Building a Knowledge Base for Guiding Users through the Cloud Life Cycle

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Abstract: Cloud Computing is still a hype to provide IT services as customers demand. Especially small and medium size businesses can benefit of this new trend because of the flexibility Cloud Computing provides for the consumption of its services. Nevertheless the step into the cloud must be carefully prepared and setup to ensure a successful usage and an appropriate return on investment. Currently the lack of experience with cloud projects and the uncertainty of its predestined application areas are detaining companies to use cloud computing services. No best practices, rules and use cases are in place yet to help to convince potential users to go their way to the cloud. With the CLiCk project the authors therefore propose a personalized web-based platform for Small and Medium Enterprises to support them over an entire Cloud Life Cycle.

1 INTRODUCTION

Cloud Computing becomes more and more popular also for small and medium enterprises (SME). Besides all the well-known advantages of such services, several entry thresholds, open questions and concerns increase the initial and management costs of a cloud project dramatically. During the last 2-3 years several studies have shown that the main concerns are based on security, regulatory, governance and availability issues (Armbrust et al., 2010). From a SME perspective such issues are leading to questions like: is my company Cloud ready, how have other enterprises approached to the cloud, how can the services be govern and monitored or in which way can services be terminated? Normally the appropriate know-how to answer such questions is not available inside a company and thus, to solve it external knowledge (e.g. expertise by consultants) through an entire cloud life cycle needs to be purchased for a high price. They have to assess the risks, the benefits and best fitting provider for the evaluation. Furthermore they have to setup and monitor a migration plan and governance and management of the Cloud services. Finally, if a client wants to terminate the current service, external expertise has to proof possibilities of leaving and/ or moving the Cloud service in a technical and judicial sense. Especially for SMEs

this is a hurdle which cannot be afforded due to the lack of resources (most often caused by budget constraints). This situation leads to the fact that such entities are stuck between a rock and a hard place. On the one hand they could benefit from cloud services on the other hand the lack of resources does not allow to evaluate and start its use.

Recent surveys are showing that companies are aware about the advantages of cloud computing but they are not ready to go in this direction caused by the issues mentioned above. A survey conducted from Cambridge Technology in Switzerland during summer 2011 shows that 55% of all companies going into the cloud need the support of external consultants (Cambridge Technology, 2011). A survey led from Easynet during spring 2011 shows that in 42% of the companies the business is not convinced of cloud computing and that 1/3 of all CIOs has no framework to measure the ROI (Easynet, 2011). A European wide study published by Vanson Bourne (2012) explains that around 85% of SME are doubtfully about the application and infrastructure services provided through a cloud. Additionally most named issues are security, governance, data privacy and availability issues as the main constraints.

Regarding Cloud Life Cycle G. Conway & E. Curry (2012) have proposed a four phase lifecycle with nine subsequent steps. These phases are very similar to our Cloud Life Cycle. However we focus

on the usability for SMEs and the application within the CLiCk project with building and realizing the appropriate artifacts. Instead of nine subsequent steps our cloud life cycle is broken down into an open number of different tools, so called artifacts with the aim to support users to their cloud stories.

When it comes to cloud marketplaces and brokering services the work of Buyya (2009) defines as follows: Market Maker/Meta-broker is a part of Cloud infrastructure that works on behalf of both Cloud users and Cloud service providers. It intermediates access to spread resources by discovering appropriate cloud providers for a given user application and attempts to optimally map users' jobs and requirements to published services. It is a part of a global marketplace where service providers and consumers join to find suitable match for each other.

In this paper we introduce the CLiCk approach; we give a brief overview of the architecture and the several artifacts. In particular we depict the Cloud-Life-Cycle with its four different stages covering different scenarios that arise around cloud services form a user perspective.

2 THE CLiCK APPROACH

The vision of CLiCk (Cloud Life Cycle) is the provision of services und supportive information which can be accessed on an appropriate platform through the accordant enterprises.

During its first visit, the user has the ability to create an account and made up a company profile on the platform. At the beginning this profile contains general information about the users' company and it will be enriched during the continuous usage of the platform based on the user's input. Based on this profile, the user will be guided and supported through its individual way through the Cloud Life Cycle and it will receive personalized output from the system. This personalization approach offers a tailored support to the individual case and needs. For example if a user is taking note that he would like to use Infrastructure as a Service (IaaS), in the further step of assessing its risks, the assessment will be focusing on IaaS and not on e.g. Software as a Service. One step further, the Provider and Service Classification will only explain offerings for IaaS. The services and information provided to the user are collected in different repositories. These services accompany the user over an entire cloud life cycle and deliver a decision and management support on

common valid questions. Thus these repositories are containing different types of artifacts.

We define the Cloud Life Cycle containing four different stages which a user will go through while thinking about cloud services and consuming it. The Life Cycle model contains the phases, evaluation, migration, operation and change. Each phase comes with its own characteristics and prepares the user to decide to move one step forward or not. The first stage "Evaluation" brings the customer to different areas which have to be analyzed. There the readiness question needs to be answered, if the company is ready to move to a cloud. Furthermore a Cloud strategy has to be build and also important is to choose the right partner for providing right the service in the right time. After the cloud strategy is set, the second part of the life cycle begins, the Migration. Users have to prepare the migration into a cloud. They setup a migration plan, including fallback scenarios etc and fulfill the migration form on premise the migration. While obtaining a Cloud service it is recommended to manage the service. Not in the sense of keeping the service running, but to control the adherence of SLA's, governance and compliance issues. Finally if a user decides to stop using the service or the change the service provider, it comes to the "change" phase. Here the exit strategy, part of a holistic Cloud strategy, has to be applied. While the client decides to change the provider, he has to do the contractual termination, to ensure his data remains his data and to begin again with the evaluation phase.

3 THE ARCHITECTURE

The current architecture level foresees several layers of the CLiCk platform. At the top a web-based interface enables the stakeholders to interact with the system. The next layer, the "matching layer" describes an Inference Engine. It derives based on the information in the different repositories the supportive knowledge. The following sub-chapters are describing the current set of artifacts and the corresponding repositories.

3.1 The Artifacts

To assess the users need and pain points, some artifacts are collecting information about the current as-is situation and the possible to-be plans. Based on the assessed (e.g. readiness maturity) further artifacts like next steps and advises, guidelines are automatically offered to the user.
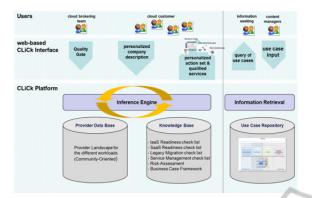
Figure 1: CLiCk Big Picture.

Therefore the artifacts are based on assessments, checklists, and guidelines. As for the different life cycle stages the artifacts are varying. Two examples are:

Risk Assessment

There are already several research works investigating different risk areas of cloud computing. In particular we rely on the seven points introduced by Mather (2009): Infrastructure Security, Security and Storage, Identity and Access Management, Security Management in the cloud, Privacy, Audit and Compliance, Cloud Service Provider.

A further scenario, described by Krutz & Vines (2010), illustrates a very detailed listing of possible risks like Confidentiality, Integrity, Availability, Identification, Authentication, Accountability, Authorization and Privacy.

In CLiCk we focus on a more simplified framework which can be easily stored in the knowledge base and going through the inference process. We identify three main areas for all set of cloud risks: 'business risks', legal risks' and technological risks'. While assessing the user's risks each of these parts will be appraised and feedback or further recommendations will be displayed to the user.

The Cloud Use Case Framework

Literature is showing that there exist different methodologies for analyzing use cases. However, these methodologies are either generic or specialized but not for cloud computing services. Different criteria which are considered important for describing cloud services use cases will assess the fitness of these methodologies. An evaluation of the different methodologies has shown, that currently no approach exists which covers all important aspects of a cloud use case (Schwitter, 2012). Thus, for

providing a holistic use case and to deliver an optimal support to the users, the authors have decided to build up a use case framework from scratch. To consider important aspects (technical and business relevant) four different layers are identified to describe and analyze a use case.

3.2 Data Bases and Repositories

Provider Data Base

The provider database will contain information on the different service providers. It reflects a so called provider landscape, where the suppliers are categorized under certain aspects. Furthermore the services offered by each provider are evaluated and will be stored here too. The provider database is the basement for the provider- and service classification which will be shown to the user as a result of its different assessments.

Knowledge Base (KB)

The central repository of CLiCk is the so called knowledge base. It contains most of the different introduced artifacts and represents the knowledge of the tool. As the artifacts are interconnected, the relations between the artifacts have to be considered. Taking this into account the artifacts and its data have to be stored in a structured way. Thus it is foreseen that the artifacts and its output within this KB are modeled with the Resource Description Framework (RDF). The RDF approach has been chosen for establishing more flexibility for further developing and integrating new artifacts. It also empowers the possibility of describing the customer's need and to match them with the different opportunities. The following example gives a short overview on the RDF based output of the IaaS Readiness Assessment. It shows the question, its description and a possible answer. Regarding the chosen type of given answers, an appropriate first feedback is given to the user.

Use Case Repository

The use case repository enables to store the collected cloud use cases. It follows a developed framework which defines different areas of interest within such a use case. Following this scheme establishes also that use cases can be compared on the different topics like the service- and deployment model but also on technical and management issues. The use cases should be (i) a viable source for the user to see how other have compete their cloud projects and (ii) to support the user by identifying different

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workloads / process areas which are predestined to run in a cloud.

3.3 Matching

Whereas the Use Case Repository can be handled with a entity-relation model, the Provider DB and especially the Knowledge Base need a more sophisticated approach. It may be very often the problem that the query to retrieve the appropriate provider or piece of knowledge is too general respective to specific resulting into a big result set resp. empty result. The retrieval mechanisms need to suggest possible specializations of the query resp. possible relaxations to the query. Thus the architecture has foreseen a matching system (i) that has to cope with inaccurate matching results and (ii) has to be adaptable for upcoming requirements. The matching system will be able to determine appropriate specializations of a given query. The system will consider which further specializations are (i) very common to the user in general as well as (ii) for him specifically depending on a determined user model and (iii) which promise a good reduction of the huge result set.

In case of an empty set the matching system will analyze which part of the query can be changed in which way in order to retrieve at least one result. For example, if someone is looking for a cloud provider with a specific business service but can't find it, probably there is a provider with a more generic or related business service, which can serve as a substitute. The matching system will realize the relaxation and suggest the provider with an explicit explanation why this provider is retrieved.

4 CONCLUSIONS AND OUTLOOK

The introduced CLiCk approach is a first attempt to build up smarter Infoplaces. Its main intention is to offer self-services to SMEs for assessing their cloud needs and abilities. Whereas big companies have the possibility to gain such know-how through consultancy, Small and Medium Enterprises are mostly being left on their own, due to budget constraints.

Based on the knowledge base, other different repositories and the user's (companies) profile an e.g. Prolog based inference engine combines the given facts and derives personalized output to the user to support him through the entire cloud life

cycle.

As the high level architecture of the platform is now almost finished and first artifacts too, the authors are now starting to cope with the detailed concept. Afterwards a first prototype will be implemented.

Thinking one step further the authors see an opportunity, while including the provider- and service landscape to shift the entire platform from a pure information source to a cloud market broker service. According to Buyya (2009) it reflects a part of a global marketplace where service providers and consumers join to find suitable match for each other. It provides various services to its customers such as resource discovery, accounting and pricing services. In contrary to Buyya this marketplace focus on the need and pain points of users interested in cloud services. Once assessed the system evaluates the most convenient services and service providers can be through the system automatically derived and suggested to the user.

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