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Abstract:	This document describes progress in the development of the HBP's High Performance Computing (HPC) Platform Subproject (SP7), as of Project Month 12. Reference is made to the Functions/SKPIs defined in the HPC Platform Specification (Deliverable D7.7.2). Overall, progress in SP7 is proceeding according to plan. A total of three Deliverables were submitted by SP7 in the period as planned. Nine out of ten Milestones were reached as planned; one has been delayed by six months, but is not critical for the Project at this time. There are no major problems in SP7 except for some non-critical delays in network-related Functions. In the next six months, SP7 will focus on the integration work leading up to the Project-internal release of the HPC Platform, which is planned for Month 18.

Keywords:	Human Brain Project, SP7, High Performance Computing Platform, Set-up, Progress, Deliverables, Milestones, Functions, Key Performance Indicators

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1. Introduction

1.1 The Human Brain Project (HBP)

The Human Brain Project (HBP) is a major international scientific research project, involving over 100 academic and corporate entities in more than 20 countries. Funded by the European Commission (EC), the ten-year, EUR 1 billion Project was launched in 2013 with the goal "to build a completely new ICT infrastructure for neuroscience, and for brain-related research in medicine and computing, catalysing a global collaborative effort to understand the human brain and its diseases and ultimately to emulate its computational capabilities."

The fields of neuroscience, medicine and information technology each have important roles to play in addressing this challenge, but the knowledge and data that each is generating have been very fragmented. The HBP is driving integration of these different contributions.

During the Ramp-Up Phase, the HBP will collect strategic data, develop theoretical frameworks, and perform technical work necessary for the development of six Information and Communication Technology (ICT) Platforms during the Operational Phase. The ICT Platforms, offering services to neuroscientists, clinical researchers and technology developers, comprise Neuroinformatics (a data repository, including brain atlases and analysing tools); Brain Simulation (building ICT models and multi-scale simulations of brains and brain components); Medical Informatics (bringing together information on brain diseases); Neuromorphic Computing (ICT that mimics the functioning of the brain); and Neurorobotics (allowing testing of brain models and simulations in virtual environments). A High Performance Computing Platform will support these Platforms.

1.2 HBP Subproject 7: High Performance Computing Platform

The High Performance Computing (HPC) Platform Subproject (SP7) is one of the HBP's 12 scientific Subprojects. Coordinated by Forschungszentrum Jülich, it currently involves 15 Partner institutions, including four leading European supercomputing centres and several universities. Its 10-year mission is to build, integrate and operate the hardware and software components of the supercomputing and data infrastructure required to:

- Run large-scale, data intensive, interactive brain simulations up to the size of a full human brain
- Manage the large amounts of data used and produced by the simulations
- Concurrently manage workloads and workflows, data processing and visualisation.

This infrastructure as a whole will form the HPC Platform. SP7 will make version 1.0 of the HPC Platform available to the HBP Consortium in Project Month 18, and to the wider scientific community in Month 30. The HPC Platform will be accessible in a seamless and intuitive manner through the HBP's Unified Portal (UP).

In the HBP's Ramp-Up Phase, the HPC Platform will comprise existing supercomputing, data management and visualisation capabilities at Forschungszentrum Jülich (Germany), the Swiss National Supercomputing Centre in Lugano (CSCS, Switzerland), Barcelona Supercomputing Centre (BSC, Spain), Cineca in Bologna (Italy), Karlsruhe Institute of Technology (KIT, Germany), RWTH Aachen University (Germany) and École Polytechnique Fédérale de Lausanne (EPFL). As part of the HPC Platform, each of the sites will play a specific role.

The HPC Platform contains the following components (for further details on these components, please refer to Deliverable D7.7.2 High Performance Computing Platform v1 - specification document):

- HBP Supercomputer
- HBP Development System
- HBP Molecular Dynamics Supercomputer
- HBP Massive Data Analytics Supercomputer
- HBP Cloud Service
- HBP High Fidelity Visualisation Systems

The HBP Supercomputers at JUELICH (P17), BSC (P4), CINECA (P10) and CSCS (ETHZ, P15) are connected via the PRACE high-speed network. All supercomputing sites, the HBP Cloud Storage at KIT and the HBP High Fidelity Visualisation Systems at RWTH and EPFL are connected via the internet. In addition, there are dedicated high-speed connections between JUELICH and RWTH (P42), and between CSCS and EPFL (P1), which are available to the HBP.

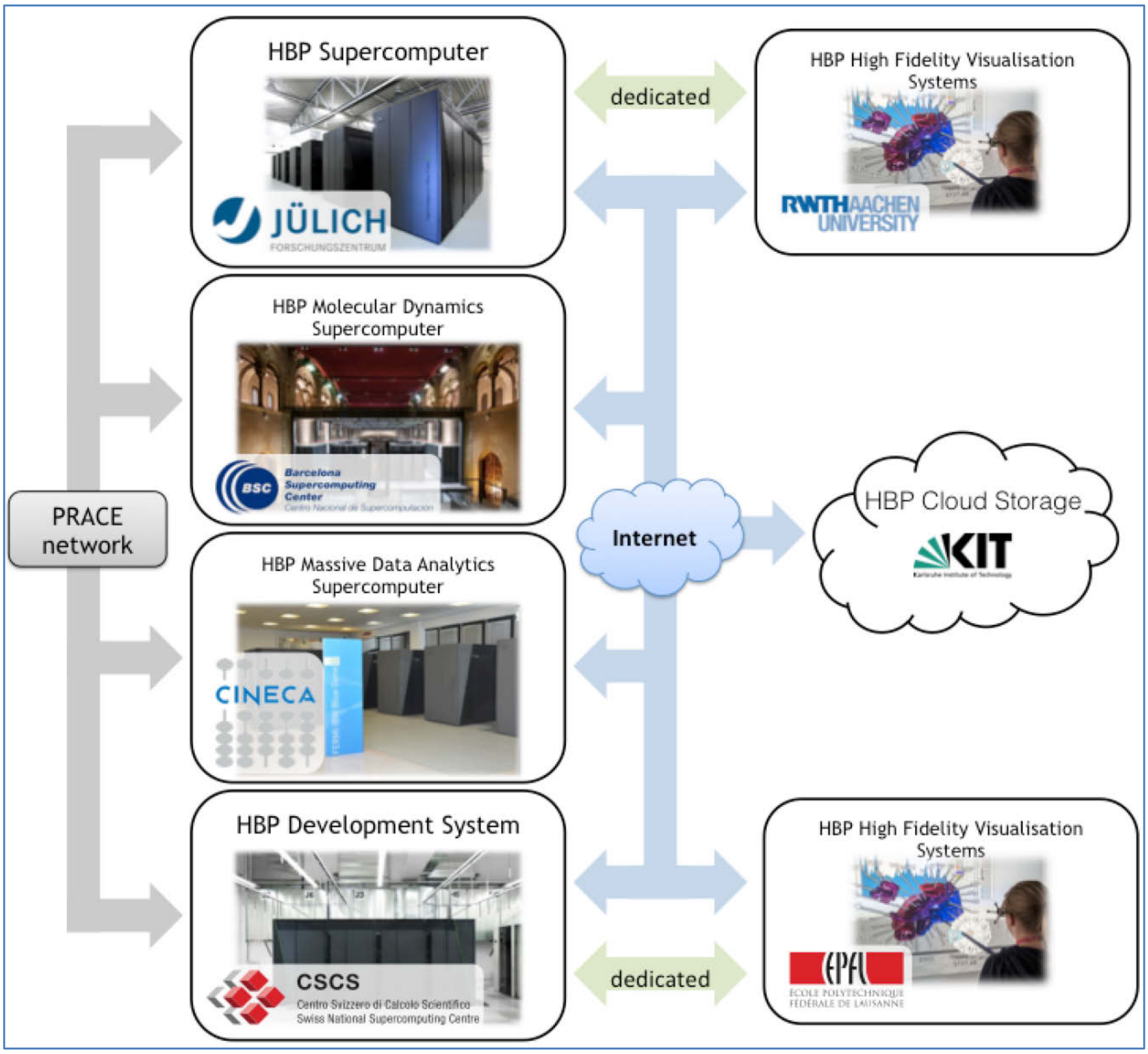


Figure 1: Physical architecture of the HPC Platform

1.3 Purpose of this Document

This report describes progress in the development of the HPC Platform.

1.4 Structure of this Document

The remainder of this chapter provides an SP-level overview, highlighting the SP's main accomplishments and issues encountered in the period M1-M12. Subsequent chapters look at accomplishments and in issues within individual components of the SP, as defined in the High Performance Computing Platform specification document (D7.7.2):

- WP7.1: Technology Evaluation (PCP)
- WP7.2: Mathematical Methods, Programming Models and Tools
- WP7.3: Interactive Visualisation, Analysis and Control
- WP7.4: Exascale Data Management
- WP7.5: HPC Platform: Integration and Operations
- WP7.6: HPC Platform: User Support and Community Building
- WP7.7: HPC Platform: Scientific Coordination

The Annexes present in tabular form what the Subproject planned to achieve in this period and what it actually achieved, including the Subproject's Scientific Key Performance Indicators (SKPIs).

1.5 Overview of Subproject 7: Achievements

1.5.1 Deliverables submitted

A total of three Deliverables were submitted by SP7 in M1-M12 (this document included). SP7's first Deliverable, D7.7.1: PCP Planning Document, was produced and submitted on time to the European Commission in Month 2. D7.7.1 is a comprehensive planning document that describes in detail the purpose and organisation of the HBP Pre-Commercial Procurement (PCP), carried out by WP7.1. The document laid out the legal and organisational framework of the PCP, the structure and provisional schedule of the envisaged process, and risks and mitigation measures. Based on the findings described in this report, the HBP Ramp-Up Phase was extended by six months to a total duration of 36 months to leave more time for the PCP.

The second Deliverable, D7.7.2 (High Performance Computing Platform v1 – specification document), provided a detailed specification of SP7's HPC Platform Version 1.0, which will be made available to the community during the HBP's Ramp-Up Phase. Due to delays at the Project level, and due the required amount of coordination at the SP level, this Deliverable was submitted about one month later than planned, i.e., at the beginning of Month 8 instead of the end of Month 6. In addition to descriptions of the goals, structure, use cases, and software and hardware components of the HPC Platform, this Deliverable defined the scientific Key Performance Indicators (SKPIs) that are now used to monitor the development of the Platform.

The third Deliverable submitted in the period is this document, D7.7.3 (High Performance Computing Platform – set-up document), which describes progress to date in the development of the Platform.

1.5.2 Milestones achieved and overall progress

WP7.1 (Technology Evaluation) is carrying out a Pre-Commercial Procurement (PCP) of innovative HPC solutions. These solutions should meet specific requirements in the areas of memory technology, visualisation and resource management, all of which play key roles in the HBP vision of "Interactive Supercomputing." Despite a very ambitious schedule, WP7.1 prepared the extensive tender documents, which comprise an administrative and a technical part, within six months of the start of the Project. WP7.1 also published the HBP PCP Call for Tender in Month 7 as planned (Milestone MS130: Requirements: publication of PCP call). A full draft version of the tender documents was submitted to the EC for review in Month 6, prior to the publication of the call (MS247: Preliminary PCP call text and rationale). After the formal and technical assessment of the bids received, the successful bids were selected and all tenderers notified in Month 10, only a few days later than planned (MS131: Pre-commercial tender finalised by selection of PCP Phase 1 participants). Currently, three of the five selected participants have signed all the necessary contracts and are carrying out their R&D work in Phase 1 of the PCP (see section 2.2 for more details on the status of WP7.1).

WP7.2 (Mathematical Methods, Programming Models and Tools) is developing software and numerical methods to support concurrent interactive brain simulation, visualisation and analysis on the same machine. The first of two Milestones for WP7.2 in the period was achieved in Month 6 as planned (MS135: Specifications and roadmap for parallel programming models). To this end, the WP worked closely with SP6, as the main user of the HPC Platform, to test and advance its numerical methods, performance tools and programming models against the most relevant applications in SP6: NEST and NEURON. The second Milestone of the WP in Month 12 was also achieved as planned (MS136: Interactive Supercomputing: algorithms and models). The activities contributing to this Milestone focused on the interplay between applications like the NEST and NEURON simulators on the one hand, and the OmpSs and PyCOMPSs programming models as well as the Dynamic Load Balancing (DLB) library on the other (see section 3.2 for more details on the status of WP7.2).

WP7.3 (Interactive Visualisation, Analysis and Control) is developing concepts and early prototypes of software that provides interactive visualisation and control for brain modelling, brain simulation and data analysis. In the period, the WP designed an event-driven architecture for loose coupling of visualisation and data analysis components, with the long-term goal of implementing flexible, multi-view visualisations on high-resolution display walls, which can visualising multi-scale neuroscience data. The corresponding Milestone, due in Month 12, was thus achieved on time (MS139: Architecture of software applications for interactive visualisation). Overall, the activities of the WP are progressing as planned (see section 4.2 for more details on the status of WP7.3).

WP7.4 (Exascale Data Management) is designing and developing the technology needed to manage very large volumes of experimental and simulation data for analysis, model building and model validation. The WP had no Milestone to achieve in the period reported on. One Milestone (MS142: Data provenance requirements), which was originally planned for Month 12, was shifted to Month 18, as the responsible Task (T7.4.3) only began in Month 13. Work in WP7.4 is progressing according to schedule. A prototype tool for indexing peta to exascale spatial data sets has been advanced to software quality, and is now ready to be deployed on the Platform (see section 5.2 for more details on the status of WP7.4).

WP7.5 (High Performance Computing Platform - Integration and Operations) is working to release the first version of the HPC Platform as a service to users in Month 18. During the period, all supercomputers of the HPC Platform were made available to the HBP as planned:

- The Blue Brain Project's IBM Blue Gene/Q system, hosted by CSCS, for the development of brain simulation software (Month 1, MS145: Development computer available)

- The IBM Blue Gene/Q system JUQUEEN at Jülich Supercomputing Centre as the HBP Supercomputer for production-scale brain simulations (Month 6, MS146: Specifications; other computers available)
- The IBM iDataPlex system MareNostrum at Barcelona Supercomputing Centre for molecular level simulations (Month 6, MS146: Specifications; other computers available)
- The IBM Blue Gene/Q system FERMI and the GPU cluster PLX at Cineca for massive data analytics (Month 6, MS146: Specifications; other computers available)

The HPC Platform was fully specified in Deliverable D7.7.2 slightly later than planned, in early Month 8. Current activities focus on harnessing the PRACE high-speed network for the Platform, implementing the Single-Sign On functionality, and setting-up the UNICORE infrastructure (see section 6.2 for more details on the status of WP7.5).

The goal of WP7.6 (High Performance Computing Platform - User Support and Community Building) is to enable scientific and industry users from within and outside the HBP Consortium to make effective use of the HPC Platform, and to coordinate the Platform's activities with PRACE and other related infrastructures. The focus of WP7.6 in the period was on the documentation of the HPC Platform specifications (D7.7.2), which included requirements for documentation and support (MS149: Documentation requirements), and which will form the basis for the future documentation of the Platform. The other main achievement of WP7.6 is the PRACE Council approval for the PRACE Programmatic Access. This will enable the HBP to submit project proposals to every PRACE call, with a reserved amount of resources. Due to the focus on programmatic access in the period, potential HPC alliances still need to be identified within PRACE and beyond (MS150). This Milestone is now expected to be achieved by Month 18 instead of Month 12. Given that sufficient HPC resources are currently available to the HBP, this delay will have no negative impact on the Project (see section 7.2 for more details on the status of WP7.6).

WP7.7 (High Performance Computing Platform – Scientific Coordination) coordinates the development of the HPC Platform, ensuring that the work is efficiently organised and documented and that the research contributes to the overall goals of the Project. In the first 12 months, WP7.7 organised five SP meetings (two face-to-face meetings and three audio/video conferences) and planned, assembled and edited the three Deliverables for SP7 due in the period (D7.7.1, D7.7.2, D7.7.3). It also contributed to the HBP proposal for a Framework Partnership Agreement (FPA), which should govern the HBP Flagship Initiative under Horizon 2020 (see section 8 for more details on the activities of WP7.7).

1.5.3 Collaboration

As can be seen from the lists of meetings in section 8, a considerable number of SP-internal, HBP-internal (cross-SP) and external meetings took place during the first 12 months. These meetings were held either face-to-face or by audio/video conference. Given that SP7 is relatively large, and that face-to-face meetings are not always possible, the access of almost all Partners to state-of-the-art audio/video conferencing equipment has been extremely beneficial. Not counted is the large number of email exchanges and phone calls between the SP7 management and individual SP7 members, among SP7 researchers, between SP7 members and other SPs, and between the SP7 management and the central Project management. An SP-internal mailing list and several additional WP-internal mailing lists are frequently used, as is the central HBP Collaboration Portal. For collaboration within SP7 in general, the fact that most Partners know each other from previous or current EU projects like DEISA, PRACE or EUDAT is a significant advantage.

1.5.4 Internal monitoring and quality control

SP7 is organised such that the SP leader and all WP leaders are each supported by a senior staff member who helps them with their coordination activities, facilitates communication, and organises the work. All WP leaders give regular progress reports in the (at least) quarterly SP7 meetings. Their reports form the basis for the quarterly reports of SP7 management to central Project management and the European Commission.

As part of the HPC Platform specification, SP7 has defined a set of Functions for most SP7 Tasks (see D7.7.2). Scientific Key Performance Indicators (SKPIs), defined in SP7 as the number of completed Functions for each Task, are now used to track the progress towards the goals defined in the HBP Description of Work (DoW). The values of the SKPIs are regularly reported via a central website to the Science & Technology Office (STO) in Heidelberg.

1.5.5 Lessons learned

Several lessons have been learned by SP7 during the first 12 months of the Project. These are listed separately for each WP in the following sections. More general lessons not unique to a specific WP include:

- For a large-scale, highly interdisciplinary project like the HBP, communication and collaboration are crucial. Previous experience with collaborative projects of comparable size (like e.g. PRACE) and appropriate equipment like a state-of-the-art videoconferencing system are very useful in this respect. Regular videoconferences at well-defined intervals, complemented by workshops on specific topics, were found to be extremely beneficial for successful collaboration. The use of simple but essential tools like mailing lists, a central repository (like EMDESK) and a web-based collaboration Platform is highly recommended. A second contact person for each WP in addition to the WP leader may help to improve communication and collaboration between the SP management and the WP.
- As a service provider, the HPC Platform does not rely on data input or services from other SPs or Platforms. However, it does rely on their requirements and use cases to guide its development. Meetings with other SPs during the period were very helpful for obtaining this input. The involvement of SP6 members in the preparation of the technical part of the HBP PCP tender documents and the assessment of the bids was also very important.
- For most activities in SP7, it is important to keep in mind that the default (if not only) way to interact with the HPC Platform will be through the Unified Portal (UP) and the Brain Simulation Platform. This affects many aspects of SP7, including security, AAA (authentication, authorisation and accounting), documentation, and training. It also requires close coordination of SP7 development with the UP development in SP6.

1.5.6 Changes to SP objectives, structure or personnel

No changes to the SP7 objectives or structure were made in this period. Thomas Schulthess (CSCS) was elected co-leader of SP7 at the first Subproject meeting during the HBP Summit in October 2013. Anne Do Lam-Ruschewski (JUELICH), member of the SP7 management team, went on parental leave in April 2014 and was followed by Anna Lührs (JUELICH). Raül Sirvent (BSC) joined WP7.2 to support the WP leader from June 2014. Benjamin Weyers (RWTH) became co-leader of WP7.3 in March 2014. Luc Corbeil left ETHZ-CSCS and Colin McMurtrie (CSCS) took over the role of WP7.5 leader in May 2014.

1.5.7 Outstanding contributions to SP work

Dirk Pleiter (JUELICH) deserves a special mention for his continued, outstanding commitment to leading the HBP PCP, which resulted in the successful completion of the Tendering Stage within an extremely short timeframe.

1.6 Overview of Subproject 7: Problems

The HPC Platform Specification (D7.7.2: High Performance Computing Platform v1 – specification document) was submitted about one month later than planned, i.e., at the beginning of Month 8 instead of the end of Month 6. This was due to delays at the Project level, but also to the complexity of the document and the required amount of coordination at the SP level and beyond.

The main challenge faced by WP7.1 was the short length of time planned for the preparation of the extensive pre-commercial tender documents, and for Phase 3 of the Execution Stage. Following a careful risk analysis in Deliverable D7.7.1, the HBP Ramp-Up Phase was extended by six months to allow more time for the PCP. As the PCP Call for Tender could only be published at the end of Month 6, and not at the beginning as planned, the HBP PCP is currently delayed by about one month. Although this will require another extension of the Project at some point, no other negative impact on the Project is expected.

A more general problem was that activities in WP7.2 and WP7.4 were slightly delayed because software and data needed by one Partner were not provided by another at first, due to IP/confidentiality issues. However, the delays caused by such problems have thus far been insignificant.

WP7.5 decided to use the PRACE high-speed network to link the supercomputers of the HPC Platform during the Ramp-Up Phase, for testing and requirement analyses. To this end, a Memorandum of Understanding (MoU) between the HBP and PRACE was drafted, but has not yet been signed. This resulted in a number of delays in network-related Functions. However, as the network demands of the HBP are still low, the normal internet connections are sufficient, and therefore these delays will have no significant impact on the HBP.

1.7 The Next Six Months for Subproject 7

1.7.1 Deliverables

SP7's next Deliverable is the release of the HPC Platform for internal Consortium use in Month 18 (D7.7.4: High Performance Computing Platform v1 – preliminary release for internal Consortium use). SP7 expects to complete this Deliverable on time.

1.7.2 Milestones and next steps

The internal release of the HPC Platform in Month 18 is the overarching goal for SP7 in the next six months, and marks the next Milestone for almost all WPs in SP7. All Milestones planned for Month 18 should be reached on time. The individual WP contributions will be:

- WP7.2: Multiscale supercomputing algorithms and models (MS137)
- WP7.3: Neuroscience visualisation methods (MS140)
- WP7.4: Data provenance requirements (MS142)
- WP7.5: Platform ready for internal release (MS147)
- WP7.6: Guidebook (internal release) (MS151)

For WP7.1, the next Milestone is the completion of Phase 1 of the PCP Execution Stage and the selection of the Phase 2 participants, which was originally planned for Month 15 (MS132: PCP Phase 1 completed). According to the current planning, this Milestone will be reached about one month late, at the end of January 2015 (Month 16). As explained above, this will not have any significant negative impact on the progress of WP7.1 or the Project as a whole.

1.7.3 Changes to the original work plan

Currently, no changes to the original work plan are foreseen.

1.7.4 Potential problems

The integration of tools developed in WPs 7.2, 7.3 and 7.4 into the HPC Platform and/or the Unified Portal remains a challenge. The MoU between the HBP and PRACE should be approved and signed by both projects in the next few weeks, otherwise it will continue to delay a number of other network-related Functions. Another potential problem is the integration of the HPC Platform into the central AAA infrastructure, due to all the different security policies of the Partners with which it must comply. Delays in this Task would cause further delays in the implementation of the rest of the HPC Platform Functions. However, there have been discussions about this issue in recent months, and a possible design is being discussed within the WP.

2. WP7.1 Technology Evaluation (PCP)

2.1 WP7.1: Overall Goals

T7.1.1: Analysis of HBP Requirements

This will analyse the performance of HBP simulation codes, and predict their performance on future architectures. The study will capture requirements from the Brain Simulation Platform (SP6) and use them to develop a packaged benchmark suite for use by T7.1.2 and T7.1.3. The suite will also be used to identify critical factors likely to affect performance on future architectures, and to provide guidance to developers, on potential optimisation strategies. The requirements will be prioritised according to their general importance for a range of data intensive applications. T7.1.1 will be led by CSCS and supported by JUELICH.

T7.1.2: Pre-Commercial Procurement

This will select several competing companies and/or consortia through a pre-commercial call for tender based on call documents prepared by T7.1.3 with input from T7.1.1, and subcontracted by Partner JUELICH. In phase 1 of the PCP ("Solution Exploration," M7-M12), these companies and/or consortia will develop and describe their proposed solutions in a high-level design document. In phase 2 ("Prototyping," M13-M18), hardware/application-software prototype solutions will be prepared as proof-of-concept. The number of suppliers retained in this phase will depend on the evaluation of the results of phase 1 by T7.1.3. In phase 3, ("Test Series", M19-M30) up to two different companies will each develop a test system, demonstrating the capabilities and features of the pre-exascale target system to be procured in 2017. The costs of this work are covered by the subcontract for WP7.1.

T7.1.3: Preparation and Evaluation of PCP Phases

This will prepare the pre-commercial tender preceding the PCP and, with the help of independent experts, assess the documents, components and/or prototypes delivered at the end of each PCP phase. The results will form the basis for the decision which of the suppliers will be retained in the next phase.

2.2 WP7.1: Main Achievements

2.2.1 Milestones achieved and overall progress

WP7.1, led by JUELICH-JSC, is carrying out a Pre-Commercial Procurement (PCP) of innovative HPC technology solutions that should meet specific HBP requirements. "Interactive Supercomputing," i.e., the interactive visualisation, analysis and control of (brain) simulations running on a supercomputer, was identified as a key requirement. A set of concrete technical goals for the PCP was derived from this overall goal based on the results of a workshop with members of SP5 and SP6, plus external participants, held at the very beginning of the Project (30 September and 1 October 2013 in Frankfurt/Main). A comprehensive planning document, which described in detail the purpose and planned organisation of the HBP PCP, was produced and submitted on time to the EC as the Project's first Deliverable (Month 2, Deliverable D7.7.1). A six-month extension of the Project to better accommodate the HBP PCP process was subsequently requested from the EC and approved. Two teams of administrative and technical experts worked intensively on the preparation of the HBP PCP call for tender. An initial version of the technical goals was presented, together with a description of the envisaged process, to interested potential suppliers and EC representatives at an "Open Dialogue" event on 18 December 2013 in Brussels. The suppliers were invited to ask questions and provide feedback during and after the event. Additional information on the planned management of intellectual property rights (IPR)—a topic which attracted particular attention from the suppliers—was made available after the meeting. A full draft version of the tender documents, which took into account the feedback from the Open Dialogue, was submitted to the EC for review on 7 March 2014 (Month 6, MS247). The review meeting itself took place in Brussels on 17 March 2014 and resulted in a number of helpful recommendations, which were incorporated in a revised version of the tendering documents. After another review of the revised tender documents, the final version of the pre-commercial call for tender was published on 30 April 2014 (Month 7, MS130). The call was closed after seven weeks, on 18 June 2014. A total of five bids were received and checked on the same day for formal correctness by the JUELICH purchasing department. The technical assessment was carried out by experts from several HBP Partners, including all four supercomputing centres of the HPC Platform and SP6, which came together for an initial meeting on 23 June 2014, a main review meeting on 3 July 2014, and a final meeting on 7 July 2014. As a result of the review, all bids were accepted and the tenderers were notified on 9 July 2014 (Month 10, MS131). Most of the Assessment Committee members were also involved in the preparation of benchmarks. This work was completed in early August, and both benchmark codes and data were made available to the three consortia that eventually signed all necessary contracts with JUELICH:

- Cray Computer GmbH (Switzerland)/Cray Computer Deutschland GmbH/Cray UK Limited
- Dell GmbH/ParTec Cluster Competence Center GmbH / Extoll GmbH
- IBM Research GmbH (Switzerland)/NVIDIA GmbH

The contractors have entered Phase 1 of the PCP and are now independently carrying out their R&D work until January 2015, when their solution designs will be assessed.

In parallel with the preparation of the PCP, T7.1.1 has been implementing and analysing libraries that implement core computations in CoreBluron, a specific variant of the NEURON code developed and maintained by the Blue Brain Project (BBP). These libraries will form the basis for future, optimised versions of CoreBluron. Performance models have been developed and the ranges of different kernels in terms of computational intensity have been characterised together with SP6. The BBP team at EPFL has performed some analyses of the CoreBluron code that are now being collated and extended to form the basis for requirement specifications and performance characteristics.

2.2.2 Collaboration

In addition to WP7.1 (JUELICH-JSC, ETHZ-CSCS), Work Packages 7.2 (BSC), 7.3 (ETHZ-CSCS, UPM-CeSViMa) and Subproject SP6 (JUELICH-INM6, EPFL-BBP) helped define the technical goals and requirements of the HBP PCP. The Assessment Committee established by JUELICH included technical experts from HBP Partners BSC, CINECA, EPFL, ETHZ, JUELICH, RWTH and UPM. Since the start of the Project, several face-to-face meetings and audio/video conferences were held.

2.2.3 Internal monitoring and quality control

To ensure rapid progress in accordance with the very tight schedule, the core team based in JUELICH was a small group of four people (two from the Jülich Supercomputing Centre and two from the purchasing department). This facilitated efficient decision-making and close monitoring of WP7.1 progress. When required, additional experts (particularly legal experts) were consulted or requested to review documents before making them available to suppliers or submitting them to the European Commission.

2.2.4 Lessons learned

The following lessons have been learned during the process:

- It is challenging to balance the technical goals of a PCP with the available budget, the time constraints, and the goal of attracting a sufficient number of bids.
- An open dialogue with potential suppliers during the preparation of the call for tender is important to improve the suppliers' understanding of the technical goals and avoid requirements that are not essential to reaching these goals, but which could prevent suppliers from bidding.
- The management of IPR requires particular attention, especially when the budget of the PCP is small compared to the value of the relevant background IP provided by the supplier.
- PCP is a relatively new procurement instrument, and there are still legal uncertainties when executing a PCP based on national laws. A careful analysis of previous PCPs and of the possible impact of national and local legislation is crucial.[1]

2.2.5 Changes to WP objectives, structure or personnel

No changes in WP objectives or structure have taken place or are foreseen as of Month 12. With regard to personnel, a number of legal and technical experts from JUELICH and other HBP Partners have contributed to the PCP in addition to the JUELICH core team members (see below).

2.2.6 Main contributors

The main individuals who contributed to the WP in the period reported on are:

- JUELICH: Martina Börger, Markus Diesmann, Jochen Eppler, Petra Jerrentrup, Susanne Kunkel, Boris Orth, Dirk Pleiter (WP Leader)
- BSC (P4): Rosa M. Badia, Jesús Labarta, Victor López
- CINECA: Giovanni Erbacci
- EPFL: Stefan Eilemann, Felix Schürmann
- ETHZ: John Biddiscombe, Benjamin Cumming, Colin McMurtrie
- RWTH: Torsten Kuhlen
- UPM (P59): Juan Hernando, Vicente Martín

2.3 WP7.1: Main Problems

The CoreBluron code developed by the BBP team only became available to CSCS at the end of Month 10. Analysis of the code by T7.1.1 is now underway. The main challenge faced by WP7.1 was the short timeframe (just three months after the start of the Project) for the preparation of the extensive tender documents. A careful risk analysis during the first two months (see D7.7.1) showed the need for a three-month extension of the preparation phase, and also of the Execution Stage Phase 3. This amounted to a six-month total extension of the PCP and the HBP Ramp-Up Phase. After this had been adjusted through an amendment of the HBP Grant Agreement, the Work Package managed to stay mostly on

[1] The HBP PCP benefitted greatly from the previous work of the PRACE-3IP PCP, particularly with respect to tender documents.

track. The current delay compared to the planned PCP schedule is about one month. No major further delays are expected.[2]

2.4 WP7.1: The Next Six Months

2.4.1 Milestones and next steps

T7.1.1 will take the results of the profiling and performance modelling done by CSCS and the BBP and collate them into a set of requirements. The algorithms and underlying implementations in CoreBluron will change when adding new features and improving performance. These changes will have to be taken into account, since they could have a significant impact on performance characteristics. The next steps within the PCP are:

- Prepare and perform monitoring visits to the sites where contractors' R&D is taking place. These visits will allow monitoring of the contractors' progress in Phase 1, and help prepare the call for tender for Phase 2.
- Develop a mechanism to implement the option of variations to the contracts, and implement possible requests for variations.
- Prepare the Phase 2 call for tender; in particular, formulate evaluation criteria for the assessment of the bids for the next phase.
- Evaluate reports submitted by contractors at the end of Phase 1 and assess the contractors' performance on the basis of these documents. Phase 1 ends on 28 January 2015 (Month 16, MS132) and reports have to be submitted five weeks before this date.
- Evaluate the bids submitted by the contractors of Phase 1 two weeks before the end of that phase.

2.4.2 Potential problems

No major problems are expected in performing these steps. MS132 (Phase 1 completed and participants for Phase 2 selected) will be reached about one month later than planned.

[2] Given that the whole PCP process must be included in the Project duration, any further (even minor) delay in the PCP will require a corresponding extension of the Project. This should be done through another amendment of the Grant Agreement towards the end of the PCP.

3. WP7.2 Mathematical Methods, Programming Models and Tools

3.1 WP7.2: Overall Goals

T7.2.1: Parallel Programming Models for Interactive Brain Modelling and Brain Simulation

This will develop general purpose, fine-grained programming models and runtime interfaces for interactive, massively parallel, highly asynchronous applications. These models and interfaces, which will subsequently be incorporated in the High Performance Computing Platform, are essential for brain modelling and simulation. They will, however, be completely independent of any specific model or simulation and thus be applicable in a broad range of other domains. T7.2.1 will derive its development strategy from recent Task-based proposals based on directionality annotations and from PGAS (Partitioned Global Address Space)-based runtime models already under development by the Partners. The resulting programming environment will support high programmer productivity, as well as automatic performance optimisation and mapping to available resources in a dynamic multi-scale, multi-application framework.

T7.2.2: Workflow and Distributed Programming Models for Brain Modelling

This will define and implement a general-purpose, medium grained workflow model that will later be incorporated in the High Performance Computing Platform, where it will enable brain modelling and simulation. The model will make it possible to specify workflows in ways that support efficient data exchange between workflow components. The implementation will take the form of extensions to existing scripting languages, and will include functionality that allows programmers to annotate the directionality of data access. This will allow the runtime system to manage locality and optimise computation and data transfer schedules. Workflows will be specified, not as graphs, as in existing systems, but as programs. This will allow the system to provide more sophisticated intelligence than current workflow management systems.

T7.2.3: Middleware for Resource and I/O Management

This will develop the highly dynamic resource management capabilities required for interactive supercomputing. The resources managed in this way will include processors, memory, interconnects and I/O. Specific specialised components will make it possible to capture the characteristics and demands of specific applications, to determine appropriate resource allocations and mappings, and to enforce these allocations. The resulting system will provide global optimisation for multi-scale simulation in a multi-application environment.

T7.2.4: Tools for Performance Analysis and Prediction

This will develop application- and system-level tools to model application performance, interactions among applications, and system performance under resource constraints. The tools will extend existing performance analysis environments and address critical scalability issues. The application-level tools will consider both the sequential and the parallel levels. System performance models will focus on the interaction between workflow components, system resources and the persistent storage subsystem.

T7.2.5: Numerical Methods for Neuroscientific High Performance Computing

This will develop scalable numerical methods, which application developers can use as building blocks for domain specific tools (e.g. tools for neuroinformatics, brain simulation tools and tools for the design of neuromorphic hardware). Typical examples include solvers for linear systems and multi-scale methods that make it possible to represent multiple temporal and spatial scales in a single simulation. The algorithms developed in this Task will be designed for use in the interactive computing environments designed in WP7.3.

3.2 WP7.2: Main Achievements

3.2.1 Milestones achieved and overall progress

The first Milestone of WP7.2, MS135: Specifications and roadmap for parallel programming models, was achieved in Month 6 as planned. The work to achieve it was dedicated to establishing relationships between the HPC Platform and the Brain Simulation Platform (BSP) developers, the latter being the main users of the former. Applications such as NEST and NEURON were analysed using performance analysis tools (Paraver and Scalasca) and ported to OmpSs, the fine-grained programming model provided by WP7.2 (Functions 7.2.1.1, 7.2.1.2, 7.2.1.3, 7.2.4.1: completed). A first version of PyCOMPSs, the coarse-grained programming model delivered by this WP, was developed (Function 7.2.2.1: completed; Function 7.2.2.2: completed). Regarding resource and I/O management, a benchmark for the PCP carried out by WP7.1 was implemented and delivered (Function 7.2.3.3: completed). In addition, a persistent object storage layer was tested in conjunction with PyCOMPSs, and a Dynamic Load Balancing (DLB) library to achieve resource sharing between processes was extended (Functions 7.2.3.1 and 7.2.3.2: completed; Function 7.2.3.4: in progress).

Regarding numerical methods, a requirement analysis in other SPs (SP4, SP6 and SP7) was performed, leading to the development of new methods (e.g., Waveform-relaxation for Ordinary Differential Equations (ODEs)) or to the improvement or use of existing ones (e.g., UG 4, HCFFT, ILU, BiCG), so they can be available in the HPC Platform. This work has been essential to better understanding and formulating the specification of the HPC Platform in Deliverable D7.7.2.

The second and last Milestone in this WP is MS136: Interactive supercomputing: algorithms and models (Month 12). It will be accomplished on time. Work to achieve it includes the tuning of NEURON and NEST using nesting techniques in OmpSs and the DLB library, together with further analysis of their performance with Paraver and Scalasca (Functions 7.2.1.3, 7.2.1.4 and 7.2.4.3: completed; Function 7.2.4.2: work in progress). Two applications were ported to PyCOMPSs: Simulations of neuron connections using Brian, from UPF, and a Neuroscience Data Processing application, from JUELICH. Two others are in the process of being ported: PSP Validation and Model Management, from EPFL (Task 7.2.2). On the other hand, the integration of PyCOMPSs applications in the Unified Portal was started. The implemented benchmark was improved according to the feedback received. The DLB library was further improved to support multiple applications sharing compute nodes, although this work is still to be finished (Function 7.2.3.4: work in progress).

The PyCOMPSs runtime is being integrated with the object storage layer to obtain information about data location, so that such information can be used for locality-aware scheduling. As of Month 12, the implementation is still in progress. Installations of Scalasca, Score-P, Paraver and Dimemas have been maintained on the HBP HPC development systems (Function 7.2.4.1: completed; Function 7.2.4.4: work in progress). In particular, Paraver and Scalasca have been improved during the period by integrating enhancements developed in other projects (Functions 7.2.4.4 and 7.2.4.5: work in progress).

Finally, we have further improved numerical methods and libraries such as: HCFFT, SDA, Poisson-Nernst-Planck solver and UG 4. In fact, a final version of the waveform-relaxation method has been integrated into the development version of NEST. Now, coupled systems of ODEs can be integrated on parallel computers, where the different equations reside on different nodes (Function 7.2.5.1: completed; Function 7.2.5.2: work in progress). For high-dimensional approximation tools, a first version of the hyperbolic cross-library (HCFFT) has been published (Function 7.2.5.3: completed). It can be applied in the framework of uncertainty quantification (stochastic collocation methods) and parameter fitting (e.g., for surrogate models). In addition, a finite volume/finite element discretisation for the three-dimensional cable equation discretisation has been finalised and implemented in UG 4 (Function 7.2.5.4: completed). This discretisation casts the asymmetric problem into a system of symmetric problems.

3.2.2 Collaboration

Users could eventually come from any WP that requires WP7.2's programming models, numerical methods or performance analysis tools; therefore, collaboration is essential in this WP. Some examples of these collaborations are:

- During the HBP kick-off event, the performance analysis team met with developers of neuroscience HPC software (NEST and NEURON, from JUELICH-INM6 and EPFL respectively) to discuss future work.
- Meetings were held between BSC and UPF, BSC and JUELICH, as well as BSC and EPFL to identify possible applications that could use OmpSs or PyCOMPSs.
- BSC also met with EPFL to discuss the integration of PyCOMPSs applications into the HBP Unified Portal.
- WP7.2 participated in the workshop, "New perspectives on workflows and data management for the analysis of electrophysiological data" in Jülich on 5-6 December 2013, with participants from JUELICH and BSC.
- Meetings were held between members of Task 7.2.5 and SP4, SP6 and SP7 Partners to identify requirements for numerical methods. FG (P18) visited the Molecular and Cellular Modelling (MCM) Group at HITS, Heidelberg, which is headed by Rebecca Wade, leader of T6.3.3: Brownian Dynamics (BD). BUW met several times with JUELICH-INM6 about the development of their method in the parallel implementation of NEST.
- A workshop on "Detailed modelling and simulation of signal processing in neurons" was organised on 23-25 June in Frankfurt/Main, which focused on a new framework enabling adaptive workflow control of neuronal processes in 3D.

3.2.3 Internal monitoring and quality control

In WP7.2, Task leaders monitor the day-to-day work, and the WP leader reports on the work at SP7 meetings. Direct meetings or calls are organised as needed, and a general WP7.2 mailing list is used to improve coordination and communication between all WP7.2 Partners. Quality control is ensured using HBP standard mechanisms, such as the internal review process that Deliverables must pass before submission to the EC.

3.2.4 Lessons learned

One of the lessons learned during the first 12 months of the Project is that we need to improve communication within the WP by using the WP mailing list more, or by establishing more direct meetings. The mechanisms are there, but Partners need to use them more. A second lesson is related to the possible collaboration between Partners using software, tools or knowledge that fall outside the Consortium Agreement. We need to foresee such situations, or try to reach agreements between Partners in a more agile way, since scientific work could be delayed due to bureaucratic issues.

3.2.5 Changes to WP objectives, structure or personnel

No changes in WP objectives or structure have been made or are foreseen as of Month 12. Raül Sirvent (BSC) joined the Project in M9 to assist in the consolidation of WP7.2 leadership.

3.2.6 Main contributors

The main individuals who contributed to the WP in the period are:

- BSC: Víctor López, Marçal Solà, Enric Tejedor, Raül Sirvent, Rosa Badia, Jesús Labarta, Harald Servat, Judit Giménez.
- BUW (P5): Jan Hahne, Matthias Bolten, Andreas Frommer.
- FG: Christian Neuen, Jan Hamaekers, Michael Griebel.
- JUELICH: Bernd Mohr, Markus Geimer, Michael Knobloch.
- UFRA (P29): Konstantinos Xylouris, Gillian Queisser, Gabriel Wittum.

3.3 WP7.2: Main Problems

Although everything is on track in WP7.2, we experienced a slight delay in the completion of one Function, F7.2.3.2 (DLB support on BG/Q systems) in the period M6-M9. Although the BG/Q support was implemented in Month 9, further testing of the DLB in this environment was needed. The cause of this delay was the dedication of BSC resources to the development and enhancement of the required benchmark for WP7.1's PCP. Despite this delay, no Tasks or functions were jeopardised at the WP or SP level, since no other Task depended on the results of this function. This delay was caught up in M10-M12.

Another problem concerns the signing of a Non-Disclosure Agreement (NDA) between EPFL and BSC, which has slightly delayed collaboration between these two Partners. No Functions or Milestones were affected. Both institutions identified possible ways of collaborating using software that was not part of the initial Consortium Agreement. This led to the definition and signing of the above-mentioned NDA, although the negotiation process and final signature took some time. We suppose that this problem could easily appear in the future between other HBP Partners. Thus, we think it could be interesting to establish guidelines, from the Project coordination and on a project-wide level, to help Partners reach these agreements more quickly and easily.

The last problem we faced is an initial lack of communication between WP7.2 Partners. Communication worked well within Tasks, but not always between Tasks. This is due to the nature of the Tasks, which could (but should not) work independently. To solve this issue, we established a WP7.2 mailing list, which we use to announce issues, request work, or send questions to other partners about the WP in general. Compared to the first months of the Project, the internal communication of the WP has clearly improved.

3.4 WP7.2: The Next Six Months

3.4.1 Milestones and next steps

The next Milestone WP7.2 is targeting is MS137: Multiscale supercomputing algorithms and models (Month 18). The work that needs to be done to reach it is of equal importance in all Tasks of the WP. The runtime of our fine-grained programming model OmpSs, or even the Mercurium compiler if needed, will be tuned with respect to the needs of NEURON and NEST, with the objective of improving their performance. In addition to these applications, the adaptation of two new applications to OmpSs, which should not belong to SP6, is desired. The main goal regarding the coarse-grained programming model PyCOMPSs will be to add advanced features to support multi-scale simulations, together with its integration with the HPC Platform. With respect to resource and I/O management, extensions for DLB to support multiple applications will be finished. This will make it possible to shift cores between processes that belong to different MPI applications sharing nodes. In addition, a demonstration and evaluation of the interactive session submission and resource management environment will be done, also integrated in the Unified Portal and evaluated with the micro benchmark developed in Task 7.2.3.

The maintenance of performance analysis and prediction tools provided by JUELICH-JSC and BSC on the HPC Platform systems will continue, and improvements developed in the context of other projects will be integrated. The next main goal is to apply the tools in cooperation with the code developers to real full production runs of the HBP simulation codes in order to detect missing features and badly behaving components on both sides, i.e. tools and simulation codes.

For the numerical methods, in the next six months we will merge the newly implemented discretisation methods into a newly implemented framework and integrate three-dimensional neuron reconstructions for later benchmark simulations. In addition, we will start to develop and implement a fast multi-grid based solver for the discrete three-dimensional cable equation. Besides, we will improve the HCFFT library and the Poisson-Nernst-Planck solver for ion migration. Further analysis of numerical bottlenecks will be performed, in particular by T6.3.3: Brownian Dynamics (BD). Finally, different relaxation and parallelisation strategies will be investigated based on the implementation of waveform relaxation in NEST. The scaling strategy will be studied in detail on large-scale parallel machines.

As clearly indicated in WP7.7, one of the main outcomes of next six months will be the first release of the HPC Platform for internal use in the HBP Consortium. All the work performed to reach MS137 will be reflected in this release and described in detail in Deliverable D7.7.4: High Performance Computing Platform v1 - preliminary release for internal Consortium use (Month 18).

3.4.2 Changes to the original work plan

All Partners in WP7.2 believe that our initial plans are still correct and feasible. This means that we do not foresee any changes in the WP plan as of Month 12.

3.4.3 Potential problems

It will be very important to monitor the feasibility of the integration of different tools into the HPC Platform and/or the Unified Portal. Since this potential problem could affect several WPs or even SPs, we expect it to be considered at the SP level. Thus, we need to strengthen our communication channels from WP7.2 to SP7 to avoid any possible problems on this issue.

4. WP7.3: Interactive Visualisation, Analysis and Control

4.1 WP7.3: Overall Goals

T7.3.1: Visualisation and Analysis Component Execution Framework

This will build on the experience of the Blue Brain Project to develop generic frameworks for resource discovery, allocation and scheduling; dynamic processing pipelines; and data staging. This work will prepare the way for production-quality software (to be released in the second phase of the Project). The new frameworks will apply modern software engineering principles, supporting Task-parallel and data-parallel execution as well as multi-threading with memory sharing. In this way, the frameworks will offer improved flexibility, ease of use and robustness, and a smaller memory footprint. The processing pipelines they provide will link HPC resources to workstations and cockpits, allowing researchers to interact with simulations in real time.

T7.3.2: Neuroscience-Specific Visualisation and Interfaces

This will build on advanced software from the Spanish Cajal Blue Brain Project to address visualisation issues specific to neuroscience, in particular the need to accommodate a huge range of spatial and temporal scales, mixed data representations, and a high level of geometrical complexity. The work will cover data representations, visualisation algorithms and human-computer interfaces. Work on data representations will focus on symbolic and realistic visual representations of structural and functional data and on visualisation-specific data structures. An important challenge will be to mix different representations and scales in coherent visualisations. Humans rely heavily on visual and auditory feedback to rapidly make sense of complex environments, and the Project aims to provide this feedback to guide in-depth analysis. T7.3.2 will develop initial building blocks for domain-specific visualisation techniques adapted to HBP requirements, and efficient methods to render results from very large multi-scale simulations accessible to the observer. Finally, T7.3.2 will work on human-computer interaction, developing user interfaces, interaction metaphors, and virtual laboratory instruments specially designed for use by neuroscientists. Development work will follow well-proven principles of user-centred design.

T7.3.3: Hardware Technology, Benchmarking and Optimisation for Visualisation and Rendering towards the Exascale

This will provide the initial design for all visualisation-related components (software, graphics hardware, interaction devices, displays) that interact with HBP data, models and simulations. The Task will adapt current ultra-scale visualisation paradigms to meet specific requirements for local and remote visualisation. The Task will pay particular attention to bandwidth, required computational capabilities, input devices and output devices. The end result will be a unified hardware design ready for integration into the HBP Simulation Platform (see T6.5.1).

T7.3.4: Integrative Visualisation and Analysis Tools for the HBP Cockpits

This will bring together the methods and interfaces developed in T7.3.2 in early software prototypes ready for integration in the HBP Simulation Platform (see T6.5.1). The concepts will include a broad range of advanced functionality, including synchronised multi-view and session management techniques and techniques to combine geometrical and symbolic information.

4.2 WP7.3: Main Achievements

4.2.1 Milestones achieved and overall progress

Work Package 7.3 is responsible for Milestone MS139: Architecture of software applications for interactive visualisation, due in Month 12. The implementation of integration tools for coupling visualisation applications led to an event-driven architecture for loose coupling of visualisation and data analysis components. This approach is designed for the long-term goal of implementing flexible, multi-view visualisations on high-resolution display walls, which can visualise multi-scale neuroscience data. MS139 will be achieved on time.

Regarding Function 7.3.1.1: Simulation data streaming to visualisation, EPFL has implemented simulation data streaming from RTNeuron to NEURON, which allows the connection and disconnection of multiple RTNeuron instances running on different sites to the same NEURON instance at runtime. Furthermore, EPFL has created an easy-to-use streaming library to display remotely generated imagery on high-resolution tiled display walls. We have shown interactive performance for parallel rendering on 12 GPUs in Lugano, displayed on a 24 megapixel wall in Lausanne.

Regarding Function 7.3.2.1: Multi-scale representation, an ontology of the structures that will be visually represented has been defined by URJC, as well as a set of abstract representations which rely on that ontology and which will allow neuroscientists to analyse data at different abstraction levels. These representations are being integrated with realistic representations (RTNeuron) leading to a demonstrator for Function 7.3.2.2: Navigation. Regarding Function 7.3.2.3: Search and filter, a first prototype that combines search Tasks with visual interaction has been developed.

CSCS evaluated the asynchronous programming library HPX extensively as a candidate for use in analysis pipelines. Developments have focused on the use of futures to pass results of computations between nodes within a parallel job and the use of reduction operators, wait semantics and the marshalling of objects to synchronise Tasks and create directed acyclic graphs of dependent calculations.

Function 7.3.3.1 represents the preparation of the visualisation benchmark that will be used to assess the visualisation components developed as part of the HBP PCP. This application benchmark, which is based on RTNeuron, was delivered by UPM on 31 July. We consider this Function as completed. However, UPM expects that the PCP participants will anticipate additional work resulting from the adaption of the benchmarks into their specific target hardware architecture. This might lead to the need of providing help or modifications to meet their individual needs.

RWTH installed a tiled display as reference implementation to the current implementation in Lausanne in addition to the existing CAVE system in Aachen (Function 7.3.4.2). RWTH also deployed the extended implementation of DisplayCluster, provided by EPFL, to run high-resolution visualisation applications from Aachen and other Partners (Function 7.3.4.1). Furthermore, Aachen initiated the implementation of an event-driven architecture, which has been continued by EPFL as a joint effort of WP7.3.

4.2.2 Collaboration

EPFL significantly improved DisplayCluster—software used to drive high-resolution tiled display walls—which was initially provided by the Texas Advanced Computer Center (TACC). URJC is working with UPM, SP1, and SP5 to define and validate ontologies, the real-time generation of meshes for neuron models, INDYVA (a framework for generation of exploratory analysis applications) and navigation for the visualisation of precise neuron morphologies with schematic representations using semantic zoom. UPM is involved in an ongoing dCache implementation as a possible solution for data exchange issues. RWTH started working on provenance tracking in immersive visualisation environments; this was done in cooperation with JUELICH-INM6 in the context of SP4. The goal of this effort is to build a coherent provenance track for the whole scientific process, which is integrated into the provenance track of the Unified Platform.

4.2.3 Internal monitoring and quality control

The WP members hold a monthly videoconference to discuss organisational and content-related issues. The software development activities are discussed in a second, bi-weekly videoconference. These meetings were established after an initial phase of three months in January 2014. Two workshops in Lausanne (July 2014) and Madrid (September 2014) facilitated in-depth discussions on the progress of the WP, and on various technical topics. These workshops included detailed discussions of the WP-internal development of an integration architecture for the loose coupling of visualisation software implementations (MS139). All Partners in the WP7.3 have published various papers on work done in the WP, and these are listed in EMDESK.

4.2.4 Lessons learned

Close cooperation has been achieved through recurring videoconferences on organisational and the software development. Furthermore, workshops like the WP7.3 workshop on 15-17 September 2014 in Madrid have been absolutely necessary for successful cooperation within the WP.

4.2.5 Changes to WP objectives, structure or personnel

No changes were made to the WP objectives or structure. Benjamin Weyers (RWTH) became WP co-leader in March 2014 (Month 6).

4.2.6 Main contributors

The main individuals who contributed to the WP in the period are:

- RWTH: Bernd Hentschel, Torsten Kuhlen (WP Leader), Benjamin Weyers (WP Co-Leader)
- EPFL: Stefan Eilemann, Felix Schürmann
- ETHZ: John Biddiscombe
- UPM: Juan Hernando, Vicente Martín
- URJC (P60): Luis Pastor, Pablo Toharia

4.3 WP7.3: Main Problems

WP7.3 did not encounter any major problems that could not be solved with internal discussions and meetings. All Tasks and Functions are on track and have been or will be finished as scheduled.

4.4 WP7.3 The Next Six Months

4.4.1 Milestones and next steps

The work on MS140: Neuroscience visualisation methods, is progressing as scheduled. There are no indications that the Milestone will not be achieved on time (Month 18). The WP plans to finalise the API for the implementation of the integration framework, and for the running of multi-view and multi-scale visualisations on various high-resolution display walls. Initial work on the optimisation of RTNeuron has begun.

4.4.2 Changes to the original work plan

Currently, there are no changes planned.

4.4.3 Potential problems

Currently, we expect no major problems.

5. WP7.4: Exascale Data Management

5.1 WP7.4: Overall Goals

T7.4.1: Scalable Querying of Peta to Exascale Data Sets

This will develop novel spatial indexes, allowing scalable querying of massive neuroscience data sets located in external data centres, cloud systems and supercomputer storage. Indexes will be designed to support queries that occur frequently in neuroscience research, decoupling query execution time from the size and density of the data sets. Critically, indexes will be designed for use in memory systems, significantly speeding up access to data.

T7.4.2: Exascale Data Analytics

This will specify requirements and develop a prototype for a system that can perform deep, real-time analytics on data from experiments, brain atlases, models and simulations, while conserving the data in its original, natural format. The full version of the system will be developed in the second phase of the Project.

T7.4.3: Data Provenance and Preservation

This started in Month 13.

T7.4.4: Array-Based Data Processing Models

This will extend current database technology with arrays, making it possible to perform statistical analyses inside the DBMS core and avoiding the need to export massive amounts of data to external statistical packages. The results will consist of new data management algorithms, supporting the HBP data analysis process.

T7.4.5: Data Platform Dissemination and Integration

This is responsible for deploying the algorithms and methods developed in T7.4.1-T7.4.4 across the HBP. The Task team will bring the research prototypes produced in WP7.4 to product-grade quality, and will include personnel to resolve bugs, manage installations and provide technical support. Given that algorithms and methods have to be developed before they can be deployed, this Task will start slowly, ramping up as new results become available.

5.2 WP7.4: Main Achievements

5.2.1 Milestones achieved and overall progress

There were no Milestones to be achieved for WP7.4 in M1-M12. T7.4.1 developed the first prototype tool for indexing peta- to exascale spatial data sets (Function 7.4.1.1: completed; Function 7.4.1.2: in progress - will be finished by the end of Month 12). This tool enables scalable execution of range queries on spatial models. The state-of-the-art indexing techniques overlap in the tree structure with increasing levels of model detail, and this ultimately slows down query execution. The tool that T7.4.1 developed exploits the connectivity of the spatial objects in the queried range and does not suffer from overlap, thereby decoupling query execution from data set size and density. T7.4.1 is also in developing the second prototype tool. This tool aims to accelerate the execution of interactive query sequences on spatial models by prefetching spatial data along the query sequences. While known approaches do not prefetch the data with high accuracy, T7.4.1's tool exploits the previous query content and identifies the guiding structure in the range query results, thus achieving high prefetching accuracy and efficiency.

T7.4.2 has focused on algorithms and tools for scalable analytics on the massive, streaming time-series data resulting from large-scale brain simulations. In addition to the large data volumes, a main issue has been the huge number of time-series involved: for instance, naively tracking pairwise correlation measures across these time series implies a quadratic explosion in state and computation, which can quickly get out of hand in a streaming environment. T7.4.2 has addressed this problem using clever indexing and parallelisation. More specifically, T7.4.2 has implemented a scalable, streaming time-series indexing technique that enables effective tracking of Euclidean similarity and correlation measures across multiple time series while avoiding the aforementioned quadratic explosion (Functions 7.4.2.1 and 7.4.2.2: completed; Function 7.4.2.3). The technique has been effectively parallelised using the Storm cluster-based stream-processing engine. A first prototype of the system is near completion and will hopefully soon be tested over real brain simulation time series.

T7.4.4 aims to develop database technology for handling arrays within a DBMS. This requires the SciQL compiler/optimiser to be fully integrated into the MonetDB system. To achieve this long-term goal, array-based applications and processing packages are studied, because they provide the necessary functional benchmark framework. In cooperation with Life Sciences groups, the MonetDB framework has been extended to support BAM files containing gene-sequencing data, which are multi-gigabyte array-based structures. The code is available in open-source as the "bamloader" branch of the MonetDB Mercurial repository, cf., http://dev.monetdb.org/hg/MonetDB/shortlog/ba874198a299 and expected to be distributed as a standard component as of Q3 2014 (Function 7.4.4.2: completed). As statistical processing or array-based processing is covered by open-source packages, T7.4.4 avoids reinventing the wheel by searching for symbiosis with such well-established products. In particular, T7.4.4 has developed a seamless integration of the R interpreter with the array-based storage facilities of MonetDB (Functions 7.4.4.1: completed; Function 7.4.4.3). The early version of this solution has been shipped as part of the MonetDB distribution and through the R-community. Over 6,000 downloads have been recorded (counted from a single mirror) after four months.

T7.4.5 has brought the first prototype tool developed in T7.4.1 to software quality, and is ready to deploy it in the Platform (Function 7.4.5.1).

5.2.2 Collaboration

To facilitate the development of statistical processing, T7.4.4 has interacted with the statistics community.

5.2.3 Internal monitoring and quality control

Each Task has been monitoring the development of the functions and controlling the quality of the developed tools. The progress of each Task has been reported in the Quarterly Reports.

5.2.4 Lessons learned

T7.4.1 learned that exploring the connectivity between spatial objects provides great opportunities to design efficient disk-based indexing algorithms for querying large and dense spatial data sets. T7.4.1 will incorporate this idea into the development of the other tools. T7.4.4 learned that the agile development strategy based on pushing the technology envelope through studying concrete applications remains effective.

5.2.5 Changes to WP objectives, structure or personnel

There have been no changes to the objectives or the structure of the WP. T7.4.1 initially consisted of a Eleni Tzirita-Zacharatou (PhD student) working on a part-time basis, and Farhan Tauheed (PhD student) also working on a part-time basis. Mirjana Pavlovic (PhD student) joined the team in M7 and Xuesong Lu (post-doctoral researcher) joined the team in M9. Both of them work full-time. Dr. Farhan Tauheed left the team in M10. T7.4.2 is recruiting a postdoc/senior researcher and a software engineer. T7.4.4 is still in the process of hiring another post-doctoral researcher.

5.2.6 Main contributors

The main individuals who contributed to the WP in the period are:

- EPFL: Xuesong Lu, Mirjana Pavlovic, Eleni Tzirita-Zacharatou, Farhan Tauheed
- CWI (P48): Martin Kersten, Stefan Manegold, Ying Zhang
- TUC (P51): Minos Garofalakis, Kalliopi Kalantzaki, Nikos Pavlakis

5.3 WP7.4: Main Problems

Staffing in T7.4.2 has been a key issue, as it has been difficult for the TUC team to hire students and researchers with the right expertise for the HBP. T7.4.2 hopes that the issue will be resolved over the next few months, and the team is currently recruiting a postdoc/senior researcher and a software engineer. According to the budget breakdown, direct participation of CWI in T7.4.4 in Year 1 was supposed to increase in a step-wise fashion. A postdoc was hired on a part-time basis to continue the work on an array database, and T7.4.4 is still searching for matching personnel.

It remains to be decided where the research outcomes from T7.4.1-T7.4.4 should be deployed, and T7.4.5 is discussing this issue within SP7 and with SP6. Once the question is resolved, T7.4.5's software engineer will start to deploy the tools.

5.4 WP7.4: The Next Six Months

5.4.1 Milestones and next steps

WP7.4 will achieve MS142 on time in Month 18. To achieve this Milestone, WP7.4 will finalise the specification of the requirements for data provenance and preservation.

T7.4.1 will develop the third prototype tool for indexing peta- to exascale spatial data sets. This tool should enable scalable in-memory spatial joins and avoid overlap in the tree structure and replication of objects in the space-oriented partitioning, thereby accelerating in-memory spatial joins. T7.4.2 will exploit the Storm time-series indexer to design new algorithms for efficiently tracking top-k correlated time-series in real time. T7.4.2 will also extend its techniques to handle non-Euclidean similarity metrics for time series (e.g., based on time-warping), and exploit sketching techniques to effectively track streaming pairwise and group correlations.

T7.4.3 began in Month 13. In the next six months, this Task will specify the requirements for data provenance and preservation.

For T7.4.4, the preparation of an alpha release of the SciQL processing system at the end of the Ramp-Up Phase remains the major Milestone. Given the software complexity of this goal, development of the runtime support for array-based processing requires a lot of effort. An incremental approach guided by concrete application requirements remains the leading methodology. T7.4.4 foresees a large impact from point-clouds applications, which constitutes multi-billion spatial-temporal records, such as produced in the context of brain simulations.

T7.4.5 will deploy and release in the Platform the first two software tools for indexing peta to exascale spatial data sets.

T7.4.5 will start to deploy in the Platform the tools developed in T7.4.1-T7.4.4 as they become gradually available.

5.4.2 Changes to the original work plan

Currently, no changes to the original work plan are foreseen.

5.4.3 Potential problems

T7.4.1 might need data inputs to test the tools and fix potential bugs. T7.4.1 will require the inputs from the SPs that we learned from the HBP Cross-SP data/services provided/needed meeting in July.

6. WP7.5: HPC Platform: Integration and Operations

6.1 WP7.5: Overall Goals

T7.5.1: The HBP Supercomputer for Brain Modelling and Simulation

This will operate the supercomputer systems used for "production runs" of HBP simulations. During the Ramp-Up Phase, these will consist of existing Jülich supercomputers. The first step in the work will be to analyse resource and software requirements. T7.5.1 will then implement and configure the necessary software and resource management tools, establishing a valid use model. After all technical requirements are implemented and the Access Committee has assigned projects, users will be able to run HBP simulation jobs on the Jülich supercomputers. In parallel with this work, members of T7.5.1 will contribute to discussions concerning the specification of the hardware and architectures for later stages of the Project.

T7.5.2: The HBP Development System

This will make available existing supercomputing resources dedicated to brain simulation and hosted at CSCS. These resources, based on current commercial technology, will be dedicated to the testing and development of brain simulation codes performed by other HBP Subprojects. Findings will contribute to the specification of the HBP Supercomputer (see T7.5.1) and future versions of the HBP Development System at CSCS and elsewhere.

T7.5.3: The HBP Supercomputer for Molecular Dynamics

This will begin the design of a supercomputing facility for molecular dynamics simulations. This work, which will be completed in the second phase of the Project, will involve the identification of user requirements, the specification of performance benchmarks, and the procurement, installation, validation and operation of the system.

T7.5.4: The HBP Supercomputer for Massive Data Analytics

This will implement and operate a data-centric HPC facility providing efficient storage, processing and management of large volumes of data generated by the HBP. During the Ramp-Up Phase of the Project, T7.5.4 will use existing CINECA HPC and data storage resources. The Task will begin by collecting and analysing HBP requirements, installing software tools and providing services based on *ad hoc* service policies. It will then go on to finalise the specification for the data analytics Platform to be developed in the second phase of the Project.

T7.5.5: HBP Cloud Services

This will design technological solutions that will provide HBP Platform users with easy, secure and transparent access to cloud-based storage and computing resources. The Task will set up interface abstractions making it possible to mix and match resources from academic and commercial providers. This Task will be carried out in close collaboration with other Tasks intending to use high-level cloud services (T7.4.1, T7.4.2, T8.1.1).

T7.5.6: Supporting Infrastructure - Networking, Storage and Monitoring

This will develop and operate a dedicated HPC network infrastructure and a parallel HBP file system that will provide archiving facilities, monitoring, and secure access to HPC resources. Work in T7.5.6 will include the development of a framework for managing cross-site operational IT security, an Acceptable Use Policy (AUP), and information exchange and trust building among Partners. It will also include the development of an interface providing engineers and users with information on the current status and compute performance, storage and network resources.

T7.5.7: HPC Platform Website Construction and Maintenance

This will design, build and operate an integrated internet-accessible portal as a single point of access to the distributed supercomputer, storage and network services of the High Performance Computing Platform, operated by T7.5.1 – T7.5.6. T7.5.7 will use the monitoring interface developed in T7.5.6 to continuously inform Platform users of the status, usage and performance of different Platform components.

The first internal release of the portal will take place in Month 18, when the HPC Platform is fully opened to the Consortium. The first full version, open for use by external researchers, will become available in Month 30. From this time onwards (in phase 2 of the Project), T7.5.7 will operate and maintain the Platform for the benefit of the community, ensuring that it is accessible and continuously upgrading its capabilities.

6.2 WP7.5: Main Achievements

6.2.1 Milestones achieved and overall progress

During the period reported on, all supercomputers of the High Performance Computing Platform have been made available to the Project: The BBP's IBM Blue Gene/Q system hosted by CSCS for the development of brain simulation software (Month 1, Milestone M145), the IBM Blue Gene/Q system JUQUEEN at Jülich Supercomputing Centre as the HBP Supercomputer for production-scale brain simulations, the IBM iDataPlex system MareNostrum at Barcelona Supercomputing Centre for molecular level simulations, and the IBM Blue Gene/Q system FERMI and the GPU cluster PLX at Cineca for massive data analytics (all Month 6, Milestone M146). While there is no HBP Access Committee yet, which will eventually oversee the Project-internal distribution of HPC resources, a mechanism has been put in place by JUELICH that allows groups from the HBP to apply for computing time on the HBP Supercomputer through the regular calls. At Cineca, a new system for massive data analytics applications and post-processing purposes has been procured and will be made available to HBP users in the coming months. A detailed specification of the HPC Platform Version 1.0, which SP7 will set up and make available during the HBP's Ramp-Up Phase, was developed and submitted to the EC (Month 8, Deliverable D7.7.2).

As of Month 12, the HBP Supercomputer at Jülich, the HBP Supercomputer for Molecular Dynamics at BSC and the HBP Supercomputer for Massive Data Analytics are physically integrated into the PRACE dedicated high-speed network (Functions F7.5.1.2, F7.5.3.2, F7.5.4.2: completed). Work on an LDAP based exchange of user information as part of an Authentication and Authorisation Infrastructure (AAI) is in progress. This work is a basic prerequisite for the planned Single Sign-On functionality (Functions 7.5.1.1, 7.5.2.1, 7.5.3.1, 7.5.4.1: work in progress). Another ongoing activity is the deployment of UNICORE at all HPC sites for the submission of workloads (Functions 7.5.1.3, 7.5.2.3, 7.5.3.3, 7.5.4.3: work in progress).

At KIT, an S3 storage service has been set up for testing purposes. Performance and scalability benchmarks were carried out on this storage cluster. A scientific paper on the collected performance results has been submitted for publication and is currently under review (Function F7.5.5.1: completed). Work on an extended S3 storage service with regular backup has started and the system will be made available to users by the end of Month 12 (Function F7.5.5.2: work in progress).

Following the decision to leverage the PRACE dedicated high-speed network for the HBP's Ramp-Up Phase, a Memorandum of Understanding (MoU) between the HBP and the PRACE-3IP project has been drafted. It is currently reviewed by both projects and should be signed by the coordinators within the next few weeks.

Technical solutions for the integration of further HBP Partner sites (CSCS, EPFL, KIT, RWTH) have been discussed. Several discussions concerning user access to HPC systems have been started. A concept for authentication and authorisation of users based on LDAP services has been developed. The implementation of this concept is work in progress.

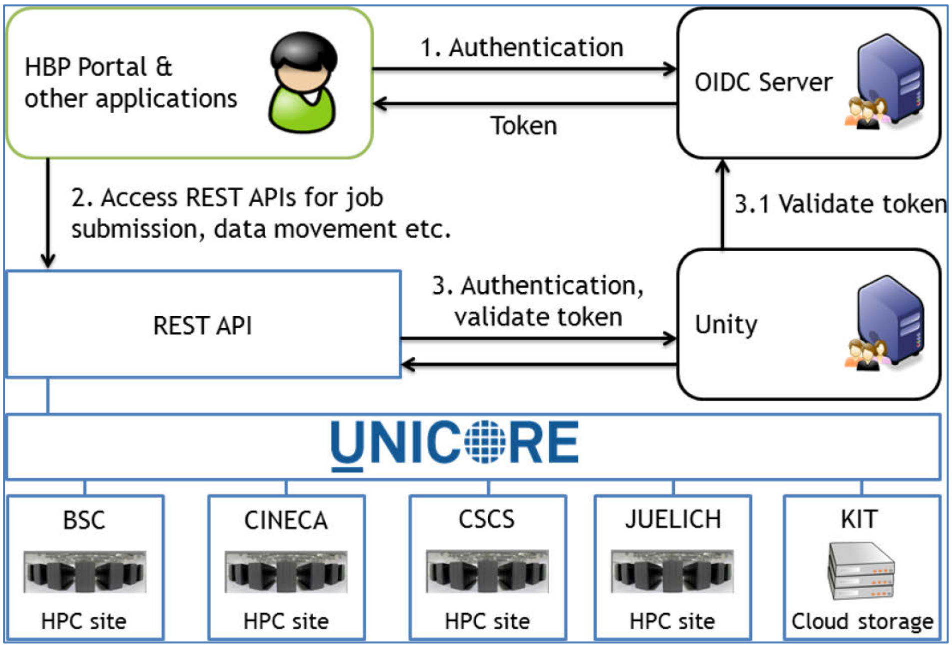


Figure 2: Unified access to the HPC Platform via UNICORE and REST API

The installation of UNICORE at all HPC sites of the Platform (JUELICH, CSCS, BSC and CINECA) is on schedule and will be completed by the end of Month 12. More specifically, the installation of the central UNICORE components Registry and user DataBase and the local installations at the HPC sites of UNICORE Gateway, UNICORE/X and UNICORE TSI is under way or completed. The corresponding services should be available by the end of Month 12 (Function F7.5.7.1: work in progress). As soon as the UNICORE installations at all HBP HPC sites are available, the integration of the HPC systems of the participating sites with the HPC Platform will be achieved (Function F7.5.7.4: work in progress). The development activities for the integration of UNICORE with the Unified Portal through a REST API and OpenID-Connect are proceeding. A prototype should be available in Month 12 and the final version in January 2015 (Function F7.5.7.5: work in progress). The following figure shows how UNICORE and the REST API are used to connect the Unified Portal with the HPC sites and the Cloud storage.

6.2.2 Collaboration

The integration of four major European supercomputing centres and the distributed Cloud storage and visualisation resources into a common HPC Platform requires close coordination and collaboration between the Partners involved as well as with other WPs and relevant SPs. During the first 12 months, a WP7.5 mailing list was set up and several WP-internal videoconferences and face-to-face meetings at various locations were held to coordinate WP activities. WP7.5 made good use of the HBP Collaboration Portal for sharing documents like meeting agendas and minutes among the WP members. Besides WPs 7.6 and 7.7, WP7.5 was the WP mainly responsible for the HPC Platform Specification (D7.7.2), which was closely coordinated with the rest of the SP7 WPs and the Unified Portal (UP) developers in SP6.

Examples of specific collaborative actions in the period reported on:

- Twenty terabytes (TB) of 3D mouse brain images produced by LENS (P34) (WP1.2) were collected in the CINECA storage system, processed and analysed. T7.5.4 also worked with T7.4.1 on the definition of data analytics requirements and tools. Further interaction with Tasks T7.4.1 and T7.4.4 will be needed in the near future to refine the initial requirements and the list of tools that need to be made available on the HPC systems.
- T7.5.5 is in the process of collecting further use cases, and a use case document for the Cloud storage at KIT is being drafted together with the SP6 UP developers.
- T7.5.6 led several discussions with the HPC Platform Partners regarding the integration with the PRACE network and AAA policies to be adopted.
- The activities of T7.5.7 have been carried out in close collaboration with the SP6 UP developers.

Ralph Niederberger (JUELICH), leader of Task 7.5.6, represents the HBP in the International User Advisory Committee of GÉANT, the pan-European research and education network interconnecting Europe’s National Research and Education Networks (NRENs).

6.2.3 Internal monitoring and quality control

Task leaders are responsible for the monitoring and quality control activities of their Tasks. Problems, risks and possible solutions are discussed regularly at the WP level during videoconferences and face-to-face meetings.

6.2.4 Lessons learned

For WP7.5 it is essential that requirements and use cases guide the integration and development of the HPC Platform. This requires a lot of communication both within the WP and with other WPs within and outside of SP7. The Platform benefits strongly from the previous work and experience of the Partners in research infrastructure projects like PRACE.

6.2.5 Changes to WP objectives, structure or personnel

Luc Corbeil left ETHZ-CSCS and Colin McMurtrie took over the role of the WP7.5 leader in May 2014.

6.2.6 Main contributors

The main individuals who contributed to the WP in the period are:

- ETHZ: Luc Corbeil, Colin McMurtrie (WP Leader), Cristian Mezzanotte
- BSC: Javier Bartolome
- CINECA: Giovanni Erbacci, Giuseppe Fiameni, Roberto Mucci
- JUELICH: Daniel Mallmann, Ralph Niederberger, Michael Rambadt, Bernd Schuller, Klaus Wolkersdorfer
- KIT (P30): Diana Gudu, Marcus Hardt

6.3 WP7.5: Main Problems

All Milestones in the period reported on were achieved as planned. However, WP7.5 is behind schedule on the integration with the PRACE network. While the supercomputers at the PRACE Hosting Sites JUELICH, BSC and CINECA are already physically connected to the PRACE network, the integration of the HBP Development system at CSCS is still pending due to missing approvals, which is delaying the completion of F7.5.6.2 (planned for July 2014). Regular usage of the PRACE high-speed network requires a formal agreement between the two projects. The signing of a Memorandum of Understanding (MoU) (F7.5.6.1), which was planned for April 2014, is still in preparation. As the network demands of the Project are currently still low, the normal Internet connections are sufficient for the time being, so that these delays will have no significant impact on the HBP.

The completion of a number of other Functions is currently also delayed (F7.5.6.3, F7.5.6.5-F7.5.6.9), with minimal to no impact on the HPC Platform. T7.5.6 will catch up on these delays as soon as the details of the network have been fixed.

Regarding Function F7.5.5.2, the amount of Cloud storage provided will be in the order of hundreds of TB. However, this will not affect the quality of service, which will be available for use as planned. The amount of storage will be increased gradually with minimal impact on operations.

6.4 WP7.5: The Next Six Months

6.4.1 Milestones and next steps

The next major Milestone for WP7.5 and SP7 as a whole is the official release of the HPC Platform for internal use by the HBP (MS147, Month 18). Within the remaining six months, T7.5.1-T7.5.4 will complete the integration of the HBP Supercomputers into the PRACE network. As a prerequisite, both the HBP and PRACE should sign the MoU, so that the implementation activities of T7.5.6 can proceed. The installation of UNICORE at all HPC sites will be completed, so that workloads can be submitted to and data be transferred to and between all supercomputers of the Platform through UNICORE. Single-Sign On should be implemented based on an agreed AAA policy.

In addition, T7.5.4 will deploy the new data-intensive computing system and make it available to the HBP community, in addition to the existing systems at CINECA (FERMI and PLX).

T7.5.5 will complete work on Function F7.5.5.3 “KIT Cloud Storage user authentication.” The Cloud storage will thus be ready for integration with the other components of the HPC Platform and the Unified Portal.

In parallel with its network implementation activities, T7.5.6 will start working on the definition of an Acceptable Use Policy (AUP) and an IT Security Policy for the HBP.

As soon as the UNICORE installation is available, T7.5.7 will start working on the Functions F7.5.7.2, “Launch of certified and registered applications on different HPC resources,” and F7.5.7.3, “Upload and download to and from HPC resources and HBP data repositories.”

6.4.2 Changes to the original work plan

None.

6.4.3 Potential problems

The integration of the HPC Platform with a Single Sign-On infrastructure could be a potential problem, mainly due to the requirement to comply with the security policies of all Partners involved. Discussions about this have been held in recent months, and a possible design is being discussed within the WP. Delays in this Task would cause further delays in the implementation of the rest of the HPC Platform Functions.

Reliance on the resources of another EU project, i.e. the PRACE network, has already resulted in delays. The planned MoU should help solve the problem. A contingency plan will be considered if the delays continue.

7. WP7.6: HPC Platform - User Support and Community Building

7.1 WP7.6: Overall Goals

The goal of T7.6.1 (HPC Platform Documentation and User Training) is to assist and train users with different backgrounds and experience to make effective use of the High Performance Computing Platform. T7.6.1 will implement and manage technical user documentation for the Platform and devise and implement a training programme. To this end, it will establish cross-site, cross-service documentation standards, implement a common document management system, produce training materials, and organise training events for different user groups.

T7.6.2 works with PRACE and other research infrastructures (RIs) to define agreements that allow HBP users to use these facilities, helping them in preparing applications to the relevant appropriation committees and defining interfaces that allow authorised users to run simulations using the submission procedures developed for the HBP environment. This work will include the integration of PRACE monitoring in the HPC Cockpit, and the identification of new opportunities for collaboration with HPC centres coordinated by PRACE.

7.2 WP7.6: Main Achievements

7.2.1 Milestones achieved and overall progress

In the period reported on, T7.6.1 played a significiant role in creating the HPC Platform specification (D7.7.2, Function F7.6.1.2: completed). Besides the goals, use cases, functional and non-functional requirements, software and physical architecture of the HPC Platform, the final document contains requirements for user documentation and support (MS149). It also includes a categorisation of the prospective HPC Platform users according to their background and objectives (F7.6.1.1: partly completed), which will help tailor documentation and trainings to the needs of specific user groups. The HPC Platform Specification serves as a basis for the work on the HPC Platform Guidebook Version 0.5 (MS151), which has started (F7.6.1.3: work in progress). With respect to training, a collection of links to all SP7 Partner websites with existing training and e-learning offerings has been created, but still needs to be published online (F7.6.1.5: partly completed). The identification of services and components of the HPC Platform for which documentation and/or trainings are inappropriate or missing has started (F7.6.1.6: work in progress).

The main achievement of T7.6.2 is the PRACE Council approval for the PRACE Programmatic Access. This programmatic access, to be implemented by PRACE in the future calls (opening in September 2014), will enable the HBP to submit project proposals to every PRACE call, with a reserved amount of resources. Once this process is established, T7.6.2 will focus on monitoring the process itself, and on extending this possibility to other RIs.

7.2.2 Collaboration

In the context of HPC Platform integration into the UP, T7.6.1 discussed the different user groups that are expected to access the HPC Platform with UP developers in several videoconferences. T7.6.1 collaborated closely with all SP7 WPs, and with SP6 during the preparation of the HPC Platform Specification. Close collaboration with all SP7 Partners will also be required in the preparation of the HPC Platform Guidebook.

Collaboration with PRACE and other research infrastructures is at the focus of Task T7.6.2. Several meetings took place during the last year to analyse and discuss the necessity of having guaranteed access to PRACE HPC resources for the HBP community.

Sergi Girona (BSC), leader of Task T7.6.2, represents SP7 in the HBP Education Programme Committee. He was chosen for this role due to his experience with the PRACE Advanced Training Centre (PATC) activities, which he oversees.

7.2.3 Internal monitoring and quality control

In WP7.6, T7.6.1 consists of two members, and T7.6.2 consists of one member. This small size facilitated close monitoring of WP progress.

7.2.4 Lessons learned

Lessons learned in the first 12 months include:

- Most existing training currently offered by the HPC Platform Partners is about high-performance computing and programming at an introductory, and sometimes more advanced level.
- The HPC Platform Guidebook should be published in electronic form, as an interactive standalone website, or as part the Unified Portal. Compared to a printed document, an online Guidebook has several advantages. For example, it may:
  - Be continuously updated,
  - Be searched (by topic or target group, for example)
  - Feature different media types
  - Contain active links to other sources of information instead of replicating it or re-inventing the wheel.
- Both documentation and training must account for the fact that the default interaction with the HPC Platform will be through the Unified Portal.

7.2.5 Changes to WP objectives, structure or personnel

None.

7.2.6 Main contributors

The main individuals who contributed to the WP in the period reported on are:

- JUELICH: Anna Lührs, Boris Orth
- BSC: Sergi Girona

7.3 WP7.6: Main Problems

Functions F7.6.1.1 and F7.6.1.5 are only partly completed, as an HBP-wide framework for Platform documentation has not yet been defined. This concerns the format of the documentation and the place where it should appear. In the meantime, Task 7.6.1 has created its own preliminary Guidebook template based on the HPC Platform Specification and the general HBP document template. Eventually , the Guidebook should appear as an interactive website with links to relevant existing documentation and training, plus new offerings on topics not yet covered. This online Guidebook should either be a standalone website, or be integrated into the HBP's Unified Portal. T7.6.1 will contact the HBP Editorial Office, the STO and the UP developers about this.

T7.6.2 did not encounter any major problems other than the slow development of the decisions required for to implement programmatic access. Due to the preoccupation with programmatic access during the period, potential HPC alliances still need to be identified within PRACE and beyond (MS150). WP7.6 expects to achieve this Milestone by Month 18 instead of Month 12. Given that sufficient HPC resources are currently available to the HBP, this delay will have no negative impact on the Project.

7.4 WP7.6: The Next Six Months

7.4.1 Milestones and next steps

The next Milestone for Task T7.6.1 is the Guidebook that will come with the internal release of the HPC Platform (MS151, F7.6.1.3, Month 18). If all relevant SP7 Tasks contribute their technical documentation, this Milestone should be achieved on time. The next step will be the construction of a preliminary website to collect documentation or links to documentation as it becomes available. This website, which could become part of the HBP Collaboration Portal and which may be integrated into the UP, will be continuously updated and should ultimately develop into the planned Guidebook. Along with the documentation, the Guidebook will contain the list of training and e-learning opportunities collected earlier. This list will also be continuously updated. The website may also feature questionnaires or polls about further documentation and training requirements (F7.6.1.6). The design of training material and events for selected topics not covered by existing material or courses will start (F7.6.1.7). This work will be coordinated with the HBP Education Programme.

Task T7.6.2 will monitor the development and implementation of programmatic access, and support any HBP user in submitting projects to PRACE calls. To identify potential HPC alliances (MS150), T7.6.2 will communicate with other HPC centres about how the HBP can access their resources. The results will be compiled and made available to HBP users.

7.4.2 Changes to the original work plan

Currently, no changes to the original work plan are foreseen.

7.4.3 Potential problems

Currently, no major problems are expected.

8. WP7.7: Scientific Coordination

8.1 Scientific Coordination: Internal Meetings

This table lists meetings between SP staff.

Date	Description	Location	Participants	Comments
8-9 Oct 2013	SP7 Subproject Meeting 1	EPFL, Lausanne	Boris Orth (JUELICH), Thomas Lippert (JUELICH), Rosa M. Badia (BSC), Javier Bartolome (BSC), Sergi Girona (BSC), Jesus Labarta (BSC), Matthias Bolten, Andreas Frommer (BUW), Giovanni Erbacci (CINECA), Martin Kersten (CWI), Carlos Aguado (EPFL), Fabien Delalondre (EPFL), John Biddiscombe (ETHZ), Luc Corbeil (ETHZ), Cristian Mezzanotte (ETHZ), Thomas Schulthess (ETHZ), Jan Hamaekers (FG), Norbert Eicker, Julia Kämpfer (JUELICH), Daniel Mallmann (JUELICH), Bernd Mohr (JUELICH), Ralph Niederberger (JUELICH), Dirk Pleiter (JUELICH), Klaus Wolkersdorfer (JUELICH), Diana Gudu (KIT), Marcus Hardt (KIT), Torsten Kuhlen (RWTH), Benjamin Weyers (RWTH), Minos Garofalakis (TUC), Gabriel Wittum (UFRA), Vicente Martin (UPM), Luis Pastor (URJC), Anastasia Ailamaki (EPFL), Thomas Heinis (EPFL), Felix Schürmann (EPFL), Peter Buneman (UEDIN)	
26 Nov 2013	Discussion about D7.7.1	Phone conference	John Richard Walker(EPFL), Guy Willis(EPFL), Boris Orth (JUELICH), Celia Luterbacher(EPFL)	
29 Nov 2013	WP7.5 Videoconference	Videoconference	Cristian Mezzanotte (ETHZ), Luc Corbeil (ETHZ), Javier Bartolome (BSC), Giovanni Erbacci (CINECA), Fabien Delalondre (EPFL), Jeffrey Christopher Muller (EPFL), Ralph Niederberger (JUELICH), Klaus Wolkersdorfer (JUELICH), Boris Orth (JUELICH), Daniel Mallmann (JUELICH)	
2&4 Dec 2013	Identifying possible applications for OmpSs and PyCOMPSs	Barcelona, Spain	Enric Tejedor (BSC), Victor Lopez (BSC), Participants from JUELICH	

Date	Description	Location	Participants	Comments
3 Dec 2013	WP7.1 Meeting	BSC, Barcelona, Spain	Dirk Pleiter(JUELICH), Boris Orth(JUELICH), John Biddiscombe(ETHZ), Vicente Martin(UPM), Felix Schürmann(EPFL), Fabien Delalondre (EPFL), Jesus Labarta (BSC), Juan Hernando, Jochen Martin Eppler (JUELICH), Stefan Eilemann(EPFL)	Meeting on the specification of the technical goals and requirements for the HBP PCP Call for Tender
10 Dec 2013	WP7.1 Video Conference	Video conference	Jochen Martin Eppler(JUELICH), Felix Schürmann(EPFL), Jesus Labarta(BSC), Dirk Pleiter(JUELICH), Boris Orth(JUELICH), Juan Hernando, John Biddiscombe(ETHZ), Stefan Eilemann(EPFL)	Discussion of the technical goals and requirements for the HBP PCP
12 Dec 2013	WP7.1 Video Conference	Video conference	Jochen Martin Eppler (JUELICH), Boris Orth (JUELICH), Felix Schürmann(EPFL), Dirk Pleiter(JUELICH), Juan Hernando, John Biddiscombe(ETHZ), Stefan Eilemann(EPFL), Jesus Labarta(BSC)	Discussion of the technical goals and requirements for the HBP PCP
16 Dec 2013	WP7.1 Video Conference	Videoconference	Jochen Martin Eppler(JUELICH), Boris Orth(JUELICH), Felix Schürmann(EPFL), Jesus Labarta(BSC), Dirk Pleiter(JUELICH), John Biddiscombe(ETHZ), Stefan Eilemann(EPFL), Juan Hernando	
18 Dec 2013	WP7.5 Meeting	Videoconference	Cristian Mezzanotte (ETHZ), Luc Corbeil (ETHZ), Marcus Hardt (KIT), Giovanni Erbacci (CINECA), Ralph Niederberger (JUELICH), Klaus Wolkersdorfer (JUELICH), Javier Bartolome (BSC)	
24 Jan 2014	WP7.5 Meeting	Video conference	Cristian Mezzanotte (ETHZ), Luc Corbeil (ETHZ), Marcus Hardt (KIT), Diana Gudu (KIT), Fabien Delalondre (EPFL), Jeffrey Christopher Muller (EPFL), Giovanni Erbacci (CINECA), Javier Bartolome (BSC), Ralph Niederberger (JUELICH), Klaus Wolkersdorfer (JUELICH), Boris Orth (JUELICH), Daniel Mallmann (JUELICH)	Regular WP7.5 Video Conference discussing Task status and next steps
30 Jan 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
5-6 Feb 2014	WP 7.5 Meeting	BSC, Barcelona, Spain	Boris Orth (JUELICH), Luc Corbeil (ETHZ), Cristian Mezzanotte (ETHZ), Ralph Niederberger (JUELICH), Daniel Mallmann (JUELICH), Diana Gudu (KIT), Marcus Hardt (KIT), Javier Bartolome (BSC)	Discussion of the HPC Platform specification and the corresponding Deliverable (D 7.7.2)
13 Feb 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development

Date	Description	Location	Participants	Comments
14 Feb 2014	SP7 Subproject Meeting 2	Video conference	Boris Orth (JUELICH), Dirk Pleiter (JUELICH), Julia Kämpfer (JUELICH), Daniel Mallmann (JUELICH), Thomas Lippert (JUELICH), Bernd Mohr (JUELICH), Ralph Niederberger (JUELICH), Klaus Wolkersdorfer (JUELICH), Anna Lührs (JUELICH), John Biddiscombe (ETHZ), Cristian Mezzanotte (ETHZ), Pawlikowska Katarzyna (ETHZ), Luc Corbeil (ETHZ), Thomas Schulthess (ETHZ), Arcara Francesca (BSC), Rosa M. Badia (BSC), Javier Bartolome (BSC), Sergi Girona (BSC), Jesus Labarta (BSC), Frommer Andreas (BUW), Matthias Bolten (BUW), Jan Hamaekers (FG), Gabriel Wittum (UFRA), Benjamin Weyers (RWTH), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Vicente Martin (UPM), Luis Pastor (URJC), Juan Hernando, Anastasia Ailamaki (EPFL), Thomas Heinis (EPFL), Minos Garofalakis (TUC), Peter Buneman (UEDIN), Martin Kersten (CWI), Giovanni Erbacci (CINECA), Marcus Hardt (KIT), Diana Gudu (KIT)	
14 Feb 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Torsten Kuhlen (RWTH), Vicente Martin (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ), Martina Schmalholz (UHEI)	Discussino and coordination of work in WP7.3
16-18 Feb 2014	Meeting about BLURON	EPFL, Lausanne	Victor Lopez (BSC), Marçal Solà (BSC), Participants from EPFL	
18 Feb 2014	WP7.5 Regular Meeting	Video conference	Cristian Mezzanotte (ETHZ), Luc Corbeil (ETHZ), Fabien Delalondre (EPFL), Jeffrey Christopher Muller (EPFL), Marcus Hardt (KIT), Diana Gudu (KIT), Javier Bartolome (BSC), Giovanni Erbacci (CINECA), Boris Orth (JUELICH), Ralph Niederberger (JUELICH), Daniel Mallmann (JUELICH), Klaus Wolkersdorfer (JUELICH)	Regular WP7.5 Video Conference discussing Task status and next steps
27 Feb 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
4-7 Mar 2014	Meeting about BLURON, OmpSs and PyCOMPSs	Barcelona, Spain	Victor Lopez (BSC), Participants from EPFL	

Date	Description	Location	Participants	Comments
13 Mar 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
14 Mar 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Torsten Kuhlen (RWTH), Vicente Martin (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Discussion and coordination of work in WP7.3
24 Mar 2014	WP7.5 Regular Meeting	Video conference	Cristian Mezzanotte (ETHZ), Luc Corbeil (ETHZ), Jeffrey Christopher Muller (EPFL), Diana Gudu, Colin John McMurtrie (ETHZ), Javier Bartolome (BSC), Giovanni Erbacci (CINECA), Klaus Wolkersdorfer (JUELICH), Daniel Mallmann (JUELICH), Ralph Niederberger (JUELICH), Boris Orth (JUELICH)	Regular WP7.5 Video Conference discussing Task status and next steps
27 Mar 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
10 Apr 2014	WP7.3	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
11 Apr 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Torsten Kuhlen (RWTH), Vicente Martin (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Discussion and coordination of work in WP7.3
24 Apr 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
8 May 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
9 May 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Torsten Kuhlen (RWTH), Vicente Martin (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Discussion and coordination of work in WP7.3
16 May 2014	WP7.5 Meeting	Videoconference		
19 May 2014	AAA and LDAP deployment	Videoconference	Cristian Mezzanotte (ETHZ), Colin John McMurtrie (ETHZ), Fabien Delalondre (EPFL), Carlos Aguado (EPFL)	Discussion of Authentication and Authorisation policies.

Date	Description	Location	Participants	Comments
22 May 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
5 Jun 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software Development
6 Jun 2014	SP7 Subproject Meeting 3	Video conference	Boris Orth (JUELICH), Dirk Pleiter (JUELICH), Julia Kämpfer (JUELICH), Daniel Mallmann (JUELICH), Thomas Lippert (JUELICH), Bernd Mohr (JUELICH), Ralph Niederberger (JUELICH), Klaus Wolkersdorfer (JUELICH), Anna Lührs (JUELICH), John Biddiscombe (ETHZ), Cristian Mezzanotte (ETHZ), Pawlikowska Katarzyna (ETHZ), Luc Corbeil (ETHZ), Thomas Schulthess (ETHZ), Arcara Francesca (BSC), Rosa M. Badia (BSC), Javier Bartolome (BSC), Sergi Girona (BSC), Jesus Labarta (BSC), Frommer Andreas (BUW), Matthias Bolten (BUW), Jan Hamaekers (FG), Gabriel Wittum (UFRA), Benjamin Weyers (RWTH), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Vicente Martin (UPM), Luis Pastor (URJC), Juan Hernando, Anastasia Ailamaki (EPFL), Thomas Heinis (EPFL), Minos Garofalakis (TUC), Peter Buneman (UEDIN), Martin Kersten (CWI), Giovanni Erbacci (CINECA), Marcus Hardt (KIT), Diana Gudu (KIT), Martina Schmalholz (UHEI)	
6 Jun 2014	Internal CSCS Meeting	Lugano	Cristian Mezzanotte (ETHZ), Colin John McMurtrie (ETHZ), Benjamin Cumming (ETHZ), John Biddiscombe (ETHZ), Pawlikowska Katarzyna (ETHZ)	Coordination of all CSCS Tasks in SP7
11-12 Jun 2014	WP7.5 Meeting	Cineca, Bologna	Cristian Mezzanotte (ETHZ), Colin John McMurtrie (ETHZ), Klaus Wolkersdorfer (JUELICH), Ralph Niederberger (JUELICH), Daniel Mallmann (JUELICH), Javier Bartolome (BSC), Giovanni Erbacci (CINECA), Marcus Hardt (KIT), Diana Gudu (KIT), Martina Schmalholz (UHEI)	
13 Jun 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Torsten Kuhlen (RWTH), Vicente Martin (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Discussion and coordination of work in WP7.3

Date	Description	Location	Participants	Comments
19 Jun 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
23 Jun 2014	HBP PCP Meeting	Leipzig	Boris Orth (JUELICH), Colin McMurtrie (CSCS), Dirk Pleiter (JUELICH), Felix Schürmann (EPFL), Giovanni Erbacci (CINECA), Jesus Labarta (BSC), Markus Diesmann (JUELICH), Susanne Kunkel (JUELICH), Thorsten Kuhlen (RWTH), Vicente Martin (UPM), Additional participants from JUELICH: Martina Börger, Petra Jerrentrup	Assessment Committee of the HBP PCP
03 Jul 2014	HBP PCP Meeting	Frankfurt (Main)	Boris Orth (JUELICH), Colin McMurtrie (CSCS), Dirk Pleiter (JUELICH), Felix Schürmann (EPFL), Giovanni Erbacci (CINECA), Jesus Labarta (BSC), Markus Diesmann (JUELICH), Susanne Kunkel (JUELICH), Thorsten Kuhlen (RWTH), Vicente Martin (UPM), Additional participants from JUELICH: Martina Börger, Petra Jerrentrup	Assessment Committee of the HBP PCP
3 Jul 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
7 Jul 2014	HBP PCP Meeting	Videoconference	Boris Orth (JUELICH), Colin McMurtrie (CSCS), Dirk Pleiter (JUELICH), Felix Schürmann (EPFL), Giovanni Erbacci (CINECA), Jesus Labarta (BSC), Markus Diesmann (JUELICH), Susanne Kunkel (JUELICH), Thorsten Kuhlen (RWTH), Vicente Martin (UPM), Additional participants from JUELICH: Martina Börger, Petra Jerrentrup	Assessment Committee of the HBP PCP

Date	Description	Location	Participants	Comments
8 Jul 2014	SP7 Subproject Meeting 4	Video conference	Anastasia Ailamaki (EPFL), Fabien Delalondre (EPFL), Thomas Heinis (EPFL), Xuesong Lu (EPFL), Felix Schürmann (EPFL), Farhan Tauheed (EPFL), Rosa M. Badia (BSC), Javier Bartolome (BSC), Raül Sirvent (BSC), Andrew Emerson (CINECA), Giovanni Erbacci (CINECA), Colin John McMurtrie (ETHZ), Cristian Mezzanotte (ETHZ), Katarzyna Pawlikowska (ETHZ), Norbert Eicker (JUELICH), Julia Kämpfer (JUELICH), Carsten Karbach (JUELICH), Anna Lührs (JUELICH), Daniel Mallmann (JUELICH), Ralph Niederberger (JUELICH), Boris Orth (JUELICH), Dirk Pleiter (JUELICH), Jan Hamaekers (FG), Diana Gudu (KIT), Torsten Kuhlen (RWTH), Benjamin Weyers (RWTH), Minos Garofalakis (TUC), Vicente Martín (UPM), Francisco Gonzalez de Quevedo (URJC), Juan Hernando (URJC), Luis Pastor (URJC), Pablo Toharia Rabasco (URJC), Guests: Martina Schmaholz (Science & Technology Office), Jochen Eppler (JUELICH)	
14-16 Jul 2014	WP7.3 Meeting	Lausanne, EPFL	Benjamin Weyers (RWTH), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Juan Hernando, Pablo Toharia Rabasco (URJC), Torsten Kuhlen (RWTH), Luis Pastor (URJC), Jeffrey Christopher Muller (EPFL)	Meeting on reporting and software development
31 Jul 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
8 Aug 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Torsten Kuhlen (RWTH), Vicente Martin (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Discussion and coordination of work in WP7.3
14 Aug 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
28 Aug 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
11 Sep 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development

Date	Description	Location	Participants	Comments
15 Sep 2014	HBP AAI Videoconference	Videoconference	Cristian Mezzanotte (ETHZ), Colin John McMurtrie (ETHZ), Fabien Delalondre (EPFL), Jeffrey Christopher Muller (EPFL), Carlos Aguado (EPFL), Karbach Carsten (JUELICH), Klaus Wolkersdorfer (JUELICH), Javier Bartolome (BSC), Marcus Hardt (KIT), Giovanni Erbacci (CINECA)	
15-17 Sep 2014	Visualisation Workshop of WP7.3	Madrid, Spain	Stefan Eilemann (EPFL), Ahmet Bilgili (EPFL), Daniel Nachbaur (EPFL), Jafet Villafranca (EPFL), Cyrille Favreau (EPFL), Felix Schürmann (EPFL), Juan Hernando (UPM), Vicente Martin (UPM), Luis Pastor (URJC), Pablo Toharia (URJC), Benjamin Weyers (RWTH), Torsten Kuhlen (RWTH), John Biddiscombe (CSCS), Jose M. Peña (UPM), Carlos Duelo (UPM), Angel Rodriguez (UPM), Juan Morales (UPM), Sofia Bayona (URJC), Oscar David Robles (URJC), Sergio E. Galindo (URJC), Juan José García (URJC), Juan Pedro Brito (URJC),	
25 Sep 2014	WP7.3 Meeting	Videoconference	Benjamin Weyers (RWTH), Stefan Eilemann (EPFL), Pablo Toharia Rabasco (URJC), Juan Hernando, John Biddiscombe (ETHZ)	Software development
29 Sep 2014	SP7 Subproject Meeting 5	Heidelberg, Germany	Fabien Delalondre (EPFL), Stefan Eilemann (EPFL), Xuesong Lu (EPFL), Mirjana Pavlovic, Giovanni Erbacci (CINECA), John Biddiscombe (ETHZ), Benjamin Cumming (ETHZ), Colin John McMurtrie (ETHZ), Cristian Mezzanotte (ETHZ), Jutta Docter (JUELICH), Julia Kämpfer (JUELICH), Karbach Carsten (JUELICH), Anna Lührs (JUELICH), Daniel Mallmann (JUELICH), Bernd Mohr (JUELICH), Ralph Niederberger (JUELICH), Boris Orth (JUELICH), Dirk Pleiter (JUELICH), Bernd Schuller (JUELICH), Klaus Wolkersdorfer (JUELICH), Diana Gudu (KIT), Marcus Hardt (KIT), Rosa M. Badia (BSC), Javier Bartolome (BSC), Jesus Labarta (BSC), Raül Sirvent (BSC), Torsten Kuhlen (RWTH), Benjamin Weyers (RWTH), Martin Kersten (CWI), Matthias Bolten (BUW), Frommer Andreas (BUW), Minos Garofalakis (TUC), Vicente Martin (UPM), Juan Hernando, Luis Pastor (URJC), Pablo Toharia Rabasco (URJC)	At HBP Summit

Table 1: Internal meetings of SP7

8.2 Scientific Coordination: HBP Meetings

This table lists meetings between this SP and other SPs.

Date	Description	Location	Participants	Comments
8 Oct 2013	HBP General Assembly	EPFL, Lausanne		
9 Nov 2013	Meeting about NEST performance	Jülich, Germany	Participants from BSC and JUELICH (INM-6)	
19 Nov	Work Meeting		Participants from BUW and JUELICH (INM-6)	
9 Dec 2013	HBP German Partners meeting	Heidelberg	Lewis Chris (ESI), Björn Kindler (UHEI), Karlheinz Meier (UHEI), Rene Schüffny (TUD), Matthias Bolten, Paolo Carloni (GRS), Christopher Coenen, Markus Diesmann (JUELICH), Frommer Andreas (BUW), Diana Gudu (KIT), Marcus Hardt (KIT), Höppner Sebastian (TUD), Thomas Lippert (JUELICH), Boris Orth (JUELICH), Rebecca Wade (HITS)	
12 Dec 2013	Internal WP5.2-WP7.3 Meeting	Skype	José M. Peña (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Juan Hernando	Coordination meeting for the interactive visual analytics for simulation activities
20 Nov 2013	Deliverable 1 - guidelines	EPFL, Lausanne	Ferath Kherif (CHUV), Thomas Heinis (EPFL), Tea Danelutti (CHUV), John Richard Walker (EPFL), Guy Willis (EPFL), Celia Luterbacher (EPFL)	
26 Nov 2013	Discussion of D7.7.1	Telco	John Richard Walker (EPFL), Guy Willis (EPFL), Boris Orth (JUELICH), Celia Luterbacher (EPFL)	
29 Nov 2013	Meeting of Visualisation and Neuroinformatics Groups	UPM-CeSViMa, Madrid, Spain	Vicente Martin (UPM), Luis Pastor (URJC), José M. Peña (UPM), Juan Hernando	
12 Dec 2013	Internal meeting WP5.2 - WP7.3	Skype	José M. Peña (UPM), Luis Pastor (URJC), Felix Schürmann (EPFL), Stefan Eilemann (EPFL), Juan Hernando	Coordination meeting for the interactive visual analytics for simulation activities

Date	Description	Location	Participants	Comments
20 Dec 2013	Internal meeting WP5.2 - WP7.3	Skype	José M. Peña (UPM), Luis Pastor(URJC), Pascal Fua (EPFL), Torsten Kuhlen (RWTH)	Coordination meeting: Structural Data Analysis (WP5.2) - Visualisation (WP7.3)
4 Mar 2014	Internal T7.2.5 Meeting		Participants of BUW and JUELICH (INM-6)	
24 Mar 2014	JUELICH/UDUS coordinators meeting	Jülich, Germany	Angela Lindner (JUELICH), Boris Orth (JUELICH), Martina Reske (JUELICH), Günter Dresia (JUELICH), Stier Jutta (JUELICH), Anne Do Lam-Ruschewski (JUELICH)	
3 Apr 2014	Internal T7.2.5 Meeting		Participants of BUW and JUELICH (INM-6)	
14 Apr 2014	HBP German Partners meeting	Videoconference	Andreas Frommer, Katrin Amunts, Michael Denker, Markus Diesmann, Anne Do Lam-Ruschewski, Sonja Grün, Julia Kämpfer, Thomas Lippert, Daniel Mallmann, Bernd Mohr, Boris Orth, Martina Reske, Oswind Ehrmann, Markus Hardt, Benjamin Weyers, Karlheinz Meier, Andreas Grübl, Martina Schmalholz, Rene Schüffny, Sebastian Höppner, Florian Röhrbein, Gudrun Klinker, Mario Pohrmann, Andreas Engel	
9 May 2014	Internal T7.2.5 Meeting		Participants of BUW and JUELICH (INM-6)	
12 May 2014	HBP German Partners Meeting	Videoconference	Andreas Frommer, Matthias Bolten, Michael Denker, Markus Diesmann, Sonja Grün, Thomas Lippert, Boris Orth, Paolo Carloni, Pietro Vidosich, Katrin Amunts, Angela Lindner, Rebecca Wade, Diana Gudu, Thorsten Kuhlen, Karlheinz Meier, Martina Schmalholz, Sabine Schneider, Björn Kindler, Rene Schüffny, Sebastian Höppner, Florian Röhrbein (FR), Ulrich Rückert, Andreas Engel (AE), Hamburg	
23 Jun 2014	Meeting of the Assessment Committee of the HBP PCP	Leipzig, Germany	Boris Orth (JUELICH), Colin John McMurtrie (ETHZ), Dirk Pleiter (JUELICH), Felix Schürmann (EPFL), Giovanni Erbacci (CINECA), Jesus Labarta (BSC), Markus Diesmann (JUELICH), Torsten Kuhlen (RWTH), Vicente Martin (UPM)	

Date	Description	Location	Participants	Comments
24 Jun 2014	Collaboration meeting between WP6.3.3 and WP7.2.5	HITS, Heidelberg	Neil Bruce (HITS), Jan Hamaekers (FG), Rebecca Wade (HITS)	Visit by Jan Hamaekers to discuss the optimisation of numerical algorithms used in WP6.3.3.
3 Jul 2014	Meeting of the Assessment Committee of the HBP PCP	Frankfurt/Main, Germany	Boris Orth (JUELICH), Colin John McMurtrie (ETHZ), Dirk Pleiter (JUELICH), Felix Schürmann (EPFL), Giovanni Erbacci (CINECA), Jesus Labarta (BSC), Markus Diesmann (JUELICH), Torsten Kuhlen (RWTH), Vicente Martin (UPM)	
7 Jul 2014	Meeting of the Assessment Committee of the HBP PCP	Videoconference	Boris Orth (JUELICH), Colin John McMurtrie (ETHZ), Dirk Pleiter (JUELICH), Felix Schürmann (EPFL), Giovanni Erbacci (CINECA), Jesus Labarta (BSC), Markus Diesmann (JUELICH), Torsten Kuhlen (RWTH), Vicente Martin (UPM)	
17 Jul 2014	HBP Cross-SP Data/Services Meeting	Videoconference	Participants of all SPs	
14 Aug 2014	Internal T7.2.5 Meeting		Participants of BUW and JUELICH (INM-6)	
19 Aug 2014	Collaboration SP-Meeting (SP1, SP5, SP7, SP9)	Madrid, Spain	Javier DeFelipe (UPM), Karlheinz Meier (UHEI), Óscar Herreras (External collaborator, IC-CSIC); Luis Pastor (URJC); Gonzalo León (UPM), members of the Cajal Cortical Circuits Laboratory; Spanish representatives of SP5 & SP7 (visualisation).	
25 Aug 2014	HBP German Partners meeting	Video conference	Matthias Bolten (BUW), Sonja Grün (JUELICH), Martina Reske (JUELICH), Thomas Lippert (JUELICH), Boris Orth (JUELICH), Anna Lührs (JUELICH), Angela Lindner (UDUS), Neil Bruce (HITS), Markus Hard (KIT), Diana Gudu (KIT), Thorsten Kuhlen (RWTH), Karlheinz Meier (UHEI), Björn Kindler (UHEI), Martina Schmalholz (UHEI), Sebastian Höppner (TUD), René Schüffny (TUD), Florian Röhrbein (TUM), Florian Walter (TUM), Paul Levi (FZI), Andreas Engel (AE), Hamburg	
28 Sep 2014	HBP German Partners meeting	Heidelberg, Germany	Protocol with participants not yet available	Before the HBP Summit

Date	Description	Location	Participants	Comments
29 Sep – 1 Oct 2014	HBP Summit	Heidelberg, Germany		
30 Sep 2014	SP5 & SP7 Meeting	Heidelberg, Germany	SP5, SP7	At HBP Summit
30 Sep 2014	SP6, SP7 & SP9 Meeting	Heidelberg, Germany	SP6, SP7, SP9	At HBP Summit

Table 2: Meetings of SP7 with other SPs

8.3 Scientific Coordination: External Meetings

This table lists meetings between this SP and Partners outside the HBP.

Date	Description	Location	Participants	Comments
30 Sep – 1 Oct 2013	IASC13 - Workshop on "Interactive Supercomputing"	Frankfurt/Main, Germany	John Biddiscombe (ETHZ), Luc Corbeil (ETHZ), Markus Diesmann (JUELICH), Giovanni Erbacci (CINECA), Sonja Grün (JUELICH), Juan Hernando, Torsten Kuhlen (RWTH), Jesus Labarta (BSC), Thomas Lippert (JUELICH), Vicente Martin (UPM), Boris Orth (JUELICH), Dirk Pleiter (JUELICH), Thomas Schulthess (ETHZ), Felix Schürmann (EPFL), Klaus Wolkersdorfer (JUELICH), Jochen Martin Eppler (JUELICH)	
4-5 Nov 2013	GÉANTplus International User Advisory Committee	Cambridge, UK	Ralph Niederberger(JUELICH) representing the HBP project in this committee	
6-8 Nov 2013	ICT 2013	Vilnius, Lithuania	Thomas Lippert (JUELICH), Yannis Ioannidis, Bernd Carsten Stahl (DMU), Charles Yokoyama (RIKEN), Eugene Griffiths (BSC), Jesus Labarta (BSC), Mel Slater (UB), Bassini Sanzio	
17-22 Nov 2013	SC13: International Conference for High Performance Computing, Networking, Storage and Analysis	Denver, CO, USA	Thomas Lippert(JUELICH), Boris Orth(JUELICH), Dirk Pleiter(JUELICH), Bernd Mohr(JUELICH), Norbert Eicker, Fabien Delalondre(EPFL), Jesus Labarta(BSC), Giovanni Erbacci(CINECA), Klaus Wolkersdorfer(JUELICH)	
5-6 Dec 2013	Workshop New Perspectives on Workflow and Data Management for the Analysis of Electophysiological Data (INCF/WP5.3)	Jülich	Martina Reske (JUELICH), Sonja Grün (JUELICH), Andrew Davison (CNRS), Jeffrey Christopher Muller(EPFL), Michael Denker(JUELICH), Alper Yegenoglu (JUELICH), Markus Diesmann (JUELICH), Jochen Martin Eppler (JUELICH), Rosa M. Badia (BSC), Jesus Labarta (BSC)	
18 Dec 2013	Open Dialogue on Pre-Commercial Procurement of Innovative HPC Solutions	Sheraton Brussels Airport Hotel, Brussels, Belgium	Thomas Lippert(JUELICH), Boris Orth(JUELICH), Dirk Pleiter(JUELICH), Julia Kämpfer(JUELICH), Jochen Martin Eppler(JUELICH), Jesus Labarta(BSC), Felix Schürmann(EPFL), John Biddiscombe(ETHZ), Juan Hernando, Vicente Martin(UPM)	

Date	Description	Location	Participants	Comments
27 Jan 2014	HBP EUDAT Workshop	CHUV, Lausanne	Richard Frackowiak (CHUV), Ferath Kherif (CHUV), Bogdan Draganski (CHUV), Anastasia Ailamaki (EPFL), Thomas Heinis (EPFL), Daniel Mallmann (JUELICH)	Objective: explore possible collaborations between the Medical Informatics Platform and EUDAT (initiative funded by the EU)
10 Feb 2014	Concertation Meeting of all on-going PCP Projects	Brussels, Belgium	Boris Orth (JUELICH)	
17-19 Mar 2014	HBP PCP Tender Documents Review	European Commission, Brussels, Belgium	Boris Orth (JUELICH), Dirk Pleiter (JUELICH), Henry Markram (EPFL), Felix Schürmann (EPFL)	Review of HBP PCP draft tender documents
22-26 Jun 2014	International Supercomputing Conference (ISC14)	Leipzig, Germany	Thomas Lippert (JUELICH), Boris Orth (JUELICH), Thomas Schulthess (ETHZ), Felix Schürmann (EPFL), Markus Diesmann (JUELICH), Lester David (UMAN), Dirk Pleiter (JUELICH)	

Table 3: Meetings of SP7 with external Partners

8.4 Scientific Coordination: Monitoring and Quality Control

SP7 is led by Thomas Lippert (JUELICH) and Thomas Schulthess (CSCS). Thomas Lippert represents SP7 on the HBP Board of Directors. He is supported by a small management team consisting of a project manager and a graduate researcher, located in Jülich. This team coordinates and monitors the development of the HPC Platform and makes regular progress reports to the central HBP management.

In the first 12 months, the SP7 management team coordinated the definition of the Platform specifications, including the scientific Key Performance Indicators (SKPIs) used to measure progress and quality, and target values for these indicators. To define the SKPIs, most Tasks in SP7 were broken down into a distinct set of "Functions."[3] The SP7 Task leaders now regularly report the values of the SKPIs via a central website to the Science STO.

Each WP leader is supported by a senior staff member, usually a postdoc, who acts as a bridge between the SP7 management team on the one side and the WP's Task leaders and collaborators on the other side. All WPs with more than two Tasks (WPs 7.1-7.5) use a WP-internal mailing list to facilitate communication within the WP. There is also a global mailing list at the SP level, run through EMDESK by the SP7 management team, for communication among all SP members. In addition, the SP7 management and some WPs, in particular WP7.5, make frequent use of the HBP Collaboration Portal for sharing documents or fixing meeting agendas.

During the first 12 months, a considerable number of internal meetings were held at WP and SP levels, either face-to-face or by audio/videoconference. Given that SP7 is relatively large, and that face-to-face meetings are not always possible, the access of almost all Partners to state-of-the-art audio/video conferencing equipment has been extremely beneficial. After the initial face-to-face meeting during the HBP Summit 2013 in Lausanne, the following three full SP7 meetings were held via audio/videoconference roughly every three months, followed by a face-to-face meeting during the HBP Summit 2014 in Heidelberg. The meetings were organised by the SP7 management, which fixed the agenda, led the scientific and technical discussions, and wrote the minutes. All WP leaders regularly reported on the progress and possible problems in their WPs, usually followed by discussions. Written minutes of all full SP7 meetings are available on EMDESK. Not counted here is the large number of email exchanges and phone calls between the SP7 management and individual SP7 members, among SP7 researchers, between SP7 members and other SPs, and between the SP7 management and the central project management. As WPs 7.5 and 7.1 play key roles in the integration and future development of the Platform, respectively, the SP7 project manager attended nearly all meetings of these WPs.

The SP-internal monitoring and quality control methods described above are complemented by project-wide instruments like quarterly reporting and SKPI monitoring. EMDESK, the Project management platform, has proven extremely valuable as a central, easily accessible point of reference.

So far, all of the above methods have shown that SP7 is progressing well and without significant deviations from the original work plan and schedule. The large number of

[3] Implementing each Function should typically take a few months and should be verifiable by one or two simple test cases. When the test cases are satisfied, the development of that Function is completed. The Functions for each Task were planned so that their expected completion dates are distributed over the 30-month duration of the Ramp-Up Phase. The number of completed Functions represents the SKPI for that Task.

meetings—internal, cross-SP and external—shows that there is very active collaboration going on within the SP and beyond.

8.5 Scientific Coordination: Additional Comments

SP7 has adopted the new quarterly reporting scheme, which was proposed by the HBP Administration Office and approved by the European Commission. The new scheme replaces the old approach (in which each Task leader had to report individually through EMDESK) with a one-page summary report at the SP level every three months.

8.6 Scientific Coordination: The Next Six Months

SP7 will continue to apply the proven coordination procedures outlined above. In view of the upcoming internal release of the HPC Platform (Month 18), it has been decided by the Subproject members to complement the quarterly full SP7 meetings by a monthly videoconference of the SP7 WP leaders and coordinators, to further improve the SP-internal coordination of activities and monitoring of progress towards this important Milestone.

Annex A: Milestones

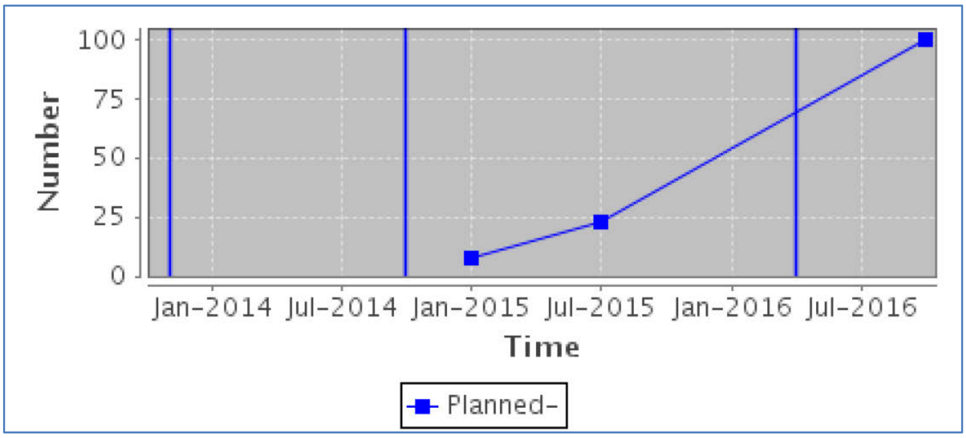
No.	Milestone Name	WP	Month Due	Month Achieved	See Page
M145	Supercomputer available for development of brain simulation software at CSCS.	7.5	1	1	32
M247	Preliminary version of the PCP call and rationale ready for evaluation by EU commission prior to publication of call	7.1	6	6	15
M130	First assessment of simulation requirements for multi-scale human brain models and interactive supercomputing; preparation of PCP process (phase 0) and evaluation criteria; publication of PCP call.	7.1	7	7	15
M135	Specifications and roadmap for parallel programming models.	7.2	6	6	19
M146	Platform fully specified; supercomputer available for production-scale brain simulation at Jülich; for molecular level simulations at BSC, for massive data analysis at CINECA.	7.5	6	6	32
M149	Requirements for user documentation and support for High Performance Computing; guidelines for establishing alliances.	7.6	6	6	37
M131	Pre-commercial tender (phase 0 of PCP) finalised by selection of PCP phase 1 participants.	7.1	9	10	15
M136	Algorithms and programming models for interactive supercomputing.	7.2	12	12	19
M139	Architecture of software applications for interactive visualisation.	7.3	12	12	24
M150	Identification of potential alliances on HPC.	7.6	12	18 (planned)	39

Annex B: Scientific Key Performance Indicators (SKPIs)

WP7.1 Technology evaluation

SP7-sKPI-001 Percentage of PCP budget spent

Responsible: d.pleiter@fz-juelich.de



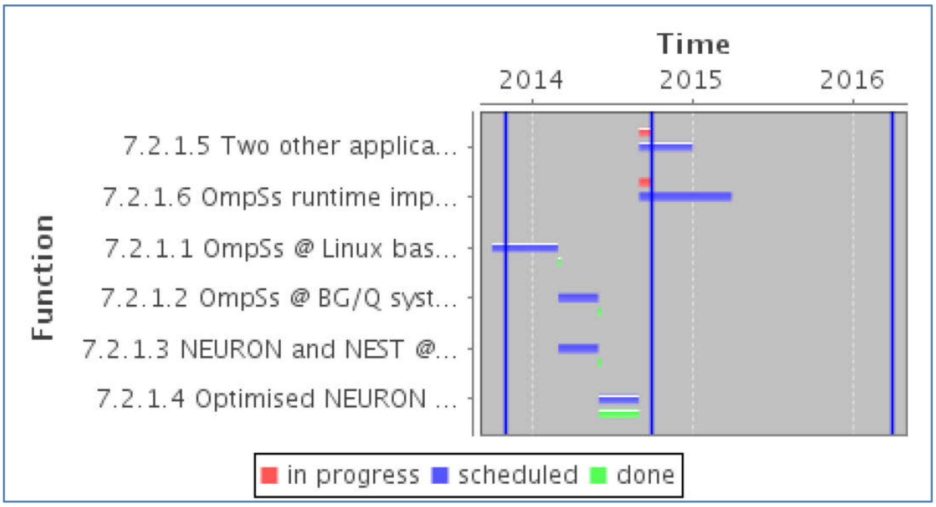
WP7.2 Mathematical methods, programming models, and tools

T7.2.1 Parallel programing models for interactive brain modelling and brain simulation

OmpSs programing models

Responsible: raul.sirvent@bsc.es

- 7.2.1.1 OmpSs @ Linux based clusters. Planned: 2013/10/01 - 2014/02/28
- 7.2.1.2 OmpSs @ BG/Q systems. Planned: 2014/03/01 - 2014/05/31
- 7.2.1.3 NEURON and NEST @ OmpSs. Planned: 2014/03/01 - 2014/05/31
- 7.2.1.4 Optimised NEURON and NEST @ OmpSs. Planned: 2014/06/01 - 2014/08/31
- 7.2.1.5 Two other applications @ OmpSs. Planned: 2014/09/01 - 2015/01/01
- 7.2.1.6 OmpSs runtime implementation optimised for the needs of NEURON and NEST. Planned: 2014/09/01 - 2015/03/31

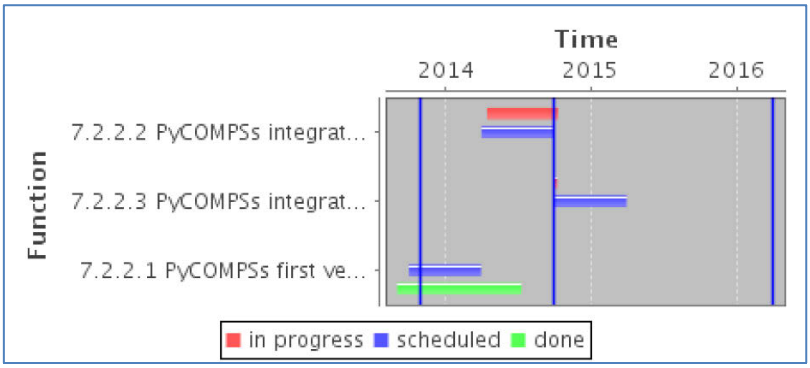


T7.2.2 Workflow and distributed programming models for brain modelling

Definition and implementation of a general-purpose, medium grained workflow model in HPC

Responsible: rosa.m.badia@bsc.es

- 7.2.2.1 PyCOMPSs first version. Planned: 2013/10/01 - 2014/03/31
- 7.2.2.2 PyCOMPSs integrated with the HPC Platform. Planned: 2014/04/01 - 2014/09/30
- 7.2.2.3 PyCOMPSs integrated with the HPC Platform and with advanced features to support multi-scale simulation. Planned: 2014/10/01 - 2015/03/31

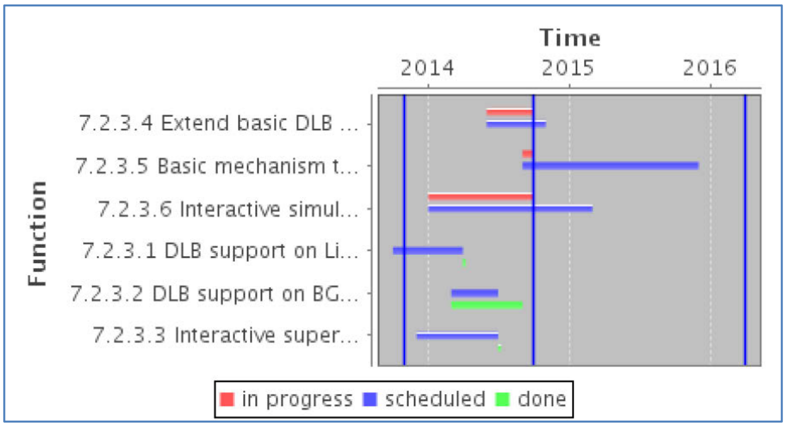


T7.2.3 Middleware for resource and I/O management

Resource management for interactive supercomputing

Responsible: jesus.labarta@bsc.es

- 7.2.3.1 DLB support on Linux systems. Planned: 2013/10/01 - 2014/03/31
- 7.2.3.2 DLB support on BG/Q systems. Planned: 2014/03/01 - 2014/06/30
- 7.2.3.3 Interactive supercomputing microbenchmark to test dynamicity in resource management policies. Planned: 2013/12/01 - 2014/06/30
- 7.2.3.4 Extend basic DLB mechanism to multiple applications. Planned: 2014/06/01 - 2014/10/31
- 7.2.3.5 Basic mechanism to enable interactive simulation. Planned: 2014/09/01 - 2015/12/01
- 7.2.3.6 Interactive simulation demonstrator and evaluation. Planned: 2014/01/01 - 2015/03/01

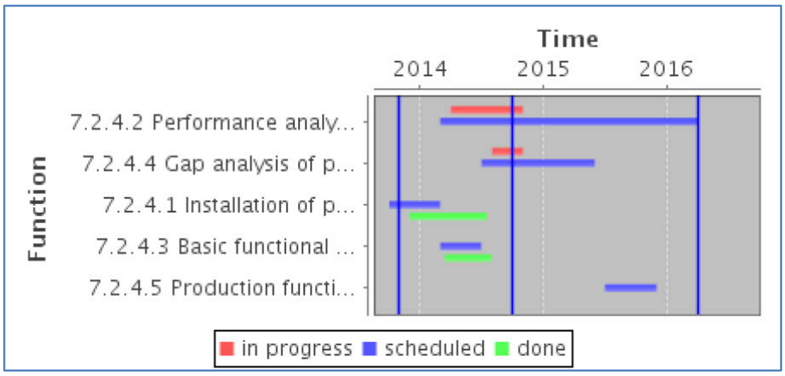


T7.2.4 Tools for performance analysis and prediction

Tools for performance analysis and prediction

Responsible: b.mohr@fz-juelich.de

- 7.2.4.1 Installation of performance analysis tools. Planned: 2013/10/01 - 2014/02/28
- 7.2.4.2 Performance analysis of simulation codes. Planned: 2014/03/01 - 2016/03/31
- 7.2.4.3 Basic functional test of performance analysis tools installation. Planned: 2014/03/01 - 2014/06/30
- 7.2.4.4 Gap analysis of performance analysis tools. Planned: 2014/07/01 - 2015/06/01
- 7.2.4.5 Production functional test of performance analysis tools installation. Planned: 2015/07/01 - 2015/12/01

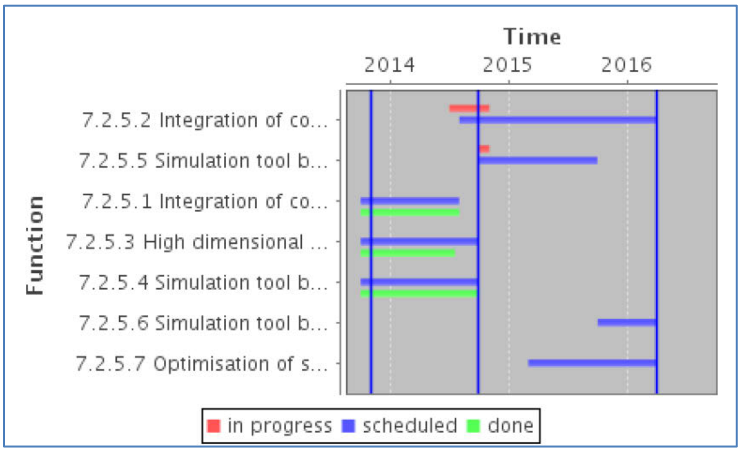


T7.2.5 Numerical methods for neuroscientific high performance computing

Multi-scale numerical methods for Neuroscience HPC.

Responsible: frommer@math.uni-wuppertal.de

- 7.2.5.1 Integration of coupled systems of ODEs in NEST. Planned: 2013/10/01 - 2014/07/31
- 7.2.5.2 Integration of coupled systems of ODEs on parallel computers. Planned: 2014/08/01 - 2016/03/31
- 7.2.5.3 High dimensional approximation tools. Planned: 2013/10/01 - 2014/09/30
- 7.2.5.4 Simulation tool based on the three-dimensional cable equation: Discretisation. Planned: 2013/10/01 - 2014/09/30
- 7.2.5.5 Simulation tool based on the three-dimensional cable equation: Solver. Planned: 2014/10/01 - 2015/09/30
- 7.2.5.6 Simulation tool based on the three-dimensional cable equation: Parallelisation and interface. Planned: 2015/10/01 - 2016/03/31
- 7.2.5.7 Optimisation of simulation codes on the molecular scale. Planned: 2015/03/01 - 2016/03/31



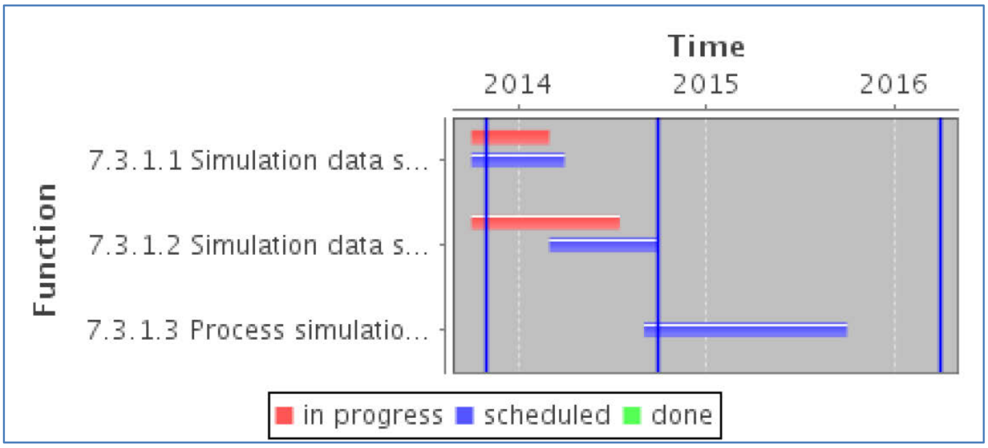
WP7.3 Interactive visualisation, analysis, and control

T7.3.1 Visualisation and analysis component execution framework

Visualisation and analysis component execution framework

Responsible: felix.schuermann@epfl.ch

- 7.3.1.1 Simulation data streaming to visualisation. Planned: 2013/10/01 - 2014/03/31
- 7.3.1.2 Simulation data steering. Planned: 2014/03/01 - 2014/09/30
- 7.3.1.3 Process simulation data during streaming. Planned: 2014/09/01 - 2015/09/30

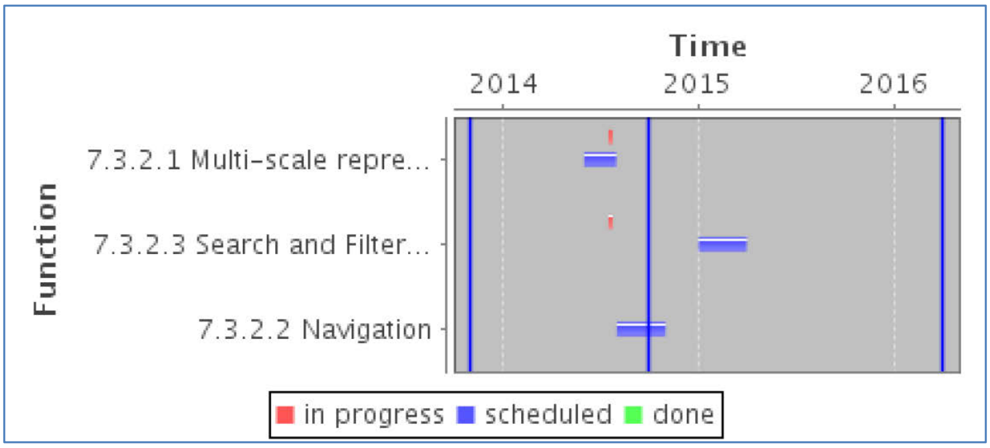


T7.3.2 Neuroscience-specific visualisation and interfaces

Neuroscience-specific visualisation and interfaces

Responsible: luis.pastor@urjc.es

- 7.3.2.1 Multi-scale representation. Planned: 2014/06/01 - 2014/07/31
- 7.3.2.2 Navigation. Planned: 2014/08/01 - 2014/10/31
- 7.3.2.3 Search and Filtering. Planned: 2015/01/01 - 2015/03/31

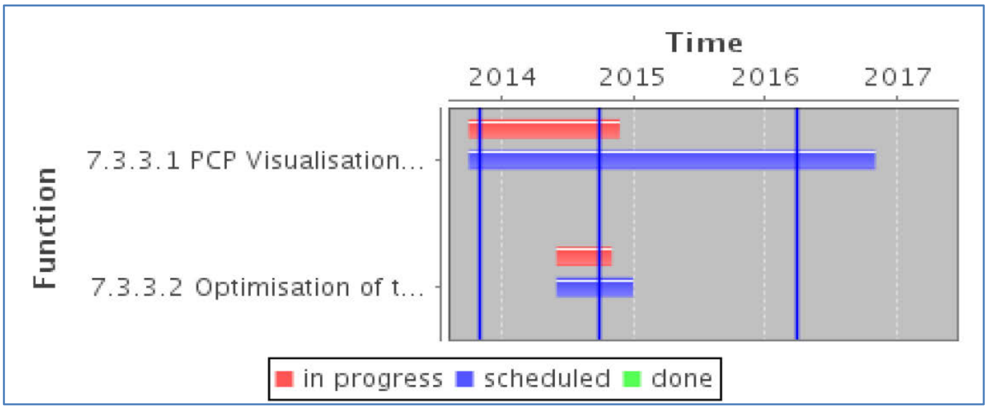


T7.3.3 Hardware technology. benchmarking and optimisation for visualisation and rendering towards the exascale

Initial design for all visualisation-related components

Responsible: vicente@cesvima.upm.es

- 7.3.3.1 PCP Visualisation subsystem benchmarks, support and assessment. Planned: 2013/10/01 - 2016/10/31
- 7.3.3.2 Optimisation of the visualisation tools (1). Planned: 2014/06/01 - 2014/12/31

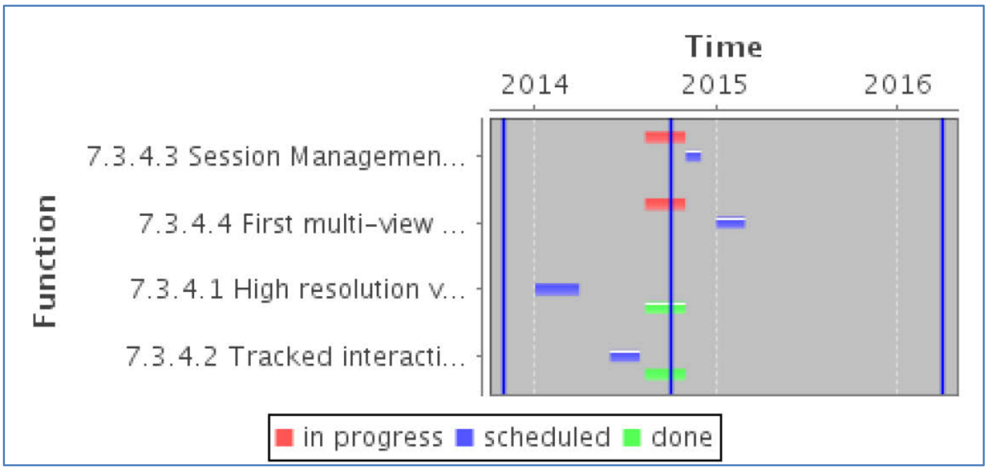


T7.3.4 Integrative visualisation and analysis tools for the HBP cockpits

Integrative visualisation and analysis tools for the HBP cockpits

Responsible: kuhlen@vr.rwth-aachen.de

- 7.3.4.1 High resolution visualisation. Planned: 2014/01/01 - 2014/03/31
- 7.3.4.2 Tracked interaction with high resolution displays. Planned: 2014/06/01 - 2014/07/31
- 7.3.4.3 Session Management. Planned: 2014/11/01 - 2014/12/01
- 7.3.4.4 First multi-view architecture. Planned: 2015/01/01 - 2015/02/28



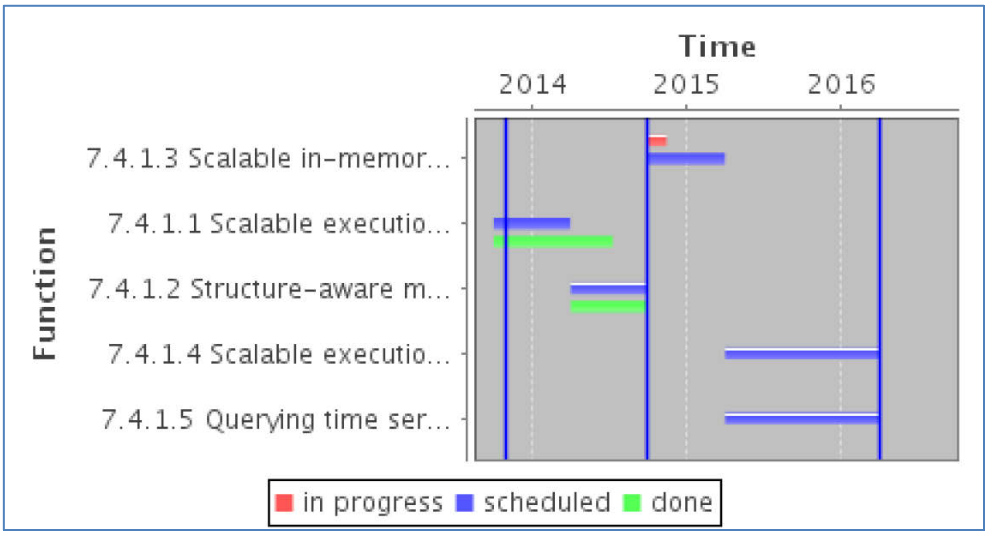
WP7.4 Exascale data management

T7.4.1 Scalable querying of peta to exascale data sets

Scalable querying of peta to exascale neuroscience data sets

Responsible: anastasia.ailamaki@epfl.ch

- 7.4.1.1 Scalable execution of range queries on spatial models. Planned: 2013/10/01 - 2014/03/31
- 7.4.1.2 Structure-aware methods for executing spatial query sequences. Planned: 2014/04/01 - 2014/09/30
- 7.4.1.3 Scalable in-memory spatial join. Planned: 2014/10/01 - 2015/03/31
- 7.4.1.4 Scalable execution of disk-based, large-scale spatial joins. Planned: 2015/04/01 - 2016/03/31
- 7.4.1.5 Querying time series with spatio-temporal predicates. Planned: 2015/04/01 - 2016/03/31

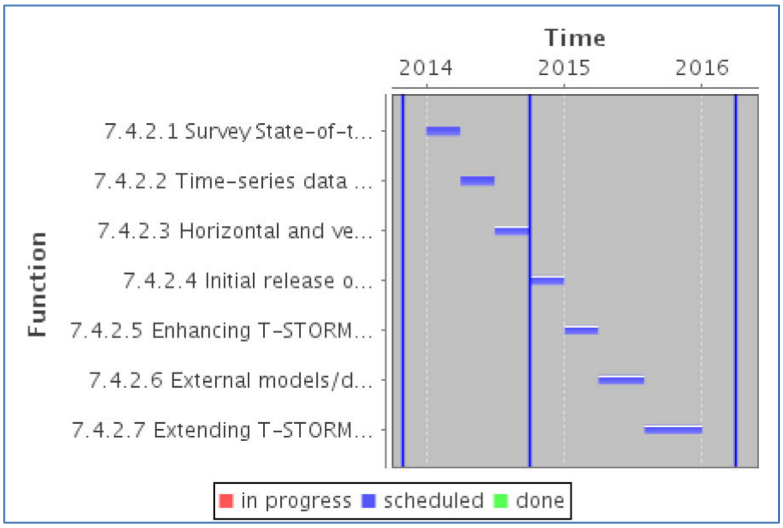


T7.4.2 Exascale data analytics

Prototype system to perform deep, real-time analytics on exascale data

Responsible: minos@softnet.tuc.gr

- 7.4.2.1 Survey State-of-the-Art. Planned: 2014/01/01 - 2014/03/31
- 7.4.2.2 Time-series data mining in STORM. Planned: 2014/04/01 - 2014/06/30
- 7.4.2.3 Horizontal and vertical scaling. Planned: 2014/07/01 - 2014/09/30
- 7.4.2.4 Initial release of T-STORM. Planned: 2014/10/01 - 2014/12/31
- 7.4.2.5 Enhancing T-STORM functionality. Planned: 2015/01/01 - 2015/03/31
- 7.4.2.6 External models/data sources in T-STORM. Planned: 2015/04/01 - 2015/07/31
- 7.4.2.7 Extending T-STORM functionality and HPC Platform integration. Planned: 2015/08/01 - 2015/12/31

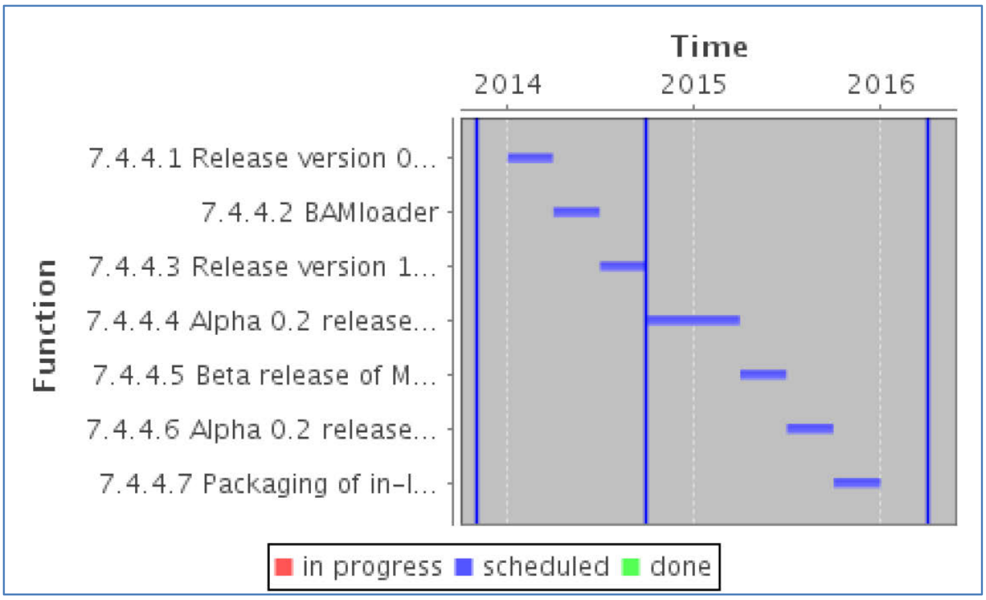


T7.4.4 Array-based data processing models

Array-based data processing models

Responsible: martin.kersten@cwi.nl

- 7.4.4.1 Release version 0.9 of MonetDB/R. Planned: 2014/01/01 - 2014/03/31
- 7.4.4.2 BAMloader. Planned: 2014/04/01 - 2014/06/30
- 7.4.4.3 Release version 1.0 of MonetDB/R. Planned: 2014/07/01 - 2014/09/30
- 7.4.4.4 Alpha 0.2 release of MonetDB/Python. Planned: 2014/10/01 - 2015/03/31
- 7.4.4.5 Beta release of MonetDB/SciQL. Planned: 2015/04/01 - 2015/06/30
- 7.4.4.6 Alpha 0.2 release of MonetDB/Javascript. Planned: 2015/07/01 - 2015/09/30
- 7.4.4.7 Packaging of in-lined language bindings. Planned: 2015/10/01 - 2015/12/31

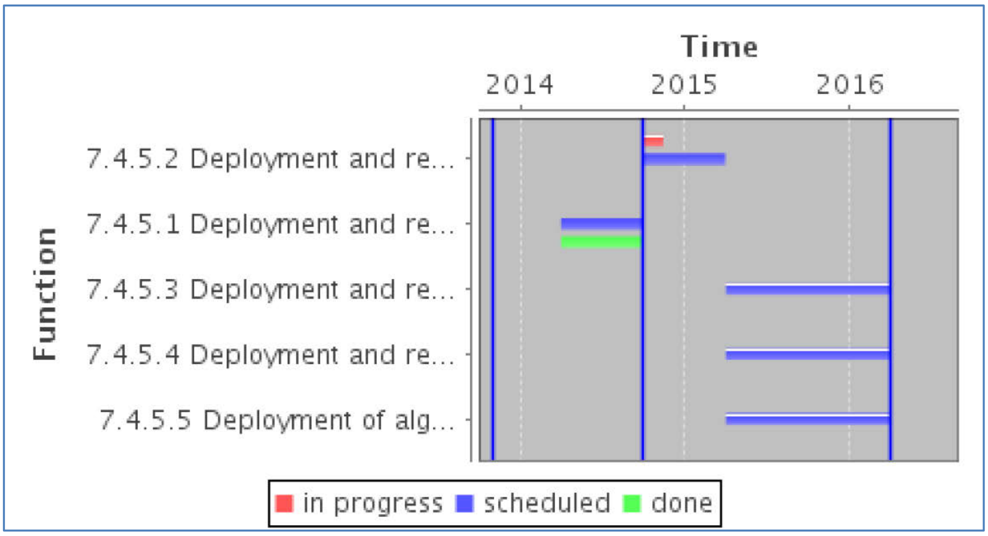


T7.4.5 Data Platform dissemination and Integration

Algorithm and method development and deployment: quality management, installation, tech. support

Responsible: anastasia.ailamaki@epfl.ch

- 7.4.5.1 Deployment and release of software for range queries on spatial models. Planned: 2014/04/01 - 2014/09/30
- 7.4.5.2 Deployment and release of structure-aware methods for the efficient execution of spatial query sequence Planned: 2014/10/01 - 2015/03/31
- 7.4.5.3 Deployment and release of scalable in-memory spatial join. Planned: 2015/04/01 - 2016/03/31
- 7.4.5.4 Deployment and release of algorithm for disk-based, large-scale spatial joins. Planned: 2015/04/01 - 2016/03/31
- 7.4.5.5 Deployment of algorithms for querying time series with spatio-temporal predicates. Planned: 2015/04/01 - 2016/03/31v

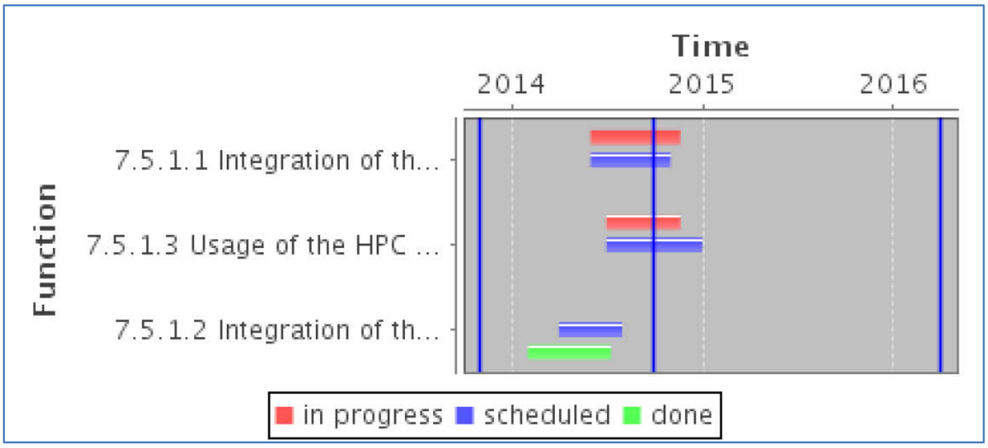


WP7.5 High Performance Computing Platform: integration and operations

T7.5.1 The HBP Supercomputer for brain modelling and simulation

Analysing resource and software requirements, implementation and assignment of user projects Responsible: k.wolkersdorfer@fz-juelich.de

- 7.5.1.1 Integration of the HBP Supercomputer into the Single Sign-On (SP7-FR-002). Planned: 2014/06/01 - 2014/10/31
- 7.5.1.2 Integration of the HBP Supercomputer within the PRACE network (see Section 2.6.1.6). Planned: 2014/04/01 - 2014/07/31
- 7.5.1.3 Usage of the HPC Platform to submit workloads to the HBP supercomputer (SP7-FR-003). Planned: 2014/07/01 - 2014/12/31

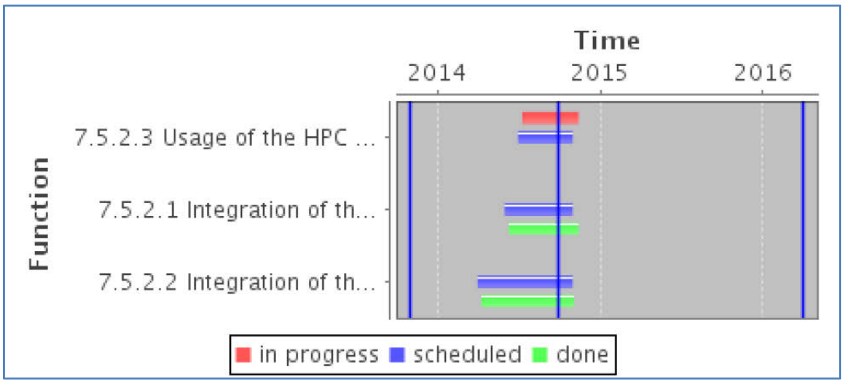


T7.5.2 The HBP Development System

Make available existing supercomputer resources dedicated to brain simulation and hosted at CSCS

Responsible: cmurtrie@cscs.ch

- 7.5.2.1 Integration of the HBP Development System into the Single Sign-On (SP7-FR-002). Planned: 2014/06/01 - 2014/10/31
- 7.5.2.2 Integration of the HBP Development System within the PRACE network (see Section 2.6.1.6). Planned: 2014/04/01 - 2014/10/31
- 7.5.2.3 Usage of the HPC Platform to submit workloads to the HBP Development System (SP7-FR-003). Planned: 2014/07/01 - 2014/10/31

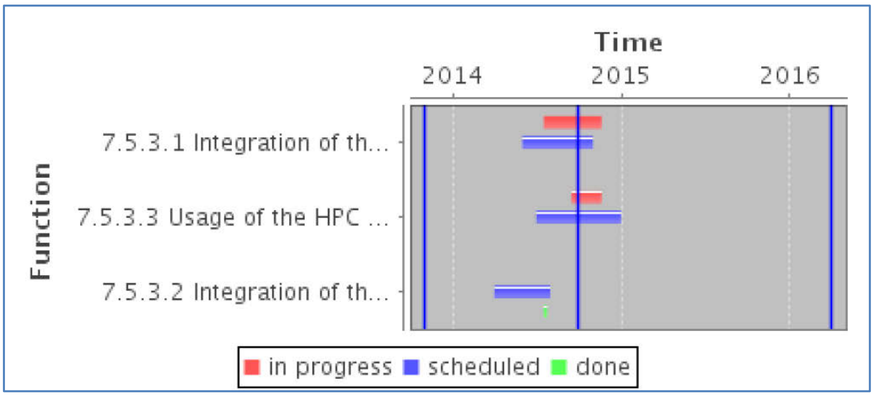


T7.5.3 The HBP supercomputer for molecular dynamics

Design of a supercomputing facility for molecular dynamics simulations

Responsible: javier.bartolome@bsc.es

- 7.5.3.1 Integration of the HBP Supercomputer for Molecular Dynamics into the Single Sign-On (SP7-FR-002). Planned: 2014/06/01 - 2014/10/31
- 7.5.3.2 Integration of the HBP Supercomputer for Molecular Dynamics into HBP within the PRACE network. Planned: 2014/04/01 - 2014/07/31
- 7.5.3.3 Usage of the HPC Platform to submit workloads to the HBP Supercomputer for Molecular Dynamics. Planned: 2014/07/01 - 2014/12/31

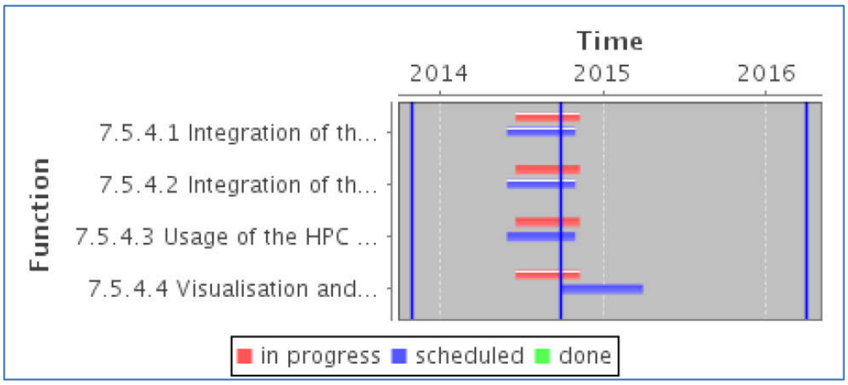


T7.5.4 The HBP supercomputer for massive data analytics

The HBP supercomputer for massive data analytics

Responsible: g.erbacci@cineca.it

- 7.5.4.1 Integration of the HBP Supercomputer for Massive Data Analytics into the Single Sign-On (SP7-FR-002). Planned: 2014/06/01 - 2014/10/31
- 7.5.4.2 Integration of the HBP Supercomputer for Massive Data Analytics into HBP within the PRACE network. Planned: 2014/06/01 - 2014/10/31
- 7.5.4.3 Usage of the HPC Platform to submit workloads to the HBP Supercomputer for Massive Data Analytics. Planned: 2014/06/01 - 2014/10/31
- 7.5.4.4 Visualisation and post-processing. Planned: 2014/10/01 - 2015/03/31

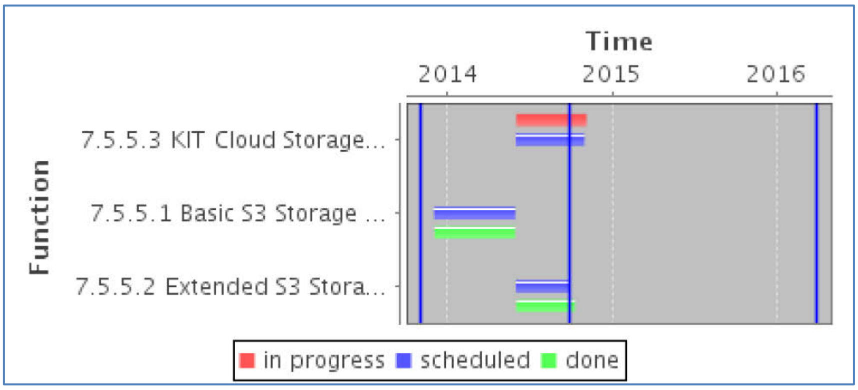


T7.5.5 HBP Cloud services

Technological solutions providing HBP Platform users acces to cloud-storage and computing resources

Responsible: diana.gudu@kit.edu

- 7.5.5.1 Basic S3 Storage service. Planned: 2013/12/01 - 2014/05/31
- 7.5.5.2 Extended S3 Storage service with regular back-up. Planned: 2014/06/01 - 2014/09/30
- 7.5.5.3 KIT Cloud Storage user authentication. Planned: 2014/06/01 - 2014/10/31

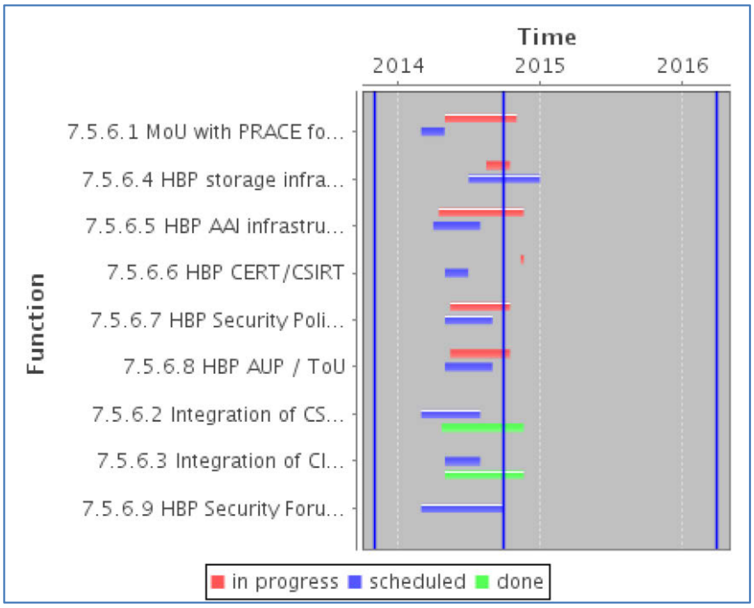


T7.5.6 Supporting infrastructure - networking. storage and monitoring

Supporting infrastructure - networking. storage and monitoring

Responsible: r.niederberger@fz-juelich.de

- 7.5.6.1 MoU with PRACE for network usage. Planned: 2014/03/01 - 2014/04/30
- 7.5.6.2 Integration of CSCS and EPFL into the PRACE dedicated network. Planned: 2014/03/01 - 2014/07/31
- 7.5.6.3 Integration of Cloud storage system at KIT into the network infrastructure. Planned: 2014/05/01 - 2014/07/31
- 7.5.6.4 HBP storage infrastructure. Planned: 2014/07/01 - 2014/12/31
- 7.5.6.5 HBP AAI infrastructure. Planned: 2014/04/01 - 2014/07/31
- 7.5.6.6 HBP CERT/CSIRT. Planned: 2014/05/01 - 2014/06/30
- 7.5.6.7 HBP Security Policy. Planned: 2014/05/01 - 2014/08/31
- 7.5.6.8 HBP AUP / ToU. Planned: 2014/05/01 - 2014/08/31
- 7.5.6.9 HBP Security Forum. Planned: 2014/03/01 - 2014/09/30

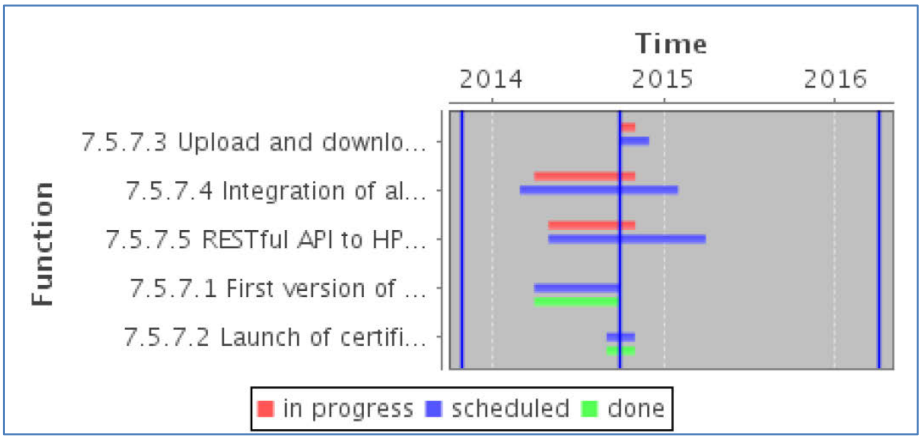


T7.5.7 HPC Platform website construction and maintenance

HPC Platform website construction and maintenance

Responsible: d.mallmann@fz-juelich.de

- 7.5.7.1 First version of the HBP HPC Platform Website. Planned: 2014/04/01 - 2014/09/30
- 7.5.7.2 Launch of certified and registered applications on different HPC resources. Planned: 2014/09/01 - 2014/10/31
- 7.5.7.3 Upload and download to and from HPC resources and HBP data repositories. Planned: 2014/10/01 - 2014/11/30
- 7.5.7.4 Integration of all HPC systems of the participating sites (JUELICH, CSCS, BSC and CINECA) with the HPC Platform. Planned: 2014/03/01 - 2015/01/31
- 7.5.7.5 RESTful API to HPC Platform. Planned: 2014/05/01 - 2015/03/31



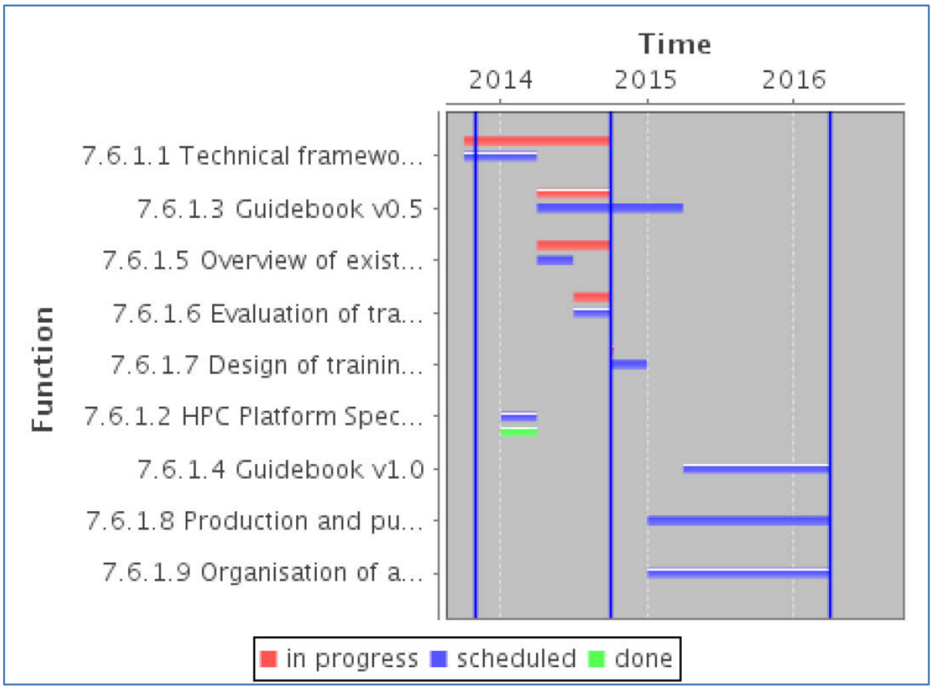
WP7.6 High Performance Computing Platform: user support and community building

T7.6.1 HPC Platform documentation and user training

HPC Platform documentation and user training

Responsible: b.orth@fz-juelich.de

- 7.6.1.1 Technical framework and guidelines for documentation. Planned: 2013/10/01 - 2014/03/31
- 7.6.1.2 HPC Platform Specification. Planned: 2014/01/01 - 2014/03/31
- 7.6.1.3 Guidebook v0.5. Planned: 2014/04/01 - 2015/03/31
- 7.6.1.4 Guidebook v1.0. Planned: 2015/04/01 - 2016/03/31
- 7.6.1.5 Overview of existing training courses. Planned: 2014/04/01 - 2014/06/30
- 7.6.1.6 Evaluation of training requirements. Planned: 2014/07/01 - 2014/09/30
- 7.6.1.7 Design of training material and events. Planned: 2014/10/01 - 2014/12/31
- 7.6.1.8 Production and publication of training material. Planned: 2015/01/01 - 2016/03/31
- 7.6.1.9 Organisation of a training event. Planned: 2015/01/01 - 2016/03/31



Annex C: Glossary

Term	Definition
AAA	Authentication, Authorisation and Accounting
AAI	Authentication and Authorisation Infrastructure
API	Application Programming Interface
Artifact	a high data-density discrete data element, primarily meant to denote a file larger than ~10kB which is not human readable or editable.
AUP	Acceptable Use Policy
CAVE	A high resolution, 3D fully immersive virtual reality environment where projectors are directed to three, four, five or six of the walls of a room-sized cube
CERT	Community Emergency Response Team
Cockpit	Desktop, display wall or CAVE visualisation resource with a mechanism for good data locality.
Compute resource	A computer or collection of computers where a Job can be executed
CSIRT	Computer Security Incident Response Team
DBMS	Database Management System
DEISA	Distributed European Infrastructure for Supercomputing Applications, a European Union supercomputer project
EUDAT	European data infrastructure, a project to provide a pan-European solution to the challenge of data proliferation in Europe's scientific and research communities
GÉANT	The pan-European research and education network that interconnects Europe's NRENs
GUI	Graphical User Interface
HBP Unified Portal (HBP-UP)	The unifying web interface through which the web accessible components of the 6 HBP Platforms and all other HBP activity are delivered.
Host	A single operating system instance, running on virtualised or real hardware
Job	An instance of an execution of a Task on a compute resource. For some Tasks the compute resource will be selected by the user in the UP on job launch. For other Tasks the execution will be decided by the Task.
LDAP	Lightweight Directory Access Protocol
MoU	Memorandum of Understanding
MPI	Message Passing Interface, for more information see http://en.wikipedia.org/wiki/Message_Passing_Interface
NDA	Non-Disclosure Agreement
NREN	National Research and Education Network
Parameter	A low data-density discrete data element, primarily meant to denote a value that one might enter into a single form element. It might also be used to refer to a richer configuration document containing a group of settings.

Term	Definition
Platform	Software components: libraries, services, APIs and their documentation that are to be used to build portals or cockpits.
PRACE	Partnership for Advanced Computing in Europe, a project with the mission to enable high impact scientific discovery and engineering research and development across all disciplines to enhance European competitiveness for the benefit of society
Resources	Parameters, Artifacts, services, or compute capacity
REST	Acronym for REpresentational State Transfer, for a definition see: http://en.wikipedia.org/wiki/Representational_state_transfer
Service	A software function performed by a third party for a User or other Service. Services consume Parameters, Artifacts and compute capacity. Services produce Artifacts and parameters.
Site	A collection of hosts collected together in a single location. The grouping is potentially arbitrary.
Task	A logical software unit. A Task takes Artifacts and Parameters as input. A Task produces Artifacts and Parameters as output. It may or may not be visible as a Service. A Task identifies its dependencies and its default parameters. Concretely, it is a software component that combines: • A Python-based Task entry point • A Git repository or Python package index URL for the Task, a repository revision or package content specified by sha1 • A requirements file specifying all required dependencies. Tasks can have dependencies in non-Python languages, but these dependencies must be packaged for reproducible deployment
Task definition	The collection of data that defines an individual Task
Task repository	A database of Task definitions
ToU	Terms of Use
Workflow	A tree of decision structures and Tasks. A Workflow takes Artifacts and Parameters as input. A Workflow produces Artifacts and Parameters as output. It may or may not be visible as a Service.

Annex D: References

[1] PCP Planning Document (Deliverable D7.7.1)
[2] High Performance Computing Platform Specification (Deliverable D7.