Dynamic Enterprises Architecture for One or More Clouds

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Abstract. Cloud computing goal is to support the IT organizations to integrate their services globally. It can help enterprises to improve their creation and delivery of IT solutions by providing them to access services in a cost effective and flexible manner. Cloud applications have different compositions, configurations, and deployment requirements. Quantifying the performance of scheduling and allocation policies in a real Cloud environment is extremely challenging due to several reasons like, variety of demands, supply patterns, and system size, heterogeneous and meeting the requirements of users competitively. To simplify this process, we develop a Dynamic Enterprise Architecture- (DEA) through industry collaboration to enable interoperability among various clouds and service providers. The Dynamic Architecture helps the user to utilize the services and integrate their applications from anywhere in the world by on demand, at competitive costs. Resources can be dynamically adjusted pertaining to the demand. It selects the suitable service provider or the coordination of the service provider according to the requirement of the user.

Keywords: Cloud Computing, Cloud Service Provider, Dynamic Enterprise Architecture, Service on Demand, Service Level Agreement.

1 Introduction

Cloud computing[1] is a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources like networks, servers, storage, applications and services that can be rapidly provisioned and released with minimal management effort or service provider interaction . These services in industry are referred to as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). It offers a readily available and scalable computing environment without substantial capital investment and hardware administrative and maintenance cost.

Service Level Agreement (SLA) is a contract between customers and service providers. It is an indenture between the service provider and the customer to describe the commitment of the providers and to specify penalties if their commitments are not met [5]. Service providers are not created equal. Some are excellent in computing power, some are good in security issues and some are good at offering unlimited

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storage at the lowest cost. Documenting the effective SLAs is always a challengeable task. The main aim of the document is to maintain the agreement level based on their requirements between the user and the provider.

There are different types of users with different types of Applications, different sets of requirements and different sets of environments. Some Applications require high computing power and some Applications need maximum security. From the perspective of the users, their goal is to run their Application efficiently to meet their performance and security requirements within the cost.

Companies with global operations require faster response time to save time by distributing workload requests to multiple clouds in various locations at the same time. This creates the need for establishing a computing atmosphere for dynamically inter connecting and provisioning clouds from multiple domains within and across enterprises. To support maximum optimization the Application or the components of the Application needs to be located in anywhere (independent, location free), or in any type of clouds Such as private cloud, public cloud and hybrid cloud.

Existing systems do not support mechanisms and policies for dynamically coordinating the work among different clouds in order to determine optimal location. Further, the Cloud service providers are unable to predict geographic distribution of consumption of their services by users; it is also difficult to manage the distribution of services when there are changes in application behaviour.

Hence DEA is developed. It is loosely joined and highly interoperable software architecture, for deploying the application in the cloud. DEA supports application deployment to happen automatically, in a particular cloud with a suitable service provider or a coordination of service providers. The organization can leverage storage-as-a-service from one service provider, database-as-a-service from another service provider and even a complete development and deployment platform from a third service provider. DEA also supports distributed computing technology and database distribution for deployment.

2 DEA Framework

Once the organization has decided to integrate their services in cloud computing, the next task is to identify the processes contained in its service strategy and service design. Figure 1, shows the high level architectural view of the application and service mapping system. A user sends a request with their requirements to the DEA, which automatically assigns a service provider or a coordination of service providers based on the application requirements.

The goal of this architecture is to help clients to determine and plan how to manage in-house IT and its relationship to one or many clouds. Service providers use specific technologies, system architectural designs and the best practices in the industry to provide and support the multiple customers. This helps end users to have more agile and flexible service oriented architectures for their applications and services.

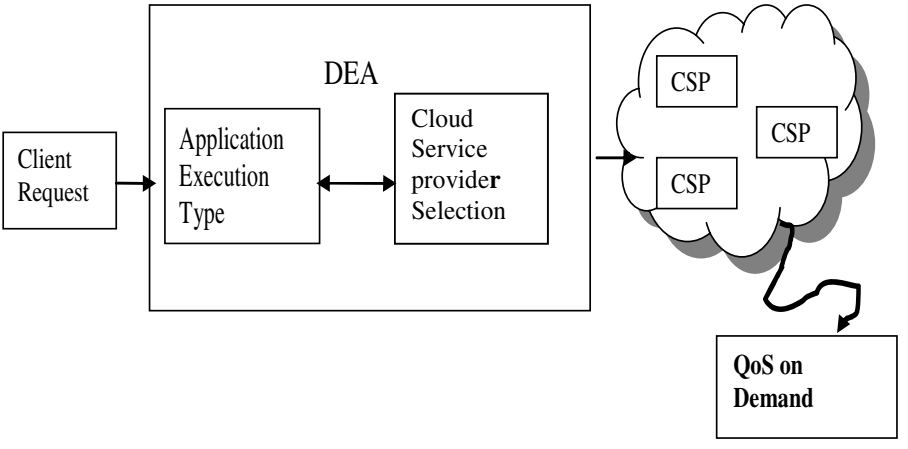

Fig. 1. High Level Architecture

Figure 2 shows the overview of the architecture with its different phases. The first phase of the frame work is to understand the utilities as they relate to the service strategy of an organization. In this phase, prioritization of candidate services to be put into the cloud is identified and analysis of the impact on business, data, applications and security issues is done.

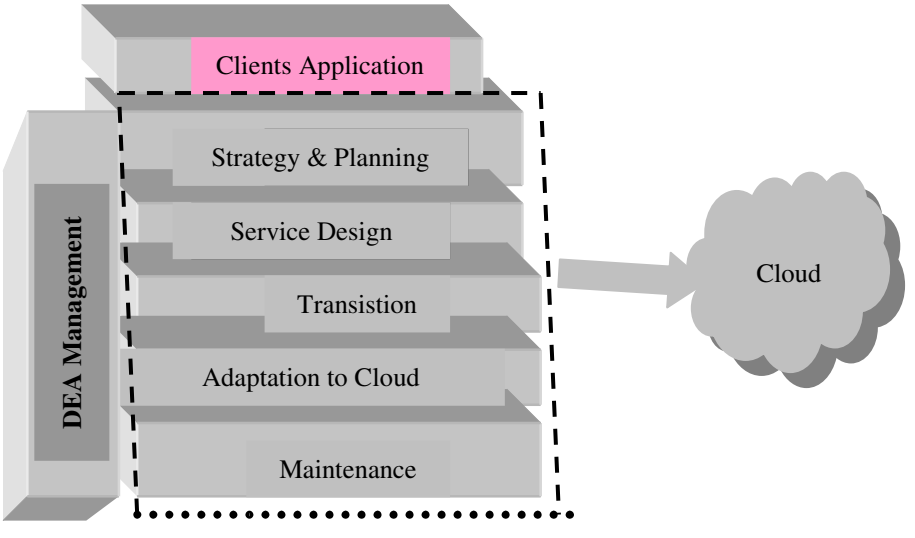

Fig. 2. Dynamic Enterprises Architecture

Once a service is approved, the process moves to the second phase of the framework, the service design phase. This is where the service is chartered, designed, developed, built and is entered into the service catalog for future reference. The decision regarding the type of cloud computing and service providers or the coordination of service providers are decided to support the requirements. The selection process is given in figure 3.

The third phase of the frame work is the validation phase where the SLA is finalized, mutually agreed upon and signed by both parties. Once the SLA has been documented, the service then moves to the transition stage, where the planning will begin to convert the transition from service to production. The transition phase deals with cloud option assessment and transition strategy. It also works with the cloud based system and the service integration plan.

The Adaptation phase relates Enterprises Architecture to functional mappings in the cloud. It also deals with the general project review and support. In the final phase, the maintenance of architecture and updates of transitions are carried out. Monitoring of the architectures viability is done over time and new cloud products and services are assessed. Technology update or insertion plan is created.

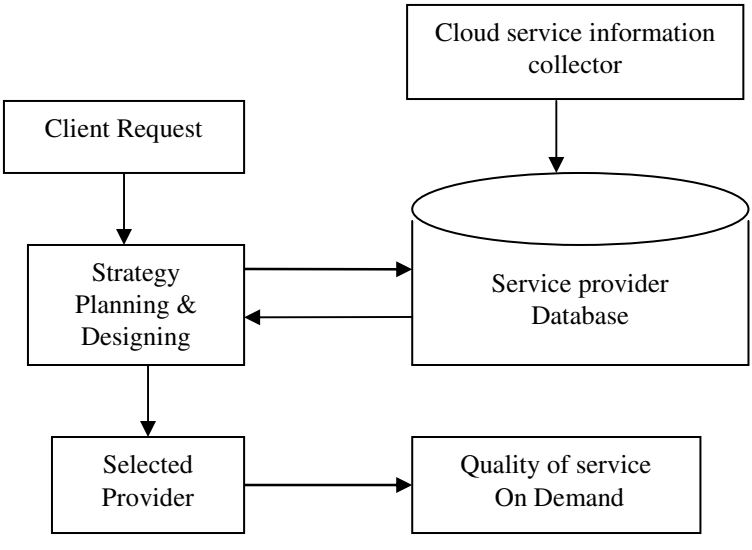

Fig. 3. Applications and Service Providers selections overview

Figure 3 shows the overview of the Strategy planning and designing. System applications are broadly classified in to small, medium and large scale. Applications based on their attributes such as security, integrity, availability and resource requirements, classified as transactional and analytic Applications. Based on their characteristics they are divided into small fragments. Later, these are mapped to the service provider's specific level of performance within the cost target.

The overview also includes a cloud service provider information collector and a repository for storing the metrics of each available cloud service provider. Database, which includes historical data about each service provider with characteristics such as security issues, memory availability, CPU utilization, I/O performance and the cost charged by the service providers, level of performance and also physical properties such as mean time to repair and the percentage of incidents of successful correction in the first attempt. Based on the nature of applications and QoS provided by the Service Provider, the DEA automatically maps the Application into the cloud with suitable CSP to extract the result.

3 DEA Advantages

Two or more independent cloud computing providers can join together to create a federated cloud. The participants of the federated cloud can share their resources on agreement with price. The sharing and paying models will help individual providers to effectively deal with shortage level of resources when spikes in capacity demand occur. In a multi cloud environment, system automated decisions need to address federated decision of determining which cloud to be used for a particular work load.

4 DEA Challenges

There are no standards for integrating all the bits and pieces of IT information on the cloud. The Organization has to monitor how everything works together and supports the business needs. Data ownership, security and reliability, and the coordination to manage the delivery over the clouds are very tough. Organizations still have to define and manage relationships and dependencies among mission, processes, technologies and business initiatives. The architecture requires the user to manage application binaries and dependencies. Images and packages must be created and redeployed in the event of any change to an application, its configuration or its dependencies on clouds. Sometimes, maintenance becomes tedious as nature of applications and their clients needs increase in time or there is the change in API's.

5 Conclusion and Future Work

This paper introduces a new software architecture called DEA - Dynamic Enterprises architecture. Based on the analysis performed on the emerging requirements of the enterprises dynamic architecture is introduced. It is targeted to support the requirements of enterprises and deploy complex Application services for a complete solution in the cloud computing environment. This Architecture supports and manages its in-house IT and its relationship to one or many cloud without manual intervention.

In this paper outline of the Dynamic architecture is discussed at the conceptual level. The detailed architectural design and its implementation techniques are taken for future work.

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