



SEVENTH FRAMEWORK PROGRAMME
Research Infrastructures

**INFRA-2010-2.3.1 – First Implementation Phase of the European High
Performance Computing (HPC) service PRACE**



PRACE-1IP

PRACE First Implementation Project

Grant Agreement Number: RI-261557

D3.2.3

PRACE Advanced Training Centres

Final

Version: 1.0
Author(s): Pekka Manninen, CSC and Simon Wong, ICHEC
Date: August 19, 2011

Project and Deliverable Information Sheet

PRACE Project	Project Ref. №: RI-261557	
	Project Title: PRACE First Implementation Project	
	Project Web Site: http://www.prace-ri.eu	
	Deliverable ID: D3.2.3	
	Deliverable Nature: Other	
	Deliverable Level: CO	Contractual Date of Delivery: 31 / December / 2011
		Actual Date of Delivery: 31 / August / 2011
EC Project Officer: Bernhard Fabianek		

* - The dissemination level are indicated as follows: **PU** – Public, **PP** – Restricted to other participants (including the Commission Services), **RE** – Restricted to a group specified by the consortium (including the Commission Services). **CO** – Confidential, only for members of the consortium (including the Commission Services).

Document Control Sheet

Document	Title: PRACE Advanced Training Centres	
	ID: D3.2.3	
	Version: 1.0	Status: Final
	Available at:	
	Software Tool: Microsoft Word 2007	
	File(s): D3.2.3.docx	
Authorship	Written by:	Pekka Manninen, CSC and Simon Wong, ICHEC
	Contributors:	Nicola McDonnell, ICHEC and David Henty, EPCC
	Reviewed by:	Tanja Weber, FZJ; Rolf Rabenseifner, HLRS; Aleksandar Belic, IPB
	Approved by:	MB/TB

Document Status Sheet

Version	Date	Status	Comments
0.0	05/April/2011	Draft	
0.1	05/May/2011	Draft	Version for broader circulation
0.2	07/June/2011	Draft	Implementing comments and gathering some more
0.3	15/June/2011	Draft	Version for internal review
1.0	20/August/2011	Final version	Version submitted to EC

Document Keywords

Keywords:	PRACE, HPC, Research Infrastructure, Training, Education, Outreach, PATC, PRACE Advanced Training Centre
------------------	--

Copyright notices

© 2011 PRACE Consortium Partners. All rights reserved. This document is a project document of the PRACE project. All contents are reserved by default and may not be disclosed to third parties without the written consent of the PRACE partners, except as mandated by the European Commission contract RI-261557 for reviewing and dissemination purposes.

All trademarks and other rights on third party products mentioned in this document are acknowledged as own by the respective holders.

Table of Contents

Project and Deliverable Information Sheet	ii
Document Control Sheet.....	ii
Document Status Sheet	ii
Document Keywords	iii
Table of Contents	iv
List of Figures	v
References and Applicable Documents	v
List of Acronyms and Abbreviations.....	v
Executive Summary	1
1 Introduction	1
2 Mission and Vision	2
2.1 Rationale.....	2
2.2 PATC mission statement.....	2
2.3 PATC vision	2
3 Scope and Operation	3
3.1 General considerations.....	3
3.2 Training curriculum.....	3
3.3 PATC brand.....	5
3.4 Training material.....	5
3.5 University connections	5
3.6 PATC trainers.....	6
3.7 Feedback.....	6
3.8 Future development.....	6
4 Organisation and Management Models	6
4.1 Organisation and roles	6
4.2 Financial sustainability	7
4.3 Control and assessment metrics	7
5 Marketing strategy	8
6 Selection Criteria for Hosting Sites.....	8
6.1 Location.....	8
6.2 Capability	9
6.3 Facilities.....	9
6.4 Selection process	9
7 Proposal for Establishment of PRACE Advanced Training Centres.....	10

List of Figures

Figure 1: PATC curriculum building and events organisation process..... 4

References and Applicable Documents

1. **Manninen, Pekka.** *D3.2.2 First Training Report.* s.l. : Partnership for Advanced Computing in Europe (PRACE-1IP), 2011.
2. **Free Software Foundation.** GNU Public License v.3.0. [Online] <http://www.gnu.org/copyleft/gpl.html>.
3. **Creative Commons.** [Online] <http://creativecommons.org/licenses/>.
4. **Stitt, Tim and Robinson, Timothy.** *A Survey on Training and Education Needs for Petascale.* s.l. : The Partnership for Advanced Computing in Europe (PRACE-PP), 2008.
5. **Robinson, Timothy, Poznanovic, Jeffrey and Stringfellow, Neil.** *D3.1.5: HPC Training Portal.* s.l. : Partnership for Advanced Computing in Europe (PRACE-1IP), 2011.

List of Acronyms and Abbreviations

AISBL	“Association Internationale à But Non Lucratif”, international non-profit association under Belgian law
CSC	Finnish IT Centre for Science (Finland)
EPCC	Edinburg Parallel Computing Centre (represented in PRACE by EPSRC, United Kingdom)
FZJ	Forschungszentrum Jülich (Germany)
HLRS	High Performance Computing Center Stuttgart (Germany)
HPC	High Performance Computing; Computing at a high performance level at any given time; often used synonym with Supercomputing
ICHEC	Irish Center for High-End Computing (Ireland)
IPB	Institute of Physics Belgrade (Serbia)
OMB	(PATC) Operational Management Board
PATC	PRACE Advanced Training Center
PGAS	Partitioned Global Address Space
PRACE	Partnership for Advanced Computing in Europe; Project Acronym
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

Executive Summary

This is a proposal to establish three PRACE Advanced Training Centres (abbreviated as PATCs) in the PRACE region. The mission of the PATCs is to “serve as European hubs of advanced, world-class training for researchers working in the computational sciences”, that is, to provide and to coordinate training and education activities needed to achieve best utilisation of the PRACE research infrastructure by the community. The envisioned long-term purpose of the centres is to become the driver in European high-performance computing education. There will always be at least one such centre in operation, but the geographical locations of the hosting countries may and will vary over time and decided upon every two years. The PATCs will promote a common PRACE brand, representing the whole PRACE community rather than individual hosting sites. A common training curriculum, designed and coordinated by PRACE with input from user communities, is to be implemented by the centres along with site-specific courses/workshops. The Operational Management Board, consisting of representatives from the hosting centres and PRACE (project and/or association), will oversee and be responsible for the activities of the PATCs.

1 Introduction

The PRACE preparatory and implementation phase projects have been an ongoing effort in providing top-class education and training initiatives for European computational scientists. Demand has always exceeded supply in HPC-related training organised by PRACE so far, and the target audience is likely to widen as PRACE now encompasses both Tier-0 and Tier-1 systems. Hence, it is important that the education and training activities such as those carried out by PRACE have a sustainable future that will accommodate growth. This will be addressed by establishing PRACE Advanced Training Centres (PATCs).

In essence, the PATCs will strive to sustain top-class education and training for computational scientists through collaboration among European partners. Their work will be a coordinated effort where the development of a joint curriculum and joint education outreach activities are envisioned. They will be established within the PRACE-2IP project and in time, become sustainable centres beyond the duration of the PRACE-2IP and subsequent projects.

This document is a proposal for their establishment. This document not only serves as a basis for decision making by the Executive Board of the PRACE-2IP project, but it is also intended for current/future work-package leaders, other executives of the PRACE project and of the persistent PRACE association (i.e. PRACE AISBL).

This document is structured as follows: Section 2 defines the mission and vision statements for PATCs. Section 3 is a general outline of the scope and operation of the centres. Section 4 addresses organisation and management and Section 5 outlines a marketing plan. In Section 6, the selection criteria for PATCs are formalised. Section 7 is the proposal of the establishment of PATCs in writing, addressed to the Executive Board of PRACE-2IP project.

2 Mission and Vision

These are the core mission and vision statements for the centres. They are subject to revisions as needed.

2.1 Rationale

PRACE (Partnership for Advanced Computing in Europe) is a persistent pan-European high-performance computing (HPC) service infrastructure. The users of the infrastructure need to be in a position to fully exploit the strengths of existing and future hardware and software resources. Education and training activities are key for ensuring that the PRACE infrastructure is productive.

The PRACE projects have been conducting a highly successful series of face-to-face training events by various PRACE partners. It is however necessary to set up more permanent sites of HPC training – the PRACE Advanced Training Centres – that will be responsible for the quality and efficiency of PRACE training activities.

Since most of the PRACE partners already run different portfolios of training events on HPC topics, the PATCs will have coordination and supportive roles. The “European HPC Training Network” is therefore a combination of PATCs, PRACE organised training events (e.g. seasonal schools) and local training activities. The PATCs will focus on the coordination of training activities such that synergies with the existing “training infrastructure” can be harnessed, and perceived gaps can be fulfilled in a flexible manner.

2.2 PATC mission statement

The mandate for the PATCs is as follows:

“The PRACE Advanced Training Centres will serve as European hubs of advanced, world-class training for researchers working in the computational sciences.”

2.3 PATC vision

The PATC vision statement for the next few years is:

“When all centres are functional, the PATC network is a visible and important part of the electronic research infrastructure in Europe.”

This vision implies that the centres:

- Integrate expertise and know-how from partners to develop world-class training events
- Disseminate consolidated expertise back to partner institutions
- Support and leverage training and education collaboration between PRACE partners.
- Coordinate and facilitate training collaboration between PRACE and other European research infrastructures and EC-funded projects.
- Engage with the academic community to teach HPC methodologies in local programmes.

3 Scope and Operation

In this section, the scope of the PATCs and their operation are described.

3.1 General considerations

Three PATCs will be selected and established in the first year of the PRACE-2IP project and they will operate until the end of the project.

The centres are then selected on two-year terms. No partner should host a PATC for more than three terms (2+2+2 years) without a very good reason (e.g., in case if only the existing PATCs apply for continuation).

The PRACE Executive Board (or the Board of Directors if/when the PATCs are to come under the management of the persistent PRACE association) will decide on the number of PATCs for each two-year term. There should always be at least one operational PATC.

The PATCs will deliver training and associated material in English.

3.2 Training curriculum

The jointly-developed training curriculum for the PATCs will be developed by the Operational Management Board (see below) each year. It is envisaged here that a PATC would deliver 9-10 training events annually, each for duration of 2-4 days. This duration was noted to be the most effective in the Training Survey conducted in the PRACE Preparatory Phase [1].

The PATCs will maintain a clear picture of the existing training activities all over Europe and attempt to enhance such activities. This information will steer the design of training curriculum by the Operational Management Board. The curriculum development process will involve the collection of input from the PRACE community, i.e. including a review of the contemporary training activities, as well as the needs of existing/potential users. Subsequent analysis of this input would then steer towards a curriculum that supplement and enhance local training content.

The curriculum development process is illustrated in Figure 1 **Fehler! Verweisquelle konnte nicht gefunden werden.** In essence, the following is carried out once a year:

- The PATC Operational Management Board agrees on the guidelines for the curriculum. Input is collected from the PRACE community, which includes people working in PRACE as well as PRACE users. The PRACE User Forum and the Scientific Steering Committee are to be consulted. In addition, results from the revisited Education & Training Survey planned by Work-Package 4 of the PRACE-2IP project should be taken into account in this process for the near future. The (expected) training activities at PRACE partner sites are to be reviewed; needs to support and enhance this portfolio are assessed.
- Based on the curriculum guidelines, each PATC coordinator and director draft a list of events and other relevant activities.
- Having this information from all the PATCs, the Operational Management Board creates the joint curriculum for all the sites, gathers comments from the PRACE community, and finalises the curriculum after a review of the comments.

The detailed list of events for all the centres is at this point final for the following year, having exact dates and brief descriptions of the events. It can be used for further dissemination

purposes (flyers, posters) and it will be available in the PRACE Training Portal as well as in the prace-ri.eu website. The curriculum for each year should be fixed early enough to allow for marketing, and should be complete no later than October 1 in the year before.

An example curriculum could consist of the following events¹:

- 3 HPC programming courses (basic – intermediate – advanced), which are self-consistent but also form a systematic build-up from scratch to semi-advanced HPC programming skills. The topics to be covered include the usual HPC programming languages, parallel programming with MPI and shared-memory parallelisation, code optimisation, etc.
- 1-2 PRACE systems workshops, which help the users to port and optimise applications to PRACE infrastructure systems available at that time and teach efficient use of the systems.
- 2 scientific discipline specific workshops. These will be different in each centre (within the year-long curriculum) to ensure the best coverage of disciplines.
- One “future techniques” workshop, i.e. teaching the use of emerging HPC technologies and techniques (in 2011 for example it means PGAS languages and accelerator programming).
- One workshop on a free topic
- One larger event (a seasonal school or a conference).

The first two sets of events would be common to all PATCs (i.e. based on the same material), the rest are to be customised locally.

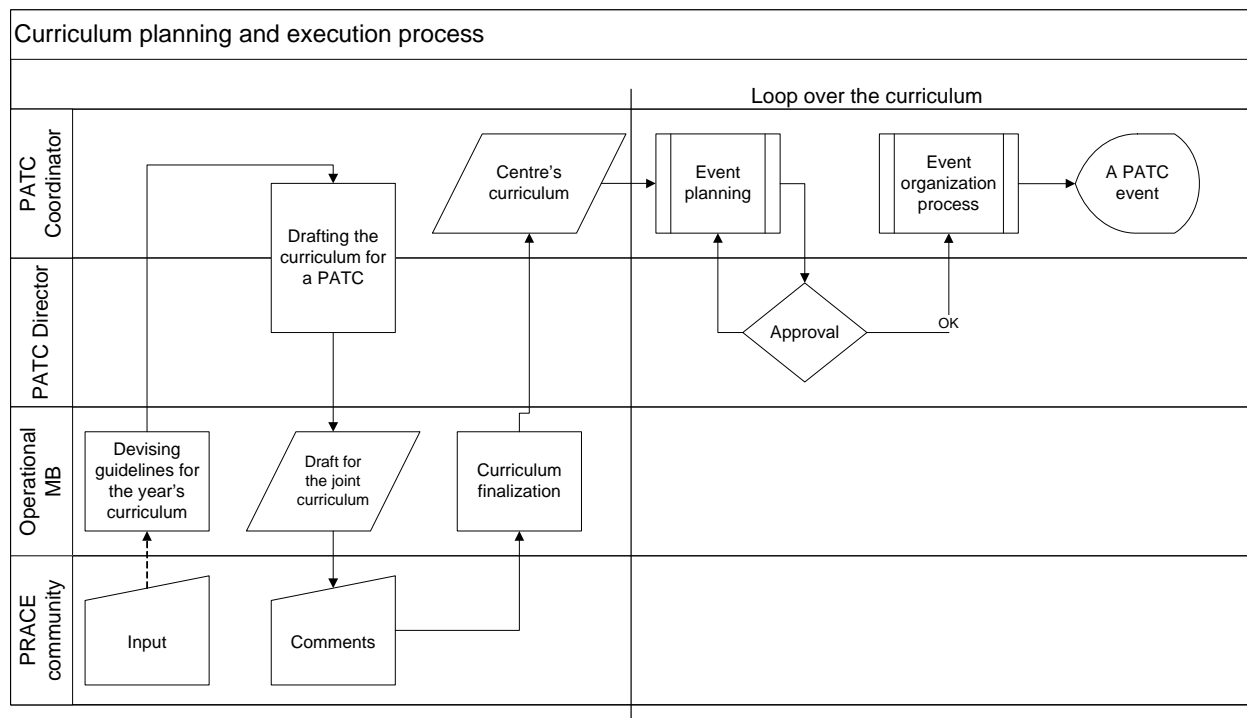


Figure 1: PATC curriculum building and events organisation process

¹ The authors wish to emphasise that this listing is provided only as an example and is not meant to be taken as a guideline when devising the curricula.

3.3 PATC brand

All the events by the PATCs should follow a set of common denominators: visuals, workshop agenda structures and other look and feel aspects – this will establish the PATC *brand*. The PATCs do not represent the hosting organisation but PRACE; therefore, all slide show templates, handouts, giveaways and so forth should be in line with PRACE dissemination practices. It is important to note that this branding also concerns old training material (i.e. some effort should be spent for conversion of material) as well as external trainers, who should be asked to use PRACE document templates when feasible.

In addition, in creating a common brand, the PRACE community should have an idea what the target audience should expect from participating in an event by a PATC (no matter which partner is hosting it). We highlight three targets:

- Each event provides excellent networking opportunities with other European and international researchers from different disciplines.
- The participant should perceive benefits from attending the event that is taught by well-informed instructors and up-to-date material.
- The events are organised in a professional manner in every respect (e.g. practical arrangements, material).

3.4 Training material

The training material (lecture slides, exercise solutions, demo programs etc) from the PATC training events will be published in the PRACE Training Portal [2]. The portal not only contains a comprehensive list of PRACE training events (not restricted to PATCs), it has the scope to publicise also local training events organised by PRACE partner sites.

The recommended copyright scheme of the material is the Creative Commons “Attribution-ShareAlike” or “Attribution-NonCommercial-ShareAlike” license [3] and using the GNU Public License [4] for program source codes, in line with the practices of the Training Portal. This scheme will ensure acknowledgement of all original material that are utilised; the same applies to any derivative work.

The PATC training courses will also be made available online for remote participation, either as live broadcasts or downloadable recordings; in order to serve the whole PRACE community and to reduce travel to some degree (for economical and ecological reasons). The realisation will be, at the minimum, recorded lectures and electronic materials available via the PRACE Training Portal. The lectures need only be recorded once per PATC course. Some of the courses are to be broadcasted using video-conferencing technology to allow remote participation, providing the audience the ability to ask questions and participate in hands-on sessions remotely.

3.5 University connections

The PATCs should give credits or provide recommendations for granting the credits for the workshops (1 ECTS for a 2 or 3-day workshop).

The PATCs should employ crowdsourcing as much as possible – that is, to engage academic communities to organise workshops at PATCs – for the realisation of curriculum items and the organisation of extra-curricular courses (but utilising PATC premises).

3.6 PATC trainers

The envisioned world-class training will not be possible without skilled trainers – not only in technical skills but also on how to transfer knowledge. PATCs will ensure the quality of teaching by continually training the trainers. The OMB must approve the people providing training in PATCs. In addition, a certification system could be implemented.

The “training the trainers” approach will also benefit sites that do not play host to a PATC, as these workshops will be open for everyone conducting HPC training courses.

3.7 Feedback

Feedback from participants at PATC events will be collected using a common feedback form (the same or a derivative of the feedback form employed in the PRACE-1IP seasonal schools, see [5]). Such feedback will then be analysed collectively by the OMB. The normalised and centrally analysed feedback will also guide the ‘training the trainers’ activities.

3.8 Future development

We envisage that the PATCs would take over the organisation of PRACE training events (seasonal schools, scientific seminars) after the third implementation phase (if such a project materialises; if not, this would happen after the second implementation phase). Events may be organised at locations outside of the countries hosting the PATCs; only the coordination work and responsibilities for these events would be the burden of PATCs.

The PATCs will play a key role in producing material for the PRACE Training Portal. On the other hand, the Training Portal will be utilised extensively by the PATCs. Responsibility for the development and maintenance of the training portal does not necessarily belong to the PATCs, but rather it could belong to other partner(s) of the persistent PRACE association.

There exist a significant potential for PATCs to collaborate with other EC-funded projects on training, e.g. where HPC knowledge dissemination is of use in other projects. Furthermore, PATCs could also develop replacing functions for activities now carried out by other EC-funded projects in the field of knowledge transfer, should the funding for these proposals end at some point of time.

4 Organisation and Management Models

The PATCs should have a common management model, together with a body that supervises the work and devises strategies.

4.1 Organisation and roles

The PATC operations are supervised and steered by PATC Operational Management Board (OMB), consisting of the PATC representatives, one member from the current PRACE project (the training WP leader), and one member appointed by PRACE association. The OMB sets the guidelines for the joint curriculum each year and allocates the budget for each centre. It may also appoint a coordinator for all the PATCs who will have the role of harmonising the events across all the centres and look after common functions, such as publicity, registration, templates for material, reporting, surveys, etc.

Each PATC in turn has a *director* and a *coordinator*. The PATC director acts as a representative of each centre and is in charge of operations as well as reporting of the results. He/she participates in curriculum planning with both the centre coordinator and the OMB. The coordinator is responsible for the operation of core activities where duties should include arrangement of lecturers and ensuring top-quality practical arrangements (catering, facilities, etc). The coordinator also participates in curriculum planning and monitors the budget of the centre.

4.2 Financial sustainability

Each PATC director and coordinator may utilise PRACE project PMs for his or her work. Neither of them is expected to be fully funded by the PATC.

A typical PATC training course (three days) will generate running expenses (materials, caterings) of roughly 100 €participant. Thus the total expenses of a course with 25 participants will be around 2,500 € with local trainers and 3,500-4,000 € with external trainers. Therefore the necessary funding level per PATC for running the curriculum is somewhere between 30,000 to 50,000 € per year. The running costs of the centres will be fully covered by the PRACE-2IP project for the first two years. Each centre may operate within their given budget quite freely, e.g. can make the decision to use funds for reimbursement for participants' travel, etc. During this period, the centres should move towards a more self-sustaining model of operation. Possible sources of revenue include course fees, industry (vendor) support and sales of training products (e.g. organise on-demand, tailored training). Course fees should be at all times affordable for academics of PRACE countries.

After PRACE-2IP, financial support (not necessarily 100%) may come from subsequent implementation phase projects or the persistent PRACE association. Some level of funding from PRACE is to be expected in the foreseeable future.

4.3 Control and assessment metrics

The success of a PATC in its task can be measured by three inter-dependent measures:

- Realisation of the curriculum; if all the workshops were delivered in the planned time and scope
- The average number of participants
- Customer satisfaction; measured by feedback and credit points given by customers.

Secondary indicators could be, for example, the number of external/international lecturers (if these can be taken as a sign of a high profile course and bring added value compared with using the own specialists of the hosting site).

5 Marketing strategy

The marketing strategy has the following goals:

- Researchers and directors in academia as well as in industry all around Europe are well- and fully-informed of the range of training services provided by PRACE and the learning outcomes bring relevant and significant benefits to participants.
- Funding bodies as well as universities are aware that PRACE has a strong reputation in training and education for scientific computing and that it can play an important role in up-skilling graduates and researchers.

The crux of the strategy lies in dissemination of relevant key information to the target audiences. Targeted announcements of PATC training events will be distributed mainly through user mailing lists, PRACE partner sites, the PRACE Training Portal, social media, word-of-mouth, etc. Brochures and posters provide additional dissemination material to be distributed by PATCs as well as partner sites.

The PRACE Training Portal will play an important role in providing clear, up-to-date information on all upcoming training events (those organised by PATCs as well as other local events). It will also make available digital training content produced by PRACE from past events. Not only will it be a resource for researchers and users, it provides a directory of training services on offer for those at management or decision-making level (e.g. HR departments).

Key outcomes from PATC training events should also be highlighted and disseminated to the community to build up a well-recognised brand and reputation. While the operation of the PATCs overlaps PRACE-2IP, such highlights will be published in relevant PRACE publications (e.g. PRACE magazine), in collaboration with WP3 (Dissemination). The PATC directors, along with key personnel in the PRACE RI (e.g. leader of the training work package, relevant task leaders), are responsible for promoting PATC training. Such activities may include participation in networking events and working with other pan-European research infrastructure projects.

6 Selection Criteria for Hosting Sites

In this section, we outline the criteria for deciding the hosting sites of the centres. These include geographical as well as capability considerations.

6.1 Location

First, the hosting site must be in a PRACE member country. Only one PATC should be located in one country. The selection of hosting sites should aim to achieve a wide geographical coverage, where each PATC has an associated catchment area of training requirements. These requirements may be captured in preliminary surveys (see Section 3.2).

Secondly, a large number of PRACE infrastructure key users in the hosting country and neighbouring countries is a clear benefit for the country. However, this criterion should not rule out newly established sites with many potential users in a need of training. In fact, it could be considered if in deciding the location of one centre a preference for “new PRACE countries” would be given.

However, if a site is applying for a renewal of PATC status and funding, the number of attendees at past events, and their increase as a function of time, represents a major criterion for consideration of renewal.

6.2 Capability

The hosting site should preferably have a proven record of running a large number of top-class training events consistently over a long period.

However, this should not become an obstacle for a newly established, ambitious site to obtain the PATC status, and can be omitted, if the site has clearly the necessary skills available (either in-house or through crowd- or outsourcing).

6.3 Facilities

Candidate PATC hosting sites should have flexible, on-demand, even exclusive, access to training facilities that are suitable for hosting the events, i.e. access to at least one computer classroom that is large enough (20-30 workstations). Hospitable areas for breaks and group sessions (e.g. lounges) are also factors to be taken into consideration.

Facilities should also include state-of-the-art educational infrastructure, including the capability to broadcast courses (with AccessGrid, H.323, Adobe Connect Pro, Evo, or other similar technologies) and/or record them for subsequent online use, well-equipped workstations, large white screens, powerful (preferably several) projectors, etc. Overall, the facilities should have a professional look and feel.

6.4 Selection process

At the period between each two-year term of the PATCs, a call for proposals should be opened where sites can apply or re-apply for PATC status. The proposals should demonstrate that the particular site meets the aforementioned criteria. Judging from these, the training WP leader in the PRACE project, or the corresponding Director of the persistent PRACE association, proposes the PATC hosting sites, which are then approved (or rejected) by the Executive Board (or comparable). The call for proposals should be opened during spring of the relevant year with the final decision on selected PATCs announced in September. In passing, we note that these deadlines cannot be applied to the very first PATCs, in order to allow for a rapid initialisation of the PATC network.

7 Proposal for Establishment of PRACE Advanced Training Centres

In this document, the concept and operation of “PRACE Advanced Training Centres” have been outlined. Their mission is to provide and to coordinate training and education activities that enable the European research community to utilise fully the computational infrastructure available through PRACE. The long-term vision is that such centres will become the hubs and key drivers of European high-performance computing education.

The centres are permanent in the sense that there will be always at least one such centre operational, but their locations in the map may and will vary over time. Their locations are decided for two years at a time.

The centres will carry out a curriculum of workshops and other training events. Most often, these refer to a 2-4 day face-to-face intensive courses. The curriculum is common for all the centres, but they overlap partially: some workshops will be run in all the centres, some only in a centre. This balance is chosen to ensure the best variety and coverage of courses with the whole PRACE community in mind. The PATC training activities will be accessible also online to some extent, either as live broadcasts or as recordings available online. Input from the PRACE user community will be taken into account in devising the curricula. The PATCs will deliver all training in English.

The centres are supervised and instructed by the Operational Management Board consisting of the training centre representatives and PRACE (project and Research Infrastructure) representatives.

We hereby propose the establishment of three centres, as soon as possible, under Work Package 4 of the PRACE-2IP project. Their locations shall be decided by the PRACE-2IP Executive Board, upon delivery of a proposal from the PRACE-2IP WP4 leader. This proposal will involve a call for applications where all PRACE sites could potentially apply for PATC status. The yet to be selected sites should meet the selection criteria as stated above that feature a proven capability of conducting high-quality training events with sufficient facilities and resources.