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# Porting Web Application to the Cloud

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***Abstract*:** One of the most commonly used phrase in today's world of technology is "in the cloud". Thus it has become a necessity to know the importance of cloud computing. Cloud computing services is witnessing rapid growth till date.The companies n India have already started providing their customers cloud-based solutions.This increases the productivity of the company thereby realizing high profit margins.The world of cloud benefactors insist on the concept of following an approach that is structured in order to migrate to cloud based applications. In this study, there is an analysis of the steps to be adapted by the companies to migrate to the cloud. Without a blueprint that depicts the migration of the application, the project of Porting a web application to the cloud can be felt like a an unwanted burden than a boon to the company. There are many reasons as to why a company would like to move a web application to the cloud. The company would like to scale out the application in order to reduce the burden of the growing traffic. This will surely increase the number of customers using the website. The deployments can be automated there by reducing the cost of administration and investment in new hardware. This extra capacity or scaling is required only when it is actually required.

***Keywords:*** Cloud Computing Services, Windows Azure, Iaas, Paas, Dbaas, Cloud Migration, Deployment Models, Scaling

## I. INTRODUCTION

The term "Cloud computing" seems to be quite confusing to the common world. But even though this is the case, the common man uses it either knowingly or unknowingly. It actually is the phrase that defines various circumstances in which resources used for computing is delivered as a service over a network connection. The symbol of cloud was used to represent Internet. The cloud has to be accessed through the Internet and thus the name Cloud.

A formal definition for Cloud Computing is proposed by NIST (National Institute of Standards and Technology) and is as follows: "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."[1]A cloud can be defined as an infrastructure that consists of various cloud computing services.

## II. CLOUD CHARACTERISTICS

The NIST has emerged with five characteristics of Cloud Computing which has made it easy for understanding the concepts of cloud.On-demand self-service, Broad network access, Resource pooling, Rapid elasticity and Measured service [1]. Without the requirement of manual interaction with the service providers, a client can access the services like network storage.Thin or thick client platforms like tablets, phones or workstations can be used to access the standard services available over the network[2].Multi-tenancy makes the computing resources to be pooled in-order to serve the multiple tenants that try to access the services through various locations. The client need not be aware of the location of the resources [3].According to the demand of the services, scaling of the resources happen. Automatic scale up and scale down happens according to the quantity required at any specific time. Monitoring of the usage of resources are done for both the client and the provider of the service. This helps in the controlling of the resource utilization and acts as a reporting tool for the both the type of users.

Three service models are devised by the NIST based on the difference in the types of services provided. The types of services that are provided are differentiated as online applications, software development platforms and the computing power or the storage space. The service models are: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

Software as a service (SaaS) is the service model in which applications or software are delivered as a service over the Internet [4]. This software can be accessed by the client via the Internet without installing it in the client system. Thus maintenance of the software is reduced.Platform as a service (PaaS) is the cloud service that provides the developers the environment to create services and applications over the internet. The developers use the tools and the programming language supplied by the providers. The infrastructure that are provided along with the platforms are the operating systems, servers and storage. The clients have no control over these as they are hidden below the platform.Infrastructure as a Service (IaaS) is the service model in which the computer resources are provided as service to the clients. The services that are provided are the servers, storage, network components or hardware. Thus it is also called as Hardware as a Service (HaaS).

The above mentioned cloud services can be implemented or deployed depending on the structure of the organization that requires the service. [5]The deployment models are characterized as private, public, community or hybrid cloud service.Private cloud is built for one specific organization. This cloud can be managed by a third party cloud provider or the same organization. It can be existing off the premise of the organization or on the premise.Public clouds are accessible by the general public. It is owned by a cloud service provider.Community cloud is created for a specific group that has common concerns and this can be shared by several organizations that has the same concern. This cloud can be managed by a third party cloud provider or the same organization. It can be existing off the premise of the organization or on the premise.Hybrid cloud is a combination of two or more clouds of either private, public or community types. They can stay as a whole unique feature but a common

property binds it together to help in the portability of the application.

## III. RELATED WORK

*A. Porting Web Application to the Cloud*

Since several years, one of the most popular platforms for Enterprise development is Java. Large investments are done on huge Java codes by various organizations. It is found that hosting a Java application is difficult and costly since it requires many data centre resources and dedicated servers. Cloud computing can be used as an alternative to the data centers and servers. This helps to reduce and unify IT infrastructure. This leads to huge savings in cost as the application is moved to the cloud.As the use of Sun Microsystems is nearing anend, one of the most common choice as a hosting platform is Windows Server and SQL Server. One up the ladder is Windows Azure and SQL Azure.

Just moving a Java application to the cloud is the most basic step of utilizing the cloud features. To increase the yield of cloud, one has to make use of the cloud architecture and its features.

*B. Java Web Application*

Java web applications are typically implemented using Servlets or Java Server Pages running on servlet container such as Tomcat or Jetty. In order to install the latter web stacks, Microsoft provides various solution accelerators such as Windows Azure Tomcat Solution Accelerator or Windows Azure Jetty Solution Accelerator.

Java applications usually use shared session state. Ideally, cloud based applications should be stateless. One approach that is commonly used is to use a session manager provided by Azure called the AtomusTomcatAzureSessionManager. This is used to persist the session information to the table storage provided by Microsoft Azure.

*C. Potential Benefits*

One of the most important benefits by the concept of Cloud computing is the reduction in cost [6]. During this process of migration to the cloud, we found that in each case of its benefits, deep analysis is required in order to gain the best from cloud computing. The prices for the cloud computing services that are listed indicates the lowest prices for each feature even though the costs for migration are not included. Other than these low prices, few other benefits can be obtained. They are:

- Implementation of various offerings by customers in an approach that is faster than the usual process of running and testing in the developer's system. This reduces the initial costs.
- Collaboration tools can be accessed easily. This adds to the value of the product.
- Delivery to the mobile devices is made innovative with rich user interfaces and many new tools which make the product more fascinating to the modern world.

Innovations in business can be boosted in a positive angle by using the combination of various tools available. This increases the productivity of the application and it can become more effective.

## IV. STEPS FOR MIGRATING TO THE CLOUD

*A. Assessment of Cloud*

In cloud assessment, various aspects of cloud has to be assessed which includes: Cloud access cost, security and the architecture used by the cloud provider [7]. First of all, the selection of the cloud provider is a major matter of concern. During this selection, the features of the cloud services provided by them are to be considered and the differences noted. The various cloud developers considered for this study were Google's App Engine, Microsoft's Azure and Amazon's AWS.

Google App Engine costs $0.05 per hour. Azure costs upto $0.02 per hour and AWS also costs upto $0.02 per hour. The service model of GAP is PaaS, Azure provides both IaaS and PaaS and AWS provides PaaS. GAP has Web based control panel and API as the control interfaces. Azure has Web based control panel, API and command line interface. AWS has only command line interface. If a company need only storage, then Amazon is the most likely picked option. But if additional hosting services are required, then Google or Azure may be in consideration. Since cloud computing is a huge concept and no single vendor is above the other, the selection of the service provider should be based on other potential cloud services that could be integrated with storage to make the process more simple. Java applications are run on the App engine using the Java 6 Virtual machine (JVM). In order to isolate the application for security reasons and services, the JVM is made to run in a secured sandbox environment. The data that is stored in Amazon Simple Storage Service(S3) is not encrypted by AWS. Users will have to encrypt the data before uploading it. Azure is more secure because it uses firewalls, network segmentation, centralized monitoring, correlation and analysis systems [8].

*B. Proof of Principle*

In this step, the cloud is learnt and a prototype is built. The cloud assessment has made us regard Azure as the best option to migrate a web application to it. The computing instances in the Windows Azure Compute run the Windows Operating System and the applications use CPU, RAM and Hard disk. IIS machine uses Web role to host web applications and WCF services. Long-running computations use Worker role and Windows Virtual machine uses non-persistent VM roles. Azure data storage services are provided through Table storage, Queue storage and Azure blobs. Azure Table storage is a highly scalable distributed database. It can store entities with properties. Azure Queue storage works on the publish/subscribe storage and has a message queue service. Azure blobs are used for file storage and it acts as a large data store. SQL Azure is the SQL Server in the cloud. It is a highly available and a scalable relational database. For a 100MB storage, it costs about $0.0067/hour. For 1GB storage, it costs $0.0133/hour.

In order to run an application, there are two ways in Azure. They are: Azure Cloud Services which acts as a PaaS and Windows Azure Virtual Machines which acts as an IaaS. While using Windows Azure Virtual Machine, there is a creation of Virtual Machine image and the management and installation of this VM is done by the developer himself. Java developers can use the pre-built VMs like Windows. While using Windows Azure Cloud Services the developer just has tobuild the application. Scaling of instances and load

balancing are maintained automatically by the platform for the security updates.

*C. Migration of Data*

The data has to be migrated to the databases provided by the vendor. Many distributed resources together make up a cloud storage. Azure SQL is a relational database-as-a-service which is fully managed by Microsoft. It delivers elastic scale, continuity in business, predictable performance and programmatic functionality. It can be used by developers and the cloud architects for programmatic functionality in database. Blobs can be used to store binary data such as media files and documents. DocumentDB is a NoSQL document or JSON database. Oracle database images can be used in virtual machines in order that already built application with Oracle database can use this image for the storage of data.

*D. Migration of Application*

To migrate an already existing application to Azure, necessary code changes are to be done to the application. Then compilation and deployment of code is done. For this, first convert the application to Windows Azure roles. If using Cloud services, then .cspkg file should be uploaded to the Azure storage for deployment [9]. A publish settings file is required to upload the application in either a production or staging environment. Once you decide to migrate your application to Azure, start with a pilot version of your application with minimal data to build a proof-of-concept. First, implement necessary code changes in your application to meet the Azure deployment goals in terms of business and technical requirements. Then, compile and deploy the application code to the appropriate roles on Azure.

*E. More Cloud Features*

In order to increase scalability and performance optimization the application should be made such that it uses multiple roles. Through distribution of data and redundancy, the cloud storage is made highly fault tolerant. The versioned copies that are created make it highly durable.This makes the data replicas consistent. Azure has the cloud features of horizontal scaling which is implemented automatically by Microsoft.

*F. Optimization*

The data being used is monitored by Microsoft. This can be viewed in the portal in the form of graphs. Better scaling performance can be gained by reframing the code in an effective manner.

*G. Switchover*

After following all the above steps, the last step to be considered is the switchover to the cloud. During this, there should be a suspension of the services used by the application. During this time,the last few chunks of data to be stored on the cloud is copied to the cloud platform in the production stage. After this, the control is switched back to the cloud platform. This completes the process of porting a web application to the cloud.

## CONCLUSIONS AND FUTURE WORK

This paper examined current cloud computing servicesand the steps required to port a web application to the cloud. The paper captured the features of Windows Azure which was used a cloud vendor for the migration of the application.

Various data analytics methods can be used to estimate the usage of the website. Thus scaling can be achieved only when it is required, especially when the traffic is more.

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