

CASE STUDY FOR MIGRATION FROM ON PREMISE TO CLOUD

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Abstract - The cloud computing has acquired a great deal of attraction, the possibility for minimizing over and under provisioning through enabling a flexible sharing resource and allocation is still large. In this article, a complete analysis towards development of migration method from on premise to cloud will be presented. First we define cloud computing that includes three service models; platform, infrastructure, and software as a service over a network connection. This work demonstrates the issues which the decision makers are facing in the case of evaluating the feasibility of the migration legacy system in organization into cloud computing. Furthermore, describes our technology toolkit, which has developed to support this process. The efficiency of the proposed technology toolkit has been evaluated under testing as a case study that is exploring options to choosing deployment and cloud service models.

Keywords – Cloud computing, web service, cloud migration, decision support, cloud architecture, database.

I. INTRODUCTION

Cloud computing is the product of decades of evolutions, which goes back to earliest computers. Although the term Cloud sometimes refers to collection practice, research old/new concept in various research field like service-oriented architecture, distributed and grid computing [1]. The development of the concept of the cloud-computing has altered how the services of the information technology are invented, deployed, developed, scaled and maintained as mentioned in [2] and [3]. Presently, a small numbers of the case studies have investigated the migrations of the available legacy system to cloud [4]. The legacy system can be defined as a conventional computer system which is still being used even after modern technology, some of organization wrote or rewrote software to run in the cloud. The decision to migrate exiting system to clouds may be complex, due to the fact that it requires evaluating the advantages, risks and cost, which are not very straightforward [5].

Before the team starts building solution for migrate to cloud computing, a business requirement must be delivered to provide value and understand some substantial architecture steps that must take place. When it is properly leveraged, the cloud computing is capable of bringing the organization exceptional agility and a considerable reduction in the costs at the same time as connecting organization to a global group of the services. Therefore, this paper proposes conceptual model for supporting the decision-making for migration to the cloud. Decision-making process a discussed further in two methods.

The aim of the paper is to present and test method to determine decision for migration to cloud. Few works have been presented in [6], [7] and [8] concentrate on decision-making supports for the cloud migration in the enterprise. How efficiently legacy system to cloud migrates, success in the organization to be effectively migrate their legacy system to cloud depends upon the application of basic architecture concepts. Furthermore, raising 6 questions (Why, What, Who, When, Where and How), in the technology toolkit will add steps which the majority of the methodologies suggest prior to plunging head first into cloud.

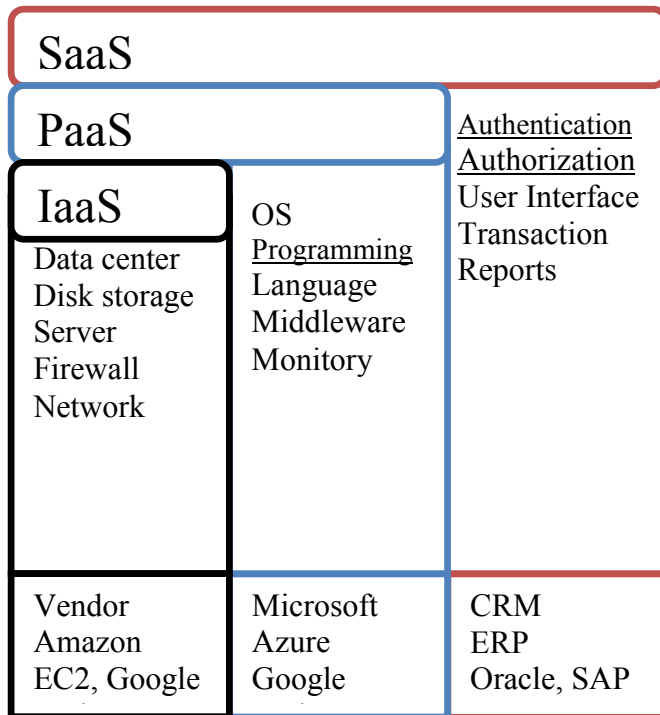
This paper is constructed as follow: defines some foundation for cloud computing and introduces the proposed migration use case in Section II, before detailing the technology toolkit in Section III. The analysis results are discussed in Section IV. Finally, the conclusions of this research are drawn in Section V.

II. Background

Cloud computing is commonly classified into two categories; based on the location of the Cloud and based upon the services provided. Location of the Cloud can be private, public and hybrid Cloud models. Based upon the services offered, Clouds are typically classified into three models. Realize the 3 models of the cloud service Platform as a Service PaaS, Infrastructure as a Service IaaS, and Software as a Service SaaS, are decisive for enterprises to make the completely investment in the cloud. These classifications are normally organized to become appropriate for implementing migration to cloud.

A. Cloud Computing

The following brief background of cloud computing can be considered as a time line of how it is progressed from many years of computing. Cloud computing can be defined as the greatest technologies shift since the first PC has emerged and Internet has been adopted. The Enterprises shift the currency from the licenses of the commercial software and hardware investments in favor of different cloud services over all 3-service models. The factor which guarantees the success of the enterprise will pick the suitable cloud solution for solving the correct business issues [9].



Figure(1): Block diagram of service models of cloud computing.

With the IaaS, a wide range of tasks which are associated with the management and the maintenance of the physical data center and the physical infrastructure (disk storage, servers, networks, etc). Admin can be accessed and automated from the web-based and/or code-based consoles of the management. The next level is the PaaS resides on the top of the IaaS and offers libraries, programming languages, tools, and services for writing massive amounts of the code. That level used to be handling the caching, data-base scaling, asynchronous messaging, and much more that the user cannot control or regulate the underlying cloud infra-structure. The infrastructure of the cloud includes the networks, OSs, servers, or storage, but controls the utilized application and potentially the settings of the configurations for application-hosting environments [10].

SaaS can be considered as a full application which has been delivered in the form of service to service consumers, who are at the top of Cloud. Consumers are only required to be managing users and configuring some of the application-specific parameters. Service providers handle the whole infrastructure, all deployments, the entire application logic, and everything which pertains to service or product delivery. The users don't control or regulate the underlying infrastructure of the cloud, which includes the servers, network, storage, and the OS [11].

Reduces the efforts of each service model of the cloud that presents an abstraction level which is required by service consumer to build and deploy system. There is an importance in understanding the cloud computing deployment models for migration on-premises to private model, public model and hybrid model. Figure 2. shows the deployment models of cloud computing.

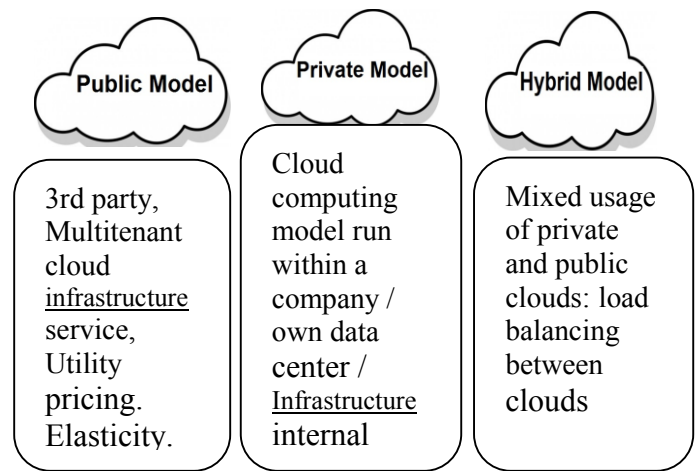


Figure. (2): Block diagram of deployment models of cloud computing.

The public cloud can be defined as a multi-tenant environment in which end users pay to use the resources on the commodity resources shared grid as well as other consumers. An end user does not have any visibility to the actual location where the program is running except for the location of data centers. A layer of abstraction which has been built on the top of the hardware and exposed as Application Programming Interfaces (API) to end users, who will leverage those Application Programming Interfaces for the sake of creating virtual computing resources running in a large resource pool which can be shared by several. The infrastructure of the cloud is provisioned to be exclusively used with one organization which comprises several customers. It is managed, owned, and operated by organization. The private clouds may be on-premise or could be hosted in the data center of the cloud provider. A wide range of the organizations are leveraging the public as well as the private clouds, and that is referred to as the hybrid cloud, which can be described as a combination of more than 1 distinct infrastructures of the cloud (public&private).

B. Proposed Migration Project

The case study, the organization of Construction and Engineering in Iraq comprises of around 300 employees in major office in Baghdad and two branches contain each of those around 100 employees in south and north Iraq. The use-case of the migration is comprised of the migration of on-primacy system in organization to cloud computing. Below is an anonymized case description: Organization built its entire infrastructure on-premises and installed internal Enterprise Management System (EMS). Branches in south and north assets are dependent upon major company's production facilities, which is why, the server and database located on major company and all branches access the application (EMS) using remote desktop client over the Internet. The major office support department has been responsible for the maintenance of the system and solving any problem which has emerged. Figure 3. provides an overview of the system.

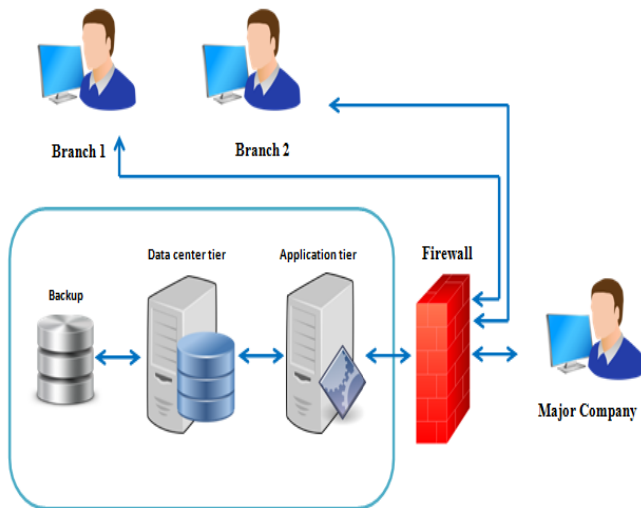


Figure. (3): A system overview.

Organization management hypothesizes that movement to cloud and gives the company a competitive advantage as well as reduces expenses for managing and maintaining the system and updates features EMS tools have today, like the mobile applications, social networking. This case study investigated the possibility of the same system that could be deployed into cloud Figure 4. An overview of this scenario. In the case of the proper leveraging, the cloud computing is capable of bringing exceptional agility and considerably reducing the expenses while connecting its organization to the global collections of services, therefore you must fully understand the pros and cons of cloud computing.

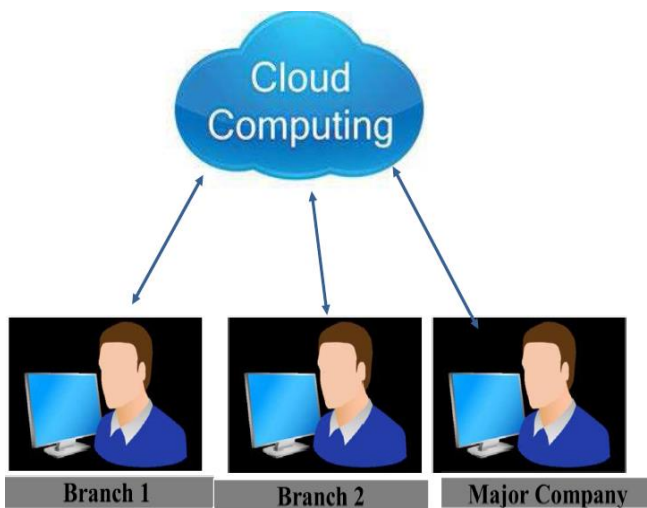


Figure.(4): An overview of this scenario.

III. METHODOLOGY

The fact is that the implementation of the migration to the clouds may be considerably more difficult. There were firms which successfully implemented the initiative of the cloud and

have been capable of reducing the costs of the IT, improving the flexibility, scalability, and speed to market. Focusing the search in the literature of cloud computing problems, several works were demonstrating the techniques or tool-kits for supporting the decision making throughout migration on premise into cloud such as; [12], [13], [14] and [15]. These articles are providing decision supports for application migrations to Cloud. Decision support in these cases needs to include different options for distributing the application in the Cloud.

The main contribution of this article is developed and processed to incorporate six tools that help architect to decision making for migration into cloud.

To reach these demands, a comprehensive analysis related to migration from on premise to Cloud is required.

Architects are in a more convenient position for selecting the optimal services for their company and their deployment in cloud, these tools must happen prior to when the team begins to build solutions, tools described below in a form of a sequence of steps

- **Step 1.** Design on the project, begins answering the six key questions (Why, What, Who, When, Where and How) as a first step in Table I. The architecture is collecting information of the questions and analyzing them in details.
- **Step 2.** The technical category focus area such as the scalability, performance, and the security needs are crucial to decide between the IaaS and the PaaS service model. For most applications with an extreme number of transactions, the PaaS is not capable of delivering the scale and the performance. Which is why, some top-visited website leverage IaaS cloud service to achieve the scale, but for EMS system with medium number of transaction, SaaS delivers scale and performance.
- **Step 3.** The financial category has to focus on Total Cost of the Ownerships (TCOs), which is much more complex to calculate, because we have existing legacy architectures, decision makers have to estimate the cost for changing, integrating or re-engineering the system of legacy. Requiring the calculation of price/hour or price/month of the cloud services, other costs may include employee training, acquiring tools and much more.
- **Step 4.** Strategic requirements, the higher is the possibility that decision makers are going to be looking for leveraging the PaaS or the SaaS over the IaaS. In the case where the control is a strategy of the highest importance, there is a higher possibility for the decision makers in the gravitation towards IaaS solutions where the IT has a higher level of the control on underlying infrastructures, whereas with the PaaS and the SaaS the infrastructure will be an abstract from end users.

TABLE I: Answer Key questions

Key questions	Answers
Why	- What problem which requires being solved? -How best migration on-premise into cloud is a much more complicated decision to make in enterprise? - What are the business goal and drivers? - Business drivers is for the reduction of the IT Infrastructure cost and data center and reduce expenses for the management, maintenance and provision of several modern characteristics such as Mobile and social network and integration with third party.
What	- What are the business and technical requirement? - Must protect/secure all transaction - Has to scale for handling random spikes in the traffic. - Must alter underling architecture for making it be stateless. - Required exceptional engineers SOA and cloud and security. - Staff must be learning new technology and approaches for making the transitions. - What are the constraint and risks? ✓ One of the challenges that many legacy system are reliant on ACID transaction - What is the budget? ✓ Being aware of the costs of every one of the models of the cloud services and specifies suitable governance software levels for the optimization and monitoring of the costs. - What is the ongoing state of the organization into its capability of migration into cloud? ✓ Organization with the available infrastructures and IT staff that do not have much experience. ✓ Software considerably depends upon physical hardware. Legacy application EM is whether or not the design of the system is stateful. ✓ Cloud computing is loosely coupled and stateless, which is not having in legacy system Em in our organization.
Who	- Who are all of actors that are involved (external as well as internal)? There are consumers which interface with the high-scale web-sites and there are suppliers interface with an Enterprise system and maybe using channel partners
When	- When are these services needed? ✓ Six months
Where	-Where will these services be consumed? ✓ There is a high importance in understanding the effect of the legislations, due to the fact that they are related to the local in which the consumption of the cloud services takes place and where date is stored. Regulations have a variety of the constraints over the countries.

	-How can the organization deliver these services? ✓ Company have the many of the people on current staff including security expert , website expert and enterprise management system, but limited experience in cloud and SOA and
How	

- **Step 5.** Organization category could be having an impact on the model of the cloud service which should be chosen. In the case where the organization has no IT skills in the distributed computing field, the service-oriented architecture could be leaning towards the PaaS and SaaS model or obtaining a partner which is capable of building the cloud service on the IaaS.
- **Step 6.** The final category risk is one of the main determining factors in whether the company selects going based on the location of the Cloud with a private cloud, public one, or a hybrid of the two. There are many questions to take under consideration when to come to risks about private, data ownership. Constraint on the project must get to market quickly because time is one of the main constraints for the architect.

IV. IMPLEMENTING AND TESTING

This section describes in details how using the technology toolkit that used to support the organization the feasibility migration legacy system to the cloud. In step 1 after collecting information for this six questions and analysis answers by details, architects have the a better position for the selection of the optimal service for their company and deploying it in the cloud. This enables to fill Table 1.

TABLE II: Reasonable variant migration.

Step 2 - 6	SaaS	PaaS	IaaS
Technical	+	-	-
Financial	+	+	-
Strategic	+	-	-
Organization	+	+	-
Risk	+	-	-
Architect & Expert	+		

This point is the fact that those questions of discovery have to be raised and their answers have to have an effect on design decisions and eventually the general model. There are numerous

factors which are involved in the selection of the appropriate service model. The Decision makers have to take under consideration the feasibilities of every one of the cloud service models according to step 2 – step 6. Determining the reasonable variant enables to choose service model for leverage legacy system into cloud, as shown in Table II. SaaS can be considered as the most mature of those 3 models of the cloud service. Its vendors usually present 2 ways for the customers for using their applications. The most typical approach is the web-based user interface which is typically accessible on any of the devices which have the ability of connecting to Internet. The second way is providing an API to the customer for the sake of providing the consumer of the service with the ability of integrating the features to their available application EMS.

After reviewing all the above data, architect and expert stockholders decide that depending on these technologies toolkit to leverage SaaS solution which is a good candidate for migration.

V. CONCLUSIONS

This article is supporting that the decision of selecting models of the cloud service and deployment are crucial tasks in any of the initiatives of the cloud computing. The selection has to be made according to the impacts of the business drivers and factors. Presently, automating the organizations and enterprises business processes is growing in interest. The progress in the present information systems needs careful designs, modeling, and typically requires modifying the available business procedures [16].

Technology toolkit for supporting the decision-making for migration to clouds has been presented. A review of the organization and architect EMS system has been performed for finding out the services that would be appropriate for the migrations. Architect and expert analysis stage on legacy system applicability is from the point measuring factors in the steps and answering the six architecture questions of making this decision to migration into cloud. These decisions influence each other and depend on total risks and costs of ownership.

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