FORTISSIMO

D9.1
WP9 Year 1 Report

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Executive Summary

Work Package 9 “Business Models for ISVs” aims to analyse the marketplace for HPC-Cloud based simulation focusing on business models for Independent Software Vendors (ISVs). On the basis of this analysis, ISVs will be informed of the needs of the HPC-Cloud value chain, which will in turn be informed of the needs of ISVs who will be able to make informed decisions in the formulation of their own confidential business models.

To achieve its objectives this work package is structured into four tasks: a management task, a task to analyse licensing models, a task to analyse the ISV marketplace, and a task supporting a yearly forum engaging ISVs in the analysis, training and dissemination activities of Fortissimo.

The major achievements of this Work Package obtained during the reporting period (Project months 1 to 12) were:

- providing requirements to the marketplace architecture;
- creating a directory map of ISVs in Europe;
- conducting the first Market Analysis on the approach of European ISVs to HPC cloud services;
- spawning a Thematic Working Group on cloud licensing topics;
- completing the preliminary organization of the first ISV forum.

The only notable deviation from what stated in the Fortissimo Description of Work (DoW) is the shift of the First ISV Forum outside the reporting period, due to the delayed start of the 2nd wave of experiments from Call1, in order to insure a relevant participation to the event.

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1 Introduction

Work Package 9 “Business Models for ISVs” aims to analyse the marketplace for HPC Cloud based simulation focusing on business models for Independent Software Vendors (ISVs). It needs to be noted that throughout this document the term ISVs will refer only to those vendors that serve HPC users, typically, but not limited to, producing software for engineering and manufacturing simulation.

On the basis of this analysis, ISVs will be informed of the needs of the HPC-Cloud value chain, which will in turn be informed of the needs of ISVs who will be able to make informed decisions in the formulation of their own confidential business models.

To achieve its objectives this work package is structured into four tasks: a management task, a task to analyse licensing models, a task to analyse the ISV marketplace, and a task supporting a yearly forum engaging ISVs in the analysis, training and dissemination activities of Fortissimo.

This deliverable presents the Work Package activities from month 1 to month 12 of the Project.

In Section 2 we present the Work Package Roadmap and vision, explain the key challenges of this work package, as well as its main priorities and objectives.

In Section 3 we list the main achievements over the yearly reporting period.

In Section 4 we report the work done, through three subsections. Subsection 4.1 describes the workplan for the period which is being reported, what each task is supposed to achieve and how the tasks relate to each other and other tasks in other work packages. Subsection 4.2 describes the technical work done on a task-by-task basis, detailing with any technical problems encountered. Subsection 4.3 brings all of the work of the work package together into a coherent whole. It also describes the interaction with other work packages and presents details on future plans.

In Section 5 we introduce the deliverables from the work package, including the internal ones and state their purpose, significance and how they will contribute both to the future work of the work package and to that of the other work packages.

In Section 6 we report the effort spent at the end of the first yearly period, analysing deviations from the planned effort.

In Section 7 we discuss problems and deviations from workplan.

In the final Section 8, we present the outline of the work to be completed during the next reporting period.

2 Work Package Roadmap and Vision

Fortissimo's final scope is to facilitate access to digital manufacturing tools and high-performance computing platforms for European industries and especially SMEs. This action must bring together the whole value chain in order to stimulate both the use of the Cloud by industries for simulation, modelling and forecasting and the provision of relevant services exploiting the Cloud's capabilities to support innovation.

ISVs are therefore a key stakeholder for the Fortissimo Infrastructure, since not only is Fortissimo contributing to increase competitiveness of European manufacturing industry through the innovative infrastructure that it is developing and testing, but it aims to create commercial opportunities for European ISVs, and service and HPC infrastructure providers through the creation of a new market for their products and services.

With respect to ISVs, on the one hand Fortissimo is addressing innovation offering ISVs and simulation service providers the possibility to port their applications to a cloud of HPC resources and to be able to evaluate and gain experience with cloud-based service and business models in a controlled environment. On the other hand Fortissimo is trying to overcome the present barriers to the development and exploitation of HPC-Cloud-based simulation services, and the licensing models used by ISVs are often considered one of the major obstacles restricting software use in Cloud environments

Modelling and simulation software can be developed in-house, be obtained from ISVs or be available as open source. Most small companies whose principal business involves manufacturing will be unlikely to have the necessary skills to generate the software or the resources to fund its development. Neither will they have the in-house application or HPC expertise to set up models to run on an HPC system. Nor are software licence terms particularly favourable for companies that need to perform simulations only occasionally. Many End-user companies have been critical of ISVs' licensing models, which they find to be too restrictive to use in HPC environments. These issues limit the ability of small companies to exploit modelling and simulation and have a direct impact on their competitiveness.

ISVs are often themselves small companies that rely on a core customer base and do not have the resources to carry out the major restructuring of their software to exploit emerging and future computer architectures. In some cases the only way forward for ISVs is to be acquired by a bigger player, which often moves core competences out of Europe. Fortissimo is addressing this situation by supporting ISVs to make their applications be more HPC-enabled as part of the experiments. Often the changes required for a software to operate on a high-end HPC system are minimal and the benefits to the end-user in terms of scale of model and speed of result are very high.

Fortissimo is creating an environment in which different business models can be trialled by ISVs and end-users. This will not only enable end-users to access modelling and simulation in a cost-effective way that was previously unavailable. It will also allow ISVs to investigate new business and licence models that would enable them to innovate their products while retaining profitability, independence and their customer base. Fortissimo is committed to moving the state-of-the-art forward in terms of software licensing and business models forward taking into account the needs of both the software providers and end-users.

To obtain the collaboration of ISVs it is evident that Fortissimo must provide value to them. With this in mind, it is evident the experiments in WPs 4, 5 and 6 play a key role, most of those requiring the use of ISV applications. The conduct of these experiments needs to confirm the role that ISV applications have to play in the successful implementation of end-

user applications and to establish the viability of a business providing such applications on HPC Clouds. The role of this Work Package, directly addressing business models for ISVs for an HPC Cloud, is indeed to monitor and evaluate, with the precious contribution of WP8, the value of this business.

The action is conducted through three technical Tasks, related to the analysis of actual licensing models (Task 9.1), the analysis of ISV marketplace (Task 9.2) and the organization of a yearly ISV forum (Task 9.3), bringing together ISVs and other key stakeholders.

The first 12 months activities were conceived as a set up and general intelligence gathering period. The first steps were therefore to collect a database of reference contacts of Fortissimo partners with ISVs, to be used as a basis for the information collection, and to set up the basis of a general framework of challenges ISVs meet when porting their applications to the Cloud in general and specifically to a HPC cloud. The first Market Analysis, conducted with a broad and complex questionnaire and a set of interviews, had the scope to go further, as a first test of the assumptions of the framework. A second important test will come with the first ISV Forum which will bring together ISVs with End Users and Resource Providers.

The second 12 months activities will leverage on the work done in the first period, together with the indications coming from the first wave of experiments that are reaching their conclusions, and the second wave starting their activities. The challenges framework will be further tested concentrating on specific aspects, and conclusions will be drawn on how to tackle some of the most impacting challenges.

3 Major Achievements

The major achievements of this Work Package obtained during the reporting period (Project months 1 to 12) are:

- providing initial requirements to middleware architecture, published as Fortissimo internal Deliverable P2.1;
- creating a directory map of ISVs contacts in Europe based on partners' knowledge;
- conducting the first Market Analysis on the approach of European ISVs to HPC cloud services;
- spawning a Thematic Working Group on cloud licensing topics, as a lively enlarged Forum for discussion and insight gathering;
- completing the preparatory work for the first ISV forum organization, that will be held outside the reporting period due to the delayed start of the 2nd wave of experiments from Call1.

4 Work done

4.1 Work planned for the reporting period

To achieve its objectives this work package is structured into four tasks: a management task, a task to analyse licensing models, a task to analyse the ISV marketplace, and a task supporting a yearly forum engaging ISVs in the analysis, training and dissemination activities of Fortissimo. Cineca is leading this work package.

Task 9.1 Analysis of licensing models

This task analyses current ISV licensing models, their underlying motivation and resultant barriers to the use of ISV products in an HPC-Cloud environment.

It was already clear that although the licensing models issue is by far the most relevant to the End Users, for the ISV is just one of many aspects of a complex situation. Therefore, the activities of Task 9.1 needs to be strictly interwoven with those of Task 9.2.

The plan for the reporting period consisted in creating a kernel of contacts not only in ISVs but in all involved stakeholders to be used to gather insight through interviews and questionnaires, establishing a set of initial requirements for WP2 activities on creating the Marketplace architecture, and collecting information helpful to analysing ISVs challenges when dealing with HPC clouds.

Task 9.2 Analysis of the ISV marketplace

An analysis is made of the marketplace for ISV products and the barriers to their use in an HPC-Cloud environment. Issues such as availability of HPC-resources, of application domain expertise, of HPC expertise, of appropriate training and other relevant factors are considered.

Task 9.2 plan consisted in leveraging on and contributing to Task 9.1 activities, with similar actions, but from a broader point of view.

Task 9.3 The yearly ISV forum

A yearly forum, where ISVs and other interested organisations including end-users and domain experts will be able to discuss the outcomes of the above tasks and use the intelligence gained to formulate their own confidential marketing and business plans will be held. This forum will make extensive use of the intelligence and insights gained in Tasks 9.1 and 9.2 and will draw on the work of WP8, Sustainability, and contribute to WP10, Dissemination and Training. This task is led by Intel.

4.2 Work done during the period

Task 9.1 Analysis of licensing models

In the framework of this task, the first step was collecting a database of contacts of Fortissimo partners with European ISVs, meaning in this context ISVs either having origin and core business in Europe, or multinational entities with relevant regional sites in one or more of European countries.

This database provides in itself interesting and useful information, drawing a network map of diffusion of specific companies or ISV, and it constitutes the basis for reaching the ISV base for interviews and market analyses.

The effort of all involved partners provided input for the Deliverable P2.1 "Initial requirements capture, Fortissimo Marketplace and service infrastructure design", including the Fortissimo Marketplace User Stories related to ISVs (Ch. 6.6), and then for the definition of the framework described here in Ch. 4.3.1.

At the end of the reporting period it was considered necessary, following the input coming from the first wave experiments, to expand the contribution of the discussion on licensing models to other project partners. The most suitable way to accomplish this objective was the creation of a Thematic Working Group (TWG) on licensing models for cloud, collecting all interested participants from Fortissimo partners, acting as a live discussion forum to support Task 9.1 activities. At the moment the TWG counts 15 members. It will become completely operational in the next reporting period.

Task 9.2 Analysis of the ISV marketplace

This task, through the effort of all involved partners, provided input for the Deliverable P2.1 "Initial requirements capture, Fortissimo Marketplace and service infrastructure design", including the Fortissimo Marketplace User Stories related to ISVs (Ch. 6.6), and then provided the core material for the definition of the framework described here in Ch. 4.3.1.

The analysis of the ISV marketplace has been made starting from available literature [1, 2], extending this through brainstorming activities with WP partners, conducting interviews with ISVs and end-users both those involved in the experiments and others picked up by the network of contacts of all partners.

Task 9.3 The yearly ISV forum

Organizing a large event, involving a significant number of participants from industry is always a complex task, especially in the current economic crisis period, where budget cuts to travel costs are commonplace.

Being the first edition of the Forum, it is also necessary to ensure a level of participation high enough in number and quality to ensure this event will gain momentum assuring the success of following editions as well. One possible solution would be to have the First ISV Forum not as a standalone event, but in the framework of a larger conference, where ISVs would have been attracted by a significant industrial end-users' participation. An additional mechanism to support the participation of end-users would be to join the Forum with a planned experiment workshop organized by WP4, acting both as a show case for the preliminary results and challenges of the first wave of experiments and as a kick-off meeting for the second wave of experiments.

Since the second wave of experiments was scheduled to start their activities in July, a good occasion was identified in the IEEE 2014 International Conference on High Performance Computing & Simulation (HPC2014) [3] in Bologna, Italy, on July 21-25, 2014.

The conference is a well-known event meant to address, explore and exchange information on the state-of-the-art in high performance and large scale computing systems, their use in modelling and simulation, their design, performance and use, and their impact. Participation is extended to researchers, designers, educators and interested parties in all related disciplines and specialties. The conference includes invited presentations by experts from academia, industry, and government as well as contributed paper presentations describing original work on the current state of research in HPC & simulation technologies and systems and related issues.

The venue had two important advantages. First of all it has usually a relevant participation of industrial and ISVs participants (about 30% of total, according to the organizers). Secondly the 2014 edition had Cineca among the local organizers, facilitating the management task and the inclusion of the Fortissimo Forum in the framework of the event.

Since the DoW expected the Forum to be held within the first 12 months period, a formal approval of holding the First ISV Forum at the end of July 2014 was requested and obtained.

Intel, leader of this task, completed the preliminary steps of organizing the Forum in the framework of the conference. However, the decision made by Fortissimo Project Management to delay the start of the second wave of experiments obliged to reconsider the issue. WP9, WP4 and Project Management agreed that involving the incoming partners was a key opportunity for the Forum to reach a sufficient “critical mass” to attract ISVs, and therefore a decision was made to postpone the event to a date during the first project month for the second wave experiments. Date and venue will be decided as soon as possible.

4.3 Overall work package

4.3.1 Setting a general framework

We tried first of all to set up a general framework enucleating a number of challenges that ISVs are likely to meet when moving to the Cloud, starting from available literature [1,2], internal discussions and interviews with ISVs representatives. This has the aim to establish a first set of assumptions to be tested later on.

Our general assumption is that the Cloud in general, and the specificity of HPC Clouds notwithstanding, requests a services-centric approach. Therefore we need to consider not only the challenges of the initial ISV transition to Cloud-driven environments, but also the additional challenges that await ISVs while the Cloud ecosystem evolve.

Considering carefully the challenges met by ISVs is a key aspect for Fortissimo to consider to build a successful marketplace.

We identified six key areas where challenges may be met by ISVs and that have been successively tested in the Market Analysis detailed in Subsection 4.3.2 and related Tables 1 and 2:

- Management
- Technology
- Operations
- Sales

- Partnering

Management challenges

When we consider established ISVs, all of those have legacy, traditional software businesses to manage. Retaining customers and cash flow while moving to the Cloud (partially or totally) can mean shifting a delicate balance in managing resources. This entails a series of significant management challenges, like:

- **What to do with the legacy solutions and how to set up the strategy for transition**? How the current product portfolio is managed while transitioning to a new set of Cloud offerings? Is a paradigm shift, or a subsidiary is created maintaining parallel sales and marketing divisions, each with its own strategy, business plan and compensation structure?
- **What is the brand strategy?** Is it better to move the established brand recognition or establishing a completely new brand with Cloud association?
- **How does the financial process change?** Cloud businesses typically introduce different financial models, based on recurring revenue streams, rather than large license fees and ongoing maintenance streams, and understanding how to manage Cloud financial processes could be a challenge.

Technology Challenges

Any ISV's long-term, HPC Cloud technology strategy should take into consideration not only the initial deployment phase, but the ongoing plan for delivering the solution that includes efficiency of the infrastructure of choice.

A Cloud-based ISV will also need to have a plan for managing the transition between legacy solutions, and their customers, to the evolving Cloud platform. Other key challenges include R&D management for innovation and efficiency, solution development and enhancement, extending solution customization capability and the ease of integration with other Cloud and traditional solutions. In any case, the two biggest worries will be security and regulatory compliance.

Performance, reliability and robustness of the HPC Cloud solution are of course something very important for any ISVs. Reliable and robust operations are critical to customer confidence. In that sense, it is important for the Fortissimo marketplace to set up mechanisms to thoroughly test the efficiency of the solution and design for failure to ensure that customers will not be left hanging should a problem occur. Trust is the first essential imperative of a Cloud solution.

We can summarize the above into the following key Technology management challenges every ISV perceive when moving to a Cloud solution:

- **Which is the best Technology Strategy for our software?** How do we choose the correct Platform or Infrastructure Services?
- **How do we manage both Cloud & traditional versions of our software?**
- **How do we set up an Integration/Customization Strategy?**
- **How do we manage R&D for Solutions & Efficient Operations?** This issue relates with the challenges found in partnering, since a close collaboration between ISV and Resource Provider is necessary.

These Technology challenges are of critical importance, as they pertain to the technology advantages, long-term architecture, platform, portfolio migration, integration, performance,

security and regulatory compliance, among other things, of the Cloud solution. Thus, successfully meeting and managing the Technology challenges needs to be in harmony with all the other dimensions of this complex transition.

The Fortissimo infrastructure needs to provide not only world-class security and privacy, but to understand that for ISVs operating in key markets an infrastructure operating under regulatory certifications (like ISO 27000 [4] or FedRAMP [5]) is indeed critical.

Operations Challenges

To move to a HPC Cloud for an ISV means often moving to a different kind of business model, a service vs. a product model of operations. A key driver for that would be that at its foundations, a Cloud solution is a promise to the customer to deliver superior functionality (like a major flexibility), predictably and responsively.

It is not just about being secure and robust. Cloud solutions should guarantee a high level of service quality to the customer. That includes service-level transparency, the availability of operational metrics that provide the customer with data and analysis capability.

Cloud Operations needs to create a synergy between the resource provider operations, tuning and ensuring the performance, security and integrity of the service, and the ISV operations, directly engaging the customer in the process, in soliciting improvements or providing the quality of customer support that ensures customer loyalty. Because it is evident that profitability is, at least partially, based on the length and increasing depth of the customer relationship, retention-oriented practices should be an important part of the operations activities.

Operational metrics may provide a quantitative basis with which to understand how the solution is performing, as well as how much it is valued both by the end-user and by the ISV using a third-party infrastructure like Fortissimo.

Operational challenges are also the main difference between developing software for sale and offering a Cloud business solution While Operations may be the most significant departure from the ISV's previous business model, it has in common the need of continuous improvement.

To summarize, the key Operational Challenges that ISVs must consider when considering how to move to a HPC Cloud infrastructure are:

- **How are Security, Performance, Service Levels, Back-up & Recovery implemented?**
- **How are Billing, Accounting and SLAs managed?**
- **How may we work with the Resource Provider to deliver Continuous Innovation & Functional Enhancements?** This means staying in close contact with customers, understanding what they value most and responding to their requests for improvements.
- **How the HPC Cloud may delivering Technology/Platform Advantages for our software?**
- **How do we deliver the best service for our customers?** Potential customers are likely to ask for historical uptime and response-time metrics, backup, recovery and disaster planning solutions, and track record for managing service levels and failures.
- **How are Operational Metrics collected and how to use them for improvement?** Capturing and managing operational metrics may provide insight into usage that has market value, either by tuning pricing to match certain conditions, or in identifying new functional patterns.

Sales challenges

Transitioning to a Cloud business model requires that Sales and Marketing need to change since the ISV moves from selling and supporting a software product to a service.

Meeting the needs of legacy customers during and after the transition is critical to customer retention and upsell. The ISV needs to build new channels for sales and marketing reach and transforming sales compensation for direct sales to ensure the Cloud solutions will receive the attention in the marketplace that they need.

To summarize, the key Sales Challenges for an ISV are:

- **Which are the pricing Strategies and Metrics we need to adopt?**
- **How do we adapt the Sales and Marketing strategies to the Cloud?** The Cloud is not only the source of new business solutions, but also of information about potential solutions.
- **How do we manage the migration of customers and partners?** The cloud solution may be a replacement or be just complementary to old systems.
- **How do we overcome Customer Resistance?** This means managing customers concerns over a range of issues going from security to responsibility.
- **Do we need to build and manage new Channel Partnerships?**
- **How do we set up and manage new Sales Compensation Strategies and Models?**

Partnering Challenges

Moving to the Cloud is likely to affect every aspect of an ISV's organization. Customer retention will play an important role in making profitability possible. But critical to Cloud profits will be the leverage gained through partnering with the best resource providers and in some occasions trying to extend geographic reach connecting with already-established distributors.

This is an area where Fortissimo should be particularly careful in its offering. It is evident that the ISV will look for three important benefits when choosing the correct Partner as Resource Provider:

- Lower costs.
- Better solutions. They will likely look for the very best the market has to offer in terms of experience, expertise and innovation.
- Faster results.

To summarize, the key Partnering Challenges are:

- **How do we set up a partnering strategy?**
- **How do we manage the role of all partners in the new ecosystem?**
- **How do we manage old and new distribution channels for value-added services and improve the geographic reach?**

In conclusion the transition to the Cloud affects so many aspects of an ISV organization that we may conclude that indeed the culture of the organization is challenged. For that reasons it is quite common in the application areas where the transition to cloud is much more advanced than in HPC related sectors, the ISV found it necessary to create a separate organization.

Testing the validity of this model (extracted from literature and brainstorming), and, when valid, the relative impact of the identified challenges, is evidently a very complex task. The chosen way consists in a threefold approach made of questionnaires, interviews to key players, and a general discussion on hot topics made possible by the ISV forum.

4.3.2 Licensing models

Due to the importance of licensing models we add here a few considerations on the most commonly licensing models for Clouds, limiting our consideration essentially to SaaS offers, that are the most relevant for the Fortissimo model.

Most HPC software license servers are activated by license files. A license file usually grants the right to use software on a limited amount of resources (e.g., maximum number of parallel threads) for a fixed list of features (e.g. a set of software modules) with some restrictions (e.g. maximum number of concurrent executions).

The standard license servers for HPC software are:

- FlexLM [6] (used e.g. by ESI, Simulia, CST, Numeca, etc.)
- Reprise License Manager - RLM [7] (used e.g. by EXA, Tecplot, etc.)
- Proprietary FlexLM-like (used e.g. by LSTC, ANSYS, etc.)

A relevant difference comes from the location where the license servers are installed, that is: on the Cloud provider site (i.e. on a server of the cluster used for the computations), on the ISV site (i.e. on a server managed by the software provider) or on the customer site (i.e. on a server managed by the customer). For each of these 3 cases, different ways to validate license apply.

If the license server is run on the cloud provider site, the license file may be uploaded by the customer itself who bought it from the ISV, managed by cloud provider team on behalf of the customer who bought it, or provided by the ISV once and for all possible customers. The first two cases have for ISV and end-user the advantage of a strict control on the license, while the main disadvantage lies in the fact the license file is paid for a fixed period of time whether it is used or not. The third case is very user friendly, but this approach relies heavily on the trust between the ISV and the Cloud provider.

If the license server is run on the ISV site, then the customers usually need to request an encrypted license key and declare it on the Cloud platform. All the license accounting is done by the ISV. This approach allows the ISV to easily charge the customer on pay-per-use policy and also allows the implementation of monitoring tools on the ISV web site to the benefit of the end user (license usage, statistics, key request, key renewal, etc.).

If the license server is run on the customer site, the customer firewall rules need to allow the Cloud platform to connect to it (or using a Virtual Private Network - VPN). The license server may be the same as the one already used by the customer infrastructure for local runs.

Other more “exotic” systems exist, like those requiring the use of physical o virtual dongles, A dongle is an object (pluggable piece of hardware or file) that is uniquely associated to a physical machine. Once plugged in its host a dongle grants license rights for this very host.

Some licensing systems have limitations that may challenge their use in a complex environment, like the Fortissimo Marketplace. Typical examples are:

- License servers that cannot be run on Virtual Machines (VMs). Using VMs for such a simple task as hosting a license server is a common practice, since they are flexible, easy to manage and quick to reconfigure.

- License servers that require root privileges. Root access is usually denied to users for security and confidentiality reasons. License servers that do require executing with "root" privilege are thus difficult to integrate. They need to be isolated on a specific machine with specific rules. This requires some additional work and resources and impacts the flexibility of the whole Cloud solution.
- Node-locked licenses or requiring dongles. These approaches have limited flexibility and therefore are a big limitation in a Cloud environment.

4.3.3 The first market analysis

The basis of this framework are then tested and adapted and improved through a Questionnaire, and with many interviews conducted with ISVs representatives. The output of the Questionnaire constitutes a first broad market analysis on the attitude of ISVs with respect to HPC cloud services, and gives some hints on their perception as a new major player, Fortissimo, is entering the arena.

The submission of the Questionnaire was preceded by a selection of the available sample. Since Fortissimo is not focused on any vertical application silo, for the first research we decided to be the widest in scope as possible. The first step was therefore to leverage on the ISVs present in Fortissimo as partners, and on the network of pre-existing contacts each partners, and especially the core partners acting as resource providers, own. A call across the whole project was therefore issued in order to create a contact database mapping the European ISVs, meaning here both organizations having their main sites in Europe, or organizations having relevant subsidiaries or sales volumes in Europe.

The produced database include about 90 organizations. In order to respect privacy rights we insured that contacts with ISVs, when necessary, happened only through their respective contact owners.

The first questionnaire being broad in its scope, needed to be rather complex, with many answers triggering clarification or follow-up questions.

The research is divided into two sections, the first one trying to profile the subject with respect to a score of parameters, financial, geographical, or application field related. The second addresses the attitude towards a possible HPC cloud strategies, trying to ascertain the perceived value, challenges and risks. Finally some enquiries are made to understand what the arrival on the market of a one-stop-shop for HPC cloud services could alter their attitude and what is expected by such an entity.

The following tables report the structure of the questionnaire:

Section 1: demographics		
1.1	Please confirm you are authorized to answer this questionnaire as representative of an Indipendent Software Vendor (ISV).	
		YES
		NO
1.2	What is your role in the company?	
		free text
1.3	Is your company an SME, according to EU definitions?	
		YES
		NO
1.4	What is the application field of your company's main/best selling product?	
		CAE: CFD
		CAE: structural analysis
		CAE: multiphysics
		Life sciences
		Computational chemistry
		Finance
		Other: free text
1.5	In which country is the main European site of your company?	
		free text
1.6	What is the gross revenue of your company for EMEA region in 2012 (in MEuros)?	
		free text
1.7	How much of the annual sales are due to SMEs customers (in percent)?	
		<5%
		6-25%
		26-50%

		51-75%
		>75%
		don't know/can't disclose
1.8	Are you available for a follow-up phone interview?	
		YES, without restrictions
		YES, with a prior NDA
		NO
1.9	Would your company be interested in participating a round table where ISVs, end-users and resource providers discuss about HPC cloud services opportunities and obstacles?	
		YES
		NO
1.10	If you are available for a follow-up or simply to receive ISV forum related informations, please provide your name with an email and/or phone number.	
		free text

Table 1: ISV Market analysis questionnaire Section 1

Section 2: HPC cloud strategy enquiry						
2.1	Are you aware of marketplaces for HPC cloud services?					
		YES				
			2.1.1	Which ones?		
					free text	
		NO				
2.2	Are you aware of the Fortissimo Project scope and activities?					
		YES				
		NO				
2.3	Does your company plan to adopt a strategy specific for HPC cloud services?					
		a) We already have one in place				
			2.3.a.1	Which kind of strategy?		
					We offer a special licensing model	
						2.3.a.1.1 Which kind of licensing model?
						free text

			We offer HPC cloud services on our own infrastructure	
			We offer HPC cloud services through an exclusive partner as Resource Provider	
			We offer HPC cloud services through several Resource Providers	
			Other: free text	
	2.3.a.2	Which is the major driver for you to adopt a HPC cloud strategy?		
			Enter new market segments	
			Acquire a greater market share in segments where we are already present	
			Respond to competitors' moves	
			Adapt to technological/market trends	

			Respond to customers' requests	
			Increase ease of use/flexibility for customers	
			Other: free text	
	2.3.a.3	Have you met any resistance in the adoption process?		
			NO	
			YES. Internally, mainly from ICT	
			YES. Internally, mainly from Sales	
			YES, from Customers	
			Other: free text	
	2.3.a.4	Have you met unexpected obstacles (technical or not) in the adoption phase?		
			YES	
			NO	

	2.3.a.5	Could you provide some comments on that answer?	
			free text
	2.3.a.6	Since when is your strategy operational?	
			Less than 1 year
			1-2 years
			more than 2 years
	2.3.a.7	How much of your revenues come from cloud-delivered services (in percent)?	
			free text
	2.3.a.8	What is your satisfaction level with the outcomes?	
			1-10 scale
	2.3.a.9	Do you have any comment on the previous answer?	

			free text		
	b) We haven't at the moment, but it is already planned				
		2.3.b.1	When will it be implemented?		
			Less than 1 year		
			Less than 5 years		
			Don't know yet, when the market will make it feasible		
			Don't know yet, when I will find suitable partners		
			Other: free text		
		2.3.b.2	Which type of strategy?		
			We will offer a special licensing model		
				2.3.b.2.1	Which kind of licensing model?
					free text

			We will offer HPC cloud services on our own infrastructure	
			We will offer HPC cloud services through an exclusive partner as Resource Provider	
			We will offer HPC cloud services through several Resource Providers	
			Other: free text	
	2.3.b.3	Which is the major driver for you to adopt a HPC cloud strategy?		
			Enter new market segments	
			Acquire a greater market share in segments where we are already present	
			Respond to competitors' moves	

			Adapt to technological/market trends	
			Respond to customers' requests	
			Increase ease of use/flexibility for customers	
			Other: free text	
		2.3.b.4	Doyou expect any resistance in the adoption process?	
			NO	
			YES. Internally, mainly from ICT	
			YES. Internally, mainly from Sales	
			YES, from Customers	
			Other: free text	
	c) We have some interest, but nothing is planned yet			
	d) We will not adopt a strategy for HPC cloud			

	2.3.d.1	What is the main reason?			
			We do not think this will increase our revenues		
				2.3.d.1.1	Why so?
					The market is not yet mature enough
					It damages our existing sales channels
					It creates confusion in our customers
					Other: free text
			We do not have the competences to implement it		
				2.3.d.1.2	Which competences are lacking?
					ICT
					Marketing
					Other: free text

			2.3.d.1.3	Do you think the existence of an established european marketplace (one-stop-shop) for HPC cloud services might help you to procure these competences?
				YES
				NO
		We do not have the resources to implement it		
			2.3.d.1.4	Which resources are lacking?
				Human
				Financial
				Other: free text

		2.3.d.1.5	Do you think the existence of an established european marketplace (one-stop-shop) for HPC cloud services might help you to procure these resources?	
				YES
				NO
	We think our customers are not interested			
	We think the market is not mature enough			
		2.3.d.1.6	What is the most critical factor in your opinion?	
				Uncertain security
				Insufficient network bandwidth

				Insufficient middleware maturity
				Lack of competences in endusers
				The size of the average industrial problem does not justify the adoption
				Lack of adequate licensing models
				Other: free text
	Lack of trust in cloud providers			
		2.3.d.1.7	What is the most critical factor in your opinion?	
				Security
				Service Level Agreements
				Long-term commitment
				Other: free

			text
		We think it will require a disruptive change in our internal organization	
		Other: free text	
2.4	Do you think the creation of a big marketplace (one-stop-shop) for HPC cloud services could be an opportunity for your company?		
	YES		
	NO		
2.5	Do you think the creation of a big marketplace (one-stop-shop) for HPC cloud services could influence your strategy?		
	YES		
	NO		
2.6	Do you think the creation of a big marketplace (one-stop-shop) for HPC cloud services could enhance the adoption of HPC techniques in SMEs?		

		YES	
		NO	
2.7	Which kind of services would you expect to find in a HPC cloud marketplace?		
		Software-as-a-Service (SaaS) offering OpenSource applications	
		SaaS offering commercial (ISV) products	
		Platform-as-a-Service (PaaS) offerings	
		CPU cycles	
		Infrastructure-as-a-Service (IaaS) offerings (based on virtual istances)	
		Competence brokering	
		Best practices	
		Success stories / Use cases	

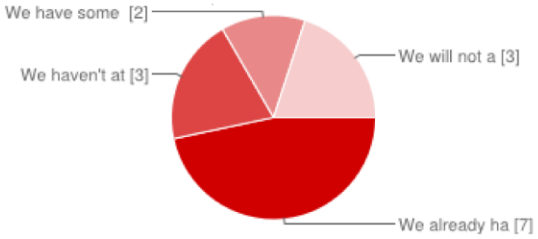
	Advanced training	
	Other: free text	
2.8	Do you have any additional comment?	
	free text	

Table 2: ISV Market analysis questionnaire Section 2

4.3.4 Analysis and conclusions

Since publishing the whole raw data would be rather confusing we will provide here the answers to the key questions and then proceed to the analysis of the resulting view. Moreover, although already meaningful, the number of answers (15) remains limited with respect to the number of ISVs in the database. It is our intention to further solicit the completion of this enquiry, and will publish an updated version of the results in next reporting period report.

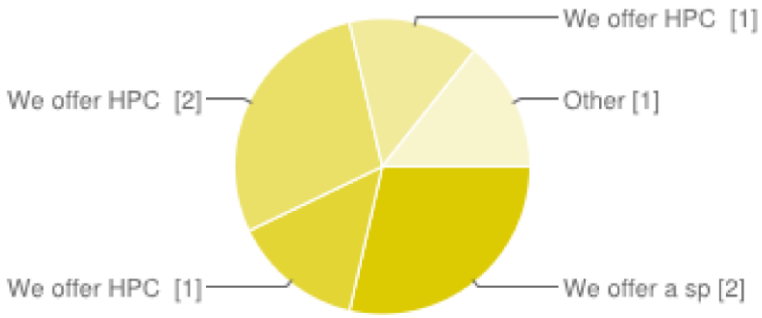
Figure 1 is the key question concerning whether the ISV has a HPC cloud strategy.



We already have one in place	7	47%
We haven't at the moment, but it is already planned	3	20%
We have some interest, but nothing is planned yet	2	13%
We will not adopt a strategy for HPC cloud	3	20%

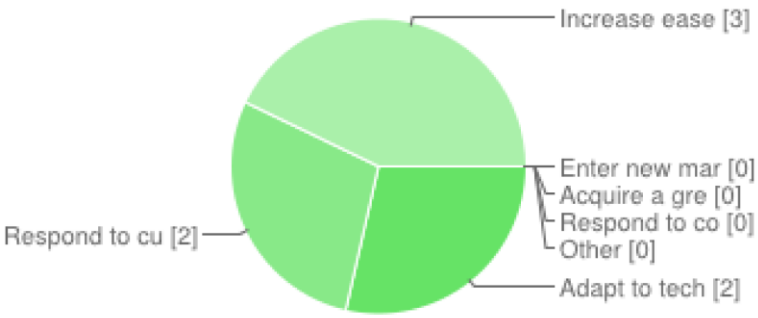
Fig. 1 Question 2.3: Does your company plan to adopt a strategy specific for HPC cloud services?

Figures 2,3,4 show answers to follow-up enquiries for ISVs who affirmed "We already have a cloud strategy in place" in Question 2.3.



We offer a special licensing model	2	29%
We offer HPC cloud services on our own infrastructure	1	14%
We offer HPC cloud services through an exclusive partner as Resource Provider	2	29%
We offer HPC cloud services through several Resource Providers	1	14%
Other	1	14%

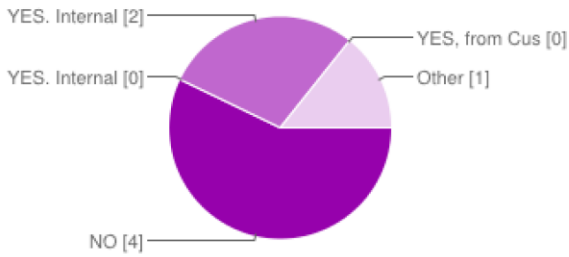
Fig. 2 Question 2.3.a.1: Which kind of strategy?



Enter new market segments	0	0%
Acquire a greater market share in segments where we are already present	0	0%
Respond to competitors' moves	0	0%
Adapt to technological/market trends	2	29%
Respond to customers' requests	2	29%
Increase ease of use/flexibility for customers	3	43%
Other	0	0%

Fig. 3 Question 2.3.a.2: Which is the major driver for you to adopt a HPC cloud strategy?

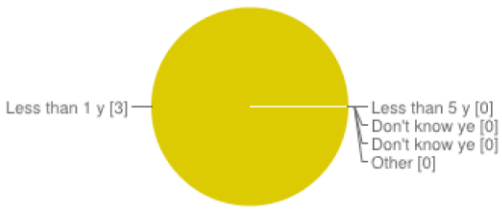
Have you met any resistance in the adoption process?



NO	4	57%
YES. Internally, mainly from ICT	0	0%
YES. Internally, mainly from Sales	2	29%
YES, from Customers	0	0%
Other	1	14%

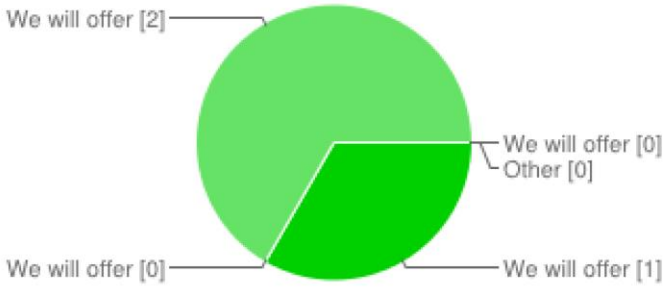
Fig. 4 Question 2.3.a.3: Have you met any resistance in the adoption process?

Figures 5,6,7,8 show answers to follow-up enquiries for ISVs who affirmed “We don’t have a Cloud strategy in operation but we are planning one” in Question 2.3.



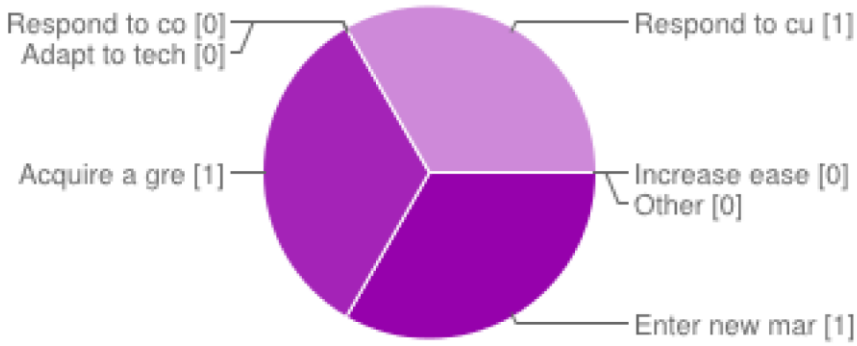
Less than 1 year	3	100%
Less than 5 years	0	0%
Don't know yet, when the market will make it feasible	0	0%
Don't know yet, when I will find suitable partners	0	0%
Other	0	0%

Fig. 5 Question 2.3.b.1: When will it be implemented?



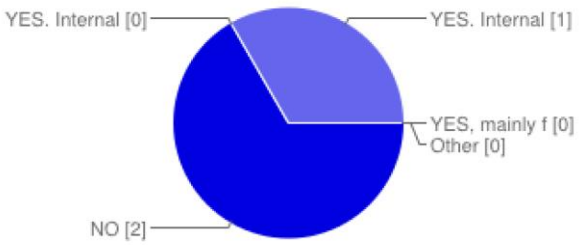
We will offer a special licensing model	1	33%
We will offer HPC cloud services on our own infrastructure	0	0%
We will offer HPC cloud services through an exclusive partner as Resource Provider	2	67%
We will offer HPC cloud services through several Resource Providers	0	0%
Other	0	0%

Fig. 6 Question 2.3.b.2: Which type of strategy?



Enter new market segments	1	33%
Acquire a greater share in markets where we are already present	1	33%
Respond to competitors' moves	0	0%
Adapt to technological/market trends	0	0%
Respond to customers' requests	1	33%
Increase ease of use/flexibility for customers	0	0%
Other	0	0%

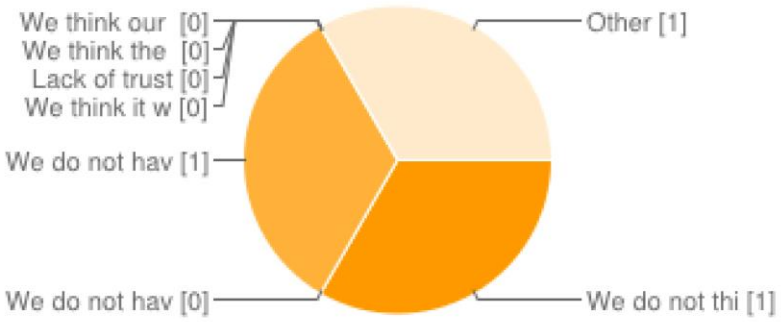
Fig. 7 Question 2.3.b.3: Which is the major driver for you to adopt a HPC cloud strategy?



NO	2	67%
YES. Internally, mainly from ICT	0	0%
YES. Internally, mainly from Sales	1	33%
YES, mainly from customers	0	0%
Other	0	0%

Fig. 8 Question 2.3.b.4: Do you expect any resistance in the adoption process?

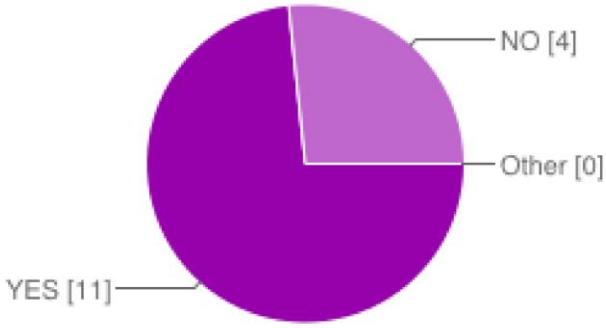
Figure 9 show answers to the follow-up enquiry for ISVs who affirmed "We will not adopt a strategy for HPC Cloud" in Question 2.3



We do not think this will increase our revenues	1	33%
We do not have the competences to implement it	0	0%
We do not have the resources to implement it	1	33%
We think our customers are not interested	0	0%
We think the market is not mature enough	0	0%
Lack of trust in cloud providers	0	0%
We think it will require a disruptive change in our internal organization	0	0%
Other	1	33%

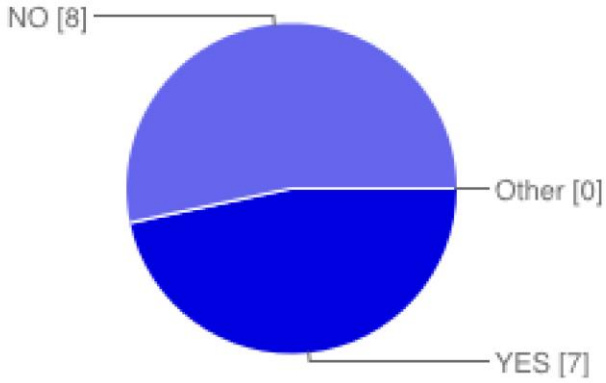
Fig. 9 Question 2.3.d.1: What is the main reason?

Figures 10,11,12,13 show the answers to the key questions about the perceived contribution of a large HPC Cloud Marketplace, and what kind of services are expected from such a Marketplace.



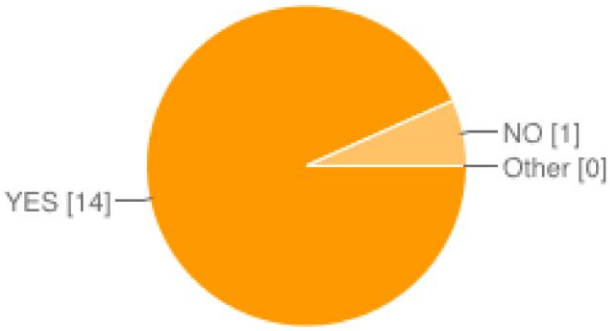
YES	11	73%
NO	4	27%
Other	0	0%

Fig. 10 Question 2.4: Do you think the creation of a big marketplace (one-stop-shop) for HPC cloud services could be an opportunity for your company?



YES	7	47%
NO	8	53%
Other	0	0%

Fig. 11 Question 2.5: Do you think the creation of a big marketplace (one-stop-shop) for HPC cloud services could influence your strategy?



YES	14	93%
NO	1	7%
Other	0	0%

Fig. 12 Question 2.6: Do you think the creation of a big marketplace (one-stop-shop) for HPC cloud services could enhance the adoption of HPC techniques in SMEs?

Software-as-a-Service (SaaS) offering OpenSource applications	7	10%
SaaS offering commercial (ISV) products	13	19%
Platform-as-a-Service (PaaS) offerings	5	7%
CPU cycles	7	10%
Infrastructure-as-a-Service (IaaS) offerings (based on virtual istances)	8	12%
Competence brokering	6	9%
Best practices	7	10%
Success stories / Use cases	9	13%

Fig. 13 Question 2.7: Which kind of services would you expect to find in a HPC cloud marketplace?

Summarizing the outcome of the questionnaire and of the many interviews and personal communications held with ISVs representatives, a few indications emerge.

The first important indication is that if for many ISVs the technical aspects of the transition to the Cloud appear to be rather well understood, even if the roadmap is uncertain, less understood are the implications in other areas of the business. The changes in those areas may result in practice much deeper and harder to execute, with a consequent high level of risk.

Only a few of the ISVs seems to grasp that moving to the Cloud is essentially a transition to entirely new ways of doing business, with new requirements from customers and partners, and new opportunities that enable significant reward, and related potential risk.

Remaining on the technological aspects, security is the greatest concern. The cloud solution must not only be secure, but also must be perceived as secure by its potential customers and partners. The second big concern arise from the lack of clarity in long term technological scenarios. Cloud solutions are perceived in a continuous evolution, and many ISVs are confused by the coexistence of proprietary and non-proprietary (Open) standards, the necessity of considering capability for integration with other platforms and solutions (via APIs, toolkits, partner solutions) and the operational efficiency and robustness of those integration solutions. In that sense trusting a technological partner is definitely relevant, and Fortissimo should invest effort in creating trust.

Outside the technological aspects, most of ISVs perceive Cloud as a disruptive technology, but have difficulties in rethinking the current business value proposition in the terms the new technology of the Cloud requires and allows. For almost all of them the goal is not migrating customers to the HPC Cloud, but to find a Cloud advantage, functional or economic in nature, to bring new customers in, especially having in mind the SME market so many of them have difficulties to deal with.

What could the Cloud advantage be is however not yet clear to many ISVs and it will surely be one of the major investigations of this Work Package in the future analysis.

Offering simply pricing flexibility is perceived as dangerous, since it is likely to push existing customers to the new offering, and this is what they would like to avoid. They are more interested in design functional enhancements that can deliver value in the Cloud but only as complementary to the traditional usage.

On the other end they begin to realize that moving to a service-oriented framework could open new opportunities to long-term growth and profitability, adopting strategies typical of the service oriented companies, such as upselling at the moment of contract renewals, based on better quality of service, service improvement, and continuous innovation. But that requires a continuous measurement of metrics and result, and again the question of trust in resource providers arises.

Also, the question of licensing models and pricing is very important, with no clear winner. ISVs have in mind that they need new models, but are uncertain which one would guarantee the margins they are accustomed to. This opens opportunities for Fortissimo to act as an experiment playground for willing ISVs to test even exotic models. One of the most interesting suggestions that came from an interviewee is the possibility of adoption of a pricing based on perceived value. Especially new ISVs tend to struggle with pricing. Traditionally pricing depend on costs, that of course establish the lower limit for prices, and the evaluation of the “marketplace”. But the “marketplace” is often too broad a view to allow a reliable estimation. According to the interviewee, profit margin should be based upon the willingness to pay in a specific customer segment. The most effective Cloud pricing should exploit metrics that successfully relate to the value the user perceives.

The major resistance in moving to the Cloud come internally from Sales, where the personnel perceive a threat to their compensation for direct sales. In that sense it is difficult to think of a solution alternative to separate sales channels, creating a Cloud sales organization. But this issues relates also to the above discussion on the advantage of a complementary Cloud proposition with respect to traditional software.

5 Work Package Deliverables and Outputs

5.1 Introduction

As detailed in the Fortissimo Description of Work (DoW) the outputs of this Work Package consist of three yearly reports, in detail:

D9.1) WP9 Year 1 Report: The first formal yearly report on WP9 including the first ISV Market Analysis Report and a report on the first ISV Forum. At month 12. This is the present document.
D9.2) WP9 Year 2 Report: The second formal yearly report on WP9 including the second ISV Market Analysis Report and a report on the second ISV Forum. At month 24.
D9.3) WP9 Year 3 Report: The final formal yearly report on WP9 including the final ISV Market Analysis Report and a report on the final ISV Forum. At month 36.

Since for the opportunity reasons explained in the 4.2 subsection, the first ISV Forum will be held outside the reporting period, having obtained the necessary EC approval, a dedicated Whitepaper, meant as an Appendix of this document, will be published within one month after the event detailing its outcomes..

Number	Title	Due	Status
D9.1	WP9 Year 1 Report	PM12	Done
	Whitepaper: the first ISV Forum organization and outcomes	TBD	In progress

Table 3: Cumulative status of deliverables from Work Package 9

5.2 D9.1 WP9 Year 1 Report

It is the current document.

5.3 Whitepaper: the first ISV Forum organization and outcomes

As explained above, it is to be considered an Appendix to D9.1 documenting the organization and the outcomes of the first Fortissimo ISV Forum, that will be held in conjuction with the experiments workshop in the first month of activity of the second wave experiments.

The inputs coming from the discussion between ISVs, End Users and the other stakeholders in the Forum, will constitute precious indications on the direction of the Market Analysis of WP9, and will provide data for WP8 analysis.

Of course, the lessons learned in the organization of the first Forum will be discussed and analysed to improve the quality of the future ISV Forums.

6 Resources used

The following effort (in staff months) by partners has been reported in this work package at month 12 (or 24 or 36) for the period months 1 to12, 13 to 24 and 25 to 36.

Participant	Pro-rata effort	Planned effort	Reported effort
UEDIN	0,67	0,67	0,00
GENCI	0,67	0,67	0,04
CINECA	2,00	2,00	2,65
XLAB	0,67	0,67	0,00
ARCTUR	0,67	0,67	0,75
GOMPUTE	0,67	0,67	0,02
INTEL	1,00	1,00	0,21
SICOS	0,72	0,72	0,13
Totals	**7,05**	**7,05**	**3,80**

Table 4: Resources used

Due to the low quantity of overall effort available to this Work Package, we do not consider the deviations from planned effort meaningful, since they may be easily overcome in the next reporting periods. Moreover, the focus of the work package is expected to be more towards later periods, so the reduced effort at this stage is not unexpected.

7 Problems and Deviations

Although we could successfully achieve the planned tasks, it has to be noted that this Work Package requires a large communication effort needing to ensure the collaboration of a large base of entities, both ISVs and End Users. To obtain a significant number of answers it not sufficient to simply launch a mail campaign, but requires a good dose of ingenuity, leveraging on personal contacts, the participation to networking events and social media exploitation.

This is valid for obtaining collaboration and information from existing Fortissimo partners also.

The result is that often the estimated timeframe for internal targets (like finalizing the collection of contact data, obtaining an interview, etc…) was hardly respected in the course of the first reporting period.

This challenges may be alleviated only with a more balanced distribution of work efforts among all involved partners, and with the identification and adoption of a tool, possibly to be integrated with the 4PM portal, to collect and share formal and informal interviews data in a structured form. The implementation of such a tool will be a target for the next reporting period.

8 Plans for next period

Task 9.1 Analysis of licensing models

The next period will see the full operational activity of the Thematic Working Group on cloud licensing models as a Forum to exchange ideas and collect requirements.

Besides collecting new information and insights, we will approach ISVs collaborating as partners in the first or second wave of experiments to propose and lead limited experiments on new licensing models, and estimating their impact on their business operations.

Task 9.2 Analysis of the ISV marketplace

The outcome of the first market analysis will be used to further test the framework, with questionnaires and interviews for limited, specific points that need to be clarified. This will be used as a basis for discussion during the first ISV Forum, that will provide new insights to use for further refinements.

Once we are confident to have identified all the challenges and their relative importance, insights will be gathered to identify best practices to overcome them or at least to mitigate their effects.

Task 9.3 The yearly ISV forum

The first ISV Forum will be held in conjunction with the experiments workshop in the first month of activity of the second wave experiments, and its outcome analysed, in order to provide hints not only for Task 9.1 and 9.2 activities, but also for improvements to the organization of the second Forum. The delayed occurrence of the first ISV Forum is likely to move the second Forum at the beginning of Year 3. This will be decided in a timely way, having in mind the necessity of guarantee the success of the final Forum at the end of the Project.

The following risks have been identified and contingencies have been proposed:

- Insufficient interest in the Second ISV Forum, translating in a limited participation to the event;
    - the event is likely to have a good participation is the perceived value is high, therefore we must make sure the outcome of the first Forum and of the Work Package activities is widely disseminated, including through social media;
    - to overcome resistance to attendance by industrial End-User and ISVs due to budget restrictions, we will consider the possibility to hold event in the framework of a larger conference a score of the expected participants is already likely to attend.
- Limited involvement of ISVs in Work Package activities, especially low completion rates of questionnaires and low number of interviews;
    - in occasion of questionnaires release or interviews campaign we will ask the contribution of all partners to push their respective personal contacts to the participation;
    - a policy of sharing the insights from the analysis with all stakeholders will be put in place in order to increase the perceived value of participation.

9 References and Applicable Documents

[1] PlanetHPC report, "A Strategy for Research and Innovation through High Performance Computing", http://cordis.europa.eu/fp7/ict/computing/documents/planethpc-strategy.pdf
[2] IDC White Paper, "Council on Competitiveness Study of ISVs Serving the High Performance Computing Market: Part A - Current Market Dynamics", July 2005
[3] IEEE HPCS2014 Conference, http://hpcs2014.cisedu.info/
[4] ISO 27000 Standards Directory, http://www.27000.org/
[5] FedRAMP standards, http://cloud.cio.gov/fedramp
[6] FlexNet Publisher (formerly known as FLEXlm), http://www.flexerasoftware.com/products/flexnet-publisher.htm
[7] Reprise License Manager, http://www.reprisesoftware.com/