects; 5) Ratio of resources awarded for 'foreign' projects; 6) Ratio of awarded projects with National support; 7) Ratio of awarded projects with EC support; 8) Ratio of awarded projects with International support; 9) Number of Papers published; 10) Number of Thesis completed; 11) Number of Scientific talks delivered; 12) Number of person-days registered PRACE Training days; 13) Number of industrial attendees that made contact with PRACE in SC and ISC; 14) Industrial participation (percentage) in PATCs training days; and 15) Number of industrial projects that were awarded access.

It is clear that most of these PRACE-RI KPIs are dependent on the resources made available by PRACE-RI through Project Access Calls. After a reasonable ramp-up, these values have remained stable from Call 4 to Call 10. This has been followed by a decrease during the end of PRACE 1, and a final important increase coinciding with the beginning of PRACE 2 in Call 14 (Table 7).

EAC	Call 1	Call 2	Call 3	Call 4	Call 5	Call 6	Call 7	Call 8	Call 9	Call 10	Call 11	Call 12	Call 13	Call 14	Call 15
0,3	0,4	0,4	0,7	1,1	1,3	1,3	1,3	1,2	1,2	1	0,5	0,7	0,9	2,0	1,8

Table 7. Resources made available by PRACE-RI in Project Access Calls. Values in billion core hours.

This availability of resources has been taken into account to define the baseline and target values for each KPI. In addition, the objectives of PRACE 2 have been also considered to define the target values. Nevertheless, and given the important changes from PRACE 1 to PRACE 2, it is necessary to review all the values proposed in the near future. This will be done by WP2 in PRACE-5IP.

3.4 Further developments

In this section, it has been shown that most of the KPIs for PRACE-RI rely on the provision of HPC resources, and specifically on the statistics related to the large Tier-0 allocations provided through PRACE Project Access.

These KPIs describe appropriately the services of PRACE, but do not report on other aspects that are also relevant for a research infrastructure. This has been analysed, and a number of indicators have been identified as suitable to cover additional features of PRACE. All these recommendations will be addressed by WP2 in PRACE-5IP.

PRACE capacity

In this topic, it is relevant to collect the resources made available by PRACE and the maximum theoretical peak performance of the PRACE-RI, from call to call. The real usage of these resources, and the fraction of this maximum, by PRACE users is also a relevant indicator.

Quality of service

In this topic, it is relevant to collect the overall availability of PRACE systems, and the number and duration of service interruptions. Average queue time in PRACE systems, i.e.: how long does a user have to wait until a job is run, is also a relevant information to be taken into account by PRACE users.

Quality of support

In this topic, the number of petitions received and resolved, including the average resolution time would be collected.

Environmental impact

In this topic, PRACE resources would be translated into their energetic cost. Energy efficiency indicators could be also included.

Stratification of PRACE users

So far, PRACE has been successful in attracting an important number of users for the infrastructure. A sign of this is the average success rate of proposals being awarded, which is 38% until Call 11 (Table XXX, KPIs #1 and #2) is a healthy sign of this. However, there is no

analysis about the distribution among scientific domains. This analysis is required to understand and if necessary promote PRACE in those domains less represented currently.

Indicators for the Tier-1 ecosystem

The main objective of PRACE is the coordination of the large-scale HPC services in Europe, the so-called Tier-0 layer in the HPC services pyramid. This top layer is highly dependent on the lower ones, where the Tier-1 layer represents the national-wide systems, and the Tier-2 layer involves regional or academic systems. As a consequence, a secondary objective for PRACE-RI is the alignment of the Tier-1 layer, through the DECI programme. The services provided through this PRACE Tier-1 programme are actually not considered in PRACE-RI KPIs. These services should be analysed, and new indicators should be developed for them. In addition, cross-indicators comparing Tier-0 and Tier-1 services would be useful as well.

4 Report on PRACE-4IP project Key Performance Indicators

Impact assessment has been a subject of major interest for PRACE since the very beginning of the infrastructure. Strong efforts have been dedicated in all the EC-funded PRACE-IP projects to develop a strong impact assessment methodology for PRACE Research Infrastructure. The current status of this methodology has been already described in the previous section, and the results can be found in the KPI section of the PRACE Research Infrastructure (PRACE-RI) web page: <http://www.prace-ri.eu/prace-kpi/>

The KPIs of PRACE-RI are a reflection of the performance of the activities in PRACE-IP projects. Nevertheless, there are areas of the PRACE-IP projects not sufficiently represented in PRACE-RI KPIs, particularly the most innovative, or those areas not directly related with the services provided by PRACE-RI. This fact has been mentioned in one of the EC recommendations of the mid-term evaluation of PRACE-4IP: “*KPIs for services rely on existing PRACE KPIs and as a consequence do not sufficiently reflect the new areas of the project. In addition target figures are not defined in the proposal*”.

The objective of this section is to address this recommendation, by defining new impact assessment indicators for the IP project and reporting on them.

4.1 Description of KPIs

In order to identify new KPIs for PRACE-4IP, it is important to understand the relation of the activities carried out in the PRACE-4IP project and the activities of PRACE-RI. The following table shows this relation:

PRACE-4IP	Activity type	PRACE-RI activities
WP2	Management activity	Management of PRACE-RI
WP3	Management activity	Communications
WP4	Operational service	Training in HPC
WP5	Management activity	Procurement of HPC systems
WP6	Operational service	Provision of HPC resources
WP7	Operational Service	Support to HPC users

Table 8: PRACE-4IP WPs and their corresponding PRACE-RI activities.

The KPIs for PRACE-RI were developed based on the operational services of the infrastructure. This table gives a first view of those PRACE-4IP WPs that are not completely represented in PRACE-RI KPIs. In addition, and given the scope of PRACE-4IP, it is also evident that the WPs carry out activities beyond PRACE-RI services.

These two factors have been taken into account to identify the following new indicators for PRACE-4IP, in order to fill the gaps in impact assessment:

- WP2: This WP provides support to the PRACE Council, to the management of PRACE-RI, and to other PRACE-4IP WPs. Therefore, there is no direct measure for the performance. However, the number of support tasks carried out can be an indirect indicator for it. In addition, a meta-indicator is applicable in this case, and this is to use the number of indicators developed and reported as an indicator of performance.
- WP3: This is the WP in charge of Communications, Dissemination and Outreach event. The performance of this WP can be measured directly through the number of events where PRACE has been represented. PRACE KPI #13 *industrial attendees to PRACE booth in SC and ISC* is also an indirect measure of the performance of this WP. Another indirect indicator for this WP can be the visitors of PRACE website.

- WP4: This WP is operating the training activities of PRACE. PRACE KPI #12 *person days registered for PRACE training* is a major indicator for the performance of this WP. An additional indicator for this WP is the number of applicants and participants to PRACE schools.
- WP5: This WP provides valuable input to PRACE members regarding future technologies. In addition to the periodic reports delivered, a relevant performance indicator is the number of attendants to the HPC Infrastructure Workshops organized by this WP.
- WP6: This is the WP related to the operation of the systems, which is the major service of PRACE. Service availability and amount of resources provided are the main indicators for this. PRACE KPIs #1 *total number of projects awarded* is also an indirect measure.
- WP7: This WP coordinates the advanced support to PRACE-RI users through the Preparatory Access Types C and the SHAPE programme. The performance of this WP can be measured in terms of the number of projects supported, the number of best practice guides prepared and the number of white papers published.

An important aspect in the definition of KPIs is the applicable timeframe, that is, the frequency to collect and present the data. The following table summarizes the KPIs identified and their corresponding timeframe:

WP	KPI	Timeframe
WP2	Support tasks completed	Project duration
WP2	KPIs reported	Project duration
WP3	Events with PRACE representation	Yearly update
WP3	Visits to PRACE web site	Yearly update
WP3	PRACE KPI #13 – Industrial attendees to PRACE Booth in ISC&SC	Yearly update
WP4	PRACE KPI #12 – Person-days registered in PRACE training events	Yearly update
WP4	Applicants to PRACE schools	Yearly update
WP4	Attendants to SoHPC & IHPCSS	Yearly update
WP5	Attendants to HPC Infrastructure workshops	Project duration
WP6	Service availability	PRACE Calls
WP6	Resources provided in PRACE-RI calls	PRACE Calls
WP6	PRACE KPI #1 – Large-scale projects awarded by PRACE	PRACE Calls
WP7	Projects supported	Project duration
WP7	Best practice guides	Project duration
WP7	White papers	Project duration

Table 9. KPIS identified for PRACE-4IP

Using these timeframes, the following tables show the historical values for all these indicators:

WP	KPI	PRACE-3IP	PRACE-4IP
WP2	Support tasks completed	6	9
WP2	KPIs reported	-	13
WP7	Projects supported (PA Type C and SHAPE)	32	31
WP7	Best practice guides	5	4
WP7	White papers	48	40

Table 10. Values for project-wide PRACE-IP KPIs.

WP	KPI	2012	2013	2014	2015	2016
WP3	Events with PRACE representation	4	7	5	8	13
WP3	Visits to PRACE web	66326	77561	66505	56462	81509
WP3	PRACE KPI #13 - Industrial attendees in PRACE Booth	163	286	204	254	208
WP4	PRACE KPI #12 - person-days registered in PRACE training	4570	5216	6538	5267	5812
WP4	Applicants to PRACE schools	373	613	349	378	344
WP4	Attendants to SoHPC & IHPCCS	30	54	40	51	51
WP5	Attendants to HPC Infrastructure workshops	-	60	63	73	78

Table 11. Values for yearly updated PRACE-IP KPIs.

WP	KPI	Call 5	Call 6	Call 7	Call 8	Call 9	Call 10	Call 11	Call 12	Call 13
WP6	Service availability (systems)	5	5	5	5	5	5	2	2	2
WP6	Resources provided in PRACE-RI calls, billion core hours	1,3	1,3	1,3	1,2	1,2	1	0,5	0,7	0,9
WP6	PRACE KPI #1 - projects awarded	57	57	42	44	43	48	18	27	33

Table 12. Values for PRACE-IP KPIs related to PRACE-RI calls.

4.2 Targets and baselines

As it has been already mentioned in PRACE-RI KPIs, an indicator is a value that needs an adequate background and reference to receive meaning. This background is provided by the baseline value, which can only be defined with time and experience. The nature of the KPIs defined, and their relation to PRACE-RI activities makes it difficult to set a baseline within the timeframe of the PRACE-4IP project. However, this project and most of its activities are continuation of previous EC grants, which can be used to establish the baseline for each of them. The following table shows the baselines proposed for each KPI taking into account the information from 2012 to 2014, normalized to duration of one year.

WP	KPI	Baseline (per year)	Comments
WP2	Support tasks completed	3	Tasks completed in PRACE-3IP
WP2	KPIs reported	100 %	The baseline should be complete reporting
WP3	Events with PRACE representation	6	Average value of 2012-2014
WP3	Visits to PRACE web site	70000	Average value of 2012-2014
WP3	PRACE KPI #13	215	Average value of 2012-2014
WP4	PRACE KPI #12	5500	Average value of 2012-2014
WP4	Applicants to PRACE schools	360	Average value of 2012 and 2014. 2013 is exceptionally high
WP4	Attendants to SoHPC & IHPCCS	40	Average value of 2012-2014
WP5	Attendants to HPC Infrastructure workshops	60	Average value of 2012-2014
WP6	Service availability	100 %	The number of systems contributing to PRACE does not depend on the PRACE-IP projects. Therefore, this baseline needs to be relative.
WP6	Resources provided in PRACE-RI calls	1,2 Billion core hours	Average value of the complete period 2012-2016
WP6	PRACE KPI #1	100	Average value of calls 5 to 10

WP7	Projects supported	12	Value for PRACE-3IP, normalized to the PMs of WP7 in PRACE-4IP
WP7	Best practice guides	2	From value for PRACE-3IP
WP7	White papers	20	From value for PRACE-3IP

Table 13. Baseline values proposed for PRACE-4IP KPIs.

In addition to impact assessment, KPIs can be used to set future objectives, through the definition of appropriate targets for each KPI. These targets should serve to verify the fulfilment of the objectives set, by comparing the final values to them. The following table shows the targets agreed by the PRACE-4IP Technical Board for each KPI at the end of the project, and their level of fulfilment.

WP	KPI	Target for PRACE-4IP	Fulfilment
WP2	Support tasks completed	Increase from 3 to 5 support tasks completed per year	90%
WP2	KPIs reported	Report on 100% of the PRACE-4IP project KPIs	100%
WP3	Events with PRACE representation	Increase from 6 to 10 events per year	105%
WP3	Visits to PRACE web site	Maintain the average 70.000 visits per year	99%
WP3	PRACE KPI #13	Increase to 250 industrial attendees to PRACE booths	92%
WP4	PRACE KPI #12	Increase to 6.000 person-days registered in PRACE training per year	92%
WP4	Applicants to PRACE schools	Maintain the number of applications	100%
WP4	Attendants to SoHPC & IHPCSS	Increase the number of attendants to 50 per year	100%
WP5	Attendants to HPC Infrastructure workshops	Increase the number of attendants to 75 per year	100%
WP6	Service availability	100%	100%
WP6	Resources provided in PRACE-RI calls	1.8 billion core hours, according to the objective set by the PRACE SSC	80%
WP6	PRACE KPI #1	100 projects per year, according to the objective set by the PRACE SSC	60%
WP7	Projects supported	Maintain the level of support	125%
WP7	Best practice guides	Maintain the amount of BPG	80%
WP7	White papers	Maintain the amount of white papers	83%

Table 14. Targets set for PRACE-4IP KPIs, and their level of fulfilment at the date of preparation of this deliverable.

Even one month before the end of the project, it is clearly seen that all PRACE-4IP work packages have performed excellently. The only KPIs for which the target has not been reached at this moment are the amount of resources provided and the number of projects awarded. These two KPIs are directly related to PRACE-RI, and unfortunately are only an indirect indicator for WP6. The amount of resources that PRACE offers in each call is out of the control of the PRACE-4IP project, and therefore these values cannot be interpreted as a low performance of WP6.

5 Conclusions

PRACE is nowadays an excellent European Research Infrastructure, built on top of a solid basis, created with the support of the Preparatory Phase and Implementation Phase projects. This excellence relies on the contributions of all PRACE members to the infrastructure, in terms of resources but also of expertise and manpower, and in the regular review and improvement of the processes of the Research Infrastructure as well, according to experience and lessons learned. This excellence is shown through the Key Performance Indicators of both the PRACE Research Infrastructure and the PRACE Implementation Projects reported in this deliverable, and has clearly been a key element in the continuation of PRACE operation through the PRACE 2 programme. However, this is only half of the journey, and further work is still necessary to reach a sustainable and persistent infrastructure.

Annex 1 Conflict of Interests policy

Purpose

The objective of this policy is to permit PRACE to manage conflict of interest situations successfully and resolve them fairly.

PRACE has always had high ethical standards within its core value, in order to merit the trust of its members, governments and the public and thus is committed to conducting business in a manner that ensures members' judgment and decision making is not influenced by undue personal interests. This was deeply embedded into his governance, and was reflected into his day to day practice, as into his fair and transparent peer review system that was put in place for the attribution of access to its resources and which meet the international standard for such process. Nevertheless, in order to continue the improvement of its governance, a conflict of interest policy for PRACE has been formalised, based on the best practices from other similar organisations, in order to provide guidance for efficiently dealing with this kind of situations.

The integrity of PRACE depends on ethical behaviour throughout the organisation, and in particular, on fair, well-informed decision-making. A conflict of interest may arise when a member's personal interests influence, could have the potential to influence or could be perceived to influence their decision making at PRACE.

PRACE understands that avoiding a situation of conflict of interest may not always be possible. The required action for a member who does not or cannot avoid a situation of potential conflict of interest is to disclose it. Having a situation of conflict of interest is not necessarily wrong, and transparency, in the form of disclosure, is critical and is necessary to protect the integrity and reputation of PRACE and the member by allowing PRACE to react promptly and appropriately when the impartiality and objectivity of PRACE members in the performance of their functions or in the fulfilment of their contractual obligations for and towards PRACE might be influenced, compromised or perceived as so.

For all the above, this Policy aims to explain the relevant principles and rules for preventing or managing conflicts of interest and how such principles and rules are to be implemented and applied for the whole association of PRACE.

This policy shall apply to all representatives of PRACE aisbl Bodies and participants in meetings acting on behalf of PRACE. This includes decision bodies/positions such as the Board of Directors, PRACE Committees and Working Groups.

Definition of Conflict of Interest

Conflicts of interest may arise where an individual places his or her personal interests before the interests of PRACE and where such personal interests unduly influence members' judgments, decisions, or actions. These situations may include both closely related persons and friends as well as organisations which someone may have interests in. Making judgments, taking decisions, or pursuing actions when facing a conflict of interest may make it difficult to perform work for PRACE objectively and effectively and may have legal and regulatory consequences.

A conflict of interest is thus a situation in which a person has a private or personal interest sufficient to appear to influence the objective exercise of his or her official duties at PRACE.

"Private or personal interest" refers to an individual's self-interest (e.g. to achieve financial profit or avoid loss, or to gain another special advantage or avoid a disadvantage); the interests of the individual's immediate family or business partners; or the interests of another organization in which the individual holds a position (voluntary or paid).

“Objective exercise of duties” refers to an individual’s ability to carry out her or his responsibilities in the best interest of PRACE.

Types of conflict

An individual working in PRACE may be in a conflict of interest situation that is:

1. Actual or real, where his official duties are or will be influenced by their private interests.
2. Perceived or apparent, where their official duties appear to be influenced by their private interests.
3. Foreseeable or potential, where their official duties may be influenced in the future by their private interests.

Timing of conflict of interest disclosure

Disclosure must take place as soon as the individual identifies that there may be a conflict of interest and before the member engages in the conduct in question. Late disclosure could disrupt PRACE operations, hamper an appropriate response from the PRACE and/or ultimately compromise the credibility of PRACE as well as that of the PRACE member.

Responsibility for Managing Conflicts of Interest

Members are expected to recognize when they have, potentially have, or could be perceived as having, a conflict of interest. Members should consult their Management Board members or chair of their respective committee if in doubt about what circumstances might create a conflict of interest.

a) Avoiding a Conflict of Interest

In the first place, PRACE, members should avoid conflicts of interest against PRACE wherever possible. “Avoiding” a conflict of interest means members take decisions or actions to ensure a conflict of interest does not occur, or does not have the potential to occur, in the first place.

b) Managing a Conflict of Interest

Where prevention is not possible, conflict of interest situations must be managed. Here are the steps to be taken by those involved in such situations by working together and supporting one another’s ethical responsibilities.

1. Declare it to your Management Board or chair of the respective PRACE Body/ Committee. Ensure transparency by self-declaration, and by making sure that a record of the declaration is made and kept between the person reporting the conflict of interest and the person or chair of the body to which it was declared. To be effective, the declaration of interests will be updated at least annually, and also when any changes occur.
2. Discuss it. In a doubtful situation, take a moment for a quick word with the chair of your meeting, or undertake a full dialogue with the group, if the situation warrants it.
3. Deal with it. Measures to mitigate or eliminate a conflict of interest will depend on what is appropriate to the severity of the situation. Options include:
 - a. Restrict the involvement of the individual. For example, withdraw from decision-making or partake in discussion only. This would not be appropriate if the conflict of interest arises frequently, or if the individual cannot be separated from parts of the activity.
 - b. Recruit a third party to assist such as another colleague or an external party.

- c. Remove the individual from affected duties. When restrict and recruit are not suitable options, the individual with the conflict may be removed from duties related to the conflict. The individual could transfer to other duties.
- d. Resign from the official duties. In serious cases where other solutions are not possible, the individual may have to resign from the position creating the conflict.

In the event that the person disclosing a conflict of interest is part of a body, body members should collectively decide on the appropriate measure to follow; In the event that the disclosure is confidential and made to the body chair only, the chair shall assume the decision making on their own.

The less disruptive option will be given preference. A written confidential record must be maintained of any such strategy agreed upon as well as of the measures taken.

c) Protection of the information disclosed

PRACE shall take the necessary measures to maintain confidential records of disclosures made as well as to safeguard the confidentiality of any private information disclosed in respect of the conflict of interest policy and according to the PRACE Data Protection Policy.

Recipients of disclosures shall respect confidentiality, and communicate information contained in such disclosures on a strict “need to know” basis.

Annex 2 Recommendations for KPIs improvement

(Old version in the left, new version in the right)

PRACE KPI

Sunday 21 June 2015

PRACE Key Performance Indicators

With so much calculating power in the PRACE portfolio, numbers about PRACE itself have become increasingly important. This data highlights the impact of PRACE on HPC-based research, on HPC know-how in Europe, and on European industry engagement in HPC. The following set of

Key Performance Indicators (KPIs), approved by the PRACE Council in 2014, allow for a deeper analysis and evaluation of its achievements and successes.

These KPI cover the first half of the PRACE initial period, up to the 5th PRACE Call for Proposals for Project Access.

Last update: June 2015

PRACE KPI

Sunday 21 June 2015

PRACE KPI's - Key Performance Indicators

With so much processing power in the PRACE portfolio, numbers and statistics which highlight the success of PRACE have become increasingly important.

Key Performance Indicators (KPIs) were developed during the PRACE 2IP and 3IP projects and approved by the PRACE Council in 2014. The goals of the KPIs are to better track and clearly present key PRACE achievements, which will aid for a deeper analysis and evaluation into PRACE's successes and possibly weaknesses. This will allow for PRACE to carry on with its successful achievements but also identify possible areas where more focus for improvement should be given.

The following approved KPI's highlight the impact of PRACE on HPC-based research, on HPC know-how in Europe, and on European industry engagement in HPC covering the first half of the PRACE initial period, up to the 9th PRACE Call for Proposals for Project Access.

Last update: December 2015

D2.3

Management Processes and Tools

PRACE's impact on evolving research

- Upward trend in the number of project applications received via the PRACE Calls for Proposals for Project Access.
- Downward trend of rejected projects reversed from 6th Call. Evolution confirms the maturation process of proposal submissions.
- Evolution reflects good outcomes of PRACE Preparatory Access calls that enable a prior technical support for application and scalability tests.

The overall trend highlights the **increasing importance and impact of PRACE Tier-0 service for research** (figure 1).

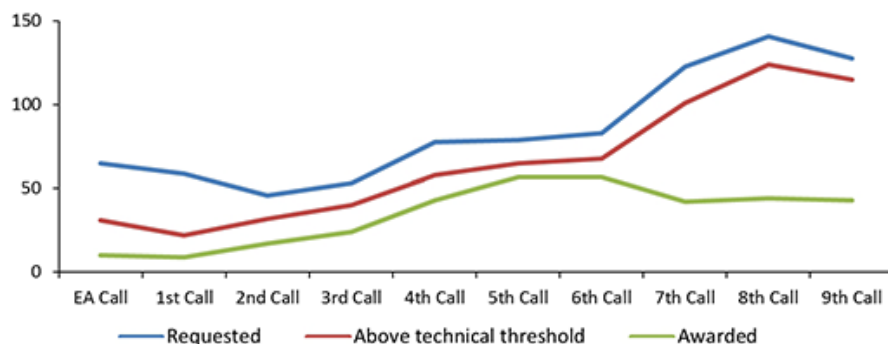


Figure 1 – Number of projects requested (blue), above technical threshold (red) and awarded (green)

- A total of 60% of the projects awarded and two-thirds (63%) of those resources are awarded to “foreign projects” (projects with PIs from a different country (as per the primary institution of the PI) than the machine on which the research is executed).
- The evolution of the ratio of awarded foreign projects remains stable over time.
- The nationality of the PIs' institutions does not impact the chances of a project being awarded.
- The PRACE Peer Review Process upholds its main criteria of scientific excellence.

PRACE's impact on evolving research

Using the PRACE peer-review database, three KPI's were designed to help assess PRACE's impact on project technical maturity, computational research using Tier-0 machines and its outreach capabilities in allowing for European and International collaboration, all with respect to research projects which require access to Tier-0 machines (such as those available through PRACE) to carry out their research.

The first KPI identifies the number of projects that requested access to PRACE Tier-0 computational resources, the number of these projects, which were mature enough and rated above the PRACE technical threshold and also the number of projects, which were awarded access to resources.

Outcomes of this KPI can be seen in the figure below:

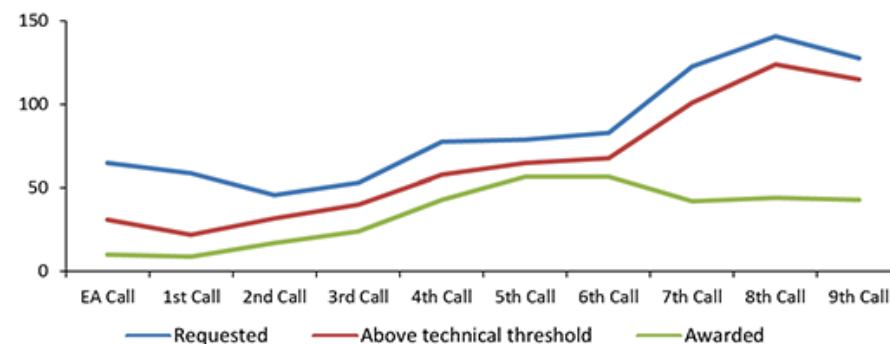


Figure 1 – Number of projects requested (blue), above technical threshold (red) and awarded (green).

It is easy to see that:

- There is an increasing trend in the number of project applications received via the PRACE Calls for Proposals for Project Access.
- There is a decreasing trend in the number of rejected projects (up until the 6th Call). This trend confirms the maturation process of proposal submissions.

D2.3

This also demonstrates **PRACE's impact in the enhancement of European and international collaboration** (figure 2).

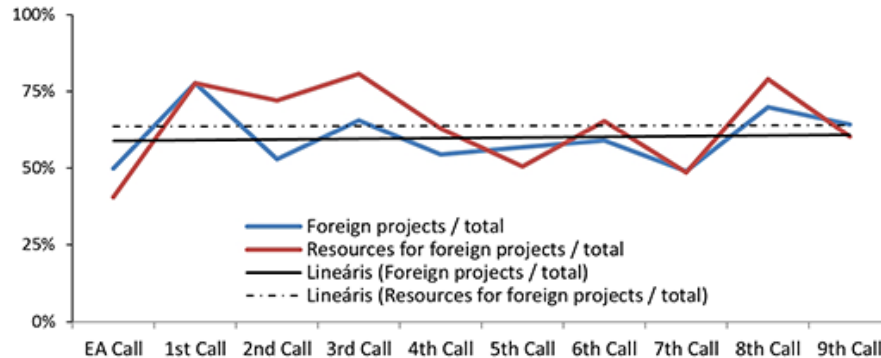


Figure 2 – Ratios of awarded 'foreign' projects (blue) and resources for awarded 'foreign' projects (red) and respective trend-lines.

- Slight increase of EC support for PRACE-awarded projects PRACE illustrates the outcomes of EC funding policies aligned with support for HPC as a key enabler technology (figure 3).

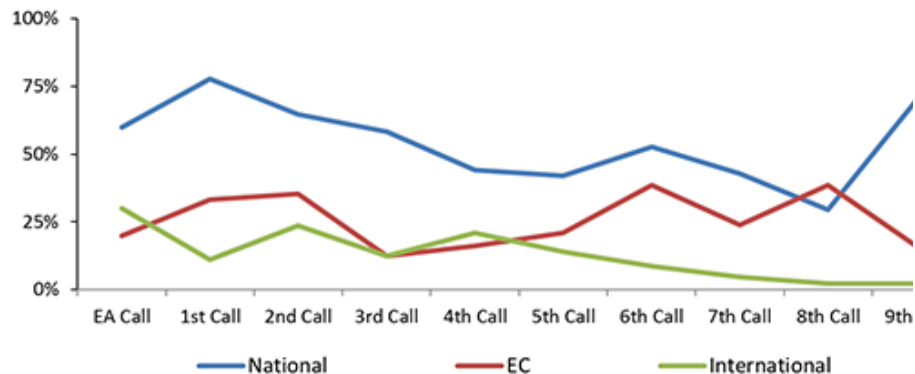


Figure 3 – Ratios of awarded projects with National (blue), EC (red) and International (green) support.

Management Processes and Tools

- The increasing trend of projects rated as above the technical threshold is a reflection on the positive impact of PRACE Preparatory Access calls, which allow for prior technical support for application and scalability tests.

The stability in the number of awarded proposals is a sign of PRACE's commitment to provide high quality services to the best applications and to ensure that PRACE-RI remains a tool for supporting high-quality scientific work.

The above trends highlight the **increasing importance and impact of PRACE Tier-0 service for research**.

The second of these three KPIs identifies the international nature of PRACE by demonstrating that through the European HPC Infrastructure established by PRACE, access to Tier-0 computational resources is solely based on scientific excellence and the nationality of a project's Principal Investigator (PI) is not a factor on whether a project will be awarded resources.

Defining as "foreign project" a project whose PI is based in an institution located in a country different to the country where the awarded Tier-0 computational resources are hosted, the statistics of the following figure are obtained from this KPI:

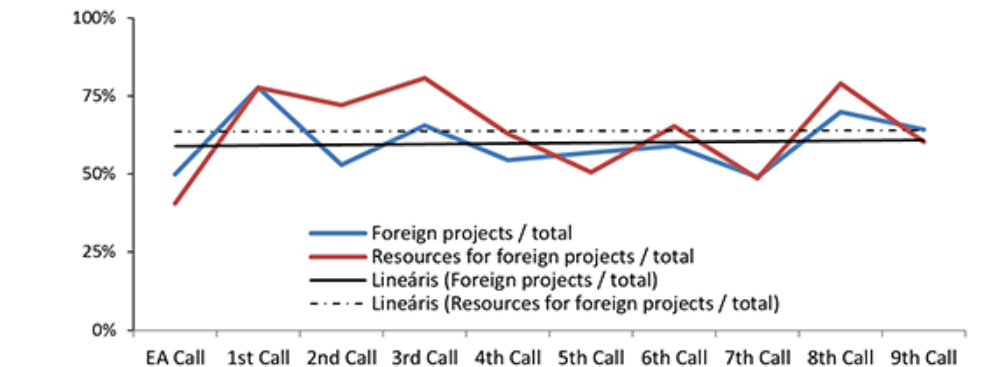


Figure 2 – Ratios of awarded 'foreign' projects (blue) and resources for awarded 'foreign' projects (red); and respective trend-lines.

D2.3

Management Processes and Tools

From the above figure one can deduce:

- A total of 60% of the projects awarded and two-thirds (63%) of those resources are awarded to “foreign projects”
- The evolution of the ratio of awarded foreign projects remains stable over time.

This clearly demonstrates **PRACE’s impact in the enhancement of European and international collaboration.**

The third KPI explores the projects, which are awarded PRACE Tier-0 computational resources with regards to the type of support (National, EC or International) they receive, and how these change over the PRACE Call for Proposals for Project Access calls. The relevant statistics up to the 9th call are presented in the following figure.

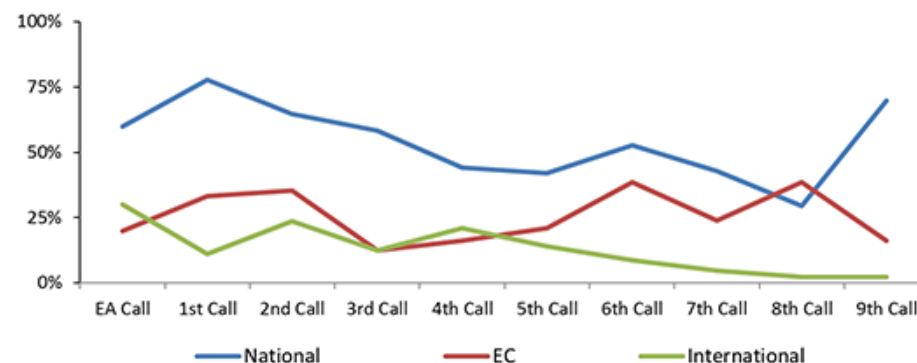


Figure 3 – Ratios of awarded projects with National (blue), EC (red) and International (green) support.

From the above, the slight increase of EC support for PRACE-awarded projects illustrates the outcomes of EC funding policies aligned with support for HPC as a key enabler technology - as these are offered to European scientists through the European HPC infrastructure setup and available through PRACE.

PRACE's impact on scientific production

- It is only possible to measure the impact of PRACE Access calls on scientific production one year after the project end therefore the data presents the evolution of scientific production supported by PRACE until the 5th PRACE Call for Proposals for Project Access (end of 2013)
- Until the 5th PRACE Call for Proposals for Project Access, PRACE has supported 158 PhD theses, 507 publications and 719 scientific talks.
- Two patents resulting from projects supported by PRACE have been filed.
- The data reflect an increasing trend in all types of scientific production supported by PRACE (figure 4).
- A future analysis of the impact-factor of published papers will reveal quantitatively whether the quality of scientific production also improves over time.

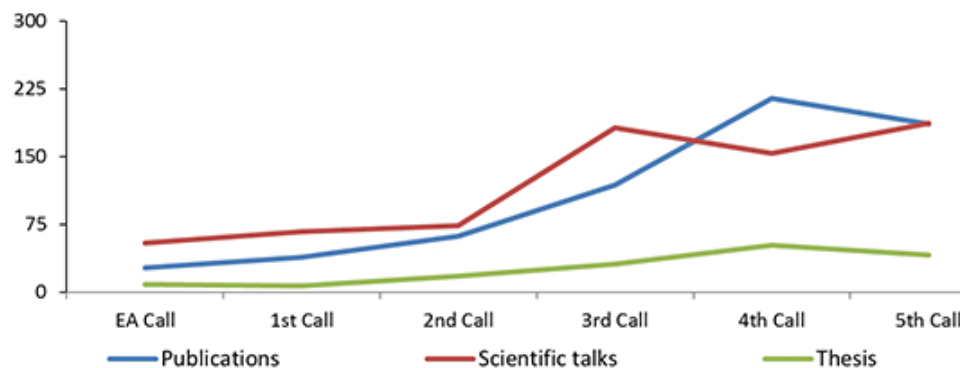


Figure 4 – Scientific production supported by PRACE.

PRACE's impact on scientific production

Using PRACE peer review data, this KPI was developed to trace the impact that PRACE has on scientific production through the access to Tier-0 computational resources it provides to computational scientists. A year after each awarded project ends, Principal Investigators are contacted to provide information on the scientific outcomes of their projects – a direct result of their PRACE allocation. Such outcomes include the number of publications, the number of scientific talks given, the number of thesis supported and patents filed through and after the allocation. Until the 5th PRACE Call for Proposals for Project Access, PRACE has supported 158 PhD theses, 507 publications, 719 scientific talks and the filing of two patents. Some of these statistics can be seen throughout the calls in the figure below.

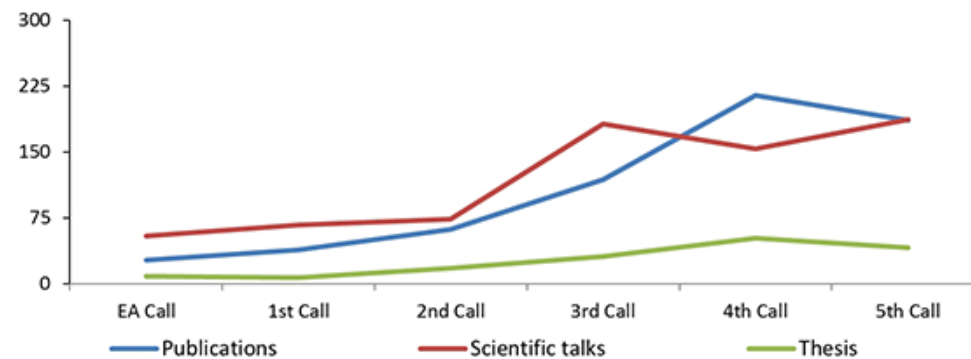


Figure 4 – Scientific production supported by PRACE.

These statistics show an increasing trend in scientific production supported by PRACE.

A future analysis of the impact-factor of published papers will reveal quantitatively whether the quality of scientific production also improves over time.

PRACE's impact on growing know-how in Europe

- Since 2008 there has been a clear increase of participants registered in PRACE Advanced Training Centres (PATC), the International HPC Summer School, and PRACE Seasonal Schools offered free of charge to eligible participants.
- Between August 2008 and December 2014, PRACE provided 19,686 person-days of training through attendance-based courses with an upward attendance trend (figure 5).
- PRACE courses were attended by 5,249 unique individuals.
- The average rate of recurring participation in training is 30%, illustrating that the majority of attendees are not the same people attending repeatedly but with sufficient recurrence to indicate the attractiveness of PRACE training courses
- In 2014 the number of participants registered in PATCs courses reached 2,545 (2,175 from academia and 274 outside academia).
- More than 90% of participants attending PATCs courses have academic affiliation (2,175), demonstrating the impact of this on the research and scientific communities, in particular for early stage researchers and PhD students.

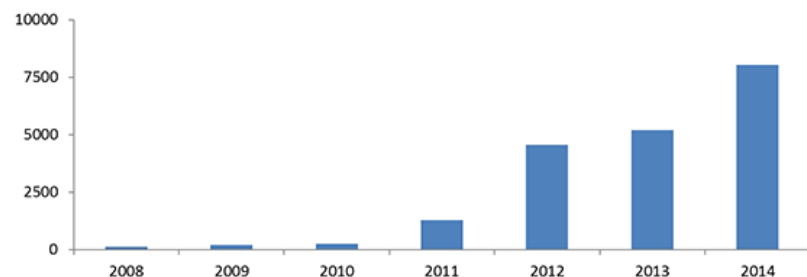


Figure 5 – Number of person-days registered at PRACE Training days between 2008 and 2014.

- Total total number of attendances registered is not dependent on the number of training days and courses.
- Despite the number of PRACE training days being the lowest in the third quarter, the number of attendances registered is the highest observed for 2014 (figure 6).

PRACE's impact on growing know-how in Europe

PRACE has throughout all implementation projects been very active in developing and sustaining a wide range of training events through PRACE Seasonal Schools and the International HPC Summer School. Since the establishment of the six PRACE Advanced Training Centres (PATCs) a jointly devised programme of courses aimed at the European HPC user community has also been available free of charge to trainees from academic and non-academic eligible participants.

By counting the number of participants attending each training event multiplied by the number of days of training and summing this over a period of time, between August 2008 and December 2014 PRACE provided 19,686 person-days of training through the various training events it offers. Figure 5 below shows the increasing person-days offered by PRACE throughout these years.

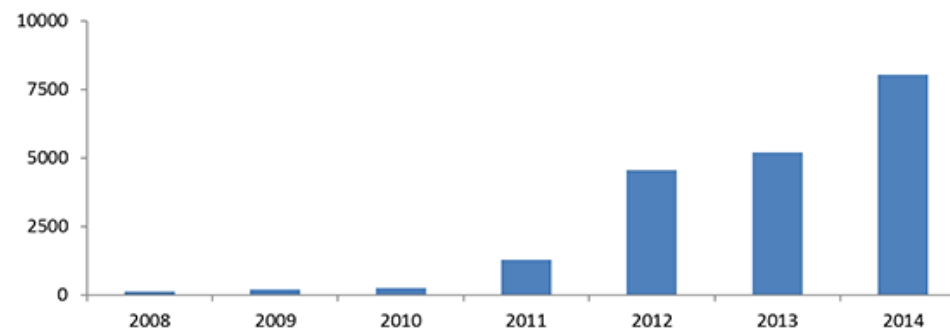


Figure 5 – Number of person-days registered at PRACE Training days between 2008 and 2014.

Throughout this time, 5,249 individuals attended PRACE Training events. The average rate of recurring participation in training is 30%, illustrating that the majority of attendees are not the same people attending repeatedly but with sufficient recurrence to indicate the attractiveness of PRACE training courses

Another related KPI looks at the interest of PRACE Training events through the registrations for PRACE training carried out on the PRACE Events website (<https://events.prace-ri.eu>).

Using the data from the registration form, registrants can be identified as either from an academic or a non-academic affiliation.

In 2014, 2,545 people - 2,175 from academia and 274 from non-academia, registered for PRACE training events. This data is presented in Figure 6 below:

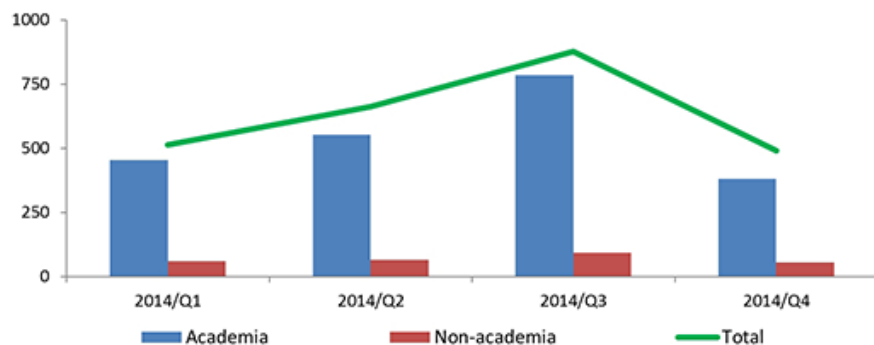


Figure 6 – Number of person-days registered at PRACE Training days in 2014.

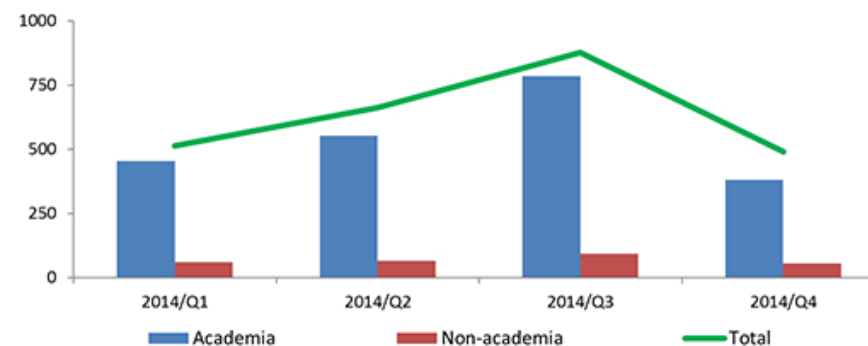


Figure 6 – Number of person-days registered at PRACE Training days in 2014.

The importance of PRACE towards European research and scientific communities is highlighted by the fact that around 85% of these registrants have an academic affiliation. Furthermore, data from the registration page identifies a particular interest from early stage researchers and PhD students. This highlights the importance of PRACE with regards to training new and upcoming computational scientists.

PRACE's impact on attracting the industrial sector

- There has been a steady increase in industrial interest in PRACE at high-level international events (figure 7).
- The number of industrial participants showing interest at two main HPC events (Supercomputing (SC) in the US, and the International Supercomputing Conference (ISC) in Germany between 2008 and 2013 totalled 695 unique individuals.
- The ratio companies that repeat their contact with PRACE during the main HPC events stabilized at around 50% for SC and 64% for ISC.
- This extremely high level of recurrence is an indicator that industrial interest in PRACE is genuine and not mere curiosity.

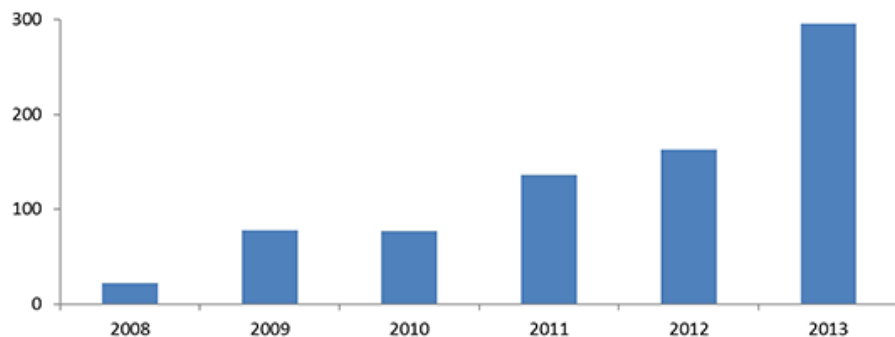


Figure 7 – Number of industrial attendees that made contact with the PRACE booth at ISC and SC.

- Average participation of industry in PATC training events is 14% (figure 8).
- Industrial participants trained by PRACE totalled 250.
- Eligible industrial participants enjoy the same service as academic trainees and can attend PATC courses free of charge.

PRACE's impact on attracting the industrial sector

PRACE is also keen on engaging with industry showcasing how industrial productivity can improve through the use of HPC. In light of this, three further KPIs have been created to measure PRACE's involvement and interaction with industry.

The first of these identifies how industrial interest for PRACE at two main HPC events - Supercomputing (SC) in the US and the International Supercomputing Conference (ISC) in Germany, changes throughout time. This interest is measured by the number of industrial contacts who leave their contact details at the PRACE booth in such events. This is presented in the figure below for the years between 2008 to 2013.

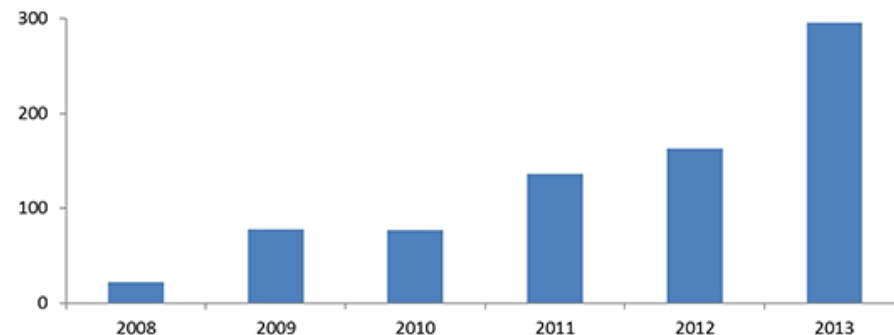


Figure 7 – Number of industrial attendees that made contact with the PRACE booth at ISC and SC.

It should be noted that during this time, 695 unique individuals left their details at the PRACE booth, and that the ratio of companies, which revisit the PRACE booth at these events, is around 50% for SC and 64% for ISC. This extremely high level of recurrence indicates that industrial interest in PRACE is genuine and not a mere curiosity.

The second of these KPIs tracks industrial participation at PATC training events. Similar to academic trainees, industrial participants can attend PRACE training events free of charge.

The figure below show the PATC industrial trainee participation for 6 quarters between 2012 and 2014 the number of which totalled to 250 individuals.

D2.3

Management Processes and Tools

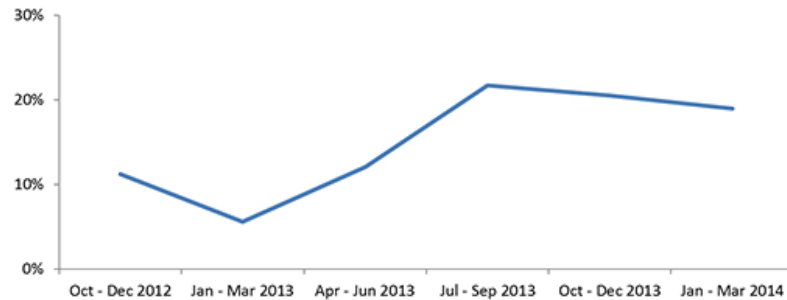


Figure 8 – Industrial participation in PATCs training days.

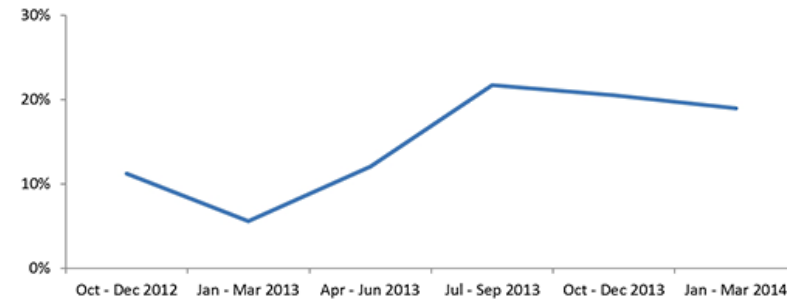


Figure 8 – Industrial participation in PATCs training days.

- PRACE first opened Calls for Proposals to industrial applicants in mid-2012.
- Industrial participation can be a project led by a principal investigator from an industrial enterprise, or by a researcher from industry collaborating in an academia-led project.
- The reduction and stabilisation of projects awarded after the 7th Call has a strong impact on the number of projects awarded with industrial participants but also in the amount of CPU hours allocated to industry (figure 9).
- In the framework of the SHPAE pilot, PRACE can report 10 success stories of SMEs from 6 different countries benefiting not only from PRACE HPC resources but more importantly, from the know-how in the PRACE centres.

The last of these KPI's tracks industrial participation in PRACE Calls for Proposals either through a project led by a principal investigator from an industrial enterprise, or by a researcher from industry collaborating in an academia-led project. Industrial participation in these calls was allowed from the 3rd call in mid-2012 and the industrial participation since then can be seen in the figure below:

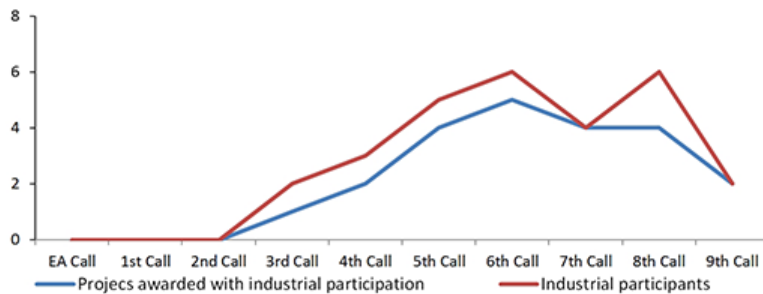


Figure 9 – Industry participation in PRACE allocations.

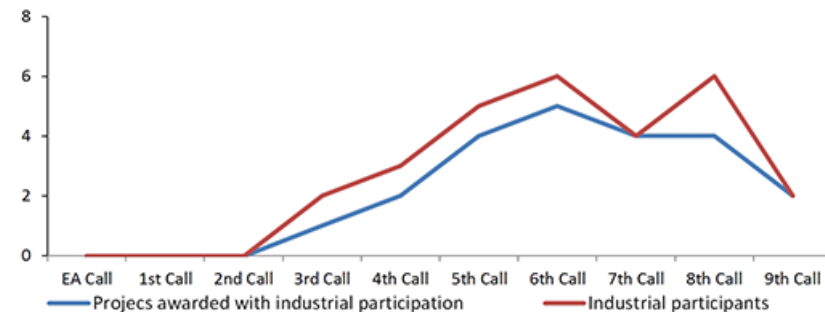


Figure 9 – Industry participation in PRACE allocations.

The reduction and stabilisation of projects awarded after the 7th Call has a strong impact on the number of projects awarded with industrial participants but also in the amount of CPU hours allocated to industry. Despite this, in the framework of the SHPAE pilot, PRACE can report 10 success stories of SMEs from 6 different countries benefiting not only from PRACE HPC resources but more importantly, from the know-how in the PRACE centres.