D5.1– Proof-of Concept work set-up
Version 1.0

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Change Log

Version	Author	Description of Change
v0.1	C. Niethammer	Initial Draft
v0.2	C. Niethammer	Changes addressing comments from the internal review (BSC)
v0.3	C. Niethammer	Changes addressing comments from the internal review (RWTH)
v1.0	C. Niethammer	Final version for releases to the EC.

Contents

Executive Summary

This document presents the operation procedure for the third POP service activity, namely the Proof-of-Concept activity, as conducted in work package WP5, as well as interactions with activities in other work packages, in particular those related to training and dissemination.

The procedure addresses the selection of cases for Proof-of-Concept activity, including prerequisites, association to POP partners which will conduct the activity, and cancellation of the activity. In both cases we aim to maximize the efficiency of POP resource utilisation and thus impact.

In addition, this document presents the procedure related to the actual conduction of the activity, interaction with the customer, the Proof-of-Concept plan, which defines the scope of the activity and measures to monitor activity progress, and finally reporting.

1 Introduction

Within the POP Centre of Excellence three types of services are provided which build upon each other: Performance Audit, Performance Plan and Proof-of-Concept. While the first two services focus on the overall analysis and detailed identification of performance issues in customer codes together with a plan to address these issues, the Proof-of-Concept service shall showcase how to implement suggested performance optimizations to the customers mostly based on mock-ups. A mock-up collection (mock-up tests base) will be created serving as show case of best practices and will also provide material helpful for the training activities in WP6. Resulting improvements will often lead to publications which can be used in the dissemination process in WP7. The Proof-of-Concept service is implemented in work WP5.

This deliverable describes the work performed in WP5 in the first months of the project.

During the first months of the project, we have defined a basic operational procedure to implement this service, identified must-have requirements and main steps based on the partner's previous experience. Because this service builds up on the results of the two performance services and each proof of concept has an estimated duration of six months, no real service request could be processed so far in the first three months. However, during the writing of this deliverable, there have already some candidates been identified and are under investigation in the analysis preserve, so they may use this service after passing through the performance services.

2 Proof-of-Concept procedure

Based on previous experience from the partners in both commercial and academic support and service offerings, we have defined a basic operational procedure to implement the Proof-of-Concept service. This procedure is defined in a very generic way, because the performed actions will be extremely case specific.

2.1 Proof-of-Concept case selection

At first, customers shall request the Proof-of-Concept service only after, or as a result of, either a Performance-Audit or a Performance-Plan activity. This requirement ensures that Proof-of-Concept work will address the specific, severe, and well understood performance bottlenecks in customer codes and thus have the highest possible impact on code performance.

While a typical Performance Plan activity takes between one and three months, Proof-of-Concept activities are expected to bind personnel resources for up to 6 months. It is therefore very important to select only relevant cases for this service level.

Depending on the future amount of requests for this service, a strict selection process may become necessary to limit the number of codes worked on. Here results from the Performance Plan about quantified improvement potential may become a very important information.

Having a code analysis performed by POP staff beforehand, will also guarantee that all legal requirements and contract conditions are fulfilled and that a working environment for the analysis tools is already available. The recommendations of the Performance-Plan activity will be the starting point for the Proof-of-Concept activity. Also, results from the former activity will be the reference for the evaluation of performance improvements.

2.2 Partner association

After agreeing on an interesting Proof-of-Concept case, one partner will be selected and take responsibility for the conduction of the activity. In most cases this will be the partner, which did the performance evaluation for this particular code and use-case, as he has good knowledge of the code and it's issues. In case that a different POP partner has significantly higher expertise with the proposed optimisation work, that partner will be selected. Depending on the issue, the conducting partner may request support from or encourage other partners to work on the service cooperatively.

2.3 Cancellation of activity

If POP staff encounter any issues, which prevents the success of the service or increases the effort to an unjustifiable level, POP will finish the service at this point. This also includes poor communication and high response times from the customer side. The results obtained to that point, will be available to the customer on request.

Any other unforeseen issue, even if this is beyond the control of the customer, which would result in inefficient use of POP resources, can also justify the cancellation of the activity.

2.4 Proof-of-Concept plan

Key point for any Proof-of-Concept work is a very close interaction with the customer whose knowledge about the algorithms, code structure and usage scenarios are essential for the success of this service. The customer thus has to nominate a direct technical contact in order to keep communication overhead as low as possible.

Starting point of the actual service activity will be the recommendations from a Performance Plan. The Proof-of-Concept service may have different results:

- implementation of optimisations or code refactoring in the application itself
- implementation of optimisations or code refactoring in a demonstrator based on a kernel which was extracted from the application
- implementation of optimisations or code refactoring in a mock-up of the application

Together with the technical contact the performance issue will be discussed and the type of result decided on. Depending on the issue and result type selected the responsible partner may be changed at this point.

Following the suggestions from the Performance Plan a detail Proof-of-Concept plan shall be set up how to achieve the desired result. The plan shall also include metrics to monitor the progress. These metrics will be selected from the Performance-Plan.

For the implementation of optimisations or code refactoring in the application itself, POP has to get access to and the customer shall provide documentation about the code. POP staff will then do the actual code work with support of the technical contact.

In the case of a demonstrator based on a kernel, the kernel will be extracted by the customer. The details of the kernel extraction will be decided together—by POP staff and the customer—in a way, ensuring that POP can work on the kernel and the customer can later on bring the changes back into his original code. Technical details which have to be agreed on are, e.g., clear interfaces to the kernel, input and output data for this interface to start and validate the kernel and documentation of the kernel code. POP will then perform the necessary improvements on this kernel and evaluate the work based on the provided input and output data sets using the interfaces defined before.

For results in form of a mock-up, the mock-up will be provided by the customer. POP staff and the customer will decide on the form of the mock-up. It is important that the provided mock-up mimics the behaviour of the real application as accurate as possible so that the results are transferable later on, ensuring the ROI of the effort. POP will do a sanity check on the mock-up to ensure this. Also the mock-up must be well suited to implement the suggested performance optimisations and the customer shall include documentation about it. POP staff will then apply the suggested improvement onto the mock-up. If the mock-up is not well-suited, POP may decide to finish work at this point as described above.

2.5 Proof-of-Concept implementation

The Proof-of-Concept implementation step performs the actual work of this service implementing the suggestions based on the Proof-of-Concept plan. It will include regular interaction between the technical contact and POP staff to showcase the progress to the customer as well as obtaining feedback from the customer helping with the implementation and ensuring good customer satisfaction. This is obviously important in the case of the result being implemented directly into the original application, but also in the case of kernel extraction and mock-up.

Along with the implementation the progress will be monitored with the selected performance metric.

2.6 Proof-of-Concept reporting

Due to the close interaction of POP staff and the customer's technical contact, the customer is always up to date with intermediate steps and results. The monitoring based on the predefined performance metric minimizes the risk of miss-optimisations in an early stage and will allow direct feedback about the current status.

The final result will be presented in detail to the customer by POP at the end of the activity. This will include

- the description of the initial state as identified by the performance analysis services beforehand
- a detailed description of the considered performance issue
- a description of the suggested solution in form of the Proof-of-Concept plan
- a description of the actually performed steps and the implementation to overcome the performance issue
- an evaluation of the improvements in comparison to the initial state.

3 Interaction with other activities

3.1 Interaction with training/mock-up tests base

In general, the Proof-of-Concept work can be seen as focused training for a customer, as we showcase him how to implement the suggestions from the Performance Plan. Beside the service work targeting the "training" of a single customer, WP5 will also establish a connection to the training activities in WP6 which can target a much wider audience. Two scenarios for interaction are identified:

First, interesting optimization work can be used as a demonstrator for courses and training materials. Here the mock-up tests base will serve as the main source of information for WP6. The mock-ups from the collection can be used, for instance, to demonstrate the application of performance tools to detect prominent issues and also to illustrate the individual stages of the whole performance analysis workflow. One additional aim is to collect mock-ups from a broad range of users and technical disciplines, particularly those not yet present in the well-known benchmark suites, to provide new and highly valuable application case studies. Therefore the mock-up tests base will include information about the domain (Physics, mechanical engineering, ...) of the mock-up, the partner which performed the service work, a rough description of the original problem and the algorithm which was optimized as well as the form of the optimization along with some results from the evaluation.

Second training activities may request material, e.g., in form of a mock-up. This will be treated similar to a regular customer request.

From the Proof-of-Concept work best practice will be identified and discussed with the partners in the training activities. Clearly this is something which must be expected for the later phases in the project, when more services are performed, and POP has a better understanding of user communities and their specific issues and needs.

3.2 Interaction with dissemination

After a successful Proof-of-Concept service the final service chain will span a performance analysis of the original problem from the performance audit, the suggestions from the performance plan, a description of the implementation as well as an evaluation based on a customer use-case of the work at the end.

In most cases this will be enough material for a publication in the scientific community. POP will considers therefore to do such a publication and if decided to do so, suggest the customer to take part into the publication. The publication will then be provided to WP7 for dissemination purpose.

3.3 Feedback to tools community

The Proof-of-Concept work will make frequent use of performance tools along the service activities as they play a key role for monitoring of the progress and evaluation of the results. During their use we may identify issues of and possible improvements for the performance tools. If feasible within the project we will contact the developers, report our findings and encourage them to consider these for future releases of their tools.

4 Conclusion

This document presents the operation procedure for the third POP service activity, namely the Proof-of-Concept activity, as conducted in work package WP5, as well as interactions with activities in other work packages, in particular those related to training and dissemination.

The procedure addresses selection of cases for Proof-of-Concept activity, including pre-requisites, association to POP partner which will conduct the activity, and cancellation of the activity. In both cases we aim to maximize the efficiency of POP resource utilisation and thus impact.

Secondly, we present procedure related to the actual conduction of the activity, interaction with the customer, the Proof-of-Concept plan, which defines the scope of the activity and ways to monitor progress, and finally reporting.

As the Proof-of-Concept service depends on the results from the previous services the procedure could not be tested so far - but initial Proof-of-Concept candidates are identified at the moment of writing this deliverable.

Acronyms and Abbreviations

- BSC: Barcelona Supercomputing Center
- D: deliverable
- HLRS: High Performance Computing Centre (University of Stuttgart)
- M: Month
- POP: Performance Optimization and Productivity
- R: Report / Risk
- ROI: Return On Investment
- RWTH Aachen: Rheinisch-Westfaelische Technische Hochschule Aachen
- USTUTT (HLRS): University of Stuttgart
- WP: Work Package