

# Integrating Web - based Services with Distributed Computing over a Network

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**Abstract** - Past few decades has been years of revolution especially in Information Technology. Because of its omnipresent nature, evolution has taken place from standalone applications to web based applications to distributed computing. Combining interrelated features of IT gave rise to services using Distributed Computing over a network also known as Cloud Computing. Cloud computing is basically internet computing, where the data is stored, accessed and processed on remote servers via internet. This electronic document focuses on integration of web service with cloud, which gives an essence of SaaS aspect of Cloud computing. This also describes the case study to attempt an implementation of the same.

**Keywords** - *Cloud Computing, Distributed network, SaaS, Web Service, Security, Cloud Management, Hosting on Cloud.*

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## I. INTRODUCTION

Traditionally Stand alone applications were the solutions to IT industry problems. With increase in demand, stand - alone applications did not seem to be economical due to following reasons:

- Cost of purchase
- Maintenance of individual copy
- Hardware problems at both the ends

This became the bottleneck of the existing technological solutions and reason for the advent of cloud computing.

The idea of an “intergalactic computer network” was introduced in the sixties by J.C.R.Licklider. This is a vision that sounds a lot like what is called cloud computing. One of the first milestones for cloud computing was the arrival of Salesforce.com in 1999, which pioneered the concept of delivering enterprise applications via a simple website. Since then, people have explored their researches in the field of cloud computing to manage, store, monitor and data processing.<sup>[2]</sup>

Primarily web was invented to render the static documents, but today it has reached to the level where it supports multiple media, dynamic content and is getting closer to give look, feel and functionalities given by applications running on the computers and mobile phone. For developing any application, the developer has to create same application number of times to achieve compatibility with different

operating systems. However, to develop a web application, developer is not concerned about the operating system on which it runs as any computer or mobile having a browser would be able to run this web application. It is not hidden that still stand-alone applications are more powerful than web applications but if the requirements of the application are easily captured using available web technologies then one can always go for it and it is already been known that the web technology is growing rapidly. Thus, the capabilities of the web are also increasing day by day.

## II. WEB SERVICE AND CLOUD

The W3C defines a Web Service as “a software system designed to support interoperable machine-to-machine interaction over a network”. It has an interface described in a machine-processable format. Other systems interact with a Web Service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.<sup>[3]</sup>

Cloud Computing is the practice of using a network of remote servers hosted on the internet to store, manage, and process data, rather than a local server or personal computer.<sup>[1]</sup>

Providing web service over cloud is any web application or service hosted onto to cloud and accessed via internet to achieve the advantages of cloud by any IT user/firm.

There exists ample of web applications on the internet which are hosted onto the servers and not onto cloud. However, the need for cloud arises when there are many users visiting a web application and using it. A customer is satisfied if his needs are fulfilled within shortest time possible. But as the hits on the server where the intended web application is located increases, the performance is hampered due to excessive load on the server. However cloud would not suffer from this because as the web application hits increases it has a feature of load balancing which would never make customer dissatisfied. Apart from load balancing feature, the reason why one chooses to use cloud over a traditional server is because of the following cloud characteristics:

- Shared resources: consumers of cloud can access the resources like physical storage, applications, network capabilities that is overall infrastructure.
- Ease of maintenance: Instead of individual maintenance of each user's copy, a single copy is maintained on the cloud reducing the maintenance overhead of the vendor.
- Reliability and Scalability: Services provided by cloud is less prone to failures and more scalable as compared to stand alone applications. Cloud feature, software automation which performs the expansion and contraction of service as per need leads to reliability and scalability.
- Managed metering: Uses metering for managing and optimizing the service and to provide reporting and billing information. In this way, consumers are billed for services according to how much they have actually used during the billing period.
- Simplicity: The services provided by cloud would be easily accessible and simple to understand
- Ease of administration: web service provider can administrate the application at one place and thus
- Compatibility: All users would have same version of software.

### III. SOFTWARE AS A SERVICE (SaaS)

In cloud computing, service can be stated as the concept of reusing the reusable components provided by vendor. This is known as "as a service".

XaaS (X as a service) is a term which can be interpreted as "anything as a service" or "everything as a service". Some of the variations of XaaS are SaaS (Software as a Service), PaaS (Platform as a Service), IaaS (Infrastructure as a Service) and so on. Web based services comes under the category of SaaS.

Software as a Service provides an application hosted onto cloud as a service to all the intended customers. Customer uses a web browser to access the application. Also, the vendor may charge as per the usage of the application thus a single application can be used by many users helping the vendor to

earn more and also helping customer to pay less or pay as per usage.

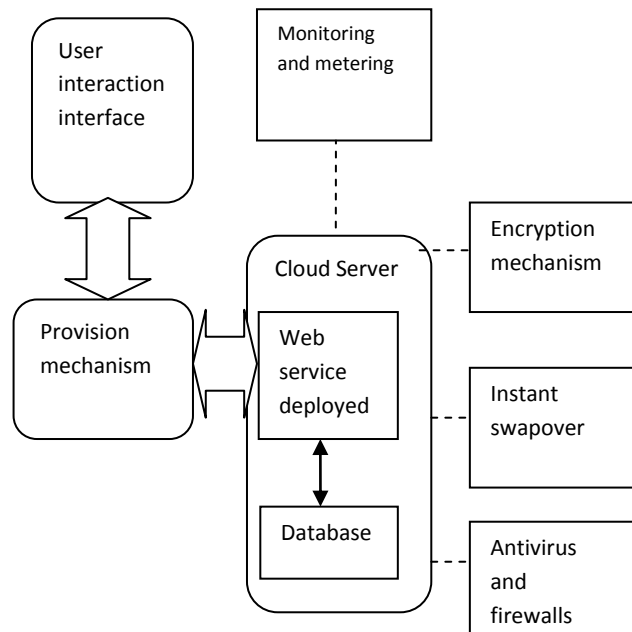


Figure 1. Interaction between client and web service

### IV. FEATURES OF THE PROPOSED SERVICE

#### A. Building of generic software

While developing a web service one always keeps in mind its users. If we are building a web application which is hosted on the cloud then a generic web service would be more appropriate. The reason being it will target large number of users hence specializing an application as per the specific needs of a few would lead to less fulfillment of the requirements of the mass. Generic web service will help vendor to get more customer and in turn getting cost benefits. Also it would reduce overall cost of the service thus also being economical to the clients.

#### B. Automating the company's recruitment process

It would allow the company to manage its recruitments more efficiently. Also it would serve in maintaining up-to-date information of every candidate in terms of his resume, interview rounds, schedules, feedback from interviewer.

#### C. Building a reliable cloud providing secure and fast access to client

Cloud that can be used to provide web service can be any of the following:

- Private cloud: If web service developer wants to gain the maximum control over the cloud handling, maintenance, scalability and security is a vital issue then he should go with the private cloud. However great deal of efforts is needed to handle private cloud leading to high cost web service.

- Public cloud: If the web service developer wants to rely on the service provider of cloud infrastructure for cloud handling, maintenance and scalability then public cloud should be chosen. Unlike private cloud the infrastructure is same for all the users of cloud. The treat in public cloud is compromise of security and limitation on configurations. However public cloud web service is most economical.

## V. CASE STUDY

This case study deals with the development a generic web service for IT firms. Why generic? So that the service can be used by any mid size IT firm. This application was responsible for handling chores of the company. The task that were performed by the web applications are listed as follows:

### A. Handling of recruitment process

The major purpose of this service would be handling up-to-date information about every candidate who has gone through the recruitment process in term of his resume, interview rounds, scheduling information, feedback of the interviewer. In brief it would contain:

- Resume submission: Candidate willing to join the company has to submit the resume to the company. Candidates who have submitted their resumes are eligible for the further recruitment process.
- Source tracking: The web service will always hold the information about from where the candidate has applied. Candidate may come from agencies, references or advertisements.
- Interview status: All candidate profiles will have this column which will specify the current interview status of that candidate. The status can be pending or completed.
- Interview Scheduling: This task is responsible for scheduling an interview. Interview scheduling task is usually performed by an HR manager and hence this feature is available only to those people who has the credentials needed to login as an HR manager. Here, by credentials it means the login ID and password for the same.
- Interview process control: Once the interview is scheduled, an automatic generated mail will be sent to both, the interviewer and candidate. Also, a reminder mail before 2 days of interview will be sent. Feedback tracking of interview will be done for future reference.

### B. Company and employee regulation system

Up-to-date information about the company project, employees, leave records, appraisal is maintained. The brief explanations are as follows:

- Company control: the IT firms who wants to use this web service will contact the developer of the web service who would be super administrator of the web service and is sole responsible for creation, retrieval, updating and removal of the company. For example,

if company “XYZ” wants to use this web service then the developer would create a company with all the necessary details.

- Post-Employment system: Administrating the tasks performed by employees is a necessity. The reasons behind it is to know
  - 1) How much time one project is taking to complete
  - 2) Whether the employee is performing off the mark
  - 3) Work remaining.
- Project management: A company most of the times deals with number of projects at a time. Also, many projects might have been completed or aborted in past. Keeping the records of the same which include Name of the project, estimated and actual hours for completion, cost, estimated and actual start and end date of the project and final status whether project is completed or not would help the organization to keep the track of it.
- Employee role handling: The administrator of the company always has a privilege to promote an employee as and when needed. So by managing various employees’ job he can always change the role of an employee. For example, making ABC an R from employee.

## VI. IMPLEMENTATION

Numerous technologies are available to develop a web service, but this implementation was done using open source technologies LAMP. LAMP is an acronym for solution stack of free, open source software, referring to the first letter of

- Linux (Operating system): There are many advantages and disadvantages of Linux, however our main advantage of Linux is its security leading to more secured web service.
- Apache HTTP Server: Highly efficient and secure as web server, support for multiple operating Systems and programming languages like PHP, PERL, Python.
- MySql (Database software)
- PHP

Together, these open source software stack provide a world-class platform for web applications.

Next concern is the deployment of the web application to the cloud. Based on the choices we are provided with from public, private and hybrid cloud; Microsoft’s windows azure public cloud was chosen. Windows Azure is a cloud computing platform and infrastructure for building, deploying and managing applications and services through a global network of Microsoft-managed datacenters. It supports many different programming languages, tools and frameworks.

Quick procedure to set up the application onto windows azure cloud:

- Setup environment
- Install all the necessary SDKs
- Create a new web site on the cloud
- Select URL
- Setup GIT
- Perform GIT publishing
- Create a SQL database
- Get SQL database connection information
- Connect to a SQL database instance.

Once done with the above steps, the web service can be seen running on the azure cloud.



Figure 2. Creation of Web service on Windows Azure



Figure 3. Index page of the Website

## VII. SECURITY CONCERNS

Security has always been a concern in IT industry, may it be data storage, processing or rendering. A complete security cannot be adhered in an application but efforts are always taken to reach to the highest security possible. Security in

cloud computing has been an issue for many web developers, providers, users and researchers. It is a two sided coin with its pros and cons.

### A. Benefits

- **Centralization:** The biggest benefit one has is the centralization of data. Managing, monitoring and securing data at one place is always more convenient than over distributed data. Any mishap can be easily detected and tackled.
- **Delegation of work:** Cloud being third party software its entire handling n security provisions are managed by cloud providers. So security is of least concern to the cloud consumer as someone else is performing that work for them. Also he will try tackle with security issues to the best of his ability as the vendor's reputation is at stake.
- **Logging:** In the virtual world of cloud computing, storage is never a problem. Thus high level logging techniques such as C2 audit trail can be employed to reach that level of granularity.

### B. Solutions

Hackers and intruders are always into finding ways to breach security, so it is better to avoid uploading critical data over web or cloud as nobody can steal the critical data that isn't there, as this is not viable so take the necessary solutions among many. Some of them can be:

- **Instant swapper:** If system detects that the security is compromised then a mechanism should be implemented over cloud that would transparently shift data to other machine. Abstracting the hardware allows to do it instantly.
- **Secure builds:** To achieve a good level of security, third party security tools can be bundled together for examples, firewalls, and antivirus and provided to the consumer of the cloud in such a way that he has the options to select the level of security he needs.
- **Encryption:** The best way to secure data is to encrypt it. Instead of saving any data onto the cloud as it is, encryption is performed to avoid direct

## VIII. FUTURE SCOPE

The project was developed successfully with all possible areas of concern thoroughly exploited. Along with these, few more modules could be added and thus could be included as future enhancements. The various enhancements which could be included in future are as follows:

- A separate module for on hold candidates during Recruitment process.
- A more Automation done regarding the monthly Expense Calculation.
- Building a more secure Private cloud.

- Thus imparting more security and related featured to the application.

## IX. CONCLUSION

Here in this paper, the term web service and its deployment on cloud were discussed. Also it dealt with some of the key features of the application, SaaS, case study, cloud security concerns and its future scope

Thus, the service described in the paper would serve as a generic utility for any IT firm. The cloud based management would also reduce the work of the maintainer.

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