D3.3 Final Customer Feedback Report
Version 0

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Change Log

Version	Author	Description of Change
V0.1	Paul d'Escodeca de Boisse	Initial Draft
V0.2	Jesus Labarta	Reviewed version
V0.3	Samir Ben Chaabane	Revised version
V1.0	Paul d'Escodeca de Boisse	Final version

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Executive Summary

This report summarizes the findings of the customer advocate work package (WP3) and how they influenced its operation during the whole project. It provides a list of recommendations considered in the operation of the Centre of Excellence to maximize customers (users) satisfaction. The feedback from users on the quality of POP CoE services they received, is detailed and analysed in this report.

1. Introduction

The objective of WP3 "Customer Advocacy" is to verify that the activities of the POP CoE are being performed to the satisfaction of POP users and to provide feedback to the governing board of the project. The customer advocate collects evaluations from users and then uses this information to influence project operations, to help ensure that the target of more than 90% customer satisfaction is met.

To achieve this objective, the methodology previously described in deliverable D3.1 and D3.2 is applied. This methodology includes several types of interaction, with both, the users - to collect their feedback, and the POP analysts - to relay this information to improve the quality of the services. This may involve:

- Invitations sent to users to fill in the appropriate survey, each time a POP service had been completed and the corresponding report received by them.
- The survey feedback is transmitted to the POP analysts who performed the service so that they can better satisfy the needs of users. The survey is also published on the WP3 POP Wiki page[i].
- A given survey may be followed up by an interview, to explore or clarify potential issues or to better understand the user's expectations.The interview is also an opportunity to keep in touch with the users and to keep listinning to their needs. The minutes of the interview are validated by the user and then published on the WP3 POP Wiki page[ii].

All these actions not only help guarantee the best quality of POP services but also enable us to maintain links with POP users to build a POP user community.
The following sections of the report detail the customer feedback and present the suggestions provided to POP experts to maintain and enhance the quality of the services provided by the POP CoE.

2. Customer Feedback

2.1 Customer Feedback through Surveys

Each time a Performance Assessment or a Proof-of-Concept is completed, the corresponding survey is sent to the end-user who benefited from this POP service and in most cases, an interview by video conferencing is organized to obtain more details or clarifications about the answers or requests of the user. All surveys are published on the POP2 Wiki Portal, POP experts can consult and appreciate the feedback related to their work, and if necessary take the appropriate measures to correct any issu.
As of today (November 20, 2021), a total of 101 answers to the surveys have been gathered for both, PA and POC services.
Copies of the users' answers are assembled in Annex I for the performance assessment (PA) surveys and Annex II for the Proof of concept (PoC) surveys.

2.1.1 Performance Assessment Feedback

Up to November 20, 127 Performance assessments were performed by POP experts and the correspondant reports deliverd to users. 127 invitations to answer the PA survey were sent to the users. We gathered 88 answers, this represents an answer rate of 70%

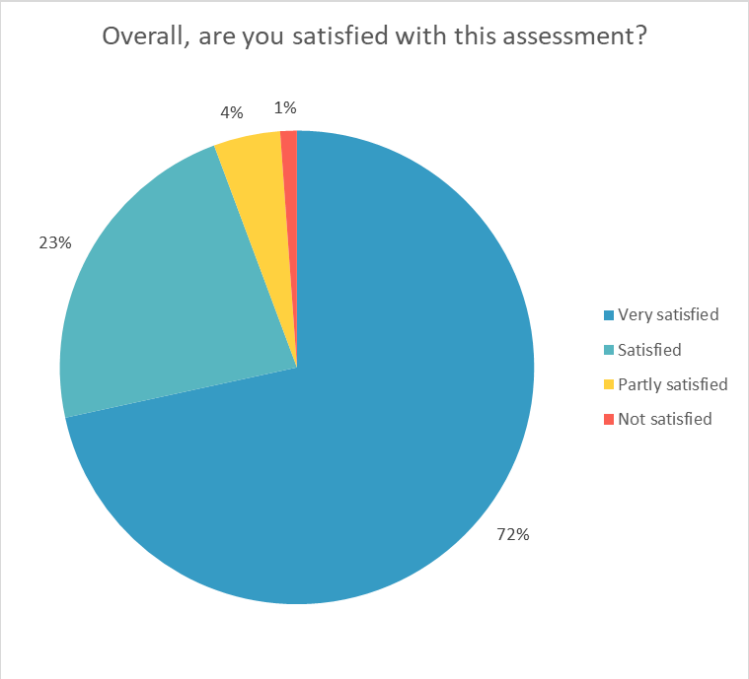

Figure 1 Performance Assessment Overall satisfaction

The overall satisfaction is very good. Indeed, more than 95% of users are satisfied or very satisfied with the PA service as shown in figure 1. A compilation of the answers to the PA survey is provided in Annex I.
Four users are partly satisfied and only one user-declared his dissatisfaction.

Table 1 presents comments of users who answered "Partly satisfied".

Reference	Overall, are you satisfied with this assessment?	Could you say why?
POP2_AR_004	Partly satisfied	I hoped for more feedback.
POP2_AR_044	Partly satisfied	Someone else from POP started the project and then left POP.
POP2_AR_074	Partly satisfied	The Analysis focused on a code region that had a high runtime only due to instrumentation overhead. Although the respective code region now is faster with the suggestions implemented from the performance report, the overall performance benefit is very small.
POP2_AR_096	Partly satisfied	Unexpected delays

Table 1, Partially satisfied user comments

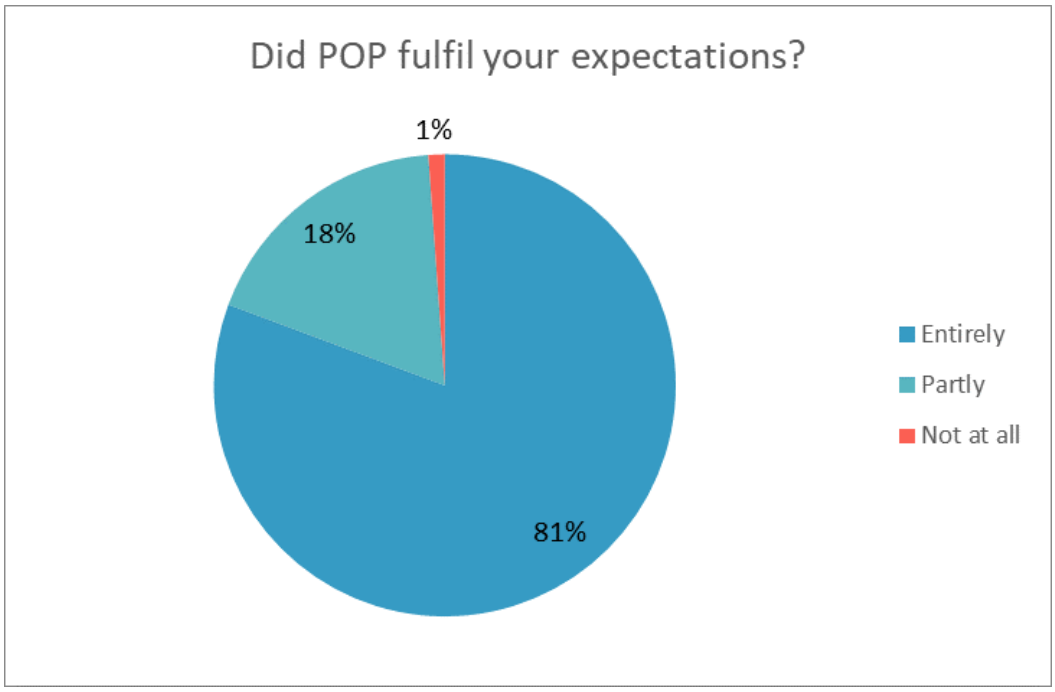

Figure 2 how users' needs are met

As shown in figure 2, 81% of users find that the PAs have fully met their expectations. Some users explain the reasons for their partial satisfaction, their comments are presented in table 2:

Reference	Any suggestions for improvement of the Performance Assessment?
POP2_AR_004	Please provide feedback proactively. I'd rather prefer to have a report with routines, or code fragments named that are the cause of the inefficient or unexpected behavior than having the performance analysis output files for self-evaluation.
POP2_AR_021	Occasionally the results were not good when using a specific number of cores. This is due to the way the equation solver was parallelized. No solution was found how to get a better way of parallelizing the solution of the linear equations
POP2_AR_023	It would have been nice to have been able to include a GPU-based system in the evaluation.
POP2_AR_034	It was very useful to get the analysis - currently, the work is ongoing to remedy the problems and to improve the efficiency
POP2_AR_051	Some issues where AMD architecture didn't support much output data so limited analysis possible. Highlighted areas of the MPI comms that were taking significant time but we have insufficient knowledge and experience to convert that result into a performance improvement.
POP2_AR_075	The POP assessment was already useful and interesting, however as discussed with the POP expert this could be made even more useful if repeated in the future for a larger, more realistic problem size.
POP2_AR_093	Comparison with other reports would be useful, but they are all confidential.

Table 2, Partly fulfill the expectation of POP User

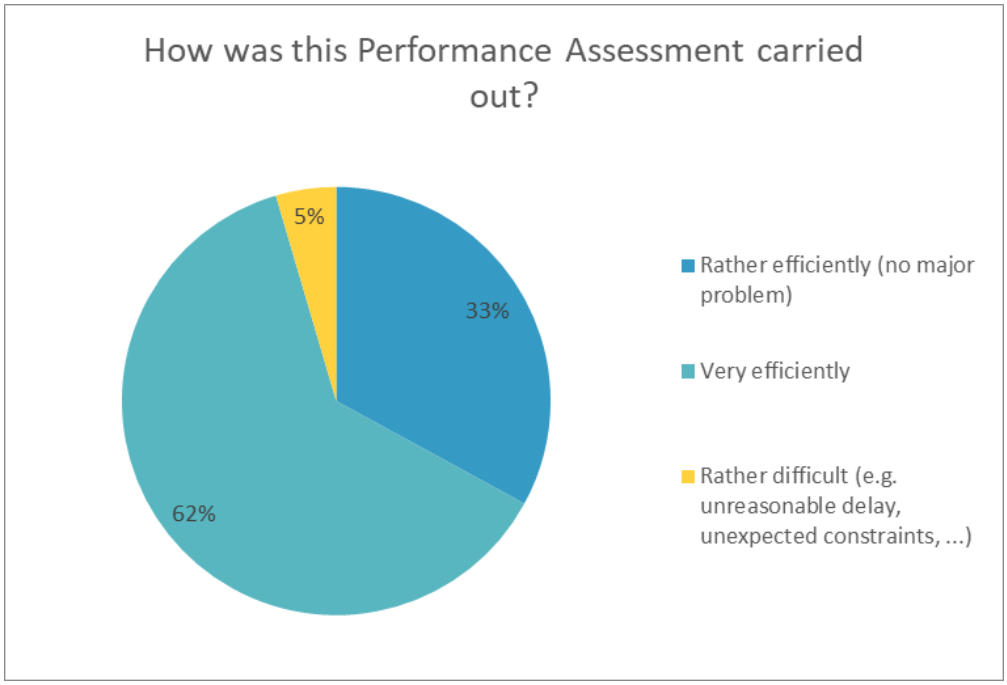

Figure 3 Performance Assessment effectiveness statistic

Concerning the way the PA was carried out, only 4 POP users found the performance analysis rather difficult. More than 95% of the users declare that their PA was efficiently or very efficiently carried out (Figure 3). According to POP users, the reasons mentioned for the few encountered difficulties are for the unexpected delay, inadaptation of tools to Python programs, change of POP expert during the assessment, and some issues of Extrae tool running on an AMD based cluster.

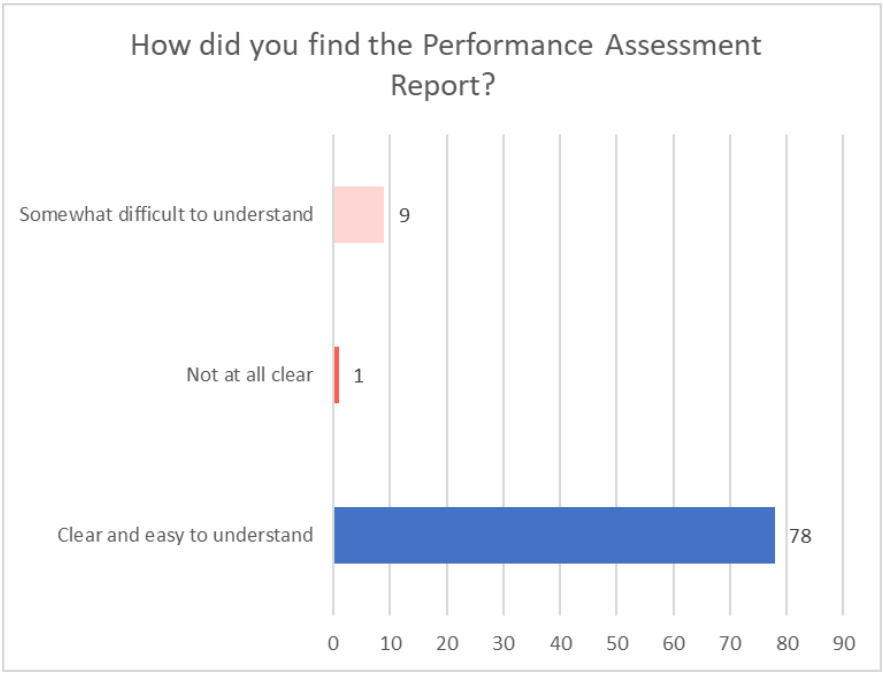

Figure 4 Users' satisfaction with PA reports

Figure 4 shows the degree of satisfaction of POP users for the report provided by POP experts. The report is the only document left by the expert after the audit, so it is very important that it is well understood by the user. More than 88% of the users find the report easy to understand whether 9 users found the report difficult to understand. This is mainly because users are not familiar with assessment tools and methodologies used by POP experts. Some of them made the following remarks:

Reference	Comments on user satisfaction with the PA report
POP2_AR_004	I never received a report. I got an email with some hints and two score-p output files. Further analysis output files were provided on the system.
POP2_AR_007	No real insights. No actionable recommendations
POP2_AR_025	Personally, I am not an informatician / IT-expert so it takes some more time to understand some plots
POP2_AR_030	It was not so clear how understanding performance projections making assumption on the values of some metrics. But conversations with experts were very important to better understand.
POP2_AR_031	Some more explanation about performance projections were needed
POP2_AR_044	It was much easier to understand when presented orally than it was as a written-only report.
POP2_AR_075	Some of the metrics were different to what I have previously encountered, however after explanation from the POP expert, things became much clearer.
POP2_AR_078	Report was clear but some of the HPC concepts are hard to really understand in order to fully benefit from the support
POP2_AR_093	What looked like poor scaling wasn't actually bad.

Table 3, Unsatisfied users with PA report

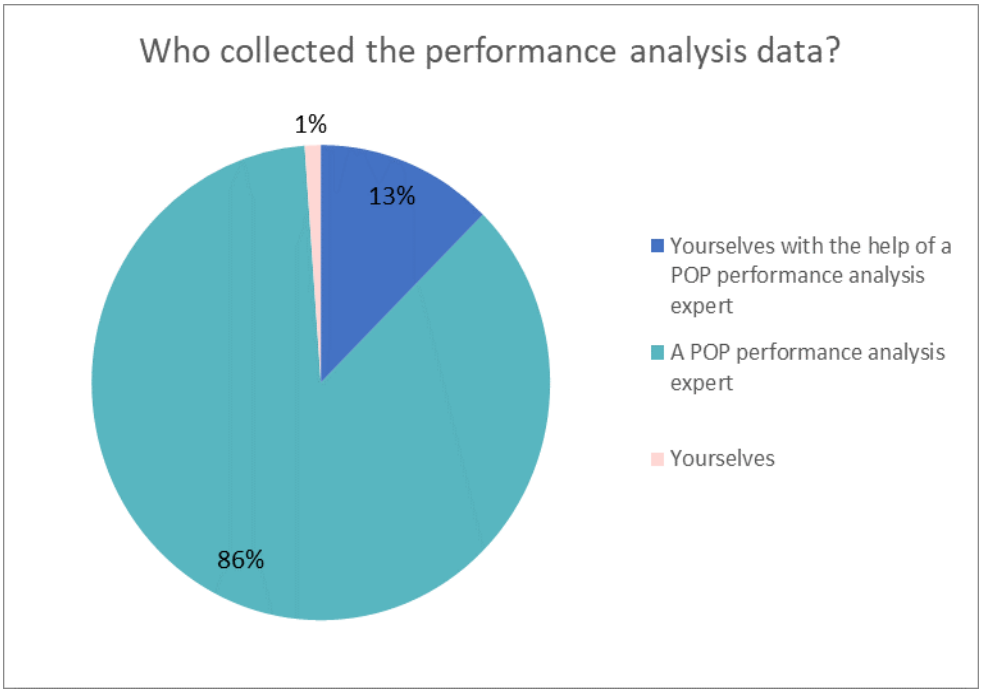

Figure 5 Performance Assessment data collection statistic

The degree of involvement of the users in the PAs varies from one user to another. The Assessment itself is performed by a POP expert; the user involvement is generally limited to the collection of the data produced by analysis tools (Figure 5).
During the performance assessment, only one user collected the data by himself, in most of the cases the user was not involved in the data collection.

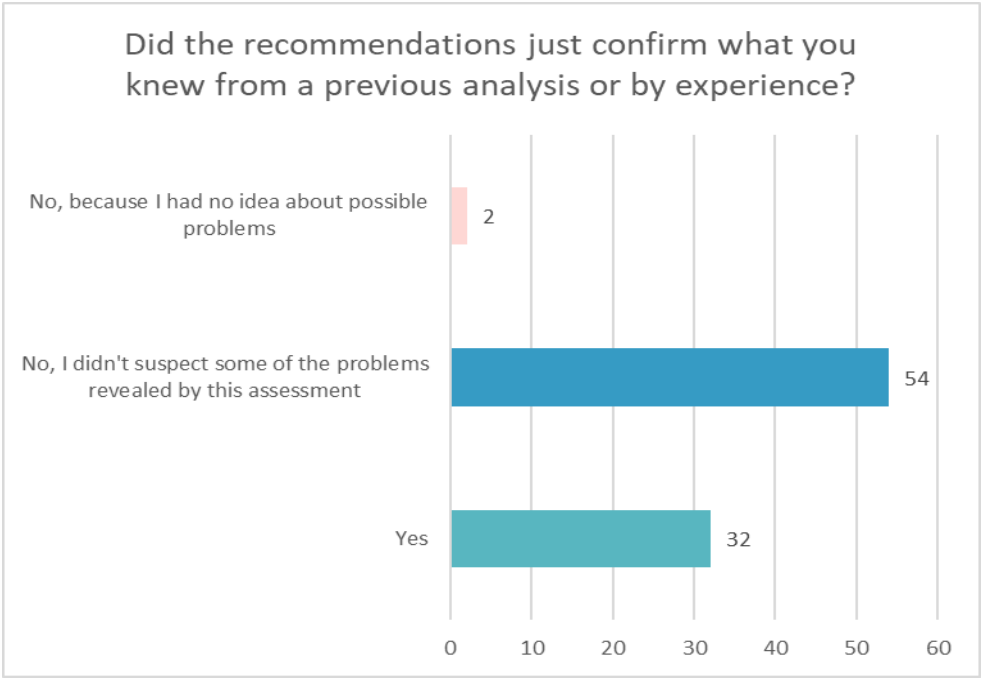

Figure 6 Performance Assessment problems expected statistics

Figure 6 indicates that most users didn't suspect the problems revealed by the assessment (61%). Only 32 of them are aware of the performance problems revealed by POP experts. This confirms the importance of the contribution made by the services provided by POP.

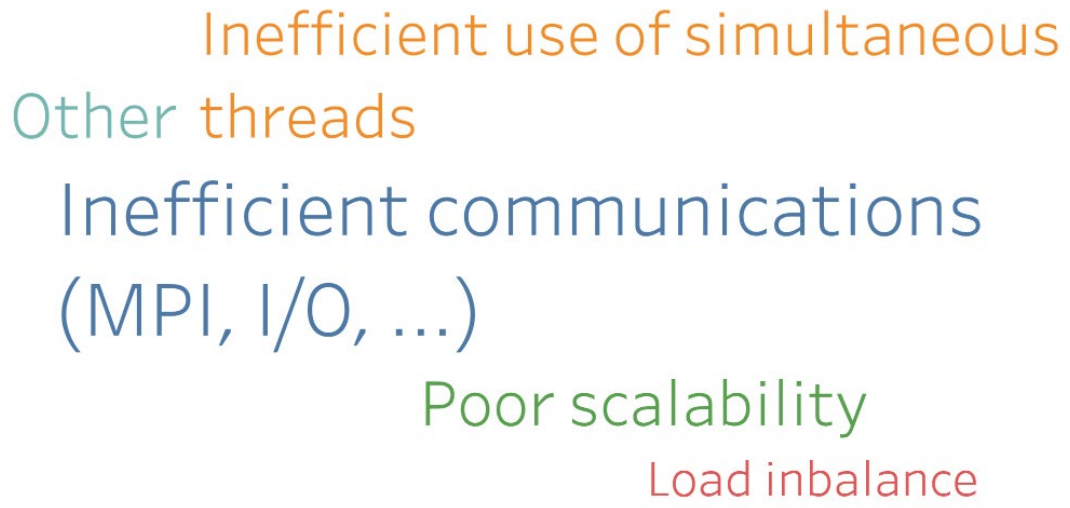

Figure 7 Performance Assessment unexpected problems

Figure 7 illustrates the main unexpected problems revealed by the assessments performed by POP experts. We find essentially inefficient communication problems, poor scalability, or load imbalance.
Some less frequent unexpected problems were reported by POP users, we can point out the following:

- Routine responsible for superlinear speedup
- Scalability degradation introduces the second level of parallelization to MPI, i.e. OpenMP
- The scalability of IPC has unexpected behavior.
- Hardware issues on specific nodes.
- Identification of replicated code
- the low arithmetic intensity in certain regions
- System noise
- Low IPC region, likely due to reading from other processes memory
- Big memory copy operations in boundary exchange routines
- Bug in implementation for higher numbers of MPI processes, inefficient load balancing in some corner cases

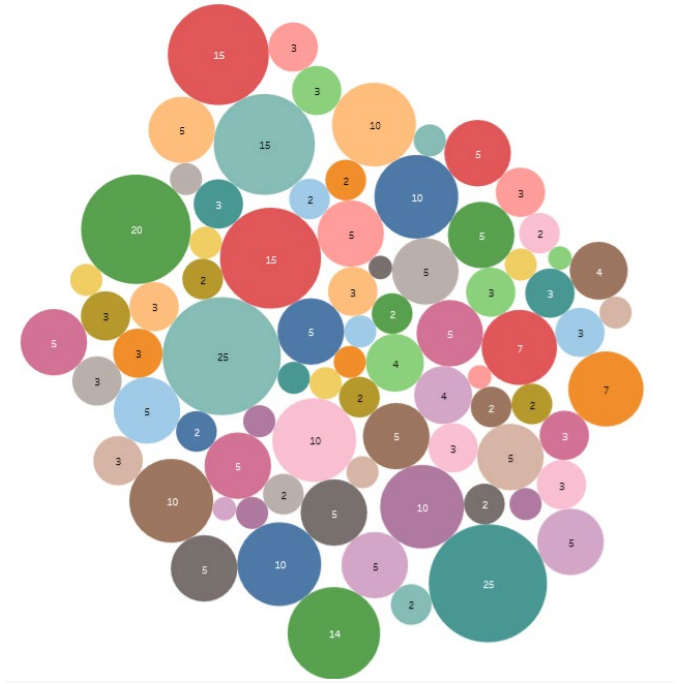

Figure 8 Performance Assessment user's effort (in days)

The effort required by the user to perform the Performance Assessment varies from a user to another and depends on the complexity of the code. In general, we observe an average effort of 5.4 days depending on the degree of involvement of the user in tools installation and data collection (Figure 8).

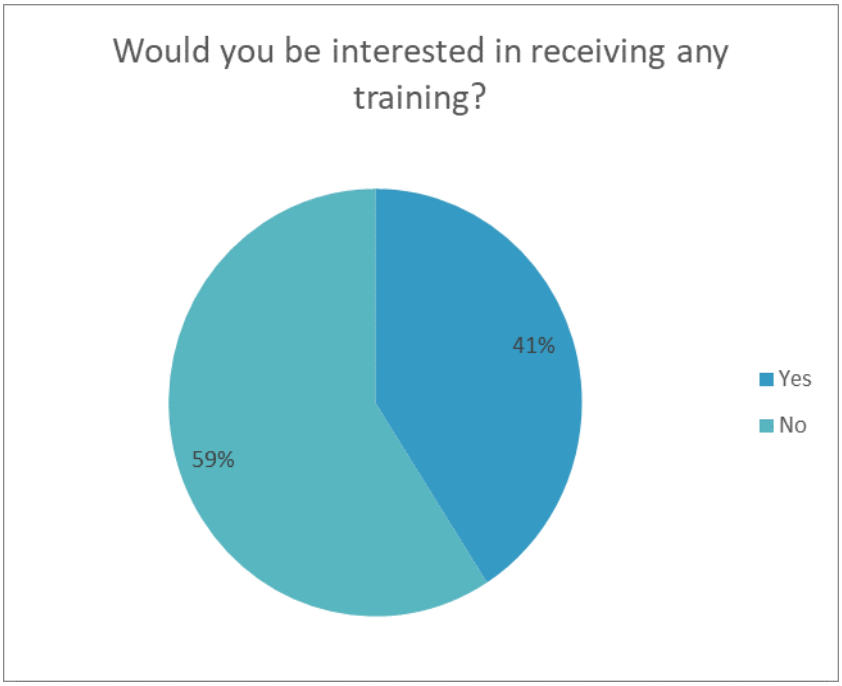

Figure 9 Request for trainings

A proportion of 41% of POP users would be interested in receiving a training (Figure 9), some of them ask for the following training:

- Bottleneck detection
- Training w/ HPC analysis tools, such as those offered by POP (Extrae / Paraver).
- Profiling tools (e.g. score-p), profiling CUDA
- OpenFOAM c++ libraries, especially their parallel structure.
- MPI HPC Optimisation
- GPU programming and porting
- Use of simultaneous threads
- Load balancing / vectorization
- Refactoring techniques

We point out that sevral trainings and workshops are offered by POP experts on these subjects, so the requests of POP uers concerning trainings are genrally satisfied.

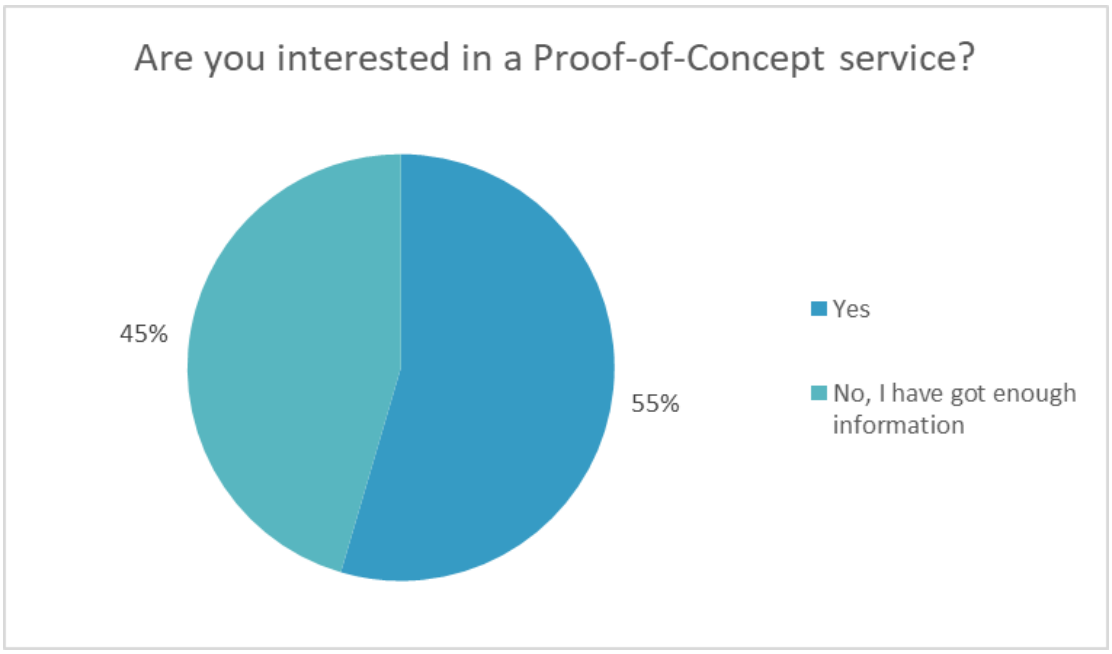

Figure 10 Proof of Concept request statistics

Several of POP users who received a PA, like to continue with a Proof of Concept. Actually, almost 55% of POP users asked for a Proof of concept in order to learn how to modify efficiently their code and improve its performance (Figure 10).

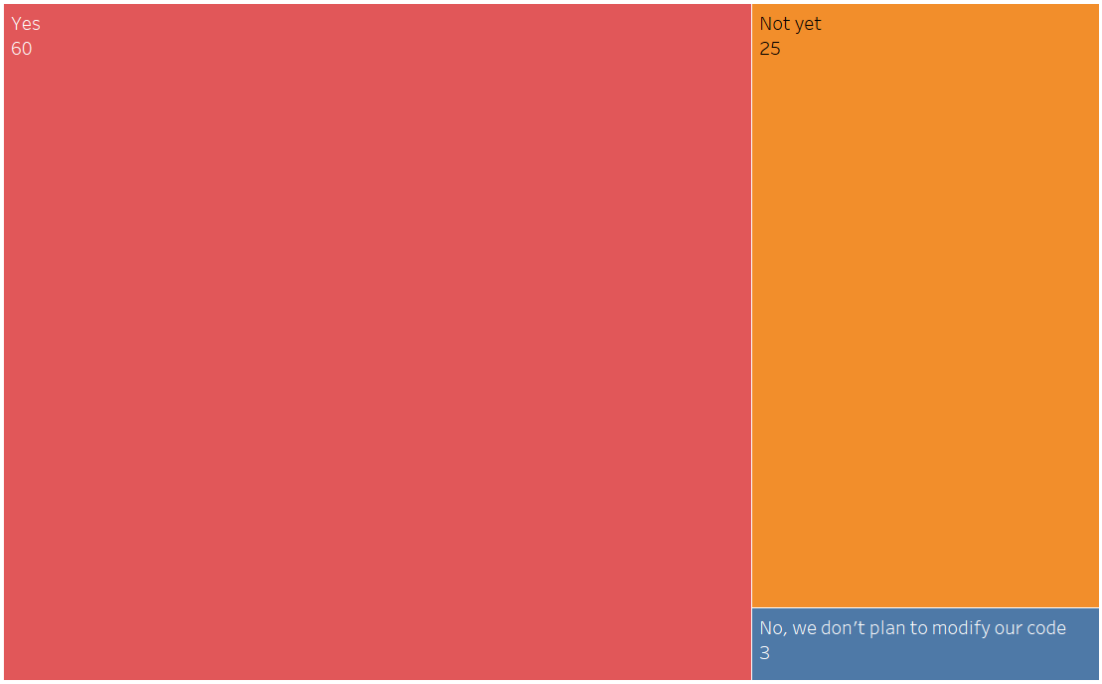

Figure 11 intention of users to modify their code

Following the audit, 68% of POP users plan to modify their code (Figure 11). Most users plan apply POP experts' recommendations 6 months to one year after the end of the service (Figure 12). In practice, we remark that, for different reasons, these modifications can take more time than planned.

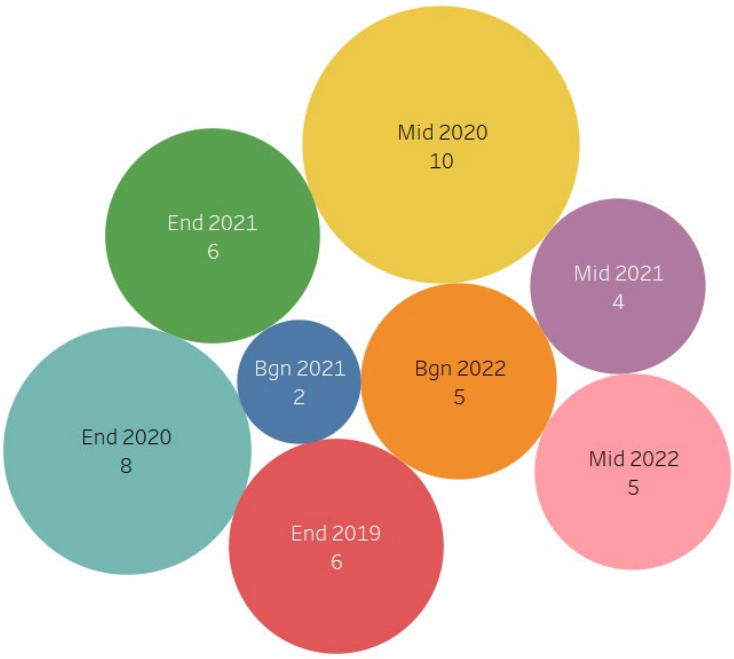

Figure 12 Expected date for code modification

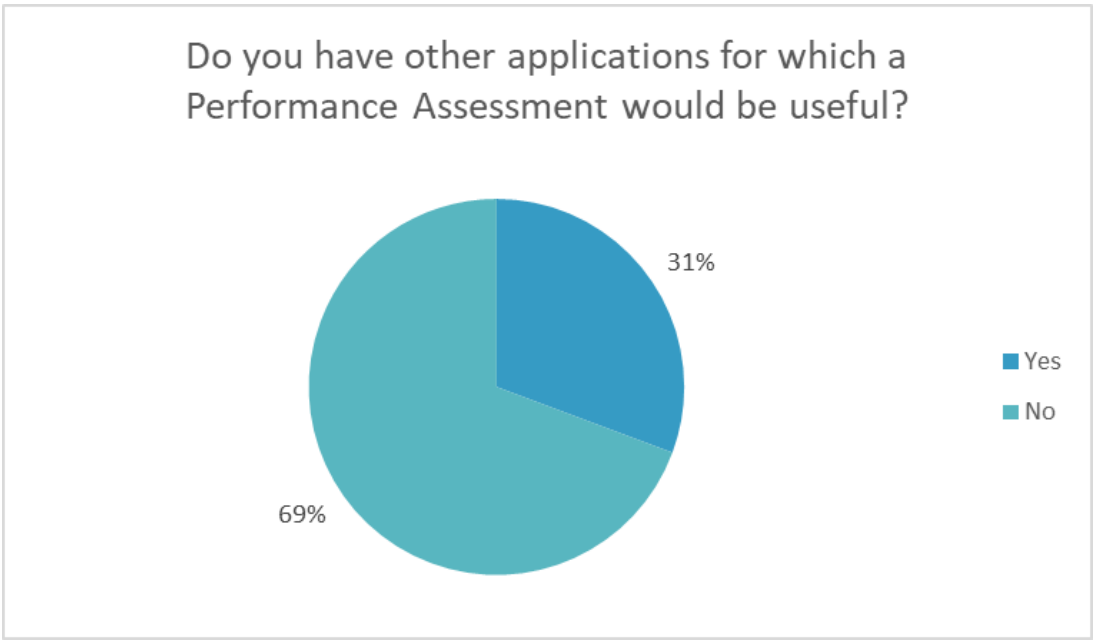

Figure 13 Re-enrollment potential statistic

According to figure 13, 31% of users declared they have other applications or codes to submit to POP experts.

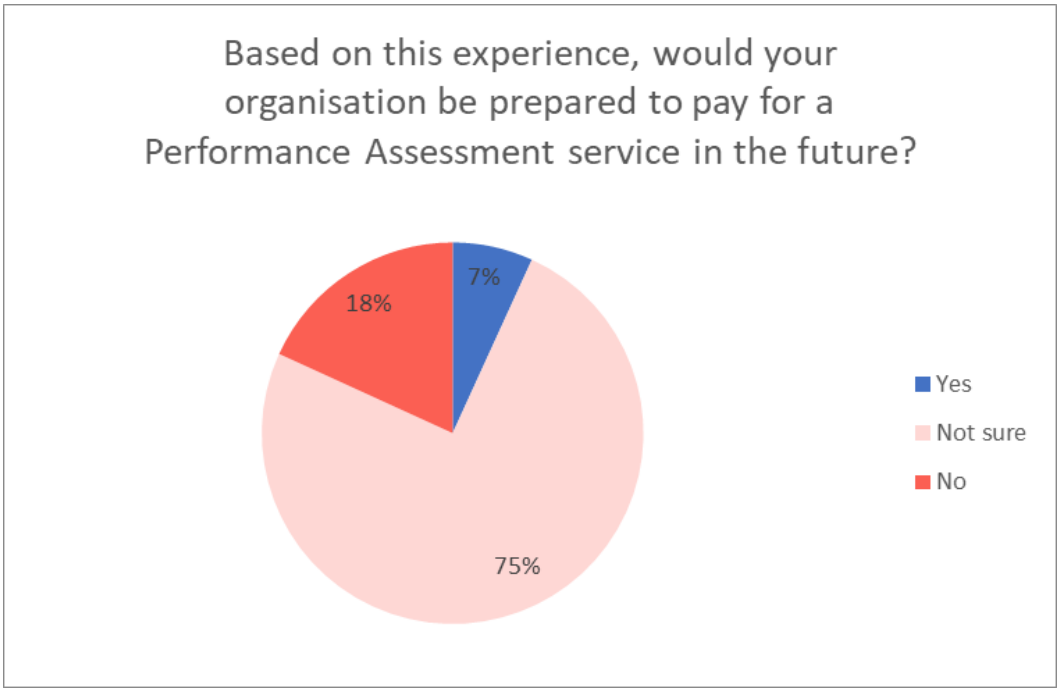

Figure 14 Readiness to pay for Performance Analysis services

Only a few users declared be ready to pay for PA services (Figure 14). The 5 users ready to pay for POP services are:

- UTH Zurich: several thousand
- UCL: a couple of thousands of Euros
- INGV

- BSC: At the hourly price of an experienced engineer (R3-R4) that we pay at BSC
- Laboratoire de météorologie dynamique Polytechnique

In addition, the amounts they can budget for such services are not very high and can't completely cover the services' costs.
Table 4 presents the reasons invoked by the users who are not sure or do not want to pay for this service.

Reference	Why you cannot pay for PA services
POP2_AR_003	We should have a code quite different from current codes in order to take full advantage of a Performance Assessment Service
POP2_AR_007	It did not provide us with any value.
POP2_AR_015	Not sure if our organisation can pay for these services.
POP2_AR_016	Funding unavailable
POP2_AR_017	Own expertise in house
POP2_AR_019	lack of funds
POP2_AR_021	CalculiX is an Open-Source code without financial resources
POP2_AR_022	Profiling didn't show any unknown issue (mostly because profiling tools couldn't handle parallelization strategy of MPI+OpenMP+pthreads).
POP2_AR_023	The motivation for us is to obtain an independent and unbiased performance assessment on systems that we do not have access to using metrics that we do not typically use. Otherwise, we could (with more effort of course) conduct the assessment ourselves. However, this might not be the case for other application users/developers.
POP2_AR_025	We are in close contact with JSC and would think that in the context of the collaborations a performance assessment can be made
POP2_AR_030	It depends on the cost. After this experience, we think we could get an approximated Performance Assessment by our own. Expertise from POP is surely an added value; therefore, the cost should be bound to the delta of what we could get by our own and what can be obtained with an expert assessment. Moreover, paying for PA depends on the readiness level of the code under investigation.
POP2_AR_031	It depends on the cost. Getting some more information about PA, we probably will be able to get an approximated PA by our own. Surely, POP experience is an added value. We think the cost should be relative to gap between what we can do by our own and what not. Moreover, we will pay for PA of a code with a certain level of readiness or of a code our experience in performance assessment cannot tell us enough to get a better performance.

POP2_AR_033	no so much funds dedicated to that in our university
POP2_AR_034	difficult to make any prediction whilst the corona problem and its impact on businesses ongoing
POP2_AR_035	This would require a change in company policy for money allocated for computing services other than specific HPC vendor related, which is outside my area of responsibility.
POP2_AR_036	industrial Partner could be interred
POP2_AR_037	price
POP2_AR_042	Own expertise in house
POP2_AR_047	I left my previous position.
POP2_AR_048	Depends on amount of money.
POP2_AR_051	Would need to be more cost effective than just increasing cluster resource.
POP2_AR_052	We are academic institution and it would depend on funding situation/restriction associated with funding. However, we probably include funding for such services into budget of our future grant applications.
POP2_AR_053	requires further success stories
POP2_AR_054	Depends on the cost and if this cost can be publicly funded.
POP2_AR_060	I would definitely consider it useful and would be ready to pay for the service from our project, but not sure if administratively would be easy/possible.
POP2_AR_061	we are SME
POP2_AR_062	We do not have the money for it
POP2_AR_066	Access to the Performance Assessment service would be strongly recommended from our side, but any budget consideration concerning our organization needs the authorization from our hierarchical superiors.
POP2_AR_068	It depends on the available credits
POP2_AR_070	Depends on cost
POP2_AR_071	Since BDDCML is a scientific code, this ability depends on available funding on our side.
POP2_AR_072	We have not talked about it yet.
POP2_AR_073	Depend on the available fundings and service costs
POP2_AR_075	Although this could potentially be useful, I'm not sure if/where I would be able to find the budget to pay for it.
POP2_AR_077	no funds devoted to this aim.

Reference	Why you cannot pay for PA services
POP2_AR_078	Academic Research does not usually pay for collaboration, but things are changing and I will personally agree to pay for such high-quality service.
POP2_AR_079	I am generally not involved in budget decisions
POP2_AR_080	It would depend on what individual academics would want - we could recommend it but would need them to make the decision on if they wanted the service or not.
POP2_AR_081	My organization is a current POP member
POP2_AR_083	I think it is a very valuable service, but not sure how difficult (administratively) would be to use project money to pay for such a service.
POP2_AR_090	It is not clear from the report how to proceed to improve performance (performance is already very good).
POP2_AR_092	There are no specific funds available at our university for external support towards code development.
POP2_AR_093	The code is developed by the community at zero cost.
POP2_AR_094	My application is relatively simple, and once improved, any further testing would not be necessary.
POP2_AR_102	Needs funding which is hard to get
POP2_AR_104	It depends whether there will be a grant project. My institution will not pay it.
POP2_AR_107	Not sure how the university I work for would deal with that. Maybe as part of another grant or something. Not sure.
POP2_AR_109	too few people involved in code improvement in our lab.
POP2_AR_112	I don't currently have a budget for this, but it was very useful so we would consider it if possible.
POP2_AR_115	Lack of funds devoted to this particular aim
POP2_AR_119	Funding
POP2_AR_120	It would depend on the prices, and the corresponding eligibility for funding as part of an ANR or EU project
POP2_AR_121	This should be checked with our hierarchy
POP2_AR_125	We have internal performance tool and collaborator, and this would be preferred against a service to be paid.
POP2_AR_130	Depends on policies that are out of my control, this activity has been carried out within an EU funded project, we should see if part of such funding could be used to pay for these services in the future

Table 4, Reasons why users are not sure to pay for POP services

More than 90% of POP users are sure to recommend POP services to their colleagues and partners. The remaining 10 % of users say they possibly recommend POP services and made the remarks reported in table 5.

Reference	Why you will not recommend POP to your colleagues
POP2_AR_004	Normal users in the earth system modelling community would not analyze performance analysis tool output files. They'd rather prefer a hint to specific parts of the code.
POP2_AR_022	POP service was fast but not necessarily suited for HPC groups but might be very useful for groups that do not have much HPC experience or a less tuned code basis
POP2_AR_090	If colleagues need help for performance improvements
POP2_AR_123	Why not? It was helpful.

Table 5, Users who may recommend POP2 PA services

The most common reasons for refusal to pay PA services are the lack of funds, or the presence of in-house expertise, or the fact of having learned to use analysis tools through the expertise and training provided by POP experts.

2.1.2 Proof of Concept Feedback

A PoC is a service that follow a PA service and generally take a longer time to be carried out (6 months for a PoC vs 3 months for a PA).
For the PoCs, we have a lower response rate (65%) than for Pas. We have collected 13 responses to 20 invitations to complete the PoC survey.
We point that others PoCs are in progress.

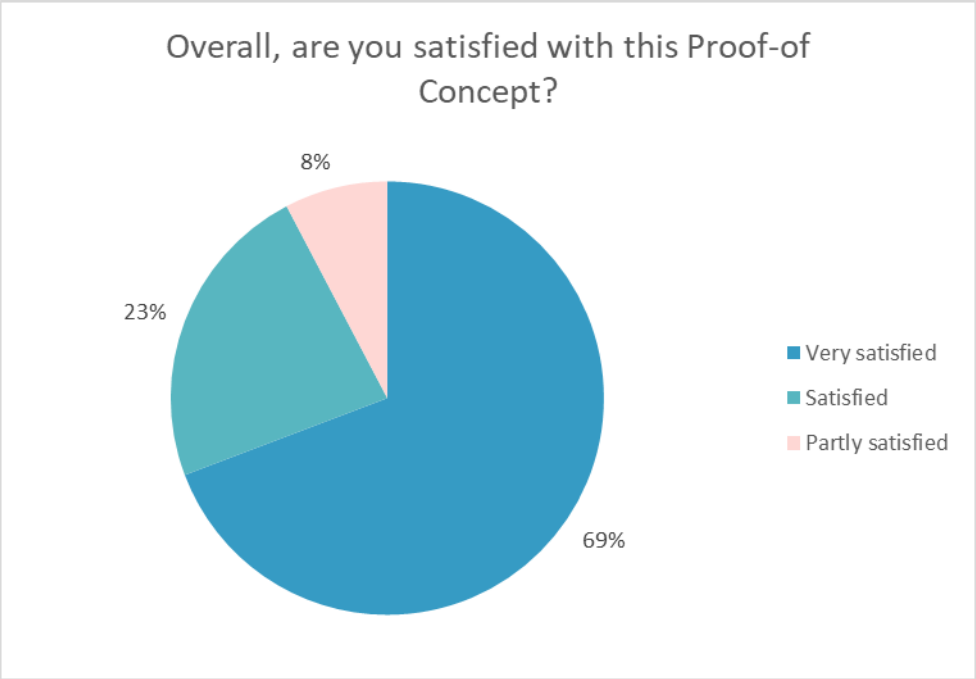

Figure 15 Proof of Concept overall satisfaction

The overall satisfaction is globally for PoCs are very good, 92% of users are satisfied or very satisfied with the POC service. Only one user-declared he is partly satisfied, this user requested *"we need more expertise".*

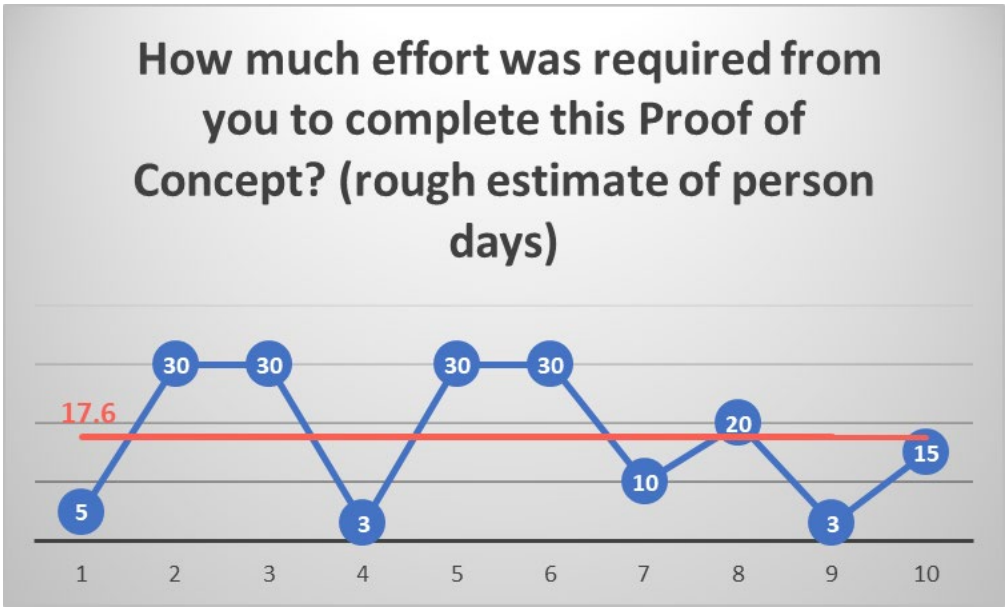

Figure 16 User effort for Proof of Concept

Since the PoC service takes longer to run, it requires a higher degree of user involvement and their better interaction with the POP expert.
Figure 16 shows the contribution of users, in terms of effort to the realisation of the PoC. This can vary from a few days to a month depending on their degree of involvement, with a average of 17.6 days.

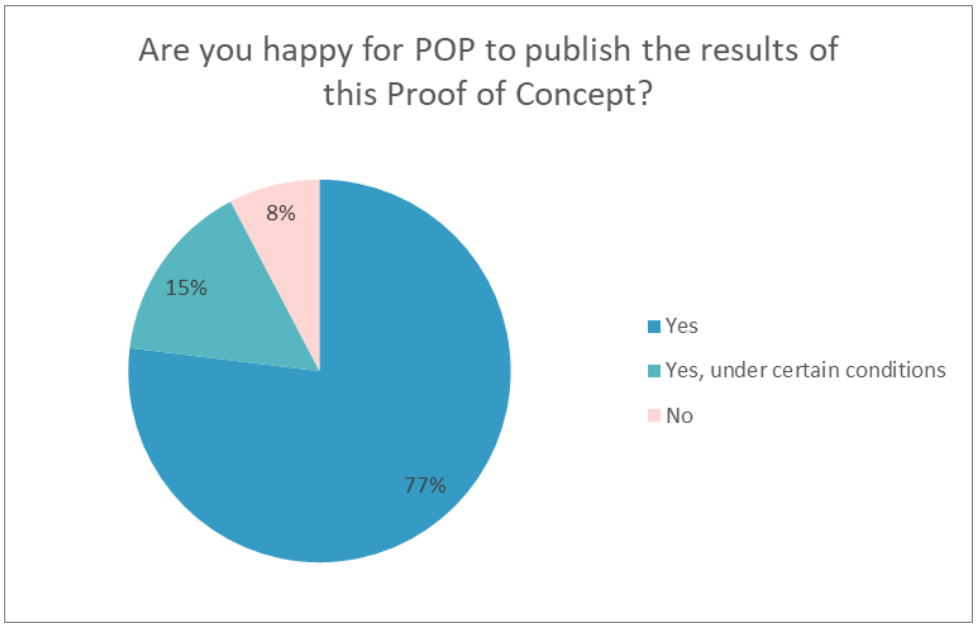

Figure 17 Readiness to pay for Proof-of-Concept services

As presented in figure 17, a majority of PoC beneficiaries agree to publish the results of their PoCs. These PoCs usually result in success stories posted on the [POP web page](#).

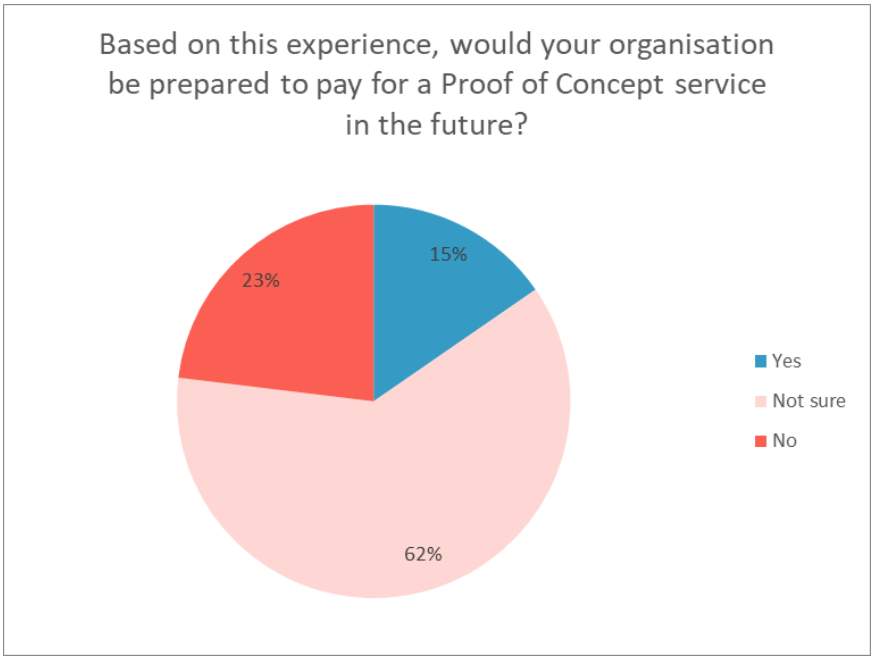

Figure 18 Readiness to pay for Proof-of-Concept services

Like for the Performance assessment service, few POP users declared be ready to pay for POC services. In fact, only two users (UCL, UK & Optimad, Italy) are ready to pay for PoC services. Optimad said that they can invest up to 10k€ for a POC.

2.2 Return on Investment Feedback

Return on investment survey is generally sent 6 months after the POC service is provided to users, for that the number of users eligible to complete this questionnaire at this time is low. In addition, this questionnaire requires more thought to be completed. Despite contacting users before sending the questionnaire, we have a very low response rate.
Only 4 users replied to the Return-on-Investment survey, three of them estimate runtime reduction around 10% and one of them declared a runtime reduction by more than 50%.
Two users have implemented all the POP experts' recommendations and two others have partly implemented these recommendations.
Three of them have added new features or have evolved some of the algorithms while refactoring their codes. To implement the recommendations, they spent from few days to few weeks (from 3 days to 3 weeks), which represents a cost of less than 5k€ for the most expensive one. Compared to the gain on computation costs, this can be considered as a negligible investment even if the users were unable to estimate the financial gain after these modifications at this time.
We will continue asking users to complete the ROI survey during the extension period of the project.

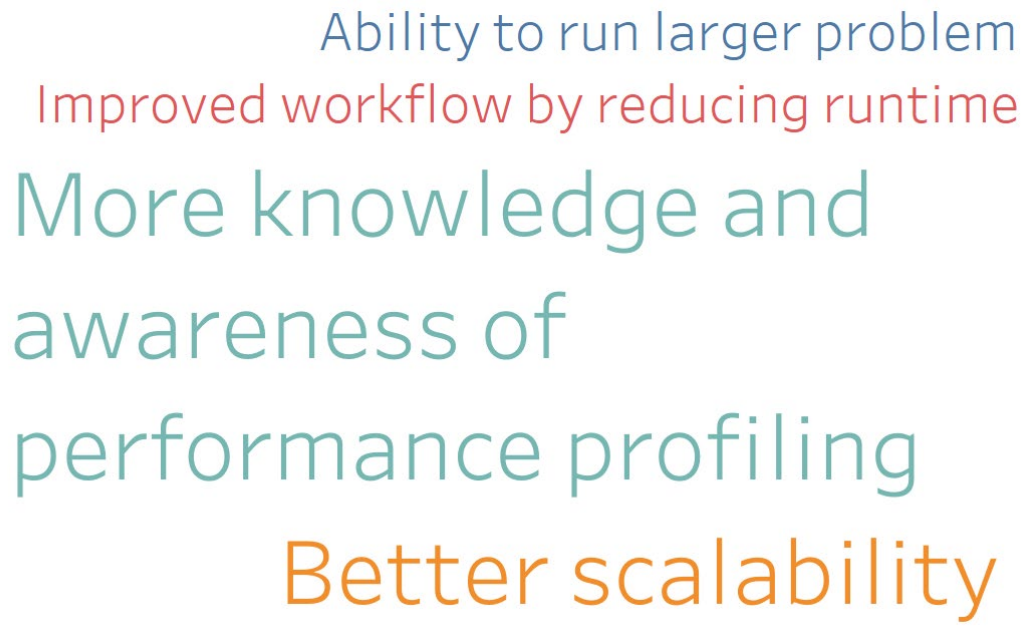

Figure 19 Code improvement declared by POP users

The main improvements the users noticed are better scalability, and More knowledge and awareness of performance profiling (figure 19)

2.3 Customer Feedback through Interviews

In addition to PA and POC surveys, and in some cases, we invited POP users to a digital meeting to clarify and deepen some topics or to answer some of their questionings. Up to 20 November 2021, we sent 106 invitations to interviews and we have realized 33 interviews. All interviewed users are globally very satisfied, while making few remarks about how the assessment went or how it can be improved.

Some users have experienced some difficulties installing analysis tools. Here are their comments:

Reference	Quote
POP2_AR_001	"We struggled to install analysis tools, but BSC was very responsive to help us."
POP2_AR_015	"The most complex thing for me, was the set-up of the application to take traces and record information."
POP2_AR_035	"Initially, I used an Extrae version that didn't quite work. I spoke to BSC developers, and they gave me then a new version which I installed. They fixed that and then I ran with that special version that's the only incident I remember."
POP2_AR_060	"In the beginning, when I tried to get the traces there was some complication on actually getting the traces, because I use Pthreads for some part of the code. I don't know the tool very well. I just told BSC about the problems that I had and very quickly They managed to provide some solutions to change the script, and then the traces were okay."

Table 6, Interview quotes for users who have experienced some difficulties with tools

Few users report some slowness with the completion of the service. Table 7 presents their comments.

Reference	Quote
POP2_AR_004	"It would be better if the whole process goes faster."
POP2_AR_017	"As always it could be somewhat faster, but the main hold up for me is that the time frame could have been communicated better."
POP2_AR_044	"It took a long time but with the circumstances with the original POP expert leaving the project and his chief taking over, I can understand why it took so long so it's not so bad."
POP2_AR_051	"If it was faster, we would have been able to probably make more use of it. Another problem is a lot of complexities for getting the tools working."
POP2_AR_109	"The audit took a long time to start, the beginning was laborious."

Table 7, Interview quotes for users reporting a slowness with the completion of the service

Some users would have liked face-to-face meetings with the expert. This is not always feasible since the users and experts are dispersed over several European countries, in addition to Covid 19 problems.

Reference	Quote
POP2_AR_004	"Perhaps it would be good if you have better formalism with a meeting at the beginning for the code exchange and to explaining the problem and another one for the final report explaining the results and recommendations."
POP2_AR_034	"Because of COVID, the communication was a little bit difficult. if we could communicate face to face it would be much better but in the current situation, we couldn't do that."
POP2_AR_079	"From my point of view, the performance analysis lacked face to face meetings mainly due to the covid"

Table 8, Interview quotes for users would have liked face-to-face meetings

Some users have liked more indication in the report to be able to reproduce the performance analysis. This kind of service is delivered by the trainings and the workshops provided by POP experts.

Reference	Quote
POP2_AR_017	"The Data delivery that would have been interesting for me. Maybe having this option available would have been nice because then we could have done a little bit more with the profiles and traces ourselves."
POP2_AR_054	"If we could have had an explanation of how to use the analysis tools at the end of the PA in order to be able to reproduce it later, it would be interesting."
POP2_AR_074	"It would be wise to add indications in the report to be able to reproduce the audit later by myself"

Table 9, Interview quotes for users have liked more indication in the report

Other users requested GPU analysis tools for their applications:

Reference	Quote
POP2_AR_036	"I would like to have profiling tools for GPUs and a little more detailed documentation."
POP2_AR_062	"For a future POP service, I would like to have advice on porting and performance analysis on GPUs."

Table 10, Interview quotes for users request GPU analysis tools

The users often report difficulties in the understanding of the code by the expert. This is normal due to the high-level complexity and specialisation of some scientific codes (Table 11).

Reference	Quote
POP2_AR_044	"I had to help POP experts to understand how to run JULES on the supercomputer and that took some time and that was somewhat complex to do."
POP2_AR_079	"Our simulation is very complex, the expert had difficulty understanding the code to optimize it"
POP2_AR_118	"We first encountered problems installing the code, then the expert had difficulty understanding the code. At the end of the audit, we had a lack of computing power on the cluster to go a little further."

Table 11, Interview quotes for users report difficulties on the understanding of the code by the expert

Some users expressed their difficulty in understanding how profiling tools work, table 12 presents their comments on this subject.

Reference	Quote
POP2_AR_035	"I think the hurdle to use the visual analysis tools is too high"
POP2_AR_058	"If there had been a clear correspondence that we could easily see which function calls specifically had the inefficiencies, it would have been easier in PA tools."
POP2_AR_060	"I would like to have like introduction or some idea of how the assessment tool works."

Table 12, Interview quotes for users made remarks about the analysis tools

Few users indicate encoutring difficulties to understand the report:

Reference	Quote
POP2_AR_044	"Recording the oral report and making that publicly available to us would be useful rather than just having a written PowerPoint presentation."
POP2_AR_060	"Maybe the report could include some information about each metrics because if time goes by, maybe I will forget what each of the metrics exactly means, it would be nice to add an appendix or some information about every metric that is calculated in the report means."
POP2_AR_068	"The report was very complex and difficult to understand by someone who is not from the field, during a rereading later after the audit I had to ask the expert to explain me some results again."

Table 13, Interview quotes for users indicate difficulties with the report

Other users reported internal resources issues to correctly perform the PAs:

Reference	Quote
POP2_AR_036	"We had two types of problems: cluster availability problems due to high attendance and maintenance interventions. This generated a little delay. The optimization proposals require too heavy modifications of the source code and that requires too much human resource and too much investment."
POP2_AR_058	"We never got the time to properly investigate it and make improvements. It's because it also requires a lot of interpretation."
POP2_AR_089	"We did not have enough time to properly manage this project"

Table 14, Interview quotes for users reported internal resources issues

Concerning the code update and performance improvements after the Performance Assessment here are the remarks of some POP users:

Reference	Quote
POP2_AR_001	"We performed some optimisations according to the results of the assessment."
POP2_AR_018	"Code is in evolution. Scalability is good up to 256 cores. Efficiency is improved to 80% while after the PA it was of 53% on 128 cores."
POP2_AR_060	"All POP recommendations are applied."
POP2_AR_016	"Running twice better than before modifications due to improvement in parallelisation, but scalability still bad."
POP2_AR_015	"Started code modifications but needs a lot of resources to refactor the code We never got time to apply the recommended improvements."
POP2_AR_017	"I wish POP all the very best and that continue to serve the HPC community for much longer time it's I find it entirely needed."
POP2_AR_034	"This type of project is really useful for industry because in small companies they don't have the capability and the budget to access to this knowledge."

Table 15, Interview quotes for the code update and performance improvements

2.4 Recommendations

The cross-checking of the various user feedback allowed us to identify a few areas of improvement. Recommendations to the POP team were made through the various team meetings.

Here is a non-exhaustive list of recommendations made to POP experts:

- **Systematically organise a (virtual) meeting with the customer to present the results of the PA or PoC**.
- **Verify that the customers have received the final report and maintain contact with the customers after report delivery.**
- **Tailor the explanation in the report to the understanding of the user.**
- **Reduce the delay in answering customers when they request a service.**
- **After the Performance Assessment ends, some users were contacted for an interview and the POC is explained, they are also informed by the survey.**
- **Inform POP experts about training and workshops requested by users.**
- **Motivate the users to answer the surveys.**
- **Motivate the users to continue the collaboration with an additional PA or a PoC.**
- **Push for the creation of success stories with very successful services.**

3. Conclusion

Throughout the duration of POP2 project more than 150 services were delivered by POP experts. The customers are systematically invited to fill in the survey related to their type of service. These services were provided for different types of structures: Academics, industrials, and SMEs (the target of 30 SMEs is reached).
The feedback from the customers was very helpful for us to adapt our strategy and fully satisfy our customers, and shows that the services provided by POP experts are of excellent quality. More than 94% of the customers are satisfied with POP services and judge them to have been conducted efficiently or very efficiently. The KPI of 90% customer satisfaction is therefore being exceeded and the Milestone **MS6** is satisfied. In addition to this, more than half of POP users wished to continue their collaboration with POP CoE by requesting a PoC, or by attending training and Workshops organised by POP experts. Some identified improvements were considered by POP experts, helping to maintain the good quality of POP services and supporting to both, retain existing customers and attract new ones, and thus promoting the POP brand.

Acronyms and Abbreviations

- CoE – Centre of Excellence
- D – deliverable
- DoA – Description of Action (Annex 1 of the Grant Agreement)
- EC – European Commission
- HPC – High Performance Computing
- KPI – Key Performance Indicator
- MS – Milestone
- NAG – Numerical Algorithms Group
- PA – Performance Assessment
- PoC – Proof of Concept
- POP – Performance Optimisation and Productivity
- ROI – Return On Investment
- WP – Work Package

List of Figures

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[i] POP Wiki Page, https://wiki2.pop-coe.eu/index.php5/WP3
[ii] POP Wiki Page, https://wiki2.pop-coe.eu/index.php5/WP3