Migrating Applications to Clouds with BPM and TOGAF Framework

Jyhjong Lin
Department of Information Management, Ming Chuan University, Taoyuan, Taiwan
e-mail: jlin@mail.mcu.edu.tw

Abstract. For the advances of Cloud Computing technologies in recent years, cloud applications have been popularity for their rich set of features. Therefore, their practical use on business with promising values can be expected. As such, cloud applications are recognized as a trend for the next generation of business applications, and hence how to migrate these on-premise applications to the clouds becomes a desired field in the literature. For this need, we present a migration method that employs such well-known constructs as BPM lifecycle and TOGAF framework to support an effective migration of on-premise applications into the clouds.

Keywords: cloud computing, migration method, on-premise application, cloud application.

1. Introduction

For the advances of Cloud Computing technologies in recent years, their utilization on applications has been most widely addressed due to the rich set of features in such cloud applications. These applications can be quickly deployed on the clouds that make users utilize them in a low cost-, threshold-, and risk-way. Therefore, their practical use on business can be expected as a trend for the next generation of business applications.

In terms of the architecture for on-premise applications (e.g., web information systems), client-server or distributed patterns were most commonly used in the past decades; almost all existing applications were constructed using these styles. However, as stated above, cloud applications have been recognized as a trend for the next generation of business applications; how to migrate these on-premise applications to the clouds becomes a desired field. For this need, some discussions about the migration work have been presented in [1-9]. In general, these statements have clarified some important issues about the migration and then proposed various approaches for addressing these issues. However, some shortcomings can still be found: (1) few considerations except for [2] are addressed on the architecture of both on-premise applications and clouds; (2) few sentences are stated about the cloud requirements for the distributed styles of application architectures / profiles and (3) few words are stated about the employment of BPM [10] for enhancing the effectiveness of the migration.

Therefore, to address these limits, we present herein a method for directing the migration process. The method is based on the TOGAF framework [11] that (1) starts from the identification of the architecture and profile of the application, and then the discussion of the requirements for clouds via the BPM lifecycle, (2) through the identification and selection of the clouds whose service models satisfy the cloud requirements, and (3) finally ends at the deployment of the application into selected clouds.

For illustration, the method is applied to the migration of a Customer Support System (CSS) [12,13] to its cloud version.

2. The TOGAF-based migration method

Phase 1 (TOGAF phases A-D): Baseline Architecture Identification

Based the TOGAF framework, the method starts from the identification of the architecture and profile of the on-premise application (i.e., the baseline architecture). As an example, Figure 1 shows the architecture of a CSS where

1. It is a 4-layer of collaborative components where Customers interact with Enterprises via three intermediaries: Community, Customer Knowledge Agent, and Task Service Provider.
2. **Community** helps **Customers** share information about their desired tasks (e.g., buy/rent services from **Enterprises**).

3. **Customer Knowledge Agent** collects Customer knowledge to help **Enterprises** catch customer needs.

4. **Enterprises** provide services information about desired tasks to help **Customers** make recognition and comparisons.

With the application architecture, the next is to capture its profile to size the application. In general, there are two kinds of profile data: (1) use data about its executions (e.g., CPU, memory, storage, I/O, and network uses); and (2) action data about its users (e.g., # of active users, request rates, transaction rates, and request/transaction latencies).

**Phase 2 (TOGAF phases A-D): Target (Clouds) Architecture Identification**

With the baseline architecture and profile, the next is to identify the cloud requirements for satisfying its target cloud-deployed ones. This can in general be achieved by imposing the BPM lifecycle [10] for identifying the limits of the baselines and the enhancements of the target ones via its Strategy, Design, Execution, and Control lifecycle phases. The identified requirements may include (1) for architectural components, their deployments on the configuration elements in selected clouds are required to support enhanced functional purposes; and (2) for execution profiles, their QoSs in selected clouds are required to support enhanced non-functional purposes such as customized user interfaces and access modes, performance, reliability, security, and scalability. For CSS example, its 5 components may require respective deployments on various cloud environments to support its architecture and profile requirements. Further, for its purposes of collecting knowledge from and delivering information to customers, it may require such QoS from these deployed clouds as customized user interfaces and information accesses, and reliability of the services information.

**Phase 3 (TOGAF phase E): Candidate Clouds Identification**

Based on the TOGAF phase E (i.e., opportunities & solutions), the method continues to identify the candidate clouds whose configurations and service models – SaaS or PaaS or IaaS satisfy the cloud requirements. For this, therefore, it is good to consider all of the available environments that provide either of the following service models:

1. In SaaS model, the services can replace those in the application where specific QoS features are required for ensuring their replacement such as Service-Level-Agreements (SLAs), service replacement, and data/access portability.
2. In PaaS model, the cloud provides platform services on which the application can be deployed under such QoS features as SLAs, application deployment, service compatibility, and data/access portability.
3. In IaaS model, the cloud provides infrastructure services like servers, storages, and networks where the application and its residual platforms can use under such QoS features as SLAs, application deployment, service compatibility, and data/access portability.
As a result, some clouds may be identified to satisfy the cloud requirements and then become the candidates for the migration. For example, Figure 2 shows the possible candidate clouds for the CSS where as an instance for Community, some IaaS clouds are identified as candidates since its services are expected to be provided by some infrastructures that support well the storage and manipulation capabilities for the information sharing among Customers.

**Phase 4 (TOGAF phase E): Clouds Selection**

With the candidate clouds identified, the next is to select from them the clouds to be migrated. In general, the selection can be achieved by the QoS features identified above for satisfying the cloud requirements. For example, based on the above QoS features, a candidate whose service models have the best credits may be selected as the targeted cloud. Continue the above instance for Community, among such available IaaS clouds as Google GCE [14] and Amazon EC2 [15], the EC2 may be selected due to its well-known storage capabilities for the information sharing among customers.

**Phase 5 (TOGAF phase F): Clouds Migration Plan**

Based on the TOGAF phase F (i.e., migration planning), the method continues to specify the plan about the activities involved in the migration. In general, the activities include (1) deploying the application components on the configuration elements in these selected clouds; (2) deploying the interaction mechanisms among application components on the inter/intra-cloud interaction solutions over/in these clouds; and (3) refactoring deployed components to satisfy the QoS requirements for these clouds.

**Phase 6 (TOGAF phases G-H): Clouds Migration and Testing**

Based on the TOGAF phases G & H (i.e., implementation governance & change management), the method continues to realize the migration to the selected clouds in accordance with the migration plan. In addition, the migration is governed and tested accordingly.

**3. Conclusions**

In this paper, we present a method for directing the migration of on-premise applications to selected clouds. In particular, the method employs such well-known constructs as BPM lifecycle and TOGAF framework to support an effective migration of the on-premise applications into the clouds. For illustration, the method is applied to the migration of a CSS application to its cloud version that takes advantages of cloud configurations and services to help not only enterprises collect customer knowledge but also customers receive services information in a low cost-, threshold-, and risk-way.
As our future work, we will continue to explore the real migrations of the CSS applications to the clouds where the most popular clouds such as Google GAE and Amazon EC2 will be used as the deployed platforms. In fact, with the TOGAF-based phases that gradually identify the application/cloud architectures and features and then conduct the deployment on the most suitable clouds, the quality of the migrated applications can be expected. Finally, for the most critical issues in the migration such as identifying available clouds and then selecting desired ones from them, we will also study explicit formal approaches such as semantic ontologies that support the identification and selection from available clouds in a systematic and managed manner.

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References


