

# Integration of Application Services on Private Cloud System

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## Abstract

*Service composition and integration are well investigated problems in Service Oriented Architecture (SOA). However, this still remaining among the hard SOA challenges. These issues are hindering the agile and cost-effective development of service-based business solutions, and the need for addressing them becomes more pressing with the increase in the number of online cloud services. This system presents a composition of services that solves a business problem as a solution. As well as it describes the solution reuse at a large scale can be exploited to address challenges of service composition and integration. This paper proposes a reference architecture and technical design of a platform for representation, sharing, and search of solutions.*

## 1. Introduction

The number of services offered on the Internet is growing fast pushing us a step further to realizing the vision of offering everything-as-a-service [1]. Cloud computing has provided an unprecedented opportunity for an economical and large scale offering of software and hardware resources as services [2].

The advent of Software as a Service and Cloud Computing has revolutionized the software industry by providing access to software and services via the web to all. SaaS applications offer outstanding value in terms of features and capabilities relative to cost. But they have introduced several challenges specific to integration. Integration and Security issues are clearly users' biggest fears about cloud computing. Service composition and integration need for addressing them becomes more pressing with the increase in the number of online (cloud) service. The successful adoption of SaaS solution will transform usage from purpose built point solutions to integration into mission critical processes.

In this paper, we focus on the issues of integration and composition of cloud services into solutions for businesses. It presents the solution that has been carefully constructed to meet the needs of integration of application services on

private cloud system. SaaS cannot provide their full value without the Integration of Services that this paper provides. Although there are many services on private cloud system, some services need to integrate the requirement of users' need. We propose the design and development of a platform for sharing and reusing solutions for cloud services. Unlike existing software and process reuse work, where templates or patterns have been defined as reusable artifacts, service integration and composition solutions are the building blocks. Furthermore, the implementation is based on the open source software such as Eucalyptus and KVM. These solutions are cost-effective, scalable, simple and flexible.

The rest of this paper is organized as follows. Section 2 describes the related work. In section 3, Background is described. Section 4 describes the defining of services. Section 5 describes the Integration of services. In section 6, Challenges of a Solution Reuse Platform is presented. Proposed System is written in section 7. Finally section 8 concludes the paper.

## 2. Related Work

The service-oriented architecture (SOA) was proposed initially as an emerging paradigm for business process integration inside or across organization boundaries. Zlatkin and Kaschek [3] propose a repository of processes in order to process reuse and provide a conceptual architecture for it. The idea of reuse is also explored in the context of data integration. For instance, [4] presents an approach to schema matching by learning from a corpus of previous matches. However, the issue of how the information-base is built and managed is not explored. The proposed platform in our work offer technology and business foundations which are useful in realizing the complementary vision of "service parks" [5]. Service parks are envisioned to be formed by communities of related services.

Commercial cloud service providers such as Boomi, Bungee Connect and Cast Iron provide integration solutions at the technical level. These provide pre-built adapters for many enterprise applications, and also languages in which data and

application integration logic can be developed by programmers. However, they do not support large scale sharing and reuse of integration solutions developed by the community. Salesforce.com, on the other hand, has offered App Exchange that enables sharing add-ons that are developed on top of salesforce.com applications and capabilities. It provides a catalog listing of such applications. There are currently hundreds of applications in payroll management, service and support surveys, recruiting, etc., that have been built by partners and developers.

### 3. Background

The idea of reuse is not new and it is well-investigated in various contexts including software reuse, component reuse, and more recently process reuse, which are discussed in the following.

#### 3.1 Software Reuse

Different software artifacts have been the subject of reuse including code, modules, components, frameworks, architectures, templates and patterns [6]. Code reuse refers to using existing code, as a function, subroutine or module, in developing a new application and in more than one place. Software libraries aggregate a set of reusable components addressing recurring problems (such as converting one format to another) with well-defined inputs and outputs. In order to foster component and software reuse, usually software repositories are created in enterprises with guidelines from software product line engineering. There exists also work on how to search software repositories to automatically retrieve software components, e.g., based on the signature of input and output [7].

#### 3.2 Process Reuse

This notion of reuse has been also explored in the area of business processes. Workflow patterns [8] are reusable control flow constructs that can be used in the design of processes. Each pattern comes with a description, example usage, and how it is supported in various workflow products. Process templates present a generally accepted procedure for performing particular business activities in a given domain. Process reuse refers to the reuse of a concrete definition of a process without the need for extensive customization.

### 4. Defining the Services

In general there are two services on system. They are regular SaaS services and Specific SaaS service. Regular SaaS services are Login, Logout, Photos Sharing, News, Noticeboard, Calendar

Service, Comments, Game, Print, Download, Upload, Mail, Talk, Application softwares, Operational softwares, Multimedia, and so on. Specific SaaS Services are Appointment with supervisors, Library, Student Registration, and so on.

### 5. Integration the Services

It is based on the user needs and groups (Research students, Teachers, Operational Staff). For example research students will do the appointment with the teachers. In this case, we need to integrate calendar service, mail service and photo service. In case of photo sharing, we need to integrate photo sharing service, upload service and download service. The services which need to integrate will do according the set theory.

#### 5.1 Reuse for Service Composition and Integration

The service composition and integration problems have been widely investigated for enterprise settings [3] and also for individual user settings, most recently through mashup applications [8]. The recent focus in enterprise settings has been on the integration and composition of applications rendered as WSDL-based Web services. With mashups, the focus has been integration and composition of REST-based interactions and user interface-driven services [8]. Despite the fact that various semi-automated and software engineering-based (e.g., pattern-based [4] [6]) approaches have been investigated for service composition, these problems are still recognized as hard challenges of SOA [3].

We view a solution as an integration and composition of concrete artifacts capable of being deployed and executed. A solution includes concrete binding definition for the specific set of services that are integrated or composed. A solution is offered (shared) by a solution provider and used by a solution user. A solution in this context may be delivered as a piece of code (e.g., BPEL or Java code) or service package that can be readily deployed (e.g., as virtual machine image), or may be offered as a service hosted by the solution provider. SMBs can benefit more than large enterprises from solution reuse, and prefer solution reuse to templates and patterns, as they are looking for ready-to-use artifacts.

#### 5.2 Mashup

**Mashups** are common integration pattern to support information sharing, information enrichment and collaboration in SaaS application. A mashup is a web application that is developed by composing data, application logic, and/or user

interfaces originating from disparate web sources. Can integrate two or more [...] Web APIs to create something new and unique, known as a mashup.

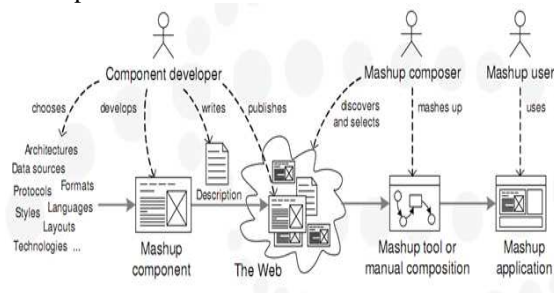


Figure 1. Mashup pattern in integration

## 6. Challenges of a Solution Reuse Platform

**Representation of solutions:** The integration and composition solution may be provided as simply as a reference to the resultant composite service (SaaS). Common abstractions are needed to represent solutions to simplify reuse. The abstractions should include meta-data about the solution, e.g., which services are integrated/composed, which versions, supported business function definitions and applicable business domains, etc.

**Organization and Discovery of solutions:** Solutions need to be organized that it easy for users to find the solution candidates through searching, catalog browsing, and referrals. A large solution repository becomes cluttered and makes solutions hard to browse and find.

**Quality of solutions:** One issue that has been hindering reuse in software libraries is the poor quality of shared solutions [4]. The approach for software libraries has been to appoint inspectors to ensure the quality of contributed materials before posting them to the library. In the community-driven portals, it has been shown that the feedback from the community can serve an important role in identifying the quality through a rating system.

**Granularity of solutions:** One important issue that affects the reuse is the granularity of solutions. If a solution includes too many services, it may apply solutions composing too few services is that they have to be composed together to fulfill a business need. Enabling configurability of solutions is an approach allowing automatically generating a configured solution (in different granularities) based on customer needs.

## 7. Proposed System

We propose a reference architecture for a platform for sharing and reusing solutions. To support the search, configuration, sharing and integration of a business solution, we envision there is a collaborative environment between service users, service providers, and service integrators (service integrators help to integrate solutions into their existing business service suite).

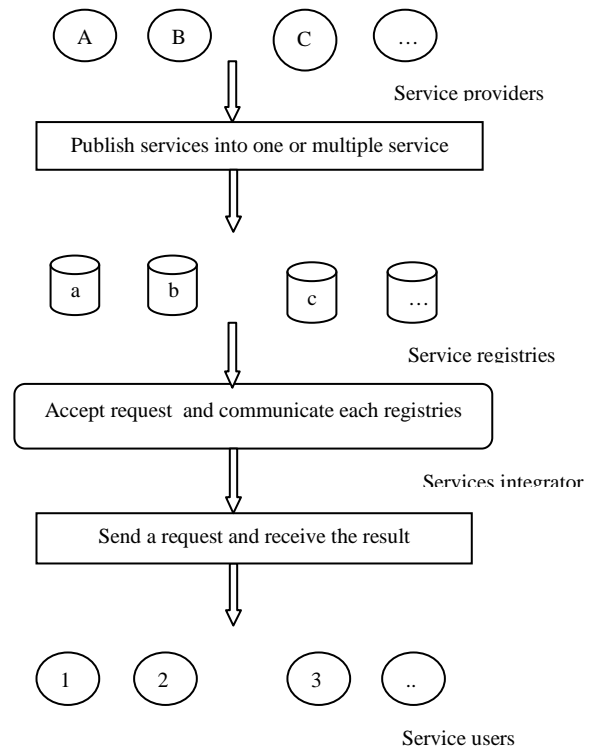
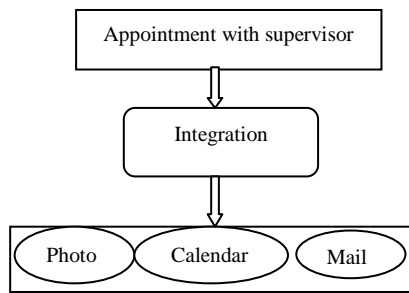


Figure 2. An Environment to Support Business Solution Reuse

### 7.1 Example Use Case on Reuse

A simple example is the task of scheduling an appointment with a supervisor. This task requires a calendar service capable of holding and managing appointments, email services to set the appointment with supervisor and update the scheduled appointment time in the service once it is settled. Through browsing the platform, we may select among business solutions that have already been built and tested by solution providers. The chosen business solution can then be integrated, e.g., by the solution integrator contracted by the solution provider, into the agency's business service suite.



**Figure 3. Example Case of Integration on Private Cloud System**

## 7.2 Solution Sharing and Discovery

Business solution sharing and discovery allow solution providers to publish business solutions and solution users to find business solutions that satisfy their needs. Each business solution is represented by two sets of information: (i) the solution package, e.g., a Java code library, BPEL code, or service endpoints, and configuration specification and supporting materials (test cases, and Web content if the solution is packaged as a Web application), and (ii) description of the solution including the business domain, pricing model, documentation, and details of services that are composed.

## 7.3 Business Solution Packaging

When the business solution is retrieved from the solution repository, it has different options and feature sets. In example the appointment with supervisor, setting appointments with email, with phone or both. The packaging service helps the customer determine which option to choose based on capturing information. Once a particular business solution configuration is chosen, and the involved services are identified, the solution packager generates the specific business solution package corresponding to what the solution user specified in the configuration phase. An interesting problem to pursue is the automatic generation of the solution from configuration data.

## 7.4 Requirement Management Service

The solution discovery service may find no existing solutions that meet the user's exact requirements. The collaboration portal enables the solution user to communicate to the solution provider about (i) their specific solution requirements, (ii) the solution in the repository which is closest to their needs, and (iii) the preferred service providers.

## 7.5 Solution Integration

The integrator is responsible to take the solution the user has chosen from the solution provider, and integrate it into the user's business environment. The solution integration occurs at three layers: business logic, data, and presentation (user

interface) [9]. A challenge of such integration is how to test the solution without disturbing the running business of the solution user.

## 8. Conclusion

Private cloud system has to ensure their key business applications work together. Some features and capabilities of the proposed platform for service integration and composition solutions are implemented to various degrees at existing cloud platform and service providers. This integration platform is truly proven, trusted and complete for current integration needs on private cloud system. As a further extension, future integration needs will be solved.

However, the application reuse at these platforms is limited to the add-ons built on top of each provider's solutions. Also, the proprietary solution stack is fully controlled by the platform provider. The presented approach and the platform are also very useful in the context of application services. This is to ensure that we can leverage online services with significantly reduced cost and time and acceptable risk.

## 9. References

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