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Software as a Service (SaaS) Through a Grid Network: Business and Legal Implications and Challenges

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Abstract: The paper will approach the topic of the provision of SaaS in a Grid environment in light of the experience gained by the authors as business and legal consultants within BEinGRID project. In particular, starting from the analysis of 18 real business cases, some sensitive issues will be addressed, like the impact of Grid applications and resources offered with the SaaS model in existing and new markets (investments, market entrance, competition etc.), pricing policies and schemas, SLAs and some major legal aspects, namely in connection with the contract entered into by the parties in a typical SaaS scenario. The main lessons are that Grid is a very promising technology and that software providers gained a deeper understanding and trust of how Grid can be useful for their scope and is able to create a new paradigm for the supply of SaaS. From the legal point of view, then, Grid is not a neutral technology and indeed it does matter when drafting and applying SaaS agreements.

Keywords: software, service, Grid, business, legal, SaaS, SLAs, economic issues

1. Introduction

A Grid can be perceived as a collaborative high-throughput environment for efficiently sharing resources (software and hardware) over the web from different heterogeneous administrative and geographically dispersed domains, virtualized with the means of specialised middleware. In the past few years the focus has been diverted in promoting the usage of Grid networks and designing Grid-enabled applications for industrial purposes.

Nevertheless, latest studies strongly indicate the lack of appropriate business models for exploiting this new technology at its full potential from the various industry sectors. This paper, then, is aimed to fill this important gap.

With this regard, the authors' interaction with major players from diverse industries (automotive, financial, film industry etc) in the context of FP6 EU-funded IST project BEinGRID (IST5-034702) as business and legal consultants has indicated among many others that the most promising business model for providing Grid services (hardware or software) resides in the Software as a Service (SaaS) delivery model. Offering services together with resources such as CPU cycles and storage on a pay-per-use basis according to this model is seen by economists as part of the evolution of the Grid towards a next generation Grid-powered marketplace where heterogeneous software services and

enormous amounts of resources are offered dynamically over IP, independently of user platform, not owned by users and paid only for when required.

In order for this vision to become a reality there are various implications to be investigated on two fronts: the business and the legal ones provided that legal findings and business models are strongly interrelated and thus have to be jointly assessed.

2. Objectives

This paper sets the scene for SaaS adoption in Grid today and based on the study of specific business cases and lessons learnt from BEinGRID will identify and analyse a number of specific business and legal challenges that need to be addressed in order for the industrial community to gain more trust in the SaaS-based Grid solutions and benefit the most out of it. Some of the issues to be analysed include the following:

- The impact of Grid applications and resources offered with the SaaS model in existing and new markets such ones related to investments, market entrance, competition etc.
- Issues to be addressed related to pricing and Service Level Agreements (SLAs) in order for the new services to be economically sustainable and attractive to the customers, including the need for the definition of new associated legal schemes for SLAs.
- Network externalities foreseen as SaaS will play a catalytic role in the Web 2.0 era and in conjunction with Service Oriented Architecture (SOA) architectures new business opportunities will arise. In such a modular and highly-interactive open environment each component adds value to others and to the whole product thus creating network externalities.
- Legal issues: provided a general overview of the contractual framework to be adopted in the field of SaaS, sensitive issues must be taken into account like the coexistence between proprietary rights and licenses, confidentiality and liability. The question that we aim to solve is whether Grid is a neutral technology from the legal point of view, in other words it is necessary to wonder if the fact that the application is provided through a Grid network alters the above contractual framework and affects the content of the relevant provisions.

3. Methodology and Business Cases

This paper employs a twofold methodology, based respectively on the observation of the findings, experiences achieved and research performed in the context of the project complemented by an extensive review of the literature on the topic and it will comprise a cross-analysis of the 18 Business Experiments (thereinafter, BEs) from diverse business sectors that constitute part of the BEinGRID project. A BE is a real Grid pilot application that addresses a concrete business case and in which the main actors of the economic sector are represented: end-user, service provider, Grid service integrator. Our study will focus on those business cases exploiting the SaaS paradigm and sources of input will include the business models and exploitation plans of the BEs which as business and legal consultants of the project we had access to. Due to the sensitive nature of information required to produce such an analysis (business plans, industry internal market analysis, legal information) we couldn't supplement our resources with scenarios derived from simple literature studies.

4. Grid Technology and SaaS Delivery Model Description

Over the last years Grid technology has proven its merits through enabling the execution of highly resource demanding, mainly high-performance related applications for the scientific community. However, in order for Grid technology to fulfil the aforementioned promise, it has first to be adopted by the diverse business community thus being provided and

consequently validated by a significantly larger number of providers and users. The work performed in the context of BEinGRID project has been focused on that scope, i.e. addressing the concerns of various business sectors with regard to entering the Grid market and dealing with real-life business problems as these emerge in the life-cycle of producing and selling a new Grid product or application.

From the early start of the Grid market it became apparent that for Grid applications to revolutionise and impact the mass market they should be delivered in a different model from the traditional On-Demand or Application Service Provision (ASP) ones in order to be appealing to a greater base of customers from Short and Medium Enterprises (SMEs) or organisations to average but demanding home users. One of the delivery models that can fulfil these requirements is the SaaS one. SaaS is a software application delivery model where a software vendor develops a web-native software application and hosts and operates (either independently or through a third-party) the application for use by its customers over the Internet. Customers do not pay for owning the software itself but rather for using it[i] [1].

As we will discuss in the next section, despite the fact that the advantages of this model are apparent and rather emphatic (i.e. applications can address a global market, no maintenance costs for the user, simplicity and ease of use, costless market entrance for the provider etc.), there still exist certain barriers for the Grid enablers that holds them back from exploiting this model.

5. The SaaS Adoption in Grid Today – The BEinGRID Findings

Latest market studies on the Grid market [2] have not provided any statistics on the Grid application delivery models currently used by Grid practitioners worldwide or their impact in the market. We tried to bridge this gap by analysing 18 different business cases from diverge industries. Our sources have been the analysis and evaluation of their business plans, the personal interaction with them and other business consultancy related activities (completed questionnaires, assistance in producing presentations for exploitation, business training etc).

Based on the information gathered the 18 business cases were classified in three distinct categories according to their business model and in particular their strategic mission, the added value of their product, their value chain and the sources of anticipated economic benefits. Among others, this analysis also revealed which of the BEs had built their business model around the provision of service based on the SaaS paradigm, which is the subject under discussion in this paper. Furthermore, it should be mentioned that the categorisation has been made based on added value of the end-product offered to the user.

The 3 categories were the following:

- Category 1: “Grid Business Cases with a clear performance-associated benefit”. This represents those cases whose implementations primarily aim to address one of the following problems/limitations: a) additional CPU power needed for executing a demanding application (typical high-performance computing scenario); b) huge amount of data storage/memory is required; c) access to heterogeneous, geographically distributed data resources is required.
- Category 2: “Grid Business Cases with a highly collaborative benefit” i.e. benefit arising from sharing complementary resources among participating organisations. In this case, the resulting benefit from Grid adoption comes from sharing data, power and resources utilized for a common scope. Typical examples of this category are intra-organisational Grids and Virtual Organisations, and the expected economic benefit in this case could be shared among all participants in contrast to the first category where the main economic benefit is anticipated from the end-user.
- Category 3: “Grid Business Cases exploiting the SaaS paradigm”. This comprises those business scenarios exploiting new models for provisioning of their services such as for

instance the pay-per-use or SaaS one. For example, a service provider could offer applications on a pay-per-use basis rather than by means of licensing or long term static agreements and, thus, exploiting to the most the concepts of these new software paradigms.

The categorisation of the BEinGRID BEs based on the aforesaid categories is presented in the next table. The detailed description of the BEs can be found for reference in the projects web-page [3]. It should be noted that each BE was listed under one primary and one secondary category in the case it exhibited characteristics from more than one category, thus enabling them in the future to commercially exploit their results utilising different business models. For example, a company that will offer in the near future a new application to the end-user to be executed on a Grid infrastructure could eventually consider offering in the long-term the same service in a SaaS model running solely in their premises. An analysis of the findings is presented in the next section.

Finally, it should be mentioned that these business cases involve the participation of more than one party (usually 4-5) from the whole value chain i.e. application providers, infrastructure providers, technology experts etc. Therefore, our aim is not to classify existing services from commercial providers such as Sun, Amazon, IBM etc. as these are offered only through a single provider, are mainly based on the provision of resources, and therefore we can not investigate the economic and business relations between other parties of the value chain. Also, our main interest in the context of our project focuses on promoting the provision and utilisation of the Grid SaaS services from SMEs in diverse industries rather than from a few major players of the market thus endorsing an oligopoly.

Table 1: Business Cases Classification

BE	Application	Sector	Primary Category (BE original goal)	Secondary Category (also possible)
BE01	Computational Fluid Dynamics & Computer Aid Design	Advanced manufacturing	Category 1	Category 3
BE02	Business workflow decision making	Media	Category 1	Category 3
BE03	Visualisation & virtual reality	Media	Category 3	
BE04	Financial Portfolio Management	Financial	Category 3	Category 1
BE05	Retail Management	Retail/Logistics	Category 1	Category 3
BE06	Groundwater modelling	Environmental/ e-Science	Category 1	Category 3
BE07	Earth Observation	Environmental/ e-Science	Category 3	Category 1
BE08	Integration of engineering and business processes in metal forming	Advanced Manufacturing	Category 2	Category 3
BE09	Distributed online gaming	Media	Category 2	Category 3
BE10	Collaborative environment in the supply chain management	Retail/Logistics	Category 2	Category 3
BE11	Risk management	Financial	Category 1	Category 3
BE12	Sales management system	Retail/Logistics	Category 1	Category 2
BE13	Textile Grid portal	Retail/Logistics	Category 2	Category 3
BE14	New product & process development	Advanced Manufacturing	Category 1	
BE15	Virtual engineering workplace for financial e-services	Financial	Category 3	Category 2
BE16	Ship building	Advanced Manufacturing	Category 3	Category 1
BE17	Logistics & Distribution	Retail/Logistics	Category 1	Category 3
BE18	Seismic imaging & reservoir simulation	Environmental/ e-Science	Category 2	Category 3

6. Discussion of Results & Analysis of Related Business Issues & Benefits

As it can be seen from the above table and illustrated graphically in the figures below, the most popular category for the short-term implementation (primary) is the first one related to the performance related benefits, whereas for future implementations (2nd category) is the third one related to the SaaS. However, compared to a similar analysis at an earlier phase of the project of the same BEs a clear tendency towards most complicated business scenarios and models in the framework of the third category in regard to the SaaS can be observed.

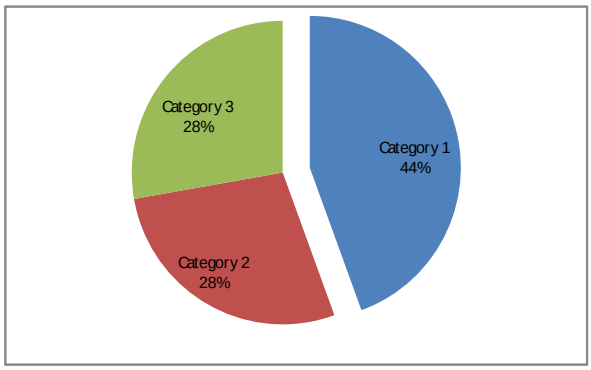

Figure 1: Primary Category Distribution

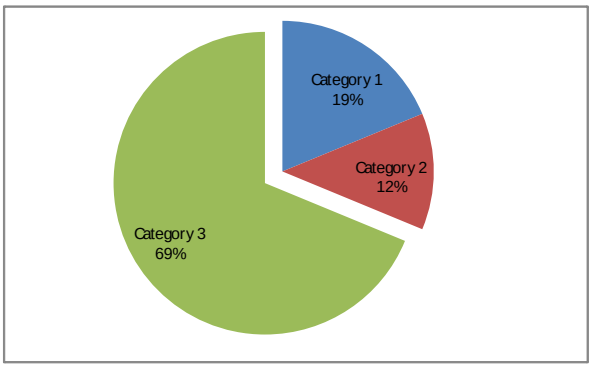

Figure 2: Secondary Category Distribution

This reveals a higher level of trust gained towards the Grid capabilities such as the SaaS provisioning model, that has been gradually built following the deeper understanding of the technological aspects and the interaction with other business partners as the project progresses and the first results are evaluated. Furthermore, the fact that still Category 1 (HPC) is the most common for short-term implementation displays the fact that Grid technology is most-of-all seen by the industry as a very promising solution to overcome performance-associated problems at a lower cost than today.

Another conclusion that can be driven from these graphs is that there is still a lot of way to pave through a more global acceptance of the SaaS paradigm for next-generation services including the Grid ones. By leaving aside the technological advances and solutions which are now numerous and have proven its merits through successful business stories, we have defined a number of business issues that we believe that, once taken into account by the new players, the benefits of using SaaS in many fronts will be more apparent and the risks/considerations by their side significantly reduced.

First of all, the adoption of SaaS-built Grid solutions by the array of diverge industries such as the ones listed in Table 1 will create new markets not foreseen before. For example, a company that was selling a software product or service to a customer based on specific commercial licenses (e.g. per machine installation), now can provide another version of the same service over a Grid infrastructure, on a pay-per-use basis where the customer will pay for the times he uses the service only and depending on his requirements such as the QoS needed, the availability of the service etc. Furthermore, the use of highly-customised web-services with this model could also lead to the creation of new compound services built from smaller service components thus taking advantage of the new market.

Moreover, Grid applications and resources offered with the SaaS model can significantly lower the investments by SMEs needed on the corresponding traditional software license and/or computational infrastructure. The SMEs can also offer new, more demanding services by utilising computing infrastructure of other SMEs (which now serve as providers!) purchased accordingly to the SaaS model. Therefore, the market-entrance barrier is reduced for new players, increasing competition, hence again changing the existing markets as well as creating new markets where these players offer not-possible-before services. Furthermore, as demand increases the providers can now expand their

customers' base and product offerings. In this case, economies of scale and scope apply. Therefore, the impact of all the aforementioned issues to the market needs to be carefully analysed before a business model and associated plan is generated by the involved parties.

Other issues to be taken into consideration by new players are those related to network externalities. Network externalities are the effects on a user of a product or service of others using the same or compatible products or services. Positive network externalities exist if the benefits are an increasing function of the number of other users, whereas negative ones exist if the benefits are a decreasing function of the number of other users. Network externalities strongly apply to the Grid case as SaaS will play a catalytic role in the Web 2.0 era. By embedding web-services in SOA components and mashups, numerous new business opportunities will arise. In such a modular and highly-interactive open environment each component adds value to others and to the whole product thus creating network externalities. Therefore, it is imperative to offer the right incentives for developers to create such components, away from the monolithic structures of the past and also to share in a justified and fair way the generated revenues. Developing the right market mechanisms for that remains a big challenge that needs to be dealt with in the future.

Moreover, in order for the new services to be economically sustainable and attractive to the customers new, flexible and dynamic pricing schemes have to be developed, including the monetary value to be used for pricing the resources offered (i.e. defining the "Grid dollar" concept). Our cross-case analysis of the BEs revealed that this is not a trivial task as there are still conflicting opinions on whether the user should be charged per Virtual Machine used (what exactly is a "VM" has to be also defined…), per time allocated or/and priority given to his tasks or depending on the type of resources (e.g. per CPU cycle, MB of storage or bandwidth reserved) or a combination of all these! Offering the user various pricing and charging options might seem attractive at first, however past experience has shown that simple, straight-forward solutions for the customer are more likely to achieve the required economic benefits.

Finally, as regards the SLA [4] from the legal point of view, we have to point out that, in the light of the experience acquired so far with the BEs, the fact that the SaaS is supplied through a Grid network does matter. In other words, provided that the use of a Grid infrastructure to deliver the service is supposed to increase the quality of such supply, the client will require and expect a better level of services and therefore, unlike traditional and 'non-gridified' scenarios, the extension of clauses on inoperability of and inaccessibility to the service, breakdowns for periodic maintenance procedures or upgrades and limitation of supplier's liability for congestion of the servers will be dramatically limited. At the same time, the user could request that no scheduled and non-scheduled downtimes will be allowed, so that the SaaS shall be always available. This implies, as we will show *infra*, that the burden of liability for the software provider is broadened and that it is necessary to balance the responsibilities (and their consequences) between the software supplier, the Grid provider and the customer.

7. Analysis of Legal Issues from the Business Cases

The analysis of the project's cases shows that in addition to business aspects, major legal issues have to be addressed and therefore in the following lines we will report some of the findings that we could achieve in light of the consultancy activity provided to the BEs and of the assessment of the applicable contractual framework, taking into account the solutions (e.g. clauses templates) developed for the BEs.

It is pivotal to address, as starting point, what is, in legal terms, the agreement that encompasses the provision of SaaS. This, of course, depends on the applicable national legal framework but, for simplicity and for its general use in the international practice, we will focus on the ASP contract. This agreement consists of the practice in which a company

licenses software applications to a customer, normally providing for hosting for his data, so that the user does not have to purchase and operate his own software [5] [6]. The provision of SaaS implies that there is no physical item delivered to the end user and that, unlike in the normal contract between a customer and a software house for the writing of a specific computer program, the software provider keeps the ownership of the application. In case of due diligence, for instance, this element has to be taken into account, as the software can be considered as an asset (and not a liability) of the targeted company only if this undertaking has the ownership of the software.

The coexistence between proprietary rights and licenses is one of the most important issues to take into account when drafting an ASP agreement. As regards the BEs, they have basically two options for their licensing models: open source and proprietary license. In no case the ownership will be transferred to the end user, as it would go against the rationale of SaaS. Provided that many standard open source licenses exist and that the BEs, if they prefer so, can choose one of them, we drafted a general template of a clause that the BEs will adopt in their ASP agreement and which is of general interest in the field of SaaS[ii].

The service provider, in the model adopted by the BEs, will limit as much as possible the rights of the client, which could use the SaaS only during its ordinary course of business, thus he will be liable for breach of contract if, in practice, he sublicenses the supplier's applications. It is pivotal to say that the parties, by virtue of their contractual freedom, would have the possibility to adapt the above clause to their exigencies, and they could opt, for instance, for a transferable or exclusive license. As regards the code provided to the client, in a typical SaaS scenario the object of the contract will concern the object code and not the source code. The contractual freedom of the parties plays a fundamental role also as regards confidentiality obligations. This issue is particularly complex and the experience gained as business consultants shows that the relative clause should address at least the following issues:

- Extension of the confidentiality obligations of the supplier and the client as regards, basically and respectively, the data of the customer and the executable code of the software;
- Duties of the parties;
- Contractual and Court remedies, taking into account that the latter are heavily influenced by the applicable national legal framework;
- Exceptions to the rule, i.e. situations in which there are no confidentiality obligations.

It is interesting, finally, to provide the reader with our findings as concerns liability of the software supplier. In this field, in fact, the ASP agreement (and the other related contracts entered into by the concerned parties) has the duty to shift and balance the risk and the corresponding liabilities between the software provider, the Grid provider and the end user. In principle, in fact, the former should avoid to be responsible (if it does not own and manage the Grid infrastructure) for technical failures of the Grid itself. In other words, he should be liable only for deficiencies that are under his control. At the same time, provided that the majority of disputes concerns the gap between the concrete performance of the service and the level expected by the client, the use of Grid technology should reduce this risk and, at the same time, as explained above, could extend the burden of liability of the software provider. For this reasons, in light of our experience as consultants, the software provider should limit his responsibility to the functionality of the application and the service to the exclusion of the client's requirements.

For what concerns the remedies at disposal of the customer, then, they usually include Service Credits (and, with this regard, it is possible to wonder whether the customer, in a Grid environment, will require higher credits in case of failure to meet the promised level of services), damages (regulated by the applicable national laws) up to, in the most serious cases, termination of the contract.

8. Conclusions

In the previous lines we demonstrated that the provision of SaaS through a Grid infrastructure is a very promising scenario and that the potential for such a paradigm is extremely interesting. In particular, in light of the findings achieved within BEinGRID, it is possible to say that there is a clear tendency towards increasingly complicated and rich business scenarios and models as regards SaaS. This implies a higher level of trust gained by software providers towards the Grid capability such as the SaaS provisioning model, thanks to a deeper understanding of the technological aspects and the close interaction with other business partners within BEinGRID. This point undoubtedly represents a success for the project as a whole.

From a more general perspective, Grid as such is (and is perceived to be by ICT companies) a very promising technology. At the same time, from the legal point of view, we can assess that Grid is not neutral, in the sense that the provision of SaaS in a Grid environment alters the very content of the SLA and of the ASP agreement, especially as regards the level of services and liability of the parties involved. The overall lesson is that it is necessary to balance the risk between software provider, Grid provider and end user in a new way, for the very fact that the traditional ASP paradigm is not able to encompass all the novel elements that are typical of a Grid scenario.

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[i] The relations between SaaS and ASP, from the legal and contractual point of view, will be analyzed under paragraph 7.

[ii] "Supplier (i) grants to Client a limited, non-transferable, non-exclusive license, in object code only, to use the Service solely to support Client's normal course of business, provided, however, that Client may not use the Service in a resale capacity, or process and/or analyse third party data in a commercial service bureau environment or on any hardware[ii], and (ii) retain all right, title, and interest in and to any hardware, software applications and other technology and materials supplied by Supplier."