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Towards Bridging the Communication Gap Between Consumers and Providers in the Cloud

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ABSTRACT

The number of available cloud services has recently grown considerably. Therefore, consumers demand new methods for choosing the appropriate cloud services for their needs, whereas providers require dedicated ways to correctly elicit requirements from very heterogeneous consumers. In this poster, we present the StakeCloud community platform. This will act as a cloud resources marketplace, allowing consumers to input their needs and providing them with matching cloud services. Moreover, in case the needs are not met, they can be communicated as new requirements to cloud providers. Our solution will enable easier resource identification and requirements communication in cloud systems, thus supporting both consumers and providers.

Categories and Subject Descriptors

D.2 [Software Engineering]: Requirements/Specifications, Interoperability

General Terms

Design, Standardization

Keywords

cloud computing, requirements communication, requirements engineering, stakeholder, cloud service

1. RESEARCH PROBLEM

Cloud computing is becoming a dominant computing paradigm with significant impact on the distribution of computing resources. Cloud services go beyond the provision of specific functionality, and can rather be seen as a new IT deployment model, enabling users to consume software and hardware services which are supplied and managed by cloud service providers. Mobility, customization, scalability and flexible pricing are key characteristics which indicate that cloud computing will soon become a utility [1], available anytime, anywhere.

With the emergence of cloud systems, consumers' needs also become increasingly sophisticated, which leads to two problems. Firstly, due to the diverse cloud offers, consumers very often find it difficult to choose the services which best match their needs. Secondly, providers demand new methods to correctly elicit requirements coming from such heterogeneous cloud consumers. We are proposing a project which attempts to bridge the requirements communication gap between consumers and providers and also provides support for resource identification in the cloud.

Despite existing research in the field of cloud stakeholders roles, this mostly refers to stakeholders' functions, and does not address more specific topics such as requirements communication in the cloud. Additionally, it does not indicate methods for consumers to find the resources they need.

Most of the existing approaches which aim at addressing the requirements communication issue and could potentially further support resource identification in the cloud are based on requirements extraction from Service Level Agreement (SLA) documents [2] and on building a phased process for SLA document writing [4]. Another attempt to bring the Services and Requirements Engineering (RE) fields together was to use an ontology mapping [5]. However, these methods rely on the existence of SLA documents and do not suffice for the cases where these are not provided. Additionally, they do not involve cloud consumers from the early stages of the service purchase and do not provide any decision support. Therefore, the existing methods only partially address consumers' and providers' needs. As a result, cloud consumers often have to rely on search engines to look for cloud services. Moreover, there is no method specific to cloud computing for providers to elicit requirements from consumers, and they can only utilize traditional RE methods, which may not always be the most appropriate due to the different nature of the cloud.

2. THE STAKECLOUD IDEA

Our primary research goal is to conceptualize, implement and deliver a method that addresses both cloud service consumers' and providers' needs, thus enabling better communication of requirements - the implementation will be materialized in the form of a community platform, the StakeCloud platform. Firstly, the community platform envisioned supports consumers to express their needs and find the appropriate providers for their requirements. Secondly, it allows providers to utilize it as a method for eliciting new consumer requirements and expanding their offering.

Although the communication problem identified was also

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discussed in the service-oriented architectures (SOA) context, the cloud brings new challenges. Here, services are most often rather complete solutions, described by natural language SLAs. Therefore, methods used in SOAs such as describing offerings with service description languages (SDL) cannot be used, leading to a need for new methods which support resource discoverability.

To meet the research goal, we conceptualized the StakeCloud platform depicted in Figure 1, which acts as a marketplace between cloud consumers and providers. A possible *scenario* which illustrates the workflow on the platform is the following. "Bob& Alice Inc." is a company which needs a new server and decided to pay-per-use for a cloud server. This makes it a potential cloud consumer and user of the StakeCloud platform. Firstly, Bob, the employee responsible for finding the best cloud service for the company, inputs the needs in the dynamic platform: he chooses the server option, which leads the platform to self-adapt to the option IaaS (Infrastructure as a Service), prompting him to input some features such as the size of physical memory he requires and what operating system to run. He chooses 20GB and 64-bit Debian, and leaves the other features blank. However, he also makes a natural language note in the space allocated for supplementary information: "I want to manage it on-the-go from my Android tablet".

The needs collected are processed by StakeCloud and turned into well-defined, structured requirements. Then, it searches in its cloud services database and matches the requirements with the best fitting cloud server solutions available. These are displayed as a list by Bob's browser. Since all listed results match his search criteria and the availability of the service is also very important to the company, he chooses the service with the highest availability. If his requirements are not matched to any available cloud service, they are stored in the platform database and made available as "unmet user requirements". These can further be used by cloud service providers to extend their offering. The platform permanently maintains and updates a database containing cloud service offerings extracted from cloud providers.

3. RESEARCH STEPS AND VALIDATION

This research project is based on the findings from a *systematic literature review* on the principal stakeholders of cloud systems, their requirements communication issues, and a *domain analysis*. The latter method was utilized to have an early validation of our idea. Then, the *conceptual solution* of the envisaged platform was elaborated. The results of a second *literature review* on methods to elicit cloud consumers' requirements using such an Internet platform led to the decision that the user interface has to be dynamic and self-adaptable depending on user-input. Complementary natural language processing methods will also be considered when the dynamic features do not suffice. The Web Service Level Agreement (WSLA) framework [3] represents the starting point for retrieving information on cloud offerings from providers, but we will also explore other options independent of the availability of SLA documents. Overall, *action research* will be used.

We are planning to conduct an iterative *evaluation* of the project, which will enable us to develop StakeCloud incrementally. The final evaluation will consist of *case studies* which will assess the degree to which the platform can be populated with the required data from both consumers and

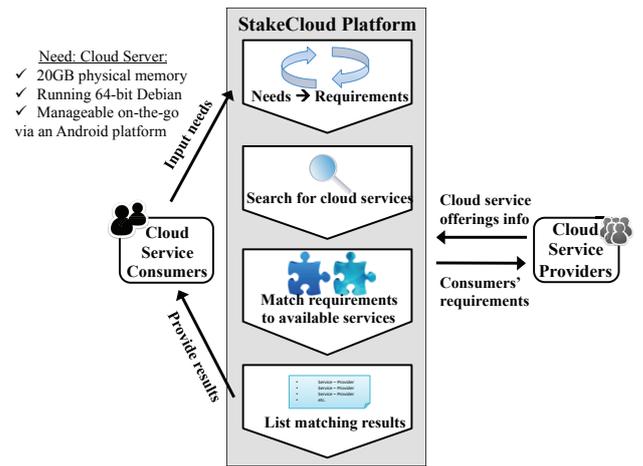


Figure 1: The StakeCloud platform

providers, and their satisfaction. The main criteria used are the success rate for finding solutions to needs, the possibility to turn needs into meaningful requirements to providers, and the acceptability rate of the platform. To mitigate the threat to external validity, we plan to involve in the case studies both individual consumers and organizations requiring cloud resources. In addition, we will use partner cloud service providers to evaluate the success of requirements elicitation with the StakeCloud platform.

4. CONTRIBUTIONS AND CONCLUSIONS

The main contributions of the StakeCloud project lie in enabling consumers to find the best mapping cloud services for their needs, and in supporting providers to identify real consumer needs.

Future work includes completing the development of the requirements elicitation features, investigating the necessary natural language processing methods, and partial evaluation. Then, we will continue with the information retrieval methods from cloud providers.

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